

# ***Evidence Synthesis***

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# **Primary Care Interventions to Prevent Child Maltreatment: An Evidence Review for the U.S. Preventive Services Task Force**

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## Structured Abstract

**Purpose:** To systematically review evidence on the benefits and harms of interventions provided in or referable from primary care to prevent child maltreatment for the U.S. Preventive Services Task Force.

**Data Sources:** MEDLINE, the Cochrane Library, and trial registries through February 2, 2023; bibliographies from retrieved articles, outside experts, and surveillance of the literature through December 6, 2023.

**Study Selection:** Two investigators independently selected studies using a priori criteria. Eligible trials (1) enrolled children (from birth through age 18 years with no known exposure to maltreatment and no signs or symptoms of current or past maltreatment) or their caregivers; (2) evaluated interventions feasible in a primary care setting or that could result from a referral by a primary care provider; and (3) reported abuse or neglect outcomes or proxies for abuse or neglect (injury, visits to the emergency department [ED], hospitalization) or harms.

**Data Extraction:** One reviewer extracted data and a second checked accuracy. Two reviewers independently rated methodological quality for all included studies using predefined criteria. When at least three similar studies were available, we conducted meta-analyses.

**Data Synthesis:** Twenty-five trials (N=14,355 participants) provided evidence on benefits of child maltreatment interventions. We found no evidence of differences in reports to child protective services (CPS) within 1 year of intervention completion (pooled odds ratio: 1.03 [95% confidence interval, 0.84 to 1.27]; 12.9% [intervention] vs. 12.2% [control]; 11 studies; 5,311 participants) or removal of the child from the home within 1 to 3 years of followup (pooled risk ratio: 1.06 [95% CI, 0.37 to 2.99]; 3.9% [intervention] vs. 3.5% [control]; 5 studies; 3,336 participants). Owing to heterogeneity of outcome measures, we could not pool other results, but the evidence either demonstrates no benefit or was inconclusive for abuse, neglect, or their sequelae. The evidence suggested no benefit for ED visits in the short-term (<2 years) and hospitalizations. The evidence was inconclusive for long-term outcomes for reports to CPS and ED visits ( $\geq 2$  years), because results were inconsistent and imprecise. The evidence was also inconclusive for injuries, failure to thrive, failure to immunize, internalizing and externalizing behavior symptoms, child development, school attendance, school performance, prevention of death, and other measures of abuse or neglect because of the limited number of trials reporting on each outcome and imprecise results. Among two trials reporting harms, neither reported statistically significant differences in harms. Contextual evidence indicated (1) widely varying reporting practices, including variations by race and ethnicity; (2) poor to good accuracy of screening instruments; and (3) evidence that child maltreatment interventions may be associated with improvements in some social determinants of health (such as economic stability, education access and quality, healthcare access and quality, and social and community context).

**Limitations:** The scope of this review limited conclusions to primary care–relevant interventions for children who have not experienced maltreatment with evidence focused on direct or proxy measures of child maltreatment. Other limitations included the heterogeneity of outcome measures and the limited information on harms. We identified no gold standard instruments for

identifying child maltreatment in our review of contextual evidence. Both parent-reported abuse and neglect measures and child welfare measures such as reporting to child protective services, or substantiated reports of abuse may reflect over- or underreporting of true child maltreatment occurrence.

**Conclusions:** The evidence base on interventions feasible in or referable from primary care settings to prevent child maltreatment suggests no benefit for some outcomes (reports to CPS, removal of the child from the home, visits to the emergency department, hospitalization, child development) and is insufficient to demonstrate benefits for other direct or proxy measures of child maltreatment. Limited or no information was available about possible harms.

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# Chapter 1. Introduction

## Scope and Purpose

The U.S. Preventive Services Task Force (USPSTF or Task Force) will use this report to update its 2018 recommendation on primary care–based or referable interventions to prevent child maltreatment. In 2018, the USPSTF concluded that the evidence was insufficient to assess the balance of benefits and harms of primary care interventions to prevent child maltreatment.<sup>1</sup> This report will summarize the evidence for the benefits and harms of interventions to prevent maltreatment among children and youth younger than 18 and identify key gaps in the scientific literature. Assessing the evidence on interventions for children with signs and symptoms of maltreatment or known exposure to child maltreatment is outside of the scope of this report. In 2004, this topic included evidence on screening, but poor accuracy of screening coupled with harms of screening (e.g., legal consequences, stigma) led to a change in scope to behavioral counseling.

## Condition Background

### Condition Definition

Child maltreatment, which includes child abuse and neglect, has profound consequences for health and well-being. The World Health Organization (WHO) defines child maltreatment as “the abuse and neglect that occurs to children younger than 18 years of age. It includes all types of physical and/or emotional ill-treatment, sexual abuse, neglect, negligence and commercial or other exploitation, which results in actual or potential harm to the child’s health, survival, development or dignity in the context of a relationship of responsibility, trust or power.”<sup>2</sup> In 2008, the Centers for Disease Control and Prevention recommended a set of uniform definitions to support public health surveillance of maltreatment.<sup>3</sup> These definitions differentiate between child abuse as “acts of commission” and child neglect as acts of “omission.” Child abuse is defined as “words or overt actions that cause harm, potential harm, or threat of harm to a child. Acts of commission are deliberate and intentional.”<sup>3, p. 11</sup> Physical abuse, sexual abuse, and psychological abuse constitute child abuse. Child neglect is defined as “the failure to provide for a child’s basic physical, emotional, or educational needs or to protect a child from harm or potential harm.”<sup>3, p. 11</sup> Physical, emotional, medical and dental, and educational neglect constitute failure to provide. Inadequate supervision and exposure to violent environments constitute failure to supervise. For both acts of commission and omission, harm to a child might not be the intended consequence.

The Federal Child Abuse Prevention and Treatment Act (CAPTA), passed in 1974, was the first attempt in the United States to advance nationwide efforts in identifying, preventing, and treating child maltreatment.<sup>4</sup> In its most recent reauthorization bill (November 2021), the term “child abuse and neglect means, at a minimum, any recent act or failure to act on the part of a parent or caretaker, which results in death, serious physical or emotional harm, sexual abuse or

exploitation (including sexual abuse)” or “an act or failure to act which presents an imminent risk of serious harm.” The bill states that sexual abuse includes, “(A) the employment, use, persuasion, inducement, enticement, or coercion of any child to engage in, or assist any other person to engage in, any sexually explicit conduct or simulation of such conduct for the purpose of producing a visual depiction of such conduct; and (B) the rape, and in cases of caretaker or inter-familial relationships, statutory rape, molestation, prostitution, or other form of sexual exploitation of children, or incest with children).”<sup>5</sup>

The CAPTA definition serves as a minimum standard nationally, but each State provides its own definition of child abuse and neglect.<sup>6</sup> Minimum standards vary across States and within States across time as new legislation is adopted. The Child Welfare Information Gateway, a service of the Children’s Bureau of the U.S. Department of Health and Human Services’ Administration for Children and Families, summarizes State definitions of child abuse and neglect that determine when State child protective agencies intervene.<sup>7</sup> These definitions, as of March 2019, are summarized in **Appendix A**. Although CAPTA offers a minimum threshold, variations in State laws and definitions result in a heterogeneous landscape of definitions, operationalization, and research. An Institute of Medicine report on child abuse and neglect noted that this heterogeneity has impeded full understanding of the scope of child maltreatment but also offers an opportunity to conduct and learn from natural experiments.<sup>8</sup>

## Etiology and Natural History

Maltreatment—that is, abuse and neglect in childhood—can result in serious negative physical, psychological, and behavioral consequences that can span a life course and influence subsequent generations.<sup>8</sup> The immediate aftermath of abuse can include injuries, brain trauma, disabilities, and death, while neglect can result in failure to thrive, infections, malnourishment, lack of needed medical care, and death.<sup>9</sup> In fact, in 2019, 73 percent of children who died from maltreatment suffered from neglect alone or in combination with another type of maltreatment.<sup>10</sup>

Although neglect may not be as apparent as abuse, it also has profoundly negative consequences on children.<sup>9</sup> Child maltreatment can also lead to long-term chronic health problems such as diabetes, high blood pressure, obesity, brain or vision problems, lung disease, and functional limitations and increase the risk for heart attack, cancer, stroke,<sup>11,12</sup> and premature death.<sup>13</sup> Evidence suggests that child maltreatment can be associated with epigenetic changes in stress response with potential lifetime effects.<sup>14,15</sup>

Psychological consequences of maltreatment include diminished executive functioning,<sup>16,17</sup> diminished school performance,<sup>18</sup> weakened cognitive skills, poor mental and emotional health, attachment and social difficulties, and posttraumatic stress.<sup>19-24</sup> Child maltreatment appears to alter the response to treatment for depression, resulting in differential<sup>23</sup> or poor response<sup>24</sup> to treatment. Behavioral consequences of maltreatment include unhealthy sexual practices leading to earlier initiation of sex, multiple sexual partners, transactional sex, unprotected sex, and the risk of sexually transmitted infections.<sup>25-28</sup> Adverse childhood experiences, including abuse and neglect, are associated with unwanted pregnancies.<sup>29,30</sup> Behavioral consequences can also include juvenile delinquencies and adult criminality,<sup>31</sup> alcohol and other drug use,<sup>32,33</sup> and future perpetration of maltreatment<sup>11</sup> and intimate partner violence.<sup>11,34,35</sup>



## Risk and Protective Factors

Child maltreatment is rarely caused by a single risk factor and more often is the result multiple risk factors.<sup>36</sup> However, the presence of risk factors does not guarantee that maltreatment will occur, nor does their absence eliminate the chance that maltreatment will occur.<sup>37,38</sup> As a result, risk assessment tools have poor to good accuracy (**Appendix A CQ 2**), with areas under the receiver operating characteristic curve ranging from 0.31 to 0.89; sensitivities range from 14.8 to 97.0 percent, and specificities range from 16.6 to 98.5 percent. Instruments in settings that are not applicable to primary care (emergency departments [EDs] and hospitals) have consistently higher accuracy (areas under the receiver operating characteristics curve [AUCs] range from 0.78 to 0.89) than instruments in settings applicable to primary care (AUCs range from 0.31 to 0.85). Instruments can be classified as actuarial (instruments based solely on empirically established relationships of risk factors and child maltreatment) or clinical (instruments based on the judgment of a professional or a group of experts).<sup>39</sup> Actuarial instruments may be better at predicting the onset of maltreatment than clinical instruments, but both have poor to good accuracy. Actuarial sensitivity ranges from 61.1 to 96.8 percent, and specificity ranges from 16.6 to 98.5 percent. Clinical sensitivity ranges from 14.8 percent to 97.0 percent, and specificity ranges from 21.0 to 98.25 percent. Differences in the accuracy of these instruments by race or ethnicity are unclear (**Appendix A CQ 2**).

Several studies have assessed characteristics that may increase a child's risk for maltreatment. Risk factors can be broadly grouped into the categories of parental risk factors, child risk factors, and societal/community risk factors. Parental characteristics associated with increased risk of child maltreatment include substance use, mental health problems, presence of intimate partner violence in the home, lack of social supports, the parent/caregiver being maltreated as a child, financial stress, and the parent being emotionally absent.<sup>38,40-42</sup> Child risk factors include the child experiencing prior maltreatment, developmental delays and other special healthcare needs,<sup>43</sup> disabilities,<sup>44</sup> and gender (female children are more likely to be victims of sexual abuse).<sup>45</sup> The risk of maltreatment with respect to the child's age varies depending on the type of maltreatment; younger children and infants are at higher risk of neglect,<sup>46</sup> and older children and adolescents are at higher risk for physical and sexual abuse.<sup>45</sup> Regarding community factors, high rates of poverty, high rates of community and neighborhood violence, high local unemployment rates, and weak social networks within communities are associated with higher rates of child maltreatment, particularly when measured by verified reports by child protective services (CPS).<sup>37,38,47</sup>

More recent research has assessed factors that may play a role in mitigating risk of the occurrence of child maltreatment and mitigating the negative outcomes of child maltreatment after it has occurred. These factors are believed to exert their effect by strengthening families; strengthening connections with peers and community members; and, as a result, increasing parent or child resilience.<sup>48</sup>

Several studies have looked at the characteristics of children that seem to promote positive outcomes after maltreatment, which include self-regulation skills, adaptive functioning, social competence, and self-esteem.<sup>49,50</sup> Parent and family factors that reduce risk of maltreatment include family connection, which is associated with children thriving, even in the setting of other

adverse circumstances. Strong family supports are also associated with reduced risk of maltreatment, including in the prevention of intergenerational transmission of harsh parenting.<sup>49,51-57</sup> Social and environmental protective factors include easy access to healthcare and social services and neighborhood social cohesion.<sup>58,59</sup> Societal factors also appear to have a role with mitigating risk of child maltreatment. Paid family leave has been found to be associated with reduced hospitalizations for abusive head trauma,<sup>60</sup> and increases in the minimum wage have been associated with fewer CPS investigations.<sup>43,61</sup>

## Prevalence and Burden of Disease

Because measures of prevalence rely on known or self-reported cases of maltreatment, substantiated numbers likely are an underestimate of prevalence. In the United States, child maltreatment reports to CPS are one important measure of prevalence of maltreatment. In 2021, data from the National Child Abuse and Neglect Data System (NCANDS) indicated that nationally, CPS received 4.0 million referrals for suspected abuse or neglect, representing 7.2 million children (27.6 screened-in referrals per 1,000 children nationwide).<sup>62</sup> Fewer than half of these children (3.0 million), or 42 percent, received an investigation or an alternative response, identifying approximately 600,000 victims of abuse or neglect. Of these children, 76.0 percent were victims of neglect, 16.0 percent were victims of physical abuse, and 10.1 percent were victims of sexual abuse.<sup>62</sup> Rates for other forms of neglect were not reported in 2021. In 2020, 6.4 percent were victims of psychological maltreatment, 1.9 percent were victims of medical neglect, and 6.4 percent were victims of other forms of abuse or neglect (such as lack of supervision, threatened abuse or neglect, or parent drug/alcohol addiction).<sup>63</sup> Young children are the most vulnerable. More than a quarter of victims (27.8%) are between birth and 2 years of age. Victimization rates decrease with age from a high of 25.3/1,000 for children under 1 year of age, sharply at first, to a rate of 10.7/1,000 for children between ages 1 and 2 and then to a relatively steady rate in older children and younger adolescents ranging from 7.7/1,000 for 7-year-old children to 5.0/1,000 for 16-year-old youth. Rates of victimization were slightly higher for girls (8.7/1,000) than for boys (7.5/1,000); the average rate is 8.1 per 1,000 children.<sup>62</sup> Rates of victimization also vary by race/ethnicity; they were highest among American Indian or Alaska Native children (15.2/1,000), followed by Black children (13.1/1,000), children of multiple races (10.3/1,000), Pacific Islander children (8.5/1,000), Hispanic children (7.7/1,000), White children (7.1/1,000), and Asian children (1.4/1,000).<sup>62</sup> Structural, institutional, and interpersonal racism can contribute to variations in risk factors and differential identification and reporting to CPS which then lead to differences in prevalence by race; a detailed discussion follows in the section below on racial patterns in prevalence. An estimated 1,820 children died from abuse and neglect in 2021.<sup>62</sup> Child abuse mortality rates are consistently among the highest rates in highly developed nations.<sup>64,65</sup> The total lifetime cost of substantiated fatal and nonfatal cases of child maltreatment incurred annually in the United States in 2015 was estimated to be \$428 billion,<sup>66</sup> up from a prior estimate of \$124 billion in 2010.<sup>67</sup>

Reports, investigations, and substantiated victims are one important way to understand the prevalence of maltreatment. However, not all acts of maltreatment are reported to authorities. The National Incidence Study of Child Abuse and Neglect (NIS)<sup>68</sup> is a congressionally mandated effort to provide estimates of the incidence of child abuse and neglect in the United States. The NIS obtains data on children who were investigated by CPS and on children who were

recognized as maltreated by community professionals but not reported to CPS. The fourth and most recent wave of data collection was completed in 2005–2006. Approximately 1.25 million children (17/1,000) were harmed by maltreatment (harm standard), and nearly 3 million children were at risk of harm from maltreatment (40/1,000 by the endangerment standard).<sup>68</sup> Estimates of childhood maltreatment obtained via self-report were even larger than rates reported by CPS and NIS. Approximately 11,000 participants ages 18 to 26 years in the National Longitudinal Study of Adolescent Health self-reported on maltreatment experienced before sixth grade. Forty-two percent reported supervision neglect, 28 percent reported physical assault, 12 percent reported physical neglect, and 5 percent reported contact sexual abuse.<sup>69</sup>

Some surveys and many primary studies of interventions commonly documented parent-reported measures of abuse or neglect. In surveys, these measures are heterogeneous and have the potential to underreport abuse and neglect.<sup>70</sup> One study compared rates of maltreatment types across four different data sources: the National Survey of Children Exposed to Violence, or NatSCEV (caregiver and child reports on the Juvenile Victimization Questionnaire); Gallup (parent only, Parent–Child Conflict Tactics Scale); NIS (cases investigated by CPS and known to community professionals); and NCANDS (cases substantiated by child protection agencies) in the United States.<sup>71</sup> The study reported higher rates in parent-only or caregiver-and-child reported measures when compared with known or substantiated cases for physical, emotional, or sexual abuse or neglect. These results were roughly consistent despite differences in the measure, respondent, and time period for NatSCEV and Gallup for physical (4.0% vs. 4.9%) and sexual abuse (2.2% vs. 1.9%). For emotional abuse and neglect, however, the studies reported inconsistent rates (5.6% in NatSCEV vs. 19.1% in Gallup for emotional abuse; 4.7% in NatSCEV vs. 27.0% in Gallup for neglect). Variations in measures and respondents could explain these differences. These results suggest that measurement issues are a likely ongoing concern for emotional abuse and neglect, which are large contributors to child maltreatment.

A contextual synthesis of parent-reported measures in the 2018 evidence synthesis for the USPSTF found wide heterogeneity of measures, inconsistent results within studies across different measures, use of selected subscales without clear reporting on an a priori selection of measures, and potential for chance findings.<sup>72</sup>

### **Racial Patterns in Prevalence**

A systematic review of disparities in the child welfare system found evidence of overrepresentation of Black children in the source of referral, the reason for investigation, caregiver risk factors, and outcomes of being in the child welfare system in the United States.<sup>73</sup> One study reported higher rates of both false-positives and false-negatives in referrals leading to substantiation, suggesting lower accuracy for Black children at the “front-end” of the child welfare system.<sup>74</sup> The latest round of NIS data, drawing from a 2005–2006 survey, found higher rates of maltreatment (cases investigated by CPS and known to community professionals) among Black children when compared with White children, even after controlling for predictors of maltreatment. Further exploration of these results suggested correlation with socioeconomic status.<sup>75</sup> Studies have also demonstrated overrepresentation of children from minoritized groups, more missed cases among White children, and differences in evaluation when assessing outcomes such as head injury and fractures.<sup>76-78</sup>

Although Black children are disproportionately represented in the child welfare system, the reasons for this disparity are complex and continue to be debated. Explanations for these differences center around racism in reporting arising from subjectivity, inconsistency, and implicit bias,<sup>79-81</sup> including in diagnosis and reporting on the part of pediatricians;<sup>82</sup> institutional racism arising from policies and processes that are biased against Black children;<sup>83</sup> and structural factors putting Black families at greater disadvantage and higher exposure to risk factors for maltreatment,<sup>84-86</sup> such as poverty and single parenthood. Exploring these risk factors further reveals additional overlays of structural factors, including geography. For example, the links between poverty, race, and reporting for maltreatment are complex; individual, familial, community, and structural issues may serve as confounders between poverty and reporting for maltreatment. These relationships are further complicated by segregation by race or ethnicity.<sup>81</sup> Neighborhood effects may also play a role: Black families are more likely than White families to live in impoverished neighborhoods and tend to have greater exposure to social service agencies and law enforcement.<sup>81,87</sup> Spatial effects can also be complex, with greater disparity in maltreatment in most and least densely populated counties.<sup>84</sup> Studies examining geographic distributions have found associations between geography, race, and overrepresentation of Black children in the welfare system, suggesting a complex set of mechanisms that include risk factors, behavior, differences in definition and application of child maltreatment standards, and structural racism.<sup>81,84</sup>

The more limited evidence on reasons for the disproportionate rates of victimization among American Indian or Alaska Native children also point to the co-occurrence of factors such as poverty and public health insurance that could lead to a higher rate of reporting among American Indian/Native Alaskan children.<sup>88</sup> One study continued to find a higher rate of American Indian/Native Alaskan children being assigned maltreatment diagnosis codes even after adjusting for other factors such as public health insurance, age of the mother, sex of the child, and admission year.<sup>88</sup> Whether the differential could be attributed to the severity of the presenting problem or racial bias or not was unclear. Factors such as higher rates of adverse childhood experiences, including family substance abuse and family interpersonal violence that are risk factors for maltreatment, are higher among American Indian/Alaska Native persons.<sup>89,90</sup> Historic racial trauma,<sup>91</sup> forced removal of children from families to boarding schools, and cycles of generational trauma<sup>92</sup> serve as a backdrop to higher rates of adverse childhood experience and risk factors for maltreatment.

Although rates of victimization among Hispanic children are higher than White children nationally (7.7/1,000 vs. 7.1/1,000 in 2021), state-level analyses suggest a more complex picture where Hispanic children may be either under- or overrepresented for child maltreatment when compared to White children. The term “Hispanic” covers a very heterogeneous population in terms of immigration status, income, culture, and assimilation. The spatial concentrations of these factors may result in overrepresentation of Hispanic children among those reported to CPS in some states and underrepresentation in others.<sup>93</sup>

The potential for disparities in the child welfare system exists at every stage but particularly prior to entry, at the front-end (that is, prior to intake into the child welfare systems), which suggests the need for more contextual information on differences in race and ethnicity in current practices

for identifying children at risk of maltreatment (**Appendix A Contextual Question [CQ] 1**) and the validity and reliability of risk assessment tools (**Appendix A CQ 2**).

**Appendix A CQ 1** presents contextual information on current practices and variations in these practice by race and ethnicity of the child in the identification/diagnosis and reporting of child maltreatment. In brief, when comparing the accuracy of reporting to child protective services (CPS) against substantiation of maltreatment from the 2006 NCANDS, the ratio of false-positives to false-negatives was higher in Black children (1.71) than in White children (1.54) suggesting a clear pattern of disparity by race.<sup>74</sup> Variations in approach to the diagnosis of physical abuse may have led to higher rates of missed diagnoses of physical abuse for White children (37%) than children overall (31%).<sup>77</sup> Differences in insurance and clinician bias may be contributing to discrepancies in diagnosis by race, but the use of guidelines appear to reduce variations in care. Regarding reporting, differences by State, individual characteristics such as informant type and Medicaid-eligibility or lack of insurance, household composition, and structural factors such as occupancy rate and proportion of Medicaid patients in hospitals could explain wide variations in overall reporting. Evidence to explain these disparities is not clear or consistent. Maternal risk factors (such as prenatal care, maternal education, and number of children), socioeconomic status, insurance status, clinician judgment, and community-level factors may play a role in explaining these racial and ethnic differences in reporting.

## Rationale for Intervention

The field of public health has been instrumental in the development of a framework for organizing three levels of intervention services for preventing child maltreatment and neglect.<sup>94</sup> The focus of this review is on prevention programs relevant to primary care. Included interventions focus on children who are at risk for maltreatment or neglect without signs and symptoms of maltreatment, with a goal of preventing abuse or neglect from occurring. Interventions without links to the clinical setting are ineligible for the review.

Eligible interventions are primary care–feasible or referable; in other words, they may be (1) delivered in primary care settings, (2) feasible for delivery in primary care, or (3) referable from primary care settings. To be feasible in primary care, the USPSTF guidance notes that “the intervention could target patients seeking care in primary care settings, and the skills to deliver the intervention are or could be present in clinicians and/or related staff in the primary care setting.”<sup>95, p. 15</sup> To be referable from primary care, “the intervention could generally be ordered/initiated by a primary care clinician.”<sup>95, p. 15</sup>

Primary care–feasible or referable prevention programs may be implemented in settings including the home, primary care, school, and community-based settings. Social determinants of health (SDOH), such as poverty, food or housing insecurity, and lack of insurance, are associated with child maltreatment.<sup>96</sup> The rationale for screening for SDOH and referral of those at risk to programs to ameliorate basic needs aligns with national and State approaches focused on promoting protective factors to mitigate risks for child maltreatment and improve well-being.<sup>97</sup> Interventions comprising multiple components to address these varied needs may be delivered in person (as is the case with many home visitation programs) and additionally include telehealth support. **Table 1** and **Appendix A** list potential types of interventions to prevent child

maltreatment. Key questions (KQs) address the effectiveness of interventions to prevent child maltreatment and harms of such interventions. Whether these interventions change the SDOH that are associated with child maltreatment is unclear and is the subject of CQ 3 (**Appendix A**).

## **Recommendations and Clinical Practice**

Existing guidelines either recommend against screening because of insufficient evidence,<sup>98</sup> note the risk of false-positives or mislabelling,<sup>99</sup> or make no statement on screening.<sup>100</sup> Guidelines vary substantially in their confidence in interventions to prevent child maltreatment (**Appendix A Table 4**). The American Academy of Family Physicians reaffirms the USPSTF's position of insufficient evidence to recommend preventive interventions in a clinical setting to prevent child maltreatment in children without signs and symptoms of maltreatment. Other guideline groups such as the Canadian Task Force on Preventive Health Care and the Community Preventive Services Task Force recommend home visitation programs.<sup>99,100</sup> The American Academy of Pediatrics recognizes the pediatrician's unique role in identifying and protecting children and recommends offering anticipatory guidance and referring families to programs and resources to promote safe, stable, nurturing relationships with the aim of preventing maltreatment.<sup>101</sup> The American Academy of Family Physicians offers a list of steps that primary care physicians can take, while acknowledging insufficient evidence on screening and behavioral interventions.<sup>102</sup>

## Chapter 2. Methods

### Key Questions and Analytic Framework

The investigators, USPSTF members, and Agency for Healthcare Research and Quality (AHRQ) Medical Officers developed the scope, KQs, and analytic framework (**Figure 1**) that guided the literature search and review. Two KQs guide this review:

1. For children without obvious signs and symptoms of abuse or neglect, do primary care–feasible or referable preventive interventions reduce exposure to abuse or neglect; improve behavioral, developmental, emotional, physical, or mental health and well-being; or reduce mortality? Does the effectiveness of interventions differ by populations of interest (e.g., defined by child or caregiver characteristics such as age, developmental stage of the child, sex, gender identity, race and ethnicity, sociodemographic characteristics [rural/urban location, place of residence, family income or wealth], or special healthcare needs)?
2. What are the harms from interventions intended to prevent child maltreatment? Do the harms of interventions differ by populations of interest (e.g., defined by child or caregiver characteristics such as age, developmental stage of the child, sex, gender identity, race and ethnicity, sociodemographic characteristics [rural/urban location, place of residence, family income or wealth], or special healthcare needs)?

In addition to the KQs, this review included three CQs to help inform the report:

1. What are current practices for a) identifying children at risk of maltreatment, b) referring children or families to prevention programs, c) reporting children or families to CPS, and d) diagnosing child maltreatment outcomes? Do current practices in identification, referral, reporting, and diagnosis of outcomes of child maltreatment differ by race or ethnicity of the child or caregiver? If evidence exists of practice differences, what factors might explain these differences?
2. What are the validity and reliability of risk assessment tools to identify children and adolescents who are at risk of child maltreatment? Does the reported validity and reliability (of risk assessment tools) differ by race and ethnicity? If yes, what might explain these differences? Is there evidence that these tools alter or increase inequity?
3. What are the effects of primary care–feasible or referable preventive interventions that report on child maltreatment outcomes on SDOH? Do primary care–feasible or referable preventive interventions that report on child maltreatment outcomes examine the association between SDOH and child maltreatment outcomes?

These CQs were not a part of our systematic review. They are intended to provide additional background information. Literature addressing the CQs is summarized in **Appendix A**.

## Data Sources and Searches

We searched MEDLINE® (via PubMed), the Cochrane Library, and Health and Psychosocial Instruments for English-language articles published from June 18, 2016, through January 3, 2022. We conducted a bridge search on February 2, 2023. We used Medical Subject Headings as search terms when available and keywords when appropriate, focusing on terms to describe relevant populations, screening tests, interventions, outcomes, and study designs. **Appendix B1** describes the complete search strategies.

To supplement electronic searches, we reviewed the reference lists of pertinent review articles and studies meeting our inclusion criteria and added all previously unidentified relevant articles. We reassessed all articles in the 2018 report.

We also conducted targeted searches for unpublished literature by searching ClinicalTrials.gov, Cochrane Clinical Trials Registry, and the WHO International Clinical Trials Registry Platform. We conducted ongoing surveillance of the literature from February 2023 onward through article alerts and targeted searches of journals to identify major studies published in the interim that may affect the conclusions or understanding of the evidence and the related USPSTF recommendation. The last surveillance was conducted on December 6, 2023, and identified no additional unique studies.

## Study Selection

We selected studies on the basis of inclusion and exclusion criteria developed for each KQ for identifying populations, interventions, comparators, outcomes, timing, settings, and study designs (PICOTS) (**Appendix B2**). **Appendix C** lists studies excluded at the full-stage review stage. We imported all citations identified through searches and other sources into EndNote X9™. In addition to searches for the updated literature, we incorporated all references from the previous report from 2018.<sup>72</sup>

Two investigators independently reviewed titles and abstracts. We dually and independently reviewed the full text of abstracts marked for potential inclusion by either reviewer. We resolved disagreements by discussion and consensus.

## Population

The focus of the review is on children and adolescents (younger than age 18 years) with no known exposure to maltreatment and no specific signs or symptoms of current or past maltreatment. We required included studies to have a majority of children (>50%) without known exposure to maltreatment and no signs or symptoms of current or past maltreatment. We excluded studies consisting entirely of symptomatic children and adolescents undergoing diagnostic evaluation for conditions related to abuse or neglect, children with known exposure to child maltreatment, children of caregivers who perpetrated maltreatment toward them, and perpetrators of maltreatment. For this update, we included populations of interest defined by child or caregiver characteristics such as age, developmental stage of the child, sex, gender



identity, race and ethnicity, sociodemographic characteristics (rural/urban location, place of residence, family income or wealth), or special healthcare needs.

## Interventions

We included studies that evaluated services that were feasible in a primary care setting or to which primary care provider could refer children (**Table 1**). These services may have been implemented by a non-clinician; they may also have included one or more of a complex package of programs such as home-visiting programs, primary care–based programs, respite care, parent education programs, and family support and family-strengthening programs. We excluded communitywide programs, such as public awareness campaigns or public service announcements, without specific interventions linked to clinical settings.

## Comparators

Eligible comparators included usual care and delayed interventions. We also included active interventions that allowed for assessment of the independent contribution of the primary care–feasible or referable preventive intervention (e.g., clinical interventions plus media campaigns vs. media campaigns).

## Outcomes

We required that all studies report direct or proxy measures of abuse or neglect. Direct measures include those reflecting physical, sexual, or emotional abuse perpetrated by a parent or caregiver. We excluded self-report but included reports to CPS and removal of the child from the home as outcome measures. Because these measures of abuse or neglect were likely to be rarely observed, we also included proxies for maltreatment such as injuries, visits to the ED and hospitalizations, failure to thrive, and failure to immunize. These proxy measures have low specificity to abuse or neglect, but their inclusion in the report was intended to capture a broad array of outcomes that might reflect potential benefits from the intervention. For studies that reported direct or proxy measures of abuse or neglect (other than self-report), we then evaluated behavioral, developmental, emotional, mental, or physical health and well-being; mortality; and harms. Compared to the previous review, we added two new types of eligible outcomes (quality of life or functional status measures; unintended pregnancy, sexually transmitted infections, or termination of pregnancy of the child) and further specified examples of eligible outcomes (e.g., added community involvement in examples of social–emotional results). As with our inclusion of proxy measures of abuse or neglect, we intended to be broadly inclusive of health and well-being outcomes to collect evidence of benefit.

## Settings

We included studies that occurred in primary care or school-based clinics or other settings (such as the home). We required that studies were conducted in countries categorized as “very high” on the Human Development Index.<sup>103</sup>

## Study Designs

We limited KQ 1 to randomized, controlled trials (RCTs). For KQ 2, we also searched for eligible cohort trials with a control group and case-control studies.

## Data Abstraction and Quality Rating

For each newly included study, one investigator extracted pertinent information about the PICOTS and study designs (**Appendix D**). A second investigator checked all data extractions for completeness and accuracy. Among included studies from the 2018 report, one reviewer checked for relevant data based on newly included outcomes as well as the accuracy of previously generated abstraction tables and updated them as needed.

We assessed the quality of studies as good, fair, or poor using predefined criteria developed by the USPSTF and adapted for this topic (**Appendix B3**) using the Cochrane ROB 2.0 for randomized studies of interventions<sup>104</sup> (individual study ratings provided in **Appendix E**). Two investigators independently evaluated the risk of bias of each newly included study. We checked the quality ratings of all eligible studies from 2018 to ensure that studies met our current quality rating criteria. Only results from fair- and good-quality studies were included in the synthesis. We resolved disagreements by discussion and consensus. We rated studies as poor quality (i.e., high risk of bias) for the following reasons: outcome assessors not masked, concerns about missing outcome data, inadequate randomization, and no intention-to-treat analysis.

## Data Synthesis and Analysis

We evaluated the findings for each outcome, first using a qualitative approach that considered the clinical and methodological characteristics of the evidence base. We paid close attention to PICOTS criteria in evaluating heterogeneity and summarized study characteristics for the evidence base for each outcome in **Appendix F**. With relatively rare outcomes such as reports to CPS, removal from the home, and hospitalizations, a longer time period for observation of outcomes allows for a greater accumulation of events, but it also increases both the likelihood of unmeasured co-interventions that vary differentially between arms and the attenuation of intervention effects overall. Because of the potential heterogeneity of combining longer-term outcomes with studies reporting results at or close to the end of the intervention, we generally limited meta-analyses to the first report of outcomes from studies (generally within a year of study completion) and stratified results by timing of followup.

We then presented results either qualitatively or quantitatively. We generated pooled estimates when at least three similar studies were available, using the Comprehensive Meta Analysis program.<sup>105</sup> For all meta-analyses, we used random effects models using the inverse-variance weighted method (DerSimonian and Laird) and calculated the chi squared statistic and the  $I^2$  statistic (the proportion of variation in study estimates due to heterogeneity) to assess statistical heterogeneity in effects between studies.<sup>106,107</sup> An  $I^2$  from 0 to 40 percent might not be important, 30 to 60 percent may represent moderate heterogeneity, 50 to 90 percent may represent

substantial heterogeneity, and 75 to 100 percent represents considerable heterogeneity.<sup>108</sup> The importance of the observed value of  $I^2$  depends on the magnitude and direction of effects and on the strength of evidence for heterogeneity (e.g., p-value from the chi squared test or a confidence interval for  $I^2$ ). However, as precision and the number of participants increase,  $I^2$  may become inflated toward 100 percent and may not reflect clinically relevant heterogeneity.<sup>109</sup>

## **Expert Review and Public Comment**

A draft research plan for this topic was posted on the USPSTF website for public comment from February 17, 2022, through March 16, 2022. In response to comments, we added greater specificity to the analytic framework and KQs 1 and 2 by adding “developmental health” as an outcome. We also added, to population characteristics of interest for KQs 1 and 2, developmental stage of the child; we specified that sociodemographic characteristics include rural/urban location, place of residence, and family income or wealth. We added “worsening of inequities” as a potential harm in KQ 2. Reviewers also suggested including SDOH as outcomes; we added CQ 3 to explore this issue.

The draft evidence review was reviewed by content experts, representatives of Federal partners, USPSTF members, and AHRQ Medical Officers and was revised based on comments received. Specifically, we expanded the section on prevalence to include information on American Indian/Alaska Native youth. We removed data on some maternal outcomes (unintended pregnancy, pregnancy termination, sexually transmitted infections) to focus attention on child outcomes as intended in our protocol. We revised the report for clarity and expanded the section on review limitations. The draft evidence review was also posted for public comment, and a newly identified study was added to the report as a result of public comments..

## **USPSTF and AHRQ Involvement**

The authors worked with USPSTF liaisons at key points throughout the review process to develop and refine the analytic framework and key questions and to resolve issues around scope for the final evidence synthesis. AHRQ staff provided oversight for the project, reviewed the draft report, and assisted in an external review of the draft evidence synthesis.

# Chapter 3. Results

## Literature Search

We identified 6,576 unique records and assessed 189 full texts for eligibility (**Figure 2**). We excluded 146 records for various reasons detailed in **Appendix C** and included 25 RCTs of good or fair quality (in 43 articles). Twenty-five trials addressed KQ 1, and 2 addressed KQ 2. Of the 25 included trials, 22 (in 33 articles) were included in the 2018 review. Details of quality assessments of included studies and excluded studies based on poor quality are provided in **Appendix E**. **Appendix D Tables 1–5** present detailed background characteristics for included studies for KQ 1 and KQ 2; an overview of study characteristics is presented below, followed by detailed study results. Study results are organized by outcome and, within outcome, are summarized for the overall population and then populations of interest (child or caregiver socioeconomic, demographic, or other characteristics).

### Study Characteristics

Twenty-five trials comprising 42 publications, reported on benefits;<sup>110-152</sup> of these, two trials, comprising five publications reported on harms.<sup>131,132,149-151</sup> **Table 2** describes summary characteristics. The majority enrolled participants in the prenatal period or immediately after birth (60%). A minority of studies did not recruit participants based on risk of maltreatment (32%); the other studies either recruited participants based on parents being at risk of maltreating children or children being at risk of maltreatment because of prematurity or low birthweight. Although studies that included a majority of participants who had previously been reported for maltreatment were ineligible for the review, 24 percent of the studies included at least some but not a majority of participants who had previously been reported for maltreatment. Almost a third of the studies recruited young mothers (<20 years of age). Nearly two thirds of studies included a population that was  $\geq 25$  percent non-White, and nearly one quarter of studies included a population that was  $\geq 25$  percent Hispanic or Latina/o. All but two were home-visiting interventions.<sup>123,132,151</sup> Home-visiting interventions included support and information related to topics such as positive parent-child interactions, child health and development, social support, child environmental safety, and health behavior during pregnancy and early childhood. Some interventions also included medical care, referrals, and linkages to community resources. Many of the interventions included weekly or monthly home visits; home-visiting intervention duration ranged from 3 months to 3 years. Of the two trials that were not home-visiting interventions, one was a clinic-based intervention for parents entering outpatient substance abuse treatment,<sup>123</sup> and the other was a group Family Nurse Partnership intervention held in children's centers, health centers, or other community facilities.<sup>132,151</sup> A majority of trials included clinical personnel (e.g., nurses, midwives, social workers, therapists) (67%). All but three studies compared interventions with usual care.<sup>115,123,127</sup>

The other three compared child maltreatment-specific intervention variants with more intense care or with no care.<sup>115,123,127</sup> Specifically, one study compared standard behavioral couples therapy or combined parent skills and behavioral couples therapy with individual-based

treatment;<sup>123</sup> a second study compared a cognitively based extension of the Healthy Start home-visitation program with a visitation condition that did not include this component;<sup>115</sup> and a third study compared home visits with no home visits or other forms of intervention.<sup>127</sup> Most included studies were conducted in the United States (72%);<sup>110,111,113-117,119-126,129,133,137,138,141,143-147,152</sup> other studies were set in the United Kingdom,<sup>112,130,131,132,136,148-151</sup> Canada,<sup>127</sup> Australia,<sup>128</sup> and New Zealand.<sup>118,140</sup> Ten studies specified primary study outcomes, which included reports to CPS for child maltreatment, child injury, birthweight, emergency hospital attendance and admission for the child, mother-child interaction, maternal characteristics (mental health, substance use, smoking, dyadic adjustment, reflective functioning, incidence of rapid subsequent childbearing, knowledge of contraception, breastfeeding, and infant vaccination), intimate partner violence, and incidence of adverse neonatal outcomes (infant death, severe non-accidental injury, and non-voluntary foster care).<sup>110,112,116,123,125,128,130-137,148-151</sup>

## Results by Key Question

### Key Question 1. Benefits of Interventions to Prevent Child Maltreatment on Direct Measures of Maltreatment

#### Direct or Proxy Measures of Child Maltreatment

##### *Reports to Child Protective Services*

Fifteen trials analyzed reports to CPS (**Appendix D Tables 6–9**).<sup>110-112,114,116-118,121-126,131,133,135-140,143-146,149,150</sup> All except one trial reported initial results during the intervention (1 year from baseline), at the end of the intervention, or within a year of the completion of the intervention. The exception was a study that reported safeguarding actions at the end of the intervention when the child was 2 years old (addressed under “other measures of abuse and neglect”) but reported referral to children’s social care for abuse or neglect when the child was 6 years old. A subset of trials reported outcomes at one or more time points after the first analysis of results. The timing of these reports varied, from within 6 months of the initial results<sup>111,117,126</sup> to 1 to 2 years after the initial results<sup>111</sup> or over a longer term (6 years after the initial results,<sup>117</sup> when the child was 7 years of age,<sup>138</sup> or 13 years after the initial results, when the child was 15).<sup>144-146</sup>

**Results for first followup.** The pooled odds ratio (OR) from 11 trials, all having reported results within about a year of completion, suggested no difference between study arms (OR: 1.03 [95% confidence interval {CI}, 0.84 to 1.27];  $I^2$ : 10.2%; 12.9% [341/2635 from 10/11 trials providing event rates] vs. 12.2% [307/2519 from 10/11 trials providing event rates]; N=5,311; Figure 3). All studies included in the meta-analysis reported results with no statistically significant benefit at first followup. Four trials did not contribute to the meta-analysis. One trial reported only relative risks (RR; i.e., no raw data) with asymmetric CIs that we could not recalculate (RR: 1.35 [95% CI, 0.86 to 2.11]).<sup>136</sup> A second trial provided counts without standard deviations or frequencies (no statistically significant differences; results not reported).<sup>122</sup> A third trial did not specify the time period of outcome measurement, reporting only that the arms did not differ significantly, with a reported  $p=0.769$ .<sup>110</sup> A fourth trial reported safeguarding in the United Kingdom at 2 years, included under “other measures of abuse or neglect,” and measured referrals

to children's social services for abuse or neglect at 6 years;<sup>131,149,150</sup> this outcome is summarized in the section on long-term followup below.

**Results for subsequent followup.** Trials reporting additional results within 6 months<sup>126</sup> or 1 year<sup>111,117</sup> of the original results also reported no difference between the arms.

Trials measuring outcomes for later time points provided mixed results: two trials reported statistically significant differences and two reported no differences. One trial measured outcomes at 36 months from baseline and reported a statistically significant difference favoring the intervention arm; the trial reported a higher probability of *no* involvement with CPS in the intervention arm (adjusted odds ratio [AOR], 2.1 [95% CI, 1.0 to 4.4], N not reported).<sup>111</sup> One trial reporting referral to children's social care for abuse or neglect reported similar proportions between intervention and control arms by 6 years followup, 4 years after initial reports of safeguarding actions (198/760 [58.9%] vs. 205/746 [57.9%]; calculated RR, 0.95 [95% CI, 0.80 to 1.12]).<sup>149,150</sup> A third trial reported outcomes at 7 years (5 years after the end of intervention<sup>117,138</sup>) and reported no differences between arms in the cumulative rate of the biological mother or the target child being confirmed as a subject (presumably perpetrator) or a victim in CPS reports through 7 years of age (27.1% vs. 29.6%; AOR, 1.13,  $p>0.1$ ; CIs not reported [161/594 vs. 171/579; calculated OR, 1.13 {95% CI, 0.87 to 1.45}]).<sup>138</sup> A fourth trial followed children through age 15 but did not provide sufficient details for independent calculation of effects. The authors noted that the intervention group had fewer child maltreatment reports involving the mother as perpetrator ( $p=0.01$ ),<sup>145</sup> fewer child maltreatment reports involving the study child ( $p=0.04$ ),<sup>145</sup> and fewer verified reports of parents as perpetrators of child abuse and neglect ( $p<0.001$ ).<sup>144</sup> This trial also evaluated time to event and found that the treatment effect by time period was significant, with longer periods without CPS reports for children ages 4 to 15 years than for children from birth to age 4 years.<sup>146</sup>

**Intervention effectiveness for populations of interest.** One study reported on subgroup analyses focusing on populations of interest.<sup>117</sup> The study focused on a "High Prevention Opportunity" subgroup comprising young, first-time mothers who initiated home-visiting services prenatally.<sup>117</sup> The results in the populations of interest were consistent with the results for the overall sample at age 7 years and did not demonstrate a statistically significant benefit for the intervention arm for substantiated CPS reports.<sup>117</sup> A second study reported no statistically significant differences between intervention and control arms for reports to CPS between 25 and 48 months<sup>143</sup> or substantiated child maltreatment reports involving mother as perpetrator at age 15 years<sup>146</sup> for low-income, unmarried teens. These results were consistent with the results for the overall sample.

### *Removal of Child From Home*

Six trials<sup>112-114,120,128,133,136</sup> reported on outcomes relating to removal of the child from the home. Five trials contributed to a pooled analysis of removal of the child from the home across time points ranging from 12 months to 3 years after baseline (**Appendix D Tables 10 and 11**).<sup>112-114,128,133,136</sup> The results show no statistically significant differences between study arms on this outcome (3.9% [68/1751] vs. 3.5% [55/1585]; RR, 1.06 [95% CI, 0.37 to 2.99];  $I^2$ , 49.9%; 5 trials; N=3,336; **Figure 4**). All studies included in the meta-analyses reported results with no

statistically significant benefit at first followup. One study reported on number of days in out-of-home placement and reported no differences (15.2 days for the intervention vs. 12.7 days for the comparator arm,  $p=0.430$ ).<sup>133</sup>

One trial, reporting on removals at birth, included CPS-involved placements and informal care arrangements (type of placement by study group not specified).<sup>120</sup> The trial also collected data on the percentage of women with one or more children in out-of-home care at followup but did not differentiate new removals from placements at the time of birth after the index pregnancy. Because of measurement issues with the followup outcome, we focused on removal rates only at birth and did not include results in the pooled analysis above. This trial reported results no statistically significant difference between study arms; 9 percent of the intervention group and 4 percent of the control group had been placed in out-of-home care at birth (the intervention began during pregnancy) ( $N=187/225$ ; RR, 2.33 [95% CI, 0.66 to 8.20]).

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for out-of-home placements for populations of interest.

#### *Other Measures of Abuse or Neglect*

Two RCTs<sup>113,115</sup> reported on study-specific measures of abuse (**Appendix D Tables 12 and 13**). These measures included physical abuse (i.e., hitting with the hand or objects, biting, burning with objects or by immersion, twisting, shaking, throwing or pushing so as to cause a fall, or hair pulling; identified from review of public agency documents from the Tennessee Department of Human Services)<sup>113</sup> and neglect (i.e., abandonment, leaving a child with an inappropriate caretaker, gross failure to seek medical care, failure to provide shelter or nutrition, or gross failure to provide for normal intellectual development; identified from review of public agency documents from the Tennessee Department of Human Services,<sup>113</sup> and results from the Framingham Safety Survey about household hazards<sup>115</sup>). One trial reported no differences, finding 13/141 cases (9.2%) of physical abuse in the intervention arm vs. 8/122 (6.6%) in the comparator arm (RR, 1.45 [95% CI, 0.58 to 3.62]). The same study<sup>113</sup> reported 15/141 (10.6%) cases of neglect in the intervention arm vs. 5/122 (4.1%) in the comparator arm (RR, 2.79 [95% CI, 0.98 to 7.91]).<sup>113</sup> The second reported a statistically significant difference on the Framingham Safety Survey, but the clinical importance of the effect is unclear because the scale range is not reported. The trial reported mean values on the Framingham Safety score of 1.72 (intervention) vs. 1.68 (comparator); higher scores represent greater safety. The trial noted a  $p$ -value of 0.03 for this outcome but provided no measures of dispersion for us to calculate mean differences independently.<sup>115</sup> A third trial reported safeguarding (that is, actions to protect children from harm and promote their welfare) in the United Kingdom. This outcome included actions beyond reports to child protection. The outcome came from any record in general practitioner notes indicating the initiation, progression, or closure of a safeguarding process.<sup>131</sup> These records included initial assessment, being identified as a child in need, and child protection conferences. The study found higher rates of safeguarding in the intervention arm (AOR, 1.85 [95% CI, 1.02 to 2.85]).<sup>131</sup>

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for out-of-home placements for populations of interest.

#### *Injuries With a High Specificity for Abuse or Neglect*

One trial reported only one nonaccidental injury in the control arm (0/65 vs. 1/71; calculated RR, 0.36 [95% CI, 0.015 to 8.77]) (**Appendix D Table 14**).<sup>128</sup>

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for injuries with a high specificity for abuse or neglect for populations of interest.

#### *Emergency Department Visits*

Fourteen trials reported on ED visits (**Appendix D Tables 15–18**),<sup>112,114,116,118,119,121,122,126,127,129-132,136,137,140,141,143-150,152</sup> when specified, lower ED visits in the intervention arm were interpreted as beneficial. The timing and type of outcome measurement varied substantially across trials; several trials presented outcomes at multiple time periods. To ensure that we captured all the evidence without inappropriately combining different periods of followup, we present the results by timing of outcome measurement first and then by type of outcome measurement for each time period. The results were generally inconsistent in direction of effect.

**Results for followup <1 year.** One trial reported infant “accident and emergency” (A&E) visits at 2 months of age and found a mean difference of 0.19 greater ED visits in the intervention arm compared with the control arm (calculated 95% CI, 0.02 to 0.36).<sup>132</sup> Two of three trials that reported outcomes at 6 months of corrected gestational age found no statistically significant difference in the percentage of infants in each of four arms who visited the ED from age 0 to 6 months (p=0.637 in one study<sup>126</sup> and AOR, 1.52 [95% CI, 0.86 to 2.70] in the second study<sup>131</sup>). A third study reported statistically significant differences favoring the intervention arm in the number (mean not reported, p=0.023) and proportion of patients with ED visits (36.5% vs. 49.7%, p=0.021) at 6 months when compared with the control arm.<sup>152</sup> The same trial found that benefits were no longer statistically significant at 1 year (presented below).

**Results for followup from 1 to <2 years.** Of these 13 trials, eight reported ED visit outcomes between 1 and 2 years after enrollment or recruitment.<sup>112,121,122,126,127,130,132,136,143-146,148,152</sup> Measurement of outcomes varied and included (1) mean number of all-cause ED visits, (2) mean number of ED visits for accidents and poisonings, (3) number of children using the ED for any reason, and (4) total ED visits. Overall, the results are inconsistent in demonstrating benefit.

Because four of seven trials reporting on the *mean number of all-cause ED visits* do not provide measures of dispersion, the results cannot be pooled.<sup>122,127,136,152</sup> Six trials reported no statistically significant differences.<sup>122,127,130,132,136,148,152</sup> One study found that the nurse home-visiting group had fewer total ED visits at 12 months with a mean difference of 0.28 (95% CI, 0.08 to 0.48; p=0.04).<sup>121</sup>



One trial reported the *mean number of ED visits for accidents and poisonings* at 12 months.<sup>121</sup> For ED visits for accidents and poisonings, there was no statistically significant difference between study arms.<sup>121,143-146</sup>

Three trials calculated RRs for the *number of children in each group who visited the ED for any reason*.<sup>126,130,148,152</sup> Two trials found no statistically significant differences for intervention arms compared with usual care at 12 months<sup>130,148,152</sup> or 18 months.<sup>130,148</sup> One trial found a statistically significant difference at 12 months (reported  $p=0.048$ ) with a greater number ED visits in the intervention arm than the control arm.<sup>126</sup>

One trial of extended contact between mothers and neonates with or without home visits, when compared with usual care, reported on *total number of ED visits per arm* (rather than means; no standard deviations were reported). The study authors noted a lack of statistical significance.<sup>122</sup>

**Results for followup from 2 to <4 years.** Of these 13 trials, 6 reported ED visit outcomes at 2 to <4 years of followup.<sup>116,118,119,121,129,131,137,140,141,143-147</sup> Variations in the type of outcome reported again precluded pooling. Outcomes included (1) mean number of all-cause ED visits; (2) mean number of ED visits for accidents, injuries, and ingestions; (3) number of children seen in the ED; (4) number of children seen for accidents or injuries; and (5) number of children seen for injuries or ingestions. Overall, the results are inconsistent in demonstrating benefit.

Two trials reported the *mean number of all-cause ED visits* over the 2-year study period.<sup>116,121</sup> One trial reported a statistically significant difference with a reduced number of ED visits for the nurse-visited arm compared with the control arm ( $p=0.01$ );<sup>121</sup> the second reported no statistically significant differences.<sup>116</sup>

Two trials reported the *mean number of ED visits specifically for accidents, injuries, or ingestions*.<sup>119,121,141,143-146</sup> One reported no difference;<sup>119</sup> the other reported a statistically significant reduction in mean number of ED visits for the nurse-visited arm compared with the control arm ( $p=0.03$ ).<sup>121</sup>

Two trials<sup>116,129,137</sup> reported the *number of children seen in the ED* for any reason but found no statistically significant differences between study arms (AOR, 1.23 [95% CI, 0.74 to 2.05];<sup>116,137</sup> AOR, 1.21 [95% CI, 0.96 to 1.52]<sup>129</sup>).

Two trials reported *the number of children seen specifically for accidents or injuries*.<sup>118,129,140,147</sup> One study found a statistically significant difference (OR, 0.59 [95% CI, 0.36 to 0.98]) with fewer visits in the intervention arm compared to the control arm,<sup>118,140</sup> and the other found no statistically significant differences (AOR, 0.94 [95% CI, 0.65 to 1.34]).<sup>129,147</sup>

One trial found no statistically significant difference in the *proportion of children seen specifically for injuries and ingestions* (AOR, 1.16 [95% CI, 0.92 to 1.46]).<sup>131</sup> This study also combined ED visits and hospitalizations and did not find any statistically significant differences (AOR, 1.32 [97.5% CI, 0.99 to 1.76]).

**Long-term followup ( $\geq 4$  years).** Three trials reported long-term outcomes at 4 years,<sup>143</sup> 5 to 5.5 years,<sup>147</sup> and 6 years<sup>149,150</sup> and yielded mixed results. One trial, which evaluated outcomes at 4 years for three groups,<sup>143</sup> reported a 35 percent reduction in ED visits of all types for children in the nurse-visited group ( $p=0.0008$ ) compared with rates for the control group but no difference in the number of ED visits for injuries or ingestions ( $p>0.05$ ); the trial did not report raw numbers, RRs, or CIs. One trial, which reported the proportion of children who had used the ED in the past year at the 5- to 5.5-year followup,<sup>147</sup> found no statistically significant difference between groups (10% vs. 9.2%; AOR, 0.96 [95% CI, 0.73 to 1.27]). One trial, which evaluated visits to the ED for injuries and/or ingestions through 6 years of age<sup>149,150</sup> also did not find a statistically significant difference between groups (54.7% vs. 58.3%; AOR, 1.17 [95% CI, 0.95 to 1.45]).

**Intervention effectiveness for populations of interest.** Two studies<sup>121,129,143</sup> reported on subgroup analyses focusing on populations of interest.

One study reported outcomes from subgroup analyses by low, middle, or high income; first-time vs. second-time mothers; and maternal age.<sup>129</sup> The percentage of children with ED visits in the last year decreased with increasing levels of income and maternal age, but comparisons were not significantly different between the intervention and control groups or across any subgroups for ED visits at age 30 to 33 months.<sup>129</sup>

One study reported total ED visits and ED visits for accidents and poisonings by risk subgroups at 1, 2, and 4 years.<sup>121,143</sup> The high-risk subgroup was comprised of single-parent mothers under the age of 19 of low socioeconomic status. Members of the nurse home visit group had fewer total ED visits at 1 year for the whole sample ( $p=0.04$ ) and the high-risk subgroup ( $p=0.04$ ).<sup>121</sup> This difference was explained by a reduction in visits for upper respiratory tract infections in the nurse home visit group. The study found no statistically significant difference by study arm in ED visits for accidents and poisonings in the first year of life the high-risk subgroup; the results were consistent with the findings for the entire sample.<sup>121</sup> There was also no statistically significant difference for total ED visits or ED visits for accidents and poisoning at 2 years of age for the high-risk subgroup ( $p>0.05$ ).<sup>121</sup> Members of the nurse home visit group had fewer total ED visits at 4 years (25 to 50 months of life) in the whole sample ( $p=0.0008$ ) and in the high-risk subgroup ( $p<0.05$ ).<sup>143</sup> There was no statistically significant difference for the high-risk subgroup for ED visits for injuries or ingestions during this same time frame.<sup>143</sup>

### *Hospitalization*

Thirteen trials reported on hospitalization outcomes (**Appendix D Tables 19–22**).<sup>112,114,116,118,119,122,126,128,131,132,137,140,143,147-150</sup> Because of substantial heterogeneity in outcome definitions and time periods of interest, results could not be pooled.

Outcomes varied in their degree of specificity to child abuse and neglect. They included (1) the number of children with hospital admission as a result of an injury that were referred for independent investigation by the Family and Children's Services staff and whose injuries were concluded to be nonaccidental, (2) the number of children hospitalized because of child abuse and neglect, (3) the proportion of children hospitalized because of injury or ingestion, (4) the number of children hospitalized for ambulatory-care sensitive conditions, (5) the number of

children rehospitalized, (6) the number of children with all-cause hospitalization, (7) the mean number of all-cause hospitalizations, (8) the mean number of hospitalizations for injury or ingestion, (9) the total counts of hospital visits, (10) the mean number of hospital days, and (11) the types of injuries reported among those hospitalized. In general, the evidence did not demonstrate benefit for the active intervention arm(s).

The most specific outcomes showed no significant differences with one trial each finding no difference in (1) *the number of children hospitalized with nonaccidental injuries and referred for investigation*,<sup>118</sup> and (2) *the number of children hospitalized because of child abuse and neglect*. Less specific outcomes also did not consistently demonstrate benefit in the intervention arm. Three studies reported on (3) the proportion of children hospitalized because of injury or ingestion. Of these studies, two reported no difference;<sup>118,149,150</sup> neither specified whether injuries were intentional or accidental. One trial found that the home visitation group had lower overall rates of hospital admission for unintentional injury than the control group at the 9-year followup (28.3% vs. 42.1%;  $p < 0.05$ ).<sup>118,140</sup>

One trial each found no difference (4) *the number of children hospitalized for ambulatory-care sensitive conditions*,<sup>116</sup> and (5) *the number of children rehospitalized at 14 days and 18 months (the original cause was not specified)*.<sup>114</sup>

Four<sup>112,130,136,137,147</sup> of five trials<sup>112,126,130,136,137,147</sup> reporting on (6) *the proportion of children hospitalized for any reason* found no differences. The specific definition, timing, and details related to these outcomes precluded synthesis. One trial reported four outcomes for the number of children hospitalized (6 months' followup, 12 months' followup, less than 24 hours' stay, more than 24 hours' stay);<sup>126</sup> the investigators reported no statistically significant differences for three of these outcomes. The exception was the number of children hospitalized for more than 24 hours at 6 months (lower numbers in the intervention arm when compared with the control arm,  $p = 0.017$ ).<sup>126</sup>

Two of three trials found no statistically significant differences in (7) *the mean number of all-cause hospitalization* (the results were not pooled because measures of dispersion were not reported).<sup>119,130,143</sup> One trial showed no difference in the mean number of hospitalized between groups from baseline to 2 months or for the whole followup period (baseline to 12 months) for most measures of hospitalization (hospitalization in the special care baby unit, high-dependency unit, neonatal intensive care unit; the children's ward; and other hospitalizations).<sup>132</sup> The only exception was a mean difference of 0.14 fewer children's ward hospitalizations for the whole followup period in the intervention arm (mean of 0.03 for children's ward hospitalization) compared with the control arm (mean of 0.17 for children's ward hospitalizations) (calculated 95% CI, -0.23 to -0.05).<sup>132</sup> One trial found no statistically significant difference in (8) *the number of hospitalizations for injuries or ingestions*.<sup>119</sup>

One trial reported no differences in (9) *the total counts of hospital visits* (measures of dispersion not reported).<sup>122</sup>

Four trials reported on (10) *the mean number of hospital days*. Of these, two trials found that children receiving home visits spent fewer days hospitalized.<sup>119,143</sup> In one trial the nurse-visited

children in a home health program had fewer mean hospital days than the children in the usual care arm (log incidence difference, -0.66 [95% CI, -1.21 to -0.13];  $p < 0.05$ ).<sup>143</sup> In another trial the home-visited children had fewer total days hospitalized for injuries or ingestions (log incidence difference, 1.64 [95% CI, 0.78 to 2.50];  $p < 0.01$ ).<sup>119</sup> The other two home visitation trials did not find between-group differences in hospital days.<sup>112,130</sup>

One trial reported differences in (11) *the nature of injuries* between home visitation program groups.<sup>119</sup> The three nurse-visited children from this trial who were hospitalized had burns to the face, coin ingestion, and ingestion of iron medication; the 13 children in the control group were hospitalized for fractures (fibula, tibia, skull [two children]), head trauma without skull fracture [three children]), strangulated hernia with delay in care, coin ingestion, suspected child abuse and neglect, burns (face and neck, both legs), and finger injury with osteomyelitis.<sup>119</sup>

**Intervention effectiveness for populations of interest.** Two studies<sup>121,129,143,147</sup> reported on subgroup analyses focusing on populations of interest.

One study reported outcomes from subgroup analyses by low, middle, or high income; first-time vs. second-time mothers; and maternal age.<sup>129,147</sup> The comparisons showed no significant differences between the intervention and control groups across subgroups, for injuries or hospitalizations at 30 to 33 months; these results were consistent with the findings for the overall sample. One study reported total number of hospital admissions by risk subgroup from 25 to 50 months of age.<sup>121,143</sup> The high-risk subgroup was comprised of single-parent mothers under the age of 19 of low socioeconomic status. There was no statistically significant difference ( $p > 0.05$ ) seen in hospital admission in the high-risk subgroup or in the whole sample.<sup>121,143</sup>

#### *Failure to Thrive*

One trial reported on the outcome of failure to thrive (**Appendix D Table 23**). There were no statistically significant differences between study arms for the outcome of failure to thrive (0% [0/39] for the intervention group vs. 2.5% [1/40] for the control group; calculated RR, 0.34 [95% CI, 0.01 to 8.14]).<sup>114</sup>

**Intervention effectiveness for populations of interest.** The included study did not report on intervention effectiveness on failure to thrive for populations of interest.

#### *Failure to Immunize*

One trial reported on failure to immunize (**Appendix D Table 24**). It found no statistically significant differences between study arms in the rate of *no* vaccinations at 6 months (calculated RR, 0.41 [95% CI, 0.13 to 1.26]).<sup>128</sup>

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for failure to immunize for populations of interest.

## Behavioral, Developmental, Emotional, Mental, or Physical Health and Well-Being

### *Internalizing and Externalizing Behavior*

Six trials reported on internalizing (depression, anxiety) and externalizing (disruptive, aggressive, or delinquent) behavioral outcomes in children (**Appendix D Tables 25–27**).<sup>111,116-119,129,137-141,147</sup> As with other outcomes, the evidence included substantial heterogeneity in the timing and type of outcome measurement. Overall, the findings are inconsistent. Three of six trials found a reduction in behavior difficulties in children in primary care or primary care–referable interventions to prevent child maltreatment.<sup>111,116,118,137,140</sup>

**Results for followup <2 years.** One trial<sup>111</sup> reported behavior outcomes at 6 months and 12 months<sup>111</sup> on the internalizing and externalizing scales of the Infant-Toddler Social Emotional Adjustment Scale (ITSEA). The study presented results that adjusted for baseline values and repeated measures and found a significant effect of the intervention on the proportion of children with ITSEA externalizing behaviors ( $p<0.05$ ) and mean ITSEA externalizing behaviors at 12 months (mean score, 13.8 vs.18.4; effect size, 0.094) but not at 6 months (T scores  $\geq 65$  indicate clinical problems). The study found no statistically significant differences between arms for proportion of children with ITSEA internalizing behaviors or mean ITSEA internalizing behavior scores at 6 months or at 12 months.

**Results for followup for 2 to <4 years.** Four trials reported outcomes between 2 and 4 years of followup;<sup>116,118,119,129,137,140,141,147</sup> two found no differences and two found statistically significant differences. One trial<sup>119,141</sup> of nurse home visits examining child behavior outcomes at 2 years of age using the Child Behavior Checklist (CBCL) found no difference between arms. One trial reported outcomes at 30 to 33 months<sup>129,147</sup> and found no statistically significant differences between intervention and control arms for the proportion or mean scores of children with aggressive behavior problems or anxious or depressed problems based on CBCL.

One trial<sup>116,137</sup> found that children in the intervention group were more likely to have a higher percentage of participants with CBCL internalizing score in the “normal range” (T score  $<60$ ) at age 2 years (87% vs. 79%; AOR, 2.06 [95% CI, 1.31 to 3.25]), and they had significantly lower mean scores of internalizing behavior problems on the CBCL than usual care (48.2 vs. 51.0; mean difference, -2.8 [95% CI, -4.2 to -1.5]). More participants in the intervention group were found to have CBCL externalizing scores in the normal range (82% vs. 77%; AOR, 1.48 [95% CI, 1.14 to 1.94]), but no statistically significant differences were found for externalizing behavior problems on the mean CBCL score.

One trial examined outcomes at 36 months.<sup>118,140</sup> At 36 months of age, the study reported lower mean scores for internalizing problems on the ITSEA (scores were normalized to a mean of 10) (mean score, 9.86 vs. 10.12; correlation ratio, 0.13; 95% CI, 0.03 to 0.23; Cohen’s d, 0.26 [95% CI, 0.06 to 0.47];  $p<0.01$ ) and lower overall mean scores of behavior problems on the ITSEA (mean score, 9.87 vs. 10.11; correlation ratio, 0.12; 95% CI, 0.02 to 0.22; Cohen’s d, 0.24 [95% CI, 0.04 to 0.44]) but no differences in mean scores for externalizing behaviors as assessed by ITSEA.

**Long-term followup (≥4 years).** Four trials evaluated long-term outcomes.<sup>118,119,129,138-141,147</sup> One trial reported lower overall behavioral scale scores in the intervention when compared with the control arm, and three reported no statistically significant effects.

One trial reported outcomes again at ages 5, 6, and 9 years using the 30-item Strengths and Difficulties Questionnaire.<sup>118,140</sup> The intervention group demonstrated fewer overall behavior problems (mean score across 5, 6, and 9 years, 9.91 vs. 10.08; Cohen's *d*, 0.17 [95% CI, 0.06 to 0.29]; *p*<0.05).

One trial reported on child internalizing and externalizing behavior problem outcomes at age 9 years, 7 years after the intervention ended, using the Computerized Diagnostic Interview Schedule for Children and found no statistically significant differences between arms for mother or teacher reports of conduct failures (incidence ratio, 0.56 [95% CI, -1.26 to 0.11]); depressive and anxiety disorders (0.64 [95% CI, -0.99 to 0.11]); and disruptive behavior disorders with impairment (1.15 [95% CI, -0.19 to 0.47]).<sup>119,141</sup>

In one trial at 5.5 years,<sup>129,147</sup> mothers in the intervention group reported no statistically significant differences in borderline or clinical behavioral concerns on the CBCL (20.2 vs. 16.5%; AOR, 1.26 [95% CI, 0.94 to 1.69]) when compared with the control group.

One trial examined outcomes of a paraprofessional home visitation program at age 7 years on five subscales of the CBCL measuring rule-breaking, aggressive behaviors, social problems, and anxious depressed and withdrawn depressed behaviors but found no significant differences between arms.<sup>138,139</sup>

**Intervention effectiveness for populations of interest.** One study reported on subgroup analyses focusing on populations of interest.<sup>138</sup> The study focused on a “High Prevention Opportunity” subgroup comprising young, first-time mothers who initiated home-visiting services prenatally.<sup>138</sup> The results in the populations of interest were consistent with the results for the overall sample at age 7 years and did not demonstrate a statistically significant benefit for the intervention arm for rule-breaking, aggressive behaviors; social problems; and anxious depressed and withdrawn depressed behaviors.<sup>138</sup>

#### *Social, Emotional, and Other Developmental Outcomes Not Otherwise Categorized*

Five trials evaluated discrete social, emotional, or other developmental outcomes separately from overall measures of externalizing or internalizing problems (**Appendix D Tables 28–30**).<sup>111,112,129,136,138,141,147</sup> The heterogeneity of outcomes precluded meta-analysis, but no trials reported statistically significant differences between treatment and control groups.

One trial evaluated dysregulation midway through the intervention period and at intervention completion and found no significant differences between study arms at 6- or 12-months post-baseline.<sup>111</sup>

Another trial<sup>129,147</sup> reported sleep problems as an outcome, assessed toward the end of the intervention period when the children were 30 to 33 months of age.<sup>129</sup> The mean scores were not

significantly different between the intervention group and control group (mean difference on CBCL, 0.12 [95% CI, -0.13 to 0.36]), although the proportion of parents of *intervention* children reporting sleep problems was higher than the proportion of parents of *control* children (AOR, 1.37 [95% CI, 1.01 to 1.86]). Longer-term outcomes from this same trial examined children's social skills when the children were 5 to 5.5 years of age, again finding no difference between the intervention and control groups ( $p=0.40$ ).<sup>147</sup>

In a third trial,<sup>138</sup> researchers assessed attention and social problems using subscales of the CBCL when children were 7 years of age, 5 years after the intervention had been completed.<sup>138</sup> The trial demonstrated no significant differences between the intervention and control groups for either attention or social problems.

A fourth trial found no significant differences between study arms in a few school-related outcomes (conduct, antisocial behavior, and peer affiliation) at a followup 7 years after the intervention had been completed, when children were 9 years of age.<sup>141</sup>

One trial assessed but did not report infant or toddler social and emotional adjustment outcomes.<sup>112</sup> A subsequent cost evaluation alluded to self-reported results not being significant but did not report specific outcome data.<sup>136</sup>

**Intervention effectiveness for populations of interest.** Two studies reported on subgroup analyses focusing on populations of interest.<sup>138,141</sup> One study reported on findings in a subgroup of women defined as having low psychological resources (defined by limited intellectual functioning, poor mental health, and low sense of control over their life circumstances).<sup>141</sup> A second study focused on a “High Prevention Opportunity” subgroup comprising young, first-time mothers who initiated home-visiting services prenatally.<sup>138</sup> Both studies reported that the results in the populations of interest were consistent with the results for the overall sample and did not demonstrate a statistically significant benefit for the intervention arm for attention or social problems<sup>138</sup> or school-related outcomes (conduct, antisocial behavior, academically focused behavior, and peer affiliation).<sup>141</sup>

#### *Child Development as Measured by the Bayley Development Scales*

Four trials<sup>112,116,119,121,136,137,141,143-146</sup> reported on child development as measured by the Bayley Scales of Child Development (**Appendix D Tables 31–33**). The results generally indicated no differences between intervention and control groups, with the exception of some results from one trial.<sup>137</sup>

Two trials reported Bayley Scale outcomes at 1 year of age; both reported no statistically significant differences.<sup>112,121,136</sup>

Two trials reported on Bayley Scale outcomes when children were 2 years of age.<sup>119,137</sup> One trial reported no difference in the Bayley mental index at 2 years of age.<sup>119</sup> The other evaluated the Bayley mental and psychomotor indices at 2 years of age and reported scores as a continuous measure of development and as a categorical measure using the recommended cutoff (<85) for mild delay. The mean difference between the two groups for the mental development index was

significantly different with those in the experimental group, having a 3.2-point higher mean score (mean score, 88.0 vs. 84.8 [95% CI, 1.2 to 5.2]).<sup>137</sup> The experimental group had higher adjusted odds of being in the normal range on the mental index than the control group. For the mental index, 58 percent of the experimental group and 48 percent of the control group were in the normal range, with an AOR of 1.55 (95% CI, 1.01 to 2.37). The unadjusted odds were not statistically significant (calculated OR, 1.50 [95% CI, 0.91 to 2.47]).

The mean difference between the two groups was not significant for the psychomotor index. The percentage of children in the normal range on the psychomotor index was also similar between the two groups, with 85 percent of the experimental group and 80 percent of the control group in the normal range. The differences were not statistically significant (AOR, 1.36 [95% CI, 0.72 to 2.58]).<sup>137</sup>

**Intervention effectiveness for populations of interest.** One study<sup>121</sup> reported on subgroup analyses focused on maternal and sociodemographic characteristics. The study reported that babies of highest risk mothers, defined as poor, unmarried teenagers who were assigned to the nurse-visited condition, did not have statistically significant differences on the Bayley mental development index at 12 months than babies whose mothers were assigned to a developmental screening and free transportation comparator group (115.01 vs. 104.13;  $p=0.06$ ).

#### *Other Development Outcomes*

Five trials reported on other development outcomes, which varied substantially in constructs (mother-infant communication, attachment, clinically concerning language development, intelligence quotient [IQ], maternal concerns regarding cognition) and specific measures by study (**Appendix D Tables 34–37**).<sup>111,121,125,131,143,147</sup> Although the results cannot be compared across studies, three of five studies suggested at least some benefit on different measures of outcomes.<sup>111,125,131</sup>

Four of five studies reported at least some nonsignificant results.<sup>121,125,131,147</sup> Specifically, one trial reported no measures of variance but noted that the overall results for a group of infant development tests at 2 years was not statistically significantly different;<sup>121</sup> tests of IQ using the Stanford-Binet test at 3 and 4 years were also not statistically significantly different.<sup>143</sup> Another trial found no statistically significant differences in the proportion of parents with a significant concern regarding the child's development on the Parents' Evaluation of Development Status (calculated RR, 0.94 [95% CI, 0.76 to 1.16]).<sup>147</sup> A third trial found no statistically significant differences between study arms in maternal concerns regarding cognitive development at 12 months.<sup>131</sup> Subsequent measures showed fewer concerns in the intervention arm by 24 months. The same study demonstrated better early language scores (the Early Language Milestone Scale score) at 24 months and fewer language concerns at 12 and 18 months in the intervention arm. A fourth study found that infants in the intervention arm were statistically significantly less likely to have disordered attachment than infants in the control arm at 12 months (measured with the Strange Situation Procedure-Secure Attachment Classification).<sup>125</sup> Mother-child communication at 4 months (measured with the Atypical Maternal Behavior Instrument for Assessment and Classification) was not statistically significantly different.<sup>125</sup> Finally, a fifth study reported that children in the intervention arm were less likely to have clinically concerning problems with



language (measured by the Infant-Toddler Developmental Assessment) at 6 and 12 months than children in the control arm.<sup>111</sup>

**Intervention effectiveness for populations of interest.** Two studies reported on subgroup analyses focusing on populations of interest.<sup>121,125,143</sup> One study that demonstrated a lower likelihood of disordered attachment among intervention infants when compared with infants in the control arm at 12 months (measured with the Strange Situation Procedure-Secure Attachment Classification) did not report a statistically significant difference among teen mothers.<sup>125</sup> As with the overall results, mother-child communication at 4 months (measured with the Atypical Maternal Behavior Instrument for Assessment and Classification) was not statistically significantly different between intervention and control arms.<sup>125</sup> A second study reported no statistically significant differences between intervention and control arms for cognitive measures (on the Cattell scale score<sup>121</sup> and the Stanford-Binet test<sup>143</sup>) for low-income, unmarried teens. These results were consistent with the results for the overall sample.

### *School Performance*

Three trials assessed varied school performance outcomes and reported few between-group differences for the overall sample (**Appendix D Tables 38–41**). One trial reported no statistically significant differences in the percentage of children repeating a grade in the home-visiting intervention arm compared with the control arm at the child's age of 7.<sup>138</sup> At age 6 years, groups did not differ in teacher-reported academic engagement (mean 6.16 vs. 6.86; effect size, -0.03;  $p=0.72$ ), arithmetic achievement (mean 89.7 vs. 88.6; effect size, 0.25;  $p=0.30$ ), or reading achievement (mean 93.8 vs. 93.6; effect size, 0.02;  $p=0.84$ ) on child-completed assessments, but children in the intervention group had higher mental processing scores compared with children in the control arm (mean 92.3 vs. 90.2; effect size, 0.18;  $p=0.03$ ).<sup>142</sup>

At 9 years of age, this same study found no statistically significant differences on grade point averages (GPAs) averaged across reading and math. The study also found no statistically significant differences on math and reading achievement test scores in grades 1 through 3 or in academically focused behavior in grade 3.<sup>141</sup> Groups also did not differ in academic failures, retention in/repeating a grade, or special education placements in grades 1 through 3.<sup>141</sup>

A third trial, based in the United Kingdom, reported no differences in the number of children in the intervention vs. control group reaching at least the expected standards for reading (65% vs. 61%; AOR, 1.23 [95% CI, 0.99 to 1.53];  $p=0.051$ ), arithmetic (62% vs. 61%, AOR, 1.04 [95% CI, 0.84 to 1.28];  $p=0.73$ ), science (73% vs. 70%, AOR, 1.14 [95% CI, 0.91 to 1.43];  $p=0.25$ ), and writing (2016/17 academic year, 48% vs. 43%; AOR, 1.24 [95% CI, 0.97 to 1.60];  $p=0.09$ ).<sup>131</sup>

**Intervention effectiveness for populations of interest.** One study reported that fewer children in the intervention arm repeated a grade compared with the control arm in a high-prevention opportunity sample (first-time mothers  $\leq$  age 19 years who could initiated home-visiting services prenatally [gestational age  $\leq$  30 weeks]) at age 7 years (12.4% vs. 23.9%; AOR, 0.45;  $p\leq 0.10$ ), but the difference between the arms was not statistically significant.<sup>138</sup> These findings align with

results for the whole sample, in which the number of children repeating a grade did not differ between intervention and control arms.

Another trial<sup>119,141,142</sup> with followup at ages 6 and 9 years also reported school performance outcomes for mothers with “low psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances.”<sup>141, p. 3</sup> At the age 6 years followup, children of low psychological resource mothers who received nurse visiting had significantly higher scores on the mental processing composite scale (mean 90.5 vs. 87.6; effect size, 0.25;  $p=0.03$ ) and arithmetic achievement scale (mean 88.6 vs. 85.4; effect size, 0.25;  $p=0.04$ ) compared with control children in this sample.<sup>142</sup> As in the whole sample, differences between groups in other school performance measures (academic engagement, reading achievement) were not significant.

In the 9-year followup, children of low psychological resource mothers who received nurse visiting had higher reading and math GPAs (mean 2.7 vs. 2.4,  $p=0.02$ ) and higher reading and math achievement scores (mean 44.9 vs. 35.7,  $p=0.002$ ) compared with control children at 9 years; effect sizes from analyses adjusting for covariates were small (0.22, 0.33, respectively). These findings were different from outcomes in the whole sample, in which GPAs did not differ between intervention and control groups. This study also reported academically focused behavior at 9 years. As in the whole sample, differences in academically focused behavior in grade 3 were not significant between groups in the low psychological resources sample.<sup>141</sup>

In the trial conducted in the United Kingdom,<sup>131,149,150</sup> most education outcomes did not differ by subgroup (child sex; maternal age; maternal employment, education, or training or no employment, education, or training; deprivation quintile). The findings are similar to findings for the whole sample. However, this U.K. study did report some differences by sex, maternal age, maternal employment or education status, and deprivation quintile in the number of children reaching some educational standards: differences were seen in the number of males achieving the minimum writing standards in the intervention vs. control arms (43% vs. 32%; AOR, 1.62 [95% CI, 1.13 to 2.33];  $p=0.009$ ). The number of females achieving writing standards did not differ.

The U.K. study also reported differences in some educational outcomes for children of mothers who were less than age 16 years at baseline: 66 percent of children of young mothers in the home-visiting group vs. 42 percent of control (AOR, 3.23 [95% CI, 1.36 to 7.67];  $p=0.008$ ) reached expected standards for math. Intervention vs. control differences for children of mothers greater than age 16 were not significant; however, the interaction between maternal age subgroups did reach significance ( $p=0.01$ ). More children of younger mothers also reached expected standards for writing in the intervention group vs. control (55% vs. 23%; AOR, 5.28 [95% CI, 1.49 to 18.73];  $p=0.010$ ) with no intervention vs. control differences in children of mothers older than age 16 and a significant interaction between maternal age groups ( $p=0.02$ ). More children of mothers greater than age 16 years in the intervention group reached reading standards compared with control children of mothers greater than age 16 years (66% vs. 62%; AOR, 1.25 [95% CI, 0.99 to 1.57];  $p=0.07$ ); reading outcomes did not differ for children of mothers younger than age 16.<sup>149,150</sup>

In the U.K. study, 49 percent of children of mothers who were not in education, employment, or training met writing standards compared with 38 percent of control group children whose mothers who were not in education, employment, or training (AOR, 1.56 [95% CI, 1.05 to 2.30];  $p=0.03$ ). Writing outcomes did not differ for children of mothers who were in education, employment, or training; the study reported a significant interaction between these education or employment subgroups ( $p=0.028$ ).<sup>149,150</sup>

In the least deprived quintile (measured on the Index of Multiple Deprivation), significantly more children in the intervention arm reached reading, science, and writing standards compared with the control arm (68% vs. 61%; AOR, 1.75 [95% CI, 1.00 to 3.07];  $p=0.05$ ; 77% vs. 68%; AOR, 1.94 [95% CI, 1.13 to 3.30];  $p=0.015$ ; 54% vs. 43%; aOR, 1.83 [95% CI, 0.95 to 3.51];  $p=0.07$ , respectively). Outcomes did not differ in other deprivation quintiles.<sup>149,150</sup>

### *School Attendance*

Two trials evaluated school attendance outcomes and reported few differences in outcomes between intervention and comparison groups (**Appendix D Tables 42 and 43**). One trial<sup>138</sup> reported on school attendance and found that children at age 7 in the intervention group self-reported skipping school significantly less often than children in the usual-care group (2.35% [9/388] vs. 6.47% [26/405]; RR, 0.36 [95% CI, 0.17 to 0.76]). The same study reported no statistically significant differences using maternal reports of skipping school more than once.

In another, U.K.-based study, the number of children with no school absences at ages 6 to 7 did not differ between the intervention and control group (1.9% in each group), nor did the percentage with at least one absence (98% in each arm; AOR, 1.00 [95% CI, 0.47 to 2.12];  $p=0.99$ ) or the percentage with authorized (97% per group; AOR, 1.01 [95% CI, 0.58 to 1.75];  $p=0.98$ ) or unauthorized absences (66% per group; AOR, 0.95 [95% CI, 0.76 to 1.18];  $p=0.62$ ).<sup>131,149,150</sup>

**Intervention effectiveness for populations of interest.** In contrast to findings in the whole sample, in which intervention group children reported skipping school less often than control children, differences in skipping school were not significant in a high-prevention opportunity sample in the first trial: 1.85 percent (1/62) of intervention group children and 4.53 percent (3/60) of control group children reported skipping school “often” ( $p$ =not significant). Differences in maternal reports of skipping school more than once were not significant in the high-prevention opportunity subgroup, which aligns with findings for the whole sample.<sup>138</sup>

### *Unintended Pregnancy, Sexually Transmitted Infections, or Termination of Pregnancy*

No studies reported on intervention effectiveness for unintended pregnancy, sexually transmitted infections, or termination of pregnancy.

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for unintended pregnancy, sexually transmitted infections, or termination of pregnancy for populations of interest.

## Other Outcomes

### *Death*

Of the six eligible studies, none reported statistically significant differences in the rates of child death between intervention and usual-care groups (**Appendix D Table 44**). Five trials reported a lower but nonsignificant difference in rate of child death among children in their intervention groups.<sup>112,119,128,131,132,141,149,150</sup> One trial reported a higher but nonsignificant rate of death among children in the intervention group.<sup>114</sup> In the longest study (9 years of followup),<sup>119,141</sup> one death occurred in the intervention group (222 participants) and 10 deaths in the control group (498 participants). The OR was 0.22 but with wide CIs (95% CI, 0.03 to 1.74).<sup>119,141</sup> These were rare events even among these mostly high-risk children recruited for risk factors also associated with increased risk of infant mortality. Also, these studies often include small samples. For example, the 3 percent reported neonatal death rate was in a control arm of a trial in which 2 infants died in a sample of 72 (2/71, 2.8%).<sup>128</sup>

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for deaths for populations of interest.

### *Composite Outcome (Infant Death, Severe Nonaccidental Injury, and Involuntary Foster Care Placement)*

One trial reported on a composite outcome comprising infant death, severe nonaccidental injury, and involuntary foster care placement (**Appendix D Table 45**).<sup>128</sup> The investigators found a lower but not statistically significant risk for this measure outcome in the intervention group (3% [2/65] vs. 12.7% [9/71] in the usual-care group; RR, 0.24 [95% CI, 0.05 to 1.08]). When adjusted for baseline covariates, the RR was 0.22 (95% CI, 0.02 to 0.98).<sup>128</sup>

**Intervention effectiveness for populations of interest.** No studies reported on intervention effectiveness for composite outcome of child abuse and neglect for populations of interest.

## Key Question 2. Harms of Interventions to Prevent Child Maltreatment

### Adverse Events

Two trials comprising five publications reported on harms but did not report on any prespecified harm outcomes such as stigma, labeling, legal risks, risks of further harm to the child, or dissolution of families or worsening of inequities (**Appendix D Table 46**).<sup>131,132,149-151</sup> In one study (with 99 participants randomized to the intervention arm and 67 to the control arm), adverse events included miscarriage/terminations (5 events in the intervention arm vs. 1 in the control arm), late miscarriage (1 vs. 0), suspected miscarriage/termination (1 vs. 0), and infant death (0 vs. 1).<sup>132,151</sup> These events occurred before the participants could begin attending group family nurse partnership sessions and are so unlikely to be related to the intervention. The calculated RR is 2.37 (95% CI, 0.51 to 11.06). The second study, with 810 women analyzed in the intervention and 808 in the usual care arm, reported that 357 (43%) participants (mothers or children) had a serious adverse event (defined as primarily clinical events associated with

pregnancy and infancy period) in the intervention arm vs. 310 in the usual care arm (38%) (calculated RR, 1.15 [95% CI, 1.02 to 1.25]).<sup>131</sup> However, none were judged to be related to the intervention. The study also reported numbers (rather than rates) of miscarriages/terminations (24 in the intervention arm vs. 27 in the control arm), stillbirth/neonatal/infant death (5 in the intervention arm vs. 7 in the control arm), death of the mother/infant pair (1 in the intervention arm vs. 0 in the control arm) and adoption of the child (7 in the intervention arm vs. 7 in the control arm).

**Harms for Populations of Interest.** No studies reported on harms of intervention for populations of interest.

## Chapter 4. Discussion

This chapter begins with a summary of review findings for the evidence; **Table 3** provides additional details. We then present limitations of the evidence and our update review and end with conclusions and recommendations for future research. As noted in the introduction, SDOH such as poverty, food or housing insecurity, and lack of insurance serve as risk factors for child maltreatment.<sup>96</sup> A comprehensive intervention approach may require societal changes including broad policy mandates that address structural drivers of these risk factors. For this report, the remit is narrower and specific to the USPSTF considerations, to interventions that are *primary care relevant* and their effect on *direct or proxy measures of maltreatment*.

### Summary of Review Findings

#### Benefits of Interventions (Key Question 1)

**Table 3** provides a summary of the main findings in this evidence review organized by KQ, along with a description of consistency, precision, quality, limitations, strength of evidence, and applicability. The evidence on the effect of interventions that are feasible in or referable from primary care settings on short-term outcomes for interventions to prevent child maltreatment on reports to CPS, removal of the child from the home, ED visits, and hospitalizations suggests no benefit (**Table 3**). Long-term results of the same outcomes are not consistent. At or beyond the 3-year followup, two trials reported fewer CPS reports<sup>111,144,145</sup> and two did not.<sup>117,138,149,150</sup> One<sup>143</sup> of three trials<sup>143,147,149,150</sup> reporting on ED visits at or beyond the 4-year followup found lower rates of ED visits in the intervention arm. Other concerns with long-term outcomes include risks of contamination (where elements of the intervention become part of usual care over time or where individuals in the usual care arm receive the intervention) or unmeasured co-interventions. Additionally, interpretation of some outcomes can be challenging. Lower rates of all-cause ED visits or hospitalization may represent changes in patterns of healthcare utilization as a result of the intervention rather than lower rates of abuse or neglect. The evidence was also inconclusive for other outcomes, based primarily on the limited number of trials reporting on each outcome and lack of statistically significant results. These include injuries, failure to thrive, failure to immunize, internalizing and externalizing behavior symptoms, child development, school attendance, school performance, prevention of death, and other measures of abuse or neglect.

Significant uncertainties persist in interpreting the evidence. Ethical study design demands comparisons of interventions to prevent child maltreatment with enhanced or active usual care. The extent to which interaction with observers and care providers in the usual care arm mutes intervention effects remains unclear. Surveillance bias in the intervention arm may also serve to raise the rates of negative outcomes (for example, safeguarding actions,<sup>131</sup> reports to CPS,<sup>133</sup> or ED visits<sup>132</sup>) in the intervention arm, further obscuring potential benefits of the interventions.

Despite the inclusion of a wide range of potential direct or proxy measures of child maltreatment outcomes and child well-being outcomes, we found no consistent evidence of benefit. For some

outcomes, such as internalizing and behavior scores in one study,<sup>118</sup> despite statistically significant evidence of improvement in the intervention arm, very small differences between arms raise questions of clinical significance.

The KQs for this update include an explicit focus on intervention effectiveness for populations of interest. Although we found evidence for positive effects on some education-related outcomes for populations with greater need (“low psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”<sup>141, p. 3</sup>), differences in the ways the samples were stratified limit our ability to come to conclusions. Outcomes for mothers with limited intellectual functioning may differ substantially from mothers with poor mental health for widely varying reasons.

Our evidence consisted entirely of RCTs and almost entirely of interventions that included home visits. Trials generally focused on young mothers and drew from populations characterized as vulnerable. These similarities permitted qualitative and quantitative syntheses. Some interventions, such as the Nurse Family Partnership and Healthy Families, were tested in multiple settings. Nevertheless, the 25 included trials may have differed in other characteristics, such as the populations of interest, baseline risk of maltreatment, intervention intensity and duration, and outcomes measured. These reported and unreported characteristics may explain variations in the effectiveness of the intervention, but the evidence base for each outcome was not extensive enough to identify any patterns, especially in the context of consistent lack of statistically significant effect on many included outcomes.

## **Harms of Interventions (Key Question 2)**

Two studies did not report statistically significant adverse events between study arms. However, the studies focused on rare harms (such as miscarriages, terminations, stillbirth, infant or neonatal death, maternal death), and as a result, the findings were inconclusive. No studies reported on harms such as stigma, labeling, legal risks, risks of further harm to the child, or dissolution of families, or worsening of inequities. In the context of the limitations on risk assessment as a tool for screening (and therefore as a tool for assessing eligibility for preventive interventions), the risk of surveillance bias in intervention arms leading to a higher risk of reporting to CPS and removal of the child from the home, and the presence of racial and ethnic disparities in reporting to CPS, the burden of these harms has the potential to fall disproportionately on families of color. No study, however, evaluated how harms varied according to factors such as race and ethnicity.

## **Contextual Issues**

CQs present information on the current practices in identification/diagnosis and reporting and variations by race and ethnicity in these practices (CQ 1), the accuracy of risk assessment tools (CQ 2), and the association between child maltreatment prevention interventions and SDOH (CQ 3) (**Appendix A** provides detailed results). In brief, our findings for CQ 1 highlight the wide variations in reporting practices, clear presence of disparities by race and ethnicity in reporting, and lack of clarity on reasons for these differences. They also suggest that guidelines, when clear

and consistent as in the case of diagnosis, can help reduce racial and ethnic disparities in practice. Our findings for CQ 2 indicate poor to good accuracy of risk assessment tools. The potential risks of false-positives (e.g., family separation, trauma for the child and parent, costs) limit reliance on screening as an approach to identifying those at risk. Regarding the association between interventions to prevent child maltreatment and outcomes representing SDOH (CQ 3), 18 of the 25 studies included for this review addressed a SDOH-related outcome. Studies evaluated multiple, diverse SDOH-related outcomes, measured using disparate methods and at multiple time points. Overall, effects of interventions were mixed with some positive changes in some SDOH outcomes reported for intervention vs. control groups (e.g., receipt of well-child care and social support) and no group differences reported for other outcomes. Four studies reported SDOH-related outcomes in subpopulations defined by factors including socioeconomic status and intensity of intervention. Although subgroup definitions varied, one study suggested that groups characterized by higher socioeconomic need (as defined by greater use of social services) had higher risk of being reported for maltreatment, but other studies also found that those characterized by higher socioeconomic need experienced greater improvements in SDOH outcomes after receiving child maltreatment interventions than overall study populations. Because surveillance bias may be a factor in explaining the higher rates of maltreatment outcomes in intervention participants with greater social needs, more and better evidence is needed to clarify when and to what extent child maltreatment interventions are linked with improving SDOH and reducing child maltreatment outcomes.

## **Limitations of the Review**

A primary limitation of the scope of the review is its focus on primary care relevant interventions and their effect on direct or proxy measures of maltreatment. This scope is consistent with the remit of the USPSTF, but it does not address all potentially relevant policy solutions to prevent child maltreatment, such as changes in social policy at the national, State, county, or municipal level or community or universal interventions that are not primary care referable. In keeping with the intended scope of the review, we restricted inclusion to studies focused on preventive interventions for children who had not yet experienced maltreatment. Therefore, we are unable to determine whether child maltreatment prevention interventions are effective for children who have experienced maltreatment. Although our contextual assessment suggests at least some benefits for SDOH, our review does not address other outcomes such as family or maternal well-being or mental health.

In keeping with USPSTF methods, we summarize the results of trials rated as fair or good quality. In the previous update, we had also included a wide array of other trials rated as poor quality and found in sensitivity analyses that the inclusion of poor-quality trials did not materially change our findings of insufficient evidence or evidence of no benefit. Our restriction to English-language publications and very highly developed countries limits the applicability of the review to other countries.

Although the vast majority of included interventions included home visiting components, our specific focus on studies reporting direct and proxy measures of child maltreatment means that



our report cannot speak to the efficacy of home visiting for other outcomes. Other sources address the evidence on overall effectiveness of home visiting directly.<sup>153</sup>

## Limitations of the Evidence

The limitations of the evidence are largely unchanged from the prior review. Even outcomes specified as “direct” measures of child maltreatment may be prone to under- and overreporting, leading to challenges in interpreting the evidence. A key limitation pertains to the diversity of the interventions and the resultant heterogeneity. Although all but two trials had a home-visiting component, several aspects of this particular activity differed. These included the nature and theoretical basis of the interventions delivered during the home visits, credentials of the home-visiting staff, and intensity and duration of the intervention.

In addition, all trials involved implementing multiple components. Complex, multicomponent interventions need to report the theoretical foundation for the intervention to help interpret the results and reproduce successful interventions.<sup>154</sup> Study authors generally did not provide a theory of change or logic model that identified components essential to the success of the intervention. Without theoretical or contextual information on critical intervention components, we cannot determine how successful interventions are different from unsuccessful interventions. This lack of information limits our ability to understand when and how interventions work. Because of the link between SDOH and the risk of child maltreatment, analyses of effects in populations with greater need are of particular interest. Some stratified analyses of intervention effects in these populations of interest are available, but studies generally do not explain the reasoning behind grouping diverse participants. In interpreting the results for educational outcomes in a group of mothers with “low psychological resources,”<sup>141</sup> the mechanism of action and specific needs may be vastly different for mothers with limited intellectual functioning and mothers with poor mental health.

The issue of applicability of the findings to other pediatric or caregiver populations (e.g., with lower or higher risk profiles) and other settings (e.g., with fewer resources) remains uncertain.

Studies focusing on short-term outcomes of relatively rare events such as hospitalizations, removal from the home, and reports to CPS generally did not find statistically significant results. The few trials that did assess measures over the long term reported mixed results. The extent to which positive results in long-term trials can be attributed to the interventions themselves, to contextual factors such as the resources and abilities of the investigators and sponsoring institutions, or to intervening factors is unclear.

## Future Research Needs

Child maltreatment causes undeniable harm to children and is relatively common. One in 58 children in the United States in 2005–2006 experienced harm from maltreatment, and one in 25 was at risk of harm.<sup>68</sup> Preventive interventions offer an opportunity to decrease the risks of maltreatment and avert long-term sequelae for children and families. However, child

maltreatment prevention trials in the United States operate in the context of inaccuracies in risk assessment, racial and ethnic bias in reporting and diagnosis of child maltreatment, and poor outcome measurement. Interventions to prevent maltreatment, in this context, may not always be offered to those in need. The process of identification of participants eligible for the intervention, when paired with “at-risk” terminology, may cause harms from stigma, labeling, legal risks, and family separation and dissolution. Multiple studies included in the review have raised surveillance bias in the intervention arm as a potential explanation for higher rates of direct or proxy measures of child maltreatment in the intervention arm. When interventions to prevent child maltreatment are implemented, difficulties around measuring child maltreatment directly or through proxies impede an accurate understanding of the benefits of the intervention. Future research on child maltreatment interventions that incorporate provider education about implicit bias offer another approach to addressing surveillance bias.

Another consideration for future research is that many root causes of maltreatment stem from unmet social needs. In fact, many included interventions in this review aim to address family well-being. Framing future work in the context of child and family well-being offers an opportunity to address a serious and potentially preventable problem while minimizing the constraints associated with measuring risk and outcomes of child maltreatment.

The work of ensuring child safety is not solely within the purview of the healthcare system. Child safety requires interfacing with the education system, childcare system, CPS, and law enforcement. The ability of primary care to intervene on an outcome like substantiated child abuse reports is limited by these interfaces where the work of healthcare ends and the work of other systems begins. Additionally, interventions that attempt to address multiple risk factors may require structural changes in the community and/or changes to policy to be fully implemented. These types of interventions (such as universal child care as a policy to prevent child maltreatment<sup>155</sup>), while likely effective, are outside the scope of the USPSTF. The suggested change to focus on child and family well-being reframes the question to focus on those components of ensuring child safety for which primary care and thus the USPSTF are best suited: coordination and support for children and families; active facilitation of and connection to services address SDOH; and provision of fundamental healthcare, like vaccines and well-child checks. Primary care-relevant research can focus on the components of child safety within the purview of healthcare rather than attempting to intervene indirectly on things that are not.

Research, in this expanded framework, must still be able to support causal links between the intervention and outcomes. Improving child and family well-being will require multiple, complex interventions. Designing studies to support causal claims and promote implementation requires articulating the mechanism of action, clarifying the effects of specific intervention components (such as intensity, duration, and modality), identifying the benefits in the group with the highest need, and following participants for a sufficient length of time to record relevant outcomes. For instance, the links between interventions that address social needs alongside child maltreatment prevention efforts, uptake of social needs, and improvement of child maltreatment outcomes need to be clearly articulated and examined. RCTs may face substantial challenges in design and recruitment, leading to the need for pragmatic trials (such as stepped-wedge designs) and observational study designs. Community-based participatory research approaches can

enhance recruitment and ensure that interventions are designed to address patient and community social needs and risk factors.

Racial bias may influence the measurement of proxy and direct measures of maltreatment; low event rates further limit their ability to meaningfully measure change. Limitations in the validity and reliability of measurement of self- and parenting reporting serve as further challenges. Potential areas for research include more reliable and valid measures from youth self-report and the development and validation of composite outcomes with potentially higher event rates. Rates of harms, including those arising from surveillance, for racial and ethnic populations of interest will be important to document in future trials.

## Ongoing and Unpublished Studies

We identified several ongoing trials that are potentially relevant to this topic. One is a Japanese trial to evaluate the efficacy of an internet-based behavioral activation therapy program via smartphone (Smart Mama) for postnatal mothers; the program aims to reduce depression symptoms among mothers and reduce child abuse.<sup>156</sup> No results have been published to date. A second trial implemented Minding the Baby, an interdisciplinary, home-visiting program to support first-time young mothers in the United Kingdom; no eligible outcomes were reported in initial results.<sup>157,158</sup> One trial implementing Minding the Baby in the United States has been included in this review.<sup>125</sup> Six ongoing trials conducted in the United States are currently enrolling participants. These trials include Enhanced First Connections, a short-term, perinatal, home-visiting program that aims to prevent child abuse and neglect and reduce child exposure to intimate partner violence;<sup>159</sup> Personalized Education Regarding Clinical and Community Supports, which provides an enhanced level of engagement in resource navigation;<sup>160</sup> and a group caregiver training program (PriCARE/CARIÑO) designed to improve child behaviors, caregiver-child relationships, parenting capacity, and reduce caregiver stress.<sup>161</sup> Three of the six trials are being conducted among women with substance use disorders. In one trial, participants will be referred to the Substance Use Treatment and Recovery (STAR) prenatal clinic or to STAR plus home visits from a licensed therapist focused on attachment and positive parenting in substance exposed babies.<sup>162</sup> In another ongoing trial (Parent-Child Assistance Program), case managers work closely with mothers who have used alcohol, opioids, or other drugs during pregnancy, meeting the mothers in their homes, when possible, to help them to set goals and take advantage of available resources.<sup>163</sup> The third ongoing trial is enrolling mothers with substance use disorder and is evaluating a novel mother-child therapeutic model, with the goal of improving child well-being, permanency, and safety and reducing the risk for involvement in the child welfare system.<sup>164</sup> We also identified one trial of the Navy and Marine Corps' New Parent Support Program home-visiting program that is in the pre-recruitment phase, with an estimated study completion date of November 2024.<sup>165</sup>

## Conclusions

The evidence base on interventions feasible in or referable from primary care settings to prevent child maltreatment suggests no benefit for some outcomes (reports to CPS, removal of the child

from the home, visits to the ED, hospitalization, child development) and is insufficient to demonstrate benefit for other direct or proxy measures of child maltreatment. Limited or no information was available about possible harms.

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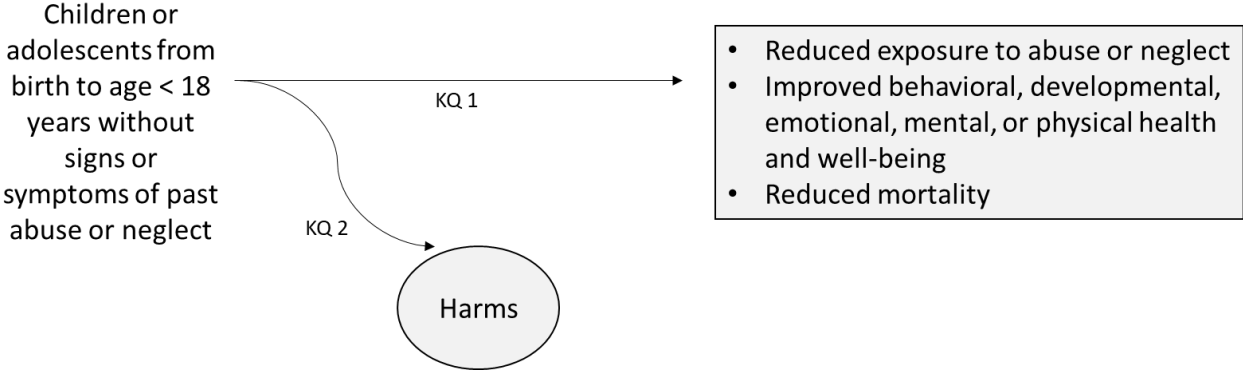
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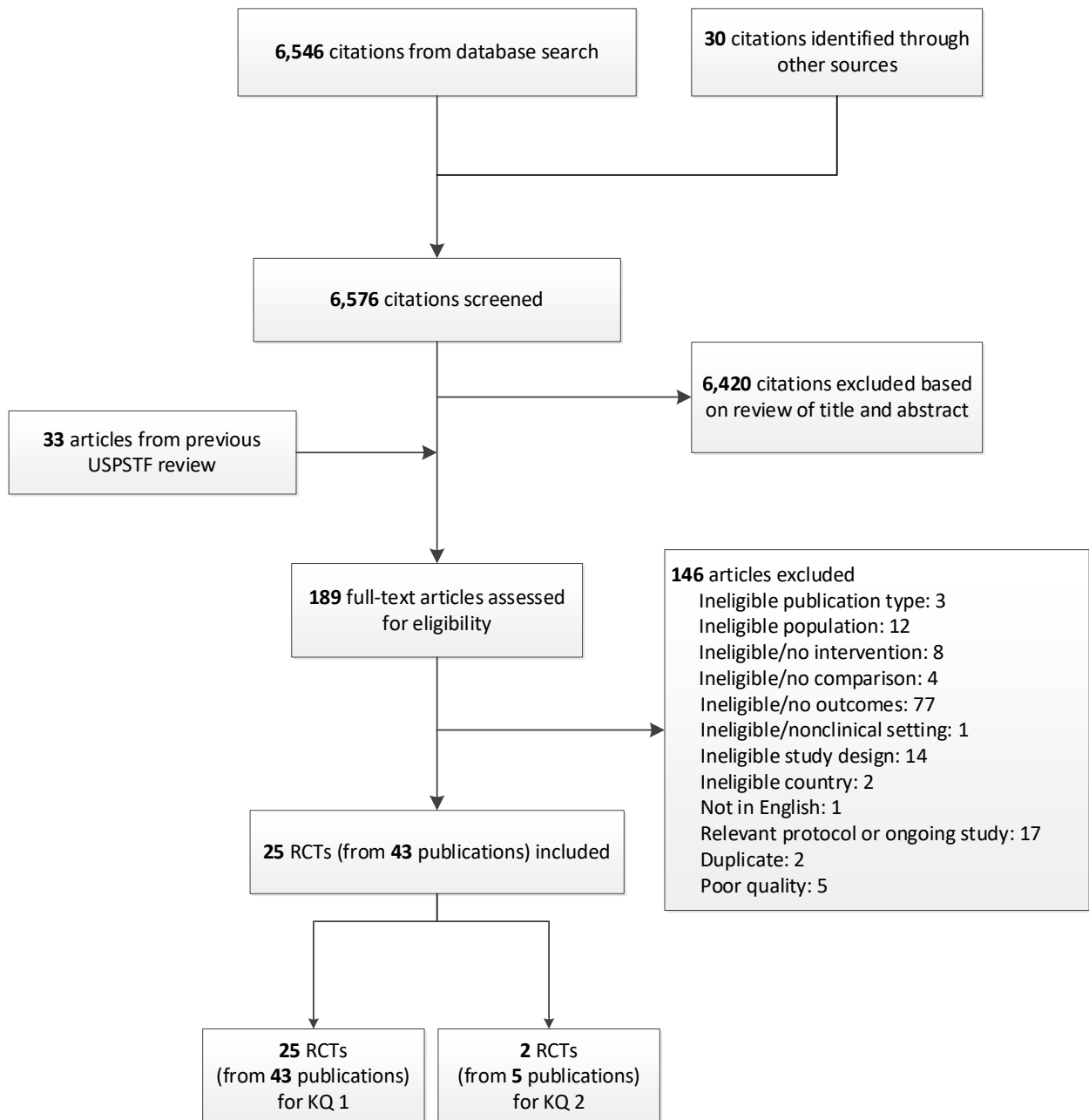
**Figure 1. Analytic Framework**



**Abbreviations:** KQ=key question.

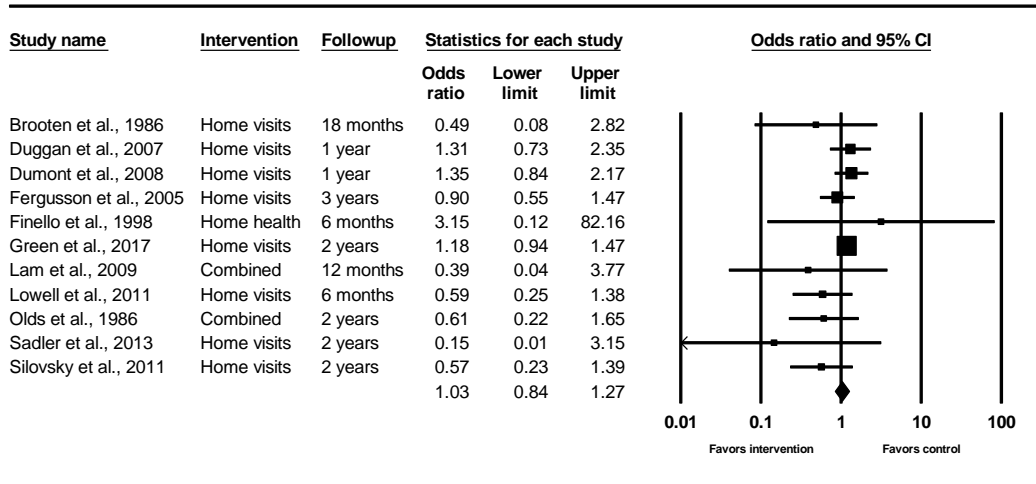


**Figure 2. Literature Flow Diagram**



**Abbreviations:** KQ=key question; RCT=randomized controlled trial; USPSTF=U.S. Preventive Services Task Force.

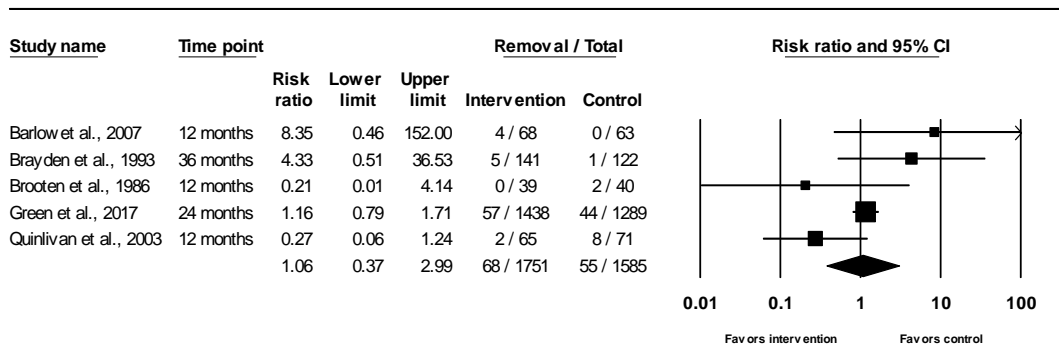
**Figure 3. Child Protective Services Reports: Pooled Results**



$I^2 = 10.2\%$

**Abbreviations:** CI=confidence interval.

**Figure 4. Removal of the Child From the Home: Pooled Results**



$I^2 = 49.9\%$

**Abbreviations:** CI=confidence interval.

**Table 1. Types of Child Maltreatment Prevention Programs**

<b>Type of Program</b>	<b>Description of Program</b>
Home visitation programs	Aim to improve parenting and parent–child relationships by building positive parent–child relationships and attachment, reducing harsh parenting, increasing nurturing parenting, and improving safety in the home. Components may support parents in meeting basic needs (e.g., employment) and help them gain access to social support and community services.
Pediatric primary care programs	Train health professionals to identify risk factors placing infants or children at high risk for maltreatment or neglect and to make referrals to community resources. Components include comprehensive parent education and support interventions.
Psychotherapy interventions	May target high-risk groups. May focus on improving the parent’s mood and coping skills, using cognitive behavioral therapy strategies. Components include strengthening the parent–child relationship and addressing attachment problems between caregiver and child. May be offered in the home as a home-visiting service, included as a component of a home visitation program, or be clinic-based.
Respite care programs	Offer short-term, temporary relief to families caring for children with developmental disabilities or serious emotional disturbances that place them at risk for maltreatment or neglect. Offer families a break while providing a safe environment for the child. May be provided for several hours, overnight, or for a few weeks at a time and may be provided in the home, a foster home, or a facility in the community.
Parent education programs	Improve parents’ understanding of children’s developmental needs and normal developmental behaviors, improving their capacity to provide nurturing care and increasing the use of positive discipline strategies. Are often didactic and delivered via parent groups.
Community-based programs	Aim to reduce barriers created by a lack of community support and other negative forces within a community by both reducing risks and enhancing protective factors. Components include fostering partnerships with other local programs serving young children and working to create more supportive relationships among community residents. May also include achieving policy-level changes that increase resources available at the level of clinical care.

**Table 2. Characteristics of Interventions to Prevent Child Maltreatment**

<b>Study Characteristics*</b>	<b>Subcharacteristics</b>	<b>Number of Studies</b>	<b>Percentage</b>
Study quality	Good-quality studies	1	3.3%
	Fair-quality studies	24	80%
	Poor-quality studies	5	16.7%
Population characteristics: Enrollment	Enrolled in prenatal period or immediately after birth	15	60%
	Enrolled prenatally, immediately after birth, and after the perinatal period	1	4%
	Enrolled after the perinatal period	9	36%
Population characteristics: Maltreatment reported at baseline	Reported maltreatment at baseline	6	24%
	Did not report maltreatment at baseline	19	76%
Population characteristics: Risk status	Parent identified to be at risk	15	60%
	Child identified to be at risk because of birth status (premature or low birthweight)	2	8%
	Participants not specifically identified to be at risk	8	32%
Population characteristics: Age of mother	Most or all mothers younger than age 20 years	7	28%
	Mothers age 20 years or older on average	18	72%
Population characteristics: Race	Study population ≥25% non-White	16	64%
	Study population <25% non-White	5	20%
	Study population race NR	4	16%
Population characteristics: Ethnicity	Study population ≥25% Hispanic or Latina/o	6	24%
	Study population <25% Hispanic or Latina/o	6	24%
	Study population % Hispanic or Latina/o NR	13	52%
Intervention characteristics: Home visits	Home visit component	23	92%
	No home visit component	2	8%
Intervention characteristics: Personnel	Clinical personnel involved in care	17	68%
	No clinical personnel	8	32%
Comparator	Usual care comparator	22	88%
	No usual care comparator <sup>†</sup>	3	12%
Geographic setting	United States of America	18	72%
	United Kingdom	4	16%
	Canada	1	4%
	Australia	1	4%
	New Zealand	1	4%

\* For all characteristics other than study quality, the table presents data from good- or fair-quality studies only.

† One study compared standard behavioral couples therapy or combined parent skills and behavioral couples therapy with individual-based treatment;<sup>123</sup> a second study compared a cognitively based extension of the Healthy Start home visitation program with a visitation condition that did not include this component;<sup>115</sup> and a third study compared home visits with no home visits or other forms of intervention.<sup>127</sup>

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: Reports to CPS	Caregivers of children at risk of maltreatment	15; 8,513 <sup>110-112,114,116-118,121-126,131,133,135-140,143-146,149</sup>	CPS reports at or within 1 year of trial completion: OR, 1.03; 95% CI, 0.86 to 1.27; $I^2$ , 10.2%; 12.9% vs. 12.2% (k=11, 5,311 participants*)  Mixed results for long-term followup*	Consistent/imprecise short-term outcomes; inconsistent/imprecise for long-term outcomes	No evidence of reporting bias	Fair	Heterogeneity across studies in type of intervention	Low for no benefit for short-term outcomes, insufficient for long-term outcomes	Unclear whether findings apply to subgroups defined by parent risk factors
KQ 1: Removal of the child from home	Infants/toddlers age $\leq 3$ years	6; 3,657 <sup>112-114,120,128,133,136</sup>	Removals 0–3 years: 68/1751 (3.9%) vs. 55/1585 (3.5%); RR, 1.06; 95% CI, 0.37 to 2.99; $I^2$ , 49.9% (k=5, 3,336 participants)  Removals at birth (for intervention started in pregnancy) in one study: calculated RR, 2.33; 95% CI, 0.66 to 8.20; 225 participants	Inconsistent/imprecise	No evidence of reporting bias	Fair	Heterogeneity across studies in timing of outcome	Low for no benefit	Unclear whether findings apply to subgroups defined by parent risk factors
KQ 1: Other measures of abuse or neglect	Caregivers (mothers or families)	3; 2,106 <sup>113,115,131</sup>	Abuse:† 13/141 (9.2%) vs. 8/122 (6.6%); RR, 1.4; 95% CI, 0.58 to 3.62; k=1, 263 participants  Neglect:‡ 15/141 (10.6%) vs. 5/122 (4.1%); RR, 2.79; 95% CI, 0.98 to 7.91; 1 trial, 263 participants  Significantly higher safety scores in the	Inconsistent/imprecise	No evidence of reporting bias	Fair	Heterogeneity across studies in outcome measures	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: Other measures of abuse or neglect (continued)			intervention arm; 1 trial, 141 participants  Higher rates of safeguarding actions in the intervention arm: AOR, 1.85; 95% CI, 1.02 to 2.85; 1 trial, 945 participants						
KQ 1: Injuries with a high specificity for abuse	Adolescent mothers	1; 136 <sup>128</sup>	Nonaccidental injuries: 0/65 (0%) vs. 1/71 (1.4%); calculated RR: 0.36; 95% CI, 0.015 to 8.77	Consistency unknown (single trial)/imprecise	No evidence of reporting bias	Fair	Single small trial	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors
KQ 1: Visits to the ED	Children	14; 8,180 <sup>112,114,116,118,119,121,122,126,127,129-132,136,137,140,141,143-150,152</sup>	2 of 4 studies reported a statistically significant difference in the mean difference of ED visits at 2 months <sup>132</sup> and 6 months of age; <sup>152</sup> the other 2 studies report results that are not statistically significant at 6 months of age <sup>126,131</sup>  3 of 8 studies reported a statistically significant difference in mean number of all-cause ED visits from 1 to 2 years of followup <sup>121,126,132</sup> ; all other studies report results that are not	Inconsistent/imprecise	No evidence of reporting bias	Fair	Heterogeneity across studies in outcome measures	Low for no benefit for short-term outcomes, insufficient for long-term outcomes	Unclear whether findings apply to subgroups defined by parent risk factors

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: Visits to the ED (continued)			<p>statistically significant<sup>121,122,127,130,136,143-146,148,152</sup></p> <p>1 of 2 studies reported statistically significant results at the 2- to 4-year followup for each of the following: mean number of all-cause ED visits;<sup>121</sup> mean number of ED visits for accidents, injuries, and ingestions;<sup>121</sup> and number of children seen for accidents or injuries;<sup>118,140</sup> 2 studies found no differences for number of children seen in the ER;<sup>116,129,137</sup> 1 study found no difference in the proportion of children seen for injuries and ingestions<sup>131</sup></p> <p>1 of 3 studies reported statistically significant differences at long-term followup<sup>143</sup></p>						
KQ 1: Hospitalization	Infants	13; 7,475 <sup>112,114,116,118,119,122,126,128,131,132,137,140,143,147-150</sup>	1 of 5 studies showed a reduction in number of children with all-cause hospitalization, but only for 1 of 4 outcome measures <sup>126</sup>	Consistent/imprecise for results under 3 years; inconsistent/imprecise for long-term followup	No evidence of reporting bias	Fair	Heterogeneity outcome measures; each outcome/timing only presented in a single study	Low strength of evidence of no benefit	Unclear whether findings apply to subgroups defined by parent risk factors



**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: Hospitalization (continued)			<p>1 study found a statistically significant mean difference in number of children hospitalized at 12 months in 1 of 5 hospital wards and no statistically significant differences in any of the 5 wards at 2 months<sup>132</sup></p> <p>2 of 4 studies found a lower mean number of hospital days or fewer total days hospitalized of injuries or ingestions<sup>119,143</sup></p> <p>1 trial found lower overall rates of hospital admission for unintentional injury at a 9-year followup<sup>118,140</sup></p> <p>All other outcomes are not statistically significantly different<sup>§</sup></p>						
KQ 1: Failure to thrive	Infants	1; 79 <sup>114</sup>	0% (0/39) vs. 2.5% (1/40); RR, 0.34; 95% CI, 0.01 to 8.14	Consistency unknown (single trial)/imprecise	No evidence of reporting bias	Fair	Single small trial	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: Failure to immunize	Adolescent mothers	1; 136 <sup>128</sup>	No vaccinations at 6 months: 4/71 (5.6%) vs. 9/65 (13.8%); calculated RR, 0.41; 95% CI, 0.13 to 1.26	Consistency unknown (single trial)/imprecise	No evidence of reporting bias	Fair	Single small trial	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors
KQ 1: Internalizing and externalizing behavior symptoms	Caregivers of children at risk of maltreatment	6; 5,115 <sup>111,116-119,129,137-141,147</sup>	3 of 6 trials reported reductions in behavior difficulties <sup>¶</sup>  Other outcomes are not statistically significantly different <sup>¶</sup>	Inconsistent/imprecise	No evidence of reporting bias	Fair	Small number of trials; heterogeneity of outcome measures	Insufficient	Home-based intervention targeting high-risk families may be effective in decreasing behavior problems
KQ 1: Other social, emotional, and developmental outcomes	Infants/toddlers ≤3 years of age	5; 4,439 <sup>111,112,129,136,138,141,147</sup>	0 of 5 studies reported statistically significant differences on a variety of social, emotional, and developmental measures <sup>#</sup>	Consistent/imprecise	No evidence of reporting bias	Fair	Heterogeneity outcome measures; each outcome/timing only presented in a single study	Low strength of evidence of no benefit for children ≤3 years	Unclear whether findings apply to subgroups defined by parent risk factors; one intervention may not be readily generalizable to other (pediatric practice) settings
KQ 1: Bayley Scales of Development	Caregivers and families	4; 1,638 <sup>112,119,121,137</sup>	1 of 4 trials reported higher scores in the intervention arm (mean difference between arms: 3.2; 95% CI, 1.2 to 5.2)	Consistent/imprecise	No evidence of reporting bias	Fair	Outcomes measured at different ages	Low for no benefit	All studies focused on at-risk caregivers and families

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: Other measures of development	Pregnant mothers	5; 4,542 <sup>111,121,125,131,143,147</sup>	3 of 5 trials reported statistically significant differences on other development outcomes but only for a subset of reported outcome measures and timing	Inconsistent/ imprecise	No evidence of reporting bias	Fair	Heterogeneity in outcome measures	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors
KQ 1: School performance	School-age children	3; 3,561 <sup>131,138,141,142,149,150</sup>	3 studies found no difference on varied school performance measures (repeating a grade, test scores, academically focused behavior) assessed at varied times <sup>131,138,141,142,149,150</sup>  1 of 3 studies reported statistically significant difference in mental processing (Kauffman Assessment Battery for children) at age 6 (mean 92.3 vs. 90.2; effect size, 0.18; p=0.03) <sup>142</sup>	Inconsistent/ Imprecise	No evidence of reporting bias	Fair	Heterogeneity in outcome measures	Insufficient	Unclear whether findings apply to groups not defined by parent risk factors
KQ 1: School attendance	School-age children/ families	2; 2,818 <sup>131,138,149,150</sup>	1 study reported statistically significant difference in attendance based on child report: Child-reported school attendance at age 7: 9/388 (2.35%) vs. 26/405 (6.47%); RR, 0.36; 95% CI, 0.17 to 0.76 <sup>138</sup>	Inconsistent/ imprecise	No evidence of reporting bias	Fair	Heterogeneity in outcome measures; self-report, maternal report, pupil database; inconsistency between child and maternal reports	Insufficient	Unclear whether findings apply to groups not defined by parent risk factors

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 1: School attendance (continued)			No difference in maternal reports of skipping school or reports from school records <sup>138,149,150</sup>						
KQ 1: Death	Pregnant or postpartum women; 5 studies included only women at risk for maltreatment, 5 studies included home visiting, 1 study included group intervention	6; 2,900 <sup>112,114,119,128,131,132,141,149,150</sup>	0 of 6 trials reported statistically significant differences in death	Consistent/ imprecise	No evidence of reporting bias	Fair	Heterogeneity in included studies	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors
KQ 1: Composite maltreatment outcome**	Mothers of newborns	1; 136 mothers <sup>128</sup>	2/65 (3.1%) vs. 9/71 (12.7%); RR, 0.24; 95% CI, 0.05 to 1.08; Adjusted RR, 0.22 (95% CI, 0.02 to 0.98; p=0.04)	Consistency unknown (single trial)/imprecise	No evidence of reporting bias	Fair	Single small trial	Insufficient	Unclear whether findings apply to subgroups other than teenage first-time mothers

**Table 3. Summary of Evidence of Interventions to Prevent Child Maltreatment**

Key Question	Population, Intervention	No. of Studies; No. of Observations	Summary of Findings by Outcome	Consistency/Precision	Reporting Bias	Overall Quality of Studies	Body of Evidence Limitations	EPC Assessment of Strength of Evidence: For Outcome	Applicability
KQ 2: Harms	Pregnant women; 2 home-visiting studies	2; 1,784 <sup>131,132,149-151</sup>	0 of 2 trials reported statistically significant differences in harms	Consistent/imprecise	No evidence of reporting bias	Fair	Heterogeneity in outcome assessment	Insufficient	Unclear whether findings apply to subgroups defined by parent risk factors

\* Long-term CPS reports: AOR, 0.48; 95% CI, 0.23 to 1.0, in one study (3 year followup, 157 participants);<sup>111</sup> calculated RR, 0.95; 95% CI 0.80 to 1.12 in second study (6-year followup; AOR, 1.13, 1,506 participants);<sup>149,150</sup> p>0.1 in third study (5-year followup, 1,173 participants);<sup>117,138,139</sup> p=0.04 in fourth study (13-year followup, 216 participants, no effect size provided).<sup>144,145</sup>

† Abuse is defined as “hitting with the hand or objects, biting, burning with objects or by immersion, twisting, shaking, throwing or pushing so as to cause a fall, or hair pulling;” identified from review of public agency documents from the Tennessee Department of Human Services.

‡ Defined as abandonment, leaving a child with an inappropriate caretaker, gross failure to seek medical care, failure to provide shelter or nutrition, or gross failure to provide for normal intellectual development; identified from review of public agency documents from the Tennessee Department of Human Services.

§ Outcomes with no statistically significant results include number of hospitalizations because of nonaccidental injury to the neonate (1 study), number of children hospitalized because of child abuse and neglect (1 study), proportion of children hospitalized for injuries and ingestions (2 studies), number of children hospitalized for ambulatory-care sensitive conditions (1 study), number of children rehospitalized (1 study), mean number of all-cause hospitalizations (5 studies), and total count of hospital stays (2 studies).

¶ One study reported statistically significant differences on each of the following: mean and proportion of children with higher externalizing behaviors at 12 months; internalizing behaviors at 2 years and 3 years; behavior problems at 5, 6, and 9 years.

¶ Outcomes with no statistically significant results include internalizing behaviors at 6 and 12 months (1 study); child behavior at 2 years (1 study), 30 to 33 months and 5.5 years (1 study), and 7 years (1 study); and internalizing and externalizing behaviors at 9 years (1 study).

# Outcomes included dysregulation, sleep problems, problems with social skills, attention and social problems, school-related conduct outcomes, and infant social and emotional adjustment.

\*\* Defined as infant death, severe nonaccidental injury, and involuntary foster care placement.

**Abbreviations:** AOR=adjusted odds ratio; CI=confidence interval; CPS=child protective services; ED=emergency department; EPC=Evidence-based Practice Center; KQ=key question; OR=odds ratio; RR=relative risk; vs.=versus.

## Contextual Questions

**CQ 1. What are current practices for a) identifying children at risk of maltreatment, b) referring children or families to prevention programs, c) reporting children or families to child protective services, and d) diagnosing child maltreatment outcomes? Do current practices in identification, referral, reporting, and diagnosis of outcomes of child maltreatment differ by race or ethnicity of the child or caregiver? If evidence exists of practice differences, what factors might explain these differences?**

### Key Points

- Evidence suggests that disparities arise frequently prior to intake into the child welfare system, potentially due to bias.
- Identification and diagnosis overlap considerably; we summarize studies on these findings together below along with a synthesis of studies on reporting.

### Identification/Diagnosis

- The American Academy of Pediatrics (AAP) guidelines detail the recommended steps for the diagnosis of physical abuse.
- These guidelines were developed in part as a response to wide variations in practice for making a diagnosis of physical abuse.
- Data on practice variations primarily address the pediatric emergency department (ED) setting and young children (typically younger than age 2 years).
- Evidence on practice variations suggests:
  - Variations in approach to the diagnosis of physical abuse probably led to higher rates of missed diagnoses of physical abuse for White children (37%) than children overall (31%).
  - Differences in insurance may be contributing to discrepancies in diagnosis by race.
  - Clinician bias may be contributing to discrepancies in diagnosis by race.
  - Clinicians' initial impressions when distinguishing between accidental and abusive trauma is poor.
  - Use of guidelines seems to be reducing variations in care.

### Referral to Prevention Programs

- One study offered supportive interventions that had been shown to reduce child maltreatment to a cohort of families at higher risk; the study found an association between higher risk and active pursuit of home visitation services suggesting receptiveness to interventions.

## Appendix A. Contextual Questions and Additional Background

### Reporting

- States vary considerably regarding standards for reporting, burden of proof, and protection of the identity of the reporter.
- Certain professions, including healthcare workers, are required to report suspected abuse (mandatory reporters), but these can vary by State and even include professions without routine contact with children such as film or photograph processors, computer technicians, and animal control officers.
- Much of the data are from the 1990s and mid- to late 2000s.
- In addition to State variations in standards for reporting, reporting discrepancies by individual characteristics, such as informant type and Medicaid-eligibility or lack of insurance; household composition; and structural factors such as occupancy rate and proportion of Medicaid patients in hospitals exist.
- Clear and consistent patterns of racial and ethnic disparities exist with reporting. One study evaluating the accuracy of reporting to child protective services (CPS) against substantiation of maltreatment found that the ratio of false-positives to false-negatives was 1.71 in Black children when compared with 1.54 in White children.<sup>74</sup>
- Evidence to explain these differences is not, however, as clear or consistent. Maternal risk factors (such as prenatal care, maternal education, and number of children), socioeconomic status (SES), insurance status, clinician judgment, and community-level factors may play a role.

### Main Findings

As noted in the main report, the potential for disparities in the child welfare system exists at every stage but particularly at the front-end, prior to intake into the child welfare systems. These disparities require a better contextual understanding of current practice standards and variations in practice. Specifically, this contextual question (CQ) focuses on understanding standards and practices in identifying children at risk of maltreatment, referring children or families to prevention programs, reporting children or families to CPS, and diagnosing outcomes following child maltreatment.

In reviewing the evidence, we encountered significant overlap of the literature in the domains of identification and diagnosis and opted to address those two domains together rather than separately. We found no studies that reported on current practices in making referrals to prevention programs.

We first present evidence on identification and diagnosis and then on reporting. Within each section, we present (1) guidelines or standards, (2) variations in practice, and (3) variations in practice by race and ethnicity. We then summarize evidence gaps for the CQ.

## Appendix A. Contextual Questions and Additional Background

### Identification and Diagnosis

#### *Guidelines or Standards for Identification/Diagnosis of Child Maltreatment*

Identification and diagnosis of maltreatment are critical steps toward referring families to appropriate preventive and intervention services that decrease children's immediate and short-term risk of further maltreatment as well as the likelihood of experiencing long-term negative outcomes. However, identification and diagnosis of maltreatment is complex because maltreatment is often not witnessed by anyone other than the perpetrator and the child, perpetrators rarely report their actions, and children may be too young or too frightened to disclose their abuse.<sup>166</sup> Additionally, certain injuries, such as rib fractures, are highly concerning for abuse, but not diagnostic. So, diagnosis of maltreatment requires the synthesis of data from a number of sources rather than simply relying on a single test.<sup>167</sup> Identification and diagnosis of maltreatment are further complicated by variation in legal definitions of maltreatment, specifically neglect and emotional abuse, across States.<sup>168</sup> So, even when a physician or other clinician has concerns about neglect or abusive injury, the clinical findings may not meet the legal definition of maltreatment in a particular jurisdiction.

The AAP has published guidelines regarding child physical abuse,<sup>166,169,170</sup> sexual abuse,<sup>171</sup> and caregiver-fabricated illness.<sup>166,169,170, 172</sup> In "The Evaluation of Suspected Child Physical Abuse," the AAP reviews the recommended course of care. The clinical approach to the diagnosis of maltreatment typically involves a comprehensive nonaccidental trauma evaluation, which includes (1) a medical and event history, (2) a physical examination, and (3) additional laboratory and imaging studies (if indicated). A comprehensive medical history includes information about the child's temperament and medical, developmental, and social history; family health history (e.g., bleeding, bone, metabolic genetic disorders); mothers' pregnancy history; familial patterns of discipline; history of abuse to the child or siblings or parents' and family involvement with CPS; parental or caregiver experiences with substance abuse, mental health problems, domestic violence, and arrests and incarcerations; and social and financial stressors and resources. In addition to explicit disclosure of abuse or neglect, medical and event histories that include explicit denial of recent trauma in a child with obvious injury; vague, inconsistent, or no explanation for a serious injury; or notable delay in seeking medical care may raise concern for maltreatment.

A physical examination includes inspection of the head, eyes, ears, nose, and throat for traumatic wounds; an oral examination for dental trauma or dental caries; an evaluation of skin injuries such as bruises, lacerations, burns, and bites, as well as assessment of skeletal and thoracoabdominal injuries; and a complete neurological and motor assessment (including assessment of the fontanelle in infants). Injuries that raise suspicion of maltreatment include any injury to a nonmobile infant; injuries that are patterned, affect multiple organ systems, or occur in unusual locations such as the torso, ears, or neck; multiple injuries in different stages of healing; unusual fractures including rib, midshaft humerus or femur, scapula, classic metaphyseal lesions of the long bones, vertebrae, and sternum; and other significant injuries that are unexplained. In addition to physical injuries, symptoms such as unexplained vomiting, lethargy, irritability, apnea, or seizures may also be indicative of abuse.



## Appendix A. Contextual Questions and Additional Background

Based on the findings of the history and physical, the clinician then determines if further diagnostic work-up is needed. In certain cases, the indications for further work-up are quite specific and clear. For example, any injury in an infant before they are cruising raises concern for abuse and likely merits a detailed history and physical examination. Others require significant clinical judgment on the part of the practitioner seeing the patient. For example, a clinician should be concerned for abuse when the explanation for the injury is inconsistent with the child's physical and/or developmental capabilities, which requires them to exercise their judgment regarding the child's physical and/or developmental capabilities.

If the clinician determines that further work-up is needed, laboratory and radiologic testing is conducted. Appendix A Table 1 summarizes the types of tests clinicians may conduct during a medical assessment based on the type of injury observed during the physical exam.

### *Variations in Practice in Identification/Diagnosis of Child Maltreatment*

The AAP guidelines were developed in part as a response to the variation in the approach to possible cases of physical abuse.

A 2018 systematic review included a total of 22 studies reporting on skeletal survey utilization among 62,226 children age 0 to 59 months.<sup>174</sup> The review revealed variations in practice by whether abuse was suspected or not, age of the child, type of clinical setting, and type of injury. Eleven studies reported on skeletal survey use among children suspected of abuse. Of these, four studies conducted in pediatric hospitals reported that 85 to 99 percent of *infants* (<12 months old) and 77 to 90 percent of children (12 to 23 months old) with any type of injury from suspected or diagnosed abuse received a skeletal survey. Two studies conducted in pediatric hospitals reported that 36 to 45 percent of *children older than 24 months* with suspected or diagnosed abuse received a skeletal survey. Notably, the one study conducted in non-pediatric centers reported much lower use of skeletal surveys among infants (58%) and 1-year-olds (32%) suspected of abuse. Seven studies reported skeletal survey utilization rates among children with specific injuries. Rates were high in studies of infants referred to a child protection team with retinal hemorrhage (100%), skull fracture (94%), bruising (91% to 94%), and burns (89%). Greater variation was observed in children younger than 48 months old diagnosed with abusive head trauma (65% to 92%) and abusive fractures (79%).

In the review, twelve studies reported on skeletal survey utilization among infants younger than 12 months old with injuries concerning for abuse (i.e., bruising or fracture), regardless of whether abuse was suspected.<sup>174</sup> Skeletal survey utilization was most frequent (59% to 82%) among infants treated at pediatric centers for significant head injuries. Greater variability and inconsistency was observed across other injury types. Skeletal survey performance ranged from 12 to 21 percent among infants with bruising, burns, and minor head injuries, 11 to 60 percent for infants with any type of fracture, 0 to 77 percent for infants with long-bone fractures, and 41 to 86 percent for infants with skull fractures without associated intracranial hemorrhage. Among children older than 12 months, a single study reported that skeletal surveys were used in 66 percent of children 12 to 23 months old and 48 percent of children 24 to 35 months old presenting with severe head injury. More recent studies published after the review continue to find persistent and wide disparities in the use of skeletal surveys<sup>175</sup> and neuroimaging.<sup>176</sup>

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The level of variation described in the systematic review<sup>174</sup> is concerning because many children are seen by healthcare practitioners prior to the diagnosis of abuse being made, meaning that the failure to obtain recommended testing constitutes a missed opportunity to diagnose child maltreatment. These kinds of missed opportunities appear to be common. In one study, the authors found that 54 of 173 children (31 percent) under 3 years old who were ultimately diagnosed with abusive head trauma were initially misdiagnosed when they were brought to medical attention.<sup>77</sup> That study also found that White children and children from “intact” families in which both the mother and the father lived in the home had even higher rates of missed diagnoses at 43 of 115 cases (37 percent) and 37 of 92 cases (40 percent), respectively; children from “minority” families had lower rates of missed diagnoses (11 of 58 or 19%). Another study of 653 children younger than age 3 who were presented to either the ED or orthopedic clinic with a fracture found that 151 of those cases (23%) were consistent with possible missed abuse.<sup>177</sup> Pediatric centers appear to be less likely to miss a diagnosis of abuse than primary care or the adult EDs.<sup>178,179</sup>

Missed diagnoses have significant consequences for children. When the initial presentation of suspected abuse is unrecognized, 39 to 50 percent of patients experience additional abusive injuries within 1 year. Moreover, missing the initial presentation of suspected abuse is also associated with a 10 to 25 percent increased risk of death.<sup>180</sup>

### **Clinician Judgment as a Contributor to Variation**

Studies that aim to understand the logic behind a physician’s or other clinician’s thought process when a child presents with symptoms or signs concerning for abuse are limited because of the difficulty in obtaining these data. Surveys of how clinicians would handle hypothetical patient scenarios have been done,<sup>181,182</sup> but it is unclear how well these surveys correlate with actual practice, and so these are not described here.

Other studies have taken different approaches to try to understand clinicians’ assessment of childhood injuries. One study sought to assess a clinician’s concern for abuse at the time of presentation for young infants presenting with bruising; clinicians reported their level of concern for abuse, with 1 being “definite abuse” and 5 being “abuse very unlikely.”<sup>183</sup> This rating was done prior to ordering any additional testing, thus isolating the concern for abuse prior to seeing imaging or other laboratory results. The clinician participants worked in primary care offices, EDs, and child abuse programs and clinics. Overall, clinician judgment regarding the likelihood of abuse was poor. For level of concern ratings from 1 to 4, at least 30 percent of the children were determined to have been abused based on the clinical judgment of the study site’s primary investigator after a more thorough evaluation. So, even when providers had a lower suspicion of abuse based on the initial presentation, a substantial proportion of children have been abused. This study was conducted from 2010 to 2017, both before and after the publication of AAP guidelines regarding diagnosis of abuse. The authors recommended routine and protocol-based evaluations for infants with bruising.

Another study assessed physician documentation and orders in a pediatric ED for evidence that abuse was considered as a possible cause of fracture in infants younger than 1 year-old who had not been in a motor vehicle accident.<sup>184</sup> For study purposes, physicians were classified as

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considering child abuse as a cause of fracture if they (1) mentioned child abuse as a possible cause of the injury in their note, (2) ordered a skeletal survey, or (3) ordered a consult from the child abuse team. Overall, 66 percent of the cases met criteria for considering abuse, and more than 80 percent of the cases in children younger than 6 months old met criteria for considering abuse. Significant predictors for considering abuse included presenting to the ED between midnight and 6AM, an unwitnessed injury, a male attending physician, rib fractures, and the presence of bruises or lacerations in addition to the fracture.

### Variation in the Legal Response to a Diagnosis of Child Maltreatment

As mentioned earlier, a clinical diagnosis of maltreatment may or may not translate into legal action. One study reviewed 1,698 evaluations by a child abuse pediatrician over a 2-year period and found that out of the 1,698 cases, a diagnosis of child maltreatment was made in 477 (28%).<sup>185</sup> Of those, only 151 cases were reported as going to court; the study is unclear on the disposition of the other cases. This highlights one of the difficult points for many clinicians with respect to addressing child maltreatment. Even when physicians state confidently that child has been maltreated, their judgment may not always translate into identification of or consequences for the perpetrator.

#### *Variations by Race/Ethnicity of the Child or Caregiver in Identification/Diagnosis of Child Maltreatment*

In one systematic review, seven studies examined associations between race and ethnicity and skeletal survey utilization.<sup>174</sup> Three studies compared skeletal survey use among Black and White children and found that Black children were significantly more likely than their White counterparts to receive skeletal surveys when presenting with unwitnessed head injuries, isolated skull fractures, and intracranial hemorrhage. Three studies compared skeletal survey use among “minority” and White children; two of the three reported that skeletal surveys were more common among minority children than White children when children presented with skull or long-bone fractures and when siblings or other household contacts had been diagnosed with physical abuse. One study reported no significant differences in rates of skeletal surveys between Hispanic and non-Hispanic children with minor head injuries.

In addition to the review, one study of 414 cases of children 3 years old and younger who were admitted to the hospital with a primary diagnosis of skull or long-bone fracture found that “minority children” had greater odds of getting skeletal survey than White children (odds ratio [OR], 2.01 [95% CI, 1.00 to 4.04 for children <12 months]; OR, 8.75 [95% CI 3.48 to 22.03 for children ≥12 months]).<sup>78</sup> More recent studies have continued to find higher rates of skeletal surveys among Black infants than among infants of other races.<sup>186</sup> In another study, Black newborns (7.3%) were significantly more likely than White newborns (1.9%) and other racial and ethnic groups to receive a drug test when no obstetric urine drug test was performed during the pregnancy, after controlling for insurance type.<sup>187</sup>

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### Insurance Status

Although one study suggested that insurance status was not significantly associated with receipt of a skeletal survey,<sup>78</sup> others found differences by insurance status.

One study found differences in likelihood of a skeletal survey by insurance status (81% of children with public insurance received skeletal surveys vs. 59% of those with private insurance after adjusting for age and severity of the injury).<sup>188</sup> The effect of insurance varied significantly by race. Eighty-two percent of White children with public insurance received a skeletal survey compared with 53 percent of children with private insurance. However, among Black children, 85 percent with public insurance received skeletal surveys vs. 75 percent of those with private insurance, and 72 percent of Hispanic children with public insurance vs. 55 percent of those with private insurance received surveys ( $p=0.2$ ).

A second study found that in ED, primary care, or urgent clinic settings, infants 6 months old or younger with at least one injury with public insurance were more likely to receive a skeletal survey than those with non-public insurance.<sup>175</sup>

A third study reported differences in rates of neuroimaging among infants with humerus and femur fractures by insurance status after adjusting for age, sex, race/ethnicity, fracture type, and hospital.<sup>176</sup> Publicly insured infants underwent neuroimaging more frequently (62.0%) than privately insured infants (55.1%) ( $p=0.001$ ). However, detection of an intracranial injury was no more likely among publicly insured infants (3.7%) than privately insured infants (1.7%) ( $p=0.10$ ). Among infants less than 6 months of age, there was no significant difference in rates of neuroimaging between publicly (81.6%) and privately (76.3%) ( $p=0.08$ ) insured infants. However, among infants between 6 and 12 months of age, publicly insured infants (42.7%) were significantly more likely to undergo neuroimaging than privately insured infants (33.5%) ( $p=0.003$ ).

### Physician Perceptions

Physician perceptions may also be a contributor to the variations in diagnosis by race. A study of children referred for physical abuse evaluation by child abuse pediatricians from 23 institutions across the United States found that physicians' perceptions of social risk for abuse was highest for non-minority families and minority families with low SES. More specifically, the study found that the two lowest SES tertiles were associated with higher perceived social risk for abuse for both minority and non-minority families, indicating that SES plays a role in pediatricians' perception of abuse risk.<sup>189</sup>

A retrospective, secondary analysis of young children hospitalized acutely for the treatment of head trauma in 1 of 18 participating pediatric intensive care units (PICUs) found that race/ethnicity-based disparities in abusive head trauma (AHT) evaluation and reporting were observed. However, evidence of racial disparities at 2 of the 18 sites seemed to be the primary contributors to the evidence of bias across the whole study. When the other 16 sites were analyzed separately, the evidence of bias by race was no longer statistically significant. In the

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absence of local confounders, these disparities likely represent the impact of local physicians' implicit bias at the 2 sites where bias was noted.<sup>76</sup>

### Role of Guidelines in Addressing Provider Bias

In areas for which recommendations are clear regarding the need for evaluation of maltreatment, implementation of guidelines appears to reduce disparities. In one study, the implementation of a protocol recommending a skeletal survey for all children younger than 1 year with unwitnessed head trauma, disparities by race in obtaining a skeletal survey were reduced.<sup>190</sup> Prior to the protocol, Black infants underwent a skeletal survey 90 percent of the time vs. 69 percent for White infants. After the implementation of the protocol, Black children received skeletal surveys 92.3 percent of the time vs. 84.6 percent of the time for White children. Another study found that disparities in skeletal survey testing by insurance type and ED settings were reduced after the implementation of a child abuse guideline.<sup>191</sup> Prior to guideline implementation, among infants who met AAP criteria for evaluation of abuse those who did not have private insurance were significantly more likely to receive a skeletal survey than those with private insurance across community and pediatric EDs. Prior to guideline implementation, 29.6 percent of infants with a single type of medically minor injury (i.e., oral injury or high-risk bruising) received a skeletal survey in pediatric EDs compared to 4.0 percent of infants in community EDs. After guideline implementation, variation in skeletal survey testing for infants with a single type of medically minor injury was nearly eliminated (26.7% vs. 25.05%). Calls have been made to develop clearer guidelines for more nuanced patient presentations, such as infants who present with brief, resolved, unexplained events, which include symptoms such as pauses in breathing or alterations in consciousness that are less straight-forward with respect to appropriate testing.<sup>186</sup>

### Referral to Prevention Programs

One study offered supportive interventions that had been shown to reduce child maltreatment to a cohort of families at higher risk.<sup>192</sup> Birth records were used to identify factors interpreted as risks for child maltreatment: (1) “abnormal” condition of the newborn, (2) low birth weight, (3) absence of private insurance, (4) inadequate prenatal care, (5) single parenthood, (6) parenting multiple children, (7) maternal age <25 years, (8) maternal education less than high school, and (9) prior abortion. The study found an association between higher risk and active pursuit of home visitation services ( $p < .047$ ) suggesting receptiveness to interventions.

### Reporting

#### *Guidelines or Standards for Reporting Child Maltreatment*

Our review of guidelines for reporting suspected abuse or neglect reveal significant State-based variations in specifying mandatory reporters, reporting by other persons institutional reporters, standards for making a report, and confidentiality of the reporter's identity. Mandatory reporters belong to professions whose members were required to report suspected maltreatment. Forty-seven States specify mandatory reporters. While mandatory reporters generally included professions with frequent contact with children (such as social workers, teachers, healthcare workers [including mental health professionals], childcare providers, medical examiners, and law

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enforcement officers), they may also include—depending on the State—professions without routine contact with children such as film or photograph processors, computer technicians, and animal control officers. Regarding reporting by other persons, 18 States *require all persons* who suspect abuse or neglect to report it regardless of professions. All remaining 32 States permit all persons who suspect maltreatment to report it; these persons are considered “permissive reporters.” Institutions that employ mandatory reporters also have specified roles, responsibilities, and requirements that vary by State (“institutional reporters”). For instance, laws vary about whether the mandated reporter or the institutional head is required to report the suspected maltreatment. Some States have laws that prohibit discouraging or retaliating against employees who report suspected maltreatment.

Recent investigative reporting suggests that expansion of reporting (as in case of the State of Pennsylvania, which expanded the list of mandatory reporters, broadened the definition of abuse, and increased penalties for failing to report abuse) may have resulted in overwhelmed systems dealing with a 42 percent increase in reported cases (29,766 from 2010 to 2014 vs. 42,399 from 2015 to 2019) without a concomitant increase in substantiated cases (10,410 from 2010 to 2014 vs. 10,399 from 2015 to 2019).<sup>193</sup> The burden of this increase in investigation is more likely to fall on Black families who are reported at greater rates than their proportionate share of the population (in Philadelphia, Black children comprise 42% of the child population but were the focus of 66% of the reports to the Department of Human Services).

As with standards for who is required to report suspected maltreatment, standards for making reports also vary by State. These can include suspicion or reason to believe that a child has been abused or neglected or knowledge or observation of a child being subjected to conditions that would reasonably result in harm to the child. In Maine, for example, having reasonable cause to suspect that a child is not living with their family requires mandatory reporting. While mandatory and permissive reporters are required to explain the circumstances that led to the report, neither are required to provide proof of maltreatment. Although most States (44 as of 2019) protect the identity of reporters from alleged perpetrators of maltreatment, State requirements on the inclusion of the reporter’s name on the report is more variable. Toll-free telephone lines for reporting suspected maltreatment generally permit anonymous reporting. Nineteen States (as of 2019) require the name of mandatory reporters to be included in the report.

### *Variations in Practice for Reporting Child Maltreatment*

In addition to State variations in standards for reporting, reporting discrepancies persist by individual characteristics such as informant type and insurance status; household composition; and structural factors such as hospital characteristics (occupancy rate and proportion of Medicaid patients). A 2020 systematic review reported on *informant* discrepancies between case files, youth self-report, and parent report. To explore level of agreement between informants, the systematic review included studies with at least two types of informants of at least one form of child maltreatment.<sup>194</sup> The authors found that discrepancies in reporting were common, with generally poor agreement between informants across all maltreatment types ( $k=-0.02$  to  $0.37$  [poor to fair agreement]). Across studies, youth tended to endorse physical abuse, sexual abuse, and emotional abuse more often than recorded in their case files but reported less neglect relative

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to their case files. Fewer studies included comparisons of other types of informants including caregivers and residential treatment staff; however, the directionality between youth and those informants was often inconsistent across studies.<sup>194</sup>

Some evidence suggests an association between *insurance status* and risk of being reported. When controlling for race and age, Medicaid-eligible/uninsured infants were more likely than privately insured infants to be reported to CPS in the presence of a complex skull fracture or clinical findings that raised suspicion for abuse.<sup>195</sup>

*Household composition* also appears to play a role. A national, longitudinal study of household composition and maltreatment allegations for children from ages 4 to 10 years explored familial risk factors and found substantial variability in the rate of maltreatment allegations across different types of single-mother household compositions. In particular, the presence of non-relatives, especially unrelated males, demonstrated an increased risk for maltreatment allegations in the home. However, single-mother homes with two or more adult relatives, especially grandmothers, had a reduced risk for child maltreatment allegations. The study demonstrated that maltreatment allegations in single-mother homes were linked to the composition of types of other adults in the home rather than correlated with the number of adults in the home.<sup>196</sup>

Hospital-level factors may affect reporting. A study of *hospital-level risk factors* using a merged dataset of birth, hospital discharge and CPS records for all children born in Washington State between 2006 and 2013 reported associations between hospital-level factors and variations in CPS reporting. The study found significantly higher likelihood of being reported to CPS among substance-exposed infants born at hospitals that served larger populations of patients with Medicaid (OR, 1.25 [95% CI, 1.08 to 1.45]) and children in hospitals with higher occupancy rates (OR, 1.43 [95% CI, 1.15 to 1.77]) than substance-exposed children born in hospitals serving smaller populations of patients with Medicaid and with low occupancy rates to be reported to CPS.<sup>197</sup>

### *Variations by Race/Ethnicity of the Child or Caregiver in Reporting of Child Maltreatment*

The National Incidence Study of Child Abuse and Neglect (NIS), a congressionally mandated effort to provide estimates of the incidence of child abuse and neglect, was last conducted from 2005 to 2006. This study (which included 29,488 children) represents the most recent geographically representative data source for the United States.<sup>75</sup> The study used two definitions: the harms standard and the endangerment standard. The harm standard requires that “an act or omission result in demonstrable harm in order to be classified as abuse or neglect,” whereas the more inclusive endangerment standard also counts children who had the potential to be harmed because of maltreatment.<sup>75</sup> A further analysis of these data, coupled with California’s child welfare agency data, sought to understand the rates of disproportional reporting at the front-end of the system.<sup>74</sup> The study assumed that substantiation of maltreatment (using the endangerment standard) was the true positive and sought to identify the accuracy of referral when compared with substantiated cases. The study showed that specificity and sensitivity were both lower among Black participants when compared with White participants (sensitivity, 0.399 vs. 0.374 and specificity, 0.944 vs 0.972, respectively). The ratio of false-positives to false-negatives was 1.71 in Black children when compared with 1.54 in White children. The study suggested that

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these differences may be attributable to more random errors or “honest mistakes”<sup>74</sup>, pp. 390 for minority groups. The study did not, however, explore factors such as interpersonal or structural racism as reasons why supposedly random errors may occur more frequently among Black children than among White children.

Other population-based studies also report large disparities in reporting by race both within and across States. A study of a 2002 cohort in California reported the number of Black children referred for maltreatment before age 5 was 300.0 per 1,000 vs. 133.5 per 1,000 for White children (risk ratio [RR], 2.24 [95% CI, 2.20 to 2.29]).<sup>198</sup> A comparison of reports to CPS in Alaska and California found that disparities across two States (26% in Alaska for 2009 to 2011 vs. 19% in California) in rates of reporting could be explained by population race structure.<sup>199</sup> Furthermore, within each State, rates of reporting vary by race: (cumulative incidence rates in Alaska for American Indian/Alaska Native children: 0.487, Black: 0.305, White: 0.167; cumulative incidence rates in California for American Indian/Alaska Native children: 0.432, Black: 0.379, White: 0.159).<sup>199</sup> These clear and consistent patterns of differences in reporting of maltreatment by race have led to numerous investigations of individual and familial factors, provider factors, and larger community factors to explain these differences.

### *Individual, Maternal, and Familial Risk Factors*

One population-based study of children born in 2008 in Tennessee addressing the *child-specific risk factor* of a diagnosis of autism spectrum disorder did not reveal differences in reporting of maltreatment when comparing White children to all other races. Notably, however, pooling all races other than White as the comparator may have conflated varying rates of reporting.<sup>200</sup> Studies of *maternal risk factors*—specifically, prenatal substance abuse exposure—failed to demonstrate bias. A study using 2006 linked birth, hospital discharge, and CPS record data in California did not find evidence that racial disparities in CPS reports arise from bias in response to prenatal substance exposure.<sup>201</sup> The study found that substance-exposed Black and Hispanic infants were reported at significantly lower or statistically comparable rates to substance-exposed White infants. A merged dataset of birth, hospital discharge, and CPS records for all children born in Washington State between 2006 and 2013 also failed to demonstrate statistically significant differences in the odds of reporting by race (Black, Hispanic, Native American, White) and type of prenatal substance use exposure (amphetamine, cannabis, alcohol, cocaine, opioids), with the exception of Black women with prenatal alcohol exposure—these women had higher odds (2.43 [95% CI, 1.18 to 5.03]) of having their children reported for maltreatment than White women with prenatal opioid exposure.<sup>197</sup> An Illinois-based study of neonatal toxicology reports and child welfare agency data in 2012 did not find data to support differential reporting by race; rather the study found that White infants were more likely to be reported than Black infants. The study notes, however, that the type of prenatal substance use exposure may influence the decision to report, and the type of prenatal substance use varied by race in this study (Black infants were reported more frequently for prenatal cannabinoid exposure and White infants were reported more frequently for prenatal opioids exposure).<sup>202</sup>

A study exploring other maternal risk factors (SES, prenatal care, maternal education, number of children) found that controlling for these risk factors reduced the risk of CPS referral among Black children. A study using 2002 linked birth and CPS record data in California found that



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Black children were more than twice as likely as White children to be referred for maltreatment before age 5, but when stratifying for public health insurance as a marker of SES, race no longer showed a significant association with referral for maltreatment; low-SES Black children had a lower risk of referral to CPS than their socioeconomically similar White counterparts. Further, the study found that the relative risk of CPS referral decreased when maternal risk factors including prenatal care, maternal education, and number of children were included in the model as covariates. For instance, prenatal care during the first trimester of pregnancy, presence of some college education, and having fewer children were protective factors associated with reduced risk of a child's report for maltreatment. More specifically, those with prenatal care that began during the third trimester or not at all were 2.04 and 3.92 times as likely to have been referred than those whose care began during the first trimester, respectively.<sup>198</sup>

*Insurance status* may also influence disparities in reporting by race. One study found that among privately insured patients, Black children were more likely to be reported to CPS than White children; however, among children without private health insurance, the reporting rate for Black patients did not differ significantly from the reporting rate for children of all other races.<sup>203</sup> These findings suggest that private health insurance can protect White children from being reported to CPS.<sup>203</sup>

### *Clinician Factors*

Studies reporting clinician factors demonstrate racial disparities in healthcare providers' reporting decisions, with a tendency to over-report Black and other "minority" children in comparison to White children. A retrospective chart review of 388 children hospitalized for skull or long-bone fracture between 1994 and 2000 at an urban academic children's hospital in Philadelphia found that minority toddlers were significantly more likely (AOR, 4.32 [95% CI, 1.63 to 11.43];  $p=0.003$ ) to be reported to CPS by hospital clinicians compared with White toddlers, even after controlling for insurance status and likelihood of abuse.<sup>78</sup> This finding demonstrates differential reporting by race and suggests provider implicit bias plays a role when reporting pediatric fractures for child abuse. Similarly, a retrospective study of children diagnosed with rib fractures at an urban tertiary care children's hospital in Philadelphia between 2007 and 2018 found that Black children were more likely to have a CPS report than White children (89% vs. 59%;  $p=0.035$ ).<sup>204</sup> Similarly, a secondary analysis of CPS reports for pediatric patients at a regional, academic center in New York found racial/ethnic disparities in CPS reporting.<sup>81</sup> Specifically, the study reported that medical personnel made significantly disparate reporting decisions for "minority" pediatric patients compared with decisions for White pediatric patients, with the odds of Black and Hispanic pediatric patients being reported to CPS being approximately four times greater than the odds of White pediatric patients. In addition to racial disparity findings, the study found SES to be significant in reporting decisions: pediatric patients from high poverty neighborhoods were reported to CPS at approximately five times the rates of pediatric patients from low poverty neighborhoods.<sup>81</sup>

### *Community-Level Risk Factors*

Studies of *community-level risk factors*—specifically, neighborhood composition—demonstrated disparities in families' contact with CPS authorities but did not demonstrate reasons for these

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disparities. In a study investigating the cumulative risk of CPS reports before age five by neighborhood poverty rate and neighborhood racial composition using 1997 to 2015 administrative record data of CPS reports in Connecticut, the investigators found that CPS reports occurred at disproportionately rates among children in poor neighborhoods and children in non-White neighborhoods. For example, while only 28 percent of children in the State live in neighborhoods with greater than 10 percent poverty, these areas account for more than half of CPS reports. Similarly, nearly half of reports involve families in majority-non-White neighborhoods, which is disproportionate to the 26 percent of Connecticut children who live in these neighborhoods. The study does not shed light on whether unequal CPS involvement results from greater risks faced by groups disproportionately involved or from bias on the part of child maltreatment reporters and the CPS system.<sup>205</sup>

Further analysis of community-level risk factors suggests that disparities in reporting do not entirely disappear in analyses that stratify by poverty, with Black children still reported more than White children at the highest level of poverty.<sup>206</sup> A study of school employees in 2016 to 2017 in a metropolitan California county demonstrated that Black to White disparity in CPS referral by school employees remained even when data was stratified by different poverty levels. This study found that Black children were still reported slightly more often than White children at the highest level of poverty (as measured by the percentage of students eligible for free meals); the Black/White disparity index was 1.10, indicating disproportionate reporting in the first group compared with the second. More specifically, the highest level of poverty was associated with a reduction of the Black/White disparity index by an average of 8 percent per each 1 percent of student population eligibility, but the Black to White disparity ratios did not completely disappear.<sup>206</sup>

### **Evidence Gaps in Identification/Diagnosis of Child Maltreatment**

We identified multiple gaps in the literature in seeking to answer this CQ. Much of the data on the diagnosis and identification of maltreatment comes from EDs, mostly pediatric EDs. Data regarding the approach to identification and diagnosis of maltreatment in primary care settings, both pediatrics and family medicine, are needed, especially since the little available data suggest high rates of missed diagnoses in those settings.<sup>179</sup> Much of these data were collected before the publication of the 2015 AAP guidelines. New studies to assess practice since the release of those guidelines would be helpful, particularly since studies suggest that the implementation of guidelines seems to be reducing bias in practice.

Additionally, the data on variations in practice have been extracted primarily in the context of physical abuse toward small children, a context in which guidelines have clear recommendations about evaluation and diagnosis. Studies assessing variations in practice for the diagnosis and evaluation of sexual abuse and neglect are needed, as well as studies assessing variations in the approach to diagnosis of physical abuse in older children, areas for clear recommendations, are lacking.

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### Evidence Gaps in Referral to Prevention Programs

With the exception of the very limited evidence on higher uptake of home visitation among those identified to be at higher risk of child maltreatment,<sup>192</sup> we found no information on the rates and variations in referrals and uptake, including by race or ethnicity.

### Evidence Gaps in Reporting of Child Maltreatment

As with the evidence on identification/diagnosis, much of the evidence on reporting is older, collected in late 1990s and mid- to late 2000s. More recent studies will help to identify current patterns in reporting. As noted above, although evidence of disparities was clear, evidence on the reasons for disparities were lacking clarity or consistency. Studies addressing multifactorial and structural causes, including social determinants of health (SDOH) may offer greater clarity. Vast State-to-State variations in reporting also highlight the importance of continuing to study whether specific State systems are associated with better outcomes or worse outcomes.

## **CQ 2. What are the validity and reliability of risk assessment tools to identify children and adolescents who are at risk of child maltreatment? Does the reported validity and reliability (of risk assessment tools) differ by race and ethnicity? If yes, what might explain these differences? Is there evidence that these tools alter or increase inequity?**

### Key Points

- We identified two systematic reviews, one meta-analysis, and 33 studies describing evidence on 25 instruments. Of these studies, 10 describe reliability and 23 describe validity.
- No gold standard exists for identifying child maltreatment: both parent-reported abuse and neglect measures and child welfare measures, such as reporting to CPS or substantiated reports of abuse, may reflect over- or underreporting of true child maltreatment occurrence.
- Risk assessment instruments may rely on referrals to CPS, substantiated reports, or consensus judgment for validation.
- Typical settings of use include screening for physical abuse in the context of the ED or hospital setting. Eleven of the 23 instruments were evaluated in an outpatient or home setting; of these two were set in primary care and one in a prenatal care setting.
- Instruments can be classified as actuarial, based solely on empirically established relationships of risk factors and child maltreatment, or clinical, based on the judgment of a professional or a group of experts.<sup>207</sup>
- The distinction between actuarial and clinical can be imprecise as there are instruments and questions that could be considered actuarial or clinical based on how the information is collected. For example, if a question or domain in a tool is evaluating harsh parenting practices, then a yes or no question that is self-reported by the caregiver could be used in

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an actuarial tool; but if a nurse is answering based on perception or clinical judgment of the parenting practices, then it would be categorized as clinical.

- Of the 25 risk assessment tools, 11 instruments can be used to predict future maltreatment: four actuarial and seven clinical.
- Instruments have poor to good accuracy overall (areas under AUCs range from 0.31 to 0.89), but instruments in settings that are not applicable to primary care (emergency departments and hospitals) have consistently higher accuracy (AUCs range from 0.78 to 0.89) than instruments in settings applicable to primary care (AUCs range from 0.31 to 0.85).
- Sensitivities range from 14.8 to 97.0 percent, and specificities range from 16.6 to 98.5 percent.
- Actuarial instruments are better at predicting the onset of maltreatment than clinical instruments, but actuarial sensitivity ranges from 61.1 to 96.8 percent, specificity ranges from 16.6 to 98.5 percent, and AUCs range from 31.3 to 89 percent. Clinical sensitivity ranges from 14.8 to 97.0 percent, specificity ranges from 21.0 to 98.2 percent, and AUCs range from 50.0 to 87.0 percent.
- Of the 24 studies included in the review of the key questions, six identified participants using a risk assessment instrument. The six studies used one of five screening instruments: Kempe Family Stress Checklist (KFSI), the Maternal History Interview (MHI-2), the Parent Screening Questionnaire (PSQ) within the Safe Environment for Every Kid (SEEK) Model, the Brief Infant-Toddler Social and Emotional Assessment (BITSEA), and the Parent Risk Questionnaire (PRQ). Studies reporting on the validity of the tools were found for only two of these instruments (KFSI and MHI-2), and those reporting on reliability were found for three of the instruments (FKSI, MHI-2, and BITSEA). Four of the five instruments are risk assessment tools for child maltreatment (KFSI, MHI-2, PSQ, and PRQ) and one instrument screens for social or emotional behavioral problems (BITSEA).
- No studies reported the reliability or validity of risk assessment tools by race or ethnicity. No information is available on whether risk assessment tools alter inequities.

## Main Findings

One meta-analysis<sup>207</sup> examined the predictive accuracy of 27 instruments from 30 studies using the AUC value for effect size. The study classified the instruments as either clinical or actuarial and found that the mean effect size was higher for actuarial instruments than for consensus-based instruments or structured clinical judgments, which were both considered clinical instruments (AUC, 0.704 vs. 0.644 vs. 0.592, respectively).<sup>207</sup> Of the 30 studies, nine examined the onset of maltreatment, 16 examined the recurrence of maltreatment, and five studies included both onset and recurrence of maltreatment or did not specify. The meta-analysis found that instruments predicting the onset of maltreatment had a higher mean effect size than instruments predicting the recurrence of maltreatment (AUC, 0.744 vs. 0.659;  $p < 0.01$ ).<sup>207</sup> The meta-analysis did not report on the reliability of predictive validity estimates but noted that very few instruments have been validated in multiple independent samples.

One study,<sup>208</sup> published after the meta-analysis,<sup>207</sup> found the opposite when it compared the validity of actuarial vs. clinical factors for identifying child maltreatment and found that the

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clinical factors better predicted CPS investigations for child maltreatment and emergency medical care (EMC) outcomes. The four demographic factors were health insurance of the infant, first-time birth, teen parenthood, and no high school diploma. Four clinical domains, together the Enhanced Eligibility Screening for Family Connects, with three factors each (healthcare, parenting/childcare, home safety, and parent mental health) were evaluated by a nurse during a home visit. The demographic and clinical factors were compared as risk assessments tools to both CPS reports and EMC for injury or illness. CPS reports had a significant coefficient for the clinical risk variable (hazard ratio [HR], 4.01 [95% CI, 1.97 to 8.15]) and a non-significant coefficient for the demographic risk variable (HR, 2.45 [95% CI, 0.58 to 10.26]).<sup>208</sup> For predicting EMC, the clinical risk variable significantly predicted higher and earlier-onset of use (HR, 2.14 [95% CI, 1.03 to 2.14]), while the demographic risk variable did not significantly predict use (HR, 1.54 [95% CI, 0.88 to 2.87]).<sup>208</sup> The study had a smaller sample size (n=201) and only represented one geographic community but had substantial interrater reliability (K=0.69). Another consideration is that the nurses who found families to be at higher risk based on the clinical domains were responsible for the higher rates of CPS reports and ED visits as they may have made reports to CPS or recommended seeking medical care as a result of their home visits and interactions with the family. One study<sup>209</sup> of the actuarial risk assessment tool, the Instrument for early identification of Parents At Risk for child Abuse and Neglect (IPARAN), compared results from the instrument to nurses only using clinical judgment to nurses using the instrument and clinical judgment. The nurses using the IPARAN with clinical judgment had the best validity (sensitivity, 66.7 percent; specificity, 77.4 percent; AUC, 72.0 percent).<sup>209</sup> Using the IPARAN alone had greater sensitivity and AUC effect size than clinical judgment alone, which was more specific. The difference between IPARAN alone and IPARAN combined with clinical judgment was not statistically significant.<sup>209</sup>

One systematic review<sup>210</sup> evaluated screening tools for child abuse and included 23 articles with 15 screening tools divided into three categories: objective assessments including interviews and physical exams (five tools), biochemical tests and precision imaging (six tools), and self-report (four tools). Of the 15 tools the study identified, validity was evaluated for 11 tools (AUC, sensitivity, and/or specificity) and reliability was evaluated for two tools (internal consistency Cronbach's alpha).<sup>211</sup> The systematic review did not evaluate the tools by category and notes that the studies were validated in a variety of settings (two during home visits, two in hospital settings, three at outpatient clinics, five in Eds, and three in PICUs). and for three studies, no gold standard for confirming child abuse was used.<sup>212</sup> The review recommends using the Escape tool (a clinic judgement tool for which they calculated an AUC of 99.2%), or if the child is being evaluated for a brain injury or fracture, they recommend the PIBIS (Pittsburgh Infant Brain Injury Score), DIPCA (Diagnostic Index for Physical Child Abuse), and SIPCA (Screening Index for Physical Child Abuse) tools (actuarial tools with reported AUC values of 83%, 86%, and 89%, respectively).<sup>212</sup>

One study of medical students and orthopedic residents identifying child abuse in children presenting with fractures found that participants who used predominantly objective data were correct in 56 percent of cases while participants who used predominantly social data were correct in 33 percent of cases.<sup>213</sup> Participants who used a combination of objective and social data had the best accuracy and were correct in 72 percent of the cases. Their sensitivity increased with training ranging from 0.71 to 0.73, while their specificity decreased with additional training

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ranging from 0.30 to 0.47.<sup>213</sup> This finding is consistent with the finding that actuarial instruments have better validity than tools that require clinical judgement.

One study examined skull fractures to determine if complex fractures are more indicative of child abuse than simple skull fractures and found that it was not possible to determine abuse versus accident from skull fracture type alone.<sup>214</sup> The positive predictive value of a complex skull fracture for abuse was 7 percent, illustrating that even something as specific for abuse as a complex skull fracture does not have a high enough positive predictive value to determine abuse by itself.<sup>214</sup>

Of the 25 risk assessment tools for which we identified evidence; 11 instruments can be used to predict future maltreatment. Four are actuarial tools: Child Abuse Potential Inventory (CAPI), Enhanced Eligibility Screening for Family Connects, IPARAN, and Predictive Risk Modeling. Seven are clinical tools: BabyFirst Screen, Early Risks of Physical Abuse and Neglect Scale (ERPANS), INTOVIAN, KFSI, MHI-2, Ontario Risk Assessment Tool, and Symptoms Associated with Sexual Abuse (SASA).

### Actuarial Tools

Twelve instruments were identified as actuarial risk assessment tools that are based on empirically established relationships of risk factors and child maltreatment. Table 2 presents information on the reliability and validity of these instruments. For the 12 actuarial instruments, sensitivity ranges from 61.1 to 96.8 percent, and specificity ranges from 16.6 to 98.5 percent. A wide variety of reference standards were used to evaluate these tools including CPS reports, abnormal radiologic findings, and consensus or clinical judgment. Five of the 11 instruments were studied in an outpatient setting while the others evaluated children already in the emergency room (ER) or hospital. Four were designed to screen for future maltreatment: CAPI, IPARAN, Predictive Risk Modeling, and Enhanced Eligibility Screening for Family Connects.

The CAPI has been validated in several studies, and the meta-analysis<sup>207</sup> calculated AUCs ranging from 0.5565 to 0.6895, showing poor discrimination for this instrument. The validity and reliability information for the Enhanced Eligibility Screening for Family Connects<sup>208</sup> and the IPARAN<sup>209</sup> were described above. The Predictive Risk Modeling<sup>215</sup> was validated in children enrolled in New Zealand's public benefit system using substantiated CPS reports as the reference. The study found an AUC of 0.76 (95% CI, 0.757 to 0.771) indicating acceptable discrimination for the tool.<sup>215</sup>

The New South Wales Child Development Study<sup>216</sup> was validated in children born in New South Wales from 2002 to 2005. The children were followed until age 13 using substantiated CPS reports or out-of-home care placement. The study found AUCs of 0.82 to 0.84 (95% CI, 0.82 to 0.85) depending on use of the full 14 indicators or the final 10 indicator model.<sup>216</sup> The mean sensitivities ranged from 0.72 to 0.74, and specificities ranged from 0.80 to 0.82.<sup>216</sup> This tool was not developed to predict child maltreatment at the individual level, and the author notes that if this tool were implemented at the population level it would result in high false positive rates resulting in individuals not likely to develop the adverse outcome being targeted for intervention.<sup>216</sup>

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### Clinical Tools

Thirteen instruments were identified as clinical risk assessment tools or based on the judgment of a professional or a group of experts. Table 3 presents information on the reliability and validity of these instruments. For these clinical instruments, the sensitivity ranges from 14.8 to 97.0 percent, and specificity ranges from 21.0 to 98.2 percent. There was a wide variety of reference standards used to evaluate these tools including CPS reports, record reviews including trauma registries, and consensus or clinical judgment. Six of the 12 instruments were studied in an outpatient setting while the others evaluated children already in the emergency room or hospital. Two were set in primary care and one in a prenatal care setting. Seven were designed to screen for future maltreatment: BabyFirst Screen, ERPAN, INTOVIAN, KFSI, MHI-2, Ontario Risk Assessment Tool, and SASA.

BabyFirst Screen<sup>217</sup> was validated in infants born in Manitoba, Canada, using reports of out-of-home placement from provincial ministry of family services records as the reference standard. The tool was found to have a sensitivity of 0.776 and a specificity of 0.833.<sup>217</sup>

The reliability of ERPANS<sup>218</sup> was evaluated in a study of home visits in the Netherlands. The tool was found to have high internal consistency (Cronbach's  $\alpha$ , 0.94) and interrater reliability (across all items:  $r=0.97$ ). No testing of validity was performed. The reliability of the INTOVIAN<sup>219</sup> tool was also evaluated among children seen in public health centers in Cyprus, Greece, and Spain, and the tool had acceptable internal consistency (Cronbach's  $\alpha$ , 0.79).

Three studies evaluated the validity of the KFSI and had varied results.<sup>39,220,221</sup> The results from one screening test accuracy study indicate high sensitivity and specificity (80% and 89.4%, respectively), but the method of validation has serious flaws because it appears to exclude participants with intermediate risk.<sup>221</sup> A meta-analysis calculated the mean effect size for the instrument from this data and found an AUC of 0.8470.<sup>207</sup> A second study reported reliability data from two trials and found relatively lower rates of specificity.<sup>220</sup> One trial reported sensitivities of 84 to 89 percent and specificities of 28 to 35 percent, depending on if followup was at 6 or 12 months.<sup>220</sup> The other trial reported sensitivities of 69 to 96 percent and specificities of 21 to 42 percent, depending on the cutoff used for the KFSI.<sup>220</sup> This trial also reported on the reliability of the KFSI and found high reliability on individual characteristics in terms of levels of risk ( $r=0.93$ ), but it did not provide answers to whether families would receive the same score by independent evaluations.<sup>220</sup>

Two studies reported on the validity of the MHI-2. One of the studies found low rates of sensitivity and specificity (65% and 81.3%, respectively) with a low positive predictive value (5.5%), high false-positive rate (34.8%), and high false-negative rate (18.7%).<sup>113</sup> The study did find an internal consistency alpha of 0.08 and both studies were able to achieve 90 percent or greater interobserver agreement among four trained interviewers.<sup>113,222</sup> Two studies of the MHI-2 were used in the meta-analysis to calculate the mean effect size for the instrument, and the AUC ranged from 0.5385 to 0.7620.<sup>207</sup>

One study evaluated the reliability and validity of the Ontario Risk Assessment Tool<sup>223</sup> based on children in the Children's Aid Society database. The tool had an acceptable internal consistency

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(Cronbach's  $\alpha$ , 0.73) for caregiver category but with lower internal consistency (Cronbach's  $\alpha$ , under 0.7) for the four other categories. The interrater reliability was poor with Cohen's Kappa scores greater than would be expected by chance alone in eight of the 22 risk items. The meta-analysis<sup>207</sup> calculated an AUC of 0.5000, indicating the tool does not discriminate any better than expected by chance.

One study evaluated the reliability and validity of the SASA,<sup>224</sup> a tool designed to screen for sexual abuse. The tool had good internal reliability (Cronbach's  $\alpha$ , 0.83). The study found that the tool had a sensitivity of 90.9 percent and a specificity of 88.5 percent compared with the reference of CPS reports.<sup>224</sup>

### Tools Used in Review Studies

Of the 24 studies included in the review of key questions, six identified participants using a risk assessment instrument. Four were screening instruments for child maltreatment: KFSI, the MHI-2, the PSQ within the SEEK Model, and the PRQ. Two of these four instruments were clinical instruments and had studies evaluating their reliability and validity (KFSI and MHI-2) as detailed above.

### Race and Ethnicity

No studies reported the reliability or validity of risk assessment tools by race or ethnicity. One meta-analysis<sup>207</sup> examined the effect of the percentage of cultural minority participants in each study and found no significant moderating effect on predicting child maltreatment. One scoping systematic review<sup>225</sup> synthesized the evidence of validity and reliability of specific risk assessments tools designed for CPS agencies. Eleven tool families were identified and divided into four consensus-based, six actuarial, and one automated algorithmic tool.<sup>225</sup> The study found a lack of evidence that the assessments tools are equally predictive or reliable across subgroups with less than one-third of the studies even describing the racial and ethnic makeup of the study population.<sup>225</sup> One of the included studies found that the California Structured Decision Making Risk Assessment disproportionately classified Native American families at higher risk despite having similar outcome rates.<sup>225</sup> The authors recommend that these CPS tools are explicitly tested among various subpopulations.<sup>225</sup>

One study<sup>226</sup> found that Torso, Ear, and Neck Bruising Clinical Decision Rule (TEN-4-FACESp), a clinical tool used to identify physical abuse using bruising, found that the tool's validity did not vary significantly by skin tone. Skin tone was assessed by the research staff and defined as fair, light, mid, brown, or dark compared with five photographs that served as the reference standard. The categorizations were verified by the principal investigator. No information is available on whether risk assessment tools alter inequities.

## Potential Interventions to Address Child Maltreatment

Interventions to prevent child maltreatment may include:

- Home-visitation programs: Prevention programs often involve home visitation programs



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aimed at improving parenting and parent–child relationships and strengthening the family. The focus of the intervention is typically on building positive parent–child or family relationships and attachment, reducing harsh parenting, increasing nurturing parenting, and creating a safe home environment.<sup>244,245</sup> These interventions sometimes include components designed to support parents in meeting basic needs (e.g., employment) and helping them gain access to social support and community services.

- **Pediatric primary care programs:** Programs implemented in the pediatric primary care setting train health professionals to identify factors placing children at high risk for maltreatment or neglect. AAP recommends that pediatricians assess parenting strengths and weaknesses and make referrals to community resources that may help prevent maltreatment.<sup>101</sup>
- **Psychotherapy interventions:** Psychotherapy interventions may target high-risk groups such as children of families exposed to substance use, marital discord, inadequate housing, poverty, or lack of social supports. Counseling and cognitive behavioral therapy strategies may be incorporated into prevention efforts with a focus on improving parental mood and coping skills. Art therapy or other psychological approaches may target child or parent mental health or behaviors.<sup>246</sup> Early childhood mental health services typically focus on strengthening the parent–child relationship and addressing attachment between caregiver and child; infant mental health services focus specifically on children from birth to age 3 years<sup>247</sup> and their caregivers. Psychotherapy interventions may be offered in the home as a home-visiting service or component of a home-visitation program or be clinic based.
- **Respite care:** Interventions may also include *respite care*, which offers short-term, temporary relief to families caring for children with developmental disabilities or serious emotional disturbances or families that lack reliable support systems. These factors may place children at risk for maltreatment or neglect. Respite care provides a safe environment for children and a break for families. Respite care can be provided on an emergent basis for several hours, overnight, or for a few weeks at a time. Care may be provided in the home, a foster home, or a facility in the community such as a crisis nursery or emergency shelter.
- **Parent education programs:** These prevention programs are commonly didactic and may be delivered via parent groups. Programs typically seek to promote parents’ understanding of children’s developmental needs and typical developmental behaviors, model positive parenting behaviors, improve parents’ capacity to provide nurturing care and problem solve, and increase the use of positive discipline strategies.<sup>248,249</sup>
- **Community-based prevention programs:** More recently, prevention programs have expanded from a focus on individuals and families to a broader community focus.<sup>97</sup> Community-based prevention programs attempt to reduce barriers created by a lack of community support and systemic factors that may affect communities. The focus of community-based prevention programs is both to reduce risks and enhance protective factors. Goals may include fostering partnerships among local programs serving young children; mitigating child maltreatment risks across the family, community, organization, and societal levels; and working to create more supportive relationships among community residents. Goals of these programs may also include achieving policy-level changes that increase resources available at the level of clinical care. These programs are most often not primary care–feasible or referable.

## Recommendations From Other Groups on Interventions to Prevent Child Maltreatment

Appendix A Table 4 summarizes current screening recommendations from other groups.

### **CQ 3. What are the effects of primary care–feasible or referable preventive interventions that report on child maltreatment outcomes on social determinants of health? Do primary care–feasible or referable preventive interventions that report on child maltreatment outcomes examine the association between social determinants of health and child maltreatment outcomes?**

#### **Key Points**

- Eighteen of the 25 studies included for this review addressed an SDOH-related outcome; almost all of these 18 studies addressed interventions including a home-visiting component.
- Studies evaluated multiple, diverse SDOH-related outcomes, measured using disparate methods and at multiple time points. The heterogeneity of outcomes and contextual nature of this analysis precluded quantitative synthesis, but the analysis below focuses on signals of benefits, regardless of volume of evidence.
- Overall, at least some interventions reported positive changes in some SDOH outcomes for intervention versus control groups (e.g., well-childcare outcomes, social support). For other outcomes, the studies reported no group differences (e.g., maternal employment, maternal access to care).
- Four studies reported SDOH-related outcomes in subpopulations defined by factors including SES and intensity of intervention. Although subgroup definitions varied, some evidence suggests that groups characterized by higher socioeconomic need experienced greater improvements in SDOH outcomes after receiving child maltreatment interventions than overall study populations.
- One study evaluating a home-visiting intervention addressed associations between SDOH outcomes and child maltreatment outcomes and reported that children of mothers who used more services between baseline and the end of followup (including Head Start and parenting classes) had a higher probability of being reported (substantiated or unsubstantiated reports) as experiencing child maltreatment; the odds of a maltreatment report increased by 1.55 with every additional service used (95% CI, 1.24 to 1.93);<sup>110</sup> surveillance bias cannot be ruled out.
- The link between improving SDOH and reducing child maltreatment remains unclear.

#### **Main Findings**

SDOH, the “conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks”<sup>251</sup> have been linked to poor health outcomes including adverse neonatal effects,

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cardiovascular disease, poor glycemic control, diabetes and diabetes complications, lower receipt of medication, and poor pediatric cancer survival.<sup>252-260</sup> Earlier research estimated that approximately 245,000 deaths in the United States were attributable to low education; 176,000 to racial segregation; 162,000 to lack of social support; 133,000 to individual-level poverty; 119,000 to income inequality; and 39,000 to area-level poverty in the year 2000.<sup>261</sup> More recently, increases in social vulnerability were associated with increased COVID-19 incidence and mortality.<sup>262</sup>

Improving SDOH may ameliorate poor health outcomes; recent systematic reviews have reported mixed effects depending on the social need targeted and type of intervention employed.<sup>263</sup> SDOH (poverty, housing insecurity, education, uninsurance) have also been associated with child maltreatment specifically,<sup>96</sup> and social programs that target SDOH such as supplemental nutrition assistance may prevent child maltreatment.<sup>264</sup>

In the context of the overlap between SDOH and risk factors for child maltreatment, uncertainty persists about whether interventions to address child maltreatment may mitigate the risk factors associated with child maltreatment. We sought to understand the effects of interventions that seek to prevent child maltreatment on SDOH and the extent to which studies of such preventive interventions examine associations between SDOH and child maltreatment outcomes.

Commonly cited frameworks addressing SDOH vary in how they conceptualize factors that comprise SDOH. Moreover, SDOH factors are multidimensional and measured in multiple ways. We prioritized the Centers for Disease Control and Prevention (CDC) SDOH domains (economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community context) to guide the SDOH considered for this CQ. We considered an outcome to be positive/beneficial or negative as implied by the study (i.e., if a study suggested that the change in the outcome was a benefit for group A vs. group B, we reported the outcome as beneficial for group A). We did not consider vaccination as an SDOH outcome in the healthcare access and quality domain given the potential overlap of attitudes toward vaccines/vaccine hesitancy on uptake of vaccinations. We also note that other SDOH-related outcomes (e.g., ED visits, academic attainment) are addressed by key questions and not repeated here.

### Effects of Child Maltreatment Prevention Interventions on Social Determinants of Health-Related Outcomes

SDOH-related outcomes were frequently addressed in studies of interventions to prevent child maltreatment: 18 of the 25 studies included for this review addressed an SDOH outcome.<sup>110-112,116-121,124,127-133,152</sup> Interventions typically targeted individuals with risk factors for child maltreatment that overlap with SDOH: homelessness, incarceration, low educational attainment, low SES, lack of social support. Several specifically targeted young mothers or included a majority of teenaged mothers.<sup>110,112,119,121,132</sup> All but one study<sup>132</sup> addressed interventions including a home-visiting component; the study without a home-based component evaluated group-based implementation of nurse visiting with nursing support offered in a group setting.<sup>132</sup> All interventions included some level of referral to social or community services such as food or employment assistance. In addition, comparison arms in eight of 17 studies included referral to

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services.<sup>110,112,117,120,124,130-132</sup> Six studies included longer term (>24 months postpartum) followup.<sup>117-119,121,129,131</sup>

Appendix A Table 5 outlines key study findings. Studies addressed multiple SDOH-related outcomes, measured using disparate methods and at multiple time points; overall, studies addressed more than 100 SDOH-related outcomes. We grouped these outcomes into CDC SDOH domains (economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community context) as applicable. No consistent direction of effects emerged across domains or studies.

Overall, effects of interventions were mixed, with positive changes in some outcomes reported for intervention vs. control groups (e.g., receipt of well-childcare and social support) and no group differences reported for other outcomes (e.g., maternal employment, child enrollment in early education). No study reported negative effects of child maltreatment interventions on SDOH-related outcomes, and direction of intended effect (i.e., whether an outcome is considered a positive or negative effect) could be ambiguous for some outcomes (e.g., length of time receiving government aid, number of community service contacts, receipt of remedial education for children).

### *Economic Stability*

Twelve studies reported one or more diverse outcomes (e.g., use of community services or government aid programs, material supports, use of employment services, incarcerations) in this domain. Of these, five studies reported beneficial outcomes for groups receiving an intervention compared with control groups: home-visiting participants reported significantly greater help in accessing transportation (48% vs. 16%), clothing for self (17% vs. 5%) and baby (26% vs. 9%), baby furniture/toys (22% vs. 4%), vs. control participants ( $p \leq 0.05$ ) in one study,<sup>120</sup> while another reported fewer months using food stamps ( $p=0.004$ ) and Aid to Families with Dependent Children (AFDC) ( $p=0.01$ ) but no difference in Medicaid use ( $p$ =not significant) in home-visited participants (effect sizes ranging from -0.24 to -0.15).<sup>119</sup> In another study, intervention participants had significantly more community service contacts (mean, 8.7 vs. 7.7: effect size, 0.31);<sup>118</sup> in a fourth study, Healthy Steps participants had greater odds of receiving community resource information (AOR, 4.23 [95% CI: 3.56 to 5.02]) and greater odds of referral to services including early intervention, marital and family support, and other social or environmental agencies (AOR, 1.44 [95% CI, 1.21 to 1.73]) than control participants.<sup>129</sup> The final study noted improvements in self-reported access to resources deemed by social workers to be attainable within 6 months (food pantry/program; Supplemental Nutrition Assistance Program; Special Supplemental Nutritional Program for Women, Infants, and Children; discounted telephone service; low-income utility assistance; Emergency Aid to the Elderly, Disabled, and Children; AFDC) in intervention families compared with control ( $p=0.007$ , proportions NR).<sup>152</sup> This study also reported receipt of resources by category: at the 12-month followup, more intervention than control families had heard of, tried to obtain, or successfully obtained utility and phone assistance (12.7% vs. 10.6%,  $p=0.006$ ) and had received a greater number of resources overall (mean 3.7 vs. 3.2,  $p=0.03$ ).

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Ten studies also reported outcomes in this domain that did not differ between groups: four studies reported no group differences in use of government aid programs such as AFDC;<sup>118,121,131,133</sup> two reported no differences in use of community services or wanting or needing social services<sup>116</sup> or accessing food or housing supports.<sup>120</sup> In another study, hearing about, attempting to obtain, or obtaining food, income, or housing assistance did not significantly differ between intervention and control groups at the 12-month followup.<sup>152</sup> Scores on the Family Resources Scale did not differ between groups in two studies,<sup>124,131</sup> and homelessness did not differ in one study.<sup>131</sup>

The number of mothers employed at followup did not differ between intervention and comparison groups in four studies,<sup>110,121,130,131</sup> and use of employment services did not differ in two studies.<sup>131,133</sup> Similarly two studies reported that mothers' assessment of their financial situation<sup>130</sup> or observers' assessment of study participants' financial situations<sup>127</sup> was not significantly different between groups. Finally, two studies, the Elmira, New York, nurse home-visiting trial and a replication of that trial with low-income women, both with long-term followup, reported no group differences in maternal arrests or incarcerations. The Elmira trial reported fewer, but not statistically significantly fewer, arrests, convictions, days in jail, New York State arrests or convictions among women receiving home visiting for children up to age 2 compared with transportation and screening and control groups (difference in incidence ranging from 0.24 to 9.00; all  $p=NS$ ).<sup>121</sup>

### *Education Access and Quality*

Seven studies reported one or more outcomes in this domain. Studies reporting significant group differences in education access and quality outcomes ( $n=5$ ) included both child and parent measures. In one study, more home-visiting children were participating in a gifted program at age 7 (5.4% vs. 2.0%; AOR, 2.80;  $p\leq 0.01$ ) compared with control group children,<sup>117</sup> and in another, more home-visited children were attending Head Start, preschool, day care, or early intervention (82% vs. 74.9%;  $p=0.05$ ).<sup>119</sup> Another study reported that families receiving the Healthy Steps intervention had greater odds of receiving books to read to children compared with control families (AOR, 29.07 [95% CI, 23.52 to 35.94]), though the percentage of mothers reading to children daily did not differ between groups.<sup>129</sup> Another study reported no differences in early childhood education attendance but higher scores on overall assessments of early learning and early learning goals in home-visited children compared with usual care (AORs of 1.26 and 1.24;  $p<0.05$ ).<sup>131,149,150</sup> One study reported that more mothers had completed at least 1 year of college in the home-visiting group vs. control (OR, 1.96 [95% CI, 1.17 to 3.30];  $p<0.01$ ), though the completion of high school did not differ between groups.<sup>110</sup> Another study similarly reported no group differences in mothers not in education, employment, or training and also no differences in mothers in formal education.<sup>131</sup> Four studies reported either no significant differences between intervention and control group in use of child learning or education services<sup>116</sup> or children in remedial programs or special education.<sup>117,119,131</sup>

### *Healthcare Access and Quality*

Ten studies reported one or more outcomes in this domain using between-group comparisons; these outcomes included receipt of well-childcare or health insurance, use of or knowledge of

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contraception, and having a healthcare provider. Four studies reported no significant group differences in receipt of well-childcare,<sup>116,119,127,131</sup> but well-childcare outcomes improved significantly in intervention groups compared with control in two studies. One reported that more home-visiting participants were up to date with health visits compared with control participants, with small effect sizes (0.20 to 0.25).<sup>120</sup> One study of the Healthy Steps intervention noted greater odds of receiving well-child visits up to age 24 months (AORs ranging from 1.49 to 2.61) and of referral to services including developmental assessment, allied health, early intervention, and marital or family issues assistance in the intervention vs. control arm (AOR, 1.44 [95% CI, 1.21 to 1.73]).<sup>129</sup> One<sup>116</sup> of two studies<sup>116,130</sup> addressing use of public health nurses, social workers, or home visitors reported no group differences; the second reported that home-visited children had fewer general practitioner (GP) visits or use of health services and more social worker or health visitor contacts than children in the control arm at 12 months, but differences had attenuated by the 18 month followup; the study does not clarify if reduced use of GPs and health services was considered a benefit.<sup>130</sup>

Other healthcare access outcomes included maternal access to care, having a specific provider or practice, health insurance access, and contraception knowledge. The number of women accessing healthcare for themselves improved in the home-visited arm vs. control in one study (45% vs. 30%;  $p \leq 0.05$ ),<sup>120</sup> while another study reported no group differences in maternal use of health services.<sup>130</sup> Another study reported no differences between intervention and control groups in the number of participants having a specific primary provider,<sup>116</sup> while a second reported that more children in the Healthy Steps intervention group remained with their pediatric practice than in the control group.<sup>129</sup> One study reported improvements in the number of children with health insurance in the home-visiting arm compared with control (95% vs. 90%; AOR, 2.05 [95% CI, 1.06 to 4.00];  $p < 0.05$ ).<sup>116</sup>

Among three studies reporting contraception-related outcomes, one reported significant improvements in the intervention group vs. control in contraception knowledge and use of contraception (adjusted RR, 1.35 [95% CI, 1.09 to 1.68];  $p = 0.007$ ) at 6 months.<sup>128</sup> Another reported that intervention participants were more likely to report condom use (OR, 1.61 [95% CI, 1.10 to 2.37];  $p < 0.05$ ) at 12 months, but at 24 months, differences between groups in use of condoms or hormonal birth control were not significant.<sup>110,134</sup> Similarly, in the third study, differences in contraceptive use between groups were not significant.<sup>131</sup>

### *Social and Community Context*

Six studies reported outcomes in this domain. Two reported more social support in intervention participants compared with those in control groups.<sup>112,131</sup> One reported longer relationships with the current partner in home-visited women vs. control (effect size, 0.28;  $p = 0.016$ ) and more relationships with employed partners in home-visited women than in control participants (effect size, 0.25;  $p = 0.002$ ).<sup>119</sup> In another, more home-visiting families used center-based parenting services compared with control participants (48% vs. 39%).<sup>116</sup> In two other studies, level of partner support and overall social support as well as tangible support, emotional support, and affectionate support or positive social interaction did not differ between groups.<sup>130,132</sup>

### Effects of Child Maltreatment Prevention Interventions on Social Determinants of Health-Related Outcomes in Populations of Interest

Four studies reported differences in effects on SDOH-related outcomes for specific populations defined by the level of intervention received, socioeconomic factors, or maternal age. Although subgroup definitions varied considerably, some evidence suggests that groups characterized by higher socioeconomic need experienced greater improvements in SDOH outcomes after receiving child maltreatment interventions than overall study populations.

In one study, women who received a medium or high level of home visiting had greater increases in use of health visitors for their own care compared with the control group; this outcome did not differ between groups in the whole sample.<sup>130</sup> Women who received a medium or high level of home visiting also had greater increases in use of health visitors for the care of their child, greater use of social workers, and decreased use of a GP for childcare compared with the control group; these outcomes were also significantly increased in the home-visiting arm vs. the whole sample.<sup>130</sup>

This study also included analyses of “socially excluded” participants, characterized by measures of social or financial deprivation including receipt of housing or welfare benefits, limited education, and relationship status (lacking a partner). Socially excluded women in the intervention group used health visitors and social workers more frequently for their own care and care of their child compared with socially excluded women in the control group at the 12-month followup; they also had increased use of GPs and hospital doctors for their own care and higher risk of using any health services in the previous month (RR, 1.25 [95% CI, 1.00 to 1.55]) compared with control group at 18 months.<sup>130</sup> These outcomes generally aligned with those reported for the overall sample.

Another home-visiting study reported outcomes for unmarried women from low-SES households. In contrast to no differences in these outcomes in the whole sample, home-visited, low-income women used fewer months of AFDC or food stamps compared with low-income women in the comparison groups (mean, 60.4 vs. 90.3).<sup>144</sup> Low-income, home-visited women were employed for a greater number of months and received Medicaid for fewer months vs. low-income women in the comparison groups, though these differences were not statistically significant. Home-visited, low-income women also had significantly fewer arrests, convictions, or days in jail vs. low-income comparison group women at the 15-year followup in one study (difference in incidence ranging from 1.19 to 3.32; all  $p < 0.01$ ); these outcomes did not differ significantly between groups in the whole sample.<sup>144</sup>

In a United Kingdom–based study comparing home visiting with usual care, scores on the Early Years Foundation Stage profile did not differ between home-visited and usual-care children in subgroups defined by maternal employment or participation in education or training or lack of employment/participation in education or training at baseline or deprivation quintile (measured on the Index of Multiple Deprivation); however, in subgroups defined by maternal age (younger than or older than age 16) at recruitment, children of mothers younger than age 16 in the intervention group had higher scores compared with the control group (total point score of 32.4 vs. 28.9; AOR, 3.65 [95% CI, 0.76 to 6.55];  $p = 0.013$ ). Scores did not differ for children of

## Appendix A. Contextual Questions and Additional Background

mothers older than age 16 (total point score of 32.2 in intervention arm vs. 31.8 in control), but the interaction between maternal age groups was significant ( $p=0.05$ ).<sup>149,150</sup>

In the Healthy Steps study, significantly more high- or middle-income families in the intervention group received children's books (89% to 93% in high-income group vs. 84% to 85% in middle-income, and 80% to 81% in low-income group) and information on community resources (48% to 54% in high income, 43% to 53% middle income, and 44% to 45% low income) compared with low-income families in the intervention group.<sup>129</sup> These outcomes aligned with outcomes for the whole sample.

### Association Between Social Determinants of Health Outcomes and Child Maltreatment Outcomes

Only one study evaluating a home-visiting intervention provided data addressing associations between SDOH outcomes and child maltreatment outcomes. One study reported a moderating effect of the use of community services on reports of child maltreatment.<sup>110</sup> Children of mothers who used more services (including Head Start and parenting classes) had a higher probability of being reported (substantiated or unsubstantiated reports) as experiencing child maltreatment; the odds of a maltreatment report increased by 1.55 with every additional service used (95% CI, 1.24 to 1.93).

## Discussion

The studies addressing child maltreatment prevention identified for this CQ reported mixed effects of child maltreatment interventions on SDOH-related outcomes. Some studies reported some moderate effects on SDOH in intervention compared with control groups, particularly on outcomes related to the domain of healthcare access and quality. In several studies, women receiving home-visiting interventions had greater access to care for themselves and their children completed more well-child visits, while other studies reported no differences in these outcomes. Interventions also positively affected access to or use of resources such as food or housing support or education services in some studies. Some studies also reported changes in the social and community context-related outcome of social support. However, many studies also reported no differences in SDOH-related outcomes between groups, and no clear pattern of effects emerges in the studies meeting criteria for this review, which makes drawing firm conclusions about effects of child maltreatment interventions on SDOH-related outcomes challenging. Nearly half of studies explicitly noted providing social services referrals to control participants, and usual community services would presumably have been available to control participants across studies; thus, between-group changes in SDOH outcomes may be muted. Of note, some studies reported that outcomes improved within groups from baseline to followup, but we focused on significant differences between intervention and comparison groups for the CQ. SDOH outcomes were also defined and measured variably, which limits comparability. We did not attempt to assess the reliability or validity of outcome measures. In addition, studies may be subject to a Hawthorne effect in home-visited participants. Studies also measured numerous outcomes, with variable correction for multiple testing.



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Despite these limitations, some SDOH outcomes were improved for intervention participants, with some stronger effects in participants with greater socioeconomic needs, which may suggest effects for these interventions beyond prevention of child maltreatment. Moreover, child maltreatment is itself linked to poor SDOH (e.g., poverty, housing instability);<sup>96</sup> thus, improving SDOH may have positive downstream effects on preventing child maltreatment.

The one study addressing links between improvements in SDOH associated with interventions and maltreatment outcomes specifically reported *increased* reports of child maltreatment with increasing use of social services, which may suggest surveillance bias with increasing service contacts. Other reviews of home visiting, not restricted to studies specifically addressing child maltreatment outcomes, have reported positive effects of home visiting on SDOH.<sup>265</sup>

**Appendix A Table 1. Laboratory and Radiologic Tests Recommended in the AAP Guidelines by Injury Type\***

<b>Injury Type</b>	<b>Laboratory Testing</b>	<b>Radiologic Testing</b>
Fracture	Bone health testing 25-hydroxyvitamin D and PTH level Serum copper, vitamin C, and ceruloplasmin levels Skin biopsy for fibroblast culture or venous blood for genetic testing	Skeletal survey <sup>†</sup>
Bruise	Hematologic disorders testing	Skeletal survey Brain imaging
Abdominal Trauma	Liver enzyme test Pancreatic enzymes test	Skeletal survey CT scan with contrast
Head Trauma	Complete blood count with platelets Coagulation testing D-dimer Review newborn screening Urine organic acids	Skeletal survey CT scan MRI
Cardiac Injury	Cardiac enzyme test	None

\* Adapted from AAP guidelines.

<sup>†</sup> The skeletal survey consists of a series of x-rays of the arms, legs, head, neck, and trunk to assess for otherwise unknown or healing fractures. The x-rays needed for a complete skeletal survey are determined by the American College of Radiology guidelines.<sup>173</sup>

**Abbreviations:** AAP=American Academy of Pediatrics; CT=computerized tomography; MRI=magnetic resonance imaging; PTH=parathyroid hormone.

**Appendix A Table 2. Reliability and Validity of Actuarial Risk Assessment Tools**

<b>Instrument</b>	<b>Study Using the Instrument</b>	<b>Description</b>	<b>Reliability</b>	<b>Validity</b>	<b>Reference Standard</b>
Child Abuse Alert System <sup>227</sup>	Berger et al (2018; United States) <sup>227</sup>	Thirty age-specific triggers in the EMR to identify physical abuse	Not reported	Validated in a sample of 226 children <2 years old in a pediatric hospital  Sensitivity was 96.8% (95% CI, 92.4 to 100.0) and specificity was 98.5% (95% CI, 98.3.5 to 98.7)  Positive predictive value 26.5% (95% CI, 21.2 to 32.8%) and negative predictive values 99.9% (95% CI, 99.9 to 100.0)	Children’s Hospital of Pittsburgh Child Protection team’s assessment of abuse
Child Abuse Potential Inventory (CAPI) <sup>39,228</sup>	van der Put et al (2017; systematic review includes multiple locations) <sup>39</sup> includes 4 studies looking at the validity of CAPI: Ayoub and Milner (1985); Chaffin and Valle (2003); Milner, et al (1984); and Ondersma (2005)	160-item, self-report measure consisting of a primary clinical scale containing a 77-item Physical Abuse Scale with eight subscales: distress, rigidity, unhappiness, ego, loneliness, problem with child and self, problem with family, and problem with others	Split-half and Kuder-Richardson-20 reliability coefficients range from 0.92 to 0.98 <sup>229</sup>  Milner & Wimberly (1986)	Calculated AUCs range from 0.5565 to 0.6895 <sup>39</sup>	Not reported
Diagnostic Index for Physical Child Abuse (DIPAC) <sup>212,230</sup>	Chang et al (2004; United States) <sup>230</sup>	6-item, 15-point scale to identify physical abuse using External Injury Codes	Not reported	Validated in a sample of 11,919 children <3 years old in a pediatric trauma registry  Sensitivity, 72.5%; specificity, 89.1%; AUC, 86.3%	Abuse cases identified from the trauma registry
Instrument for early identification of Parents At Risk for child Abuse and Neglect (IPARAN) <sup>209,212</sup>	van der Put et al (2017; Netherlands) <sup>209</sup>	16-item, 4-point actuarial instrument to identify child abuse and neglect in families with a newborn and answers	Not reported	Validated in a sample of 4,692 children <1 year-old during a home visit of families  IPARAN alone:	Verified reports of child maltreatment in the family at the Dutch child protective services (CPS) during a 3-year followup period

**Appendix A Table 2. Reliability and Validity of Actuarial Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Instrument for early identification of Parents At Risk for child Abuse and Neglect (IPARAN) (cont.)		are self-reported by parents		<p>Sensitivity, 61.1%; specificity, 78.6%; AUC, 70.0% (95% CI, 56.7 to 83.2)</p> <p>Nurse clinical judgment alone: Sensitivity, 21.4%; specificity, 96.7%; AUC, 59.1% (95% CI, 42.2 to 75.9)</p> <p>IPARAN combined with nurse clinical judgment: Sensitivity, 66.7%; specificity, 77.4%; AUC, 72.0% (95% CI, 59.3 to 84.7)</p> <p>Difference between IPARAN and IPARAN combined with clinical judgment was not statistically significant</p>	
New South Wales Child Development Study <sup>216</sup>	Green et al (2022; Australia) <sup>216</sup>	14 dichotomous risk indicators, which was reduced to 10 indicators in the final model	Not reported	<p>Validated in a sample of 72,059 children born in New South Wales, Australia between 2002 and 2005 and followed until the age of 13</p> <p>Mean AUC for full 14 indicators: 0.84 (95% CI, 0.82 to 0.85); for 10 final indicators: 0.83 (95% CI 0.82 to 0.85).</p> <p>Mean sensitivity for full: 0.72 (SD 0.06); and final: 0.74 (SD 0.05)</p>	Substantiated child protection reports (according to a “risk of significant harm” threshold) or an out-of-home care placement before age 13–14 years, as recorded in data obtained from the New South Wales Department of Communities and Justice Child Protection records

**Appendix A Table 2. Reliability and Validity of Actuarial Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
New South Wales Child Development Study (cont.)				<p>Mean specificity for full: 0.82 (SD 0.06); and final: 0.80 (SD 0.04)</p> <p>Mean positive predictive value for full: 0.18 (SD 0.03); and final: 0.16 (SD 0.02)</p>	
Pediatric Brain Injury Research Network (PediBIRN-4) <sup>212,231,232</sup>	Pfeiffer et al (2018; Australia and New Zealand) <sup>231</sup>	4-item tool for use in the PICU to identify abusive head trauma (AHT)	Not reported	<p>Validated in a sample of 141 children &lt;3 years old admitted to the hospital with head trauma</p> <p>In the PICU patients: Sensitivity, 100% (95% CI, 75.0 to 100.0) and specificity, 11% (95% CI, 0.0 to 48.0)</p> <p>In all admitted patients: sensitivity, 96% (95% CI, 82.0 to 100.0) and specificity, 43% (95% CI, 32.0 to 53.0)</p>	Multidisciplinary child protection team consensus

**Appendix A Table 2. Reliability and Validity of Actuarial Risk Assessment Tools**

<b>Instrument</b>	<b>Study Using the Instrument</b>	<b>Description</b>	<b>Reliability</b>	<b>Validity</b>	<b>Reference Standard</b>
Pediatric Brain Injury Research Network (PediBIRN-4) <sup>212,231,232</sup> (continued)	Hymel et al (2014; United States) <sup>212,232</sup>		Not reported	Validated in a sample of 291 children <3 years old in intensive care for head injury  Sensitivity, 96.0% (95% CI, 90.0 to 99.0) and specificity, 43.0% (95% CI, 35.0 to 50.0)  Positive predictive value, 0.55 (95% CI, 1.46 to 1.9) and negative predictive value, 0.09 (95% CI, 0.04 to 0.23)  AUC, 78.0%	Definitional criteria for AHT applied by PediBIRN investigators
Pittsburgh Infant Brain Injury Score (PIBIS) <sup>212,233</sup>	Berger et al (2016; United States) <sup>233</sup>	4-item instrument with a 5-point scale to identify AHT	Not reported	Validated in a sample of 1,040 children <1 year-old in the ED  Sensitivity, 93.3% (95% CI, 89.0 to 96.3) and specificity, 53.0% (95% CI, 49.3 to 57.1)  AUC, 83.0% (95% CI, 80.0 to 86.0)	Abnormal neuroimaging (head CT or MRI)
Predicting Abusive Head Trauma (PredAHT) <sup>212,234</sup>	Cowley et al (2015; United Kingdom) <sup>234</sup>	Instrument to identify AHT in children <3 years of age who have sustained an intracranial injury identified on neuroimaging based on 6 clinical features	Not reported	Validated in a sample of 198 children <3 years old with an intracranial injury in the PICU  Sensitivity, 72.3% (95% CI, 60.4 to 81.7) and specificity, 85.7% (95% CI, 78.8 to 90.7)  AUC, 88.0% (95% CI 82.3 to 92.6)	Previously determined as abusive head trauma (AHT) or non-abusive head trauma (nAHT) based on multidisciplinary assessment or court proceedings, social and historical factors beyond the presenting injury, a perpetrator admission or independently

**Appendix A Table 2. Reliability and Validity of Actuarial Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Predicting Abusive Head Trauma (PredAHT) <sup>212,234</sup> (continued)					witnessed abusive incident.
Predicting Abusive Head Trauma version 2 (PredAHT-2) <sup>235</sup>	Pfeiffer et al (2019; Australia and New Zealand) <sup>235</sup>	Instrument to identify abusive head trauma in children <3 years of age who have sustained an intracranial injury identified on neuroimaging based on 6 clinical features. Version 2 enables a probability calculation when information regarding any of the six features is absent	Not reported	Validated in a sample of 87 cases of children <3 years old admitted to the hospital with an intracranial injury  Sensitivity, 74% (95% CI 54 to 89) and specificity, 87% (95% CI 71 to 94)  Positive predictive value, 77% (95% CI, 56 to 91) and negative predictive value, 85% (95% CI, 71 to 94)  AUC, 0.80% (95% CI, 0.68 to 0.92)	Multidisciplinary child protection team case review
Predictive Risk Modeling <sup>215</sup>	Vaithianathan et al (2013; New Zealand) <sup>215</sup>	132 predictor variables related to the demographics, SES, and histories of the primary caregiver, partner, and child	Not reported	Validated in a sample of 57,986 children enrolled in New Zealand's public benefit system before age 2 years  AUC, 76% (95% CI, 75.7 to 77.1)	Substantiated report of maltreatment based on CPS data by age 5 years
Screening Index for Physical Child Abuse (SIPCA) <sup>212,236</sup>	Chang et al (2005; United States) <sup>236</sup>	6-item, 15-point scale to identify physical abuse using ICD-9 codes	Not reported	Validated in a sample of 58,558 children <14-years-old discharged from a hospital with at least 1 injury code  Sensitivity, 86.6% and specificity, 80.5%  AUC, 89.0%	Prevalence of child abuse cases in this dataset was compared externally with the finding from the initial development dataset as well as internally across different types of pediatric trauma centers

**Appendix A Table 2. Reliability and Validity of Actuarial Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Enhanced Eligibility Screening for Family Connects <sup>208</sup>	Dodge et al (2021; United States) <sup>208</sup>	Uses 4 demographic factors (i.e., health insurance of the infant, first-time birth, teen parent, no high school diploma) and 4 clinical factors (i.e., need in domains of healthcare, parenting/childcare, home safety, and parent mental health) with 3 domains each completed by nurse during home visit	Interrater independent agreement on scoring, K=0.69	Validated in a sample of 201 families in the Family Connects RCT  Any demographic risk: For CPS investigations: sensitivity, 0.947 and specificity, 0.166 and accuracy, 0.313. For EMC: sensitivity 0.893; specificity, 0.203; accuracy, 0.622  Any clinical risk: For CPS investigations: sensitivity, 0.703; specificity, 0.642; accuracy, 0.653. For EMC: sensitivity 0.500; specificity, 0.692; accuracy, 0.577	Child maltreatment investigations as recorded in the State CPS registry or emergency medical care for injury or illness

**Abbreviations:** AHT=abusive head trauma; AUC=area under the curve; CAPI=Child Abuse Potential Inventory; CI=confidence interval; CPS=child protective services; CT=computerized tomography; DIPAC=Diagnostic Index for Physical Child Abuse; ED=emergency department; EMC=emergency medical care; EMR=electronic medical record; ICD-9=International Classification of Diseases, Ninth Edition; IPARAN=Instrument for early identification of Parents At Risk for child Abuse and Neglect; MRI=magnetic resonance imaging; PediBIRN=Pediatric Brain Injury Research Network; PIBIS=Pittsburgh Infant Brain Injury Score; PICU=pediatric intensive care unit; PredAHT=Predictive Abusive Head Trauma; RCT=randomized controlled trial; SES=socioeconomic status; SIPCA=Screening Index for Physical Child Abuse



**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
BabyFirst Screen <sup>217</sup>	Brownell et al (2011, Canada) <sup>217</sup>	23-weighted-item questionnaire administered at birth to parents and completed by nurses relating to biological, psychological, and social risk factors for maltreatment.	Not reported	<p>Validated in a sample of 30,486 infants born in Manitoba, Canada from 2000 to 2002</p> <p>Sensitivity, 77.6% and specificity, 83.3%</p> <p>Positive predictive value, 10.9% and negative predictive value, 99.3%</p> <p>False-positive rate, 16.7% and false-negative rate, 22.4%</p> <p>Accuracy, 83.2%</p>	Reports of out-of-home placement from provincial ministry of family services records
Burns Risk assessment for Neglect or abuse Tool (BuRN-Tool) <sup>212,237,238</sup>	Kemp et al (2018; United Kingdom) <sup>237</sup>	7-item instrument to identify physical abuse completed by nurses or doctors in a pediatric ED	Not reported	<p>Validated in a sample of 1,327 children &lt;16 years old with a burn in the pediatric ED</p> <p>Sensitivity, 87.5% (95% CI, 61.7 to 98.4) and specificity, 81.5% (95% CI, 77.1 to 85.4)</p> <p>Positive likelihood ratio, 4.7 (95% CI, 3.6 to 6.3) and negative likelihood ratio, 0.2 (95% CI, 0.04 to 1.6)</p> <p>Positive predictive value, 17.5 (95% CI, 9.9 to 27.6) and negative predictive value, 99.3 (95% CI, 97.6 to 99.9)</p> <p>AUC, 0.87% (95% CI, 0.83 to 0.90) for scalds</p>	Rate of referrals to a children's social care team

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Burns Risk assessment for Neglect or abuse Tool (BuRN-Tool) <sup>212,237,238</sup> (continued)	Hollen et al (2020; United Kingdom) <sup>238</sup>		Interrater reliability Krippendorff's alpha for 1,293 score was 0.85	and 0.85% (95% CI, 0.81 to 0.88) for non-scalds  Validated in a sample of 2,443 children <16 years old with a burn in the pediatric ED  Sensitivity, 72.1% (95% CI, 62.8 to 80.2) and specificity, 82.7% (95% CI, 80.3 to 85.0)  Positive likelihood ratio of 4.2 and negative likelihood ratio 0.3  AUC, 0.81% (95% CI, 0.79 to 0.83)	Proportion of cases referred to children's social care or the hospital safeguarding team
	Schols et al (2019; Netherlands) <sup>218</sup>	31-item, 4-point, nurse-rated tool to identify physical abuse and neglect	Internal consistency (Cronbach's $\alpha=0.94$ ), interrater reliability (across all items: $r=0.97$ )	Validated in a sample of 1,257 children <1 year-old during a home visit of families	Child abuse reports in the child's electronic files which include referrals to service agencies and reports to the child protection agency
Escape Instrument <sup>212,239</sup>	Louwers et al (2014; Netherlands) <sup>239</sup>	6-item instrument to identify physical abuse built to be completed by ED nurse during triage irrespective of patient's reason for ED visit	Not reported	Validated in a sample of 18,275 children <18 years old who visited the ED  Sensitivity, 80.0% (95% CI, 67.0 to 89.0) and specificity, 98.0%  Positive predictive value, 0.10 (95% CI 0.08 to 0.14) and negative predictive value, 0.99	Expert Child Abuse Team panel

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
INTOVIAN <sup>212,219</sup>	Ezpeleta et al (2017; Cyprus, Greece, Spain) <sup>219</sup>	9-item questionnaire to identify physical abuse, emotional abuse, or neglect administered by medical personnel	Internal consistency, Cronbach's alpha 0.79	Validated in a sample of 219 children <3 years old in public health centers	Clinical judgment
Kempe Family Stress Inventory (KFSI) or Family Stress Checklist* <sup>39,220,221</sup>	Murphy et al (1985, United States) <sup>221</sup>	<p>10-item rating scale including psychiatric and criminal history, childhood history of care, emotional functioning, attitudes toward and perception of children, discipline of children, and level of stress in parent's life</p> <p>Original checklist developed to evaluate parents with known abuse or neglect</p>	Not reported	<p>Validated in a sample, in 197 women 2 to 2.5 years after baseline measure</p> <p>Validation of 38 with positive scores (possibly scores <math>\geq 40</math>, not clearly specified) and 157 without positive scores (threshold not specified; possibly includes 100 women with scores 0–10 and 25–35)</p> <p>80% sensitivity and 89.4% specificity, sample appears to exclude intermediate risk category</p> <p>Reported 52.5% positive predictive value, 96.8% negative predictive value</p> <p>Calculated AUC 0.8470<sup>39</sup></p>	Identified abuse, neglect, or failure to thrive from chart review (specifics not defined)
	Hawaii Healthy Start <sup>220</sup>		Not reported	Validated in a sample of 287 families (96 low risk with KFSI scores of 20 or below and 191 high risk with scores of 25 or above)	CAPI scores

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Kempe Family Stress Inventory (KFSI) or Family Stress Checklist* <sup>39,220,221</sup> (continued)				Calculated 6-month followup: sensitivity, 89% and specificity, 28% with a positive predictive value, 37% and negative predictive value, 85%  Calculated 12-month followup: sensitivity, 84% and specificity, 35% with a positive predictive value, 25% and negative predictive value, 89%	
	Oregon HFA <sup>220</sup>		High reliability reported in HFA sites in Oregon for classifying parents on individual characteristics in terms of levels of risk ( $r=0.93$ ) but does not provide answer to whether families would receive the same score by independent evaluations <sup>220</sup>	Validated in a sample of 2,870 families  25 cutoff: sensitivity, 96% and specificity, 21% with a positive predictive value, 3% and negative predictive value, 99.7%  40 cutoff: sensitivity, 69% and specificity, 42% with a positive predictive value, 4.5% and negative predictive value, 99.7%	Confirmed child maltreatment reports (about 50% of the reports were made by the HFA/study home visitors)
Maternal History Interview (MHI-2) <sup>39,113,222</sup>	Brayden et al (1993, United States) <sup>113</sup>	Series of open-ended questions that are designed to predict abuse, neglect, or nonorganic failure to thrive. Participant answers are scored by best fit into predetermined categories. Subscale scores are developed for knowledge of parenting skills and philosophy about discipline, personality (extroversion, aggressiveness,	Four interviewers trained to administer the MHI-2 and score answers at 90% or greater interobserver agreement  Internal consistency alpha, 0.80	Validated in a sample of 1,154 families seen for prenatal care at Metropolitan Nashville General Hospital  Sensitivity of 55.6% and positive predictive value of 6.6% for physical abuse  Increased risk of neglect or separation were not predicted by the MHI-2	Target children and siblings followed through 36 months for reports of physical abuse, neglect, sexual abuse, or mother-child separation in public agency documents (excluding “unsubstantiated reports, grudge or crank reports, and those without

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Maternal History Interview (MHI-2) <sup>39,113,222</sup> (continued)		dependency, and self-image), positive and negative feelings about the pregnancy, the mother's perception of her nurture as a child, a truncated version of the		Calculated AUCs 0.5385 to 0.6470 <sup>39</sup>	evidence of trauma"). Siblings were included only if their first abuse report occurred after the interview
	Altemeier et al <sup>†</sup> (1984, United States) <sup>222</sup>	Life Stress Inventory for both mother and father, and a "lie" scale (to detect attempts to respond only with socially appropriate answers)	Four research assistants trained to maintain an interrater agreement of 90% or greater	Validation study on 1,400 expectant mothers screened at a prenatal clinic  Calculated AUCs, 0.5849 to 0.7620 <sup>207</sup>	Target children and siblings followed for reports of abuse in Juvenile Court and Department of Human Services computer records (excluding "unsubstantiated reports, grudge or crank reports, and those without evidence of trauma")
Ontario Risk Assessment Tool <sup>207,223</sup>	Barber et al (2008; Canada) <sup>223</sup>	Consensus tool of 22 risk factors that are rated on a 5-point scale to predict future risk for multiple forms of maltreatment	Reliability tested in a sample of 132 cases in the Children's Aid Society database  Internal consistency, Cronbach's alpha 0.73 for caregiver category but under 0.7 for the 4 other categories  Interrater reliability evaluated using Cohen's Kappa. Kappa scores greater than would be expected by chance alone in eight of the 22 risk items	Validated in a sample of 1,118 cases in the Children's Aid Society database  Calculated AUC, 0.5000 <sup>207</sup>	Substantiated cases of maltreatment recurrence within 18 months of case closure

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Torso, Ear, and Neck Bruising Clinical Decision Rule (TEN-4 BCDR or TEN-4-FACESp) <sup>212,226,240</sup>	Pierce et al (2010; United States) <sup>240</sup>	Instrument to identify physical abuse using bruising to torso, ear, or neck (TEN), frenulum, angle of jaw, cheeks (fleshy), eyelids, subconjunctivae (FACES), and patterned (p). The 4 represents any bruising anywhere to an infant 4.99 months or younger	Not reported	Validated in a sample of 95 children <4 years old with abusive or accidental trauma in the PICU  Sensitivity, 97.0% and specificity, 84.0%	Multiple criteria for abuse were used: (1) trauma registry categorized the trauma as abuse; (2) hospital medical team determined the injuries to be highly suggestive of abuse; (3) stated cause of injury did not account for the type, severity, and/or number of injuries; (4) history of trauma was absent, vague, or changing; or (5) State social services that determined the patient was abused
	Pierce et al (2021; United States) <sup>226</sup>		Interrater reliability: Kendall coefficient, 0.89 (95% CI, 0.87 to 0.91)	Validated in a sample of 2,161 children <4 years old who presented to the ED with bruising  Sensitivity, 95.6 (95% CI, 93.0 to 97.3) and specificity, 87.1% (95% CI, 85.4 to 88.6)  Positive predictive value, 63.9% (95% CI, 60.3 to 67.7) and negative predictive value, 98.8% (95% CI, 98.1 to 99.3)	Consensus judgment of a multidisciplinary expert panel composed of pediatric emergency medicine and child abuse pediatrics physicians and a biomechanical engineer, all with expertise in pediatric injury

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

<b>Instrument</b>	<b>Study Using the Instrument</b>	<b>Description</b>	<b>Reliability</b>	<b>Validity</b>	<b>Reference Standard</b>
Screening instrument for Child Abuse and Neglect (SCAN) <sup>241</sup>	Hoedeman et al (2022; Netherlands) <sup>241</sup>	4-item questionnaire administered by ED nurses or physicians to identify child abuse and neglect	None reported	Validated in a sample of 24,963 children <18 years old presenting to eight EDs from the combination of 3 studies  Pooled AUC of 0.75 (95% CI, 0.63 to 0.87) in cross validation  AUCs range from 0.61 to 0.79 depending on imputation for unknown outcomes	Two studies used consensus diagnosis of (suspected) child maltreatment by the local multidisciplinary child abuse team. One study was defined as physical child abuse and/or neglect based on the decision of at least two out of three experts, blinded for their mutual decision
SPUTOVAMO-R <sup>212,242</sup>	Sittig et al (2011; Netherlands) <sup>242</sup>	6-item questionnaire to identify physical abuse completed by emergency room providers	Not reported	Validated in a sample of 4,290 children <7 years old with a physical injury in the ED  Positive predictive value, 0.03 (95% CI, 0.006 to 0.085) and negative predictive value, 1.0 (95% CI, 0.094 to 1.0)	Expert panel consensus
SPUTOVAMO-R2 <sup>243</sup>	Schouten et al (2017; Netherlands) <sup>243</sup>	5-question checklist to identify child abuse completed by provider. A revised version of SPUTOVAMO-R for out-of-hours primary care locations (OPCs) instead of EDs	Not reported	Validated in a sample of 50,671 children <18 years old attending an OPC  Sensitivity, 14.8% (95% CI, 7.0 to 26.2) and specificity, 98.2% (95% CI, 97.8 to 98.5)  Positive predictive value, 8.3 (95% CI, 3.9 to 15.2) and negative predictive value, 99.1 (95% CI, 98.8 to 99.3)	CPS report within 10 months of the encounter

**Appendix A Table 3. Reliability and Validity of Clinical Risk Assessment Tools**

Instrument	Study Using the Instrument	Description	Reliability	Validity	Reference Standard
Symptoms Associated with Sexual Abuse (SASA) <sup>212,224</sup>	Wells et al (1997; United States) <sup>224</sup>	12-item structured parent interview questionnaire to identify sexual abuse	Internal reliability: Chronbach's alpha, 0.83	Validated in a sample of 121 children <15 years old with 3 subgroups: substantiated sexual abuse where perpetrator confessed; alleged abuse (evaluated in a sexual abuse clinic but perpetrator didn't confess); non-abused  Sensitivity, 90.9% and specificity, 88.5%  Positive predictive value, 77% and negative predictive value, 96%	CPS referral

\*KFSI was designated as an actuarial tool in the meta-analysis,<sup>39</sup> but it's a psychosocial interview and requires clinical judgment so we have included it with the clinical instruments.

†MHI-2 is designated as both actuarial and clinical in the meta-analysis.<sup>39</sup>

**Abbreviations:** AUC=area under the curve; BuRN-Tool=Burns Risk assessment for Neglect or abuse Tool; CI=confidence interval; CPS=child protective services; ED=emergency department; ERPANS=Early Risks of Physical Abuse and Neglect Scale; FACESp=frenulum, angle of jaw, cheeks (fleshy), eyelids, subconjunctivae, and patterned; HFA=Healthy Families America; KFSI=Kempe Family Stress Inventory; MHI=Maternal History Interview; OPC=out-of-hours primary care locations; PICU=pediatric intensive care unit; SASA=Symptoms Associated with Sexual Abuse; SCAN= Screening instrument for Child Abuse and Neglect; TEN-4 BCDR=Torso, Ear, and Neck Bruising Clinical Decision Rule



**Appendix A Table 4. Current Recommendations From Other Organizations**

Organization, Year	Recommendation
American Academy of Family Physicians 2013 <sup>98</sup>	<p><b>Screening/Intervention</b></p> <ul style="list-style-type: none"> <li>Notes that evidence is insufficient that any specific screening strategy or behavioral intervention produces better health outcomes than clinician awareness and evaluation of potential signs of abuse.</li> <li>Provides a list of steps primary care physicians can take to prevent child abuse, which includes screening for risk factors or problems, with a link to the American Academy of Pediatrics' recommendations.</li> </ul>
American Academy of Pediatrics 2010, 2015, 2021	<p><b>Universal Prevention</b></p> <ul style="list-style-type: none"> <li>2014 (published in October 2010, reaffirmed in January 2014).<sup>101</sup></li> <li>Strongly recommends physician involvement in preventing child maltreatment in the context of the pediatrician's unique role in identifying and protecting children and recommends offering anticipatory guidance and referring families to programs and resources to promote safe, stable, nurturing relationships with the aim of preventing maltreatment.<sup>101</sup></li> <li>Notes that universal prevention of child maltreatment must begin with an approach that assesses the caregivers' strengths and deficits and connects the family with community resources that will protect the dependent children before abuse or neglect occurs.</li> </ul> <p>2015 (published in April 2015)<sup>166, p. e1348- e1349</sup></p> <ul style="list-style-type: none"> <li>Focuses on management of suspected physical abuse.</li> <li>Notes that, "Child abuse prevention is important but difficult and requires efforts that are broad and sustained. The pediatrician, as a trusted adviser to parents, caregivers, and families about health, development, and discipline, can play an important role in abuse prevention by assessing caregivers' strengths and deficits, providing education to enhance parenting skills, connecting families with supportive community resources that address parent and family needs, and promoting evidence-based parenting practices that are nurturing and positive." This statement cites the 2010 clinical statement.</li> </ul> <p>2021 (published in July 2021)<sup>102, p. 1451</sup></p> <ul style="list-style-type: none"> <li>Pediatricians are uniquely situated to prevent child abuse and neglect because of their relationship with families across the lifespan. Pediatricians should learn the signs and symptoms of maltreatment, obtain a thorough history when they see signs and symptoms, and report suspected cases of abuse. It also recommends advocating for supports for families and referring to home visiting and other support programs as a prevention strategy.</li> </ul>
Canadian Task Force on Preventive Health Care 2000 <sup>99</sup>	<p><b>Screening</b></p> <ul style="list-style-type: none"> <li>Unacceptable rate of predictive value (e.g., positive predictive value of 6.6% and a sensitivity of 55.6% for physical abuse in one study).</li> <li>D recommendation for screening: "because of the high false-positive rates of screening tests for child maltreatment and the potential for mislabeling people as potential child abusers, the possible harms associated with these screening maneuvers outweigh the benefits."</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>Good evidence to include referral in the periodic health examination for home visitation by nurses (A).</li> <li>Insufficient evidence to include referral in the periodic health examination for prevention of child maltreatment (C) for comprehensive healthcare; parent education and support; or home-based services, including case management, education, and psychotherapy.</li> <li>No additional evidence to alter recommendation (C) in 1993 update for programs for children aimed at preventing sexual abuse and abduction.</li> </ul>

**Appendix A Table 4. Current Recommendations From Other Organizations**

Organization, Year	Recommendation
Community Preventive Services Task Force, 2013 <sup>250</sup>	<p><b>Screening</b></p> <ul style="list-style-type: none"> <li>• None</li> </ul> <p><b>Interventions</b></p> <ul style="list-style-type: none"> <li>• Noted strong evidence of effectiveness for early childhood home visitation to prevent violence against the child (maltreatment): Recommended.</li> <li>• Also noted that “programs delivered by professional visitors (i.e., nurses or mental health workers) seem more effective than programs delivered by paraprofessionals, although programs delivered by paraprofessionals for 2 years also appear to be effective in reducing child maltreatment.”</li> </ul>

**Appendix A Table 5. Key Social Determinants of Health-Related Outcomes in Studies of Child Maltreatment Prevention Interventions**

Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
Barlow 2007 <sup>112</sup> U.S.	Pregnant individuals at risk for poor parenting	Intensive home visiting (68)  Standard services for “vulnerable” families (63)	Social Support Questionnaire scores declined (worsened) more in control group vs. home visiting at 6 and 12 months (p<0.004)
Barnes 2017 <sup>132,151</sup> U.K.	Pregnant individuals (gestation 16–20 weeks), age <20 years with one or more previous live births or age 20–24 years plus low educational qualifications	Group-based Family Nurse Partnership (99)  Usual care (67)	No significant differences in overall social support between groups (adjusted effect estimate, -0.45 [95% CI, -5.45 to 4.59]; p=0.85) or in tangible support, emotional support, affectionate support, or positive social interaction subscales
Duggan 2007 <sup>116,137</sup> U.S.	At-risk families (high risk on Kempe Family Stress Checklist)	Home visiting (162 families)  Control (163 families)	More home-visited children had healthcare coverage at followup compared with control (95% vs. 90%; AOR, 2.05 [95% CI, 1.06 to 4.00]; p<0.05) No differences in receipt of well-childcare, having specific primary care provider (AORs ranging from 0.76 to 1.01) No difference in use of community services to address mental health or substance use (30% of home-visiting group vs. 26% of control; p=0.38) or partner violence (9% of home-visiting group vs. 6% control; p=0.28) No differences in wanting or needing social services in prior year (WIC, emergency food, food stamps, TANF, child support enforcement), AORs ranging from 0.62 to 1.53 More home-visiting families used center-based parenting services vs. control (48% vs. 39%; AOR, 1.45 [95% CI, 1.05 to 2.02]; p<0.05) No differences in use of infant learning program or home-based parenting services or receipt of public health nursing services (AORs, 0.61 to 1.98)
DuMont 2008 <sup>117,138</sup> U.S.	At-risk families (high risk on Kempe Family Stress Checklist)	Home visiting (621)  Control (information + referral to appropriate community services) (633)	In both groups, 80% received referrals to community services. Percentage of families with at least 1 referral by service: “Concrete” services (not defined): 52.5 Nutrition services: 35.4 Employment, training, education: 33.3 Family and social support: 32.6 Healthcare services: 29.5 Counseling and support services: 19.3 Department of Social Services/Human Resources Administration services: 16.7 Other services (not defined): 31.0 More home visiting than control children were participating in a gifted program at age 7 (5.4% vs. 2.0%; AOR; 2.80; p≤0.01) Fewer home-visited children were receiving remedial services (32.8% vs. 33.3%), special education (12.3% vs. 16.7%), or repeated a grade (12.3% vs. 12.6) at age 7, all p=NS

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Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
DuMont 2008 <sup>117,138</sup> U.S. (continued)			No differences in costs for government supported programs (food stamps, public assistance, preventive services [undefined]), Medicaid delivery and hospitalizations from random assignment to child's 7 <sup>th</sup> birthday (all p=NS)
Easterbrooks 2013 <sup>110,134,135</sup>	First-time parents younger than age 21	Home visiting (517)  Control (referral to services and child development information) (320)	At 24-month followup, more intervention participants completed ≥1 year of college vs. control (OR, 1.96 [95% CI: 1.17 to 3.30], p<0.01) No group differences in completion of high school or full- or part-time employment (ORs, 0.92 and 0.81) At 24 months, no significant group differences in use of condoms or hormonal birth control, but at 12 months, intervention participants more likely to report condom use vs. control (OR, 1.61 [95% CI, 1.10 to 2.37]; p<0.05) In moderator analyses, higher probability of being reported as victim of child maltreatment (substantiated and unsubstantiated reports) for children whose mothers used more services from pregnancy to 12-month followup (e.g., Early Head Start, parenting classes): odds of maltreatment report increased by 1.55 with every additional service used (95% CI, 1.24 to 1.93)
Fergusson 2005 <sup>118,140</sup> New Zealand	At-risk families (≥2 risk factors)	Home visiting (220)  Control (223)	Significantly higher (all p<0.05) percentage of home-visited participants vs. control were up to date with health visits at 36-month followup: Mean # GP visits (23.4 vs. 20.7) Percentage up to date with well-child checks (41.9 vs. 30.1) Percentage enrolled with dental nurse/dentist (72.3 vs. 62.8) Effect sizes ranged from 0.20 to 0.25 Significantly greater use of community or education services in intervention arm vs. control (all p<0.05) at 36-month followup: Mean duration early child education (16.4 vs. 13.6 mo, effect size=0.22) Mean number community service contacts (8.7 vs. 7.7, effect size=0.31) At 9-year followup, no significant group differences in hardship measures (intervention vs. control): Mean number hardship factors (3.52 vs. 3.46) Mean adverse life events score (10.03 vs. 9.97) Percentage welfare dependent (59.5 vs. 56.8) Mean debt (NZ dollars) (5,248 vs. 4,492)
Green 2017 <sup>133</sup> U.S.	At-risk first-time parents (2 or more risk factors on New Baby questionnaire)	Home visiting (1,438)  Control (1,289)	Receipt of services (home visiting vs. control, ITT analysis) Ever received TANF (41.7% vs. 40.8%; OR, 1.04; p=0.60) Received 1 <sup>st</sup> TANF post-randomization (45.2% vs. 39.1%; OR, 1.78; p=0.04) Mean days on TANF (176.1 vs. 169.6; p=0.08) Ever received SNAP (84.6% vs. 82.3%; OR, 1.20; p=0.08) Receiving SNAP 1 <sup>st</sup> time post-randomization (17.7% vs. 18.3%; OR, 1.12; p=0.32) Mean days on SNAP (475.1 vs. 461.2; p=0.17) Ever received childcare subsidy (10.7% vs. 11.3%; OR, 0.94; p=0.59) Received childcare subsidy 1 <sup>st</sup> time post-randomization (79.6% vs. 82.8%; OR, 1.20; p=0.53) Mean days with childcare subsidy (19.5 vs. 19.8; p=0.96)

**Appendix A Table 5. Key Social Determinants of Health-Related Outcomes in Studies of Child Maltreatment Prevention Interventions**

Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
Green 2017 <sup>133</sup> U.S. (continued)			<p>Ever received employment services (30.6% vs. 30.2%; OR, 1.03; p=0.72)                      Received employment services 1<sup>st</sup> time post-randomization (53.9% vs. 54.7%; OR, 1.04; p=0.78)                      Mean days with employment services (98.9 vs. 94.4; p=0.42)</p> <p>Receipt of services (families receiving home visit vs. propensity score-matched controls)                      Ever received TANF (43.6% vs. 38.6%; OR, 1.22; p=0.09)                      Mean days on TANF (192.8 vs. 153.9; p&lt;0.01)                      Received 1<sup>st</sup> TANF post-randomization (45.9% vs. 42.5%; p=0.43)                      Mean days on SNAP (487.1 vs. 449.6; p=0.03)</p>
Guyer 2003 <sup>129,147</sup> U.S.	Families of newborns (<4 weeks)	<p>Intervention (randomized and quasi-experimental sites) (2,963 infants)</p> <p>Control (randomized and quasi-experimental sites) (2,602 infants)</p>	<p><b>36-month followup</b>                      Greater odds of receiving community resource information in intervention vs. control arm (AOR, 4.23 [95% CI, 3.56 to 5.02])                      Greater odds of receiving books to read to children in intervention vs. control arm (AOR, 29.07 [95% CI, 23.52 to 35.94])                      More high- or middle-income families in intervention group received children’s books and information on community resources compared with low-income participants                      No between-group difference in percent of mothers reading to children every day, though more higher income mothers read to children every day in both groups                      Greater odds of referral to non-medical services including developmental assessment, allied health, early intervention, family issues in intervention vs. control arm (AOR, 1.44 [95% CI, 1.21 to 1.73])                      Greater odds of receiving well-child visits at age 1–24 months in intervention vs. control arm (AORs ranging from 1.49 to 2.61); higher percentages of intervention vs. control children within low-, middle-, and high-income subgroups had age-appropriate well-child visits</p> <p><b>5.5-year followup</b>                      65% of intervention children vs. 61% of control children remained at the pediatric practice (p=0.04)</p>
Kitzman 1997 <sup>119,141,142</sup> U.S.	At risk individuals <29 weeks pregnant	<p>Home visiting up to child age 24 months (228)</p> <p>Control (transportation and referral services) (515)</p>	<p><b>24-month followup</b>                      No significant differences in well-child visits at (mean 4.6 in home visiting group vs. 4.8 in control)                      No significant differences in mean months worked or months on AFDC at 12 months or 24 months (mean differences ranging from -0.5 to 0.7)</p> <p><b>Age 6 followup</b>                      Significantly longer duration with current partner in home-visited arm vs. control (effect size, 0.24)                      Fewer months using food stamps (p=0.004), AFDC (p=0.01), Medicaid (p=NS) in home-visited arm vs. control (effect sizes ranging from -0.24 to -0.15)</p>

**Appendix A Table 5. Key Social Determinants of Health-Related Outcomes in Studies of Child Maltreatment Prevention Interventions**

Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
Kitzman 1997 <sup>119,141,142</sup> U.S. (continued)			<p>No significant differences in economic status of mother occupation or partner occupation among home-visited mothers vs. control (p=NS)                      More children in home-visited group vs. control attended Head Start, preschool, day care, early intervention (82% vs. 74.9%; p=0.05)</p> <p><b>Age 9 followup</b>                      No differences in special education placement between groups: 2.3% of comparison group and 2.2% of home-visited group had a special education placement in grades 1–3 (OR, 0.98 [95% CI, 0.36 to 2.65]; p=0.97)                      Home-visited mothers had longer relationships with current partner than control (effect size, 0.28; p=0.016); more home-visited participants had relationships with employed partners vs. control (effect size, 0.25; p=0.002)                      Home-visited participants had fewer months/year AFDC/TANF and food stamps from birth to child age 9 (effect sizes ranging from -0.17 to -0.14; p≤0.008)                      More maternal arrests and mothers jailed in home-visited group vs. control (p=NS), 6- to 9-year followup</p>
Larson 1980 <sup>127</sup> Canada	Pregnant individuals age 18–35, low SES	Prenatal home visit, hospital visit, postpartum home visits up to age 15 months (NR)  Home visits up to age 15 months (NR)  Control (NR)  115 total at baseline	No differences among all groups in well-child visits at 6, 12, or 18 months No differences in observed financial problems between groups receiving home visits at 12 months or 15 months of age
Lowell 2011 <sup>111</sup> U.S.	Families with children 6–36 months old with social–emotional or behavioral problems or parents with psychosocial risk factors on the Parent Risk Questionnaire	Child FIRST intervention (78)  Usual care (79)	At the 6- and 12-month followups, significantly greater percentage of "wanted social services received" in the intervention group vs. control (91% vs. 33% at 12 months); significantly greater proportion needs met in each domain in intervention arm vs. control (early education 88% vs. 26%, family support 83% vs. 9%, adult mental health 92% vs. 7%, social services 93% vs. 56%, medical services 98% vs. 78%, adult education 62% vs. 9%, concrete needs 89% vs. 16%; p<0.001) Child FIRST families received mean of 14.7 (SD 5.4) wanted services vs. usual care (5.1, SD 2.4)
Marcenko 1994 <sup>120</sup> U.S.	Pregnant individuals with risk of out-of-home child placement based on history of one of the following substance	Home visiting (125)  Control (100)	Home-visited participants reported significantly greater help in accessing transportation (48% vs. 16%), clothing for self (17% vs. 5%) and baby (26% vs. 9%), baby furniture/toys (22% vs. 4%), and healthcare vs. control participants (45% vs. 30%); all p≤0.05 No significant differences between groups in assistance with food and housing

**Appendix A Table 5. Key Social Determinants of Health-Related Outcomes in Studies of Child Maltreatment Prevention Interventions**

Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
Marcenko 1994 <sup>120</sup> U.S. (continued)	abuse, homelessness, domestic violence, psychiatric illness, incarceration, HIV, lack of social support		Significant increase in total social support home visiting participants received between baseline and followup (p<0.005); no change for control group
Olds 1986 <sup>121,143,144</sup> U.S.	Actively recruited pregnant individuals (<25 weeks gestation) with no previous live births and a sociodemographic risk factor (younger than age 19, unmarried, low SES) but any pregnant individual (<25 weeks gestation) requesting to enroll could do so	<p>Nurse home visiting during pregnancy and up to child age 2 and transportation and screening (116)</p> <p>Nurse home visiting during pregnancy and transportation and screening (100)</p> <p>Transportation and screening (94)</p> <p>Control (infant developmental screening) (90)</p>	<p><b>15-year followup</b></p> <p>Fewer months of AFDC, food stamps, Medicaid in group visited up to age 2 vs. control and transportation and screening groups combined (p=NS)</p> <p>Greater number months employed in group visited up to age 2 vs. control and transportation and screening groups combined (p=NS)</p> <p>Fewer arrests, convictions, days in jail, New York State arrests or conviction among women receiving home visiting up to age 2 compared with transportation and screening and control groups (difference in incidence ranging from 0.24 to 9.00; all p=NS)</p> <p>In low-SES unmarried subsample significantly fewer months of AFDC, food stamps in group visited up to age 2 vs. low-SES unmarried women in the control and transportation and screening groups combined (p&lt;0.01); nonsignificantly greater months employed and non-significantly fewer months receiving Medicaid in group visited up to age 2 vs. control and transportation and screening groups combined</p> <p>In low-SES, unmarried sample, significantly fewer arrests, convictions, days in jail, New York State arrests or convictions among women receiving home visiting up to age 2 compared with low-SES unmarried women in transportation and screening and control groups (difference in incidence ranging from 1.19 to 3.32; all p&lt;0.01)</p>
Quinlivan 2003 <sup>128</sup> Australia	Pregnant individuals younger than age 18	<p>Home visiting (65)</p> <p>Usual care (71)</p>	<p>Greater contraception knowledge in intervention arm vs. usual care at 6-month assessment (p=NS)</p> <p>No differences in contraception use at hospital discharge but greater use in intervention arm vs. usual care at 6-month assessment (ARR, 1.35 [95% CI, 1.09 to 1.68]; p=0.007)</p>
Robling 2016 <sup>131,149,150</sup> U.K.	Nulliparous individuals, <25 weeks gestation, age 19 or younger	<p>Home visiting (823)</p> <p>Usual Care (822)</p>	<p>At 24 months, no significant differences between groups in use of childcare; use of day nursery, children's center or toddler group; contraceptive use; primary care consultation; Family Resources score; use of social worker, contacts with employment adviser; mothers not in education, employment, or training; mothers in formal education; mothers in paid employment; mothers receiving State benefits or other financial support; mothers who were homeless from baseline to 24 months; referrals of child to social services</p> <p>No significant group differences in antenatal care checkups or planned visits to day assessment units</p> <p>More intervention participants vs. control reported high level of social support at 18 and 24 months (AOR, 1.50 [95% CI, 1.06 to 2.12]; p=0.02)</p> <p>No differences in Early Education attendance up to 4 years; more children in usual-care arm vs. intervention received special education (33% vs. 29%; absolute difference, -3.9%; AOR, 0.83 [95% CI, 0.67 to 1.03]; p=0.097)</p>

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Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
Robling 2016 <sup>131,149,150</sup> U.K. (continued)			<p>More children in the home-visiting arm compared with control had “good level of development” overall scores on early learning assessments (AOR, 1.26 [95% CI, 1.03 to 1.55]; p=0.026) and in early learning goals (AOR, 1.24 [95% CI, 1.01 to 1.52]; p=0.043)</p> <p>Scores on the Early Years Foundation profile were improved in the intervention arm vs. control in subgroup of children whose mothers were younger than age 16 at baseline; total point score, 32.4 vs. 28.9; AOR, 3.65 (95% CI, 0.76 to 6.55); p=0.013; p value for interaction between mother &lt;16 and mothers &gt;16 subgroups, 0.046</p> <p>Early Years Foundation scores did not differ between intervention and control arms for subgroups defined by maternal age &gt;16; maternal employment, education, or training status at baseline; deprivation quintile measured on the Index of Multiple Deprivation</p>
Sege 2015 <sup>152</sup> U.S.	Families of newborns <10 weeks old receiving care at one pediatric primary care clinic	<p>Collaborative clinician+family specialist primary care visit, family specialist home visits, and other contacts (text, phone, email, in-person) (167)</p> <p>Usual care (163)</p>	<p><b>6-month followup</b></p> <p>More intervention vs. control participants had access to resources (food assistance, utility assistance, Emergency Aid to the Elderly, Disabled, and Children, Transitional Aid to Families With Dependent Children) deemed likely to be attainable within 6 months by social workers (% NR, p=0.007); no group differences in resources deemed “impossible to obtain” within 6 months (e.g., housing)</p> <p><b>12-month followup</b></p> <p>At 12-month followup, more intervention vs. control participants had heard about, tried to obtain, or obtained utility and telephone assistance 12.7% vs. 10.6%, p=0.006) or had accessed more resources overall (mean 3.7 vs. 3.2, p=0.03)</p> <p>No significant group differences in hearing about, attempting to obtain, or obtaining other resources (food, housing, income assistance)</p> <p>Legal consultations arranged for 75 intervention families; data not available for usual care participants</p>
Silovsky 2011 <sup>124</sup> U.S.	Rural families with children age 0–5 and at least 1 risk factor	<p>Home visiting adapted for rural environment (48)</p> <p>Services as usual (57)</p>	<p>No significant group differences on Family Resources Scale (measures adequacy of resources in households with children) at 17-month followup but significant improvement from baseline in home-visiting arm</p>
Wiggins 2004 <sup>130</sup> U.K.	Individuals with young infants residing in economically deprived districts	<p>Home visiting (183)</p> <p>Community services referral (184)</p> <p>Control (364)</p>	<p><b>12-month followup</b></p> <p>Home-visiting group more likely than control to have seen or spoken to health visitor or social worker (RR, 3.31 [95% CI, 1.23 to 8.96]); similar proportion of home-visiting group and control group used health services for own needs in past month</p> <p>No significant differences in use of healthcare between control and community services group</p> <p>Fewer home-visited children had seen GP vs. control children (RR, 0.77 [95% CI, 0.62 to 0.97]) and home-visited children had less use of any health service than control children (RR, 0.89 [95% CI, 0.77 to 1.03])</p> <p>Fewer women in intervention groups vs. control group considered their financial situation to be worse than prior year but differences were not significant</p>



**Appendix A Table 5. Key Social Determinants of Health-Related Outcomes in Studies of Child Maltreatment Prevention Interventions**

Author, Year, Country	Population	Group (N Randomized)	Key SDOH Findings
Wiggins 2004 <sup>130</sup> U.K. (continued)			<p>Slightly fewer women in both intervention groups than in the control group were currently employed, with similar time to return to employment among all 3 groups</p> <p>Similar proportions among all groups had low partner support (11% to 14%)</p> <p>Women who received medium or high level of home visiting had greater increases in use of health visitors for self and child and use of social workers vs control group and decreased use of GP for child vs. control group</p> <p>Home-visiting participants considered “socially excluded” had greater increases in use of health visitors for self and child and greater use of social worker vs. socially excluded control group participants</p> <p><b>18-month followup</b></p> <p>Increased use of health services for self in home-visiting group vs. control, typically with wide confidence intervals</p> <p>Continued, but less than at 12 months, decreased use of GP for home-visited children vs. control children; increase in being seen by doctor at home in community services group vs. control</p> <p>31% of home-visited participants vs. 24% of control considered financial status worse compared with prior year (RR, 1.26 [95% CI, 0.23 to 1.73])</p> <p>Similar proportion of mothers and partners in home visiting and control group were not in paid employment (64% to 65% of mothers and 22% to 25% of partners)</p> <p>Fewer participants in home-visiting arm had unsatisfactory social support (41% vs. 47% in community services arm and 45% in control); proportion experiencing low levels of partner support was similar across groups but lowest in control arm (13% to 17%)</p> <p>In socially excluded population, increased maternal use of GPs and hospital doctors and higher risk of using any health services in previous month (RR, 1.25 [95% CI, 1.00 to 1.55]) in intervention group compared with control</p>

**Abbreviations:** AFDC=Aid to Families with Dependent Children; AOR=adjusted odds ratio; CI=confidence interval; GP=general practitioner; ITT= intention-to-treat; mo=months; N=number; NS=not statistically significant; NR=not reported; NZ=New Zealand; OR=odds ratio; RR=relative risk; SD=standard deviation; SDOH=social determinants of health; SES=socioeconomic status; SNAP=Supplemental Nutrition Assistance Program; TANF=Temporary Assistance to Needy Families; U.K.=United Kingdom; U.S.=United States; WIC=Special Supplemental Insurance Program for Women, Infants, and Children

## Appendix B1. Search Strategies

### PubMed KQs Search, 1/03/2022

SRs = 516; 516 imported

RCTs = 822; 822 imported

Cohort and Case-Control = 2,410; 2,294 imported

Search number	Query	Filters	Results
1	"Adverse Childhood Experiences"[Mesh] OR "Child, Abandoned"[Mesh] OR "Child Abuse"[Mesh] OR ("CranioCerebral Trauma"[Mesh] AND (abus*[tw] OR neglect*[tw] OR maltreat*[tw])) OR "Domestic Violence"[Mesh] OR ("Fractures, Bone"[Mesh] AND (abus*[tw] OR neglect*[tw] OR maltreat*[tw])) OR "Shaken Baby Syndrome"[Mesh] OR "child abuse"[All Fields] OR "child maltreatment"[All Fields] OR "infant abuse"[Title/Abstract]		57,992
2	((infant*[tw] OR "child**"[tw]) AND "abus**"[tw]) OR ((infant*[tw] OR child*[tw]) AND maltreat*[tw]) OR (child*[tw] AND neglect*[tw]) OR (domestic[tw] AND violen*[tw]) OR "emotional abuse"[tw] OR internaliz*[tw] OR ("shaken baby"[tw] AND syndrome[tw]) NOT Medline[subset]		13,339
3	#1 OR #2		69,548
4	#1 OR #2	English	65,447
5	#4 NOT ("Animals"[Mesh] NOT "Humans"[Mesh])		65,277
6	#4 NOT ("Animals"[Mesh] NOT "Humans"[Mesh])	Child: birth-18 years	38,192
7	(adolescen*[tw] OR boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR teen[tw] OR teens[tw] OR teenage*[tw]) NOT Medline[subset]		250,414
8	#5 AND #7		7,373
9	#6 OR #8		45,549
10	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "case report"[tw] OR "case reports"[tw] OR "case series"[tw] OR "comment"[pt] OR "comment on"[All Fields] OR congress[pt] OR "dictionary"[pt] OR "directory"[pt] OR "editorial"[pt] OR "festschrift"[pt] OR "historical article"[pt] OR "interview"[pt] OR lecture[pt] OR "legal case"[pt] OR "legislation"[pt] OR "news"[pt] OR "newspaper article"[pt] OR "patient education handout"[pt] OR "periodical index"[pt]		4,432,828
11	#9 NOT #10		38,989
12	#11 AND ("2016/06/18"[Date - Publication] : "3000"[Date - Publication])		12,656

## Appendix B1. Search Strategies

Search number	Query	Filters	Results
13	"randomized controlled trial"[pt] OR "controlled clinical trial"[pt] OR randomized[tiab] OR placebo[tiab] OR "drug therapy"[sh] OR randomly[tiab] OR trial[tiab]		3,553,160
14	#12 AND #13		<b>822</b>
15	"Cohort Studies"[Mesh] OR "Prospective Studies"[Mesh] OR cohort OR "Case-Control Studies"[Mesh] OR "case control"[tiab]		2,846,324
16	#12 AND #15		<b>2,410</b>
17	"Systematic Review"[pt] OR ("Review"[Publication Type] AND "systematic"[tiab]) OR "systematic review"[All Fields] OR ("Review Literature as Topic"[MeSH] AND "systematic"[tiab]) OR "Meta-analysis"[Publication Type] OR "Meta-analysis As Topic"[MeSH Terms] OR "Systematic Reviews as Topic"[Mesh] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab] OR "Umbrella Review"[tiab]		409,517
18	#12 AND #17		<b>620</b>
19	#18 NOT (#14 OR #16)		516

## Appendix B1. Search Strategies

### PubMed CQ 1 Search, 1/03/2022

Systematic Reviews = 9; 6 imported

Trials = 31; 20 imported

Cohort studies = 80, 43 imported

Everything Else (recommend to also review) = 231, 231 imported

Search number	Query	Filters	Results
1	"Adverse Childhood Experiences"[Mesh] OR "Child, Abandoned"[Mesh] OR "Child Abuse"[Mesh] OR ("Craniocerebral Trauma"[Mesh] AND (abus*[tw] OR neglect*[tw] OR maltreat*[tw])) OR "Domestic Violence"[Mesh] OR ("Fractures, Bone"[Mesh] AND (abus*[tw] OR neglect*[tw] OR maltreat*[tw])) OR "Shaken Baby Syndrome"[Mesh] OR "child abuse"[All Fields] OR "child maltreatment"[All Fields] OR "infant abuse"[Title/Abstract]		58,008
2	((infant*[tw] OR "child*" [tw]) AND "abus*" [tw] OR ((infant*[tw] OR child*[tw]) AND maltreat*[tw]) OR (child*[tw] AND neglect*[tw]) OR (domestic[tw] AND violen*[tw]) OR "emotional abuse"[tw] OR internaliz*[tw] OR ("shaken baby"[tw] AND syndrome[tw] NOT Medline[subset]		13,383
3	#1 OR #2		69,597
4	#1 OR #2	English	65,494
5	#4 NOT ("Animals"[Mesh] NOT "Humans"[Mesh])		65,319
6	#4 NOT ("Animals"[Mesh] NOT "Humans"[Mesh])	Child: birth-18 years	38,216
7	(adolescen*[tw] OR boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR teen[tw] OR teens[tw] OR teenage*[tw]) NOT Medline[subset]		251,294
8	#5 AND #7		7,396
9	#6 OR #8		45,572
10	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "dictionary"[pt] OR "festschrift"[pt] OR "periodical index"[pt]		235,172
11	#9 NOT #10		45,404

## Appendix B1. Search Strategies

Search number	Query	Filters	Results
12	("epidemiology"[MeSH Subheading] OR "epidemiology"[All Fields] OR "surveillance"[All Fields] OR "epidemiology"[MeSH Terms] OR "surveillance"[All Fields] OR "surveillances"[All Fields] OR "surveilled"[All Fields] OR "surveillance"[All Fields]) AND ("effect"[All Fields] OR "effecting"[All Fields] OR "effective"[All Fields] OR "effectively"[All Fields] OR "effectiveness"[All Fields] OR "effectivenesses"[All Fields] OR "effectives"[All Fields] OR "effectivities"[All Fields] OR "effectivity"[All Fields] OR "effects"[All Fields])		924,173
13	#11 AND #12		2,761
14	Acculturation[Mesh:no exp] OR "Racial Groups"[Mesh] OR "Cross-Cultural Comparison"[Mesh:no exp] OR "Cultural Characteristics"[Mesh:no exp] OR "Cultural Diversity"[Mesh:no exp] OR "Emigrants and Immigrants"[Mesh] OR "Ethnic Groups"[Mesh] OR "Health Equity"[Mesh:no exp] OR "Health Status Disparities"[Mesh:no exp] OR "Minority groups"[Mesh:no exp] OR "Minority health"[Mesh:no exp] OR Prejudice[Mesh:no exp] OR "Psychosocial Deprivation"[Mesh:no exp] OR "Race Relations"[Mesh] OR Racism[Mesh:no exp] OR Refugees[Mesh:no exp] OR "Social determinants of Health"[Mesh:no exp] OR "Social Discrimination"[Mesh:no exp] OR "Transients and Migrants"[Mesh:no exp] OR Xenophobia[Mesh:no exp]		373,831
15	aboriginal[tw] OR caucasian*[tw] OR deprivation[tw] OR disparit*[tw] OR "english as a second language"[tw] OR equity[tw] OR ethnic*[tw] OR ethnology[tw] OR "first nation"*[tw] OR "foreign language"[tw] OR "health*care disparit"*[tw] OR "health care disparit"*[tw] OR "health status disparit"*[tw] OR "health disparit"*[tw] OR "health inequalit"*[tw] OR "health inequit"*[tw] OR hispanic*[tw] OR indigenous[tw] OR inequalit*[tw] OR inequit*[tw] OR inuit[tw] OR "language other than"[tw] OR "migration background"[tw] OR latina*[tw] OR latino*[tw] OR latinx[tw] OR "medically underserved"[tw] OR minorit*[tw] OR "native american"[tw] OR non-English[tw] OR non-white[tw] OR race[tw] OR racial[tw] OR racism[tw] OR "social determinants"[tw] OR "Torres Strait Islander"[tw] OR whites[tw]		834,186
16	#15 NOT Medline[subset]		90,017

## Appendix B1. Search Strategies

Search number	Query	Filters	Results
17	"disproportionalities"[All Fields] OR "disproportionality"[All Fields] OR ((disparate OR disparity OR disparities) AND (race OR racial OR racism OR ethnic*))		39,691
18	#14 OR #16 OR #17		472,808
19	#13 AND #18		341
20	"Systematic Review"[pt] OR systematic[subset] OR ("Review"[Publication Type] AND "systematic"[tiab]) OR "systematic review"[All Fields] OR ("Review Literature as Topic"[MeSH] AND "systematic"[tiab]) OR "Meta-analysis"[Publication Type] OR "Meta-analysis As Topic"[MeSH Terms] OR "Systematic Reviews as Topic"[Mesh] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab] OR "Umbrella Review"[tiab]		410,347
21	#19 AND #20		9
22	randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized [tiab] OR placebo [tiab] OR drug therapy [sh] OR randomly [tiab] OR trial [tiab]		3,554,571
23	#19 AND #22		31
24	"Cohort Studies"[Mesh] OR "Prospective Studies"[Mesh] OR cohort		2,588,761
25	#19 AND #24		80
26	#19 NOT (#21 OR #23 OR #25)		231

## Appendix B1. Search Strategies

### PubMed CQ 2 Search, 1/03/2022

SRs + MAs = 9; 0 imported

Everything else = 145; 97 imported

Search number	Query	Filters	Results
1	"Adverse Childhood Experiences"[Mesh] OR "Child, Abandoned"[Mesh] OR "Child Abuse"[Mesh] OR ("Cranio-cerebral Trauma"[Mesh] AND (abus*[tw] OR neglect*[tw] OR maltreat*[tw])) OR "Domestic Violence"[Mesh] OR ("Fractures, Bone"[Mesh] AND (abus*[tw] OR neglect*[tw] OR maltreat*[tw])) OR "Shaken Baby Syndrome"[Mesh] OR "child abuse"[All Fields] OR "child maltreatment"[All Fields] OR "infant abuse"[Title/Abstract]		58,008
2	((infant*[tw] OR "child*" [tw]) AND "abus*" [tw] OR ((infant*[tw] OR child*[tw]) AND maltreat*[tw]) OR (child*[tw] AND neglect*[tw]) OR (domestic[tw] AND violen*[tw]) OR "emotional abuse"[tw] OR internaliz*[tw] OR ("shaken baby"[tw] AND syndrome[tw] NOT Medline[subset])		13,383
3	#1 OR #2		69,597
4	#1 OR #2	English	65,494
5	#4 NOT ("Animals"[Mesh] NOT "Humans"[Mesh])		65,319
6	#4 NOT ("Animals"[Mesh] NOT "Humans"[Mesh])	Child: birth-18 years	38,216
7	(adolescen*[tw] OR boys[tw] OR child[tw] OR children*[tw] OR childhood[tw] OR girls[tw] OR infant*[tw] OR neonat*[tw] OR newborn*[tw] OR pediatric*[tw] OR paediatric*[tw] OR teen[tw] OR teens[tw] OR teenage*[tw]) NOT Medline[subset]		251,294
8	#5 AND #7		7,396
9	#6 OR #8		45,572
10	address[pt] OR "autobiography"[pt] OR "bibliography"[pt] OR "biography"[pt] OR "dictionary"[pt] OR "festschrift"[pt] OR "periodical index"[pt]		235,172

## Appendix B1. Search Strategies

Search number	Query	Filters	Results
11	#9 NOT #10		45,404
12	"BabyFirst Screen"[All Fields] OR "Brief Infant-Toddler Social and Emotional Assessment"[All Fields] OR BITSEA[All Fields] OR "Brisbane Evaluation of Needs Questionnaire"[All Fields] OR "Child Abuse Potential Inventory"[All Fields] OR "Kempe Family Stress Checklist"[All Fields] OR "Maternal History Interview"[All Fields] OR "MHI-2"[All Fields] OR "Parent Risk Questionnaire"[All Fields] OR "Parent Screening Questionnaire"[All Fields]		173
13	"Child Abuse and Trauma Scale"[All Fields] OR "Child Dissociative Checklist"[All Fields] OR "Childhood Trauma Questionnaire"[All Fields] OR "Emotional Abuse Subscale"[All Fields] OR "Problem Oriented Screening Instrument for Teenagers"[All Fields] OR "Protective Factors Survey"[All Fields] OR "Trauma Symptoms Checklist for Children"[All Fields]		1,517
14	"Actuarial Risk Assessment Instrument Youth"[All Fields] OR "Brief CAPI"[All Fields] OR "California Family Assessment Factor Analysis"[All Fields] OR "California Family Risk Assessment"[All Fields] OR "CANTS 17B" [All Fields] OR "CAPI shortened version" [All Fields] OR "CFRA Abuse Scale" [All Fields] OR "CFRA Neglect Scale" [All Fields] OR "CFRA with possibility to overrule"[All Fields] OR "Check List of Child Safety" [All Fields] OR "Child Abuse Potential Inventory"[All Fields] OR "Child Abuse Risk Evaluation" [All Fields] OR "Colorado Family Risk Assessment" [All Fields] OR "Connecticut Risk Assessment"[All Fields] OR "Detection of Unsafety in Families" [All Fields] OR "Family Psychosocial Risk Inventory" [All Fields] OR "Family Stress Checklist" [All Fields] OR (Flaherty[tw] AND "neural network model"[All Fields]) OR (Flaherty[tw] AND "regression model"[tiab]) OR Horikawa[tw] OR "Instrument for Early Identification of Parents At Risk for Child Abuse and Neglect"[All Fields] OR Lealman[tw] OR "Maternal History Interview"[All Fields] OR "Minnesota Family Risk Assessment"[All Fields] OR "NCCD Risk Assessment Tools"[All Fields] OR "Screening Checklist for Risk of Referral"[All Fields] OR "Structured Problem Analysis of Raising Kids"[All Fields] OR (Vaithianathan[tw] AND "Predictive Risk Model"[All Fields])		113
15	#12 OR #13 OR #14		1,718



## Appendix B1. Search Strategies

Search number	Query	Filters	Results
16	("Risk Assessment"[Mesh] OR "risk assessment" OR "risk tool" OR "risk measure" OR "risk evaluat*" OR "risk analys*" OR "screen*") AND ("AUC" OR "ROC" OR "sensitivity" OR "specificity" OR "predictive validity" OR "predictive accuracy")		177,923
17	("Sensitivity and Specificity"[Mesh] OR "Predictive Value of Tests"[Mesh] OR "ROC Curve"[Mesh] OR "Reproducibility of Results"[Mesh] OR "False Negative Reactions"[Mesh] OR "False Positive Reactions"[Mesh] OR "predictive value"[tw] OR sensitivity[tw] OR specificity[tw] OR accuracy[tw] OR ROC[tw] OR reproducib*[tw] OR "false positive"[tw] OR "false negative"[tw] OR "likelihood ratio"[tw] OR reliability[tw] OR validity[tw])		2,941,908
18	#16 OR #17		2,945,797
19	#11 AND #15 AND #18		177
20	#11 AND #16		237
21	#19 OR #20		403
22	#21 AND ("2016/06/18"[Date - Publication] : "3000"[Date - Publication])		154
23	"Systematic Review"[pt] OR systematic[subset] OR ("Review"[Publication Type] AND "systematic"[tiab]) OR "systematic review"[All Fields] OR ("Review Literature as Topic"[MeSH] AND "systematic"[tiab]) OR "Meta-analysis"[Publication Type] OR "Meta-analysis As Topic"[MeSH Terms] OR "Systematic Reviews as Topic"[Mesh] OR "meta-analysis"[tiab] OR "meta-analyses"[tiab] OR "meta-synthesis"[tiab] OR "meta-syntheses"[tiab] OR "Umbrella Review"[tiab]		410,374
24	#22 AND #23		9
25	#22 NOT #24		145

**Appendix B1. Search Strategies**

**Health and Psychosocial Instruments (HaPI), EBSCOhost, 12/17/2022**

**Used to identify potentially relevant/new risk assessment tools and saved in EndNote for team to review:**

33 results, **33** imported

Friday, December 17, 2021

#	Query	Limiters/Expanders	Results
S1	"Child, Abandoned" OR "Child Abuse" OR "Domestic Violence" OR "Shaken Baby Syndrome" OR "emotional abuse" OR ("child*" AND "abuse") OR "child abuse" OR (child* AND (maltreat* OR maltreatment)) OR "child maltreatment" OR (child* AND neglect*) OR (domestic AND violen*) OR ("shaken baby" AND syndrome)	Expanders - Apply equivalent subjects Limiters - Publication Date: 2016-2020	4975
S2	"Child, Abandoned" OR "Child Abuse" OR "Domestic Violence" OR "Shaken Baby Syndrome" OR "emotional abuse" OR ("child*" AND "abuse") OR "child abuse" OR (child* AND (maltreat* OR maltreatment)) OR "child maltreatment" OR (child* AND neglect*) OR (domestic AND violen*) OR ("shaken baby" AND syndrome)	Limiters - Publication Date: 2016-2020	250
S3	"Child, Abandoned" OR "Child Abuse" OR "Domestic Violence" OR "Shaken Baby Syndrome" OR "emotional abuse" OR ("child*" AND "abuse") OR "child abuse" OR (child* AND (maltreat* OR maltreatment)) OR "child maltreatment" OR (child* AND neglect*) OR (domestic AND violen*) OR ("shaken baby" AND syndrome)	Limiters - Publication Date: 2016-2020 Expanders - Apply equivalent subjects Narrow by Language: - English	157
S4	validity OR reliability	Expanders - Apply equivalent subjects	19,852
S5	S3 AND S4		<b>33</b>

## Appendix B1. Search Strategies

### Cochrane Library KQs Search, 1/6/2022

All results were trials. (1 editorial and 1 clinical answer not saved)

Used SR-Accelerator Polyglot Search module to translate PubMed search to Cochrane Library syntax and reviewed translation for correctness.

Limited the 3,865 trial results by Custom date range (when added to Cochrane Library) of 6/18/2016 – 1/6/2022; and further limited to Custom year range, published between 2016–2022:

Trials = 1695; **1,367** imported

ID	Search	Hits
#1	[mh "Adverse Childhood Experiences"] OR [mh "Child, Abandoned"] OR [mh "Child Abuse"] OR ([mh "Craniocerebral Trauma"] AND (abus*:ti,ab,kw OR neglect*:ti,ab,kw OR maltreat*:ti,ab,kw)) OR [mh "Domestic Violence"] OR ([mh "Fractures, Bone"] AND (abus*:ti,ab,kw OR neglect*:ti,ab,kw OR maltreat*:ti,ab,kw)) OR [mh "Shaken Baby Syndrome"] OR "child abuse" OR "child maltreatment" OR "infant abuse":ti,ab	1644
#2	((infant*:ti,ab,kw OR child*:ti,ab,kw) AND abus*:ti,ab,kw) OR ((infant*:ti,ab,kw OR child*:ti,ab,kw) AND maltreat*:ti,ab,kw) OR (child*:ti,ab,kw AND neglect*:ti,ab,kw) OR (domestic:ti,ab,kw AND violen*:ti,ab,kw) OR "emotional abuse":ti,ab,kw OR internaliz*:ti,ab,kw OR ("shaken baby":ti,ab,kw AND syndrome:ti,ab,kw)	5027
#3	#1 OR #2	5318
#4	[mh Adolescent] OR [mh Child] OR [mh Infant]	156845
#5	#3 AND #4	1818
#6	(adolescen*:ti,ab,kw OR boys:ti,ab,kw OR child:ti,ab,kw OR children:ti,ab,kw OR paediatric*:ti,ab,kw OR pediatric*:ti,ab,kw OR teen:ti,ab,kw OR teenage*:ti,ab,kw OR teens:ti,ab,kw)	263544
#7	#3 AND #6	3989
#8	#5 OR #7	4012
#9	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR "case report":ti,ab,kw OR "case reports":ti,ab,kw OR "case series":ti,ab,kw OR comment:pt OR "comment on" OR congress:pt OR dictionary:pt OR directory:pt OR editorial:pt OR festschrift:pt OR "historical article":pt OR interview:pt OR lecture:pt OR "legal case":pt OR legislation:pt OR news:pt OR "newspaper article":pt OR "patient education handout":pt OR "periodical index":pt	31971
#10	#8 NOT #9	3867

## Appendix B1. Search Strategies

ID	Search	Hits
#11	#10 Limited to Custom date range (added to Cochrane Library) between June 18, 2016 - January 6, 2022; Also further limited to Custom year range (publication year) between 2016 - 2022	<b>1695</b>

## Appendix B1. Search Strategies

### Cochrane Library CQ 1 Search, 1/7/2022

Used SR-Accelerator Polyglot Search module to translate PubMed search to Cochrane Library syntax and reviewed translation for correctness.

Limited the results by Custom date range (when added to Cochrane Library) of 6/18/2016 – 1/6/2022; and further limited to Custom year range, published between 2016–2022

All results after date limit are trials.

Trials = 247; 3 imported

ID	Search	Hits
#1	[mh "Adverse Childhood Experiences"] OR [mh "Child, Abandoned"] OR [mh "Child Abuse"] OR ([mh "Craniocerebral Trauma"] AND (abus*:ti,ab,kw OR neglect*:ti,ab,kw OR maltreat*:ti,ab,kw)) OR [mh "Domestic Violence"] OR ([mh "Fractures, Bone"] AND (abus*:ti,ab,kw OR neglect*:ti,ab,kw OR maltreat*:ti,ab,kw)) OR [mh "Shaken Baby Syndrome"] OR "child abuse" OR "child maltreatment" OR "infant abuse":ti,ab	1644
#2	((infant*:ti,ab,kw OR child*:ti,ab,kw) AND abus*:ti,ab,kw) OR ((infant*:ti,ab,kw OR child*:ti,ab,kw) AND maltreat*:ti,ab,kw) OR (child*:ti,ab,kw AND neglect*:ti,ab,kw) OR (domestic:ti,ab,kw AND violen*:ti,ab,kw) OR "emotional abuse":ti,ab,kw OR internaliz*:ti,ab,kw OR ("shaken baby":ti,ab,kw AND syndrome:ti,ab,kw)	5027
#3	#1 OR #2	5318
#4	[mh Adolescent] OR [mh Child] OR [mh Infant]	156845
#5	#3 AND #4	1818
#6	(adolescen*:ti,ab,kw OR boys:ti,ab,kw OR child:ti,ab,kw OR children:ti,ab,kw OR paediatric*:ti,ab,kw OR pediatric*:ti,ab,kw OR teen:ti,ab,kw OR teenage*:ti,ab,kw OR teens:ti,ab,kw)	263544
#7	#3 AND #6	3989
#8	#5 OR #7	4012
#9	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR dictionary:pt OR festschrift:pt OR "periodical index":pt	37
#10	#8 NOT #9	4012
#11	(epidemiology OR surveillance OR [mh epidemiology] OR surveillance OR surveillances OR surveilled OR surveillance) AND (effect OR effecting OR effective OR effectively OR effectiveness OR effectivenesses OR effectives OR effectivities OR effectivity OR effects)	48298
#12	#10 AND #11	290
#13	[mh ^Acculturation] OR [mh "Racial Groups"] OR [mh ^"Cross-Cultural Comparison"] OR [mh ^"Cultural Characteristics"] OR [mh ^"Cultural Diversity"] OR [mh "Emigrants and Immigrants"] OR [mh "Ethnic Groups"] OR [mh ^"Health Equity"] OR [mh ^"Health Status Disparities"] OR [mh ^"Minority groups"] OR [mh ^"Minority health"] OR [mh ^Prejudice] OR [mh ^"Psychosocial Deprivation"] OR [mh "Race Relations"] OR [mh ^Racism] OR [mh ^Refugees] OR [mh ^"Social determinants of Health"] OR [mh ^"Social Discrimination"] OR [mh ^"Transients and Migrants"] OR [mh ^Xenophobia]	5972
#14	(aboriginal:ti,ab,kw OR caucasian*:ti,ab,kw OR deprivation:ti,ab,kw OR disparit*:ti,ab,kw OR "english as a second language":ti,ab,kw OR equity:ti,ab,kw OR ethnic*:ti,ab,kw OR	47202

## Appendix B1. Search Strategies

ID	Search	Hits
	ethnology:ti,ab,kw OR ("first" NEXT nation*):ti,ab,kw OR "foreign language":ti,ab,kw OR (health*care NEXT disparit*):ti,ab,kw OR ("health care" NEXT disparit*):ti,ab,kw OR ("health status" NEXT disparit*):ti,ab,kw OR ("health" NEXT disparit*):ti,ab,kw OR ("health" NEXT inequalit*):ti,ab,kw OR ("health" NEXT inequit*):ti,ab,kw OR hispanic*:ti,ab,kw OR indigenous:ti,ab,kw OR inequalit*:ti,ab,kw OR inequit*:ti,ab,kw OR inuit:ti,ab,kw OR "language other than":ti,ab,kw OR "migration background":ti,ab,kw OR latina*:ti,ab,kw OR latino*:ti,ab,kw OR latinx:ti,ab,kw OR "medically underserved":ti,ab,kw OR minorit*:ti,ab,kw OR "native american":ti,ab,kw OR non-English:ti,ab,kw OR non-white:ti,ab,kw OR race:ti,ab,kw OR racial:ti,ab,kw OR racism:ti,ab,kw OR "social determinants":ti,ab,kw OR "Torres Strait Islander":ti,ab,kw OR whites:ti,ab,kw)	
#15	disproportionalities OR disproportionality OR ((disparate OR disparity OR disparities ) AND (race OR racial OR racism OR ethnic* ))	1755
#16	#13 OR #14 OR #15	48864
#17	#10 AND #16	528
#18	#17 Limited to Custom date range (added to Cochrane Library) between June 18, 2016 - January 6, 2022; Also further limited to Custom year range (publication year) between 2016 - 2022	<b>247</b>

## Appendix B1. Search Strategies

### Cochrane Library CQ 2 Search, 1/7/2022

Used SR-Accelerator Polyglot Search module to translate PubMed search to Cochrane Library syntax and reviewed translation for correctness.

19 results before date limits. Limited the results by Custom date range (when added to Cochrane Library) of 6/18/2016 – 1/6/2022; and further limited to Custom year range, published between 2016–2022:

SRs = 2; 2 imported

Trials = 4; 0 imported

ID	Search	Hits
#1	[mh "Adverse Childhood Experiences"] OR [mh "Child, Abandoned"] OR [mh "Child Abuse"] OR ([mh "Craniocerebral Trauma"] AND (abus*:ti,ab,kw OR neglect*:ti,ab,kw OR maltreat*:ti,ab,kw)) OR [mh "Domestic Violence"] OR ([mh "Fractures, Bone"] AND (abus*:ti,ab,kw OR neglect*:ti,ab,kw OR maltreat*:ti,ab,kw)) OR [mh "Shaken Baby Syndrome"] OR "child abuse" OR "child maltreatment" OR "infant abuse":ti,ab	1644
#2	((infant*:ti,ab,kw OR child*:ti,ab,kw) AND abus*:ti,ab,kw) OR ((infant*:ti,ab,kw OR child*:ti,ab,kw) AND maltreat*:ti,ab,kw) OR (child*:ti,ab,kw AND neglect*:ti,ab,kw) OR (domestic:ti,ab,kw AND violen*:ti,ab,kw) OR "emotional abuse":ti,ab,kw OR internaliz*:ti,ab,kw OR ("shaken baby":ti,ab,kw AND syndrome:ti,ab,kw)	5027
#3	#1 OR #2	5318
#4	[mh Adolescent] OR [mh Child] OR [mh Infant]	156845
#5	#3 AND #4	1818
#6	(adolescen*:ti,ab,kw OR boys:ti,ab,kw OR child:ti,ab,kw OR children:ti,ab,kw OR paediatric*:ti,ab,kw OR pediatric*:ti,ab,kw OR teen:ti,ab,kw OR teenage*:ti,ab,kw OR teens:ti,ab,kw)	263544
#7	#3 AND #6	3989
#8	#5 OR #7	4012
#9	address:pt OR autobiography:pt OR bibliography:pt OR biography:pt OR dictionary:pt OR festschrift:pt OR "periodical index":pt	37
#10	#8 NOT #9	4012
#11	"BabyFirst Screen" OR "Brief Infant-Toddler Social and Emotional Assessment" OR BITSEA OR "Brisbane Evaluation of Needs Questionnaire" OR "Child Abuse Potential Inventory" OR "Kempe Family Stress Checklist" OR "Maternal History Interview" OR MHI-2 OR "Parent Risk Questionnaire" OR "Parent Screening Questionnaire"	38
#12	"Child Abuse and Trauma Scale" OR "Child Dissociative Checklist" OR "Childhood Trauma Questionnaire" OR "Emotional Abuse Subscale" OR "Problem Oriented Screening Instrument for Teenagers" OR "Protective Factors Survey" OR "Trauma Symptoms Checklist for Children"	92

## Appendix B1. Search Strategies

ID	Search	Hits
#13	"Actuarial Risk Assessment Instrument Youth" OR "Brief CAPI" OR "California Family Assessment Factor Analysis" OR "California Family Risk Assessment" OR "CANTS 17B" OR "CAPI shortened version" OR "CFRA Abuse Scale" OR "CFRA Neglect Scale" OR "CFRA with possibility to overrule" OR "Check List of Child Safety" OR "Child Abuse Potential Inventory" OR "Child Abuse Risk Evaluation" OR "Colorado Family Risk Assessment" OR "Connecticut Risk Assessment" OR "Detection of Unsafety in Families" OR "Family Psychosocial Risk Inventory" OR "Family Stress Checklist" OR (Flaherty:ti,ab,kw AND "neural network model") OR (Flaherty:ti,ab,kw AND "regression model":ti,ab) OR Horikawa:ti,ab,kw OR "Instrument for Early Identification of Parents At Risk for Child Abuse and Neglect" OR Lealman:ti,ab,kw OR "Maternal History Interview" OR "Minnesota Family Risk Assessment" OR "NCCD Risk Assessment Tools" OR "Screening Checklist for Risk of Referral" OR "Structured Problem Analysis of Raising Kids" OR (Vaithianathan:ti,ab,kw AND "Predictive Risk Model")	18
#14	#11 OR #12 OR #13	133
#15	([mh "Risk Assessment"] OR "risk assessment" OR "risk tool" OR "risk measure" OR ("risk" NEXT evaluat*) OR ("risk" NEXT analys*) OR screen* ) AND (AUC OR ROC OR sensitivity OR specificity OR "predictive validity" OR "predictive accuracy" )	16442
#16	([mh "Sensitivity and Specificity"] OR [mh "Predictive Value of Tests"] OR [mh "ROC Curve"] OR [mh "Reproducibility of Results"] OR [mh "False Negative Reactions"] OR [mh "False Positive Reactions"]) OR "predictive value":ti,ab,kw OR sensitivity:ti,ab,kw OR specificity:ti,ab,kw OR accuracy:ti,ab,kw OR ROC:ti,ab,kw OR reproducib*:ti,ab,kw OR "false positive":ti,ab,kw OR "false negative":ti,ab,kw OR "likelihood ratio":ti,ab,kw OR reliability:ti,ab,kw OR validity:ti,ab,kw)	118783
#17	#15 OR #16	125980
#18	#10 AND #14 AND #17	19
#19	#18 Limited to Custom date range (added to Cochrane Library) between June 18, 2016 - January 6, 2022; Also further limited to Custom year range (publication year) between 2016 - 2022	6



## Appendix B1. Search Strategies

### Grey Literature Searches, 1/11/2022

[ClinicalTrials.gov Advanced Search](#), Searched in **Condition box** (306 results, all **306** saved in EndNote):

AREA[ConditionSearch] ( Abandoned Child OR Adverse Childhood Experiences OR Bone fracture\* AND ( abus\* OR neglect\* OR maltreat\* ) OR Child Abuse OR child maltreatment OR EXPAND[Concept] "Cranio-cerebral Trauma" AND ( abus\* OR neglect\* OR maltreat\* ) OR Domestic Violence OR EXPAND[Concept] "emotional abuse" OR infant abuse OR internaliz\* OR "Shaken Baby Syndrome" OR (skull fracture\* AND (abus\* OR neglect\* OR maltreat\*)))

[WHO International Clinical Trials Registry Platform \(WHO ICTRP\) Advanced search:](#)

Searched in Condition box (2 searches to accommodate character limit)

For both searches:

Recruitment status: ALL / Search for clinical trials in children

Date of registration: 18/06/2016 – 31/01/2022

#### **Search 1**

Abandoned Child OR Adverse Childhood Experiences OR (Bone fracture\* AND (abus\* OR neglect\* OR maltreat\*)) OR Child Abuse OR child maltreatment

(65 trials found, **65** imported to EndNote)

#### **Search 2**

(Cranio-cerebral Trauma AND (abus\* OR neglect\* OR maltreat\*)) OR Domestic Violence OR emotional abuse OR infant abuse OR internaliz\* OR Shaken Baby Syndrome OR (skull fracture\* AND (abus\* OR neglect\* OR maltreat\*))

(30 trials found, **23** imported)

**Appendix B2. Inclusion and Exclusion Criteria**

Category	Included	Excluded
Population	Children or adolescents (younger than age 18 years) with no known exposure to maltreatment or specific signs or symptoms of current or past maltreatment	Symptomatic children and adolescents undergoing diagnostic evaluations for conditions related to abuse or neglect (e.g., those presenting with a broken bone or other signs of physical abuse or neglect, or trauma symptoms associated with domestic violence exposure), children with known exposure to child maltreatment and perpetrators of maltreatment, and children of caregivers who perpetrated maltreatment toward them
Interventions	<p>Primary care–based programs or services; services that could result from a referral by a primary care provider</p> <p>Services may include home-visiting programs, respite care, parent education programs, and family support and family strengthening programs</p> <p>Services may be implemented by nonclinicians</p> <p>(Interventions may be directed at the caregiver and may or may not include components directed at the child)</p>	Communitywide interventions such as public awareness campaigns or public service announcements only, without specific interventions linked to clinical settings
Comparisons	Usual care, delayed intervention, active interventions that allow for the assessment of the independent contribution of primary care–relevant preventive intervention (e.g., clinical interventions plus media campaigns vs. media campaigns)	Comparators that do not allow for the assessment of the independent contribution of the effect of primary care–feasible or referable preventive interventions (e.g., clinical interventions plus media campaigns vs. usual care)
<p>Outcomes</p> <p>Outcomes (continued)</p>	<p><b>KQ 1:</b> Direct or proxy measures of abuse or neglect (required):</p> <ul style="list-style-type: none"> <li>• Child protective services reports</li> <li>• Removal of the child from the home</li> <li>• Physical abuse, sexual abuse, or emotional abuse perpetrated by a parent or caretaker against a child (not parent-reported)</li> <li>• Physical (e.g., failure to thrive), emotional, dental/medical (for needed dental, medical, or mental health treatment), or educational neglect</li> <li>• Injuries such as broken bones, bruises, burns, and other injuries with a high specificity for abuse</li> <li>• Emergency department visits</li> <li>• Hospitalizations</li> </ul> <p>Mortality*</p> <p>Behavioral, developmental, emotional, mental, or physical health and well-being:*</p> <ul style="list-style-type: none"> <li>• Quality of life or functional status measures (using validated instruments)</li> </ul>	<p><b>KQ 1:</b> Outcomes not otherwise specified, studies without direct or proxy measures of abuse or neglect, and parent-reported measures of exposure to abuse or neglect</p> <p><b>KQ 2:</b> None specified</p>

## Appendix B2. Inclusion and Exclusion Criteria

Category	Included	Excluded
	<ul style="list-style-type: none"> <li>Internalizing behaviors: depression, anxiety</li> <li>Externalizing behaviors: disruptive, aggressive, delinquent behavior</li> <li>Child development (including school readiness and academic performance): social–emotional (e.g., attachment problems, peer relationships, community involvement), developmental delays (language, cognitive)</li> <li>Incidence of reactive attachment disorder</li> <li>Incidence of disinhibited social engagement disorder</li> <li>Incidence of acute stress disorder</li> <li>Incidence of posttraumatic stress disorder</li> <li>Incidence of traumatic stress symptoms: attachment, self-regulation, under- or overcontrolling behaviors (e.g., irritable/angry outbursts, self-destructive behavior, food hoarding), executive functioning, self-concept, hypervigilance, exaggerated startle response, dissociation, concentration problems, somatic problems (e.g., headaches, gastrointestinal problems), sleep disturbance, nightmares</li> <li>Unintended pregnancy, sexually transmitted infections, or termination of pregnancy</li> <li>Suicidality and self-injurious behaviors</li> </ul> <p><b>KQ 2:</b> Any harms that result as an effect of interventions (e.g., stigma, labeling, legal risks, risks of further harm to the child, or dissolution of families, worsening of inequities), or worsening of outcomes** listed in KQ 1</p>	
Clinical settings	Pediatrics, primary care, family medicine, school-based clinics, or other settings where primary care services are offered; services that could result from an assessment by a clinician (including delivery hospitals, in-home settings, and nonspecialist settings)	Not a primary care–feasible or referable setting, populations, or services/interventions not applicable to U.S. practice
Geographic setting	Research conducted in the United States or in populations similar to U.S. populations with services and interventions applicable to U.S. practice (countries categorized as “very high” on the United Nations Human Development Index, as defined by the United Nations Development Programme)	Research not relevant to the United States in countries categorized as less than “very high” on the Human Development Index
Study designs	<p><b>KQ 1:</b> RCTs</p> <p><b>KQ 2:</b> RCTs, controlled clinical trials, cohorts with controls, and case-control studies</p> <p>Systematic reviews will be hand searched for additional eligible studies</p>	<p><b>KQ 1:</b> Systematic reviews, nonrandomized cohort trials, case-control, case series, and case studies</p> <p><b>KQ 2:</b> Systematic reviews, case series, and case studies</p>
Timing	Any timing	No exclusion based on timing
Languages	Full-text published in English	Non-English language

## Appendix B2. Inclusion and Exclusion Criteria

Category	Included	Excluded
Publication type	Original research and systematic reviews	Editorials, commentaries, and narrative reviews

\*These outcomes were evaluated in studies that also report at least one child maltreatment outcome. Studies that do not report at least one child maltreatment outcome were ineligible for this review.

\*\* Will be restricted to RCTs

**Abbreviations:** KQ=key question; RCT=randomized, controlled trial.

## Appendix B3. USPSTF Quality Rating Criteria

### RCTs and Cohort Studies

- Initial assembly of comparable groups:
  - For RCTs: Adequate randomization, including first concealment and whether potential confounders were distributed equally among groups
  - For cohort studies: Consideration of potential confounders, with either restriction or measurement for adjustment in the analysis; consideration of inception cohorts
- Maintenance of comparable groups (includes attrition, cross-overs, adherence, contamination)
- Important differential loss to followup or overall high loss to followup
- Measurements: Equal, reliable, and valid (includes masking of outcome assessment)
- Clear definition of interventions
- All important outcomes considered
- Analysis: Adjustment for potential confounders for cohort studies or intention-to-treat analysis for RCTs

### Definition of Ratings Based on Above Criteria:

**Good:** Meets all criteria: Comparable groups are assembled initially and maintained throughout the study (followup  $\geq 80\%$ ); reliable and valid measurement instruments are used and applied equally to all groups; interventions are spelled out clearly; all important outcomes are considered; and appropriate attention is given to confounders in analysis. In addition, intention-to-treat analysis is used for RCTs.

**Fair:** Studies are graded “fair” if any or all of the following problems occur, without the fatal flaws noted in the “poor” category below: Generally comparable groups are assembled initially, but some question remains whether some (although not major) differences occurred with followup; measurement instruments are acceptable (although not the best) and generally applied equally; some but not all important outcomes are considered; and some but not all potential confounders are accounted for. Intention-to-treat analysis is used for RCTs.

**Poor:** Studies are graded “poor” if any of the following fatal flaws exists: Groups assembled initially are not close to being comparable or maintained throughout the study; unreliable or invalid measurement instruments are used or not applied equally among groups (including not masking outcome assessment); and key confounders are given little or no attention. Intention-to-treat analysis is lacking for RCTs.

Source: U.S. Preventive Services Task Force Procedure Manual. Appendix VI. Criteria for Assessing Internal Validity of Individual Studies. Available at:

<https://www.uspreventiveservicestaskforce.org/uspstf/about-uspstf/methods-and-processes/procedure-manual>

## Appendix C. Excluded Studies

### Exclusion Codes:

- X1: Ineligible publication type
- X2: Ineligible population
- X3: Ineligible/no intervention
- X4: Ineligible/no comparison
- X5: Ineligible/no outcomes
- X6: Ineligible/nonclinical setting
- X7: Ineligible study design
- X8: Ineligible country/region
- X9: Not in English
- X10: Relevant protocol or ongoing study
- X11: Duplicate
- X12: Poor quality

1. Brayden RM, Altemeier WA, Dietrich MS, et al. A prospective study of secondary prevention of child maltreatment. *J Pediatr*. 1993 Apr;122(4):511-6. PMID: 8463893. Exclusion Code: X11.
2. Eckenrode J, Ganzel B, Henderson CR, Jr., et al. Preventing child abuse and neglect with a program of nurse home visitation: the limiting effects of domestic violence. *JAMA*. 2000 Sep 20;284(11):1385-91. PMID: 10989400. Exclusion Code: X11.
3. Guterman NB, Bellamy JL, Banman A. Promoting father involvement in early home visiting services for vulnerable families: Findings from a pilot study of "Dads matter". *Child Abuse Negl*. 2018 Feb;76:261-72. doi: 10.1016/j.chiabu.2017.10.017. PMID: 29169043. Exclusion Code: X5.
4. Abrahamse ME, Tsang VMW, Lindauer RJJ. Home-based parent-child interaction therapy to prevent child maltreatment: a randomized controlled trial. *Int J Environ Res Public Health*. 2021 Aug 4;18(16)doi: 10.3390/ijerph18168244. PMID: 34444004. Exclusion Code: X5.
5. Akin BA, McDonald TP. Parenting intervention effects on reunification: a randomized trial of PMTO in foster care. *Child Abuse Negl*. 2018 Sep;83:94-105. doi: 10.1016/j.chiabu.2018.07.011. PMID: 30025308. Exclusion Code: X5.
6. Baggett K, Davis B, Feil E, et al. A randomized controlled trial examination of a remote parenting intervention: engagement and effects on parenting behavior and child abuse potential. *Child Maltreat*. 2017 Nov;22(4):315-23. doi: 10.1177/1077559517712000. PMID: 28587520. Exclusion Code: X5.
7. Barlow J, Sembi S, Parsons H, et al. A randomized controlled trial and economic evaluation of the Parents Under Pressure program for parents in substance abuse treatment. *Drug Alcohol Depend*. 2019 Jan 1;194:184-94. doi: 10.1016/j.drugalcdep.2018.08.044. PMID: 30447510. Exclusion Code: X5.
8. Behrens B, Edler K, Cote K, et al. Child internalizing symptoms during the COVID-19 pandemic among maltreating and non-maltreating families: examining the effects of family resources and the reminiscing and emotion training intervention. *Child Abuse Negl*. 2021 Oct 25:105375. doi: 10.1016/j.chiabu.2021.105375. PMID: 34749997. Exclusion Code: X2.
9. Cala Cala LF, Kelly CL, Ramos E, et al. Which mothers know that all babies cry? a randomized controlled trial of a child abuse prevention program for low-income new mothers. *Clin Pediatr (Phila)*. 2020 Sep;59(9-10):865-73. doi: 10.1177/0009922820922532. PMID: 32432487. Exclusion Code: X5.

## Appendix C. Excluded Studies

10. Colegrove VM, Havighurst SS, Kehoe CE, et al. Pilot randomized controlled trial of Tuning Relationships with Music: intervention for parents with a trauma history and their adolescent. *Child Abuse Negl.* 2018 May;79:259-68. doi: 10.1016/j.chiabu.2018.02.017. PMID: 29486348. Exclusion Code: X5.
11. Cox JE, Harris SK, Conroy K, et al. A parenting and life skills intervention for teen mothers: a randomized controlled trial. *Pediatrics.* 2019 Mar;143(3)doi: 10.1542/peds.2018-2303. PMID: 30755464. Exclusion Code: X5.
12. Demeusy EM, Handley ED, Manly JT, et al. Building healthy children: a preventive intervention for high-risk young families. *Dev Psychopathol.* 2021 May;33(2):598-613. doi: 10.1017/s0954579420001625. PMID: 33757620. Exclusion Code: X12.
13. Dijkstra S, Asscher JJ, Deković M, et al. A randomized controlled trial on the effectiveness of family group conferencing in child welfare: effectiveness, moderators, and level of FGC completion. *Child Maltreat.* 2019 May;24(2):137-51. doi: 10.1177/1077559518808221. PMID: 30463425. Exclusion Code: X2.
14. Dodge KA, Goodman WB, Bai Y, et al. Effect of a community agency-administered nurse home visitation program on program use and maternal and infant health outcomes: a randomized clinical trial. *JAMA Netw Open.* 2019 Nov 1;2(11):e1914522. doi: 10.1001/jamanetworkopen.2019.14522. PMID: 31675088. Exclusion Code: X12.
15. Eddy JM, Shortt JW, Martinez CR, Jr., et al. Outcomes from a randomized controlled trial of the relief nursery program. *Prev Sci.* 2020 Jan;21(1):36-46. doi: 10.1007/s11121-019-00992-9. PMID: 30729363. Exclusion Code: X5.
16. Feinberg ME, Jones DE, Hostetler ML, et al. Couple-focused prevention at the transition to parenthood, a randomized trial: effects on coparenting, parenting, family violence, and parent and child adjustment. *Prev Sci.* 2016 Aug;17(6):751-64. doi: 10.1007/s11121-016-0674-z. PMID: 27334116. Exclusion Code: X5.
17. Goodman WB, Dodge KA, Bai Y, et al. Effect of a universal postpartum nurse home visiting program on child maltreatment and emergency medical care at 5 years of age: a randomized clinical trial. *JAMA Netw Open.* 2021 Jul 1;4(7):e2116024. doi: 10.1001/jamanetworkopen.2021.16024. PMID: 34232300. Exclusion Code: X12.
18. Guastaferrero K, Felt JM, Font SA, et al. Parent-Focused Sexual Abuse Prevention: Results From a Cluster Randomized Trial. *Child Maltreat.* 2020 Oct 7:1077559520963870. doi: 10.1177/1077559520963870. PMID: 33025835. Exclusion Code: X5.
19. Guastaferrero K, Lai BS, Miller K, et al. Braiding two evidence-based programs for families at-risk: results of a cluster randomized trial. *J Child Fam Stud.* 2018 Feb;27(2):535-46. doi: 10.1007/s10826-017-0886-2. PMID: 29540976. Exclusion Code: X4.
20. Güllümk K, Orak OS. Effectiveness of web-based distance education for parents in the prevention of emotional neglect and abuse: A randomized controlled study. *Perspect Psychiatr Care.* 2021 Apr;57(2):573-82. doi: 10.1111/ppc.12580. PMID: 32668039. Exclusion Code: X5.
21. Hefti S, Pérez T, Fürstenau U, et al. Multisystemic Therapy for child abuse and neglect: do parents show improvement in parental mental health problems and parental stress? *J Marital Fam Ther.* 2020 Jan;46(1):95-109. doi: 10.1111/jmft.12367. PMID: 30516844. Exclusion Code: X2.
22. Jones D, Feinberg M, Hostetler M, et al. Family and Child Outcomes 2 Years After a Transition to Parenthood Intervention. *Fam Relat.* 2018 Apr;67(2):270-86. doi: 10.1111/fare.12309. PMID: 30140113. Exclusion Code: X5.
23. Kızıltepe R, Eslek D, Irmak TY, et al. "I am Learning to Protect Myself with Mika:" a teacher-based child sexual abuse prevention program in turkey. *J Interpers Violence.* 2021 Jan 15:886260520986272. doi: 10.1177/0886260520986272. PMID: 33446045. Exclusion Code: X3.

## Appendix C. Excluded Studies

24. Kliem S, Sandner M. Prenatal and Infancy Home Visiting in Germany: 7-Year Outcomes of a Randomized Trial. *Pediatrics*. 2021 Aug;148(2)doi: 10.1542/peds.2020-049610. PMID: 34326178. Exclusion Code: X5.
25. Labella MH, Lind T, Sellers T, et al. Emotion regulation among children in foster care versus birth parent care: differential effects of an early home-visiting intervention. *J Abnorm Child Psychol*. 2020 Aug;48(8):995-1006. doi: 10.1007/s10802-020-00653-4. PMID: 32419117. Exclusion Code: X2.
26. Lane WG, Dubowitz H, Frick KD, et al. Cost effectiveness of SEEK: A primary care-based child maltreatment prevention model. *Child Abuse Negl*. 2021 Jan;111:104809. doi: 10.1016/j.chiabu.2020.104809. PMID: 33203542. Exclusion Code: X5.
27. Lanier P, Dunnigan A, Kohl PL. Impact of pathways triple p on pediatric health-related quality of life in maltreated children. *J Dev Behav Pediatr*. 2018 Dec;39(9):701-8. doi: 10.1097/dbp.0000000000000608. PMID: 30074927. Exclusion Code: X2.
28. LeCroy CW, Lopez D. A Randomized Controlled Trial of Healthy Families: 6-Month and 1-Year Follow-Up. *Prev Sci*. 2020 Jan;21(1):25-35. doi: 10.1007/s11121-018-0931-4. PMID: 30039328. Exclusion Code: X5.
29. Liu S, Phu T, Dominguez A, et al. Improving Caregiver Self-Efficacy and Children's Behavioral Outcomes via a Brief Strength-Based Video Coaching Intervention: Results from a Randomized Controlled Trial. *Prev Sci*. 2021 May 7doi: 10.1007/s11121-021-01251-6. PMID: 33961176. Exclusion Code: X5.
30. Ondersma SJ, Martin J, Fortson B, et al. Technology to Augment Early Home Visitation for Child Maltreatment Prevention: A Pragmatic Randomized Trial. *Child Maltreat*. 2017 Nov;22(4):334-43. doi: 10.1177/1077559517729890. PMID: 28954530. Exclusion Code: X5.
31. O'Neill KMG, Cluxton-Keller F, Burrell L, et al. Impact of a Child Abuse Primary Prevention Strategy for New Mothers. *Prev Sci*. 2020 Jan;21(1):4-14. doi: 10.1007/s11121-018-0925-2. PMID: 29987503. Exclusion Code: X5.
32. Pfeiffer H, Cowley LE, Kemp AM, et al. Validation of the PredAHT-2 prediction tool for abusive head trauma. *Emerg Med J*. 2020 Mar;37(3):119-26. doi: 10.1136/emermed-2019-208893. PMID: 31932397. Exclusion Code: X3.
33. Portnoy J, Raine A, Liu J, et al. Reductions of intimate partner violence resulting from supplementing children with omega-3 fatty acids: A randomized, double-blind, placebo-controlled, stratified, parallel-group trial. *Aggress Behav*. 2018 May 20doi: 10.1002/ab.21769. PMID: 29781086. Exclusion Code: X5.
34. Prinz RJ. Assessing child maltreatment prevention via administrative data systems: a case example of reproducibility. *Child Abuse Negl*. 2017 Feb;64:13-8. doi: 10.1016/j.chiabu.2016.12.005. PMID: 27992829. Exclusion Code: X3.
35. Riem MME, Lotz AM, Horstman LI, et al. A soft baby carrier intervention enhances amygdala responses to infant crying in fathers: a randomized controlled trial. *Psychoneuroendocrinology*. 2021 Oct;132:105380. doi: 10.1016/j.psyneuen.2021.105380. PMID: 34391194. Exclusion Code: X5.
36. Self-Brown S, Osborne MC, Boyd C, Jr., et al. The impact of SafeCare® Dads to Kids program on father maltreatment risk and involvement: outcomes and lessons learned from an efficacy trial. *Child Abuse Negl*. 2018 Sep;83:31-41. doi: 10.1016/j.chiabu.2018.06.014. PMID: 30016743. Exclusion Code: X5.
37. Self-Brown S, Osborne MC, Lai BS, et al. Initial findings from a feasibility trial examining the safecare dad to kids program with marginalized fathers. *J Fam Violence*. 2017 Nov;32(8):751-66. doi: 10.1007/s10896-017-9940-5. PMID: 29307956. Exclusion Code: X5.



## Appendix C. Excluded Studies

38. Slep AMS, Heyman RE, Lorber MF, et al. Evaluating the Effectiveness of NORTH STAR: a community-based framework to reduce adult substance misuse, intimate partner violence, child abuse, suicidality, and cumulative risk. *Prev Sci.* 2020 Oct;21(7):949-59. doi: 10.1007/s11121-020-01156-w. PMID: 32827290. Exclusion Code: X5.
39. Slep AMS, Heyman RE, Lorber MF, et al. The impact of NORTH STAR on suicidality, substance problems, intimate partner violence, and child abuse. *Mil Med.* 2021 Feb 26;186(3-4):e351-e8. doi: 10.1093/milmed/usaa380. PMID: 33169138. Exclusion Code: X5.
40. Steele H, Murphy A, Bonuck K, et al. Randomized control trial report on the effectiveness of Group Attachment-Based Intervention (GABI©): improvements in the parent-child relationship not seen in the control group. *Dev Psychopathol.* 2019 Feb;31(1):203-17. doi: 10.1017/s0954579418001621. PMID: 30757992. Exclusion Code: X5.
41. Vanderzee KL, John SG, Edge N, et al. A preliminary evaluation of the managing youth trauma effectively program for substance-abusing women and their children. *Infant Ment Health J.* 2017 May;38(3):422-33. doi: 10.1002/imhj.21639. PMID: 28464299. Exclusion Code: X5.
42. Villodas MT, Moses JO, Cromer KD, et al. Feasibility and promise of community providers implementing home-based parent-child interaction therapy for families investigated for child abuse: a pilot randomized controlled trial. *Child Abuse Negl.* 2021 Jul;117:105063. doi: 10.1016/j.chiabu.2021.105063. PMID: 33930663. Exclusion Code: X2.
43. Whitaker DJ, Self-Brown S, Hayat MJ, et al. Effect of the SafeCare© intervention on parenting outcomes among parents in child welfare systems: a cluster randomized trial. *Prev Med.* 2020 Sep;138:106167. doi: 10.1016/j.ypmed.2020.106167. PMID: 32569643. Exclusion Code: X2.
44. Yarger HA, Lind T, Raby KL, et al. Intervening with attachment and biobehavioral catch-up to reduce behavior problems among children adopted internationally: evidence from a randomized controlled trial. *Child Maltreat.* 2021 Apr 22:10775595211010975. doi: 10.1177/10775595211010975. PMID: 33882710. Exclusion Code: X5.
45. Zief S, Deke J, Burkander P, et al. Impacts of a home visiting program enhanced with content on healthy birth spacing. *Matern Child Health J.* 2020 Sep;24(Suppl 2):105-18. doi: 10.1007/s10995-020-02968-6. PMID: 32638144. Exclusion Code: X5.
46. Bailhache M, Bénard A, Salmi LR. Simulation of the impact of programs for prevention and screening of pediatric abusive head trauma. *J Neurotrauma.* 2016 Jul 15;33(14):1397-403. doi: 10.1089/neu.2015.4014. PMID: 26566679. Exclusion Code: X7.
47. Beyazit U, Bütün Ayhan A. A study on the mother education program for the prevention of child neglect. *Psychol Rep.* 2019 Dec;122(6):2178-200. doi: 10.1177/0033294118825100. PMID: 30669953. Exclusion Code: X5.
48. Chaiyachati BH, Gaither JR, Hughes M, et al. Preventing child maltreatment: examination of an established statewide home-visiting program. *Child Abuse Negl.* 2018 May;79:476-84. doi: 10.1016/j.chiabu.2018.02.019. PMID: 29558714. Exclusion Code: X7.
49. Chartier M, Nickel NC, Chateau D, et al. Families first home visiting programme reduces population-level child health and social inequities. *J Epidemiol Community Health.* 2018 Jan;72(1):47-53. doi: 10.1136/jech-2017-209321. PMID: 29122995. Exclusion Code: X7.
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**Appendix D Table 1. Characteristic of Randomized, Controlled Trials: Program Name, Funding Source, and Design**

Author, Year	Program/Trial Name	Country	Funding Source	Study Date Range	Study Design	No. of Study Arms	Total N	Duration
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>	Family Partnership Model	United Kingdom	Nuffield Foundation, Department of Health	2003 to 2004*	Parallel group RCT	2	131 caregivers <sup>†</sup>	18 months
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup>	Group Family Nurse Partnership	United Kingdom	U.K. National Health Service National Institute for Health Research	February 2013 to March 2016	Parallel group RCT	2	166 pregnant women	18 months
Brayden et al, 1993 <sup>113</sup>	NA	United States	National Institute of Mental Health and National Institute of Child Health and Human Development	1984 to 1988	Parallel group RCT	3	314 mothers at high risk	2 years
Brooten et al, 1986 <sup>114</sup>	NA	United States	Robert Wood Johnson Foundation and the Division of Nursing, Health Resources Administration, U.S. Department of Health and Human Services	1982 to 1987	Parallel group RCT	2	79 infants	18 months
Bugental and Schwartz, 2009 <sup>115</sup>	Healthy Start+	United States	National Institutes of Health; National Science Foundation	NR	Parallel group RCT	2	147 caretakers randomized, 110 agreed to participate	1 year
Caldera et al, 2007 <sup>137</sup> Duggan et al, 2007 <sup>116</sup>	Healthy Families Alaska	United States	Alaska Mental Health Trust Authority and Alaska State Department of Health and Social Services	2000 to 2003	Parallel group RCT	2	364 families randomized	2 years
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup>	Healthy Families New York	United States	Department of Health and Human Services Office on Child Abuse and Neglect, followup funded by National Institute of Justice	Recruitment: March 2000 to August 2001	Parallel group RCT	2	1,173 mothers	Original study: 2 years Followup: 7 years
Easterbrooks et al, 2013 <sup>110</sup>	Healthy Families Massachusetts	United States	The Massachusetts Children's Trust Fund; Pew Center for the States	NR	Parallel group RCT	2	707 caregivers <sup>‡</sup>	24 months

**Appendix D Table 1. Characteristic of Randomized, Controlled Trials: Program Name, Funding Source, and Design**

Author, Year	Program/ Trial Name	Country	Funding Source	Study Date Range	Study Design	No. of Study Arms	Total N	Duration
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>	Early Start Program	New Zealand	The Health Research Council of New Zealand, the National Child Health Research Foundation, the Canterbury Medical Research Foundation, and the New Zealand Lottery Grants Board	Recruitment: January 2000 to July 2001 <sup>§</sup>	Parallel group RCT	2	443 families	Up to 36 months; average 24 months
Finello et al, 1998 <sup>126</sup>	NA	United States	PAIDOS Healthcare, Hastings Foundation, State of California Department of Health Services	NR	Parallel group RCT	4	81 infants	24 months
Green et al, 2017 <sup>133</sup>	NA	United States	Grant from the Children's Bureau, U.S. Department of Health & Human Services	Enrollment: February 2010 to February 2012	Parallel group RCT	2	2,727 families	24 months
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>	Heathy Steps for Young Children	United States	Agency for Healthcare Research and Quality; the Commonwealth Fund and more than 60 national and local sponsors	Enrollment: September 1996 to November 1998	Parallel group RCT	2	2,584 children randomized (randomization occurred at birth before enrollment or checks for eligibility), 2,235 children enrolled (RCT design only)	3 years
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup>	The Memphis Trial	United States (TN)	National Institute of Nursing Research, the Bureau of Maternal and Child Health, the Administration for Children and Families, the Office of the Assistant Secretary for Planning and Evaluation, the National Center for Child Abuse and Neglect	Participants recruited from June 1990 to August 1991	Parallel group RCT	4	1,139 caregivers <sup>l</sup> randomized during the prenatal phase of the study, 743 enrolled for followup in the postnatal phase	24 months
Lam et al, 2009 <sup>123</sup>	NA	United States	National Institute on Alcohol Abuse and Alcoholism	NR	Parallel group RCT	3	30 male patients (with their female partners and custodial children)	12 weeks

**Appendix D Table 1. Characteristic of Randomized, Controlled Trials: Program Name, Funding Source, and Design**

Author, Year	Program/Trial Name	Country	Funding Source	Study Date Range	Study Design	No. of Study Arms	Total N	Duration
Larson, 1980 <sup>127</sup>	NA	Canada	National Health and Welfare Canada, Health Programs Branch	NR	Parallel group RCT	3 <sup>†</sup>	115 mother–infant pairs	G1: 0 months G2: approximately 13.5 months
Lowell et al, 2011 <sup>111</sup>	Child and Family Interagency, Resource, Support, and Training	United States	The Starting Early Starting Smart Prototype (Substance Abuse and Mental Health Services Administration) and the Robert Wood Johnson Foundation	NR	Parallel group RCT	2	157 families	Mean: 22.1 weeks <sup>#</sup>
Marcenko and Spence, 1994 <sup>120</sup>	NA	United States	A grant from the Department of Health and Human Services (90CB004-01) under the Abandoned Infants Assistance Program	NR	Parallel group RCT	2	225 mothers	Pregnancy through 12 months of age
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>	The Elmira Trial	United States	Bureau of Community Health Services, Robert Wood Johnson Foundation, W. T. Grant Foundation	1981 to 1996	Parallel group RCT	4 <sup>**</sup>	400 families	Pregnancy through 2 years of age
Quinlivan et al, 2003 <sup>128</sup>	NA	Australia	Health Department of Australia	July 1998 to December 2000	Parallel group RCT	2	136 pregnant adolescents	6 months
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>	Family Nurse Partnership	United Kingdom	Policy Research Programme, Department of Health (England)	June 2009 (screening of women began) to April 2014 (all followup data collected)	Parallel group RCT	2	1,645 mothers	~27 to 33 months (home visits from early pregnancy [eligible women were of <25 weeks gestation] until child's second birthday)

**Appendix D Table 1. Characteristic of Randomized, Controlled Trials: Program Name, Funding Source, and Design**

Author, Year	Program/Trial Name	Country	Funding Source	Study Date Range	Study Design	No. of Study Arms	Total N	Duration
Sadler et al, 2013 <sup>125</sup>	Minding the Baby	United States	National Institutes of Health, several foundations (Irving B. Harris, FAR, Annie E. Casey, Pritzker Early Childhood, Seedlings, Edlow Family, Schneider family)	NR	Cluster group RCT	2	105 families	27 months
Sege et al, 2015 <sup>152</sup>	Project DULCE (Developmental Understanding and Legal Collaboration for Everyone)	United States	U.S. Department of Health and Human Services, Administration for Children, Youth, and Families, Office on Child Abuse and Neglect and the Child Health Foundation at Boston University	February 2010 to September 2013	Parallel group RCT	2	330 families	6 months
Siegel et al, 1980 <sup>122</sup>	NA	United States (NC)	National Institute of Child Health and Human Development, the William T. Grant Foundation	Participants recruited from January 1976 to October 1977	Parallel group RCT	6 <sup>††</sup>	321 caregiver <sup>††</sup>	3 months
Silovsky et al, 2011 <sup>124</sup>	SafeCare+	United States	U.S. Department of Justice, Oklahoma Department of Human Services	March 2007 to May 2009	Parallel group RCT	2	105 caregivers	NR <sup>§§</sup>
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>	The Social Support and Family Health Study	United Kingdom	Health Technology Assessment Programme of the National Health Service Research and Development Programme and the Camden and Islington Health Authority	Recruitment in 1999	Parallel group RCT	3	731 women and their infants	1 year

\* Based on cost analysis results reported in McIntosh et al, 2009.<sup>136</sup>

† Randomized participants were “vulnerable” pregnant women.

‡ Randomized participants were first-time mothers.

§ The 19-month recruitment period was from January 1, 2000, to July 31, 2001, so although it was not reported, the dates of the original study are likely to be 2001 to 2004, and the dates of the followup study are likely to be 2004 to 2010.

‡ Randomized participants were pregnant women.

¶ The study included a nonrandomized arm not further described in the evidence tables.

# Treatment duration was individualized; Mean 22.1 weeks (SD=14.5, median=18.7).

## Appendix D Table 1. Characteristic of Randomized, Controlled Trials: Program Name, Funding Source, and Design

\*\* Intervention and baseline characteristics only reported for three of the study groups (Treatments 1 and 2 were combined for purposes of analysis after it was determined that there were no differences between the group). See comments in **Appendix D Table 3** for detailed explanation.

†† The study stratified the design to account for neonates who needed observation nursery in the first 24 hours. The remainder of the evidence tables combine the two usual-care arms and the two intensive-intervention arms. See **Appendix D Table 3** for detailed explanation.

# Randomized participants were pregnant women.

§§ Post-service time point is no earlier than 6 months after the pre-service interview.

**Abbreviations:** FAR=the FAR fund from New York City; G=group; N=number; NA=not applicable; NC=North Carolina; No.=number; NR=not reported; PAIDOS=PAIDOS Healthcare, Inc.; RCT=randomized, controlled trial; SD=standard deviation; TN=Tennessee; U.K.=United Kingdom; U.S.=United States.

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	Parents in both arms continued to receive the standard help then available to such families	Control, n=63 pregnant women*	Standard services available for “vulnerable“ families	Women in the control group had a mean of 9.2 visits by health visitors	Intervention, n=68† pregnant women‡	18 months of weekly visits from a health visitor trained in understanding the processes of helping, skills of relating to parents effectively, and methods of promoting parent–infant interaction using the Family Partnership Model	The intervention group received, on average, two thirds (41.2) of the total possible number of 72 intervention visits
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup>  (Group Family Nurse Partnership)	NR	Usual care, n=67 pregnant women	HCP led by health visitors, offers screening tests, immunizations, developmental reviews, and information and guidance to support parenting and healthy choices; additional progressive, preventive elements for those with medium or high risk	NR	Group Family Nurse Partnership Program, n=99 pregnant women	Started in the first trimester of pregnancy and lasted until infants were age 12 months, with 44 sessions in the curriculum. Meetings were facilitated by two experienced FNP family nurses. Provided routine antenatal care and encouraged women to monitor their own health. After infants were born, both family nurses were involved in routine infant checks, conducted in accordance with the HCP. The curriculum materials and activities were modified from those used to deliver FNP to reflect group administration	Intervention participants attended a mean of 10.3 sessions, but a substantial proportion (40%) did not attend any sessions

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Brayden et al, 1993 <sup>113</sup>	NR	HR control group, n=154 mothers	Standard of care for prenatal, postnatal, and pediatric services	Some women who were predicted to be at high risk were assigned to the HR control group to receive the standard of care. Standard prenatal, postnatal, and pediatric care was provided to participants and consisted of routine medical services provided by the obstetric and pediatric residents of the hospital in outpatient clinics. Medical care was supervised by hospital attending physicians	HR intervention group, n=160 mothers	A comprehensive, medically based maternal and child health program	Prenatal, postnatal, and pediatric care was provided until children were 2 years of age. Care was provided by a multidisciplinary team of nurses, midwives, nurse practitioners, social workers, paraprofessional home visitors, a nutritionist, and a psychologist. Psychological support, education about self-care, and promotion of health behaviors during pregnancy and early parenthood were provided. Telephone calls, mailings, and, in some cases, home visits followed each missed appointment. Participants were assigned to a main support person from the clinical staff. Individual appointments with the psychologist were provided to mothers until 28 weeks of gestation. Support groups also met twice a month until children were 22 months of age. The intervention program had a lower patient-to-staff ratio and provided greater continuity of care

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Brooten et al, 1986 <sup>114</sup>	Long-term medical followup care was provided to infants in both groups by the hospital's HR followup clinic or by private pediatricians.	Routine care, n=40 infants <sup>§</sup>	Routine care	Infants were discharged from neonatal care units per routine nursery policy, which required that the infant be clinically well, feeding well, and weigh approximately 2,200 g. Although parents received support and instruction from nursery nurses about their infant and his or her care discharge, no routine home followup care by nurses was provided.	Early discharge, n=39 infants <sup>  </sup>	NR	Infants were discharged before they weighed 2,200 g so long as they were clinically well and able to feed by nipple every 4 hours, were able to maintain their body temperature in an open crib in room air, had no evidence of sleep apnea or bradycardia in a 12-hour recording of the infant's heart rate and respiration, their mother or other caregiver demonstrated satisfactory care-taking skills, and the physical home environment and facilities for the care of the infant were adequate. The early-discharge group received home followup care provided by a nurse who promoted parental interaction with the infant, evaluated parental perception and concerns, taught parents how to take care of their infant, and at times provided routine medical care. Nurses had weekly contact with parents via phone. Home visits were conducted the first week and at 1, 9, 12, and 18 months.



**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	Healthy Start home-visitation program	Standard home visit, n=59 mothers	Standard HSP home-visitation program	NR	Intervention, n=51 mothers	Cognitive-based extension of the HSP home-visitation program: The additional cognitive appraisal component was designed to enhance parents' perceptions of power and competence and included reframing in primary and secondary appraisals. Specifically, parents were assisted in acquiring skills in reading children's cues of distress and countering misattributional processes and provided with problem-solving training in which they define the problem, brainstorm possible solutions, evaluate possible consequences, develop an action plan, and observe and evaluate the success of their efforts. Home visitors were matched to cultural backgrounds of participants. Weekly supervision and monitoring occurred from a licensed clinical psychologist. Over the first year of life of the child, there were 17 home visits	Briefly, the key distinction between groups was the facilitation of mothers' own problem solving and information search in G2 vs. the provision of ideas on how to solve problems along with relevant information in G1

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Caldera et al, 2007 <sup>137</sup> Duggan et al, 2007 <sup>116</sup>  (Healthy Families Alaska)	NR	Control, n=185 randomized, 163 randomized and completed baseline interview	Referral to other community services	NR	HFAK Intervention, n=179 randomized, 162 randomized and completed baseline interview	Home visiting offered for 3 to 5 years, offered weekly for the first 6 to 9 months; families are promoted to service levels with less frequent visits as family functioning improves. Home visitation includes information, referrals, preparation of parents for developmental milestones, promotion of child environmental safety, and encouragement of positive parent-child interaction	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> (Healthy Families New York)	NR	Control, n=594 mothers	Mothers in the control group were provided with only research and information regarding other service providers. Frequency and duration are not reported	NR	Intervention, n=579 mothers	Participant was assigned a home visitor who contacted her to set up an initial home visit. Families were offered HFNY services: home visits by trained paraprofessionals. Home visits are scheduled biweekly during pregnancy and increase to once a week after the mother gives birth. Prenatal visits focus on promoting healthy behaviors, discouraging risky behaviors, coping with stress, encouraging compliance with prenatal appointments and medical advice, and educating the expectant mother about the development of the fetus. Following the birth of the child, home visits concentrate on (1) improving the parent-child relationship through instruction, reinforcement, modeling, and parent-child activities; (2) helping parents understand child development and age-appropriate behaviors; (3) promoting optimal health and development by supporting healthy behaviors, improving compliance with scheduled immunizations and well-	Families who enrolled in HFNY received an average of nearly 22 visits between baseline and 1 year, with almost 30% receiving >30 visits. Only 8% of families received just one or two visits. Families who were still participating in the program between 1 and 2 years received an average of 14 visits, with 42% receiving between 11 and 20 visits in that year

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> (continued)						child visits, facilitating linkages to and encouraging appropriate use of health care, and connecting families with Food Stamps, housing assistance, and/or other community resources; and (4) enhancing parental life course development and self-sufficiency by developing Individual Family Support Plans.	
Easterbrooks et al, 2013 <sup>110</sup>  (Healthy Families Massachusetts)	NR	Control, n=NR	Resource and information only	NR	HV (Home-Visiting Services) Group, n=NR	Statewide paraprofessional child maltreatment prevention home-visit program in which young, first-time mothers and their children received visits from paraprofessional home visitors. Frequency and duration are not reported	NR
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup> (Early Start Program)	NR	Control, n=223 families randomized, 221 families agreed to participate	NR	NR	Early Start Program, n=220 families randomized, 206 families agreed to participate	Assess needs and resources, encourage positive partnership, provide support and problem solving for up to 36 months	Services received for a mean of 24 months
Finello et al, 1998 <sup>126</sup>	Enrollment in appropriate hospital followup clinic for well-baby care, formal developmental assessment, immunizations, and general healthcare	Control group, n=20 infants	NR	The control group received no formal in-home assistance	HH group, n=21 infants	The “home healthcare (HH)” system was a short-term intervention that provided critical care in family homes during the first 1 to 4 weeks after discharge. Physician consultation was available 24 hours on-call	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Green et al, 2017 <sup>133</sup>	NR	Services as usual, n=1289 families	All screened families received a "WelcomeBaby" package with informational brochures on parenting, child development, and community resources	NR	Healthy Families Oregon, n=1438 families	Received weekly home visits for at least 6 months, and may remain enrolled through their child's third birthday. Visits are individualized to meet the needs of the families but typically involve providing information about child development, coaching and support to encourage positive parent-child interactions and attachment, and case management work to identify needs and link families to resources, including self-sufficiency, child care, and health services	44.2% received at least one home visit
Guyer et al, 2003 Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	All families received standard pediatric care	Control, n=1,102 families	Control families were provided with information and referral to other appropriate services in the community	NR	Intervention, n=1,133 families	Intervention families also received the HS program components, including contact with developmental specialists and seven services: enhanced well-child care, up to six home visits in the first 3 years, a telephone line for nonemergency developmental concerns, developmental assessments, written materials, parent groups, and linkages to community resources	NR
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup>  (The Memphis Trial)	Transportation to clinic	Transportation, n=166 women	Free round trip taxicab transportation for scheduled prenatal care appointments	NR	Screening, n=515 women	Free round trip taxicab transportation for scheduled prenatal care appointments and developmental screening and referral services for the child at 6, 12, and 24 months of age	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Lam et al, 2009 <sup>123</sup>	Standard individual CBT session conducted weekly, alternating with weekly study sessions; drawn from the Cognitive-Behavioral Coping Skills Therapy Manual for alcohol treatment (Project Match Research Group 1994)	Traditional individual-based treatment (IBT), n=10 men, their partners, and one child per participant	Consisted of 24 sessions, with two 60-min sessions per week for 12 weeks ( study therapy session and a standard individual treatment session were conducted in an alternating, yet interleaved manner); study sessions: attended only by male participants, included 12 individual-based coping skills sessions (modified from Moti, Abrams, Kadden, Cooney's CBT for alcoholism, 1989)	83% attendance rate for the 24 sessions	Standard BCT, 10 men, their partners, and one child per participant	Consisted of 24 sessions, with two 60-min sessions per week for 12 weeks (a study therapy session and a standard individual treatment session were conducted in an alternating, yet interleaved manner); study sessions: attended by both partners, included urine screens, reviewing previous week's homework, improving communication and problem-solving skills, reinforcing sobriety (O'Farrell & Fals-Stewart 2006) (no parent skills training provided)	86% attendance rate for the 24 sessions
Larson, 1980 <sup>127</sup>	NR	Control for intervention, n=44 mother-child pairs	No home visits or other forms of intervention	No home visits or other forms of intervention	Postpartum home visits, n=36 mother-child pairs	Postpartum home visits (seven visits from 6 weeks to 6 months of age and five visits from 6 to 15 months of age) covered general care-taking, mother-infant interaction, social status, and child development	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	NR	Usual care, n=79 mothers	NR	NR	Child FIRST, n=78 mothers	Children ages 6 to 36 months enrolled. Each family was assigned a clinical team consisting of a master's-level developmental/mental health clinician and an associate- or BA-level care coordinator/case manager who usually reflected the ethnic and cultural diversity of the family. The family was the target of the intervention to build supportive networks. Therapeutic services were delivered predominantly in the home. Comprehensive assessments of parent factors and child developmental and behavioral status were completed by clinician and care coordinator with parents. Family-driven plans were developed to integrate supports	Weekly visits of 45 to 90 minutes were made jointly or individually by the clinician and/or case manager as needed by the family. Although many appointments were missed or canceled, nonjudgmental and client-centered outreach continued. A parent-child psychotherapeutic and psychoeducational approach was used, guided by family-driven issues. A Child FIRST Assessment and Intervention manual was used to teach and guide the delivery of the intervention; a fidelity checklist was completed by the clinician after each visit with a family and used in clinical supervision to maintain intervention fidelity

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Marcenko and Spence, 1994 <sup>120</sup>	NR	Control, n=100 mothers	Normal facility-based services of the outpatient obstetrics and gynecology clinic were provided, including comprehensive prenatal, postpartum, family-planning, and gynecological services; onsite anonymous HIV testing; and social services. Home-visitation services were not available through this facility. Social services consisted of service assessment and referral and short-term individual counseling. However, women were free to access any other community social services	NR	Home visitation, n=125 mothers	All services included in the control intervention were provided, but social services were provided through the experimental intervention. Indigenous home visitors provided peer support, modeled appropriate parenting, and helped families overcome barriers to services. Social workers assessed the psychosocial needs of families and implemented plans to address these needs. Nurses were responsible primarily for addressing healthcare needs. Families received services from the time of the mother's first prenatal visit through the child's first birthday. During the prenatal period, families were visited at least every 2 weeks, with weekly visits during times of unusual stress. During the first 6 weeks postpartum, families received a weekly home visit. At the end of this 6-week period, a risk assessment was conducted and, if indicated, the visits were reduced to 2-week intervals. The schedule was re-evaluated at 6 months postpartum, and visits were made as necessary, but in no case less frequently than once a month.	NR



**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	NR	Comparison, n=184 <sup>†</sup> families	Original study G1: No services provided during pregnancy. Sensory and developmental screening by infant specialist at age 1 and 2 years. Original Study G2: Free transportation for regular prenatal and well-child care. Sensory and developmental screening by infant specialist at age 1 and 2 years	NR	Nurse-visited: pregnancy, n=100 families	Transportation plus nurse home visits every 2 weeks during pregnancy	Average of nine visits during pregnancy lasting 1.25 hours per visit
Quinlivan et al, 2003 <sup>128</sup>	NR	Control, n=71 mothers	No home visits	NR	Home visits, n=65 mothers	Five structured postnatal home visits by nurse-midwives at 1 week, 2 weeks, 1 month, 2 months, and 4 months after birth. Each visit lasted 1 to 4 hours. Nurse-midwives could contact the participant's OB if needed or make appointments/referrals on behalf of the mother or child	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Robling et al, 2016 <sup>131</sup>  (Nurse Family Partnership)	All participants got publicly funded health and social care	Usual care; n=822 randomized (2 assessed as ineligible, 10 withdrew consent for use of their data)	Publicly funded health and social care services, including the Health Child Programme (universally offered screening, education, immunization, and support from birth to child's second birthday) delivered by specialist community public health nurses and maternity care appropriate to clinical need	Mean visits over the study period: 10.4 visits from community midwives; 16.2 from community health visitors	Family Nurse Partnership plus usual care; 823 randomized (3 assessed as ineligible, 12 withdrew consent for use of their data)	64 structured home visits from early pregnancy (ideally, early in second trimester) until child's second birthday by specially recruited and trained family nurses; 14 visits targeted during pregnancy, 28 during infancy, and 22 during toddlerhood but actual number received can vary by individual need, engagement, and gestational age at enrollment; visits had a target minimum duration of 60 minutes	The mean number of valid visits received by phase (pregnancy, infancy, toddlerhood) was 9.71, 18.63, and 13.22, respectively, with 54.7% of participants who completed the program meeting or exceeding target rates of expected visits for the pregnancy phase, 53.0% for the infancy phase, and 43.6% for the toddlerhood phase; visits had an average duration of 79.14 minutes; nurse-reported program content was broadly in line with prescribed targets but with a greater emphasis on environmental health. Additionally, mean visits over the study period: 10.4 visits from community midwives and 16.2 from community health visitors

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	NR	Control, n=45 families	Routine pre- and postnatal well-woman and well-baby health visits per clinical guidelines and immunization schedules. Monthly mailed information sheets from Healthy Steps about child rearing and health, and birthday and holiday cards	Usual care at an urban community health center	Intervention group (MTB), n=60 families	Master's-level clinicians (a team of nurse and social worker) conducted weekly home visits from late pregnancy through child's first birthday, then every other week visits until child's second birthday. Home visitors reviewed content on child health and development, maternal mental health, parenting, social support, maternal life course, maternal health, infant mental health, and environment and safety. MTB model is based on Nurse Family Partnership and Infant-Parent Psychotherapy approaches	Visits lasted approximately 1 hour but varied based on the family's needs. Mean number of home visits per month was 3.4 (SD: 1.5), lasting 45 to 90 minutes
Sege et al, 2015 <sup>152</sup>	NR	Control, n=163 families	Usual care and unrelated infant safety intervention	NR	Intervention group (Project DULCE), n=167 families	Three types of patient contact: 1) collaborative routine visits with the family, medical provider, and family specialist; 2) home visits by the family specialist; and 3) contact with the family specialist by telephone, email, text, or in person. Intervention also included Medical-Legal Partnership consultations	Actual services delivered resulted from joint decision-making between the family specialist and parents. Mean number of routine healthcare visits per family was 3.2, with 92% of families having at least 1 visit. Mean number of home visits per family was 0.7, with 52% of families receiving a visit. Family specialist initiated consults with the Medical-Legal Partnership on behalf of 75 families.

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Siegel et al, 1980 <sup>122</sup>	NR	Control, n=111 mothers	Usual care (combines 2 arms: [1] infants with complicated labor or delivery who required observation nursery stay and did not receive early contact, and [2] infants with uncomplicated labor and delivery who did not require observation nursery stay who received early contact)	Mothers with uncomplicated labor and delivery had traditional, brief contact with infants following delivery and ~2.5 hours of routine contact each day of hospital stay; mothers with complicated labor delivery received extended but not early contact	Hospital contact only, n=50 mothers	Early and extended hospital contact only, which comprised at least 45 minutes of mother–infant contact during the first 3 hours after delivery and at least 5 additional hours each day during hospital stay	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	NR	Services as usual (SAU), n=57 parents	SAU used standard community mental health program approaches to enroll families in services, given their fee for services billing arrangements. A variety of services were offered, including individual and family therapy as well as case management services. Goal setting and treatment planning varied among families and was designed to fit the specific family's needs, such as parenting, anger management, substance abuse, depression, and anxiety		SafeCare Plus (SC+), n=48 parents	SafeCare is a home-based model using a skills-based approach to changing those parenting behaviors most proximal to child maltreatment. SC+ consists of SC with the addition of motivational interviewing as well as training of the home visitors on identification and response to imminent child maltreatment and risk factors of substance abuse, depression, and IPV. Further, for the current project, SC+ was adapted for high-risk, rural communities	NR

**Appendix D Table 2. Characteristic of Randomized, Controlled Trials: Study Arm 1 and Study Arm 2**

Author, Year (Program/Trial Name)	Co-Intervention	Group 1 (G1) Intervention Name, n	G1 Intended Intervention	G1 Actual Intervention Received	Group 2 (G2) Intervention Name, n	G2 Intended Intervention	G2 Actual Intervention Received
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	Routine NHS health visiting services	Standard health visitor services, n=364 mother-child pairs	Routine NHS health visiting services: one postnatal home visit when the baby was 10 to 15 days old and clinic support thereafter; subsequent home visits not routinely made except for women deemed to be at risk	NR	Support Health Visitor (SHV) Intervention, n=183 mother-child pairs	1 year of monthly supportive listening visits in the woman's home, beginning when the baby is about 10 weeks old; SHVs also provide practical support and information on request	Intervention was carried out by five very experienced health visitors who underwent 2 days of additional training by NHS. Interpreters available to SHVs during home visits. 94% participating women had at least one visit. Average 10 hours of support provided in seven home visits and additional telephone contacts

\* Fifty-nine randomized participants remained at 6-month followup. fifty-eight randomized participants remained at 12-month followup. However, authors reported that intent-to-treat analysis was used.

† N analyzed=67 in McIntosh et al, 2009<sup>136</sup>

‡ Fifty-eight program completers remained at 6-month followup. Sixty-two program completers remained at 12-month followup. However, authors reported that intent-to-treat analysis was used.

§ Including four sets of twins.

¶ Including three sets of twins.

¶ Ninety in original G1 + 94 in original G2

**Abbreviations:** BA=bachelor of arts; BCT=behavioral couples therapy; CBT=cognitive behavioral therapy; DULCE=Developmental Understanding and Legal Collaboration for Everyone; FNP=Family Nurse Partnership; G=group; HCP=Healthy Child Program; HFAK=Healthy Families Alaska; HFNY=Healthy Families New York; HH=Home Health; HR=high risk; HRI=high-risk intervention; HS=Healthy Steps; HSP=Healthy Start Plus; HV=home visiting; IBT=individual-based therapy; IPV=intimate partner violence; MTB=Minding the Baby; n=number; NA=not applicable; NHS=National Health Service; NR=not reported; OB=obstetrician; SAU=services as usual; SC+=SafeCare Plus; SD=standard deviation; SHV=Support Health Visitor; vs.=versus.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	NA	NA	NA	NA	NA	NA	None
Barnes et al, 2017 <sup>132</sup>  Barnes et al, 2017 <sup>151</sup>  (Group Family Nurse Partnership)	NA	NA	NA	NA	NA	NA	None
Brayden et al, 1993 <sup>113</sup>	Standard care, n=295 mothers	Standard prenatal, postnatal, and pediatric care	Standard prenatal, postnatal, and pediatric care consisted of routine medical services provided by the obstetric and pediatric residents of the hospital in outpatient clinic. Medical care was supervised by hospital attending physicians	NA	NA	NA	Although three groups were compared in the study, only the results from the HR intervention and group controls were used to assess prevention of child maltreatment. As such, baseline characteristics and study outcomes were only reported for G1 and G2 in subsequent tables in this Appendix.
Brooten et al, 1986 <sup>114</sup>	NA	NA	NA	NA	NA	NA	Children were the unit of recruitment (with parental consent) and the unit of analysis.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	NA	NA	NA	NA	NA	NA	Study design is “comparative intervention trial (no control group).” Groups were randomly assigned.
Caldera et al, 2007 <sup>137</sup> Duggan et al, 2007 <sup>116</sup>  (Healthy Families Alaska)	NA	NA	NA	NA	NA	NA	Unit of recruitment was mothers. Outcome measures were self-reported on behalf of the mother on outcomes inflicted on children.



**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup>  (Healthy Families New York)	NA	NA	NA	NA	NA	NA	942 mothers and 800 children out of the original 1,173 dyads were able to be interviewed for the 7-year followup; report includes subgroup analyses for groups named RRO (recurrence reduction opportunity, n=104) and HPO (high prevention opportunity, n=179). The RRO group was mothers who had been found to be the perpetrators of abuse against a different child. The HPO mothers were young, first-time mothers who initiated visits early.
Easterbrooks et al, 2013 <sup>110</sup>  (Healthy Families Massachusetts)	NA	NA	NA	NA	NA	NA	Study duration reflects the last time point at which mothers completed interviews after enrollment, not necessarily the length of the intervention.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  (Early Start Program)	NA	NA	NA	NA	NA	NA	Just under 60% of Early Start families received 3 or more years of service.
Finello et al, 1998 <sup>126</sup>	HV group	The HV system provided prevention and intervention services focused on developmental and health monitoring, parent support, and health and social service linkages for the first 2 years after discharge	NR	HH/HV group	The HH/HV group received both the short-term intervention (HH) and the long-term support via home visits (HV)	NR	None
Green et al, 2017 <sup>133</sup>  (Healthy Families Oregon)	NA	NA	NA	NA	NA	NA	None

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	NA	NA	NA	NA	NA	NA	Healthy Steps was a clinical trial at 15 pediatric sites, six of which delivered the intervention and control to randomized families, and nine of which were quasi-experimental (entire site delivered intervention or control). This review only included data from the randomized, controlled portion of the original study.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup>  (The Memphis Trial)	Home visits, n=230 women	Free round trip taxicab transportation for scheduled prenatal care appointments; developmental screening and referral services for the child at 6, 12, and 24 months of age; and intensive nurse home-visitation services during pregnancy, one postpartum visit in the hospital before discharge, and one postpartum visit in the home	Mean of 7 completed prenatal visits (range 0 to 18)	Extended home visits, n=228 women	Free round trip taxicab transportation for scheduled prenatal care appointments; developmental screening and referral services for the child at 6, 12, and 24 months of age; intensive nurse home-visitation services during pregnancy, one postpartum visit in the hospital before discharge, and one postpartum visit in the home; and continued visitation by nurses through the child's second birthday	Mean of 7 completed prenatal visits (range 0 to 18); mean of 26 completed postnatal visits (range 0 to 71)	To reduce cost of the study, only G2 and G4 were evaluated for postnatal outcomes and reported.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Lam et al, 2009 <sup>123</sup>	Combined PSBCT	Consisted of 24 sessions, with two 60-minute sessions per week for 12 weeks (a study therapy session and a standard individual treatment session were conducted in an alternating, yet interleaved manner); study sessions: attended by both partners, six core BCT sessions (included urine screens, reviewing previous week's homework, improving communication and problem-solving skills, reinforcing sobriety) and six parent skills training sessions (adapted from "Helping the noncompliant child," Forehand & Long 2002/McMahon & Forehand 2003)	84% attendance rate for the 24 sessions	NA	NA	NA	None

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Larson, 1980 <sup>127</sup>	NA	NA	NA	NA	NA	NA	Original study included 3 study groups. Assignment to groups B (G2) and C (G1) was random and ended when 80 participants were entered. Group A mothers were then entered into the study until a predetermined date. Results from Group A are not included in our analysis and not entered into the evidence tables in this appendix.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	NA	NA	NA	NA	NA	NA	Intent-to-treat analytic approach. Several measures were used to assess abuse and behavioral outcomes, some of which required responses from parents and others, such as the Infant-Toddler Social and Emotional Assessment, which asks parents to report on child social-emotional/behavioral problems. CPS records were used to assess CPS involvement prior to (or at) baseline and at any time from baseline to 3 years post-baseline (study/data collection period).
Marcenko and Spence, 1994 <sup>120</sup>	NA	NA	NA	NA	NA	NA	Women in the sample suspected that they were pregnant an average of 140 days (20 weeks, 4.5 months) prior to their first or second prenatal visit.

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	Nurse-visited: infancy, n=116 families	Nurse home visits every 2 weeks during pregnancy until child is age 2 years. Nurse home visitation included parent education, enhancement of informal support systems, and linkage with community services	Visit frequency diminished over time unless predetermined crisis conditions existed. Each visit lasts about 1.25 hours	NA	NA	NA	Four treatment conditions by design. Model of analysis was 3x2x2x2 factorial design. Treatments 1 and 2 were combined for purposes of analysis after it was determined that there were no differences between the groups in their use of routine prenatal and well-child care, the primary means by which transportation was hypothesized to affect pregnancy and infancy outcomes. Planned comparisons focused on the contrast of the nurse-visited (infancy) group vs. the comparison group. 46 non-White women were removed from the analysis because the sample of non-White women was too small to cross-classify race with other variables of importance.



**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Quinlivan et al, 2003 <sup>128</sup>	NA	NA	NA	NA	NA	NA	It is unclear whether any intervention activities were performed at the 6 months study visit for G2. Authors listed the 6-month followup as an intervention visit but described the content of the visit as “assessment visit” in Panel 1.
Robling et al, 2016 <sup>131</sup>  (Nurse Family Partnership)	NA	NA	NA	NA	NA	NA	Women assigned to the intervention arm had an average of 39 specialist nurse visits, each lasting on average longer than 1 hour. They also had fewer health visitor interactions than the usual-care arm (usual-care arm saw “health visitors eight more times than did those in the NFP group”).
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	NA	NA	NA	NA	NA	NA	None

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Siegel et al, 1980 <sup>122</sup>	Home visits only, n=53 mothers	First visit with mother in hospital, then nine home visits from paraprofessionals during first 3 months after discharge	NR	Combined intervention, n=107 mothers	Combines two groups (combines two arms: [1] infants with complicated labor or delivery who required observation nursery stay and received extended hospital contact and home visits from paraprofessionals, but not early contact, and [2] infants with uncomplicated labor or delivery who received early and extended hospital contact and home visits)	NR	None
Silovsky et al, 2011 <sup>124</sup> (SafeCare+)	NA	NA	NA	NA	NA	NA	None

**Appendix D Table 3. Characteristic of Randomized, Controlled Trials: Study Arm 3 and Study Arm 4**

Author, Year (Program/Trial Name)	Group 3 (G3) Intervention Name, n	G3 Intended Intervention	G3 Actual Intervention Received	Group 4 (G4) Intervention Name, n	G4 Intended Intervention	G4 Actual Intervention Received	Comments
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	CGS Intervention, n=184 mother-child pairs	Participants were assigned to one of eight community groups that offered services for mothers with children less than 5 years in the study area. Groups offered a combination of services: drop-in sessions, home visiting, and/or telephone support. Standard package of services was available to participating women for 1 year	Community groups encouraged to take the initiative to contact the women assigned to them but otherwise provide their normal service. Uptake was 19% and highest among community groups that offered home visiting as at least part of their service. Average 1.5 hours of support	NA	NA	NA	None

**Abbreviations:** BCT=behavioral couples therapy; CGS=community group support; CPS=child protective services; FNP=family nurse practitioner; G=group; HH=home health; HPO=high prevention opportunity; HR=high risk; HV=home visiting; n=number; NA=not applicable; NR=not reported; PSBCT=parent skills and behavioral couples therapy; RRO=recurrence reduction opportunity.

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	Parents who have been identified prenatally as being at high risk for poor parenting	Community midwives in the United Kingdom attached to 40 participating general practitioner practices across two counties screened women using a range of demographic and psychosocial criteria (including financial, housing, and mental health problems) for risk of infant abuse and neglect	Women without a working understanding of English or not wishing to be randomized	Age <17 years; serious housing problems or no accommodation; serious financial difficulties; isolated with no support network; history of psychiatric illness; learning problems; serious drug or alcohol problems in the past; serious parenting difficulties or had a previous child on the child protection register; domestic violence; and been referred to social services
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup>  (Group Family Nurse Partnership)	Young (age <25 years), pregnant women	Expectant mothers with EDD within approximately 10 weeks of each other, for each group in each site so that the majority would be 16 to 20 weeks pregnant when program delivery commenced in that site. Participants were either: age <20 years at their LMP with one or more previous live births; or ages 20 to 24 years at their LMP with no previous live births and low educational qualifications	Expectant mothers age <20 years who had previously received home-based FNP, psychotic mental illness (defined as bipolar disorder or schizophrenia), not able to communicate orally in English	Young age, low educational qualifications

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Brayden et al, 1993 <sup>113</sup>	Pregnant women seen for prenatal care at Metropolitan Nashville General Hospital and their infants when delivered	Women receiving prenatal care between December 1984 and November 1986 and income less than 200% of the Federal poverty guideline	Women at >28 weeks of gestation were excluded; income greater than 200% of the Federal poverty guideline; other NR ineligibility reasons	Risk assignment was determined using a structured interview, MHI-2; subscale scores developed on following categories: knowledge of parenting skills, philosophy about discipline, personality, positive and negative feelings about pregnancy, mother's perception of her nurture as a child, truncated version of Life Stress Inventory for mother and father, "lie" scale to detect attempts to answer only in a socially appropriate way. Items included changing residences more than 12 times in the previous year, previous removal of children by protective services, maternal comment or behavior suggesting abusive tendencies, or gross untruthfulness in the interview*
Brooten et al, 1986 <sup>114</sup>	Infants with birth weights of 1,500 g or less who were born at the Hospital of the University of Pennsylvania	Infants who are clinically well, able to feed by nipple every 4 hours, able to maintain body temp in open crib in room air, has no evidence of serious apnea or bradycardia in 12 hours recording of heart rate and respiration rate; mother or caretaker must demonstrate satisfactory care-taking skills, physical home environment and facilities for care of infant were adequate	Infants with life-threatening congenital anomalies; grade 4 intraventricular hemorrhage, extensive surgical intervention, oxygen dependence for a period of more than 10 weeks or a combination of these factors were excluded from the study.	Prolonged hospitalization is associated with failure to thrive, child abuse, and parental feelings of inadequacy. Infants in the routine discharge group were thought to be at increased risk due to prolonged hospitalization.
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	Families of children born at a medical risk	Presence of a medical risk factor for the infant: preterm status <36 weeks gestational age, medical problem (e.g., respiratory or cardiac problems), other reason (e.g., Cesarean delivery). Families were eligible for inclusion for children up to 6 months of age	NR	Participants were at relatively low risk for child maltreatment as indicated by their mean score (M=19) on the Family Stress Checklist.†

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Caldera et al, 2007 <sup>137</sup> Duggan et al, 2007 <sup>116</sup>  (Healthy Families Alaska)	Families at risk of child maltreatment	Scoring $\geq 25$ on the Kempe Family Stress Checklist	Families who were previously enrolled in HFAK and mothers who did not speak English well enough to complete study activities	Kempe Family Stress Checklist used to identify family at high risk of child abuse <sup>220</sup>
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup>  (Healthy Families New York)	Expectant parents and parents with an infant under 3 months of age who are deemed to be at risk for child abuse or neglect and live in communities that have high rates of teen pregnancy, infant mortality, welfare receipt, and late or no prenatal care	Scoring $\geq 25$ on the Kempe Family Stress Checklist	Residing outside catchment area, non-English or Spanish speaking	Kempe Family Stress Checklist used to identify parents at high risk of abuse
Easterbrooks et al, 2013 <sup>110</sup>  (Healthy Families Massachusetts)	Of the intervention: Young, first-time mothers in Massachusetts (ages 16 to 20 years at childbirth) Of the desired outcome: Young, first-time mothers in Massachusetts (ages 16 to 20 years at childbirth) and their first-born infants/toddlers (average age 1 year, prenatal to age 3)	Females age 16 years or older, have never received HFM services before, speak either English or Spanish, cognitively able to provide informed consent	NR	No explicit risk identification offered, but authors noted that children born to adolescent mothers are generally at risk for maltreatment
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  (Early Start Program)	Families in New Zealand facing stress and difficulty, with at least one new infant <3 months of age	Families exhibiting two or more of the following parent and family functioning risk factors: age of parents, social support, planning of pregnancy, parental substance use, family financial situation, and family violence; <sup>‡</sup> any family in which serious concerns about the family's capacity to care for the child were identified by a community nurse	NR	Risk factors listed in inclusion criteria; based on an 11-point screening instrument developed from the measure used in the Hawaii Healthy Start Program

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Finello et al, 1998 <sup>126</sup>	Very low–birth weight infants (<1,750 g) following neonatal intensive care unit discharge in Los Angeles	Infants between 750 and <1,750 g birth weight discharged from SCN at LA Co./USC Women’s hospital or Hospital of the Good Samaritan; no gross abnormality at discharge	Birth weight <750 g or 1,750 g and over; gross abnormality at discharge	Study participants were enrolled based on health and developmental risks associated with very low birth weight and were not identified a priori as being at risk per se for child abuse and neglect. <sup>§</sup>
Green et al, 2017 <sup>133</sup>	First-time Oregon mothers	First-time parents with an infant <90 days of age who score positively on any two of the NBQ risk items, or positive for either substance abuse or depression concerns	Families already involved with child welfare	Study participants scored positively on at least two NBQ risk items <sup>#</sup>
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	Families of newborns up to 4 weeks of age. <sup>  </sup>	Consecutive newborns up to 4 weeks of age were enrolled at birth or their first office visit	Newborns were excluded if they were to be adopted or placed in foster care, they were too ill to make an office visit by 4 weeks, their mother did not speak English or Spanish, or the family intended to leave the practice within 6 months	NR
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup>  (The Memphis Trial)	Women <29 weeks pregnant with no previous live births, visiting the Regional Medical Center in Memphis for obstetrical care	Eligibility determined at the obstetric care clinic: pregnant women <29 weeks’ gestation, no previous live births, no chronic illnesses, at least two sociodemographic risk characteristics (unmarried, <12 years of education, unemployment status)	NR	Sociodemographic risk conditions: unmarried, <12 years of education, and unemployed

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Lam et al, 2009 <sup>123</sup>	Heterosexual married or cohabiting male patients voluntarily entering outpatient treatment for an alcohol use disorder	Men at least 18 years of age; met DSM-IV criteria for alcohol abuse or dependence, were married (≥1 year) or cohabitating (≥2 years) with an intimate female partner at the time of admission and the female partner did not meet DSM-IV criteria for substance abuse or dependence; had legal guardianship of at least one child between 8 and 12 years of age, inclusive, who was living in the home. If the couple had more than one child in the target age range, one child was randomly selected for participation	See inclusion criteria	Parental substance abuse
Larson, 1980 <sup>127</sup>	Pregnant women attending private OB offices who deliver at a large urban teaching hospital in Montreal	French-Canadian or English-Canadian ethnicity, 18 to 35 years old, working class income (less than 1977 Montreal poverty line plus \$10K/year), HS grad or less education, no significant illness during pregnancy, no prior history of psychiatric hospitalization, normal delivery of full-term healthy newborn discharged within 5 days of birth without major congenital defects	NR	NR



**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	Families with children ages 6 to 36 months living in families at psychosocial risk and/or manifesting social–emotional/behavioral problems	Eligible families had a child ages 6 to 36 months, where child was living in a permanent caregiving environment and had a positive screen for social–emotional/behavioral problems on the Brief Infant-Toddler Social and Emotional Assessment and/or their parent screened high for psychosocial risk on the Parent Risk Questionnaire were eligible. Families recruited from sites serving predominantly inner-city families in Bridgeport, Connecticut: the Bridgeport Hospital Pediatric Primary Care Center and the Supplementary Nutrition Program for Women, Infants, and Children	Children referred directly from community providers	The study defined eligibility based on the results of screening for presence of “psychosocial risk,” not for exposure to neglect or abuse; the risk assessment covered 12 areas including depression, domestic violence, substance use, homelessness, incarceration, isolation, single and teen parenthood, education, and employment
Marcenko and Spence, 1994 <sup>120</sup>	Pregnant women visiting an inner-city hospital outpatient obstetrics clinic in Philadelphia for their first or second prenatal visit	At least one of the following histories: substance abuse, homelessness, domestic violence, psychiatric illness, incarceration, HIV infection, or lack of social support	NR	Family history listed as inclusion criteria were identified as risk factors for child out-of-home placement
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	Pregnant women with no previous live births and one of the below risk factors: <19 years of age, single-parent status, low SES	Pregnant women who, at intake, had no previous live births, were <26 weeks of gestation, and had any of the three characteristics predisposed to infant health and developmental problems. However, any women who asked to participate were enrolled regardless of their age, marital status, and SES	49 mother–child pairs were ineligible at the 15-year followup due to child death (n=26), mother death (n=2), child adopted (n=15), and refusal to participate (n=6); 81% of the original sample included and 92% of those eligible for followup <sup>145</sup>	Mother age <19 years, single-parent status, low SES

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Quinlivan et al, 2003 <sup>128</sup>	Teenagers attending their first antenatal appointment at an Australian public-care teenage pregnancy clinic for first-time mothers	Age <18, ability to speak English, intention to continue with the pregnancy and not to relinquish their infant	Residence >150 km from hospital, known fetal abnormality	NR
Robling et al, 2016 <sup>131</sup>  (Nurse Family Partnership)	First-time teenage mothers	Nulliparous women age 19 years or younger, living within the catchment area of a local FNP team, of <25 weeks' gestation, and able to provide consent and speak English; women expecting multiple births and those with a previous pregnancy ending in miscarriage, stillbirth, or termination were still eligible	Women planning to have their child adopted or to move outside of the FNP catchment area for longer than 3 months	NR

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	Primiparous women attending nurse–midwifery group prenatal care sessions at the study site	Able to speak and understand English; 14 to 25 years of age; having a first child; no active heroin or cocaine use (prescreened by the community health center as criteria for entry into group prenatal care); no DSM-IV psychotic disorder; no major or terminal chronic condition in the mother (AIDS, cancer, etc.; prescreened by the study site)	NR	NR
Sege et al, 2015 <sup>152</sup>  (Project DULCE)	Parents of newborns younger than 10 weeks of age who presented for pediatric primary care at a clinic at a major urban teaching hospital	Parent at least 18 years old, received pediatric medical care in English or Spanish	Intended to change their primary care provider from the study site within the first 6 months of life; the infant had been hospitalized for more than 7 days after birth; had a maltreatment report filed before recruitment; received other home visiting services	NR
Siegel et al, 1980 <sup>122</sup>	Pregnant women in their third trimester receiving care at the public prenatal clinic and delivered at the community hospital in Greensboro, NC	Women who had uncomplicated pregnancy, no previous delivery of nonviable infant; not expecting twins; intended to stay in the area for ≥1 year; did not have a family member in the study	NR	NR
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	Families at high risk of child maltreatment in rural communities	Families with a caregiver at least 16 years old, at least one child 5 years old, and at least one of the following risk factors: parental substance abuse, mental health issues, or IPV per preservice evaluation results <sup>¶</sup>	A current child welfare case or service involvement because of a recent child welfare case or a history of more than two prior child welfare referrals (regardless of substantiation status); the primary caretaker has a substantiated report of perpetrating child sexual abuse; any conditions that would prevent the primary caregiver from providing valid self-report data (e.g., severe psychosis, severe mental retardation)	Parental substance abuse, mental health issues, or IPV

**Appendix D Table 4. Characteristic of Randomized, Controlled Trials: Population, Inclusion and Exclusion, and Risk Factors**

Author, Year (Program/Trial Name)	Target Population	Inclusion Criteria	Exclusion Criteria	Risk Factors
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	Women living in deprived enumeration districts	Women who gave birth in the first 9 months of 1999	Women whose babies had died, were seriously ill, or had been placed in foster care	NR

\* Threshold values designating high risk were 15th percentile for the Nurture scale, 5th percentile for the Life Stress scale, and 1st percentile in other subscales. Scores of the first 200 participants were used to determine the actual scores used for risk assessment.

† The checklist makes use of a structured interview. Scores (0, 5 or 10) are made by the rater on 10 items potentially predictive of abuse (e.g., history of drug use, unrealistic caregiving expectations, past involvement with child protective services). The scoring system reflects the extent to which these scores (obtained during the mother’s pregnancy) predict later neglect or abuse by the time children were toddlers.<sup>221</sup>

‡ The Hawaii Healthy Start Program family violence measure that was used in the original trial appears to be measuring partner violence. All families in Plunket, New Zealand, received a free home visit by a community nurse within 3 months of the birth of a child. Nurses were asked to refer any family where two or more risk factors were present or where there were serious concerns about the family’s capacity to care for the child. The followup trial likewise defined its family violence measure as IPV assessed using the Revised Conflict Tactics Scale.

§ The children were not specifically identified as being at risk for maltreatment. Thirty-eight percent of the sample were “small for gestational age,” meaning they were at risk for health and developmental problems. Eighty-two percent of families had environmental risk factors. The authors reported sociodemographic data (educational level, maternal age, and environmental risk. Environmental risk referred to an MCH HV program assessment that evaluated maternal risk factors such as alcohol or drug abuse, younger than 18 years, housing, and parent–infant interaction problems)—these risk factors are assumed to be for poor child health and developmental outcomes, which may include CAN, but that was not specified in the article.

¶ At the time of the 5.5-year followup, two of six randomization sites and four of nine quasi-experimental sites continued to operate HS targeted to children 0 to 3 years of age.

¶ i.e., Child Abuse Potential Inventory >165; Beck Depression Inventory II >19; reports of partner-initiated assault, injury, sexual coercion, or psychological aggression on the Conflict Tactics Scale 2; or scores consistent with a substance abuse disorder on the Diagnostic Interview Scale.

# NBQ collects basic family demographics (race/ethnicity, language spoken, parent age, etc.) as well as 10 scored risk factors: (1) teen parent status (parents under age 19); (2) late prenatal care (beginning after 12 weeks of pregnancy); (3) lack of comprehensive prenatal care (five or fewer healthcare visits for the pregnancy); (4) single-parent status (unmarried); (5) depression risk (using PHQ-2); (6) low education (less than a high school degree or GED); (7) drug abuse/issues; (8) unemployment; (9) financial stress; and (10) troubled family relationships.

**Abbreviations:** CAN=child abuse and neglect; DSM-IV=*Diagnostic and Statistical Manual of Mental Disorders*, 4th edition; DULCE=Developmental Understanding and Legal Collaboration for Everyone; EDD=expected delivery dates; FNP=family nurse practitioner; g=grams; HFAK=Healthy Families Alaska; HFM=Healthy Families Massachusetts; HS=Healthy Start; HV=home visit; IPV=intimate partner violence; LA=Los Angeles; LMP=last menstrual period; M=mean; MCH=maternal and child health; MHI=Maternal History Interview; n=number; NBQ=New Baby Questionnaire; NC=North Carolina; NR=not reported; OB=obstetrician; SCN=Special Care Nursery; SES=socioeconomic status; USC=University of Southern California.

**Appendix D Table 5. Characteristics of Randomized, Controlled Trials: Demographics**

Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	NR*	Caregiver 100	Caregiver (Mother) Overall: White: 94 Black: 2 Asian: 2 Other: 3	NR	NR	Other relevant maternal characteristics at baseline: 30% no higher educational/vocational qualifications 61% poverty 61% history of mental health issues 52% housing concerns 35% unwanted pregnancy 17% working
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup>  (Group Family Nurse Partnership)	Caregiver (Mother) G1: 21.9 (1.6) G2: 21.7 (1.9)	Caregiver 100  Child G1: 37 G2: 46.2	Caregiver (Mother) G1: White: 76.1 Asian: 7.5 Black: 12.0 Multiracial: 4.5 G2: White: 67.7 Asian: 6.2 Black: 17.7 Multiracial: 8.3	NR	NR	Other maternal characteristics at baseline: Enrolled in school or educational program: G1: 13.4% G2: 12.4% Maternal marital status, unmarried/cohabitating: G1: 55.2% G2: 44.8% Current partner biological father: G1: 100% G2: 100%
Brayden et al, 1993 <sup>113</sup>	Caregiver (Mother) <sup>†</sup> G1: 22.4 (NR) G2: 21.2 (NR)  Child, gestation at prenatal entry: G1: 16.0 weeks G2: 17.0 weeks	Caregiver 100	Caregiver (Mother) G1: White: 73 Non-White: 27 <sup>‡</sup> G2: White: 66.7 Non-White: 33.3 <sup>‡</sup>	Previous removal of child by protective services: G1 and G2 combined: 14 (4.5) <sup>§</sup>	NR	Other relevant maternal baseline characteristics: Maternal marital status, single: G1: 57.4% G2: 64.5% Medicaid eligibility: G1: 83% G2: 85%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Brooten et al, 1986 <sup>114</sup>	Caregiver (Mother): <sup>¶</sup> G1: 23 years (6) (Range: 12 to 38 years) G2: 24 years (7) (Range: 16 to 44 years)  Child, gestational age at birth: G1: 30 weeks (2) G2: 30 weeks (2)  Child, gestational age at discharge: G1: 38 weeks (2) G2: 36 weeks (2)	Caregiver: <sup>¶</sup> 100  Children NR	Caregiver (Mother): <sup>¶</sup> G1: Black:78 White: 22 G2: Black: 83 White: 17	NR	NR	Other relevant maternal baseline characteristics: <sup>¶</sup> Maternal marital status, unmarried: G1: 67% G2: 69% Family on Medicaid: G1: 56% G2: 75%
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	Child: Overall: 9.37 weeks (5.50)  Mother: G1: 27.3 years (6.4) G2: 27.1 years (7.0)	Caregiver NR  Child* G1: 41 G2: 43	Latino children: Overall: 87 G1: 91 G2: 83	NR	NR	Child by type of medical risk factor: Preterm status: 48 Medical problem: 59 Other reasons: 40
Caldera et al, 2007 <sup>137</sup> Duggan et al, 2007 <sup>116</sup>  (Healthy Families Alaska)	Caregiver (Mother): <sup>¶</sup> G1: 23.7 (5.7) G2: 23.4 (5.7)	Caregiver: <sup>¶</sup> 100  Children: NR	Caregiver (Mother): <sup>¶</sup> G1: Alaska Native: 20 White: 56 Multiracial: 7 Other: 17 G2: Alaska Native: 23 Caucasian: 54 Multiracial: 10 Other: 13	NR	NR	Other maternal characteristics at baseline: <sup>¶</sup> Graduated from high school: 58% Below poverty level: 58% Physical assault by mother on partner (excludes mothers without a partner): 49% Poor psychological resources: 44% Depressive symptoms: 57% Maternal substance use: 56%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup>  (Healthy Families New York)	Caregiver (Mother): Overall: 22.5 years (5.5) G1: 22.5 years (5.4) G2: 22.4 years (5.6)	Caregiver 100  Child NR	Caregiver (Mother): Overall: White, non-Latina: 34.4 African American, non-Latina: 45.4 Latina: 18.0 G1: White, non-Latina: 34.3 African American, non-Latina: 46.5 Latina: 17.7 G2: White, non-Latina: 34.4 African American, non-Latina: 44.4 Latina: 18.3	Prior substantiated or unsubstantiated child abuse or neglect reports at baseline: Overall: 20.2# G1: 20.7 G2: 19.7 Prior substantiated child abuse or neglect reports at baseline: Overall: 9.0 G1: 8.9 G2: 9.0	NR	Other relevant maternal characteristics: Mother's childhood history of child maltreatment: Overall: 48.7% G1: 48.1% G2: 49.2% Family received cash assistance from welfare: Overall: 29.2% G1: 27.4% G2: 31.1% First-time mother: Overall: 54.2% G1: 53.2% G2: 55.3% % of mothers <19 years old: Overall: 31.0% G1: 29.8% G2: 32.3% % never married: Overall: 82%
Easterbrooks et al, 2013 <sup>110</sup>  (Healthy Families Massachusetts)	Child, 12 months after enrollment: G1: 11.75 months (5.65) G2: 12.05 months (5.27)  Caretaker (Mother): G1: 18.78 years (1.23) G2: 18.69 years (1.28)	Caregiver: NR  Child: G1: 45.6 G2: 47.1	Caregiver (Mother) G1: White: 41.4 African American (non-Hispanic): 17.7 Hispanic: 30.5 Other (non-Hispanic): 10.5 G2: White: 34.2 African American (non-Hispanic): 20.6 Hispanic: 38.3 Other (non-Hispanic): 6.9	NR	NR	Other relevant maternal characteristics at baseline: Single: G1: 34.1% G2: 34.1% Welfare recipient: G1: 55.3% G2: 60.1% Some and major financial difficulties: G1: 64.7% G2: 62.5%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup> (Early Start Program)	Mother: G1: 24.4 years (NR) G2: 24.6 years (NR)  Biological father: G1: 26.6 years (NR) G2: 27.3 years (NR)	NR	Mother, Maori: G1: 26.7 G2: 24.8  Biological father, Maori: G1: 25.4 G2: 30.7	NR	NR	Other relevant family characteristics at baseline: Single-parent family: G1: 63.8% G2: 64.6% Pregnancy unplanned: G1: 82.3% G2: 80.1% Welfare dependent: G1: 90.1% G2: 88.4%
Finello et al, 1998 <sup>126</sup>	Caregiver (Mother): Overall: 28.21 years (7.14) (Range: 14 to 41 years) G1: 26.2 years (6.8) G2: 28.8 years (6.8) G3: 27.9 years (7.5) G4: 29.8 years (7.5)  Child, gestational age at time of enrollment: G1: 31.9 weeks (2.8) G2: 29.8 weeks (3.1) G3: 30.4 weeks (3.0) G4: 30.5 weeks (2.0)	Caregiver: 100  Child: G1: 70 G2: 29 G3: 45 G4: 30	Caregiver (Mother): Overall: Latina: 95 African American: 3 Other: 2	NR	NR	Other relevant maternal characteristics at baseline: First-born child: 30.5% Mean no. of live births: 2.6 (SD=1.6) Mean no. of children in the household: 2.5 (SD=1.5) Mean no. of children under the age of 5 in the household: 0.99 (SD=1.2)
Green et al, 2017 <sup>133</sup>	Caregiver (Mother): G1: 22.0 (NR) G2: 21.9 (NR)	Caregiver: 100  Child: NR	Caregiver (Mother) White: G1: 60.4 G2: 57.3 Hispanic/Latina/o G1: 24.2 G2: 27.0 Other race/ethnicity G1: 15.4 G2: 15.7	0%**	NR	Other relevant maternal characteristics at baseline: Parent primary language English: G1: 79.4% G2: 78.4% Financial stress (self-reported, not based on FPL): G1: 79.0% G2: 79.9%



**Appendix D Table 5. Characteristics of Randomized, Controlled Trials: Demographics**

Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup> (Healthy Steps)	Caregiver (Mother) Overall: <sup>*</sup> ≤19 years: 13.6% 20 to 29 years: 51.0% ≥30 years: 35.4%  Child, age at 5- to 5.5-year interview <sup>*§</sup> Overall: 5.22 years	Caregiver: 100  Child: NR	Caregiver (Mother): Overall: <sup>†</sup> White: 57.9 Black: 24.4 Asian/Native American: 4.5 Hispanic: 20.2 Other: 13.2	NR	NR	Other relevant maternal characteristics at baseline: Not married: 35.8% First live birth: 46.4% Medicaid during pregnancy: 31.8%
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup> (The Memphis Trial)	Caregiver (Mother): G1: 18.0 years (3.3) G2: 18.1 years (3.2) G3: 17.9 years (2.8) G4: 18.1 years (3.3)  Child, gestational stage at enrollment: G1: 16.4 weeks (6.0) G2: 16.4 weeks (5.8) G3: 16.3 weeks (5.5) G4: 16.5 weeks (5.6)	Caregiver: 100  Child: NR	Caregiver (Mother): White: G1: 4 G2: 8 G3: 7 G4: 11 African American: Overall enrolled: 92	NR	NR	Other relevant maternal characteristics at baseline: Unmarried: 98% <18 years of age: 64% Below the Federal poverty level: 85%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Lam et al, 2009 <sup>123</sup>	Child: G1: 8.8 (2.2) G2: 9.0 (2.0) G3T: 8.9 (2.1)  Caregiver (Father): G1: 34.2 (4.4) G2: 34.6 (4.9) G3: 33.4 (5.1)	Child:† G1: 50 G2: 50 G3: 40	Caregiver (Father): G1: White: 60 Black: 20 Hispanic: 10 Other: 10 G2: White: 60 Black: 30 Hispanic: 0 Other: 10 G3: White: 70 Black: 20 Hispanic: 10 Other: 10	Open cases with CPS at baseline: G1: 30 G2: 40 G3: 40	NR	Other relevant baseline characteristics for father's female partner: Female partner's age in years: M (SD) G1: 33.1 (5.2) G2: 32.8 (5.4) G3: 33.2 (5.4) Female partner's ethnicity: N (%) G1: White: 60 Black: 20 Hispanic: 10 Other: 10 G2: White: 70 Black: 10 Hispanic: 10 Other: 10 G3: White: 70 Black: 10 Hispanic: 0 Other: 20
Larson, 1980 <sup>127</sup>	NR	Caregiver: 100  Child:** Overall: 50.4 G1: 50.0 G2: 60.0 G3: 41.7	NR	NR	NR	Other relevant family characteristics at baseline:** Single-parent household: Overall: 52.2% G1: 45.5% G2: 65.7% G3: 47.2%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	Child: G1: 18 months (8.8) G2: 19 months (9.2)  Caregiver (Mother): G1: 26.9 (6.9) G2: 27.7 (7.0)	Caregiver: 100  Child: G1: 54.4 G2: 57.7	Caregiver (Mother): G1: Latino: 57.0 Black: 32.9 White: 8.9 Other: 1.3 G2: Latino: 60.3 Black: 26.9 White: 6.4 Other: 6.4	Prior or current involvement with CPS: G1: 39.2 G2: 28.2	Proportion with clinically concerning problems at baseline: G1: Language development: 21.9 Any ITSEA domain: 48.1 ITSEA externalizing: 36.5 ITSEA internalizing: 13.5 ITSEA dysregulation: 32.7 G2: Language development: 17.1 Any ITSEA domain: 56.6 ITSEA externalizing: 43.3 ITSEA internalizing: 9.4 ITSEA dysregulation: 28.3	Other relevant family characteristics at baseline: Single, never married: G1: 57.7% G2: 59.7% Teenage mother: G1: 10.1% G2: 9.1% Receiving public assistance: G1: 92.4% G2: 92.9%
Marcenko and Spence, 1994 <sup>120</sup>	Caregiver (Mother): G1: 23.08 years (NR) (Range: 13.21 to 41.48 years) G2: 23.23 years (NR) (Range: 13.48 to 39.08 years)	Caregiver: 100  Child: NR	Caregiver (Mother): Overall: Black: 94 Hispanic: 4 White: 2 G1: Black: 93.5 Hispanic: 2.6 White: 2.6 Other: 1.3 G2: Black: 94.5 Hispanic: 3.6 White: 0.9 Other: 0	Prior family involvement with CPS: G1: 31.6 G2: 34.9	NR	Other relevant maternal characteristics at baseline: Never married: G1: 89.6% G2: 88.2% Public welfare benefits as usual source of financial support: Overall: 79%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	Caregiver (Mother): <sup>++§</sup> G1: 19.3 years (2.9) G2: 19.5 years (3.1) G3: 19.4 years (3.7)	Caregiver: 100  Child: <sup>§§</sup> G1: 45 G2: 56 G3: 45	Caregiver (Mother): Overall: White: 89 <sup>   </sup> Black: 11 <sup>ff</sup>	NR	NR	Other relevant maternal characteristics at baseline: Overall: <19 years of age: 47% Unmarried: 62% Semiskilled and unskilled laborers: 61% “Poor, unmarried teenagers”: 23%
Quinlivan et al, 2003 <sup>128</sup>	Caregiver (Mother): G1: 16.6 years (0.90) G2: 16.4 years (0.96)	Caregiver: 100  Child: <sup>*</sup> G1: 55 G2: 43	Caregiver (Mother): Indigenous Australian: G1: 18 G2: 30	NR	NR	Other relevant maternal characteristics at baseline: Low or destitute socioeconomic status score: G1: 85% G2: 88%
Robling et al, 2016 <sup>131</sup>  (Nurse Family Partnership)	Caregiver (Mother): G1: 17.9 yrs (16.9 to 18.8) G2: 17.9 yrs (17.0 to 18.8)	Caregiver 100	Caregiver (Mother): G1: White: 88 Mixed: 5 Asian: 1 Black: 5 Other: <1 G2: White: 88 Mixed: 6 Asian: 2 Black: 4 Other: <1	NR	NR	NR

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	Caregiver (Mother): Overall: 19.6 years (2.9)  G1: 19.7 years (2.8) G2: 19.5 years (2.6)  Child, gestational age at enrollment: Overall: 39 weeks (2.4) G1: 39 weeks (2.0) G2: 39 weeks (2.6)	Caregiver: 100  Children: Overall: 48 G1: 48 G2: 49	Caregiver (Mother): Overall: Latina: 62 African American or Caribbean: 28 Mixed ethnicity: 10 G1: Latina: 58 African American or Caribbean: 35 mixed ethnicity: 6.7 G2: Latina: 67 African American or Caribbean: 22 Mixed ethnicity: 11.7	Active CPS case at time of enrollment:## Overall: 6 G1: 4 G2: 7	NR	Other relevant maternal characteristics at baseline: Single/never married: Overall: 83.8% G1: 88.6% G2: 80.3%
Sege et al, 2015 <sup>152</sup>  (Project DULCE)	Parent: G1: 18-24 years: 28.8% 25-29 years: 27.6% 30-34 years: 23.3% >34 years: 20.3% G2: 18-24 years: 25.2% 25-29 years: 28.1% 30-34 years: 32.3% >34 years: 14.4%	Parent: G1: 93.3 G2: 92.8	Parent: G1: African American/Black: 55.8 Caucasian, White or European American: 10.4 Hispanic or Latino: 9.2 Other (includes multiracial, biracial, Caribbean islander, or African national): 24.5 G2: African American/Black: 55.1 Caucasian, White or European American: 6.6 Hispanic or Latino: 15.6 Other (includes multiracial, biracial, Caribbean islander, or African national): 22.8	NR	NR	Other relevant parent characteristics at baseline: Marital status: G1: Never married: 46% Married to father or mother of child in project: 28.2% Not married but living with father or mother of child in project: 11.7% Other: 14.1% G2: Never married: 41.3% Married to father or mother of child in project: 34.7% Not married but living with father or mother of child in project: 13.2% Other: 10.8%  Employment status: G1: Unemployed: 55.8% Employed: 44.2% G2: Unemployed: 62.3% Employed: 37.7%

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Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Siegel et al, 1980 <sup>122</sup>	Caregiver (Mother): Overall: 21 years (NR)	Caregiver: 100  Child: NR	Caregiver (Mother): Overall: 25***	NR	NR	Other relevant maternal characteristics at baseline: Average no. of babies before the index pregnancy: 0.8 Currently married: 33% <sup>†††</sup> Mean years of education: 11
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	Caregiver (Unspecified): Overall: 27 years (9) G1: 27.7 years (8.7) G2: 25.9 years (6.8)	Caregiver: 99  Child: NR	Caregiver (Unspecified): <sup>†††</sup> G1: White: 74 Black or African American: 14 Hispanic or Latino: 4 American Indian or Alaska Native: 7 Asian: 1 G2: White: 68 Black or African American: 15 Hispanic or Latino: 2 American Indian or Alaska Native: 15 Asian: NR	NR	NR	Other relevant family characteristics at baseline: Average no. of children: 2 Median income per month: \$700 Never married: 32.4% <sup>‡</sup>

**Appendix D Table 5. Characteristics of Randomized, Controlled Trials: Demographics**

Author, Year (Program/Trial Name)	Age Mean (SD)	Female %	Race and Ethnicity %	Maltreated %	Symptoms %	Other Relevant Baseline Characteristics
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	Child: G1: 9.2 weeks (3.2) G2: 9.0 weeks (3.5) G3: 9.6 weeks (3.8)  Caregiver (Mother), age at birth of index child: G1: 29.6 years (5.8) G2: 29.5 years (5.9) G3: 29.7 years (5.9)	Caregiver (Mother): 100	Mother defines ethnicity as "White": G1: 60 G2: 54 G3: 57	NR	NR	Other relevant maternal characteristics at baseline: Study child is mother's first baby, N (%): G1: 176 (48) G2: 87 (48) G3: 92 (50) English not mother's first language, N (%): G1: 139 (38) G2: 73 (40) G3: 70 (38) Mother is a lone parent, N (%): G1: 89 (25) G2: 53 (29) G3: 47 (26) Family lives in "public" housing, N (%): G1: 257 (71) G2: 127 (69) G3: 126 (69) Weekly household income <£200, N (%): G1: 169 (54) G2: 90 (56) G3: 95 (56) Mother had "no support" in past month, N (%): G1: 17 (5) G2: 11 (6) G3: 9 (5)

\* Proportion of mothers <17 years old at baseline: G1: 14%, G2: 12%.

† Authors reported p<0.05 for G2 vs. G1.

‡ Calculated.

§ Authors reported 14 cases of previous removal of child by protective services among the 314 HR participants at baseline. Among the 14 cases, 29% were physical abuse and 21% were neglect.

¶ Based on 36 mothers in G1 and 36 mothers in G2.

‡¶ Based on 325 families (163 in G1, 162 in G2) of those randomized who were interviewed at baseline.

# More than 40% of the prior CPS reports were still open at the time of random assignment.

\*\* A small number of families (N=7) were involved with child welfare at the time of screening, but these families were considered not eligible for the study.

†† Calculated based on 115 participating mother–infant dyads.

‡ Reported by authors based on the remaining 324 participants at the 15-year followup.<sup>144</sup>

## Appendix D Table 5. Characteristics of Randomized, Controlled Trials: Demographics

§§ Calculated based on the remaining 324 participants at the 15-year followup.<sup>144</sup>

|| At the 15-year followup, percentage of White participants among the 324 remaining participants changed to 90% for G1, 91% for G2, and 86% for G3.

¶¶ These participants are excluded from the analysis.

## All cases involved charges of abuse or neglect against the parents of the participant mothers in this study.

\*\*\* Authors reported approximately one quarter of the 321 women participating in the study were White.

††† Authors reported approximately one third of the participants were married at baseline.

‡ Authors noted that overrepresentation of American Indian families compared with the general population in the county might be because of specific recruitment efforts.

**Abbreviations:** CPS=child protective services; DULCE=Developmental Understanding and Legal Collaboration for Everyone; FPL=Federal poverty limit; G=group; HR=high risk; ITSEA=Infant-Toddler Social and Emotional Adjustment Scale; M=mean; N=number; No.=number; NR=not reported; SD=standard deviation.



**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	Placement on child protection register or care proceedings; ascertained by health visitors	12 months <sup>*</sup>	NR (6)	NR (12)	NA	NA	RR, 1.35 (95% CI: 0.86 to 2.11) <sup>†</sup>
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 infants randomized (N analyzed=79)	Reported cases of child abuse	18 months <sup>‡</sup>	4 (10)	2 (5.1)	NA	NA	Calculated RR, 0.51 (95% CI, 0.10 to 2.64)
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=309)	Substantiated CPS reports for all types of maltreatment, provided through the Alaska Office of Children's Services <sup>§</sup>	After year 1 of age only	NR (10)	NR (12)	NA	NA	No difference, <sup>  </sup> p=0.53
Duggan et al, 2007 <sup>116</sup>  Good Fair  Total N=364 families randomized (N analyzed=297)	Substantiated CPS reports for all types of maltreatment provided through the Alaska Office of Children's Services <sup>§</sup>	After year 2 of age only	NR (9)	NR (9)	NA	NA	No difference, p=0.89

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated CPS reports for all types of maltreatment provided through the Alaska Office of Children's Services <sup>§</sup>	2 years of age	NR (17)	NR (16)	NA	NA	No difference, p=0.71
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=309)	Substantiated and unsubstantiated CPS reports for all types of maltreatment, provided through the Alaska Office of Children's Services <sup>§</sup>	After year 1 of age only	NR (16)	NR (20)	NA	NA	No difference, p=0.48
Duggan et al, 2007 <sup>116</sup> ,  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated and unsubstantiated CPS reports for all types of maltreatment, provided through the Alaska Office of Children's Services <sup>§</sup>	After year 2 of age only	NR (23)	NR (18)	NA	NA	No difference, p=0.39
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated and unsubstantiated CPS reports for all types of maltreatment, provided through the Alaska Office of Children's Services <sup>§</sup>	2 years of age	NR (33)	NR (30)	NA	NA	Calculated RR, 0.91 (95% CI, 0.65 to 1.27); reported p=0.59
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=309)	Substantiated CPS reports for neglect, provided through the Alaska Office of Children's Services <sup>  </sup>	After year 1 of age only	NR (6)	NR (10)	NA	NA	No difference, p=0.32

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated CPS reports for neglect, provided through the Alaska Office of Children's Services <sup>§</sup>	After year 2 of age only	NR (7)	NR (6)	NA	NA	No difference, p=0.58
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated CPS reports for neglect, provided through the Alaska Office of Children's Services <sup>§</sup>	2 years of age	NR (13)	NR (12)	NA	NA	No difference, p=0.81
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=309)	Substantiated and unsubstantiated CPS reports for neglect, provided through the Alaska Office of Children's Services <sup>§</sup>	After year 1 of age only	NR (13)	NR (16)	NA	NA	No difference, p=0.66
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated and unsubstantiated CPS reports for neglect, provided through the Alaska Office of Children's Services <sup>§</sup>	After year 2 of age only	NR (18)	NR (16)	NA	NA	No difference, p=0.55
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=297)	Substantiated and unsubstantiated CPS reports for neglect, provided through the Alaska Office of Children's Services <sup>§</sup>	2 years of age	NR (27)	NR (26)	NA	NA	No difference, p=0.87

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
DuMont et al, 2008 <sup>117</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=1,060)	Prevalence of substantiated CPS reports at 1 year of age, defined as percentage of women with a substantiated report; obtained from review of CPS records of child abuse and neglect reports	1 year of age	NR (5.98)	NR (7.90)	NA	NA	Calculated RR, 1.32 (95% CI, 0.85 to 2.06), p=NS
DuMont et al, 2008 <sup>117</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=992)	Prevalence of substantiated CPS reports at 2 years of age, defined as percentage of women with a substantiated report; obtained from review of CPS records of child abuse and neglect reports	2 years of age	NR (4.8)	NR (5.08)	NA	NA	Calculated RR, 1.06 (95% CI, 0.612 to 1.83), p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=1,173)	Cumulative rate of biological mom or target child confirmed as subject or victim of CPS report; based on NYS Statewide Automated Child Welfare Information System database search <sup>¶</sup>	Target child's 7th birthday	NR (27.10)	NR (29.55)	NA	NA	AOR, 1.13 (95% CI, NR), p=NS

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Easterbrooks et al, 2013 <sup>110,135</sup>  Fair  Total N=707 caregivers randomized (N analyzed=707)	Rate of maltreatment; based on DCF records covering only the time period after participants enrolled in the study. Children were classified as maltreated if there were CPS reports of neglect, physical abuse, or a combination occurring after participants enrolled into the study, regardless of report resolution (substantiated or unsubstantiated) or the identity of the perpetrator (mother or other person). Children were classified as not maltreated if there were no such reports. <sup>#</sup>	Likely 12 months after enrollment (unclear)	NR (NR)**	NR (NR)**†	NA	NA	G2 vs. G1: p=0.769
Easterbrooks et al, 2013 <sup>110,135</sup>  Fair  Total N=707 caregivers randomized (N analyzed=688)	Maltreatment occurrence overall (details NR)	Up to 72 months after enrollment	NR	NR	NA	NA	No program effect on maltreatment occurrence overall (details NR)

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Parent report of contact with Child, Youth, and Family Service	36 months of age	NR (21.3)	NR (19.6)	NA	NA	OR, 0.91 (95% CI, 0.55 to 1.48) Cohen's d, 0.04 (95% CI, -0.15 to 0.25) p=0.39
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=69)	Reported child abuse cases; based on hospital and project charts as well as parent report	12 months	0 (0)	0 (0)	0 (0)	0 (0)	p=0.331
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=80)	Reported child abuse cases; based on hospital and project charts as well as parent report	6 months	0 (0)	0 (0)	0 (0)	0 (0)	p=0.408
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=69)	Reported child neglect cases; based on hospital and project charts as well as parent report	12 months	0 (0)	0 (0)	0 (0)	0 (0)	p=0.331
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=80)	Reported child neglect cases; based on hospital and project charts as well as parent report	6 months	0 (0)	1 (0.05)	0 (0)	0 (0)	p=0.439

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=2,720)	At least one maltreatment report <sup>††</sup>	24 months	162 (12.5)	205 (14.4)	NA	NA	OR, 0.17, p=0.17
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=NR)	At least one unsubstantiated report <sup>††</sup>	24 months	101 (7.9)	139 (9.7)	NA	NA	OR, 1.27, p=0.08
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=NR)	At least one substantiated report <sup>††</sup>	24 months	77 (6)	90 (6.3)	NA	NA	OR, 1.05, p=0.75
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=NR)	At least one substantiated neglect report <sup>††</sup>	24 months	74 (5.8)	87 (6.1)	NA	NA	OR, 1.06, p=0.73
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=NR)	At least one substantiated physical or sexual abuse report <sup>††</sup>	24 months	10 (0.8)	7 (0.5)	NA	NA	NR <sup>**</sup>

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Lam et al, 2009 <sup>123</sup>  Fair  Total N=30 male patients with their female partners and custodial children randomized (N analyzed=30)	Parent's report of active involvement with CPS; <sup>§§</sup> not verified or confirmed with CPS	12 months	NR (30)	NR (20)	NR (10)	NA	NR <sup>¶¶</sup>
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	Family's prior or current involvement with CPS at 36 months; based on interview with mother. State of Connecticut CPS records were abstracted upon receiving parental consent. <sup>§ §§</sup>	36 months	NR (NR)	NR (NR)	NA	NA	Reported OR, for no CPS involvement, 2.1 (95% CI, 1.0 to 4.4), p<0.05 <sup>##</sup> Calculated OR, for CPS involvement, 0.48 (95% CI, 0.23 to 1.0)
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117) (continued)							
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	Family's prior or current involvement with CPS at 24 months; based on interview with mother. State of Connecticut CPS records were abstracted upon receiving parental consent. <sup>¶¶</sup>	24 months	NR (NR)	NR (NR)	NA	NA	Reported OR, for no CPS involvement, 1.9 (95% CI, 0.9 to 4.2) <sup>##</sup> Calculated OR, for CPS involvement, 0.53 (95% CI, 0.24 to 1.11)



**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	Family's prior or current involvement with CPS at 12 months; based on interview with mother. State of Connecticut CPS records were abstracted upon receiving parental consent. <sup>111#</sup>	12 months	NR (NR)	NR (NR)	NA	NA	Reported OR, for no CPS involvement, 1.7 (95% CI, 0.7 to 3.9) <sup>##</sup> Calculated OR, for CPS involvement, 0.59 (95% CI, 0.26 to 1.43)
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	Family's prior or current involvement with CPS at 6 months; based on interview with mother. State of Connecticut CPS records were abstracted upon receiving parental consent. <sup>111</sup>	6 months	NR (NR)	NR (NR)	NA	NA	Reported OR, for no CPS involvement, 1.7 (95% CI, 0.7 to 3.9) <sup>##</sup> Calculated OR, for CPS involvement, 0.59 (95% CI, 0.26 to 1.43)

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=342)	Reports of child abuse and neglect; determined by review of medical and CAN registry records (from all 15 States across which the families spread) for the presence of verified cases of abuse or neglect from the Department of Social Services, emergency room visits, and other medical visits until the child reached the age of 4 years	2 years of age	NR (10)	NR (8)	NR (5)	NA	Calculated RR, for G3 vs. G1, 0.47 (95% CI, 0.16 to 1.36) Calculated RR, for G2 vs. G1, 0.78 (95% CI, 0.31 to 1.99)
Olds et al, 1997 <sup>143-146</sup>  Fair  Total N=400 families randomized (N analyzed=NR)	Verified reports in which parents are perpetrators of child abuse and neglect; determined by review of CPS records from states in which the mothers and target children resided during the interval from the birth of their first child (focal child) to the child's 15th birthday	15 years	NR (0.54)	NR (0.35)	NR (0.29)	NA	Parents in the nurse-visited group were perpetrators of child abuse and neglect in fewer verified reports, mean difference, 0.77 (95% CI, 0.34 to 1.19), p<0.001

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Olds et al, 1997 <sup>143-146</sup>  Fair  Total N=400 families randomized (N analyzed=NR)	Verified involving the child as subject of child abuse and neglect; determined by review of CPS records from states in which the mothers and target children resided during the interval from the birth of their first child (focal child) to the child's 15th birthday	15 years	NR (NR)	NR (NR)	NR (NR)	NA	Nurse-visited group had fewer child maltreatment reports involving the study child, p=0.04
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=945)	Safeguarding was counted as any record in GP notes indicating the initiation, progression, or closure of a safeguarding process (e.g., initial assessment, being identified as a child in need, child protection conference)***	2 years	38 (8.0)	64 (13.6)	NA	NA	Adjusted OR, 1.85 (95% CI, 1.02 to 2.85), p=0.005

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,506)	Referral to children's social care for abuse or neglect	Child is 6 years	205 (57.9)	198 (58.9)	NA	NA	Calculated RR, 0.95 (95% CI, 0.80 to 1.12)
Sadler et al, 2013 <sup>125</sup>  Fair  Total N=105 families randomized (N analyzed=78)	Open cases with CPS	24 months	2 (5)	0 (0)	NA	NA	p=0.1
Siegel et al, 1980 <sup>122</sup>  Fair  Total N=321 mother-child dyads randomized (N analyzed=162)	CPS reports, obtained from the county unit for protection services and the State central registry	12 months	6 (5.3)	3 (6)	NA	NA	NR

**Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Reports, G1 (Control) No. (%)	Number of Incident Reports, G2 No. (%)	Number of Incident Reports, G3 No. (%)	Number of Incident Reports, G4 No. (%)	Effect Estimate or Other Outcome Measure
Silovsky et al, 2011 <sup>124</sup>  Fair  Total N=105 caregivers randomized (N analyzed=105)	Caregiver had a referral to child welfare of participant as a perpetrator of any type of abuse or neglect. A computerized sequential strategy was used to match research and child welfare database cases on Social Security numbers and combinations of name, gender, and date of birth (including similar names and spellings)	Average 716 days <sup>†††</sup>	18 (31.5)	10 (20.8)	NA	NA	NR

\* Assessed for time period between 6 months and 12 months of age.

† Author-reported confidence intervals are asymmetric. Data were not sufficient to recalculate.

‡ Participants randomized were newborns, so age at followup is likely 18 months.

§ Excludes three families with a fetal or infant death and families known to be out of town for >6 months in year 2.

¶ Using CPS reports, pediatric medical records, interviews with primary caregiver, observation of the home environment, and interaction with the child: no difference in HV and control groups in rates for substantiated or overall reports of child maltreatment.

¶ Analyses control for female target child, count of moderate to severe Kempe items, annual earnings at random assignment, and having at least a GED or high school diploma.

# Categories of maltreatment included physical abuse, sexual abuse, neglect, and congenital drug addiction. Reports of congenital drug addiction were recoded as child neglect. A “case” of child maltreatment referred to a child who had one or more reports of child maltreatment. That is, the child may have had a single report at one time or more than one report at multiple points in time. A single report connoted a single instance of child maltreatment regardless of how many individuals contacted CPS.

\*\* The number of mothers and/or children in each group was not reported. The number of maltreated children in each group was also not reported. Of the 204 children that had DCF maltreatment reports, 145 were substantiated by DCF, and 84 percent of the 204 reports concerned neglect.

†† To account for variability across program sites, program site was included as a covariate in all impact analyses (dummy coded); in addition, the following covariates were used for all impact analyses: parent's race/ethnicity (White, Hispanic/Latina/o, or Other Race/Ethnicity, dummy coded); and total number of family risk factors at baseline.

‡ Sample sizes insufficient for significance testing

§§ Outcome is assessed at each interview by asking each parent separately the following single-item (yes/no) question: “Do you currently have an open case with CPS regarding the target child?” If either parent answered yes, the couple was counted as having an open CPS case at that assessment period. In cases in which only one parent’s report was available, that report was used.

¶¶ The study also reports numbers pretreatment, post-treatment, and at 6 months. The analysis here is restricted to 12 months (reports at earlier times may not represent program effects). The proportion of PSBCT participants with an open CPS case on the target child showed clinically meaningful effects at post-treatment and 6 months ( $r > 0.20$ ), with

## Appendix D Table 6. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Categorical Outcomes

stronger effects at 12 months ( $r > 0.30$ ). Although BCT showed no meaningful change in the proportion of CPS-involved participants at post-treatment and 6-month followup, clinically meaningful effects emerged at 12 months.

¶¶ There was not sufficient information detailed in the reports to establish the duration of involvement or active involvement with CPS at baseline.

## Analyses assessed the effect of the intervention on no involvement with CPS between intervention groups. Analyses adjusted for history of involvement at baseline.

\*\*\* Conducted in the United Kingdom, so safeguarding is not identical to reports to CPS.

††† All participants were followed up for child welfare referrals from enrollment through January 2010. Average length of followup was 716 days ( $SD=213$ ); children under 5 years of age.

**Abbreviations:** AOR=adjusted odds ratio; BCT=behavioral couples therapy; CAN=child abuse and neglect; CI=confidence interval; CPS=child protective services; DCF=(Massachusetts) Department of Children and Families G=group; GED=general educational development; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; NYS=New York State; OR=odds ratio; RR=relative risk; SD=standard deviation; vs.=versus.

**Appendix D Table 7. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Child Protective Services Reports, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
DuMont et al, 2008 <sup>117</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=1,060)	Frequency of substantiated CPS reports at 1 year of age, defined as percentage of women with a substantiated report; obtained from review of CPS records of child abuse and neglect reports	1 year of age	0.07 (NR)	0.09 (NR)	NA	NA	p=NS
DuMont et al, 2008 <sup>117</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=992)	Frequency of substantiated CPS reports at 1 year of age, defined as percentage of women with a substantiated report; obtained from review of CPS records of child abuse and neglect reports	2 years of age	0.06 (NR)	0.06 (NR)	NA	NA	p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=1,173)	Frequency of CPS reports where the biological mother was confirmed to be the subject or the target child was confirmed to be the victim	Target child's 7th birthday	0.55* (NR)	0.54* (NR)	NA	NA	Effect size, -0.01, p=NS

\* Outcome reported as least square mean.

**Abbreviations:** CPS=child protective services; G=group; KQ=key question; N=number; NA=not applicable; NS=not statistically significant; NR=not reported; SD=standard deviation.

**Appendix D Table 8. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Child Protective Services Reports, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  Fair  Low-income unmarried teenagers  Total N=74 families randomized (N analyzed=NR)	Reports of child abuse and neglect; determined by review of medical and CAN registry records (from all 15 States across which the families spread) for the presence of verified cases of abuse or neglect from the Department of Social Services, emergency room visits, and other medical visits until the child reached the age of 4 years	2 years of age	NR (19)	NR (4)	NA	NA	p=0.07
DuMont et al, 2008 <sup>117</sup>  Fair  “High Prevention Opportunity” comprising young, first-time mothers who initiated home- visiting services prenatally  Total N=1,173 (N analyzed=185)	Cumulative rate of biological mom or target child confirmed as subject or victim of CPS report; based on NYS Statewide Automated Child Welfare Information System database search.	Target child’s 7th birthday	NR (25.03)	NR (21.91)	NA	NA	Adjusted OR: 0.84, p=NS

**Abbreviations:** CAN=child abuse and neglect; CPS=child protective services; G=group; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; NYS=New York State; OR=odds ratio.



**Appendix D Table 9. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Child Protective Services Reports, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121,143-146</sup>  Fair  Low-income unmarried women  Total N=74 families randomized (N analyzed=NR)	Verified reports in which parents are perpetrators of child abuse and neglect; determined by review of CPS records from states in which the mothers and target children resided during the interval from the birth of their first child (focal child) to the child's 15th birthday.	15 years	0.53 (NR)	0.63 (NR)	0.11 (NR)	NA	G1 vs G3, 1.611 (95% CI, 0.87 to 2.35)
DuMont et al, 2008 <sup>117</sup>  Fair  "High Prevention Opportunity" comprising young, first-time mothers who initiated home- visiting services prenatally  Total N=NR (N analyzed=185)	Cumulative rate of biological mother or target child confirmed as subject or victim of CPS report; based on NYS Statewide Automated Child Welfare Information System database search.	Target child's 7th birthday	0.49 (NR)	0.31 (NR)	NA	NA	Effect size=-0.19, p=NS

**Abbreviations:** CI=confidence interval; CPS=child protective services; G=group; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; NYS=New York State; SD=standard deviation; vs.=versus.

**Appendix D Table 10. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Removal of Child From the Home, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Normal Social- Emotional Development, G1 (Control) No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G2 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G3 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G4 No. (%)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	Removal of child from home; ascertained by health visitors providing intervention; data source not reported	12 months*	NR (0)	4 (6)	NA	NA	p=NS
Brayden et al, 1993 <sup>113</sup>  Good  Total N=314 mothers randomized (N analyzed=263)	Mother-child separation 36 months after live birth of study infants, including separation involving the child from the study pregnancy or the child's siblings if it occurred after the interview; based on review of public agency documents	36 months	1 (0.8)	5 (3.5)	NA	NA	RR, 4.77 (95% CI, 0.51, 38.61)
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 infants randomized (N analyzed=79)	Number of infants placed in foster care; data source not reported	18 months†	2 (5)	0 (0)	NA	NA	Calculated RR, 0.21 (95% CI, 0.01 to 4.24)
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=2,772)	At least one out-of-home placement	24 months	44 (3.4)	57 (4)	NA	NA	OR, 1.71, p=0.45

**Appendix D Table 10. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Removal of Child From the Home, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Normal Social- Emotional Development, G1 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G2 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G3 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G4 No. (%)	Effect Estimate or Other Outcome Measure
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=NR)	Reunification (of those with at least one placement)	24 months	16 (36.4)	27 (47.4)	NA	NA	OR, 1.59, p=0.27
McIntosh et al, 2009 <sup>136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	Removal of the child from the home; removal status based on substantiation of child abuse and neglect per child protection register documentation	12 months	0 (0)	4 (5.9)	NA	NA	p=NS
Marcenko and Spence, 1994 <sup>120</sup>  Fair  Total N=225 mothers randomized (N analyzed=187)	Number of children informally placed out of the home through family arrangements; based on mothers' self-reporting <sup>†</sup>	6 months	4 (3.1) <sup>§</sup>	9 (9.9) <sup>§</sup>	NA	NA	Calculated RR, 1.63 (95% CI, 0.96 to 2.78), p=NS
Marcenko and Spence, 1994 <sup>120</sup>  Fair  Total N=225 mothers randomized (N analyzed=187)	Number of children informally placed out of the home through family arrangements; based on mothers' self-reporting <sup>†</sup>	Approximately 10.5 months	15 (19)	35 (32)	NA	NA	Calculated RR, 2.69 (95% CI, 0.93 to 7.8)

**Appendix D Table 10. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Removal of Child From the Home, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Normal Social- Emotional Development, G1 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G2 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G3 No. (%)	Number of Participants Exhibiting Normal Social- Emotional Development, G4 No. (%)	Effect Estimate or Other Outcome Measure
Marcenko and Spence, 1994 <sup>120</sup>  Fair  Total N=225 mothers randomized (N analyzed=187)	Number of children formally placed out of the home through CPS; based on mothers' self- reporting <sup>‡</sup>	Approximately 10.5 months	3 (4)	10 (9)	NA	NA	Calculated RR, 2.33 (95% CI, 0.66 to 8.20)
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 mothers randomized (N analyzed=136)	Placement of an infant (plus or minus mother) into the care of the State as a result of a court order placed by Family and Children's Services staff or as a result of the mother's imprisonment <sup>¶</sup>	6 months	6 (8.5)	1 (1.5)	NA	NA	RR, 0.30 (95% CI, 0.09 to 1.02), p=0.038 <sup>§</sup>
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 mothers randomized (N analyzed=136)	Placement of an infant (plus or minus mother) into the care of the State as a result of a court order placed by Family and Children's Services staff or as a result of the mother's imprisonment <sup>¶</sup>	12 months	8 (11.3)	2 (3.1)	NA	NA	RR, 0.28 (95% CI, 0.07 to 0.97), p=0.038 <sup>§</sup>

\* Assessed for time period between 6 months and 12 months of age.

† Participants randomized were newborns, so age at followup is likely 18 months.

‡ At followup, the mothers were asked whether they had been involved with CPS and, if so, to describe the circumstances.

§ Number of events calculated based on N analyzed and percentage reported in Marcenko and Spence, 1994.<sup>120</sup>

¶ Before a child can be placed in foster care by the State, a substantiated risk of child abuse and neglect must be established.

¶ It is not clear from the original study publication whether the reported relative risk is for nonvoluntary foster care of the neonate or for the incidence of all adverse outcomes including neonatal death and nonaccidental injury.

**Abbreviations:** CI=confidence interval; CPS=child protective services; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; OR=odds ratio; RR=relative risk.

**Appendix D Table 11. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Removal of Child From the Home, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,772 families (N analyzed=2,707)	Number of days in out-of- home care	24 months	12.74 (NR)	15.21 (NR)	NA	NA	F, 0.262, p=0.430
Green et al, 2017 <sup>133</sup>  Fair  Total N=2,727 families (N analyzed=NR)	Number of days in out-of- home care (of those with at least one placement)	24 months	374.11 (NR)	348.31 (NR)	NA	NA	F, 0.624, p=0.430

**Abbreviations:** G=group; N=number; NA=not applicable; NR=not reported; SD=standard deviation.

**Appendix D Table 12. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Abuse or Neglect, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Brayden et al, 1993 <sup>113</sup>  Good  Total N=314 mothers randomized (N analyzed=263)	Neglect reports including abandonment, leaving a child with an inappropriate caretaker, gross failure to seek medical care, failure to provide shelter or nutrition, or gross failure to provide for normal intellectual development; identified from review of public agency documents from the Tennessee Department of Human Services	36 months	5 (4.1)*	15 (10.6)*	NA	NA	Calculated RR, 2.79 (95% CI, 0.98 to 7.91) <sup>†</sup>
Brayden et al, 1993 <sup>113</sup>  Good  Total N=314 mothers randomized (N analyzed=263)	Physically abusive actions including hitting with the hand or objects, biting, burning with objects or by immersion, twisting, shaking, throwing or pushing so as to cause a fall or hair pulling; identified from review of public agency documents from the Tennessee Department of Human Services for reports of physical and sexual abuse	36 months	8 (6.6)*	13 (9.2)*	NA	NA	Calculated RR, 1.45 (95% CI, 0.58 to 3.62)

**Appendix D Table 12. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Abuse or Neglect, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=945)	Safeguarding: any record in GP notes indicating the initiation, progression or closure of a safeguarding process (e.g. initial assessment, being identified as a child in need, child protection conference)	Child is 2 years	38 (8)	64 (13.6)	NA	NA	Adjusted OR, 1.85 (95% CI: 1.02 to 2.85)

\* Number of child abuse or neglect events calculated based on percentages reported in Brayden et al, 1993.<sup>113</sup>

† Closer hospital monitoring of HR intervention participants (G2) was found to be a potential confounding variable. By removing three participants from the analyses who had neglect reports made from the hospital, the percentage of neglect reports changed to 4.1% in G1 and 8.5% in G2; RR, 2.18 (95 % CI, 0.74 to 6.36), p=NS.

**Abbreviations:** CI=confidence interval; G=group; HR=high risk; KQ=key question; N=number; NA=not applicable; No.=number; NS=not statistically significant; OR=odds ratio; RR=relative risk.

**Appendix D Table 13. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Other Measures of Abuse or Neglect, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Safety Score, G1 (Control) Mean (SD)	Mean Safety Score, G2 Mean (SD)	Mean Safety Score, G3 Mean (SD)	Mean Safety Score, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Bugental and Schwartz, 2009 <sup>115</sup>  Fair  Total N=147 caretakers randomized (N analyzed=94)	Neglect of child safety (infants); based on Framingham Safety Survey about household hazards (e.g., exposed electrical outlets, crib sides left down, presence of windows lacking screens)	1 year	1.68 (NR)	1.72 (NR)	NA	NA	F(1,96)=4.94; p=0.03*

\* Multivariate test of significance with mean injury score and neglect of child safety yielded significant effect: F(2,95)=3.94; p=0.01;  $\eta^2=0.04$ .

**Abbreviations:** G=group; KQ=key question; N=number; NA=not applicable; NR=not reported; SD=standard deviation.



**Appendix D Table 14. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Injuries With a High Specificity for Abuse, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Injuries, G1 (Control) No. (%)	Number of Incident Injuries, G2 No. (%)	Number of Incident Injuries, G3 No. (%)	Number of Incident Injuries, G4 No. (%)	Effect Estimate or Other Outcome Measure
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 mothers randomized (N analyzed=136)	Severe nonaccidental injury: hospital admission as a result of an injury that was referred for independent investigation by the Family and Children's Services staff and concluded to have arisen as a result of a nonaccidental injury to the neonate	6 months	1 (1.41)	0 (0)	NA	NA	Calculated RR, 0.36 (95% CI, 0.015 to 8.77)

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; RR=relative risk.

**Appendix D Table 15. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	ED Visits, G1 (Control) No. (%)	ED Visits, G2 No. (%)	ED Visits, G3 No. (%)	ED Visits, G4 No. (%)	Effect Estimate or Other Outcome Measure
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 children (N analyzed=79)	Number of infants with acute care visits	18 months	36 (0.90)	29 (0.75)	NA	NA	RR, 0.83 (95% CI, 0.67 to 1.02)
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=268)	Child seen in emergency department; measure derived from medical records*	2 years	NR (78)	NR (81)	NA	NA	AOR, 1.23 (95% CI, 0.74 to 2.05), p=0.42
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Proportion of children seen in hospital for accident/injury or accidental poisoning (0 to 36 months); based on hospital record data on enrolled child attendances supplemented interview data	36 months	NR (26.3)	NR (17.5)	NA	NA	OR, for G2 vs. G1, 0.59 (95% CI, 0.36 to 0.98) Cohen's d, for G2 vs. G1, 0.22 (95% CI, 0.02 to 0.41) p<0.05
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=75)	ER use; based on hospital and project charts as well as parent report	6 months	3 (17)	3 (18)	3 (15)	1 (5)	Calculated RR, for G2 vs. G1, 1.06 (95% CI, 0.25 to 4.54) Calculated RR, for G3 vs. G1, 0.90 (95% CI, 0.21 to 3.91) Calculated RR, for G4 vs. G1, 0.30 (95% CI, 0.03 to 2.63) Reported p=0.637

**Appendix D Table 15. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	ED Visits, G1 (Control) No. (%)	ED Visits, G2 No. (%)	ED Visits, G3 No. (%)	ED Visits, G4 No. (%)	Effect Estimate or Other Outcome Measure
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=68) Finello et al, 1998 <sup>126</sup>  Fair	ER use; based on hospital and project charts as well as parent report	12 months	2 (11)	4 (27)	5 (31)	0 (0)	Calculated RR, for G2 vs. G1, 2.40 (95% CI, 0.51 to 11.34) Calculated RR, for G3 vs. G1, 2.81 (95% CI, 0.63 to 12.54) Calculated RR, for G4 vs. G1, 0.19 (95% CI, 0.10 to 3.71) Reported p=0.048 <sup>†</sup>
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Used ED in past year for injury	30 to 33 months	NR (9.1)	NR (9.3)	NA	NA	AOR: 0.94 (95% CI, 0.65 to 1.34, p=NS)
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,308)	Used ED in past year for injury	5 to 5.5 years	61 (10)	60 (9.2)	NA	NA	AOR, 0.96 (95% CI 0.73 to 1.27), p=0.61
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Used ED in past year	30 to 33 months	NR (NR)	NR (NR)	NA	NA	AOR: 1.21 (95% CI, 0.96 to 1.52), p=NS
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=1139 (N analyzed=743)	Number of ED visits for injuries or ingestions during the first 2 years of life	2 years	NR (34) [Log incidence, -1.10]	NR (33) [Log incidence, -1.12]	NA	NA	Log incidence difference, 0.02 (95% CI, -0.27 to 0.31), p>0.05

**Appendix D Table 15. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	ED Visits, G1 (Control) No. (%)	ED Visits, G2 No. (%)	ED Visits, G3 No. (%)	ED Visits, G4 No. (%)	Effect Estimate or Other Outcome Measure
Minkovitz et al, 2007 <sup>147</sup>  Fair  Total N=2,235 families* (N analyzed=1,308)	Used ED in past year for injury	5 to 5.5 years	61 (10.0)	60 (9.2)	NA	NA	AOR, 0.96 (95% CI, 0.73 to 1.27), p=0.61
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,486)	Visits to the ED through 6 months of age for injuries and ingestions	6 months	21 (2.8)	30 (4.1)	NA	NA	AOR, 1.52 (95% CI, 0.86 to 2.70), p=0.15
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,465)	Visits to the ED through 24 months of age for injuries and ingestions	24 months	207 (27.8)	222 (30.8)	NA	NA	AOR, 1.16 (95% CI, 0.92 to 1.46), p=0.20
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,478)	Visits to the ED or hospital admissions through 24 months of age	24 months	577 (76.6)	587 (81.0)	NA	NA	Unadjusted risk difference, 4.3% (97.5% CI, 0.2% to 8.5%); AOR, 1.32 (97.5% CI, 0.99 to 1.76), p=0.03
Sege et al, 2015 <sup>152</sup>  Fair  Total N=330 families randomized (N analyzed=258)	Proportion of infants who had at least 1 ED visit by 6 months of age	6 months	NR (49.7)	NR (36.5)	NA	NA	p=0.021

**Appendix D Table 15. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	ED Visits, G1 (Control) No. (%)	ED Visits, G2 No. (%)	ED Visits, G3 No. (%)	ED Visits, G4 No. (%)	Effect Estimate or Other Outcome Measure
Sege et al, 2015 <sup>152</sup>  Fair  Total N=330 families randomized (N analyzed=258)	Proportion of infants who had at least 1 ED visit by 12 months of age	12 months	NR (65.0)	NR (59.3)	NA	NA	p=0.40
Sege et al, 2015 <sup>152</sup>  Fair  Total N=330 families randomized (N analyzed=258)	Total number of ED visits	6 months	NR	NR	NA	NA	p=0.023 favoring intervention group
Sege et al, 2015 <sup>152</sup>  Fair  Total N=330 families randomized (N analyzed=258)	Total number of ED visits	12 months	NR	NR	NA	NA	p=0.08
Wiggins et al, 2004 <sup>130</sup> , Wiggins et al, 2005 <sup>148</sup>  Fair  Total N=731 mother- infant dyads (N analyzed=621)	Child had visits to accident and emergency department; based on parent self-report	12 months	83 (27)	46 (29)	40 (27)	NA	RR, for G2 vs. G1, 1.09 (95% CI, 0.80 to 1.48) RR, for G3 vs. G1, 1.00 (95% CI, 0.73 to 1.38)
Wiggins et al, 2004 <sup>130</sup> , Wiggins et al, 2005 <sup>148</sup>  Fair  Total N=731 mother- infant dyads (N analyzed=597)	Child had visits to accident and emergency department; based on parent self-report	18 months	56 (19)	28 (19)	35 (22)	NA	RR, for G2 vs. G1, 1.03 (95% CI, 0.68 to 1.54) RR, for G3 vs. G1, 1.18 (95% CI, 0.81 to 1.72)

\* Excludes three families with a fetal or infant death and families known to be out of town for >6 months in year 2.

## Appendix D Table 15. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes

† Although the reported p value suggests statistical significance, the calculated RRs have confidence intervals spanning the null.

‡ The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or check for eligibility. Among them, 2,235 children were enrolled into the study.

§ Nurse-visited children in G3 made 35% fewer visits to the ED than control (G1).

**Abbreviations:** AOR=adjusted odds ratio; CI=confidence interval; ED=emergency department; ER=emergency room; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; OR=odds ratio; RCT=randomized, controlled trial; RR=relative risk; vs.=versus.

**Appendix D Table 16. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 (Control) Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	Number of A&E infant visits at 12 months of age	12 months	0.83 (NR)	0.43 (NR)	NA	NA	p=0.10
Barnes 2017 <sup>132</sup>  Fair  Total N=166 randomized (N analyzed=141)	Hospital outpatient service contacts: A&E baby only from baseline to 2 months; reported as mean (SE)	2 months	0.22 (0.06)	0.25 (0.06)	NA	NA	Calculated mean difference, 0.19 (95% CI, 0.02 to 0.36)
Barnes 2017 <sup>132</sup>  Fair  Total N=166 randomized (N analyzed=129)	Hospital outpatient service contacts: A&E baby only from baseline to 12 months (whole followup period)	12 months	Mean 1.25 (SE: 0.26)	Mean 1.36 (SE: 0.26)	NA	NA	Calculated mean difference, 1.10 (95% CI, 0.35 to 1.85)
Duggan et al, 2007 <sup>116</sup>  Fair  Total N=364 families randomized (N analyzed=268)	Child seen in ED; measure derived from medical records and limited to families with complete medical record data <sup>†</sup>	2 years	4.09 (NR)	3.13 (NR)	NA	NA	Effect size, 0.24, p=0.31
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=75)	Number of ED visits per infant between 0 and 6 months corrected chronological age; based on hospital charts and parent report	6 months	NR (NR) <sup>†</sup>	NR (NR) <sup>†</sup>	NR (NR) <sup>†</sup>	NR (NR) <sup>†</sup>	Authors reported nonstatistically significant between group differences

**Appendix D Table 16. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=68)	Number of ED visits per infant between 6 and 12 months corrected chronological age; based on hospital charts and parent report	12 months	NR (NR) <sup>‡</sup>	NR (NR) <sup>‡</sup>	NR (NR) <sup>‡</sup>	NR (NR) <sup>‡</sup>	X <sup>2</sup> (3, n=68), 7.91, p=0.05
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers <sup>§</sup> (N analyzed=697)	Adjusted incidence of ED visits for injuries/ ingestions; summary variable created using medical records to count the total number of encounters	24 months	NR	NR (34) <sup>  </sup>	NR	NR (33) <sup>  </sup>	Log incidence difference for G4 vs. G2, 0.02 (95% CI, -0.27 to 0.31), p=NS
Larson et al, 1980 <sup>127</sup>  Fair  Total N=115 mother- infant dyads randomized (N analyzed=NR)	Cumulative ED visit rate per child; determined by number of ED visits in each group divided by the mean number of children in the study over the four assessment periods	18 months	1.05 (NR)	1.14 (NR)	NA	NA	p=NS for comparisons that include nonrandomized arm
McIntosh et al, 2009 <sup>136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=NR)	Mean number of A&E visits	12 months	0.83 (NR)	0.43 (NR)	NA	NA	Unclear <sup>  </sup>
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=292)	Mean number of ED visits; determined by review of records for the presence of verified cases of abuse or neglect from the department of social services, ED visits, and other medical visits	1 year	1.02 (NR)	1.12 (NR)	0.74 (NR)	NA	p=0.04 for both G2 vs. G1, and G3 vs. G1 <sup>#</sup>



**Appendix D Table 16. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=292)	Mean number of ED visits for accidents and poisonings; determined by review of records for the presence of verified cases of abuse or neglect from the department of social services, ED visits, and other medical visits	1 year	0.06 (NR)	0.12 (NR)	0.12 (NR)	NA	p>0.05 for G3 vs. G1**
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=260)	Mean number of ED visits; determined by review of records for the presence of verified cases of abuse or neglect from the department of social services, ED visits, and other medical visits	2 years	1.09 (NR)	1.04 (NR)	0.74 (NR)	NA	Mean difference, 0.35 (95% CI, 0.07 to 0.63), p=0.01
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=260)	Mean number of ED visits for accidents and poisonings; determined by review of records for the presence of verified cases of abuse or neglect from the department of social services, ED visits, and other medical visits	2 years	0.34 (NR)	0.32 (NR)	0.15 (NR)	NA	Mean difference 0.19 (95% CI, 0.2 to 0.36) p=0.03
Olds et al, 1994 <sup>143</sup>  Fair  Total N=400 families randomized (N analyzed=209)	ED visits for injuries/ingestions from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	NR (NR)	NR (NR)	NR (NR)	NA	No program effect (p>0.05)  No difference (p>0.05) seen in high-risk subgroup

**Appendix D Table 16. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1994 <sup>143</sup>  Fair  Total N=400 families randomized (N analyzed=293)	Total ED visits from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	1.53 (NR)	1.24 (NR)	1.00 (NR)	NA	Log incidence difference, 0.52 (95% CI, 0.21 to 0.81), p=0.0008 <sup>s</sup>
Olds et al, 1994 <sup>143</sup>  Fair  Total N=400 families randomized (N analyzed=293)	ED visits for accidents and poisonings from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	0.61 (NR)	0.46 (NR)	0.47 (NR)	NA	Log incidence difference, 0.37 (95% CI, -0.08 to 0.81), p>0.05
Siegel et al, 1980 <sup>122</sup>  Fair  Total N=321 mother-child dyads randomized (N analyzed=161)	Healthcare utilization, including ED visits; based on medical records and maternal report. Children were considered to have received services if so indicated by either source. <sup>††</sup>	12 months	30	11	13	34	p=NS
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother-infant dyads (N analyzed=623)	Mean number of A&E visits in previous 6 months; based on parent self-report	12 months	0.36 (0.70)	0.38 (0.71)	0.35 (0.67)	NA	Mean difference for G2 vs. G1, 0.03 (95% CI, -0.10 to 0.16) Mean difference for G3 vs. G1, 0.01 (95% CI, -0.14 to 0.12)

**Appendix D Table 16. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother– infant dyads (N analyzed=598)	Mean number of A&E visits in previous 6 months; based on parent self-report	18 months	0.23 (0.53)	0.22 (0.48)	0.29 (0.61)	NA	Mean difference for G2 vs. G1, -0.01 (95% CI, -0.11 to 0.10) Mean difference for G3 vs. G1, 0.06 (95% CI, -0.05 to 0.18)

\* Excludes three families with a fetal or infant death and families known to be out of town for >6 months in year 2.

† Between discharge and the time infants were 6 months CCA (age corrected for gestation), 15 infants in the control group had no ED visits and three infants made one visit to the ED. Data were missing for two infants in the control group. In the HH group, 14 infants had no ED visits, one had one visit, one had two visits, and one had six visits. Data were missing for four infants in the HH group. In the HV group, 17 infants had no ED visits, 2 had one visit, and one had two visits. In the HH/HV group, 19 infants had no ED visits and one child made one visit to the ED.

‡ Between 6 and 12 months CCA (age corrected for gestation), two infants in the control group visited the ED for acute illness. Four infants in the HH group visited the ED (three with one visit and one with four visits; all visits were for acute illness), five infants in the HV group visited the ED (two for illness, one for injury, one for unspecified reason, and one with three visits for acute illness). Nineteen infants in the HH/HV group had no ED visits. Overall mean number of ED visits was 0.25, range 0 to 4, SD=0.68.

§ Of the 1,139 mothers randomized, 743 were enrolled for followup.

¶ This is for G2 in the original study design.

¶¶ Authors reported nonsignificant p values. However, it is not clear whether the reported p values were for continuous A&E visit outcomes or for cost.

# p<0.05 for high-risk subgroup. Significant differences were found due to reduction in visits for upper respiratory tract infections. ED visits for accidents and poisoning in first year of life also reported; no difference found in all participants included in the analysis or in the high-risk subgroup.

†† Siegel et al<sup>122</sup> randomized neonates with no health problems to four arms (control, early and extended contact, home visits, early and extended contact plus home visits).

Neonates with delivery complications were in an observation nursery for 24 hours so did not receive early contact. They were subsequently randomized to extended contact and no visit. The analysis above combines the Ns for the control group and for the combination interventions as did the previous reports. These numbers are total events (means and SDs are not reported). The study reports no differences for six arms but does not provide standard deviations or other measures of dispersion to calculate individual effect sizes by arms.

**Abbreviations:** A&E=accident & emergency department; CCA=gestation-corrected chronological age; CI=confidence interval; ED=emergency department; G=group; HH= health home; HV=home visit; KQ=key question; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; SD=standard deviation; SE=standard error.

**Appendix D Table 17. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Guyer et al, 2003 <sup>129</sup>  Fair  Low income  Total N=545 (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (44.1)	NR (48.7)	NA	NA	ES=1.23, p=NS
Guyer et al, 2003 <sup>129</sup>  Fair  Middle income  Total N=678 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (31.6)	NR (35.6)	NA	NA	ES=1.16, p=NS
Guyer et al, 2003 <sup>129</sup>  Fair  High income  Total N=772 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (23.0)	NR (27.5)	NA	NA	ES=1.26, p=NS
Guyer et al, 2003 <sup>129</sup>  Fair  First-time mothers  Total N=749 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (35.7)	NR (38.3)	NA	NA	ES=1.11, p=NS

**Appendix D Table 17. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Guyer et al, 2003 <sup>129</sup>  Fair  ≥ Second-time or greater mothers  Total N=764 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (30)	NR (36.6)	NA	NA	ES=1.32, p=NS
Guyer et al, 2003 <sup>129</sup>  Fair  Maternal age < 20 years  Total N=216 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (45.2)	NR (45.4)	NA	NA	ES=0.84, p=NS
Guyer et al, 2003 <sup>129</sup>  Fair  Maternal age 20 to 29 years  Total N=805 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (36.5)	NR (42.2)	NA	NA	ES=1.36, p=NS
Guyer et al, 2003 <sup>129</sup>  Fair  Maternal age ≥ 30 years  Total N=571 families (N analyzed=NR)	One or more ED visit in past year	30 to 33 months	NR (26.6)	NR (27.2)	NA	NA	ES=1.17, p=NS

**Abbreviations:** ED=emergency department; ES=effect size; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; vs.=versus.

**Appendix D Table 18. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121</sup>  Fair  Low-income unmarried teens  Total N=NR (N analyzed=55)	Total number of ED visits from 13 to 24 months determined by review of pediatric and hospital records	2 years	1.27 (NR)	1.19 (NR)	0.90 (NR)	NA	Mean difference, 0.37 (95% CI, -0.03 to 1.04), p>0.05
Olds et al, 1986 <sup>121</sup>  Fair  Low-income unmarried teens  Total N=NR (N analyzed=63)	Number of ED visits for accidents and poisonings from 13 to 24 months determined by review of pediatric and hospital records	2 years	0.12 (NR)	0.07 (NR)	0.09 (NR)	NA	Mean difference, 0.07 (95% CI, -0.35 to 0.49), p>0.05
Olds et al, 1994 <sup>143</sup>  Fair  Low-income unmarried women  Total N=NR (N analyzed=119)	Total number of ED visits from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	1.72 (NR)	1.18 (NR)	1.18 (NR)	NA	Log incidence difference, 0.38 (95% CI, 0.01 to 0.75), p≤0.05

**Appendix D Table 18. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Emergency Department Visits, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1994 <sup>143</sup>  Fair  Low-income unmarried women  Total N=NR (N analyzed=119)	Total number of ED visits for injuries/ingestions from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	0.53 (NR)	0.45 (NR)	0.60 (NR)	NA	Log incidence difference, -0.12 (95% CI, -0.70 to 0.45), p>0.05

**Abbreviations:** CI=confidence interval; ED=emergency department; G=group; KQ=key question; N=number; NA=not applicable; NR=not reported; SD=standard deviation.

**Appendix D Table 19. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Hospitalization Events, G1 (Control) No. (%)	Hospitalization Events, G2 No. (%)	Hospitalization Events, G3 No. (%)	Hospitalization Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	Admissions to hospital (maternal report): Proportion of admissions of baby to hospital since birth; ascertained by health visitors	6 months*	NR (14.3)	NR (8.1)	NA	NA	RR, 1.38 (95% CI, 0.68 to 2.8)
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 infants randomized (N analyzed=79)	Hospitalizations were measured as the number of infants rehospitalized (cause of rehospitalization was not specified) after discharge from the hospital	14 days	5 (12.5)	4 (10.3)	NA	NA	Calculated RR, 0.82 (95% CI, 0.24 to 2.83)
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 infants randomized (N analyzed=79)	Hospitalizations were measured as the number of infants rehospitalized (cause of rehospitalization was not specified) after discharge from the hospital	18 months†	10 (25)	10 (25.6)	NA	NA	Calculated RR, 1.03 (95% CI, 0.48 to 2.19)
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=268)	Proportion of children with no hospitalizations during the study period	2 years	NR (58) <sup>‡</sup>	N (63) <sup>‡</sup>	NA	NA	AOR, 1.20 (95% CI, 0.58 to 2.48, p=0.63)



**Appendix D Table 19. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Hospitalization Events, G1 (Control) No. (%)	Hospitalization Events, G2 No. (%)	Hospitalization Events, G3 No. (%)	Hospitalization Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Admitted to hospital for child abuse or neglect	36 months	5 (2.4) <sup>§</sup>	2 (1.1) <sup>§</sup>	NA	NA	p=0.31 for intervention group vs. control group
Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=370)	Admitted to hospital for unintentional injury	9 years	NR (42.1)	NR (28.3)	NA	NA	Cohen's d, 0.29 (95% CI, 0.09 to 0.49), p<0.05
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=76)	Number of hospitalizations that are less than 24 hours in duration; based on hospital and project charts as well as parent report	6 months	2 (11)	3 (18)	1 (5)	0 (0)	p=0.226
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=70)	Number of hospitalizations that are less than 24 hours in duration; based on hospital and project charts as well as parent report	12 months	1 (6)	3 (15)	2 (14)	0 (0)	p=0.197
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=77)	Number of hospitalizations that are more than 24 hours in duration; based on hospital and project charts as well as parent report	6 months	5 (26)	9 (50)	5 (25)	1 (5)	p=0.017

**Appendix D Table 19. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Hospitalization Events, G1 (Control) No. (%)	Hospitalization Events, G2 No. (%)	Hospitalization Events, G3 No. (%)	Hospitalization Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=68)	Number of hospitalizations that are more than 24 hours in duration; based on hospital and project charts as well as parent report	12 months	0 (0)	4 (27)	4 (25)	2 (11)	p=0.085
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=743)	Number of children hospitalized for injuries or ingestions; based on medical records review	2 years of age	NA	3 (1.3) <sup>†</sup>	NA	13 (2.5) <sup>†</sup>	Log incidence difference, 0.68 (95% CI, -0.66 to 2.02), p=NS
Minkovitz et al, 2007 <sup>147</sup>  Fair  Total N=2,235 families <sup>‡</sup> (N analyzed=1,308)	Hospital visits in the past year	5 to 5.5 years	21 (4)	21 (3)	NA	NA	AOR, 0.96 (95% CI, 0.51 to 1.79), p=0.81
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,487)	Hospital admissions through 6 months of age for injuries and ingestions	6 months	18 (2.4)	14 (1.9)	NA	NA	AOR, 0.79 (95% CI, 0.39 to 1.60), p=0.51
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,467)	Hospital admissions through 24 months of age for injuries and ingestions	24 months	49 (6.6)	35 (4.8)	NA	NA	AOR, 0.72 (95% CI, 0.46 to 1.12), p=0.15

**Appendix D Table 19. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Hospitalization Events, G1 (Control) No. (%)	Hospitalization Events, G2 No. (%)	Hospitalization Events, G3 No. (%)	Hospitalization Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  Fair  Total N=1,645 randomized (N analyzed=1,157)	At least one hospital admission through 6 years of age for injuries and ingestions	6 years	99 (13.0)	89 (11.7)	NA	NA	AOR, 0.87 (95% CI, 0.63 to 1.20)  Absolute risk difference, -1.3 (95% CI, -4.7 to 2.0)
Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  Fair  Total N=1,645 randomized (N analyzed=1,157)	Hospital admission through 6 years of age for injuries and ingestions	6 years	119 (NR)	109 (NR)	NA	NA	NR
Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  Fair  Total N=1,645 randomized (N analyzed=1,157)	Hospital attendance and/or admission through 6 years of age for injuries and ingestions	6 years	435 (57.3)	454 (59.7)	NA	NA	AOR, 1.11 (95% CI, 0.89 to 1.37)  Absolute risk difference, 2.4 (95% CI, -2.5 to 7.4)
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother– infant dyads (N analyzed=652)	Overnight hospital stays in the previous 6 months	12 months	19 (6)	13 (8)	13 (8)	NA	RR for G2 vs. G1, 1.36 (95% CI, 0.69 to 2.68) RR for G3 vs. G1, 1.38 (95% CI, 0.70 to 2.72)

**Appendix D Table 19. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Hospitalization Events, G1 (Control) No. (%)	Hospitalization Events, G2 No. (%)	Hospitalization Events, G3 No. (%)	Hospitalization Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother– infant dyads (N analyzed=597)	Overnight hospital stays in the previous 6 months	18 months	13 (4)	7 (5)	6 (4)	NA	RR for G2 vs. G1, 1.11 (95% CI, 0.45 to 2.70) RR for G3 vs. G1, 0.87 (95% CI, 0.34 to 2.25)

\* Assessed for time period between birth and 6 months of child’s age.

† Participants randomized were newborns, so age at followup is likely 18 months.

‡ Number of events differs from those reported in Duggan et al, 2007<sup>116</sup> because the latter was focused on hospitalizations for ambulatory-care sensitive conditions.

§ Percentage calculated based on number of events reported and N analyzed.

<sup>1</sup> The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or check for eligibility. Among them, 2,235 children were enrolled into the study.

**Abbreviations:** AOR=adjusted odds ratio; CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; RCT=randomized, controlled trial; RR=relative risk; vs.=versus.

**Appendix D Table 20. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 (Control) Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	Median days stayed in hospital; ascertained by health visitors	6 months*	4 (1.1)	3 (8.7)	NA	NA	p=NS
Barnes 2017 <sup>132</sup>  Fair  Total N=166 randomized (N analyzed=141)	Hospital inpatient admissions only from baseline to 2 months; reported as mean (SE)	2 months	Special care baby unit: 0.02 (0.02)  High-dependency unit: 0 (0)  Neonatal intensive care unit: 0.05 (0.03)  Children's ward: 0 (0)  Other: 0.25 (0.06)	Special care baby unit: 0.04 (0.02)  High-dependency unit: 0 (0)  Neonatal intensive care unit: 0.02 (0.02)  Children's ward: 0 (0)  Other: 0.14 (0.04)	NA	NA	Calculated mean difference (95% CI)  Special care baby unit: 0.02 (-0.04 to 0.08)  High-dependency unit: NA  Children's ward: NA  Neonatal intensive care unit: -0.03 (-0.10 to 0.04)  Children's ward: NA  Other: -0.11 (-0.25 to 0.03)

**Appendix D Table 20. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 (Control) Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Barnes 2017 <sup>132</sup>  Fair  Total N=166 randomized (N analyzed=129)	Hospital inpatient admissions other from baseline to 12 months; reported as mean (SE)	12 months	Special care baby unit: 0.02 (0.02)  High-dependency unit: 0.17 (0.05)  Neonatal intensive care unit: 0.13 (0.05)  Children's ward: 0.17 (0.05)  Other: 0.27 (0.07)	Special care baby unit: 0.04 (0.02)  High-dependency unit: 0.13 (0.04)  Neonatal intensive care unit: 0.09 (0.30)  Children's ward: 0.03 (0.02)  Other: 0.16 (0.05)	NA	NA	Calculated mean difference (95% CI)  Special care baby unit: -0.01 (-0.10 to 0.08)  High-dependency unit: 0.08 (-0.04 to 0.20)  Children's ward: -0.14 (-0.23 to -0.05)  Neonatal intensive care unit: -0.04 (-0.76 to 0.68)  Other: -0.11 (-0.27 to 0.05)
Finello et al, 1998 <sup>126</sup>  Fair  Total N=81 infants randomized (N analyzed=77)	Mean number of hospitalizations; based on hospital and project charts as well as parent report	0 to 6 months	NR (NR) <sup>†</sup>	NR (NR) <sup>†</sup>	NA	NA	NR
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=743)	The number of days that children were hospitalized and in which injuries or ingestions were noted	2 years of age	0.18 (NR)	0.04 (NR)	NA	NA	Log incidence difference: 1.64 (0.78 to 2.50), $p < 0.01$

**Appendix D Table 20. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 (Control) Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers randomized (N analyzed=NR)	Incidence of hospital admissions for injuries or ingestions (log incidence), adjusted for maternal psychological resources, discretionary household income, and poverty level of census tract	24 months	NR	0.03 (-3.63)	NR	0.01 (-4.31)	Log incidence difference for G4 vs. G2, 0.68 (95% CI, -0.66 to 2.02)
Olds et al, 1994 <sup>143</sup>  Fair  Total N=400 families randomized (N analyzed=209)	Adjusted <sup>‡</sup> means (log incidence) of number of hospital admissions; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	0.11(-5.40)	0.11 (-2.27)	0.14 (-5.30)	NA	Log incidence difference for G3 vs. G1, <sup>§</sup> 0.10 (95% CI, -0.17 to 0.17), p>0.05
Olds et al, 1994 <sup>143</sup>  Fair  Total N=400 families randomized (N analyzed=209)	Adjusted <sup>‡</sup> means (log incidence) of number of days hospitalized; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	0.31 (-1.46)	0.43 (-1.22)	0.49 (-0.80)	NA	Log incidence difference for G3 vs. G1, <sup>§</sup> -0.66 (95% CI, -1.21 to -0.13), p<0.05
Olds et al, 1994 <sup>143</sup>  Fair  Total N=400 families randomized (N analyzed=293)	Number of hospital admissions from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	0.11 (NR)	0.11 (NR)	0.14 (NR)	NA	Log incidence difference, 0.10 (95% CI, -0.17 to 0.17), p>0.05

**Appendix D Table 20. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 (Control) Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 (N analyzed=136)	Number of hospital admissions at 18 months resulting from injury referred for independent investigation by the Family and Children's Services staff and concluded to have arisen as a result of a nonaccidental injury to the neonate	18 months	1 (1.4)	0 (0)	NA	NA	Calculated RR, 0.37 (95% CI, 0.015 to 8.91)
Siegel et al, 1980 <sup>122</sup>  Fair  Total N=321 mother-child dyads randomized (N analyzed=NR)	Total number of hospitalizations; children were considered to have received services if so indicated by either medical records or maternal report	12 months	10 <sup>l</sup>	4 <sup>l</sup>	1 <sup>l</sup>	8 <sup>l</sup>	p=NS
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother-infant dyads (N analyzed=652)	Mean number of inpatient episodes in previous 6 months; based on parent self-report	12 months	0.07 (0.31)	0.08 (0.35)	0.06 (0.24)	NA	Mean difference for G2 vs. G1, 0.01 (95% CI, -0.05 to 0.08) Mean difference for G3 vs. G1, 0.01 (95% CI, -0.06 to 0.04)
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother-infant dyads (N analyzed=652)	Mean number of inpatient days; based on parent self-report	12 months	0.73 (10.1)	0.18 (1.02)	0.25 (1.35)	NA	Mean difference for G2 vs. G1, 0.55 (95% CI, -2.18 to 0.13) Mean difference for G3 vs. G1, 0.48 (95% CI, -1.95 to 0.25)
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother-infant dyads (N analyzed=596)	Mean number of inpatient episodes in previous 6 months; based on parent self-report	18 months	0.04 (0.21)	0.06 (0.31)	0.05 (0.24)	NA	Mean difference for G2 vs. G1, 0.01 (95% CI, -0.04 to 0.06) Mean difference for G3 vs. G1, 0.001 (95% CI, -0.04 to 0.04)



**Appendix D Table 20. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Mean Number of Episodes in G1 (Control) Mean (SD)	Mean Number of Episodes in G2 Mean (SD)	Mean Number of Episodes in G3 Mean (SD)	Mean Number of Episodes in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Wiggins et al, 2004 <sup>130</sup>  Fair  Total N=731 mother– infant dyads (N analyzed=596)	Mean number of inpatient days; based on parent self-report	18 months	0.07 (0.42)	0.21 (1.35)	0.17 (1.04)	NA	Mean difference for G2 vs. G1, 0.14 (95% CI, -0.01 to 0.44) Mean difference for G3 vs. G1, 0.10 (95% CI, -0.03 to 0.32)

\* Assessed for time period between birth and 6 months of child’s age.

† Mean number of hospitalizations was 0.43 (SD=0.92; range, 0 to 4) with an average number of days hospitalized at 2.75 (SD=8.64; range 0 to 54).

‡ For marital status, social class, and all interactions, plus maternal sense of control, husband/boyfriend support, and age.

§ No difference (p>0.05) between nurse-visited children and comparison-group children for total sample and high-risk subgroup as well.

¶ These numbers are total events (means and SDs are not reported).

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; RR=relative risk; SD=standard deviation; SE=standard error.

**Appendix D Table 21. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Guyer et al, 2003 <sup>129,147</sup>  Fair  Low income  Total N=545 (N analyzed=NR)	Percentage of children with one or more overnight hospitalization in past year	30 to 33 months	8.4 (NR)	10.8 (NR)	NA	NA	ES=1.39, p=NS
Guyer et al, 2003 <sup>129,147</sup>  Fair  Middle income  Total N=678 families (N analyzed=NR)	Percentage of children with one or more overnight hospitalization in past year	30 to 33 months	6.3 (NR)	6.6 (NR)	NA	NA	ES=1.07, p=NS
Guyer et al, 2003 <sup>129,147</sup>  Fair  High income  Total N=772 families (N analyzed=NR)	Percentage of children with one or more overnight hospitalization in past year	30 to 33 months	4.6 (NR)	6.5 (NR)	NA	NA	ES=1.54, p=NS
Guyer et al, 2003 <sup>129,147</sup>  Fair  Maternal age <20 years  Total N=216 families (N analyzed=NR)	Percentage of children with one or more overnight hospitalization in past year	30 to 33 months	9.7 (NR)	6.4 (NR)	NA	NA	ES=0.67, p=NS

**Appendix D Table 21. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Guyer et al, 2003 <sup>129,147</sup>  Fair  Maternal ages 20 to 29 years  Total N=805 families (N analyzed=NR)	Percentage of children with one or more overnight hospitalization in past year	30 to 33 months	6.2 (NR)	9.6 (NR)	NA	NA	ES=1.76, p=NS
Guyer et al, 2003 <sup>129,147</sup>  Fair  Maternal age ≥ 30 years  Total N=571 families (N analyzed=NR)	Percentage of children with one or more overnight hospitalization in past year	30 to 33 months	5.7 (NR)	5.7 (NR)	NA	NA	ES=1.06, p=NS

**Abbreviations:** ES=effect size; G=group; KQ=key question; N=number; No.=number; NR=not reported; NS=not significant

**Appendix D Table 22. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Hospitalization, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1994 <sup>143</sup>  Fair  Low-income unmarried women  Total N=NR (N analyzed=119)	Number of hospital admissions from 25 to 50 months of life; determined by review of pediatric and hospital records for the period spanning 25 to 50 months of age	4 years	0.18 (NR)	0.22 (NR)	0.16 (NR)	NA	Log incidence difference for high- risk subgroup, 0.10 (95% CI, -1.00 to 1.20), p>0.05

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NR=not reported; SD=standard deviation.

**Appendix D Table 23. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Failure to Thrive, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Events, G1 (Control) No. (%)	Number of Incident Events, G2 No. (%)	Number of Incident Events, G3 No. (%)	Number of Incident Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 infants randomized (N analyzed=79)	Neglect measured by incidence of failure to thrive; method of ascertainment not reported	18 months*	1 (2.5)	0 (0)	NA	NA	Calculated RR, 0.34 (95% CI, 0.01 to 8.14)

\* Participants randomized were newborns, so age at followup is likely 18 months.

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; RR=relative risk.

**Appendix D Table 24. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Failure to Immunize, Categorical Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Events, G1 (Control) No. (%)	Number of Incident Events, G2 No. (%)	Number of Incident Events, G3 No. (%)	Number of Incident Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 mothers randomized (N analyzed=136)	No vaccination; based on parent self-report	6 months	9 (14.5)	4 (5.6)	NA	NA	Calculated RR, 0.41 (95% CI, 0.13 to 1.26)

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; RR=relative risk.

**Appendix D Table 25. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G1 (Control) No. (%)	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G2 No. (%)	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G3 No. (%)	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G4 No. (%)	Effect Estimate or Other Outcome Measure
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	Percentage of participants with a normal CBCL internalizing score	2 years	NR (79)	NR (87)	NA	NA	AOR, 2.06 (95% CI, 1.31 to 3.25), p<0.01
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	Percentage of participants with a normal CBCL externalizing score	2 years	NR (77)	NR (82)	NA	NA	AOR, 1.48 (95% CI, 1.14 to 1.94), p<0.01
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Percentage of children more aggressive; based on CBCL score ≥14, completed during parent interview	30 to 33 months	NR (14.6)	NR (17.0)	NA	NA	AOR, 1.20 (95% CI, 0.89 to 1.61, p>0.05)
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Percentage of children more anxious or depressed; based on CBCL score ≥9, completed during parent interview	30 to 33 months	NR (9.0)	NR (10.5)	NA	NA	AOR, 1.35 (95% CI, 0.93 to 1.95), p>0.05
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA externalizing	6 months	(36.5)	(22.8)	NA	NA	p=NS

**Appendix D Table 25. Benefits of Primary Care Interventions for Child Maltreatment (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G1 (Control) No. (%)	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G2 No. (%)	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G3 No. (%)	Number of Participants Exhibiting Internalizing, Externalizing, or Both Behavioral Problems, G4 No. (%)	Effect Estimate or Other Outcome Measure
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA externalizing	12 months	(29.1)	(17.0)	NA	NA	p<0.05
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA internalizing	6 months	(1.6)	(3.5)	NA	NA	p=NS
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA internalizing	12 months	(1.8)	(1.9)	NA	NA	p=NS
Minkovitz et al, 2007 <sup>147</sup>  Fair  Total N=2,235 families* (N analyzed=1,308)	Clinical/borderline concern regarding child's behavior; based on CBCL	5.5 years	100 (16.5)	132 (20.2)	NA	NA	AOR, 1.26 (95% CI, 0.94 to 1.69), p=0.09

\* The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or before they were checked for eligibility. Among them, 2,235 children were enrolled into the study.

**Abbreviations:** AOR=adjusted odds ratio; CBCL=Child Behavior Checklist; CI=confidence interval; G=group; ITSEA=Infant-Toddler Social and Emotional Adjustment Scale; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; RCT=randomized, controlled trial.



**Appendix D Table 26. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=NR)	Behavior problems total scores as measured by the Achenbach CBCL completed by mothers	24 months	NA	49.2 (NR)	NA	46.0 (NR)	Mean difference for G2 vs. G4, 3.2 (95% CI, -0.6 to 7.0), p=NS
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=NR)	Conduct failures, grades 1 to 3	Child age 9 years	NA	0.1 (NR)	NA	0.06 (NR)	Incidence ratio, 0.56 (95% CI, -1.26 to 0.11), p=0.91
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=NR)	Depressive and anxiety disorders	Child age 9 years	NA	0.19 (NR)	NA	0.12 (NR)	Incidence ratio, 0.64 (95% CI, -0.99 to 0.11), p=0.116
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=NR)	Disruptive behavior disorders	Child age 9 years	NA	0.31 (NR)	NA	0.36 (NR)	Incidence ratio, 1.15 (95% CI, -0.19 to 0.47), p=0.417
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=NR)	Behavior problems total score (Achenbach CBCL)	24 months	NA	49.2 (NR)	NA	46 (NR)	Mean difference, 3.2 (95% CI, -0.6 to 7.0), p=NS
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	CBCL internalizing score	2 years	51 (NR)	48.2 (NR)	NA	NA	Effect size, 0.36 (95% CI, -4.2 to -1.5), p<0.01

**Appendix D Table 26. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	CBCL externalizing score	2 years	53 (NR)	50.8 (NR)	NA	NA	Effect size, 0.28 (95% CI, -5.0 to 0.5), p=0.09
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=897)	Rule-breaking behaviors; measured by CBCL, completed by mothers	7 years	2.66 (NR)	2.74 (NR)	NA	NA	Effect size, 0.03, p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=897)	Aggressive behaviors; measured by CBCL, completed by mothers	7 years	6.72 (NR)	6.99 (NR)	NA	NA	Effect size, 0.04, p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=897)	Anxious depressed behaviors; measured by CBCL, completed by mothers	7 years	2.97 (NR)	2.89 (NR)	NA	NA	Effect size, -0.03, p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers randomized (N analyzed=897)	Withdrawn depressed behaviors; measured by CBCL, completed by mothers	7 years	1.54 (NR)	1.47 (NR)	NA	NA	Effect size, -0.04, p=NS
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Mean externalizing score; externalizing behaviors assessed using ITSEA; scaled to a mean of 10 and SD of 1	36 months	10.09 (NR)	9.9 (NR)	NA	NA	OR, 0.09 (95% CI, -0.01 to 0.19) Cohen's d, 0.19 (95% CI, -0.01 to 0.39), p<0.07

**Appendix D Table 26. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Mean internalizing score; internalizing behaviors assessed using ITSEA; scaled to a mean of 10 and SD of 1	36 months	10.12 (NR)	9.86 (NR)	NA	NA	OR, 0.13 (95% CI, 0.03 to 0.23) Cohen's d, 0.26 (95% CI, 0.06 to 0.47), p<0.01
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Mean total behavior score; calculated by summing the externalizing and internalizing scores	36 months	10.11 (NR)	9.87 (NR)	NA	NA	OR 0.12 (95% CI, 0.02 to 0.22) Cohen's d, 0.24 (95% CI, 0.04 to 0.44), p<0.05
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  Fair  Total N=443 families randomized (N analyzed=391)	Mean total parent- reported SDQ score, assesses child behavior domains including externalizing behaviors (conduct problems and hyperactivity/inattention) and internalizing behaviors (emotionality and peer difficulties) during the 6 months before assessment	5, 6, 9 years	10.08 (NR)	9.91 (NR)	NA	NA	Cohen's d, 0.17 (95% CI, 0.06-0.29), p<0.05
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Aggressive behavior measured on the CBCL	30 to 33 months	8.4 (5.0)	8.7 (5.1)	NA	NA	Adjusted OR, 0.23 (95% CI, -0.29 to 0.75), p=NS <sup>§</sup>
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Anxious depressed behaviors measured on the CBCL	30 to 33 months	4.7 (2.8)	4.8 (2.9)	NA	NA	Adjusted OR, 0.13 (95% CI, -0.16 to 0.41), p=NS <sup>§</sup>

**Appendix D Table 26. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA externalizing	6 months	18.4 (9.4)	15.4 (7.6)	NA	NA	F-value, 2.61 Effect size, 0.037 p=NS
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA externalizing	12 months	18.4 (9.6)	13.8 (7.6)	NA	NA	F-value, 7.08 Effect size, 0.094 p<0.05
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA internalizing	6 months	15.8 (6.3)	15.4 (7.9)	NA	NA	F-value, 0.47 Effect size, 0.007 p=NS
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	ITSEA internalizing	12 months	14.6 (7.0)	13.1 (5.9)	NA	NA	F-value, 1.07 Effect size, 0.015 p=NS

\* Of the 1,139 mothers randomized, 743 were enrolled for followup.

† This is the high prevention opportunity (HPO) subgroup: first-time mothers <19 years enrolled at 30 weeks pregnant or less.

‡ The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or before they were checked for eligibility. Among them, 2,235 children were enrolled into the study.

§ Authors reported that the intervention group was more likely to report some types of problem behaviors.

**Abbreviations:** CBCL=Child Behavior Checklist; CI=confidence interval; G=group; HPO=high prevention opportunity; ITSEA=Infant-Toddler Social and Emotional Adjustment Scale; KQ=key question; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; OR=odds ratio; RCT=randomized, controlled trial. SD=standard deviation; SDQ=Strengths and Difficulties Questionnaire.

**Appendix D Table 27. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Anxious depressed behaviors as measured by the CBCList completed by mothers*	Year 7	2.80 (NR)	2.64 (NR)	NA	NA	Effect size, -0.12, p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Withdrawn depressed behaviors as measured by the CBCL completed by mothers*	Year 7	1.35 (NR)	1.16 (NR)	NA	NA	Effect size, -0.13, p=NS

**Appendix D Table 27. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Social problems as measured by the CBCL completed by mothers*	Year 7	1.25 (NR)	0.93 (NR)	NA	NA	Effect size, -0.23, p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Rule-breaking behaviors as measured by the CBCL completed by mothers*	Year 7	2.90 (NR)	2.38 (NR)	NA	NA	Effect size, -0.23, p=NS

**Appendix D Table 27. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Decreased Internalizing, Externalizing, or Internalizing and Externalizing Behaviors, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Aggressive behaviors as measured by the CBCL completed by mothers*	Year 7	6.76 (NR)	6.06 (NR)	NA	NA	Effect size, -0.12, p=NS

\* Analyses control for being Black respondent.

**Abbreviations:** CBCL=Child Behavior Checklist; G=group; KQ=key question; N=number; NA=not applicable; NR=not reported; NS=not significant; SD=standard deviation.

**Appendix D Table 28. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Other Social, Emotional, or Developmental Problems, G1 (Control) No. (%)	Number of Participants Exhibiting Other Social, Emotional, or Developmental Problems, G2 No. (%)	Number of Participants Exhibiting Other Social, Emotional, or Developmental Problems, G3 No. (%)	Number of Participants Exhibiting Other Social, Emotional, or Developmental Problems, G4 No. (%)	Effect Estimate or Other Outcome Measure
Guyet et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Percentage of children with more problems sleeping; based on score ≥6 on CBCL item on sleep problems	30 to 33 months	NR (12.2)	NR (15.3)	NA	NA	AOR, 1.37 (95% CI, 1.01 to 1.86), p<0.05

\* The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or before they were checked for eligibility. Among them, 2,235 children were enrolled into the study.

**Abbreviations:** AOR=adjusted odds ratio; CBCL=Child Behavior Checklist; CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; RCT=randomized, controlled trial.



**Appendix D Table 29. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112,136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=131)	ITSEA; based on BITSEA competence and problems subscales	12 months	NR (NR)	NR (NR)	NR (NR)	NR (NR)	p=NS
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers (N analyzed=897)	Attention problems as measured by the CBCL completed by mothers	7 years	4.75 (NR)	4.77 (NR)	NA	NA	Effect size, 0.01, p=NS/NR
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers (N analyzed=897)	Social problems as measured by the CBCL completed by mothers	7 years	1.15 (NR)	1.31 (NR)	NA	NA	Effect size, -0.04, p=NS/NR
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Sleep problems as measured by the CBCL completed by mothers	30 to 33 months	2.7 (2.3)	2.9 (2.5)	NA	NA	AOR, 0.12 (95% CI, -0.13 to 0.36), p=NS/NR
Guyer et al, 2003 <sup>129</sup>  Fair  Total N=2,235 families* (N analyzed=1,593)	Sleep problems: percentage of children who meet the cutoff based on CBCL scores (completed by mothers)	30 to 33 months	12.2%	NA	15.3%	NA	AOR: 1.37, 95% CI, 1.01 – 1.86, p<0.05
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=131)	Child social–emotional/behavioral problems assessed with ITSEA dysregulation domain. Dysregulation items included sleep, eating, sensory sensitivities, and negative emotionality	6 months	21.4 (8.1)	18.4 (9.2)	NA	NA	F-value, 1.45 Effect size (Partial <sup>2</sup> ), 0.021, p=NS/NR

**Appendix D Table 29. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	Child social-emotional/behavioral problems assessed with ITSEA dysregulation domain. Dysregulation items included sleep, eating, sensory sensitivities, and negative emotionality	12 months	20.7 (8.9)	16.4 (7.8)	NA	NA	F-value, 3.82 Effect size (Partial <sup>2</sup> ), 0.053, p=NS/NR
Minkovitz et al, 2007 <sup>147</sup>  Fair  Total N=2,235 families* (N analyzed=1,308)	Child's social skills measured by the Social Skills Rating System based on parental report	5 to 5.5 years	55.2 (10.0)	55.9 (9.8)	NA	NA	p=0.40
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers† (N analyzed=594)	Conduct grades for grades 1 to 3, based on school records; reported as mean (SE)	9 years	NA	2.68 (0.04)	NA	2.71 (0.07)	Effect size, 0.03 (95% CI, -0.11 to 0.17), p=0.673
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers† (N analyzed=558)	Antisocial behavior in grade 3; based on teacher reports of classroom behavior using items from the Social Competence Scale and Social Health Profile from the Fast Track trial and the Teacher Observation of Child Adjustment Revised; reported as mean (SE)	9 years	NA	100.08 (0.51)	NA	99.77 (0.77)	Effect size, -0.03 (95% CI, -0.21 to 0.15), p=0.742
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers† (N analyzed=558)	Academically focused behavior in grade 3; based on teacher reports of classroom behavior using items from the Social Competence Scale and Social Health Profile from the Fast Track trial and the Teacher Observation of Child Adjustment Revised; reported as mean (SE)	9 years	NA	100.08 (0.51)	NA	100.10 (0.77)	Effect size, 0.00 (95% CI, -0.18 to 0.18), p=0.981

**Appendix D Table 29. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers <sup>†</sup> (N analyzed=558)	Peer affiliation in grade 3; based on teacher reports of classroom behavior using items from the Social Competence Scale and Social Health Profile from the Fast Track trial and the Teacher Observation of Child Adjustment Revised; reported as mean (SE)	9 years	NA	99.92 (0.51)	NA	100.35 (0.77)	Effect size, 0.04 (95% CI, -0.14 to 0.23), p=0.643

\* The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or before they were checked for eligibility. Among them, 2,235 children were enrolled into the study.

<sup>†</sup> Of the 1,139 mothers randomized, 743 were enrolled for followup.

**Abbreviations:** AOR=adjusted odds ratio; BITSEA=Brief Infant-Toddler Social and Emotional Assessment; CBCL=Child Behavior Checklist; CI=confidence interval; G=group; ITSEA=Infant-Toddler Social and Emotional Adjustment Scale; KQ=key question; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; RCT=randomized, controlled trial; SD=standard deviation; SE=standard error.

**Appendix D Table 30. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Attention problems as measured by the CBCL completed by mothers	7 years	5.31 (NR)	4.33 (NR)	NA	NA	Effect size, -0.24, p=NS/NR
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  Total N=NR (N analyzed=132)	Social problems as measured by the CBCL completed by mothers	7 years	1.25 (NR)	0.93 (NR)	NA	NA	Effect size, -0.23, p=NS/NR

**Appendix D Table 30. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 2007 <sup>141</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Conduct grades for grades 1 to 3, based on school records; reported as mean (SE)	9 years	NA	2.65 (0.06)	NA	2.68 (0.09)	Effect size, 0.03 (95% CI, -0.16 to 0.22), p=0.749
Olds et al, 2007 <sup>141</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Antisocial behavior in grade 3; based on teacher reports of classroom behavior using items from the Social Competence Scale and Social Health Profile from the Fast Track trial and the Teacher Observation of Child Adjustment Revised; reported as mean (SE)	9 years	NA	100.17 (0.71)	NA	100.18 (1.06)	Effect size, 0.00 (95% CI, -0.25 to 0.25), p=0.994

**Appendix D Table 30. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Social, Emotional, and Developmental Problems Not Otherwise Categorized, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 2007 <sup>141</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Academically focused behavior in grade 3; based on teacher reports of classroom behavior using items from the Social Competence Scale and Social Health Profile from the Fast Track trial and the Teacher Observation of Child Adjustment Revised; reported as mean (SE)	9 years	NA	98.70 (0.70)	NA	99.59 (1.05)	Effect size, 0.09 (95% CI, -0.15 to 0.33), p=0.471
Olds et al, 2007 <sup>141</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Peer affiliation in grade 3; based on teacher reports of classroom behavior using items from the Social Competence Scale and Social Health Profile from the Fast Track trial and the Teacher Observation of Child Adjustment Revised; reported as mean (SE)	9 years	NA	99.37 (0.70)	NA	99.56 (1.06)	Effect size, 0.02 (95% CI, -0.23 to 0.26), p=0.882

**Abbreviations:** CBCL=Child Behavior Checklist; CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; SD=standard deviation; SE=standard error.

**Appendix D Table 31. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Healthy Social–Emotional Development Based on Bayley Scales of Infant Development, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Normal Social– Emotional Development, G1 (Control) No. (%)	Number of Participants Exhibiting Normal Social– Emotional Development, G2 No. (%)	Number of Participants Exhibiting Normal Social– Emotional Development, G3 No. (%)	Number of Participants Exhibiting Normal Social– Emotional Development, G4 No. (%)	Effect Estimate or Other Outcome Measure
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	Healthy development, reported as percentage of participants scoring ≥85 on the BSID MDI	2 years	NR (48)	NR (58)	NA	NA	AOR,* 1.55 (95% CI, 1.01 to 2.37), p<0.05 Unadjusted, calculated OR, 1.50 (95% CI, 0.91 to 2.47)
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N with baseline data =325, N analyzed=249)	Healthy development, reported as percentage of participants scoring ≥85 on the BSID PDI	2 years	NR (80)	NR (85)	NA	NA	AOR,* 1.36 (95% CI, 0.72 to 2.58), p=0.35

\* Adjusted for variables on which the two groups differed: poor psychological resources and prenatal enrollment.

**Abbreviations:** AOR=adjusted odds ratio; BSID=Bayley Scales of Infant Development; CI=confidence interval; G=group; KQ=key question; MDI=Mental Development Index; NA=not applicable; No.=number; NR=not reported; PDI=Psychomotor Development Index.

**Appendix D Table 32. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Healthy Social–Emotional Development Based on Bayley Scales of Infant Development, Continuous Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  Fair  Total N=131 caregivers randomized (N analyzed=122)	Infant development, based on BSID	12 months	NR (NR)	NR (NR)	NA	NA	p=NS
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	Mean score on Bayley Scales MDI	2 years	84.8 (NR)	88.0 (NR)	NA	NA	Effect size, 0.29, p<0.05 Mean difference, 3.2 (95% CI, 1.2 to 5.2)
Caldera et al, 2007 <sup>137</sup>  Fair  Total N=364 families randomized (N analyzed=249)	Mean score on Bayley Scales PDI	2 years	96.0 (NR)	98.1 (NR)	NA	NA	Effect size, 0.19, p=0.16 Mean difference, 2.1 (95% CI, -1.2 to 5.4)
Kitzman et al, 1997 <sup>119</sup>  Fair  Total N=743 mothers* (N analyzed=671)	Bayley mental development score, based on Bayley Scales MDI	24 months	NR	94.3 (NR)	NR	94.5 (NR)	Mean difference for G4 vs. G2, -0.2 (95% CI, -2.4 to 2.0), p=NS
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=272)	Development quotient at 12 months of life; based on Bayley Scales MDI	12 months	109.94 (NR)	105.44 (NR)	111.23 (NR)	NA	No difference was observed between control and treatment groups

\* Of the 1,139 mothers randomized, 743 were enrolled for followup.

**Abbreviations:** BSID=Bayley Scales of Infant Development; CI=confidence interval; G=group; KQ=key question; MDI=Mental Development Index; N=number; NA=not applicable; NR=not reported; NS=not statistically significant; PDI=Psychomotor Development Index; SD=standard deviation.



**Appendix D Table 33. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Healthy Social–Emotional Development Based on Bayley Scales of Infant Development, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121,143-146</sup>  Fair  “Poor, unmarried teenagers”  Total N=NR (N analyzed=54)	Development quotient at 12 months of life; based on Bayley Scales MDI	12 months	104.13 (NR)	105.86 (NR)	115.01 (NR)	NA	p=0.06

**Abbreviations:** G=group; KQ=key question; MDI=Mental Development Index; N=number; NA=not applicable; NR=not reported; SD=standard deviation.

**Appendix D Table 34. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Healthy Social–Emotional Development and Delayed Developmental Delays, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Development Problems, G1 (Control) No. (%)	Number of Participants Exhibiting Development Problems, G2 No. (%)	Number of Participants Exhibiting Development Problems, G3 No. (%)	Number of Participants Exhibiting Development Problems, G4 No. (%)	Effect Estimate or Other Outcome Measure
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=157)	Child language status assessed with the Infant- Toddler Developmental Assessment (IDA)*	6 months	NR (30.3)	NR (16.9)	NA	NA	OR, 3.0 (95% CI, 1.1 to 8.5), p<0.05
Lowell et al, 2011 <sup>111</sup>  Fair  Total N=157 families randomized (N analyzed=117)	Child language status assessed with IDA*	12 months	NR (33.3)	NR (10.5)	NA	NA	OR, 4.4 (95% CI, 1.4 to 14.2), p<0.05
Minkovitz et al, 2007 <sup>147</sup>  Fair  Total N=2,235 families <sup>†</sup> (N analyzed=1,308)	Proportion with a significant concern regarding child's development; based on Parents' Evaluation of Development Status (PEDS)	5 to 5.5 years	137 (21.7)	138 (20.4%)	NA	NA	Calculated RR, 0.94 (95% CI, 0.76 to 1.16)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=976)	Maternal concern on cognitive development item from checklist	12 months	45 (9.5)	44 (8.7)	NA	NA	Adjusted OR, 0.91 (95% CI, 0.59 to 1.40), p=0.66
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=946)	Maternal concern on cognitive development item from checklist	18 months	26 (5.7)	17 (3.5)	NA	NA	Adjusted OR: 0.59 (95% CI, 0.32 to 1.11), p=0.10

**Appendix D Table 34. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Healthy Social–Emotional Development and Delayed Developmental Delays, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Development Problems, G1 (Control) No. (%)	Number of Participants Exhibiting Development Problems, G2 No. (%)	Number of Participants Exhibiting Development Problems, G3 No. (%)	Number of Participants Exhibiting Development Problems, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 randomized (N analyzed=1,091)	Maternal concern on cognitive development item from checklist	24 months	66 (12.6)	46 (8.1)	NA	NA	Adjusted OR, 0.61 (95% CI, 0.40 to 0.90), p=0.013
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=974)	Maternal concern on language development item from checklist	12 months	94 (19.9)	55 (11.0)	NA	NA	Adjusted OR, 0.50 (95% CI, 0.35 to 0.72), p<0.001
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=945)	Maternal concern on language development item from checklist	18 months	110 (24.2)	84 (17.1)	NA	NA	Adjusted OR, 0.66 (95% CI, 0.48 to 0.90), p=0.009
Sadler et al, 2013 <sup>125</sup>  Fair  Total N=105 families randomized (N analyzed=76)	Early mother–infant effective communication (AMBIANCE)	4 months	23 (73)	27 (60.5)	NA	NA	Adjusted OR, 0.48 (95% CI, 0.16 to 1.5), p=NS

**Appendix D Table 34. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Healthy Social–Emotional Development and Delayed Developmental Delays, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Participants Exhibiting Development Problems, G1 (Control) No. (%)	Number of Participants Exhibiting Development Problems, G2 No. (%)	Number of Participants Exhibiting Development Problems, G3 No. (%)	Number of Participants Exhibiting Development Problems, G4 No. (%)	Effect Estimate or Other Outcome Measure
Sadler et al, 2013 <sup>125</sup>  Fair  Total N=105 families randomized (N analyzed=78)	Infant attachment quality (Strange Situation Procedure–Disorganized Attachment Classification)	12 months	15 (43)	12 (27)	NA	NA	Adjusted OR, 3.10 (95% CI, 1.00 to 9.53), p=0.05

\* IDA was administered by a trained assessor. The IDA has acceptable reliability and validity. “Of concern” cut points from a standardization sample were used.

† The RCT-only portion of the study originally randomized 2,584 children at birth before enrollment or check for eligibility. Among them, 2,235 children were enrolled into the study.

**Abbreviations:** AMBIANCE= Atypical Maternal Behavior Instrument for Assessment and Classification system; CI=confidence interval; G=group; IDA= Infant-Toddler Developmental Assessment; KQ=key question; N=number; NA=not applicable; No.=number; NS=not statistically significant; OR=odds ratio; PEDS=Parents’ Evaluation of Development Status; RCT=randomized, controlled trial; RR=relative risk.

**Appendix D Table 35. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Healthy Social–Emotional Development and Developmental Delays, Continuous Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average Score in G1 (Control) Mean (SD)	Average Score in G2 Mean (SD)	Average Score in G3 Mean (SD)	Average Score in G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=257)	Development quotient at 24 months of life; based on the Cattell Scale	2 years	106.49 (NR)	105.73 (NR)	109.34 (NR)	NA	Authors reported no difference among intervention groups*
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=314)	Mean IQ (Stanford-Binet Scale)	36 months	101.95 (NR)	104.2 (NR)	103.57 (NR)	NA	G1 vs. G3, -1.61 (95% CI, -6.08 to 2.85)
Olds et al, 1986 <sup>121</sup>  Fair  Total N=400 families randomized (N analyzed=314)	Mean IQ (Stanford-Binet Scale)	48 months	108.93 (NR)	111.25 (NR)	111.52 (NR)	NA	G1 vs. G3, -2.59 (95% CI, -6.77 to 1.57)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=895)	Early Language Milestone Scale score	2 years	55.7 (31.4)	60.8 (31.4)	NA	NA	Reported adjusted difference in means, 4.49 (95% CI, 0.52 to 8.45) Calculated absolute difference in means, 5.1 (95% CI, 1.47 to 8.75), p=0.006

\* Authors reported higher development quotients for babies assigned to nurse-visited groups among poor, unmarried teen subgroup (p=0.06 for G2 vs. G1 and p=0.08 for G3 vs. G1).

**Abbreviations:** CI=confidence interval; G=group; IQ=intelligence quotient; KQ=key question; N=number; NA=not applicable; NR=not reported; SD=standard deviation.

**Appendix D Table 36. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Healthy Social–Emotional Development and Developmental Delays, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Sadler et al, 2013 <sup>125</sup>  Fair  Teen mothers  Total N=NR (N analyzed=41)	Infant attachment quality (Strange Situation Procedure– Disorganized Attachment Classification)	12 months	6 (40)	6 (25)	NA	NA	Adjusted OR, 3.62 (95% CI, 0.69 to 19.04), p=0.12
Sadler et al, 2013 <sup>125</sup>  Fair  Teen mothers  Total N=NR (N analyzed=42)	Early mother–infant affective communication (AMBIANCE)	4 months	14 (93.8)	18 (66.6)	NA	NA	OR, 0.08 (95% CI, 0.01 to 1.01)

**Abbreviations:** AMBIANCE= Atypical Maternal Behavior Instrument for Assessment and Classification system; CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; OR=odds ratio.

**Appendix D Table 37. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Other Measures of Healthy Social–Emotional Development and Developmental Delays, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 1986 <sup>121</sup>  Fair  “Poor, unmarried teenagers” Total N=NR (N analyzed=66)	Mean IQ (Stanford- Binet Scale)	36 months	97.99 (NR)	100.20 (NR)	101.01 (NR)	NA	G1 vs. G3, -3.01 (95% CI, -11.65 to 5.62)
Olds et al, 1986 <sup>121</sup>  Fair  Poor, unmarried teens  “Poor, unmarried teenagers”  Total N=NR (N analyzed=58)	Mean IQ (Stanford- Binet Scale)	48 months	106.31 (NR)	103.12 (NR)	108.96 (NR)	NA	G1 vs. G3, -2.66 (95% CI, -10.73 to 5.42)
Olds et al, 1986 <sup>121</sup>  Fair  “Poor, unmarried teenagers”  Total N=NR (N analyzed=53)	Development quotient (Cattell Scale)	2 years	101.94 (NR)	96.02 (NR)	110.56 (NR)	NA	G1 vs. G3, 8.62 (95% CI, -18.26 to 1.02) p=0.08

**Abbreviations:** CI=confidence interval; G=group; IQ=intelligence quotient; KQ=key question; N=number; NA=not applicable; NR=not reported; SD=standard deviation; vs.=versus.

**Appendix D Table 38. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Events, G1 (Control) No. (%)	Number of Events, G2 No. (%)	Number of Events, G3 No. (%)	Number of Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers,† 627 at followup (N analyzed=NR)	Any academic failures during grades 1 through 3; measured by whether child failed both reading and math (GPA <1.0) in any grade, based on school records	9 years	NR	NR (5.1)	NR	NR (7.0)	OR for G2 vs. G4, 1.40 (95% CI, 0.67 to 2.92), p=0.372
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers,† 627 at followup (N analyzed=NR)	Ever retained during grades 1 through 3; based on school records	9 years	NR	NR (12.4)	NR	NR (16.0)	OR for G2 vs. G4, 1.35 (95% CI, 0.82 to 2.21), p=0.247
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers,† 627 at followup (N analyzed=NR)	Ever placed in special education during grades 1 through 3; based on school records	9 years	NR	NR (2.3)	NR	NR (2.2)	OR for G2 vs. G4, 0.98 (95% CI, 0.36 to 2.65), p=0.972
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,506)	Special education needs provision	6 years	245 (32.8)	219 (28.9)	NA	NA	Absolute risk difference, -3.9 (95% CI, -8.59 to 0.72)  Adjusted OR, 0.83 (95% CI, 0.67 to 1.03), p=0.097
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,471)	Achieving a good level of development in all five areas of learning	6 years	380 (52.2)	431 (58)	NA	NA	Adjusted OR, 1.26 (95% CI, 1.03 to 1.55), p=0.026  Absolute difference, 5.8 (95% CI, 0.7 to 10.9)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,472)	Reaching at least the expected standard for reading level	6 years	443 (60.5)	483 (65.3)	NA	NA	Adjusted parameter estimate, 1.23 (95% CI, 0.99 to 1.53), p=0.051  Absolute difference, 4.8 (-0.2 to 9.7)



**Appendix D Table 38. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Events, G1 (Control) No. (%)	Number of Events, G2 No. (%)	Number of Events, G3 No. (%)	Number of Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,472)	Reaching at least the expected standard for mathematics level	6 years	449 (61.3)	459 (62.0)	NA	NA	Adjusted parameter estimate, 1.04 (95% CI, 0.84 to 1.28), p=0.731  Absolute difference, 0.7 (-4.3 to 5.6)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,472)	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	209 (42.9)	241 (48.4)	NA	NA	Adjusted parameter estimate, 1.24 (95% CI, 0.97 to 1.60), p=0.090  Absolute difference, 5.5 (95% CI: -0.7 to 11.6)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,472)	Reaching at least the expected standard for writing level, academic year 2017/18	6 years	164 (66.9)	160 (66.1)	NA	NA	Absolute difference, -0.8 (95% CI, -9.2 to 7.5)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,472)	Reaching at least the expected standard for science level	6 years	513 (70.1)	537 (72.6)	NA	NA	Adjusted parameter estimate, 1.14 (95% CI, 0.91 to 1.43), p=0.254  Absolute difference, 2.5 (95% CI, -2.1 to 7.1)

\* Authors also reported on mothers who reported on whether their children skipped school. No difference was found between study groups.

† Of the 1,139 mothers randomized, 743 were enrolled for followup.

**Abbreviations:** CI=confidence interval; G=group; GPA=grade point average; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; OR=odds ratio; vs.=versus.

**Appendix D Table 39. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average, G1 (Control) Mean (SD)	Average, G2 Mean (SD)	Average, G3 Mean (SD)	Average, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers <sup>†</sup> (N analyzed=627)	GPA (reading and math) for grades 1 through 3, based on school records, reported as mean (SE)	9 years	NANR	2.59 (0.04)	NANR	2.69 (0.06)	Effect size for G2 vs. G4, 0.09 (95% CI, -0.05 to 0.22), p=0.200
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers <sup>†</sup> (N analyzed=627)	Achievement test score (reading and math) for grades 1 through 3, based on school records, reported as mean (SE)	9 years	NA	41.63 (1.34)	NA	44.61 (1.86)	Effect size for G2 vs. G4, 0.11 (95% CI, -0.05 to 0.26), p=0.174
Olds et al, 2004 <sup>142</sup>  Fair  Total N=743 mothers, <sup>†</sup> 627 at followup (N analyzed=NR)	Teacher-reported academic engagement, reported as mean (SE)	6 years	NA	6.86 (1.08)	NA	6.16 (1.63)	Effect size, -0.03, p=0.72
Olds et al, 2004 <sup>142</sup>  Fair  Total N=743 mothers, <sup>†</sup> 627 at followup (N analyzed=NR)	Arithmetic achievement, reported as mean (SE)	6 years	NA	88.61 (0.62)	NA	89.75 (0.92)	Effect size, 0.09, p=0.30
Olds et al, 2004 <sup>142</sup>  Fair  Total N=743 mothers, <sup>†</sup> 627 at followup (N analyzed=NR)	Reading achievement, reported as mean (SE)	6 years	NA	93.56 (0.62)	NA	93.79 (0.93)	Effect size 0.02, p=0.84

**Appendix D Table 39. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Continuous Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Average, G1 (Control) Mean (SD)	Average, G2 Mean (SD)	Average, G3 Mean (SD)	Average, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Olds et al, 2004 <sup>141</sup>  Fair  Total N=743 mothers, <sup>†</sup> 627 at followup (N analyzed=NR)	Mental processing composite (K-ABC), reported as mean (SE)	6 years	NA	90.24 (0.54)	NA	92.34 (0.82)	Effect size 0.18, p=0.03

\* Outcome reported was the cumulative mean at 36 months.

<sup>†</sup> Of the 1,139 mothers randomized, 743 were enrolled for followup.

**Abbreviations:** CI=confidence interval; G=group; GPA=grade point average; K-ABC=Kaufman Assessment Battery for Children; KQ=key question; N=number; NA=not applicable; NR=not reported; OR=odds ratio; SD=standard deviation; SE=standard error.

**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally)  N analyzed=132	Percentage of children repeating a grade	7 years	NR (23.9)	NR (12.4)	NA	NA	AOR, 0.45, p<0.10
Robling et al, 2016 <sup>131</sup>  Fair  Boys  N analyzed=749	Reaching at least the expected standard for reading level	6 years	203 (52.7)	212 (58.2)	NA	NA	AOR, 1.30 (95% CI, 0.96 to 1.75), p=0.09
Robling et al, 2016 <sup>131</sup>  Fair  Girls  N analyzed=723	Reaching at least the expected standard for reading level	6 years	240 (69.2)	271 (72.1)	NA	NA	AOR, 1.17 (95% CI, 0.84 to 1.62), p=0.36
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age < 16 years  N analyzed=102	Reaching at least the expected standard for reading level	6 years	26 (47.3)	26 (55.3)	NA	NA	AOR, 1.50 (95% CI, 0.65 to 3.48), p=0.34

**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age ≥ 16 years  N analyzed=1,370	Reaching at least the expected standard for reading level	6 years	417 (61.6)	457 (65.9)	NA	NA	AOR, 1.25 (95% CI, 0.99 to 1.57), p=0.07
Robling et al, 2016 <sup>131</sup>  Fair  Not in employment, education, or training  N analyzed=658	Reaching at least the expected standard for reading level	6 years	206 (64.2)	232 (68.8)	NA	NA	AOR, 1.31 (95% CI, 0.94 to 1.83), p=0.17
Robling et al, 2016 <sup>131</sup>  Fair  In employment, education, or training  N analyzed=602	Reaching at least the expected standard for reading level	6 years	178 (59.5)	194 (64.0)	NA	NA	AOR, 1.25 (95% CI, 0.89 to 1.76), p=0.19
Robling et al, 2016 <sup>131</sup>  Fair  Least deprived (IMD quartile=1)  N analyzed=301	Reaching at least the expected standard for reading level	6 years	85 (61.1)	113 (67.7)	NA	NA	AOR, 1.75 (95% CI, 1.00 to 3.07), p=0.05
Robling et al, 2016 <sup>131</sup>  Fair  Most deprived (IMD quartile=5)  N analyzed=293	Reaching at least the expected standard for reading level	6 years	86 (60.6)	94 (62.2)	NA	NA	AOR, 1.00 (95% CI, 0.57 to 1.75), p=0.99

**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Boys  N analyzed=749	Reaching at least the expected standard for mathematics level	6 years	219 (56.9)	215 (59.1)	NA	NA	AOR, 1.14 (95% CI, 0.84 to 1.54), p=0.40
Robling et al, 2016 <sup>131</sup>  Fair  Girls  N analyzed=723	Reaching at least the expected standard for mathematics level	6 years	230 (66.3)	244 (64.9)	NA	NA	AOR, 0.94 (95% CI, 0.69 to 1.29), p=0.71
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age < 16 years  N analyzed=102	Reaching at least the expected standard for mathematics level	6 years	23 (41.8)	31 (66.0)	NA	NA	AOR, 3.23 (95% CI, 1.36 to 7.67), p=0.008
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age ≥ 16 years  N analyzed=1,370	Reaching at least the expected standard for mathematics level	6 years	426 (62.9)	428 (61.8)	NA	NA	AOR, 0.98 (95% CI, 0.78 to 1.22), p=0.83
Robling et al, 2016 <sup>131</sup>  Fair  Not in employment, education, or training  N analyzed=658	Reaching at least the expected standard for mathematics level	6 years	214 (66.7)	215 (63.8)	NA	NA	AOR, 0.93 (95% CI, 0.66 to 1.29), p=0.65

**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  In employment, education, or training  N analyzed=602	Reaching at least the expected standard for mathematics level	6 years	179 (59.9)	181 (59.7)	NA	NA	AOR, 1.03 (95% CI, 0.73 to 1.42), p=0.90
Robling et al, 2016 <sup>131</sup>  Fair  Least deprived (IMD quartile=1)  N analyzed=301	Reaching at least the expected standard for mathematics level	6 years	87 (62.6)	106 (65.4)	NA	NA	AOR, 1.36 (95% CI, 0.82 to 2.24), p=0.23
Robling et al, 2016 <sup>131</sup>  Fair  Most deprived (IMD quartile=5)  N analyzed=293	Reaching at least the expected standard for mathematics level	6 years	88 (62.0)	89 (58.9)	NA	NA	AOR, 0.88 (95% CI, 0.54 to 1.44), p=0.62
Robling et al, 2016 <sup>131</sup>  Fair  Boys  N analyzed=649	Reaching at least the expected standard for science level	6 years	247 (64.2)	244 (67.0)	NA	NA	AOR, 1.18 (95% CI, 0.87 to 1.63), p=0.28
Robling et al, 2016 <sup>131</sup>  Fair  Girls  N analyzed=723	Reaching at least the expected standard for science level	6 years	266 (76.7)	293 (77.9)	NA	NA	AOR, 1.08 (95% CI, 0.76 to 1.55), p=0.66

**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age < 16 years  N analyzed=102	Reaching at least the expected standard for science level	6 years	30 (54.6)	29 (61.7)	NA	NA	AOR, 1.37 (95% CI, 0.59 to 3.19), p=0.467
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age ≥ 16 years  N analyzed=1,370	Reaching at least the expected standard for science level	6 years	483 (71.3)	508 (73.3)	NA	NA	AOR, 1.14 (95% CI, 0.89 to 1.45), p=0.29
Robling et al, 2016 <sup>131</sup>  Fair  Not in employment, education, or training  N analyzed=658	Reaching at least the expected standard for science level	6 years	243 (75.7)	250 (74.2)	NA	NA	AOR, 0.96 (95% CI, 0.67 to 1.39), p=0.84
Robling et al, 2016 <sup>131</sup>  Fair  In employment, education, or training  N analyzed=602	Reaching at least the expected standard for science level	6 years	201 (67.2)	221 (72.9)	NA	NA	AOR, 1.36 (95% CI, 0.95 to 1.95), p=0.10
Robling et al, 2016 <sup>131</sup>  Fair  Least deprived (IMD quartile=1)  N analyzed=301	Reaching at least the expected standard for science level	6 years	94 (67.6)	125 (77.2)	NA	NA	AOR, 1.94 (95% CI, 1.13 to 3.30), p=0.015



**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Most deprived (IMD quartile=5)  N analyzed=293	Reaching at least the expected standard for science level	6 years	96 (67.6)	107 (70.9)	NA	NA	AOR, 1.16 (95% CI, 0.69 to 1.96), p=0.57
Robling et al, 2016 <sup>131</sup>  Fair  Boys  N analyzed=192	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	83 (31.8)	109 (42.9)	NA	NA	AOR, 1.62 (95% CI, 1.13 to 2.33), p=0.009
Robling et al, 2016 <sup>131</sup>  Fair  Girls  N analyzed=258	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	126 (55.8)	132 (54.1)	NA	NA	AOR, 0.94 (95% CI, 0.65 to 1.37), p=0.76
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age < 16 years  N analyzed=102	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	9 (22.5)	18 (54.6)	NA	NA	AOR, 5.28 (95% CI, 1.49 to 18.73), p=0.010
Robling et al, 2016 <sup>131</sup>  Fair  Maternal age ≥ 16 years  N analyzed=1,370	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	200 (44.7)	223 (48.0)	NA	NA	AOR, 1.15 (95% CI, 0.89 to 1.50), p=0.29

**Appendix D Table 40. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Robling et al, 2016 <sup>131</sup>  Fair  Not in employment, education, or training  N analyzed=658	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	111 (52.9)	109 (47.8)	NA	NA	AOR, 0.82 (95% CI, 0.56 to 1.19), p=0.29
Robling et al, 2016 <sup>131</sup>  Fair  In employment, education, or training  N analyzed=602	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	77 (38.3)	105 (49.1)	NA	NA	AOR, 1.56 (95% CI, 1.05 to 2.30), p=0.027
Robling et al, 2016 <sup>131</sup>  Fair  Least deprived (IMD quartile=1)  N analyzed=301	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	39 (42.9)	63 (53.9)	NA	NA	AOR, 1.83 (95% CI, 0.95 to 3.51), p=0.07
Robling et al, 2016 <sup>131</sup>  Fair  Most deprived (IMD quartile=5)  N analyzed=293	Reaching at least the expected standard for writing level, academic year 2016/17	6 years	39 (41.1)	42 (44.2)	NA	NA	AOR, 1.17 (95% CI, 0.64 to 2.14), p=0.602

**Abbreviations:** AOR=adjusted odds ratio; CI=confidence interval; G=group; IMD=Index of Multiple Deprivation; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported.

**Appendix D Table 41. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 (Control) Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Kitzman et al, 1997 <sup>119,141,142</sup>  Fair  Mothers with “low psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=743 (N analyzed=NR)	Mental processing composite scale; reported as least square mean (SE)	6 years	NA	87.64 (0.72)	NA	90.49 (1.10)	Effect size, 0.25, p=0.03
Kitzman et al, 1997 <sup>119,141,142</sup>  Fair  Mothers with “low psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Arithmetic achievement scale; reported as least square mean (SE)	6 years	NA	85.42 (0.84)	NA	88.61 (1.27)	Effect size, 0.25, p=0.04

**Appendix D Table 41. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Kitzman et al, 1997 <sup>119</sup> Olds, 2004 <sup>142</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Reading and math GPA, grades 1-3; reported as least square mean (SE)	9 years	NA	2.44 (0.06)	NA	2.68 (0.09)	Effect size, 0.22, p=0.016
Kitzman et al, 1997 <sup>119</sup> Olds, 2007 <sup>141</sup> Olds, 2004 <sup>142</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Reading and math achievement tests, grades 1-3; reported as least square mean (SE)	9 years	NA	35.72 (1.78)	NA	44.89 (2.53)	Effect size=0.33, p=0.002

**Appendix D Table 41. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Performance, Continuous Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Frequency of Reports, G1 Mean (SD)	Frequency of Reports, G2 Mean (SD)	Frequency of Reports, G3 Mean (SD)	Frequency of Reports, G4 Mean (SD)	Effect Estimate or Other Outcome Measure
Kitzman et al, 1997 <sup>119</sup> Olds, 2007 <sup>141</sup> Olds, 2004 <sup>142</sup>  Fair  Mothers with “low levels of psychological resources,” defined as “limited intellectual functioning, poor mental health, and low sense of control over their life circumstances”  Total N=NR (N analyzed=NR)	Academically focused behavior, grade 3; reported as least square mean (SE)	9 years	NA	98.70 (0.70)	NA	99.59 (1.05)	Effect size, 0.09, p=0.471

**Abbreviations:** G=group; KQ=key question; N=number; NA=not applicable; NR=not reported; SD=standard deviation; SE=standard error.

**Appendix D Table 42. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Attendance, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Events, G1 (Control) No. (%)	Number of Events, G2 No. (%)	Number of Events, G3 No. (%)	Number of Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  Total N=1,173 mothers (N analyzed=793)	Children who reported skipping school “often”	7 years	NR (6.47)	NR (2.35)	NA	NA	Adjusted OR, 0.35, p<0.01* Calculated RR, 0.36 (95% CI, 0.17 to 0.76)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,494)	At least one absence	6 years	726 (98.1)	740 (98.1)	NA	NA	Adjusted OR, 1.00 (95% CI, 0.47 to 2.12), p=0.998
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,494)	At least one authorized absence	6 years	714 (96.5)	728 (96.6)	NA	NA	Adjusted OR, 1.01 (95% CI, 0.58 to 1.75). p=0.984
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1,494)	At least one unauthorized absence	6 years	495 (66.9)	498 (66.0)	NA	NA	Adjusted OR, 0.95 (95% CI, 0.76 to 1.18), p=0.620

\* Authors also reported on mothers who reported on whether their children skipped school. No difference was found between study groups.

† Of the 1,139 mothers randomized, 743 were enrolled for followup.

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; OR=odds ratio. RR

**Appendix D Table 43. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): School Attendance, Categorical Outcomes, Populations of Interest**

Author, Year Quality Population of Interest Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Child Abuse or Neglect Events, G1 (Control) No. (%)	Number of Child Abuse or Neglect Events, G2 No. (%)	Number of Child Abuse or Neglect Events, G3 No. (%)	Number of Child Abuse or Neglect Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
DuMont et al, 2010 <sup>138</sup>  Fair  High prevention opportunity subgroup (first-time mothers ≤ age 19 who could initiate home-visiting services prenatally) High prevention opportunity subgroup  Total N=NR (N analyzed=122)	Children who reported skipping school “often”	7 years	3 (4.53)	1 (1.85)	NA	NA	Adjusted OR, 0.35, p=NS

**Abbreviations:** G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; NS=not statistically significant; OR=odds ratio.

**Appendix D Table 44. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Mortality, Categorical Outcome**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Incident Mortality, G1 (Control) No. (%)	Incident Mortality, G2 No. (%)	Incident Mortality, G3 No. (%)	Incident Mortality, G4 No. (%)	Effect Estimate or Other Outcome Measure
Barlow et al, 2007 <sup>112</sup>  Fair  Total N=131 caregivers (N analyzed=NR)	Death for which there were child protection concerns and for which an open verdict was reached	12 months	1 (NR)	0 (NR)	NA	NA	NR
Barnes et al, 2017 <sup>132</sup>  Fair  Total N=166 pregnant women, N analyzed=NR)	Infant death	12 months	1 (NR)	0 (NR)	NA	NA	NR
Brooten et al, 1986 <sup>114</sup>  Fair  Total N=79 infants (N analyzed=79)	Death from sudden infant death syndrome	18 months*	0 (0)	1 (2.5)	NA	NA	RR, 3.08 (95% CI, 0.13 to 73.27)
Olds et al, 2007 <sup>141</sup>  Fair  Total N=743 mothers† (N analyzed=720)	Child mortality; reported at maternal assessment or from CDC National Death Index	9 years	NR	10 (2.0)	NR	1 (0.5)	OR for G4 vs. G2, 0.22 (95% CI, 0.03 to 1.74), p=0.08
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 mothers randomized (N analyzed=136)	Neonatal death confirmed by reference to a death certificate	6 months	2 (3)	1 (1.6)	NA	NA	NR
Robling et al, 2016 <sup>131,149,150</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=NR)	Infant death	6 months	<10 (combining both arms)‡	NR	NA	NA	NR



## Appendix D Table 44. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Mortality, Categorical Outcome

\* Participants randomized were newborns, so age at followup is likely 18 months.

† Of the 1,139 mothers randomized, 743 were enrolled for followup.

‡ Total number of child deaths <10 and therefore, group assignment not disclosed and significance not tested.

**Abbreviations:** CDC=Centers for Disease Control and Prevention; CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; OR=odds ratio; RR=relative risk.

**Appendix D Table 45. Benefits of Primary Care Interventions for Child Maltreatment Prevention (KQ 1): Combination Adverse Neonatal Outcomes**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Events, G1 (Control) No. (%)	Number of Incident Events, G2 No. (%)	Number of Incident Events, G3 No. (%)	Number of Incident Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Quinlivan et al, 2003 <sup>128</sup>  Fair  Total N=136 mothers randomized (N analyzed=136)	Incidence of predefined adverse neonatal outcomes: infant death,* severe nonaccidental injury, <sup>†</sup> and nonvoluntary foster care <sup>‡</sup>	6 months	9 (13)	2 (3)	NA	NA	RR, 0.24 (95% CI, 0.05 to 1.08), p=0.04 [p value as reported in manuscript] Adjusted RR, 0.22 (95% CI, 0.02 to 0.98), p=0.04

\* Confirmed through documentation via death certificate.

<sup>†</sup> Defined as having a documented hospitalization for injury and confirmation of the nonaccidental nature of the injury via an independent investigation by Family and Children's Services.

<sup>‡</sup> Defined as placement in foster care as the result of a court order or as the result of mother's imprisonment.

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; RR=relative risk.

**Appendix D Table 46. Harms of Primary Care Interventions for Child Maltreatment Prevention (KQ 2): Adverse Events**

Author, Year Quality Overall Sample Size (N Analyzed)	Outcome Definition	Followup Timing	Number of Incident Events, G1 (Control) No. (%)	Number of Incident Events, G2 No. (%)	Number of Incident Events, G3 No. (%)	Number of Incident Events, G4 No. (%)	Effect Estimate or Other Outcome Measure
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup>  Fair  Total N= 166 randomized (N analyzed=NR)	Counts of miscarriage/terminaton, late miscarriage, infant death, and suspected miscarriage termination	Not specified	Control Miscarriage/termin ation: 1 (NR) Late miscarriage: 0 (NR) Infant death: 1 (NR) Suspected miscarriage termination: 0 (NR)	Intervention Miscarriage/termin ation: 5 (NR) Late miscarriage: 1 (NR) Infant death: 0 (NR) Suspected miscarriage termination: 1 (NR)	NA	NA	Calculated RR, 2.37 (95% CI, 0.51 to 11.06)
Robling et al, 2016 <sup>131,149,150</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=1618)	Serious adverse events	Not specified	310 (38)	357 (43)	NA	NA	Calculated RR, 1.15, (95% CI, 1.06 to 1.25)
Robling et al, 2016 <sup>131</sup>  Fair  Total N=1,645 pregnant women randomized (N analyzed=NR)	Counts of miscarriages/ terminations, stillbirth/neonatal/infant death, death of mother/infant pair, and adoption of the child	Not specified	Miscarriages/termi nations: 27 (NR) Stillbirth/neonatal/ infant death: 7 (NR) Death of mother/infant pair: 0 (NR) Adoption of the child: 7 (NR)	Miscarriages/termi nations: 24 (NR) Stillbirth/neonatal/ infant death: 5 (NR) Death of mother/infant pair: 1 (NR) Adoption of the child: 7 (NR)	NA	NA	NR

**Abbreviations:** CI=confidence interval; G=group; KQ=key question; N=number; NA=not applicable; No.=number; NR=not reported; RR=relative risk.

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	Some concerns*	For abuse outcomes, the methods only stated that “participating health visitors provided data relating to case conferences, children on the protection register, children removed from the home and child deaths.” Because health visitors had far more contact with the intervention group, it is unclear how this method is equally valid for each group. It is unclear where health visitors got the information about these outcomes (e.g., via health records or purely self-report).	Y	Y	N	Low	None
Barlow et al, 2013 <sup>266</sup>  (Family Spirit)	High	No blinding of participants and care providers, no description of adverse event outcomes so cannot judge risk of bias from attrition or measurement bias	Y	Y	PN	Low	None
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup> (Group Family Nurse Partnership)	Some concerns	Participants and caregivers unblinded, some attrition but no ITT analysis	Y	Y	N	Low	None
Brayden et al, 1993 <sup>113</sup>	Low	Low potential bias arising from each domain	Y	PY	PN	Low	None
Brooten et al, 1986 <sup>114</sup>	Some concerns	Limited information about missing data	PY	NI	PN	Some concerns	No information on some items, but no signal of inadequate randomization
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	Some concerns	Study groups were different at baseline, and ITT analysis was not possible because participants who initially accepted the program and then dropped out were unavailable	PY	NI	Y	Some concerns	The education level of mothers at intake was lower in G1 than in G2. In addition, there were significantly more

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+) (cont.)							immigrant families in G1 than in G2. To control for these differences, immigration status was included as a between-participants variable and maternal education as a covariate.
Calheiros et al, 2018 <sup>267</sup>  (Family Support Program)	High	Randomization scheme inadequate and no evidence that randomization worked, no blinding of participants and care providers	PN	N	NI	High	Odd and even number scheme with no concealed allocation and no information about differences between arms
Demeusy et al, 2021 <sup>268</sup>  (Building Healthy Children)	High	No details on randomization or allocation concealment, no CONSORT diagram to confirm N randomized and retained, participants and care providers not blinded	NI	NI	PY	High	No information about randomization or allocation concealment, reported difference in groups by race
Dodge et al, 2019 <sup>269</sup>  (Family Connects)	High	Inadequate randomization (alternate day of birth), no evidence of allocation concealment, differential retention and high overall attrition, failure to analyze results by intention to treat	N	N	NI	High	Alternate day of birth randomization, no evidence of concealment (and likely not possible given type of randomization)
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  (Healthy Families Alaska)	Some concerns	Some attrition that was not accounted for in the analysis (analysis limited to those present at baseline); those who dropped out were different than those who remained but whether reasons for attrition was differential between arms is unclear	PY	NI	PN	Low	At baseline, intervention mothers were less likely than controls to have poor psychological resources and to have enrolled prenatally. However, this difference does not appear to be the

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  (Healthy Families Alaska) (cont.)							result of poor or failed randomization and would bias the effect measure toward the null
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> Kirkland et al, 2020 <sup>139</sup> (Healthy Families New York)	Some concerns	Those who dropped out were different than those who remained but whether reasons for attrition were differential between arms is unclear	PY	NI	N	Low	None
Easterbrooks et al, 2013 <sup>110</sup> Jacobs et al, 2016 <sup>134</sup> Easterbrooks, 2019 <sup>135</sup>  (Healthy Families Massachusetts)	Some concerns	Limited information about bias due to randomization, missing data departures from intended intervention	NI	NI	PN	Some concerns	No information on some items, but no signal of inadequate randomization
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  (Early Start Program)	Some concerns	Some concerns regarding lack of blinding, potential bias in CAN self-report only data, and lack of information about intervention delivery and fidelity	Y	NI	N	Low	None

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Finello et al, 1998 <sup>126</sup>	Some concerns	Randomization not described, nonblinded, not powered adequately, significant differential attrition, skeletal information about the implementation of the interventions	NI	NI	PN	Some concerns	The authors report that at the first weekly discharge meeting following the infant’s birth, those infants meeting birth weight criteria for enrollment were discussed and assigned at random to one of the four groups. There was no attempt to assign infants by “risk” status to any particular group. However, the randomization process does not provide specific information about the randomization method.
Goodman et al, 2021 <sup>270</sup>  (Family Connects)	High	Inadequate randomization based on date of birth, concerns about missing outcome data	N	N	NI	High	Alternate day of birth randomization, no evidence of concealment (and likely not possible given type of randomization)
Green et al, 2017 <sup>133</sup>  (Healthy Families Oregon)	Some concerns	Potential for ascertainment bias and bias from process of ascertaining outcomes using administrative data. Because the authors did not have access to unique identifiers, they used probabilistic matching to assign outcomes to participants; potential for error; no blinding of participants or care providers	Y	Y	N	Low	None

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	Some concerns	This was a complex multisite study. The intervention entailed a defined core of interventions based on written protocols and guidelines. The program design provided for adapting elements of the package to the needs of the individual families. Some program components could have been implemented at control sites due to the spreading of best/new practices in the HS model. High attrition for longer-term outcomes	Y	Y	N	Low	None
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup> Olds et al, 2004 <sup>142</sup>  (The Memphis Trial)	Some concerns	Long-term attrition, lack of ITT analysis	Y	Y	PN	Low	None
Lam et al, 2009 <sup>123</sup>	Some concerns	Several domains with little or no information	NI	NI	PN	Some concerns	No information on some items, but no signal of inadequate randomization
Larson, 1980 <sup>127</sup>	Some concerns	Differential attrition rates	N	NI	N	Some concerns	Assignment not fully random. Assignment to groups B (G3) and C (G1) was random, ended when 80 participants entered. Then group A (G2) mothers were entered until predetermined date; analysis in this review limited to randomized groups.



**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	Some concerns	No allocation concealment	Y	N	PN	Some concerns	Assigned families by coin toss, suggesting no concealment of allocation. Some differences in maternal education and family CPS involvement history, differences do not appear to be the result of poor randomization.
Marcenko and Spence, 1994 <sup>120</sup>	Some concerns	No mention of masking or blinding. Some concerns in the missing outcome data domain because ITT analysis was not used; differences in reasons for attrition and rates of attrition between arms.	NI	NI	N	Some concerns	No information on some items, but no signal of inadequate randomization
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	Some concerns	Some concern about potential deviation from the intervention during the study duration.	PY	PN	PN	Some concerns	Some randomization overridden to avoid having women in the same house have different treatment assignments.
Quinlivan et al, 2003 <sup>128</sup>	Some concerns	Some baseline imbalance, details not reported	Y	Y	N	Some concerns	Authors note that the following factors seemed imbalanced between the two groups at baseline: ethnic origin, social isolation, involvement of the father of the baby, and homelessness. Analyses controlled for these factors.

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  (Nurse Family Partnership)	Some concerns	No blinding to allocation, some attrition, and no sensitivity analyses; usual care received co-interventions that diluted the effect of the active intervention; poor fidelity	Y	Y	Y	Low	None
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	Some concerns	Attrition >20%, no imputation for missing data, unclear whether CPS outcome measurement was record-based or self-report	NI	Y	Y	Some concerns	No information on some items, but no signal of inadequate randomization
Sege et al, 2015 <sup>152</sup>  Project DULCE	Some concerns	High but nondifferential attrition	PY	Y	N	Low	None
Siegel et al, 1980 <sup>122</sup>	Some concerns	High attrition	NI	NI	PN	Some concerns	Method of randomization is not described. Baseline data are only shown for those who had 4- and 12-month assessments completed. However, a larger group of participants was used for determining health outcomes, and their baseline data are not shown. Authors report that there were not significant differences. Also, the mothers in the intervention group had higher scores on the vocabulary test that was given. In addition, there was some concern about the 41 participants who

**Appendix E Table 1. Quality Ratings, Overall Rating and Domain 1: Risk of Bias From Randomization Process**

Author, Year, Program/Trial Name	Overall RoB	Comments	1.1 Random Allocation Sequence	1.2 Allocation Sequence Concealed	1.3 Baseline Differences	Domain 1 RoB	Domain 1 Comments
Siegel et al, 1980 <sup>122</sup>							did not receive the intervention. If they were randomized, they should have been included, but it is not clear whether they were randomized or not.
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	Some concerns	High attrition	Y	NI	Y	Some concerns	No information on some items, but no signal of inadequate randomization
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	Some concerns	Some concerns about lack of blinding and poor uptake of second active intervention (CGS). Also, CAN outcomes are based solely on parent self-report and not verified against medical records. Otherwise, fair quality study.	Y	Y	PN	Low	None

\* Some concerns for abuse outcomes. Low for behavioral outcomes.

**Abbreviations:** CAN=child abuse and neglect; CGS=community group support; CONSORT= Consolidated Standards of Reporting Trials; CPS=child protective services; DULCE=Developmental Understanding and Legal Collaboration for Everyone; G1=group 1; G2=group 2; G3=group 3; ITT=intention-to-treat; N=no; NI=no information; PN=probably no; PY=probably yes; ROB=risk of bias; Y=yes.

**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantia I Impact	Domain 2 RoB	Domain 2 Comments
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	Y	Y	PN	NA	NA	Y	NA	Low	None
Barlow et al, 2013 <sup>266</sup>  (Family Spirit)	Y	Y	PN	NA	NA	PY	NA	Some concerns	Participants and care providers not blinded
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup> (Group Family Nurse Partnership)	Y	Y	PN	NA	NA	PY	NA	Some concerns	Participants and care providers not blinded
Brayden et al, 1993 <sup>113</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None
Brooten et al, 1986 <sup>114</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	Y	Y	PN	NA	NA	Y	NA	Low	None
Calheiros et al, 2018 <sup>267</sup>  (Family Support Program)	Y	Y	PN	PN	PN	NA	NA	Some concerns	Participants and care providers not blinded
Demeusy et al, 2021 <sup>268</sup>  (Building Healthy Children)	Y	Y	PN	NA	NA	PY	NA	Some concerns	Participants and care providers not blinded

**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantial Impact	Domain 2 RoB	Domain 2 Comments
Dodge et al, 2019 <sup>269</sup>  (Family Connects)	Y	Y	PN	NA	NA	N	PY	High	Per-protocol analysis that excluded randomization participants who did not receive interventions; trialists and participants were unblinded
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  (Healthy Families Alaska)	Y	Y	PN	NA	NA	Y	NA	Low	None
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> Kirkland et al, 2020 <sup>139</sup> (Healthy Families New York)	Y	Y	PN	NA	NA	Y	NA	Low	None
Easterbrooks et al, 2013 <sup>110</sup> Jacobs et al, 2016 <sup>134</sup> Easterbrooks, 2019 <sup>135</sup> (Healthy Families Massachusetts)	Y	Y	PN	NA	NA	Y	NA	Some concerns	No information
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup> (Early Start Program)	Y	Y	PN	NA	NA	Y	NA	Low	None

**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantial Impact	Domain 2 RoB	Domain 2 Comments
Finello et al, 1998 <sup>126</sup>	Y	Y	NI	NA	NA	Y	NA	Some concerns	The different interventions were “systems” interventions already in place at the hospital. There is very limited information provided about the intended intervention and no information about implementation.
Goodman et al, 2021 <sup>270</sup>  (Family Connects)	Y	Y	PN	NA	NA	PN	NA	High	Per-protocol analysis of a subsample that excluded randomization participants who did not receive interventions; trialists and participants were unblinded
Green et al, 2017 <sup>133</sup>  (Healthy Families Oregon)	PY	PY	PN	NA	NA	Y	NA	Some concerns	Participants and care providers not blinded

**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantial Impact	Domain 2 RoB	Domain 2 Comments
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	Y	Y	PY	PN	NI	Y	NA	Some concerns	Authors noted that the sites participating in this clinical trial might not be comparable to all pediatric practices and cautioned that the randomization design might introduce possible spillover effects. Healthy Steps incorporated into its package of services a number of strategies that were already in use in pediatric practices or other agencies in the community. The evaluation gathered information on the number of duplicate services as well as changing practice patterns that might have influenced the findings.
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup> Olds et al, 2004 <sup>142</sup>  (The Memphis Trial)	Y	Y	PN	NA	NA	Y	NA	Low	None

**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantial Impact	Domain 2 RoB	Domain 2 Comments
Lam et al, 2009 <sup>123</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None
Larson, 1980 <sup>127</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	Y	Y	PN	NA	NA	Y	NA	Low	None
Marcenko and Spence, 1994 <sup>120</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	Y	Y	PN	NA	NA	Y	NA	Some concerns	A few cases of mothers inadvertently revealing that they were visited by a nurse, but the staff gathering the data were told that the 15-year followup study was designed to assess the long-range effect of prenatal and early childhood services, including home visitations by nurses. The principal investigators and statisticians had access to the families' treatment assignments.
Quinlivan et al, 2003 <sup>128</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None



**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantial Impact	Domain 2 RoB	Domain 2 Comments
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  (Nurse Family Partnership)	Y	Y	PY	PN	PY	Y	NA	Some concerns	Usual care received more frequent home visiting services than intervention arm, likely washing out the intervention effect. Only CATI outcomes were collected by blinded assessors. Field assessors were not blinded. This is less of an issue for ED visits/hospitalizations than it would be for some of the behavioral outcomes
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	Y	Y	PN	NA	NA	Y	NA	Low	None
Sege et al, 2015 <sup>152</sup>  (Project DULCE)	Y	Y	PN	PN	PN	Y	NA	Low	None
Siegel et al, 1980 <sup>122</sup>	Y	Y	PN	NA	NA	Y	NA	Low	None
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	Y	Y	PN	NA	NA	Y	NA	Low	None

**Appendix E Table 2. Quality Ratings, Domain 2: Risk of Bias Due to Deviations From Intended Interventions**

Author, Year, Program/Trial Name	2.1 Participant Awareness	2.2 Delivery Awareness	2.3 Deviations Due to Context	2.4 Deviation Balancing	2.5 Affected Outcome	2.6 Appropriate Analysis	2.7 Substantial Impact	Domain 2 RoB	Domain 2 Comments
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	Y	Y	PN	NA	NA	Y	NA	Some concerns	Because of the nature of the interventions, it was not possible for either the trial participants or the researchers to be blinded to group allocation. Authors noted that potential confounders were balanced in randomization. However, authors did note poor uptake of intervention

**Abbreviations:** CATI= Computer Assisted Telephone Interviewing; DULCE=Developmental Understanding and Legal Collaboration for Everyone; ED=emergency department; NA=not applicable; NI=no information; PN=probably no; PY=probably yes; ROB=risk of bias; Y=yes.

**Appendix E Table 3. Quality Ratings, Domain 3: Risk of Bias Due to Missing Outcome Data**

Author, Year, Program/Trial Name	3.1 Data Randomized	3.2 No Bias from Missing Data	3.3 Missingness Dependency	3.4 Missingness Likelihood	Domain 3 RoB	Domain 3 Comments
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	Y	NA	NA	NA	Low	None
Barlow et al, 2013 <sup>266</sup>  (Family Spirit)	NI	PN	NI	NI	Some concerns	No information on the N for adverse events (the only eligible outcomes) and so cannot judge the risk of bias from attrition
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup> (Group Family Nurse Partnership)	PN	PN	PN	NA	Some concerns	Some attrition (22%) but similar in both arms, no ITT analysis
Brayden et al, 1993 <sup>113</sup>	PN	PY	NA	NA	Low	None
Brooten et al, 1986 <sup>114</sup>	NI	NI	NI	NI	Some concerns	No information provided regarding attrition, but study notes that 57 of 136 eligible infants did not participate for various reasons including death, health or family complications, or refusal. Unclear whether these infants were randomized
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	Y	NA	NA	NA	Some concerns	Completers of the program were significantly more likely to be immigrants compared with noncompleters. ITT analysis was not used. The unavailability of all participants who initially accepted the program served to prevent an “intent to treat” analysis.
Calheiros et al, 2018 <sup>267</sup>  (Family Support Program)	PN	PY	NA	NA	Low	None

**Appendix E Table 3. Quality Ratings, Domain 3: Risk of Bias Due to Missing Outcome Data**

Author, Year, Program/Trial Name	3.1 Data Randomized	3.2 No Bias from Missing Data	3.3 Missingness Dependency	3.4 Missingness Likelihood	Domain 3 RoB	Domain 3 Comments
Demeusy et al, 2021 <sup>268</sup>  (Building Healthy Children)	PY	NA	NA	NA	Some concerns	Authors do not provide a CONSORT diagram but writeup suggests that all 232 participants randomized were retained
Dodge et al, 2019 <sup>269</sup>  (Family Connects)	N	N	NI	NI	High	High overall attrition, differential engagement in the intervention/usual care arms
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  (Healthy Families Alaska)	PN	N	PY	NI	Some concerns	Families with versus those without a baseline interview were comparable on the Family Stress Checklist. However, in families followed up vs. those who withdrew, mothers were more likely to have worked before study enrollment (76% vs. 57%, p=0.01), more likely to be married or living with the child's partner (56% vs. 34%, p<0.01), and less likely to have enrolled prenatally (44% vs. 66%, p=0.01). These mothers may have been less likely to need the problem or experience benefits and their inclusion would likely have moved the outcome to the null; even without their inclusion, program effects were not observed. Whether reasons for attrition was differential between arms is unclear
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> Kirkland et al, 2020 <sup>139</sup>  (Healthy Families New York)	PN	N	PY	NI	Some concerns	The study used intention-to-treat analysis, but details are not reported, and sensitivity analyses are not provided. Participants who remained in the study (regardless of whether they continued to

**Appendix E Table 3. Quality Ratings, Domain 3: Risk of Bias Due to Missing Outcome Data**

Author, Year, Program/Trial Name	3.1 Data Randomized	3.2 No Bias from Missing Data	3.3 Missingness Dependency	3.4 Missingness Likelihood	Domain 3 RoB	Domain 3 Comments
						participate in the program) were more likely than those who dropped out of the study to be first-time mothers (Year 1: 55.5% versus 41.8%, p0.006; Year 2: 56.1% versus 43.9%, p=0.003), but less likely to have been randomly assigned at a gestational age of 30 weeks or less (Year 1: 47.4% versus 84%, p < .001; Year 2: 47.4% versus 80%, p < .001). Whether reasons for attrition were different by arm was unclear
Easterbrooks et al, 2013 <sup>110</sup> Jacobs et al, 2016 <sup>134</sup> Easterbrooks, 2019 <sup>135</sup>  (Healthy Families Massachusetts)	NI	NI	NI	NI	Some concerns	No information regarding attrition or missing data was reported
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup> (Early Start Program)	PN	PY	NA	NA	Low	None
Finello et al, 1998 <sup>126</sup>	PN	NI	NI	NI	Some concerns	G2 and G3 are missing >20% data for most 12-month outcomes
Goodman et al, 2021 <sup>270</sup>  (Family Connects)	N	N	NI	NI	High	A random subsample selected from those randomized, outcomes from most participants missing (only includes 531/4777 participants)

**Appendix E Table 3. Quality Ratings, Domain 3: Risk of Bias Due to Missing Outcome Data**

Author, Year, Program/Trial Name	3.1 Data Randomized	3.2 No Bias from Missing Data	3.3 Missingness Dependency	3.4 Missingness Likelihood	Domain 3 RoB	Domain 3 Comments
Green et al, 2017 <sup>133</sup>  (Healthy Families Oregon)	PY	PN	PN	NA	Low	None
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	N	PY	NA	NA	Some concerns	Missing data were purposefully not statistically adjusted for in the interest of an ITT analytic approach. High attrition. No information provided were missing data in control group vs. intervention group.
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup> Olds et al, 2004 <sup>142</sup>  (The Memphis Trial)	PN*	NI	NI	NI	Some concerns	Low attrition at 6-month followup. Attrition increased over time (9 years) but similar across groups. Lack of information on how missing data were handled.
Lam et al, 2009 <sup>123</sup>	PN	NI	NI	NI	Some concerns	Small sample size, some missing data, use of multiple imputation stated in methods, but N for analysis not clearly specified.
Larson, 1980 <sup>127</sup>	N	PN	NI	NI	Some concerns	Control group with lower attrition than either intervention group.
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	N	PY	NA	NA	Low	None
Marcenko and Spence, 1994 <sup>120</sup>	N	N	PY	NI	Some concerns	Intent-to-treat analysis was not used. Greater attrition in control group because participants not followed by the intervention team.

**Appendix E Table 3. Quality Ratings, Domain 3: Risk of Bias Due to Missing Outcome Data**

Author, Year, Program/Trial Name	3.1 Data Randomized	3.2 No Bias from Missing Data	3.3 Missingness Dependency	3.4 Missingness Likelihood	Domain 3 RoB	Domain 3 Comments
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	N	N	PY	NI	Some concerns	Unclear how total N reduced from 314 to 237.
Quinlivan et al, 2003 <sup>128</sup>	Y	NA	NA	NA	Low	None
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  (Nurse Family Partnership)	N	PN	PY	NI	Some concerns	ED/admission data did not use ITT, nor did they provide sensitivity analyses, but given negative results and similarity of dropout, not clear if failure to do ITT had an impact
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	N	PN	NI	NI	Some concerns	High attrition; analyses do not appear to account for missing data. Those lost to followup are similar to those retained with the exception of race/ethnicity and cesarean section, no differential attrition.
Sege et al, 2015 <sup>152</sup>  (Project DULCE)	N	PN	PN	PN	Some concerns	High but non differential attrition. Unclear whether some families were lost to followup before or after randomization, Text suggests that randomization occurred prior to drop out and exclusion from the sample, the flowchart suggests that the families were not randomized.

**Appendix E Table 3. Quality Ratings, Domain 3: Risk of Bias Due to Missing Outcome Data**

Author, Year, Program/Trial Name	3.1 Data Randomized	3.2 No Bias from Missing Data	3.3 Missingness Dependency	3.4 Missingness Likelihood	Domain 3 RoB	Domain 3 Comments
Siegel et al, 1980 <sup>122</sup>	N	PN	NI	NI	Some concerns	For the health outcomes, all 321 participants were used, so there is less bias for those than the attachment measures. Unclear whether N analyzed is N randomized
Silovsky et al, 2011 <sup>124</sup> (SafeCare+)	N	PY	NA	NA	Some concerns	High differential attrition at 17 months
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	N	PN	NI	NI	Some concerns	Overall attrition for both followup time points was at or lower than 20%, no sensitivity analysis but there was no differential attribution between groups.

\*Probably no for long-term outcomes

**Abbreviations:** DULCE=Developmental Understanding and Legal Collaboration for Everyone; G2=group 2; G3=group 3; ITT=intention-to-treat; N=no; NA=not applicable; NI=no information; PN=probably no; PY=probably yes; RoB=risk of bias; Y=yes.



**Appendix E Table 4. Quality Ratings, Domain 4: Risk of Bias in Measurement of the Outcome**

Author, Year, Program/Trial Name	4.1 Inappropriate Method	4.2 Outcome Difference	4.3 Assessor Awareness	4.4 Assessment Influence	4.5 Influence Likelihood	Domain 4 RoB	Domain 4 Comments
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	N	PY	N	NA	NA	Some concerns	For abuse outcomes, the methods only state that “participating health visitors provided data relating to case conferences, children on the protection register, children removed from the home and child deaths.” Because health visitors had far more contact with the intervention group, it is unclear how this method is equally valid for each group. It is unclear where health visitors got the information about these outcomes (e.g., via health records or purely self-report). Behavioral outcomes appear to have low concern for bias.
Barlow et al, 2013 <sup>266</sup>  (Family Spirit)	NI	NI	N	PN	NA	High	Adverse events not described
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup> (Group Family Nurse Partnership)	PN	PN	PN	NA	NA	Low	None
Brayden et al, 1993 <sup>113</sup>	N	PN	N	NA	NA	Low	None
Brooten et al, 1986 <sup>114</sup>	N	PN	NI	PN	NA	Some concerns	No information about how the 2 reports of child abuse were described or assessed.
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	N	PN	NI	PN	NA	Low	None

**Appendix E Table 4. Quality Ratings, Domain 4: Risk of Bias in Measurement of the Outcome**

Author, Year, Program/Trial Name	4.1 Inappropriate Method	4.2 Outcome Difference	4.3 Assessor Awareness	4.4 Assessment Influence	4.5 Influence Likelihood	Domain 4 RoB	Domain 4 Comments
Calheiros et al, 2018 <sup>267</sup>  (Family Support Program)	PY	PN	PY	PN	NA	Some concerns	Assessment not blinded
Demeusy et al, 2021 <sup>268</sup>  (Building Healthy Children)	PY	PN	PN	NA	NA	Low	None
Dodge et al, 2019 <sup>269</sup>  (Family Connects)	PN	PN	PN	PN	PN	Low	None
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  (Healthy Families Alaska)	N	PN	N	NA	NA	Low	None
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> Kirkland et al, 2020 <sup>139</sup> (Healthy Families New York)	N	PN	N	NA	NA	Low	None
Easterbrooks et al, 2013 <sup>110</sup> Jacobs et al, 2016 <sup>134</sup> Easterbrooks, 2019 <sup>135</sup>  (Healthy Families Massachusetts)	N	PN	NI	PN	NA	Low	None

**Appendix E Table 4. Quality Ratings, Domain 4: Risk of Bias in Measurement of the Outcome**

Author, Year, Program/Trial Name	4.1 Inappropriate Method	4.2 Outcome Difference	4.3 Assessor Awareness	4.4 Assessment Influence	4.5 Influence Likelihood	Domain 4 RoB	Domain 4 Comments
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  (Early Start Program)	N	PN	PY	PY	PN	Some concerns	Authors reported that “no blinding to assignment was undertaken,” which suggests that study personnel, assessors, and participants were not blinded. Child abuse and neglect outcomes only assessed via parent report using severe/very severe assault subscale of the Parent-Child Tactics Scale and parent report of involvement with CPS. The latter is subject to bias without confirmatory data from child welfare records. Authors provide additional child abuse and neglect data: 7 children were admitted to the hospital for child abuse and neglect (5 from control group and 2 from Early Start group).
Finello et al, 1998 <sup>126</sup>	N	PN	NI	NI	NA	Low	None
Goodman et al, 2021 <sup>270</sup>  (Family Connects)	PN	PN	PY	NA	NA	Low	None
Green et al, 2017 <sup>133</sup>  (Healthy Families Oregon)	PN	PN	PN	NA	NA	Some concerns	Potential for ascertainment bias and bias from process of ascertaining outcomes using administrative data. Because the authors did not have access to unique identifiers, they used probabilistic matching to assign outcomes to participants; potential for error

**Appendix E Table 4. Quality Ratings, Domain 4: Risk of Bias in Measurement of the Outcome**

Author, Year, Program/Trial Name	4.1 Inappropriate Method	4.2 Outcome Difference	4.3 Assessor Awareness	4.4 Assessment Influence	4.5 Influence Likelihood	Domain 4 RoB	Domain 4 Comments
Guyet et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	N	PN	N	NA	NA	Low	None
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup> Olds et al, 2004 <sup>142</sup>  (The Memphis Trial)	N	PN	N	NA	NA	Low	None
Lam et al, 2009 <sup>123</sup>	N	PN	PY	NI	PN	Low	None
Larson, 1980 <sup>127</sup>	N	PN	Y	NI	PN	Low	None
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	N	PN	Y	PY	PN	Low	None
Marcenko and Spence, 1994 <sup>120</sup>	N	PN	NI	NI	NA	Low	None
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	N	PN	Y	PY	PN	Low	None
Quinlivan et al, 2003 <sup>128</sup>	N	PN	Y	PY	PN	Low	None

**Appendix E Table 4. Quality Ratings, Domain 4: Risk of Bias in Measurement of the Outcome**

Author, Year, Program/Trial Name	4.1 Inappropriate Method	4.2 Outcome Difference	4.3 Assessor Awareness	4.4 Assessment Influence	4.5 Influence Likelihood	Domain 4 RoB	Domain 4 Comments
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  (Nurse Family Partnership)	N	PN	N	NA	NA	Low	None
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	N	PN	N	NA	NA	Some concerns	No information on how CPS outcomes were measured: unclear whether record-based or self-report.
Sege et al, 2015 <sup>152</sup>  (Project DULCE)	PN	PN	PN	PN	NA	Low	None
Siegel et al, 1980 <sup>122</sup>	N	PN	N	NA	NA	Low	None
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	N	PN	PY	PY	PN	Low	None
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	N	PN	Y	PY	PN	Some concerns	All outcomes are based on parent self-report and not verified against medical records.

**Abbreviations:** CPS=child protective services; DULCE=Developmental Understanding and Legal Collaboration for Everyone; N=no; NA=not applicable; NI=no information; PN=probably no; PY=probably yes; RoB=risk of bias; Y=yes.

**Appendix E Table 5. Quality Ratings, Domain 5: Risk of Bias in Selection of the Reported Result**

Author, Year, Program/Trial Name	5.1 Appropriate Analysis	5.2 Multiple Outcomes	5.3 Multiple Analyses	Domain 5 RoB	Domain 5 Comments
Barlow et al, 2007 <sup>112</sup> McIntosh et al, 2009 <sup>136</sup>  (Family Partnership Model)	PY	PN	PN	Low	None
Barlow et al, 2013 <sup>266</sup>  (Family Spirit)	PY	PN	PN	Low	None
Barnes et al, 2017 <sup>132</sup> Barnes et al, 2017 <sup>151</sup> (Group Family Nurse Partnership)	PY	PN	PN	Low	None
Brayden et al, 1993 <sup>113</sup>	PY	PN	PN	Low	None
Brooten et al, 1986 <sup>114</sup>	PY	PN	PN	Low	None
Bugental and Schwartz, 2009 <sup>115</sup>  (Healthy Start+)	PY	PN	PN	Low	None
Calheiros et al, 2018 <sup>267</sup>  (Family Support Program)	PY	PN	PN	Low	None
Demeusy et al, 2021 <sup>268</sup>  (Building Healthy Children)	PY	PN	PN	Low	None
Dodge et al, 2019 <sup>269</sup>  (Family Connects)	PY	PN	PN	Low	None

**Appendix E Table 5. Quality Ratings, Domain 5: Risk of Bias in Selection of the Reported Result**

Author, Year, Program/Trial Name	5.1 Appropriate Analysis	5.2 Multiple Outcomes	5.3 Multiple Analyses	Domain 5 RoB	Domain 5 Comments
Duggan et al, 2007 <sup>116</sup> Caldera et al, 2007 <sup>137</sup>  (Healthy Families Alaska)	PY	PN	PN	Low	None
DuMont et al, 2008 <sup>117</sup> DuMont et al, 2010 <sup>138</sup> Kirkland et al, 2020 <sup>139</sup>  (Healthy Families New York)	PY	PN	PN	Low	None
Easterbrooks et al, 2013 <sup>110</sup> Jacobs et al, 2016 <sup>134</sup> Easterbrooks, 2019 <sup>135</sup>  (Healthy Families Massachusetts)	PY	PN	PN	Low	None
Fergusson et al, 2005 <sup>118</sup> Fergusson et al, 2013 <sup>140</sup>  (Early Start Program)	PY	PN	PN	Low	None
Finello et al, 1998 <sup>126</sup>	PY	PN	PN	Low	None
Goodman et al, 2021 <sup>270</sup>  (Family Connects)	PY	PN	PN	Low	None
Green et al, 2017 <sup>133</sup>  (Healthy Families Oregon)	PY	PN	PN	Low	None

**Appendix E Table 5. Quality Ratings, Domain 5: Risk of Bias in Selection of the Reported Result**

Author, Year, Program/Trial Name	5.1 Appropriate Analysis	5.2 Multiple Outcomes	5.3 Multiple Analyses	Domain 5 RoB	Domain 5 Comments
Guyer et al, 2003 <sup>129</sup> Minkovitz et al, 2007 <sup>147</sup>  (Healthy Steps)	PY	PN	PN	Low	None
Kitzman et al, 1997 <sup>119</sup> Olds et al, 2007 <sup>141</sup> Olds et al, 2004 <sup>142</sup>  (The Memphis Trial)	PY	PN	PN	Low	None
Lam et al, 2009 <sup>123</sup>	PY	PN	PN	Low	None
Larson, 1980 <sup>127</sup>	PY	PN	PN	Low	None
Lowell et al, 2011 <sup>111</sup>  (Child FIRST)	PY	PN	PN	Low	None
Marcenko and Spence, 1994 <sup>120</sup>	PY	PN	PN	Low	None
Olds et al, 1986 <sup>121</sup> Olds et al, 1994 <sup>143</sup> Olds et al, 1997 <sup>144</sup> Eckenrode et al, 2000 <sup>145</sup> Zielinski et al, 2009 <sup>146</sup>  (The Elmira Trial)	PY	PN	PN	Low	None
Quinlivan et al, 2003 <sup>128</sup>	PY	PN	PN	Low	None



**Appendix E Table 5. Quality Ratings, Domain 5: Risk of Bias in Selection of the Reported Result**

Author, Year, Program/Trial Name	5.1 Appropriate Analysis	5.2 Multiple Outcomes	5.3 Multiple Analyses	Domain 5 RoB	Domain 5 Comments
Robling et al, 2016 <sup>131</sup> Robling et al, 2021 <sup>149</sup> Robling et al, 2022 <sup>150</sup>  (Nurse Family Partnership)	PY	PN	PN	Low	None
Sadler et al, 2013 <sup>125</sup>  (Minding the Baby)	PY	PN	PN	Low	None
Sege et al, 2015 <sup>152</sup>  Project DULCE	PY	PN	PN	Low	None
Siegel et al, 1980 <sup>122</sup>	PY	PN	PN	Low	None
Silovsky et al, 2011 <sup>124</sup>  (SafeCare+)	PY	PN	PN	Low	None
Wiggins et al, 2005 <sup>148</sup> Wiggins et al, 2004 <sup>130</sup>  (The Social Support and Family Health Study)	PY	PN	PN	Low	None

**Abbreviations:** DULCE=Developmental Understanding and Legal Collaboration for Everyone; PN=probably no; PY=probably yes; RoB=risk of bias.

## Key Question 1. Benefits of Interventions to Prevent Child Maltreatment

### Study Characteristics

#### Child Protective Services Reports

Fifteen fair-quality studies reported on CPS outcomes.<sup>110-112,114,116-118,121-126,131,133,135-140,143-146,149</sup> One was a newly published trial;<sup>133</sup> additionally, we identified four new publications<sup>135,139,149,150</sup> associated with already published trials.<sup>110,117,131</sup>

Seven of the 14 included trials recruited participants during pregnancy or immediately after birth.<sup>112,114,116,121,122,126,131</sup> The other eight trials either included a subset of participants recruited in the perinatal period or focused recruitment on families of infants or children. Four trials reported child maltreatment at baseline,<sup>111,117,123,125</sup> although, in accordance with our inclusion criteria, no study had more than 50 percent of participants with substantiated reports. Other trials either did not specify prior experience of maltreatment or had participants who had not perpetrated or experienced maltreatment. Most trials (11 of 15) identified participants based on the risk of maltreatment, although the specific risk factors varied across studies.<sup>111,112,114,116-118,121,123,124,126,133,140</sup> The other studies did not specify maltreatment risk status or recruited from a low-risk population;<sup>110,122,125,131</sup> participants may have had risk factors for vulnerability such as being pregnant adolescents<sup>131</sup> or having health or developmental risks.<sup>126</sup> Four studies targeted teen mothers.<sup>110,121,125,131</sup>

All but one study<sup>123</sup> included a home-visiting component. The exception was a study set in a clinic for parents entering outpatient substance abuse treatment. Many (6 of 14) had clinical teams (nurses, psychologists) delivering the active intervention.<sup>111,114,121,123,125</sup> Nearly all studies included a usual-care arm, with one exception, which compared active treatments for alcohol abuse with or without parent skills training.<sup>123</sup>

All but three studies were based in the United States; the exceptions were set in the United Kingdom<sup>112,131</sup> and New Zealand.<sup>118,140</sup> Three were primarily clinic-based interventions.<sup>114,122,123</sup>

#### Removal of Child From Home

Six studies, one good-quality trial<sup>113</sup> and five fair-quality studies,<sup>112,114,120,128,133,136</sup> reported on child removal outcomes. We identified one new fair-quality study published in 2017.<sup>133</sup>

Four studies recruited persons during pregnancy,<sup>112,113,120,128,136</sup> one recruited mothers of very low-birth weight infants postpartum,<sup>114</sup> and one study enrolled families either prenatally or immediately post-delivery through 3 months after birth. One study sample comprised only first-time, adolescent mothers,<sup>128</sup> and one study predominantly comprised mothers younger than age 20 years.<sup>112</sup> All other parents (typically mothers) were older than 21 years, on average. One trial recruited only low-income participants (<200% Federal poverty limit).<sup>113</sup> In all other trials, participants were predominantly low-income populations,<sup>112,114,128,136</sup> were on public welfare benefits,<sup>120</sup> or were experiencing financial stress.<sup>133</sup> In four of five studies reporting partner status,<sup>112-114,120,133</sup> the majority of participants were single mothers.<sup>113,114,120,133</sup> Two of the six

## Appendix F. Study Characteristics

studies reported that mothers had previous involvement with CPS,<sup>113,120</sup> and neither study had more than 50 percent of participants with substantiated reports. All six studies screened and selected participants based on the presence of demographic risk factors associated with child maltreatment,<sup>112-114,120,128,133</sup> with risk factors varying by study.

One study evaluated a comprehensive prenatal and pediatric program,<sup>113</sup> and five studies evaluated home-visiting interventions.<sup>112,114,120,128,133,136</sup> Four of the five intervention approaches offering detailed descriptions<sup>112-114,120,128</sup> involved a multidisciplinary clinical team.<sup>113,114,120,128</sup> One trial did not describe the intervention in detail.<sup>133</sup> The prenatal and pediatric program, which was clinic-based but included home visits in some cases following missed appointments, was provided through the child's second birthday.<sup>113</sup> The home-visiting interventions varied in duration, intensity, and timing: weekly, biweekly, then monthly visits beginning prenatally through 12 months postpartum;<sup>120</sup> weekly home visits for at least 6 months;<sup>133</sup> weekly home visits beginning at 6 months postpartum and provided up to 18 months postpartum;<sup>112,136</sup> five home visits from birth through 18 months postpartum, supplemented by nurse consultation while the infant was in the hospital and weekly phone contact during the first 8 weeks postpartum;<sup>114</sup> and five home visits during the first 4 months postpartum.<sup>128</sup>

All six trials compared the active intervention to routine care. The context for the routine care varied: in one study, both arms were conducted in high-risk groups, so the control was also characterized as a "high-risk control."<sup>113</sup> In a second study, early-discharge interventions for very low-birth weight infants were compared with routine care.<sup>114</sup>

The studies varied in their definitions of and data sources for evaluating removals. Four of six trials used child welfare and/or court data documenting removal and placement in out-of-home care.<sup>112,113,128,133,136</sup> One trial included both removal of the child's siblings or the target child as the outcome but did not specify sibling or target child in reporting the outcome.<sup>113</sup> Similarly, another trial defined removal as placement in foster care with or without the mother or because of the mother's incarceration but did not specify this data in reporting outcomes.<sup>128</sup> Another study assumed removal had occurred if a child's records showed substantiated child abuse or neglect but did not gather documentation on removal per se.<sup>112,136</sup> The two trials that did not report child welfare or court records as data sources either relied solely on mothers' self-report<sup>120</sup> or provided no information.<sup>114</sup> Additionally, although one of these studies<sup>120</sup> reported the number of children in foster care at followup, specific data on how many children had been removed prior to the study was not provided.

All trials focused on outcomes during the first 3 years of the child's life, each with assessment at different time points: at birth and at 6 months;<sup>120</sup> 6 months with removal data for the period between 6 months and 12 months also reported;<sup>128</sup> 12 months (assessing the period between the 6-month and 12-month assessment time points),<sup>112,136</sup> 18 months,<sup>114</sup> and 36 months<sup>113</sup> after the study child's birth, 2 years after randomization.<sup>133</sup>

Four studies were set in the United States,<sup>113,114,120,133</sup> one in the United Kingdom,<sup>112,136</sup> and one in Australia.<sup>128</sup> One intervention was provided primarily in the clinic.<sup>113</sup>

## Appendix F. Study Characteristics

### Other Measures of Abuse or Neglect

Three RCTs, of good<sup>113</sup> and fair<sup>115,131</sup> quality, reported on study-specific measures of neglect. All studies selected participants based on explicit or implicit considerations of risk. The good-quality study randomized 314 pregnant women in Metropolitan Nashville General Hospital (1984 to 1986) with income less than 200 percent of the Federal poverty level who were identified to be at high risk of maltreatment based on responses to a structured interview, the Maternal History Interview-2.<sup>113</sup> The interview included questions on knowledge of parenting skills, philosophy about discipline, personality, positive and negative feelings about pregnancy, and the mother's perception of her nurture as a child.<sup>113</sup> One fair-quality study randomized 147 families of children born at medical risk (preterm or with a medical condition) in California.<sup>115</sup> A second fair-quality study selected pregnant adolescents.<sup>131</sup> None had prior history of maltreatment. All three studies had home-visiting components over 1 to 2 years in addition to usual care and were compared with usual care. In two studies, the usual care was described as comprehensive clinical care.<sup>113,131</sup> The third study compared a cognitively based extension of the Healthy Start home-visitation program with a home-visitation condition that did not include a cognitively based component.<sup>115</sup> In the intervention arm, the parents learned to recognize children's distress and learned problem-solving techniques.

Regarding outcomes, in the good-quality trial, abuse and neglect were identified based on review of public agency documents from the Tennessee Department of Human Services through 36 months of age. Specifically, abuse was defined as "hitting with the hand or objects, biting, burning with objects or by immersion, twisting, shaking, throwing or pushing so as to cause a fall, or hair pulling." Neglect could arise from "abandonment, leaving a child with an inappropriate caretaker, gross failure to seek medical care, failure to provide shelter or nutrition, or gross failure to provide for normal intellectual development."

One fair-quality study reported neglect, reported at 1 year following intake, based on the Framingham Safety Survey, which included questions about exposed electrical outlets, crib sides left down, and the presence of windows lacking screens.

### Failure to Thrive

One fair-quality trial reported on failure to thrive.<sup>114</sup> In this study, which was conducted in the United States, children born weighing 1500 g or less were randomized to early discharge (prior to infant weighing 2200 g) with home nurse visits after discharge vs. discharge once the infant weighed at least 2200 grams with usual home care after discharge. The intervention arm, which was delivered by nurses with masters-training in neonatal and perinatal medicine, included a home safety assessment done prior to discharge, phone calls after discharge, and home visits after discharge.

### Failure to Immunize

One fair-quality study of pregnant Australian adolescents that examined home visits versus usual care (1998 to 2000) reported on the proportion with no vaccinations at 6 months.<sup>128</sup>

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### Injuries With a High Specificity for Abuse or Neglect

One fair-quality study reported on the risk of injury with a high specificity for abuse or neglect. Specifically, this study of pregnant Australian adolescents examined the effect of home visits versus usual care (1998 to 2000) on severe nonaccidental injury at 6 months. This outcome was defined as hospital admission as a result of an injury that was “referred for independent investigation by the Family and Children’s Services staff and concluded to have arisen as a result of a nonaccidental injury to the neonate.”<sup>128</sup>

### Emergency Department Visits

Fourteen fair-quality studies reported on ED visits.<sup>112,114,116,118,119,121,122,126,127,129-132,136,137,140,141,143-150,152</sup> We did not include studies that reported measures that could potentially have included nonemergency care (“acute care visits” that did not specify whether these were ED visits).<sup>114</sup> Two of the 14 studies were newly included for this update.<sup>132,152</sup>

Eleven of the 14 fair- or good-quality trials recruited participants during pregnancy or immediately after birth.<sup>112,114,116,119,121,122,126,127,129,131,132,136,137,141,143-147,149,150</sup> Three of the included trials recruited participants in early infancy.<sup>118,130,140,148,152</sup> None of the studies reported on child maltreatment at baseline. Eleven of the 14 trials identified participants based on the risk of maltreatment, with specific risk factors varying across the studies.<sup>112,114,116,118,119,121,122,126,127,130,132,136,137,140,141,143-146,148</sup> The remaining trials randomized all newborns at the study site regardless of baseline risk for maltreatment.<sup>129,131,147,149,150,152</sup> One study specifically targeted very low–birth weight infants.<sup>114,126</sup> In three studies, the majority of all mothers were younger than age 20 years.<sup>119,121,131,141,143-146,149,150</sup> One study only included mothers younger than age 25 years.<sup>132</sup>

All studies included a home-visiting component. Home visits ranged from 4 weeks to 5 years postnatally. The study of very low–birth weight infants paired early discharge and home visits.<sup>114,271</sup> All studies had a usual-care arm, except one that provided transportation to and from prenatal clinic visits to the control group.<sup>119,141</sup> Six of the 14 studies had multiple active comparisons against the usual-care arm.<sup>119,121,122,126,127,130,141,143-146,148</sup>

Eight of the 14 studies were based in the United States. The exceptions were four studies set in the United Kingdom,<sup>112,130-132,136,148-150</sup> one in New Zealand,<sup>118,140</sup> and one in Canada.<sup>121,127,143,145,146,271</sup>

Nine of 14 included studies reported ED visit outcomes at 1 to <2 years after enrollment or recruitment.<sup>112,121,122,126,127,130-132,136,143-146,148-150,152</sup> Three of these studies reported only medical record data.<sup>121,131,143-146,149,150,152</sup> Two used a combination of parental report and medical record data,<sup>122,126</sup> and four fair- or good-quality studies used parental report only.<sup>112,127,130,132,136,148</sup>

Six of 14 included studies reported ED visit outcomes at 2 to >4 years of followup.<sup>116,118,119,121,129,131,137,140,141,143-147,149,150</sup> With one exception,<sup>116,118,119,121,129,131,137,140,141,143-147,149</sup> outcomes were taken from medical records.

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### Hospitalization

Thirteen fair-quality studies reported on hospitalization outcomes.<sup>112,114,116,118,119,122,126,128,131,132,137,140,143,147-150</sup> One of the 12 studies was newly included for this update.<sup>112,114,116,118,119,122,126,128,131,132,137,140,143,147-149</sup>

Eleven of the 13 fair- or good-quality trials recruited all participants during pregnancy or immediately after birth.<sup>112,114,119,122,126,128,131,132,143,147-150</sup> Other fair- or good-quality trials focused recruitment on families of infants or children often identified as high risk during the prenatal or perinatal period.<sup>116,118,137,140</sup> The trials either did not specify prior experience of maltreatment or had participants who had not perpetrated or experienced maltreatment. Most trials (8 of 13) identified participants based on the risk of maltreatment, although the specific risk factors varied across studies.<sup>112,114,116,118,119,126,132,137,140,143</sup> The other studies did not specify risk status or recruited from a low-risk population.<sup>122,128,131,147-150</sup> In four studies, the majority of or all mothers were under age 20 years.<sup>119,128,131</sup> One study only included mothers under the age of 25 years.<sup>132</sup> All but two studies<sup>122,147</sup> included a home-visiting component. Many (9 of 13) had clinical teams delivering the active intervention.<sup>114,118,119,128,131,132,140,143,147-150</sup> All studies included a usual-care arm. Five studies had multiple active comparisons against the usual-care arm.

Seven of the 13 studies were based in the United States; the exceptions were four set in the United Kingdom,<sup>112,131,132,148</sup> one in New Zealand,<sup>118,140</sup> and one in Australia.<sup>128</sup> Four were primarily clinic-based interventions.<sup>114,122,132,147</sup>

### Internalizing and Externalizing Behaviors

Six fair-quality studies reported on internalizing and externalizing behavioral outcomes in children.<sup>111,116-119,129,137,138,140,141,147</sup> The primary outcome measures used by most studies to assess behavior symptoms were the CBCL and the ITSEA. In addition to the CBCL and ITSEA, several other measures were used, including the Strengths and Difficulties Questionnaire, the Social Skills Rating System, and the Computerized Diagnostic Interview Schedule for Children.<sup>119,141</sup>

We identified one new publication<sup>139</sup> of a previously included study.<sup>117,138</sup>

Five of the six fair- or good-quality trials recruited participants during pregnancy or immediately after birth.<sup>116-119,129,137,138,140,141,147</sup> One good-quality study recruited mothers of children ages 6 to 36 months.<sup>111</sup> Two of the six fair- or good-quality trials reported child maltreatment at baseline,<sup>111,117,138</sup> but no study had more than 50 percent of participants with substantiated reports of abuse or neglect. Other trials did not have participants with a history of maltreatment. Five of six fair- or good-quality trials identified participants based on level of risk, either for child maltreatment<sup>116,117,137,138</sup> or on general sociodemographic and psychosocial risk and/or the presence of child social-emotional/behavioral problems.<sup>111,118,140,141</sup> One fair-quality study<sup>129,147</sup> offered services to all families in a primary care setting regardless of vulnerability. For five of the six studies, most or all of the mothers were older than age 20 years.<sup>111,116-118,129,137,138,140,141,147</sup>

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All of the six trials included a home-visiting component.<sup>116-119,129,137,138,140,141,147</sup> Four of the six trials were conducted by clinicians or clinical teams delivering the actual intervention.<sup>111,118,119,129,140,141,147</sup> Two interventions relied on trained paraprofessionals.<sup>116,117,137-139</sup> All of the studies included a usual-care arm or no treatment group comparator. One study<sup>141</sup> randomized participants into four arms: free transportation to prenatal care appointments (group 1); development screening and referral services for the child at 6, 12, and 24 months plus free transportation for prenatal care (group 2); nurse visitation during pregnancy, one postpartum visit in the hospital before discharge, one postpartum visit in the home plus group 2 services (group 3); and nurse visitation through the child's first 2 years of life plus the group 3 services (group 4). The study compared group 4 with group 2 for the analysis. Another study provided control group participants with information and referrals to other appropriate services in the community.<sup>117,138</sup>

Four fair- or good-quality studies reported on behavior symptoms using the Internalizing and Externalizing Scales of the CBCL<sup>116,117,119,129,137,138,141,147</sup>; two fair- or good-quality studies reported on internalizing and externalizing behavior problems in children using ITSEA.<sup>111,118,140</sup> One study also used the Strengths and Difficulties Questionnaire.<sup>118,140</sup> One study later used the Computerized Diagnostic Interview Schedule for Children to assess for behavior symptoms.<sup>119,141</sup>

The timing of assessments varied considerably across the studies, with three studies reporting long-term followup results.<sup>118,138,147</sup> One trial reported outcomes at 6 and 12 months post-baseline assessment.<sup>111</sup> Four trials evaluated outcomes between 2 and 4 years of followup.<sup>116,118,119,129,137,140,141,147</sup> One study evaluated outcomes close to the end of the 3-year intervention period (when children were 30 to 33 months old).<sup>129</sup> The studies evaluating longer-term effects reported outcomes at different developmental and followup time points: 5 to 5.5 years (approximately 2 years post-intervention completion);<sup>147</sup> measured and reported as an average at 5, 6, and 9 years (2, 3, and 6 years post-intervention completion);<sup>140</sup> 7 years (5 years post-intervention completion);<sup>138</sup> and 9 years (7 years post-intervention completion).<sup>141</sup>

All but two of the studies were based in the United States; one study took place in New Zealand.<sup>118,140</sup> One fair-quality study took place in a primary care setting with a home-visiting component.<sup>129,147</sup>

### Social, Emotional, and Developmental Outcomes Not Otherwise Categorized

Five fair- or good-quality trials evaluated discrete social, emotional, or other developmental outcomes separately from overall measures of externalizing or internalizing problems.<sup>111,112,129,136,138,141,147</sup> All were previously included; no new publications or studies reported on these outcomes.

Two studies recruited women during pregnancy,<sup>112,141</sup> one study recruited women during pregnancy or up to 3 months postpartum,<sup>117,138</sup> one study recruited families of newborns up to 4 weeks of age,<sup>129,147</sup> and one study recruited mothers of children between the ages of 6 and 36 months.<sup>111</sup>

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Two studies were conducted with a predominantly low-income population;<sup>111,112,136,141</sup> the other two studies had a socioeconomically mixed population.<sup>117,129,138,147</sup> One study sample was predominantly African American.<sup>141</sup> Three trials had study samples comprised predominantly of single mothers.<sup>111,117,138,141</sup> Two trials included mothers with a previous history of CPS involvement, which met the threshold for inclusion in this review.<sup>111,117,138</sup> Four trials screened and selected participants based on level of risk, either for child maltreatment<sup>117,138</sup> or on general sociodemographic and psychosocial risk and/or the presence of child social–emotional/behavioral problems.<sup>111,112,141</sup>

All five trials included a home-visiting component. Four studies evaluated home-visiting models that focused on intervening for a substantive period starting before and/or during some portion of the child’s first 3 years and that varied on frequency, intensity, and duration.<sup>111,112,117,136,138,141</sup> Of these, one program initiated visits with children between the ages of 6 and 36 months, providing 12 months of weekly home visits, with the number of visits individualized based on participants’ needs (an average of 22 visits during a 1-year period).<sup>111</sup> A second trial evaluated a 2-year intervention program that began during pregnancy and provided home visits through the child’s second birthday (an average of 22 home visits during a 2-year period).<sup>117,138</sup> A third home-visiting study evaluated a program that began during pregnancy and provided biweekly home visits through the child’s second birthday.<sup>141</sup> A fourth home-visiting trial evaluated a program of weekly visits beginning 6 months postpartum and provided up to 18 months postpartum.<sup>112,136</sup> A fifth trial evaluated an enhanced pediatric well-childcare model that provided families with a developmental specialist and multiple services including up to six home visits during the child’s first 3 years, including developmental assessments, written materials, parent groups, and linkages to community resources.<sup>129,147</sup> Two trials used a clinical team in the intervention approach;<sup>111,129,147</sup> one of these interventions involved a developmental and mental health specialist teaming with a paraprofessional, reflective of the ethnic and cultural diversity of the family, providing care coordination.<sup>111</sup> One study intervention was delivered solely by nurses,<sup>141</sup> another by community midwives,<sup>112,136</sup> while another intervention relied on trained paraprofessionals.<sup>117,138</sup>

Three of the five trials compared the active intervention to usual care.<sup>111,112,129,136,147</sup> One study<sup>141</sup> randomized participants into four arms: free transportation to prenatal care appointments (group 1); development screening and referral services for the child at 6, 12, and 24 months plus free transportation for prenatal care (group 2); nurse visitation during pregnancy, one postpartum visit in the hospital before discharge, one postpartum visit in the home plus the group 2 services (group 3); and nurse visitation through the child’s first 2 years of life plus the group 3 services (group 4). The study compared group 4 with group 2 for the analysis. Another study provided control group participants with information and referrals to other appropriate services in the community.<sup>117,138</sup>

Each of the five studies reported different social, emotional, or other developmental outcomes that fell outside the categories of externalizing or internalizing behavior or that were combined with internalizing and/or externalizing outcomes in their measurement. One trial examined dysregulation (i.e., problems with sleep, eating; sensory sensitivities; negative emotionality) as an outcome.<sup>111</sup> Another study reported on children’s sleep problems<sup>129</sup> and social skills (i.e., positive social behaviors such as cooperation, empathy, assertion, and self-control; externalizing,



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internalizing, and hyperactivity problem behaviors; and academic competence).<sup>147</sup> A third trial evaluated outcomes using the attention and social problems subscales of a measure used to assess problem behavior;<sup>117,138</sup> this study also reported these outcomes for a subgroup of young, first-time mothers who engaged in the program prenatally. A fourth trial examined children's conduct problems (1st to 3d grade), antisocial behavior, academically focused behavior, and peer affiliation using either school records or teacher reports and teacher-structured observation.<sup>141</sup> One study included a measure of infant/toddler social and emotional adjustment but did not report any specific outcomes associated with that measure;<sup>112</sup> however, a subsequent cost evaluation of the trial<sup>136</sup> reported generally on outcomes.

The timing of assessments varied considerably across the studies, with three studies reporting long-term followup results.<sup>138,141,147</sup> One trial reported outcomes at 6 and 12 months post-baseline assessment.<sup>111</sup> One trial assessed outcomes at 12 months into an 18-month intervention (reflecting the period between the 6-month and 12-month time points).<sup>112,136</sup> One study evaluated outcomes close to the end of the 3-year intervention period (when children were 30 to 33 months old).<sup>129</sup> The studies evaluating longer-term effects reported outcomes at different developmental and followup time points: 5 to 5.5 years (approximately 2 years post-intervention completion),<sup>147</sup> 7 years (5 years post-intervention completion),<sup>138</sup> and 9 years (7 years post-intervention completion).<sup>141</sup>

Four studies were set in the United States.<sup>111,117,129,138,141,147</sup> One study was conducted in the United Kingdom.<sup>112,136</sup>

### Child Development as Measured by the Bayley Scales of Child Development

Four fair- or good-quality studies reported on child development as measured by the Bayley Scales of Child Development.<sup>112,116,119,121,136,137,141,143-146</sup> In addition, three poor-quality studies reported on child development as measured by the Bayley Scales of Child Development.<sup>272-275</sup> All previous studies were included in this update. No new studies were identified.

All four of the fair- to good-quality studies recruited participants during pregnancy or immediately after birth.<sup>112,116,119,121,136,137,141,143-146</sup> Two of the fair-quality studies specifically recruited first-time mothers.<sup>119,121,141,143-146</sup> The four fair- to good-quality studies identified participants based on risk factors, though different risk factors were used. Three studies reported that a majority of mothers were unmarried.<sup>116,119,121,137,141,143-146</sup> Three studies reported that a majority of mothers were living at or below the poverty line.<sup>112,116,119,137,141</sup> Two studies reported that a majority of mothers were younger than age 20,<sup>119,121,141,143-146</sup> and one study reported that 20 percent of mothers were younger than age 17.<sup>112,136</sup> Two studies reported that a majority of mothers were experiencing mental health challenges.<sup>112,116,136,137</sup> Two studies reported on maternal substance use behaviors and exposure to domestic violence.<sup>112,116,136,137</sup> Maternal substance use ranged from approximately 10<sup>112,136</sup> to 50<sup>116,137</sup> percent, and exposure to domestic violence ranged from approximately 30<sup>112,136</sup> to 50<sup>116,137</sup> percent across both studies.

All studies included a home-visiting component. This was compared to usual care,<sup>112,136</sup> developmental screening and referral services for the child at 6, 12, and 24 months of age,<sup>119,141</sup> referral to other services,<sup>116,137</sup> and free transportation to well-child visits plus developmental

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screening for the child at 1 and 2 years of age.<sup>121,143-146</sup> One study compared a group consisting of participants who got developmental screening at 1 and 2 years of age with or without transportation assistance to two active comparison groups.<sup>121,143-146</sup> The two active comparison groups in this study got the developmental screening and transportation assistance as well as prenatal visits for one of the active comparison groups and prenatal and postnatal visits for the other active comparison group.

One of the studies was in the United Kingdom,<sup>112,136</sup> and the others<sup>116,119,121,137,141,143-146</sup> were in the United States.

### Other Development Outcomes

Five fair-quality studies reported on other outcome measures.<sup>111,121,125,129,131,143-147,149,150</sup> We abstracted additional evidence from three trials<sup>111,125,143</sup> previously included in the review to address an expanded list of developmental outcomes. Four studies recruited participants prenatally or shortly after childbirth;<sup>121,125,131,143,147</sup> one study recruited participants with children between the ages of 6 and 36 months.<sup>111</sup> White participants comprised the majority in three trials<sup>121,131,143,147</sup> and Latinas in two trials.<sup>111,125</sup> Two trials included mothers with a previous history of CPS involvement, which met the threshold for inclusion in this review.<sup>111,125</sup> Three studies recruited participants based on level of risk based on general sociodemographic and psychosocial risk and/or the presence of child social-emotional/behavioral problems.<sup>111,121,131</sup> One study also admitted other pregnant women into the study.<sup>121</sup>

All five studies included a home-visiting component. One study included both a randomized and quasi-experimental component (Healthy Steps for Young Children; 1996 to 1998); this review focuses on the randomized component comparing usual care with a comprehensive pediatric care model with developmental specialists, enhanced developmental services, and home visits.<sup>147</sup> A second study randomized participants into four arms: sensory and development screening for children at 12 and 24 months (group 1), free transportation to regular prenatal and well-child visits plus the group 1 services (group 2), nurse visitation during pregnancy plus group 2 services (group 3), and nurse visitation through the child's first 2 years of life plus group 3 services (group 4). The study then combined groups 1 and 2 for the comparator group.<sup>121</sup> All other studies compared the intervention with usual care.

Each of the five studies reported on development outcomes other than school attendance, school performance, or the Bayley school. One study reported mean scores on the Cattell Scale at 6, 12, and 24 months of age<sup>121</sup> and on the Stanford-Binet scale at 36 and 48 months.<sup>143</sup> A second study reported the proportion of parents with a significant concern regarding the child's development on the Parents' Evaluation of Development Status at 5 to 5.5 years of age.<sup>147</sup> A third study reported the number of mothers with concerns on cognitive and language development and also reported results on an early language scale (Early Language Milestone Scale) at 24 months.<sup>131</sup> Another study reported on child language status using ITSEA at 6 and 12 months.<sup>111</sup> Finally, one study reported on mother-infant communication at 4 months and infant attachment at 12 months.<sup>138</sup>

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### School Performance

Two U.S.-based trials and one U.K.-based trial, all fair-quality studies reported in multiple publications, addressed school performance outcomes.<sup>117,119,131,138,139,141,142,149,150</sup> All trials recruited women in the prenatal period; one also included women with infants younger than 3 months old,<sup>117</sup> and two included nulliparous women<sup>119,131</sup> who were required to be younger than age 19 in one study.<sup>131</sup> The majority of women (64%) were younger than age 18 in the other study, but younger age was not required.<sup>119</sup>

Participants in both U.S. studies had sociodemographic risk factors for abuse (e.g., limited education, high score on Kempe Family Stress checklist), and the U.K. study included young (age <19), first-time mothers.<sup>131</sup> Twenty percent of participants had prior substantiated or unsubstantiated reports of child maltreatment in one study.<sup>117</sup> The two additional trials included nulliparous women.<sup>119,131</sup>

The overall mean age of women in one study was 22.5 (SD=5.5) years;<sup>117</sup> mean age per group in the second trial ranged from 17.9 to 18.1 years,<sup>119</sup> and mean age in both arms in the U.K. trial was 17.9.<sup>131</sup> The majority of participants in one trial were African American or Latina,<sup>117</sup> majority African American in the second,<sup>119</sup> and majority White in the U.K. trial.<sup>131</sup>

Interventions in all trials included home-visiting components: one trial evaluated a Healthy Families America–based intervention, Healthy Families New York, which included home visiting by support workers with similar cultural backgrounds as participants, linkage to social services, and parenting education.<sup>117,138,139</sup> Women randomized to the comparison arm received information and referral to community services. The study also included analyses of a “high prevention opportunity” subgroup, which included first-time mothers younger than age 19 who were enrolled in the study at or before 30 weeks gestation, and a “psychologically vulnerable” subgroup, which included women with depressive symptoms and low mastery of psychological coping.<sup>117</sup> The study measured school performance outcomes (percentage repeating a grade) at year 7 via interviews with mothers and children.<sup>138</sup>

The second trial attempted to replicate the Elmira nurse home-visiting intervention with a low-income population in Tennessee.<sup>119,141,142</sup> Women were assigned to one of four conditions: transportation to prenatal care; transportation to prenatal care plus developmental screening and referral services for the child at 6, 12, and 24 months of age; transportation to prenatal care plus developmental screening and referral services for the child at 6, 12, and 24 months of age plus nurse home visitation during pregnancy, one postpartum hospital visit, and one postpartum visit in the home; transportation to prenatal care plus developmental screening and referral services plus nurse home visitation during pregnancy and through the child’s second birthday.<sup>119</sup> The trial also included analyses of a “low psychological resources” subgroup, defined based on measures of intelligence, mental health, and sense of mastery or self-efficacy. School performance outcomes were evaluated at ages 6 and 9. At age 6, these included a cognitive assessment (Kauffman Assessment Battery for Children [K-ABC]), academic engagement based on teacher report using a scale derived from the Hightower Teacher-Child rating scale; and arithmetic and reading achievement on the K-ABC.<sup>142</sup> At age 9, school performance assessment included reading and math grade point averages (GPAs) measured from school records; achievement test

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scores (primarily the Tennessee Comprehensive Assessment Program Achievement Test); the number of times children were retained in grades 1 to 3 based on school records; and teacher-rated “academically focused behavior” derived from the Social Competence Scale, the Social Health Profile, and the Teacher Observation of Child Adjustment.<sup>141</sup>

One study conducted in the United Kingdom randomized young (age <19), nulliparous women at less than 25 weeks gestation (N=1,645) to either intensive home visiting (Family Nurse Partnership) plus standard primary care public health and social care services or usual primary care public health and social care services alone.<sup>131,149,150</sup> The study reported subgroup analyses for maternal age at recruitment (younger than or older than 16 years); for maternal deprivation measured on the Index of Multiple Deprivation; and for mothers who were or were not in employment, education, or training at the time of recruitment. School performance outcomes were assessed at ages 6 or 7 and included the percentage of children obtaining expected standards in English reading, writing, mathematics, and science measured on national “Key Stage 1” assessments. This study also included subgroup analyses for the number of children reaching expected educational standards by child sex; maternal age (younger than or older than age 16 at recruitment); maternal employment, education, or training or no maternal employment, education, or training at baseline; and by deprivation quintile (1=least deprived to 5=most deprived).<sup>149,150</sup>

### School Attendance

One U.S.-based trial and one U.K.-based trial, both fair-quality studies reported in multiple publications, addressed school performance outcomes.<sup>117,131,138,139,149,150</sup> Both trials recruited women in the prenatal period; one also included women with infants younger than 3 months old,<sup>117</sup> and one included nulliparous women younger than age 19.<sup>131</sup>

Participants in the U.S. trial had sociodemographic risk factors for abuse (high score on Kempe Family Stress checklist), and the U.K. study included young (age <19), first-time mothers.<sup>131</sup> Twenty percent of participants had prior substantiated or unsubstantiated reports of child maltreatment in the U.S. study,<sup>117</sup> and the U.K. trial included nulliparous women.<sup>131</sup>

The overall mean age of women in the U.S. study was 22.5 (SD=5.5) years,<sup>117</sup> and the mean age in both arms in the U.K. trial was 17.9.<sup>131</sup> The majority of participants in the U.S. trial were African American or Latina,<sup>117</sup> and the majority were White in the U.K. trial.<sup>131</sup>

Interventions in both trials included home-visiting components: the U.S. trial evaluated a Healthy Families America–based intervention, Healthy Families New York, which included home visiting by support workers with similar cultural backgrounds as participants, linkage to social services, and parenting education.<sup>117,138,139</sup> Women randomized to the comparison arm received information and referral to community services. The study also included analyses of a “high prevention opportunity” subgroup, which included first-time mothers younger than age 19 who were enrolled in the study at or before 30 weeks gestation and “psychologically vulnerable” subgroup, which included women with depressive symptoms and low mastery of psychological coping.<sup>117</sup> The study measured school attendance outcomes (percentage skipping school “often” or more than once) at year 7 via interviews with mothers and children.<sup>138</sup>

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In the U.K. trial, women (age <19, nulliparous, at less than 25 weeks gestation) were randomized to either intensive home visiting (Family Nurse Partnership) plus standard primary care public health and social care services or primary care public health and social care services alone (usual care).<sup>131,149,150</sup> School attendance outcomes were assessed at ages 6 or 7 and included the rate of school absences and authorized (e.g., missing school because of illness) or unauthorized absences as recorded in the National Pupil Database. The study did not report subgroup analyses for school attendance outcomes.

### Death

Six studies of fair quality reported on the outcome of child death.<sup>112,114,119,128,131,132,141,149-151</sup> All studies identified in the previous review are included in this review. We identified two fair-quality studies not previously summarized in the 2004, 2013, or 2018 report.<sup>131,132,149-151</sup>

All six fair-quality studies recruited all participants during pregnancy or immediately after birth.<sup>112,114,119,128,131,132,141,149-151</sup> Only one fair-quality trial reported child maltreatment at baseline.<sup>119,141</sup> Other trials did not specify experience of prior maltreatment. Five of the six studies identified participants based on risk of maltreatment, although the specific risk factors varied across studies.<sup>112,114,119,131,132,141,149-151</sup> The other study recruited from a low-risk population.<sup>128</sup> In three studies, the majority of or all mothers were younger than age 20 years.<sup>119,128,131,141,149,150</sup>

Five fair-quality studies included a home-visiting component.<sup>112,114,119,128,131,141,149,150</sup> One study was delivered exclusively in a group setting.<sup>112,114,119,128,131,141,149</sup> Five had clinical teams delivering the active intervention.<sup>114,119,128,131,132,141,149-151</sup> All six fair-quality studies included a usual-care arm.

Three of the fair-quality studies took place in the United Kingdom,<sup>112,131,132,149-151</sup> two were set in the United States,<sup>114,119,141</sup> and one in Australia.<sup>128</sup> In these studies, cause of death ranges widely including congenital causes, effects of prematurity, and sudden infant death syndrome, among others.<sup>112,114,119,128,131,132,141,149-151</sup> A single death across all studies is ruled homicide by firearm.<sup>141</sup> The vast majority of deaths across studies occur in the first year of life, in part because of limited duration of followup in most studies.<sup>112,114,119,128,131,132,141,149-151</sup>

### *Composite Outcome (Infant Death, Severe Nonaccidental Injury, and Involuntary Foster Care Placement)*

One fair-quality trial of home visits by nurse-midwives to teenage mothers recruited from an Australian public-care teenage pregnancy clinic (1998 to 2000) reported on a composite outcome of child abuse and neglect, which the study defined as the pooled incidence of infant death, severe nonaccidental injury, and involuntary foster care placement (N=136 adolescents, mostly low-income mothers and infants).<sup>128</sup> Participants were not identified to be at risk, and no baseline child maltreatment was reported. Mothers presenting for antenatal visits were recruited and then, after delivery, randomized to receive a set of postnatal visits from the nurse-midwives at 1 week, 2 weeks, 1 month, 2 months, 4 months, and 6 months after delivery or not at all. Visits with the nurse-midwives lasted 1 to 4 hours. The composite outcome was assessed at 6 months.

## Key Question 2. Harms of Interventions to Prevent Child Maltreatment Study Characteristics

Two fair-quality U.K.-based studies reported on harms.<sup>131,132,149-151</sup> One study is new to the update,<sup>132,151</sup> and the other includes newly abstracted data from a previously included study.<sup>131</sup> One study randomized young women (25 years of age or younger) to an intensive, nurse-led group 40-session curriculum delivered in child centers, health centers, or community centers, in addition to routine prenatal and child care.<sup>132,151</sup> The second study randomized pregnant teenagers to a nurse home-visiting program or usual care.<sup>131</sup> Both studies reported on adverse events.