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Systematic review and meta-analysis of home visiting interventions aimed at enhancing child mental health, psychosocial, and developmental outcomes in vulnerable families

Sara Cibralic[1,2*], Weng Tong Wu[1], Bright Opoku Ahinkorah[1,2], Christa Lam-Cassettari[1,2], Susan Woolfenden[3,7], Jane Kohlhoff[1,4], Rebekah Grace[5], Lynn Kemp[5], Patrice Johnson[6], Elisabeth Murphy[6], April Deering[6], Shanti Raman[6] and Valsamma Eapen[1,2]

Abstract

Background Numerous systematic reviews have shown home visiting interventions to be effective at improving a variety of parent and child outcomes. No review has, however, examined the impact of home visiting programs targeting child (aged 0–5 years) mental health, socioemotional and/or developmental outcomes in the context of families with high vulnerability and complex needs.

Method A systematic review and meta-analysis were undertaken to examine and synthesize the literature on home visiting programs administered by professionals/paraprofessionals for families with young children, high vulnerability, and complex needs. PsychInfo, Scopus, Embase, PubMed, and CINAHL were searched through August 2023. A manual review was also undertaken of the reference lists of the articles selected for the review and the Home Visiting Evidence of Effectiveness 2023 review/database. English language studies were included if they were evaluated with a group of participants (case studies were excluded), reported results of home visiting intervention targeted at improving mental health and psychosocial outcomes of caregivers and/or developmental outcomes for children (aged 0–4 years 11 months) of families with high vulnerability and complex needs. Two independent reviewers extracted data and assessed for risk of bias. Qualitative results were consolidated narratively while a meta-analysis was used to synthesize quantitative results.

Results Initial searches identified 623 articles, of which 22 were included in the final review. Findings showed that 18 different home visiting interventions have been implemented with families with high vulnerability and complex needs, and that these interventions are effective at improving a variety of child outcomes. The meta-analysis showed that the weighted mean standardised effect sizes ranged from -0.31 to 0.20, with only one of the four outcomes (i.e., socioemotional and/or behavioural outcomes) being significantly different from 0 (standardised mean difference -0.31; 95% CI: -0.49, -0.13; $z = 3.45$, $p = 0.00$). High intervention variability and missing information meant

*Correspondence:
Sara Cibralic
s.cibralic@unsw.edu.au
Full list of author information is available at the end of the article

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that it was not possible to determine clear patterns regarding features that led to effective versus non-effective interventions.

Conclusion Taken together, results indicate that there is some evidence showing that home visiting interventions targeted at families with high vulnerability and complex needs can be effective at improving some child outcomes. More research is required to solidify findings.

Trial registration The University of York Centre for Reviews and Dissemination (PROSPERO) registration number CRD42023460366.

Keywords Home visiting interventions, Vulnerable families, Child mental health, Socioemotional outcomes, Developmental outcomes, Systematic review, Meta-analysis

Introduction

A child's experiences during the first 2000 days of life (i.e., conception to the first 5 years) play a significant role in their mental health, psychosocial, and developmental outcomes [1–3]. Children from families with high vulnerability and complex needs (e.g., caregivers with substance abuse issues, caregivers with mental illness, current or past domestic violence, and/or current or a history of child protection issues) have been found to be at greatest risk of health inequalities [4–6]. In an attempt to reduce inequality, governments internationally have implemented initiatives focused on improving a child's experiences during the first 2000 days [7–9].

Home visiting programs have typically been one widely utilised approach, often delivered as part of a continuum of care and a network of services, implemented to support families with high vulnerability and complex needs [9–11]. Delivering interventions in a home environment has several benefits including reduced program attrition, better rapport building, and the involvement of the whole family [12–14]. "Home visiting" is an umbrella term used to describe interventions delivered in the home environment. Thus, home visiting programs vary depending on their goals, the target population, and the time allocated for delivery [14]. Programs can be fully manualised or have manualised components (e.g., [15, 16]), or the nature and content of program delivery can be determined by the home visitor/s on a family-by-family basis [17]. The person or people who deliver the home visiting program can also vary from individual health professionals to teams of health professionals, paraprofessionals (i.e., workers that are not registered professionals but receive training in home visiting and assist licensed professionals in their day-to-day work) to unpaid trained lay people (often referred to as volunteer home visitors). For high risk families, home visiting interventions delivered by professionals have been found to be the most cost effective [18].

Numerous reviews and reviews-of-reviews undertaken on home-visiting programs targeted at families of young children have shown that interventions delivered through home-visiting can support improved parenting attitudes and behaviours as well as child cognitive, socioemotional, and developmental outcomes (e.g., [14, 19–21]). Reviews on high-risk populations have also shown home-visiting interventions to have a positive effect on child outcomes [22, 23]. The available reviews on high-risk families, however, have tended to focus on individual risk factors (e.g., child abuse or parental mental health) [22, 23], are limited to one country [11], or are outdated [22, 23]. This review therefore aimed to examine the impact of home visiting programs targeting child mental health, psychosocial, and/or developmental outcomes for young children (aged 0–5 years) from families with high vulnerability and complex needs (i.e., families with caregivers experiencing substance abuse issues, mental illness, current or past domestic violence, and/or current or a history of child protection issues). A narrative synthesis and meta-analysis were undertaken to examine and synthesise the available literature.

Research questions

This review aimed to answer the following research questions:

- What early years home-visiting interventions are available for families with high vulnerability and complex needs caring for young children?
- How effective are early years home-visiting interventions at improving child mental health, psychosocial, and developmental outcomes in children from families with high vulnerability and complex needs?

Method

Prior to starting the review, a study protocol was developed and registered with the University of York Centre for Reviews and Dissemination (PROSPERO; registration number CRD42023460366).

Search strategy

The systematic review was conducted in line with the Preferred Reporting Items for Systematic Reviews and

Meta-Analysis (PRISMA) guidelines [24]. Three search strategies were implemented to identify relevant research studies available in the literature up to August 2023 (no limits were placed on the earliest possible publication date). First, interdisciplinary research databases PsychInfo, Scopus, Embase, PubMed, and CINAHL were searched concurrently for entries containing any combination of the following broad search terms (See Supplementary Table 1 for the exact search terms used in each database): "home visit*" AND intervention OR program OR therapy OR prevention OR support AND postnatal OR perinatal OR antenatal OR postpartum OR parent OR mother OR father OR caregiver AND "mental health" OR drug OR alcohol OR substance OR "domestic violence" OR "child protection" AND evaluation OR effectiveness OR outcome. The searches were then limited by age (0–6 years) and to articles involving human samples, published in English. Given that the authors only had English reading proficiency, it was not possible to include articles published in different languages. Second, the reference lists of articles selected for this review were searched manually. Third, the Home Visiting Evidence of Effectiveness (HomeVEE) 2023 review and database were searched for interventions that fit the inclusion criteria [11]. As per PRISMA guidelines [24], a Supplementary Table 1 provides an example of the search strategy approach.

Inclusion and exclusion criteria

Articles were included for the full text review if: (1) they evaluated a home visiting intervention targeted at improving mental health, psychosocial outcomes, and/or developmental outcomes for children; (2) the study sample comprised pregnant caregivers and/or families/caregivers of young children (aged 0–4 years 11 months; if samples represented a wide age group they were included if the average child age was below 5.5 years) with high vulnerability and complex needs (e.g., mental health concerns, substance issue concerns, domestic violence concerns, and child protection issues); (4) the intervention was delivered to a group of participants; and (5) the article was published in English. Articles were excluded if: (1) they were not available in English; (2) they were not data-based (e.g., books, theoretical papers, reviews); (3) they were unpublished dissertations/theses; (4) they evaluated clinical medical home interventions only or only reported on physical health or birth outcomes; (5) the home visiting intervention was undertaken by volunteers; (6) the intervention was only delivered to one individual (i.e., case study); or (7) the focus was on children over the age of 5.5 years. If an article did not state clearly who delivered the home visiting program (e.g., only the term "home visitor" or "health visitor" was used) researchers searched intervention manuals and/or program websites to determine who the program was generally administered by and studies were included in the review if they were administered generally by professionals or paraprofessionals (e.g., health visitors administering the Family Partnership Model are primarily professionals). Studies that noted using a combination of professional, paraprofessional, and volunteer home visits were excluded if they did not stratify results based on who administered the home visiting intervention.

Quality assessment and data analysis

The quality of the included studies was assessed using two tools: the Cochrane Collaboration's Risk of Bias Assessment Tool [25] and the Mixed Methods Appraisal Tool (MMAT; [26]). The Cochrane Collaboration Risk of Bias Assessment Tool was applied to randomised control trials (RCTs) while the MMAT was used to evaluate non-RCT studies.

The Cochrane Collaboration Risk of Bias Assessment Tool includes six risk assessment criteria: (1) random sequence generation, (2) allocation concealment, (3) blinding of participants and personnel, (4) blinding of outcome assessment, (5) incomplete outcome data, and (6) selective reporting. The tool also allows you to add "other potential biases". Each criterion was evaluated and categorised as having a low risk (indicating that any bias present is unlikely to significantly affect the results), an unclear risk (indicating some doubt about bias's impact on the results), or a high risk (indicating that bias could substantially alter the results). These individual ratings were then used to draw conclusions about the overall risk of bias in the studies. While each criterion was evaluated individually by two separate reviewers the conclusions about overall bias were discussed and agreed upon together. Reviewers agreed that blinding was difficult to achieve in the case of participants and professionals/paraprofessionals delivering the intervention. It was agreed that lack of adequate randomisation and/or high attrition (greater than 20%) would result in trials being classified as having a high risk of bias.

The MMAT tool employs five criteria to gauge study quality. For instance, for quantitative non-randomised controlled trials, the assessment is based on five key factors: (1) representative target population, (2) appropriateness of measures, (3) completeness of outcome data, (4) accounting for confounders, and (5) adherence to intervention administration. Reviewers provide responses of "yes," "no," or "can't tell" for each criterion, with "can't tell" indicating insufficient information in the paper to determine the outcome. Two independent reviewers conducted assessments for all the included studies. It is important to note that MMAT does not endorse the

calculation of an overall quality score. Consequently, an overall quality score was not computed. Instead, consensus on the quality of studies was achieved through discussions among the reviewers. Please refer to Tables 1 and 2 for the detailed quality assessments of the included studies.

Data extraction

The Cochrane Effective Practice and Organisation of Care Review Qualitative Evidence Syntheses guidelines were used to guide data extraction [49]. The data was extracted by two authors (SWT and SC extracted the data, and SC checked the data). Data items extracted included the intervention name, intervention components, problem targeted, who delivered the intervention, whether additional training was required to deliver the intervention, study design, aims, population (including number, age, and gender), evaluation measures, and outcomes.

Meta-analysis

Due to variation in home visiting programs, a single meta-analysis was not possible. Separate meta-analyses were therefore conducted for groups with similar outcomes. As per Cochrane Collaboration guidelines a meta-analysis was undertaken when two or more RCT studies had available data (i.e., sample size, mean, and standard deviation/ standard error/ confidence intervals) on a variable of interest [50]. The software package Review Manager (RevMan) version 5.4.1 [51] was used to complete the meta-analysis. A random effects model with standard mean differences and a 95% confidence interval were used to calculate continuous variables. Study heterogeneity was explored using the chi-square test, with significance set at $p < 0.05$, and was quantified using the I^2 statistic, with a maximum value of 50% identifying low heterogeneity [52]. If standard deviation was not available, it was calculated using the method outlined by the Cochrane Collaboration [50]. Forest plots were used to represent results visually.

Results

Figure 1 presents an overview of the search strategy and number of articles identified at each stage. The initial database search resulted in a total of 584 articles (1 from PsychInfo, 469 from Scopus, 5 from Embase, 109 from PubMed, and 0 from CINAHL). After duplicates were excluded a total of 526 articles remained. A further 427 articles were excluded based on title and abstract screening, resulting in 99 articles. Of the 99 articles, 2 could not be located. Through additional searches, an extra 39 relevant articles were identified, bringing the total to 136 articles that underwent a thorough full-text review. The full-text review resulted in the exclusion of 114 articles. The remaining 22 articles met inclusion criteria and were included in the present review (see Table 3 for an overview of studies included in the review).

Two reviewers (SC and BA or WTW) completed article screening, full-text reviews, and quality assessments. Any disagreements pertaining to study selection and quality assessment were deliberated upon and resolved. A third reviewer was available in the event that disagreements persisted beyond resolution by the primary reviewers. Agreement on article inclusion for title/abstract and full-text screening stood at 88.1% and 66.1%, respectively. Generally, agreement of 80% on screenings is considered acceptable. The lower agreement on full text screenings was due to variability in article definitions of "at risk" and limited information provided in some articles on the qualifications of visitors administering the intervention.

Overview of included studies

Studies that fit the inclusion criteria included those that evaluated home visiting interventions with families with high vulnerability and complex needs and reported on child outcomes. Of these, 16 were RCTs, three were quasi-experimental design studies, two were mixed methods studies, and one was a retrospective cohort design study. Twelve studies were undertaken in the United States of America (USA), six in Australia, two in the Netherlands, one in Canada, and one in the United Kingdom. Sample sizes ranged from 30 to 9746. The target populations varied across studies; most focused on single, specific populations such as parents with mental health concerns (e.g., depression, substance abuse, stress; 31.8%, $n = 7$) and populations at risk of child maltreatment (27.2%, $n = 6$). Several studies (36.3%, $n = 8$) focused on families "at risk" or "experiencing adversity", that is families who had a combination of risk factors including, for example, mental health difficulties, low income, and/ or low education. One study focused on children experiencing emotional/behavioural problems and/or parents experiencing psychosocial risk (4.5%). Most programs were delivered by professionals (31.8%, $n = 7$, primarily nurses).

Interventions

An overview of the interventions that were implemented is provided in Supplementary Table 3. Across the 22 studies, 18 different interventions were implemented. Most studies noted that they administered a structured, manualised program which also included flexibility based on the family's needs. Four studies administered The Michigan Model of Infant Mental Health Home Visiting (IMH-HV), two studies evaluated the right@home program, and numerous programs were administered in one

Table 1 Quality assessment using the Mixed Methods Appraisal Tool (2018)

Citation					
	Quantitative nonrandomised				
	Are the participants representative of the target population?	Are measurements appropriate regarding both the outcome and intervention (or exposure)?	Are there complete outcome data?	Are the confounders accounted for in the design and analysis?	During the study period, is the intervention administered (or exposure occurred) as intended?
Chartier et al. (2017) [27]	Yes	Yes	No	Yes	Can't tell
Julian et al. (2021) [28]	Yes	Yes	Yes	Yes	Yes
O'Malley et al. (2021) [29]	Yes	Yes	Yes	No	Yes
van Grieken et al. (2019) [30]	Yes	Yes	No	Yes	Can't tell
	Mixed Methods				
	Is there an adequate rationale for using a mixed methods design to address the research question?	Are the different components of the study effectively integrated to answer the research question?	Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?
Giallo et al. (2021) [31]	Yes	Yes	Yes	Yes	Yes
O'Donnell et al. (2023) [32]	Yes	Yes	Yes	Can't tell	Yes

Note. All studies met MMAT screening questions criteria S1, "Are there clear research questions?"; and S2, "Do the collected data allow to address the research questions?". The 'Can't tell' response category means that the paper do not report appropriate information to answer 'Yes' or 'No'

Table 2 Quality assessment using the Cochrane Collaboration Risk of Bias Assessment Tool

Citation	Random sequence generation	Allocation concealment	Blinding of participants and researchers	Blinding of outcome assessment	Incomplete outcome data	Selective reporting	Anything else	Overall bias
Barlow et al. [33]	+	+	+	+	+	+	+	Low
Black et al. (1994) [34]	?	?	?	+	-	+	+	High
Butz et al. [35]	+	+	?	?	+	+	+	Low
Duggan et al. [36]	+	+	+	+	-	+	+	High
Fraser et al. [37]	+	+	+	+	-	+	+	High
Goldfeld et al. [38]	+	+	-	+	-	+	+	High
Goldfeld et al. [39]	+	+	-	+	-	+	+	High
Julian et al. (2023) [40]	+	?	?	?	+	+	+	Unclear
Kemp et al. [41]	+	+	-	+	-	+	+	High
Lee et al. [42]	+	+	+	+	+	+	+	Low
Lowell et al. [43]	+	+	+	?	+	+	+	Low
Oxford et al. [44]	+	+	?	+	+	+	+	Low
Ribaudo et al. [45]	?	?	?	?	?	+	+	Unclear
Rosenblum et al. [46]	+	+	-	+	+	+	+	Low
Starn [47]	?	?	?	?	?	+	+	Unclear
Van Doesum et al. [48]	+	+	?	+	+	+	+	Low

Note. + = Low Risk, + = High Risk, ? = Unclear

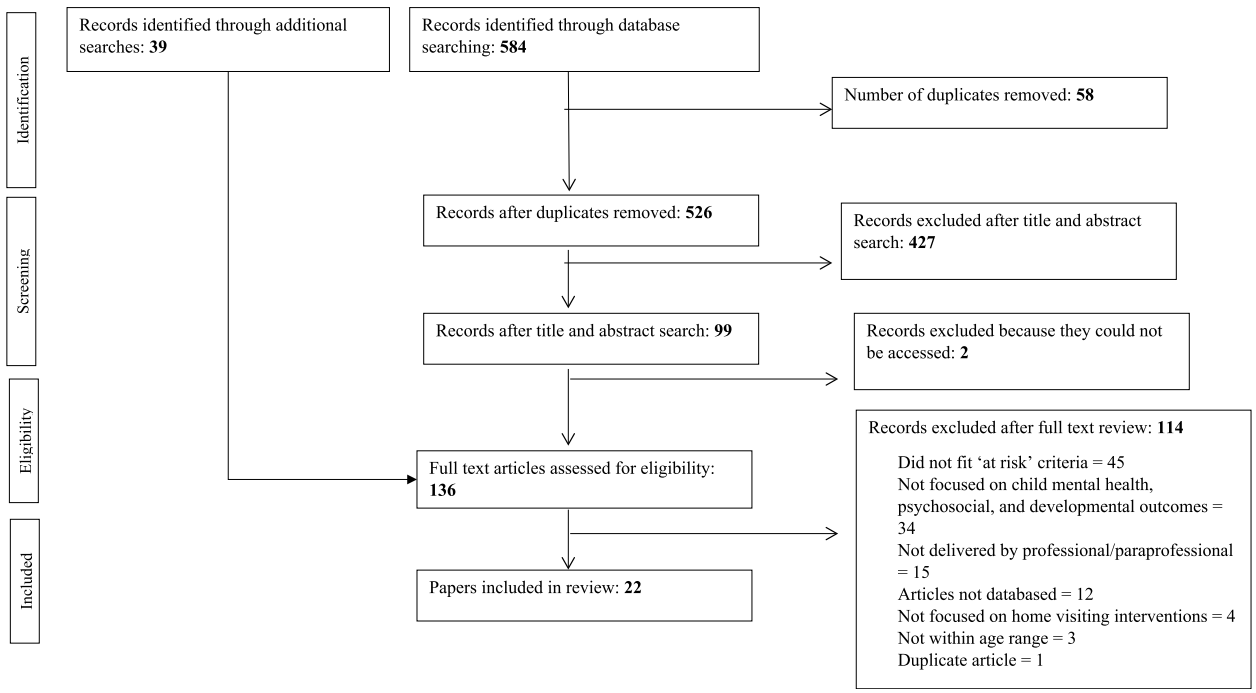

Fig. 1 PRISMA flow diagram of included studies

Table 3 Overview of included studies

Article	Target problem	Intervention	Study design	Country	Demographics
Barlow et al. [33]	Caregiver mental health (depression)	Health visiting intervention	RCT	United Kingdom	*N* = 131 women; Intervention *n* = 68, *M* age not provided; Control *n* = 63, *M* age not provided
Black et al. (1994) [34]	Caregiver mental health (substance use)	SPICE	RCT	USA	*N* = 60 women; Intervention *n* = 31, *M* age = 26.4 (*SD* 0.9); Control *n* = 29, *M* age = 27.9 (*SD* 0.7)
Butz et al. [35]	Caregiver mental health (substance use)	Home visiting intervention	RCT	USA	*N* = 117 women; Intervention *n* = *59, M* age = 28.0 *(SD 4.6);* Control *n* = *58,* M age = *28.9 (SD 4.5)*
Chartier et al. [27]	Child maltreatment	Families First home visiting	Retrospective cohort study	Canada	*N* = 9746 women; Intervention *n* = 4562, *M* age at first birth = 21.09 years (*SD* not provided); Control *n* = 5184, *M* age at first birth = 20.75 years (*SD* not provided)
Duggan et al. [36]	Child maltreatment	Hawaii Healthy Start Program	RCT	USA	*N* = 643 women; Intervention *n* = 373, *M* age = 23.7 years (*SD* 5.8); Control *n* = 270, *M* age = 23.3 years (*SD* 5.8)
Fraser et al. [37]	Child maltreatment	Home visiting intervention	RCT	Australia	*N* = 181 women; Intervention *n* = 90 women, *M* age = 25.72 years (*SD* 5.61); Control *n* = 91 women, *M* age = 26.67 years (*SD* 6.08)
Giallo et al. [31]	Child maltreatment	HoPES	Mixed methods	Australia	*N* = 30 families; mother *n* = 29, *M* age = 28.9 years (*SD* 7.1); father *n* = 11, *M* age = 34.09 years (*SD* 10.8); children *n* = 31, *M* age = 14.4 months (*SD* 9.7), 46.7% female
Goldfeld et al. [38]	Women experiencing adversity (including mental health difficulties)	right@home	RCT	Australia	*N* = 722 women; Intervention *n* = 306 women, *M* age = 27.6 years (*SD* 6.1); Control *n* = 359 women, *M* age = 27.4 years (*SD* 6.2)
Goldfeld et al. [39]	Women experiencing adversity (including mental health difficulties)	right@home	RCT	Australia	*N* = 426 women; Intervention *n* = 225 women, *M* age = 27.9 years (*SD* 6.0); Control *n* = 201 women, *M* age = 28.7 years (*SD* 6.4)
Julian et al. [28]	Child maltreatment	Michigan Model of IMH-HV	Quasi-experimental	USA	*N* = 76 mother–child dyads, mother *M* age = 27.2 years (*SD* 7.0); child *M* age = 9.9 months (*SD* 8.5)
Julian et al. (2023) [40]	Women experiencing adversity (including mental health difficulties)	Michigan Model of IMH-HV	RCT	USA	*N* = 66 mother–child dyads; mother *M* age = 31.93 (*SD* 5.57); child *M* age = 11.22 months (*SD* 7.11)
Kemp et al. [41]	Women experiencing adversity (including mental health difficulties and domestic violence)	Sustained structured nurse home visiting program	RCT	Australia	*N* = 208 women; Intervention *n* = 111 women, *M age* = 27.6 years (*SD* 6.7); Control *n* = 97 women, *M* age = 27.7 years (*SD* 5.9)

Table 3 (continued)

Article	Target problem	Intervention	Study design	Country	Demographics
Lee et al. [42]	Child maltreatment	Healthy Families New York	RCT	USA	*N* = 1173 women; Intervention *n* = 579, *M* age = 22.37 years (*SD* 5.56); Control *n* = 594 women, mother *M* age = 22.53 years (*SD* 5.43)
Lowell et al. [43]	Child emotional/behavioural problems and/or parent psychosocial risk	Child FIRST	RCT	USA	*N* = 157; Intervention *n* = 78 mothers, mother *M* age = 27.7 years (*SD* = 7.0), child *M* = 19.0 months, (*SD* = 9.2), 42.3% male; Control *n* = 79, mother *M* = 26.9 years, (*SD* = 6.9), child *M* = 18.0, (*SD* = 8.8), 45.6% male
O'Malley et al. [29]	Caregiver mental health (substance use)	TIES	Quasi-experimental	USA	*N* = 220 women, *M* age not provided
O'Donnell (2023) [32]	Families with multiple risk factors (e.g., family violence, substance use, mental health concerns, Child Protection involvement)	Cradle to Kinder	Mixed methods	Australia	Quantitative component: *N* = 57 families, metropolitan families *n* = 24 (29% = Aboriginal or Torres Strait Islander), mother *M* age = 19.33 years (*SD* = 2.31), father involvement in program = 33%; rural families *n* = 33 (32% = Aboriginal or Torres Strait Islander), mother *M* = 18.44 (*SD* = 0.68, father involvement in program = 48%. Qualitative component: *N* = 14, 11 months, 3 fathers, *M* age = 22.5 (*SD* = 3.04), 29% = Aboriginal or Torres Strait Islander
Oxford et al. [44]	Caregiver mental health	Promoting First Relationships	RCT	USA	*N* = 252 women; Intervention *n* = 127, [low distress: *n* = 85, mother *M* age = 28.81 years (*SD* 5.67), child's *M* age = 1.85 months (*SD* 0.46); high distress *n* = 42, mother *M* age = 28.64 years (*SD* 6.25), child's *M* age = 1.83 months (*SD* 0.45); Control *n* = 125, [low distress: maternal *M* age = 27.94 years (*SD* 5.27), child *M* age = 1.82 months (*SD* 0.45); high distress: maternal *M* age = 26.26 years (*SD* 6.22), child *M* age = 1.92 months (*SD* 0.53)]
Ribaudo et al. [45]	At risk mothers (including mental health difficulties and early childhood adversity)	Michigan Model of IMH-HV	RCT	USA	*N* = 58, *M* age = 32.65 years (*SD* 5.23), Child *M* age = 11.95 months (*SD* 6.19)
Rosenblum et al. [46]	Caregivers with adverse childhood experiences	Michigan Model of IMH-HV	RCT	USA	*N* = 62 families; Intervention *n* = 32, mother *M* age = 32.38 years (*SD* 5.72), child *M* age = 23.59 months (*SD* 6.57)
Starn [47]	At risk women (including substance use)	Home visiting intervention	RCT	USA	*N* = 30 women, *M* age not available
van Doesum et al. [48]	Caregiver mental health (depression)	Home visiting intervention	RCT	Netherlands	*N* = 85 women; Intervention *n* = 36 women, *M* age = 30.4 years (*SD* 4.1); Control *n* = 35 women, *M* age = 29.9 years (*SD* 3.6)

Table 3 (continued)

Article	Target problem	Intervention	Study design	Country	Demographics
van Grieken et al. [30]	Caregiver mental health (stress)	The Supportive Parenting intervention	Quasi-experimental	Netherlands	*N* = 301 families; Intervention *n* = 124, mother *M* age = 31.0 years (*SD* 7.0), father *M* age = 34.0 years (*SD* 7.3), child *M* age = 7.6 months (*SD* 3.4), 47% child as girls; control *n* = 177, mother *M* age = 30.7 (*SD* 5.3), father *M* age = 32.6 years (*SD* 6.0), child *M* age = 5.1 months (*SD* 2.8)

Note. HoPES Home Parenting Education and Support, *IMH-HV* Infant mental health home visiting, *RCT* Randomised controlled trial, *SPICE* Special parent/infant care and enrichment, *TIES* Team for Infants Exposed to Substance abuse, *USA* United States of America

study only: the Hawaii Healthy Start Program, the Special Parent/Infant Care and Enrichment Program (SPICE), Sustained Structured Nurse Home Visiting Program, The Supportive Parenting Intervention, The Team for Infants Exposed to Substance abuse (TIES) Program, Home Parenting Education and Support (HoPES), Healthy Families New York, Families First Home Visiting, Promoting First Relationships, Child FIRST, and Cradle to Kinder. Four studies noted that they administered a "home visiting" intervention and one study noted that they administer a "health visiting" intervention.

Intervention components

The information on program components provided in the published literature was often lacking in detail. Nevertheless, using categories developed by Aslam and Kemp [53] as a guide, when information was available, it was classified under seven main intervention types: counselling or psychological support; problem solving; child development; social support; parenting skills; parent infant interaction; and provision of resources, including information, equipment (such as safety equipment or books), and linking into community resources.

Child's age

Most programs were targeted at parents of children aged between 0 and 24 months. Only two studies noted that they recruited parents of children over the age of 24 months.

Length of program

A large proportion of studies had missing information regarding the duration, length, and frequency of home visiting interventions. From the studies that did provide information, the number of home visits included in the program ranged from 1–67 sessions. Most studies indicated that sessions were administered weekly (for long term interventions, sessions were initially administered weekly and then spaced out to fortnightly or monthly as treatment progressed) and lasted between 20 min to 2.5 h (60–90 min was the most reported session length).

Outcomes

As this review was focused on mental health, psychosocial, and developmental outcomes, only results pertaining to these factors are reported. That is, physical health outcomes (e.g., birth outcomes) were beyond the scope of this review. Outcomes were divided into cognitive and developmental outcomes; socioemotional and/or behavioural outcomes; child abuse potential; and parent–child interaction outcomes. Outcome summary tables are presented in Tables 4 and 5. Furthermore, the results are divided into a narrative synthesis, which includes both RCT and non-RCT studies, followed by a meta-analysis of RCT studies only. Eleven studies reported on child cognitive and developmental outcomes [27, 29, 32–34, 38, 39, 41, 43, 46, 47], 10 reported on child abuse potential [27, 28, 32–34, 36, 37, 40, 42, 43], seven reported on socioemotional and/or behavioural outcomes [30, 35, 39, 41, 43, 44, 48], and five reported on parent–child interaction outcomes [31, 41, 45, 47, 48].

Cognitive and developmental outcomes

Four [29, 32, 38, 43] of the 11 studies found significant improvements in child cognitive and developmental outcomes following intervention. The interventions implemented were TIES [29], right@home [38], Child FIRST [43], and Cradle to Kinder [32]. TIES was evaluated using a quasi-experimental design, cradle to Kinder was evaluated using a mixed-methods approach, and child FIRST and right@home were evaluated using an RCT. The TIES and right@home studies utilized parent-report measures while child FIRST and Cradle to Kinder used clinician administered measures. Following the TIES intervention, a significant improvement in child health and development, with a large effect size ($\eta_p^2 = 0.16$), was observed from baseline (child age = 3–7 months) to discharge (child age: 18–22 months). The Cradle to Kinder intervention showed significant improvements post-treatment on all child development outcomes (i.e., gross motor, fine motor, receptive and expressive language, self-help skills, and social and emotional skills) with large effect sizes (d ranged from 0.93 – 1.79). The Child FIRST program showed significant effects of intervention on language at 6- and 12-month assessments with a small to medium odds ratio ($OR = 3.0$). Following the right@home intervention, children in the intervention group were found to have significantly better language ability compared to those in the control group. Reported effect sizes fell within the small range (d ranged from 0.01 to 0.07). However, 4- and 5-year follow-up assessments [39] which used direct assessments of child language and learning (Clinical Evaluation of Language Fundamentals Preschool Second Edition) found that although results favoured the intervention group, the results were not statistically significant. In addition to Goldfeld, Bryson [39], five studies [33, 34, 41, 46, 47] used direct assessments to measure child cognitive and developmental outcomes and found no significant improvements in these domains following intervention.

Meta-analysis

Of the 11 studies looking at cognitive and developmental outcomes, eight were RCTs, of these three had data available that was used to undertake a meta-analysis. The five studies that were excluded had missing means

Table 4 RCT results summary table

Outcome	Citation	Target problem	Intervention	Results		Intervention components
				Sig.	Non. Sig.	
Cognitive/developmental	Barlow et al. (2007) [33]	Mental health (depression)	Health visiting intervention		x	Parent-infant interaction
	Black et al. (1994) [34]	Mental health (substance use)	SPICE		x	Social support Parenting skills and child development Parent-infant interaction Provision of resources
	Goldfeld et al. (2019) [38]	Women experiencing adversity (including mental health difficulties)	right@home	x		Parenting skills Parent-infant interaction Provision of resources
	Goldfeld et al. (2022) [39]	Women experiencing adversity (including mental health difficulties)	right@home		x	Parenting skills Parent-infant interaction Provision of resources
	Kemp et al. (2011) [41]	Women experiencing adversity (including mental health difficulties and domestic violence)	Sustained structured nurse home visiting program		x	Parenting skills Parent-infant interaction Provision of resources
	Lowell et al. (2011) [43]	Child emotional/behavioural problems and/or parent psychosocial risk	Child FIRST	x		Counselling or Psychological Support
	Rosenblum et al. (2020) [46]	Parents with adverse childhood experiences	Michigan Model of IMH-HV		x	Social support Parenting skills and child development Parent-infant interaction Provision of resources
	Starn (1992) [47]	At risk women (including substance use)	Home visiting intervention		x	Counselling or Psychological support Parenting skills and child development Parent-infant interaction Problem solving Social supports Provision of resources

Table 4 (continued)

Outcome	Citation	Target problem	Intervention	Results		Intervention components
Child abuse potential	Barlow et al. (2007) [33]	Mental health (depression)	Health visiting intervention		x	Parent-infant interaction
	Black et al. (1994) [34]	Mental health (substance use)	SPICE		x	Social support Parenting skills and child development Parent-infant interaction Provision of resources
	Duggan et al. (2004) [36]	Child maltreatment	Hawaii Healthy Start Program		x	Social supports Parenting skills
	Fraser et al. (2000) [37]	Child maltreatment	Home visiting intervention	x		Social supports Provision of resources
	Julian et al. (2023) [40]	Women experiencing adversity (including mental health difficulties)	Michigan Model of IMH-HV	x		Counselling or Psychological Support (if required) Social support Parent-infant interaction Parenting skills
	Lee et al. (2018) [42]	Child maltreatment	Healthy Families New York	x		Parenting skills and child development Parent-infant interaction Social support Provision of resources
	Lowell et al. (2011) [43]	Child emotional/behavioural problems and/or parent psychosocial risk	Child FIRST	x		Counselling or Psychological Support
Socioemotional and/or behavioural	Butz et al. (2001) [35]	Mental health (substance use)	Home visiting intervention	x		Parenting skills Child development Parent-infant interaction Provision of resources
	Goldfeld et al. (2022) [39]	Women experiencing adversity (including mental health difficulties)	right@home	x		Parenting skills Parent-infant interaction Provision of resources
	Kemp et al. (2011) [41]	Women experiencing adversity (including mental health difficulties and domestic violence)	Sustained structured nurse home visiting program		x	Parenting skills Parent-infant interaction Provision of resources
	Lowell et al. (2011) [43]	Child emotional/behavioural problems and/or parent psychosocial risk	Child FIRST	x		Counselling or Psychological Support

Table 4 (continued)

Outcome	Citation	Target problem	Intervention	Results		Intervention components
	Oxford et al. (2023) [44]	Mental health	Promoting First Relationships	x		Parenting skills and child development Parent infant interaction
	van Doesum et al. (2008) [48]	Mental health (depression)	Home visiting intervention	x		Parenting skills and child development Parent-infant interaction Problem solving Provision of resources
Parent-child interaction	Kemp et al. (2011) [41]	Women experiencing adversity (including mental health difficulties and domestic violence)	Sustained structured nurse home visiting program		x	Parenting skills Parent-infant interaction Provision of resources
	Ribaudo et al. (2022) [45]	At risk mothers (including mental health difficulties and early childhood adversity)	Michigan Model of IMH-HV		x	Counselling or Psychological Support Social support Parenting skills and child development Parent-infant interaction Provision of resources
	Starn (1992) [47]	At risk women (including substance use)	Home visiting intervention	x		Counselling or Psychological support Parenting skills and child development Parent-infant interaction Problem solving Social supports Provision of resources
	van Doesum et al. (2008) [48]	Mental health (depression)	Home visiting intervention	x		Parenting skills and child development Parent-infant interaction Problem solving Provision of resources

Note. IMH-HV Infant Mental Health-Home Visiting, *SPICE* Sustained Program for Improving Childhood Education

and/or data necessary to calculate means (i.e., standard error, confidence intervals). Results showed that there was no heterogeneity ($Tau^2 = 0.00$; $Chi^2 = 0.63$, $df = 2$, $P = 0.73$, $I^2 = \%$) among studies. The random effects model (standardised mean difference 0.07; 95% CI: −0.06, 0.19; $z = 1.07$, $p = 0.28$) found no significant difference between home visiting and control conditions (Fig. 2).

Child abuse potential

Six of the 10 studies measuring child abuse potential found significant reductions in child abuse potential [27, 28, 37, 40, 42, 43]. Two studies, one using an RCT and one using a quasi-experimental design, evaluated the Michigan Model of IMH-HV [28, 40]. Both studies were undertaken by the same team. One study evaluated Families First home visiting using a retrospective cohort design [27], and RCTs were used to evaluated Healthy Families New York [42], Child FIRST [43] and Fraiser's home visiting intervention [37]. Three studies measured child abuse potential using parent-report questionnaires [28, 37, 40] and three looked at hospital and state databases [27, 42] to determine child protection outcomes. Chartier, Brownell [27], Fraser, Armstrong [37], and Lee,

Table 5 Non-RCT Results Summary table

Outcomes	Citation	Target problem	Intervention	Results		Intervention components
				Sig.	Non-sig.	
Cognitive and developmental	Chartier et al. (2017) [27]	Child maltreatment	Families First home visiting		x	Parenting skills Parent-infant interaction Provision of resources
	O'Donnell (2023) [32]	Families with multiple risk factors (e.g., family violence, substance use, mental health concerns, Child Protection involvement)	Cradle to Kinder	x		Counselling or Psychological Support Parenting skills and child development Parent infant interaction Social supports Provision of resources
	O'Malley et al. (2021) [29]	Mental health (substance use)	TIES	x		Parenting skills and child development Parent infant interaction Provision of resources
Child abuse potential	Chartier et al. (2017) [27]	Child maltreatment	Families First home visiting	x		Parenting skills Parent-infant interaction Provision of resources
	Julian et al. (2021) [28]	Child maltreatment	Michigan Model of IMH-HV	x		Counselling or Psychological Support (if required) Parenting skills Parent-infant interaction
	O'Donnell (2023) [32]	Families with multiple risk factors (e.g., family violence, substance use, mental health concerns, Child Protection involvement)	Cradle to Kinder	x		Counselling or Psychological Support Parenting skills and child development Parent infant interaction Social supports Provision of resources
Socioemotional/ behavioural	van Grieken et al. (2019) [30]	Mental health (stress)	The Supportive Parenting intervention		x	Parenting skills Parent-infant interaction Social supports
Parent-child interaction	Giallo et al. (2021) [31]	Child maltreatment	HoPES		x	Parenting skills Parent-infant interaction

Note. *HoPES* Healthy Parenting, Healthy Families, *Michigan Model of IMH-HV* Michigan Model of Infant Mental Health-Home Visiting, *TIES* Team for Infants Exposed to Substance Abuse

Kirkland [42] found that treatment effects were maintained over time. Lowell, Carter [43] found that there was no treatment effect on child protection service involvement at 6-month, 12-month, or 24-month assessments, however, an intervention effect was observed at the 36-month assessment. The results of Julian, Muzik [28] and Julian, Riggs [40] as well as Fraser, Armstrong [37] need to be interpreted with caution given that quality assessment data indicates an unclear and high risk of bias, respectively.

Meta-analysis

Seven of the 10 studies evaluating child abuse potential were RCTs. Of these, three provided data that was used to undertake a meta-analysis [34, 37, 42]. Four studies were excluded from the meta-analysis due to missing means and/or data necessary to calculate means (i.e., standard error, confidence intervals). Results showed that there was significant heterogeneity ($Tau^2 = 0.35$; $Chi^2 = 17.63$, $df = 2$, $P = 0.00$, $I^2 = 89\%$) among studies. The random effects model (standardised mean difference

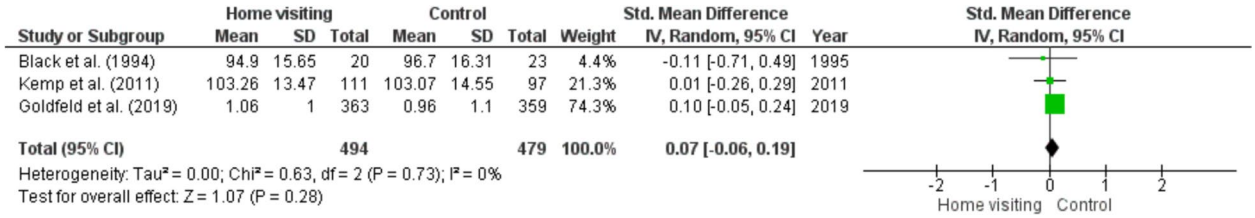

Fig. 2 Forest plot for cognitive/developmental outcomes. Standardized mean differences are shown with 95% CIs

−0.27; 95% CI: −0.98, 0.45; $z=0.73$, $p=0.48$) found no significant difference between home visiting and control conditions (Fig. 3).

Socioemotional and/or behavioural outcomes

Five of the seven studies examining socioemotional and/or behavioural outcomes reported significant improvements. The interventions evaluated included the Promoting First Relationships program [44], right@home [39], Child FIRST [43], and home visiting interventions by Butz, Pulsifer [35] and van Doesum, Riksen-Walraven [48]. All studies were evaluated using RCTs and assessed socioemotional and/or behavioural outcomes using parent-reported measures. While all five studies evaluated externalising behaviour, only four found significant reductions in externalising behaviour [35, 39, 43, 44]. Butz, Pulsifer [35] also found that children in their intervention group had lower internalising behaviour and anxiety/depression problems. Furthermore, van Doesum, Riksen-Walraven [48] found that children in their intervention group had significantly better social emotional functioning compared to control group. Goldfeld, Bryson [39] reported small treatment effect sizes ($d=0.14$ for externalising behaviour and $d=0.20$ for self-control), Oxford, Hash [44] reported treatment effect sizes ranging from small ($d=0.06$, group = mothers with low psychological distress) to large ($d=0.63$, group = mothers with high psychological distress), and Lowell, Carter [43] reported a moderate effect size ($\eta_p^2=0.07$). van Doesum, Riksen-Walraven [48] and Butz, Pulsifer [35] did not report effect sizes. The risk of bias in four [35, 43, 44, 48] of the five studies was assessed to be low. Goldfeld, Bryson [39] study indicated a high attrition rate, increasing the risk of skewed results due to attrition bias.

Meta-analysis

Sex of the seven studies focused on socioemotional and/or behavioural outcomes were RCTs. Of these, five had data available that was used to undertake a meta-analysis [35, 41, 43, 44, 48]. The one study that was excluded did not provide a standard deviation or values from which a standard deviation could be calculated (i.e., standard error or confidence intervals). Results showed that heterogeneity was not significant ($\text{Tau}^2=0.01$; $\text{Chi}^2=4.85$, $df=4$, $P=0.30$, $I^2=18\%$) among studies. The random effects model (standardised mean difference −0.31; 95% CI: −0.49, −0.13; $z=3.45$, $p=0.00$) found significant difference between home visiting and control conditions, with results favouring home visiting (Fig. 4).

Parent-child interaction outcomes

Two out of five studies looking at parent-child interaction found significant improvements [47, 48], one study found a trend towards significant treatment effects on parent–child attachment ($p.=0.06$) [45], and 2 studies found no significant changes in parent–child interactions [31, 41]. Mothers in Giallo, Rominov [31]'s study did, however, note positive changes in their relationships with their children. The two studies that saw significant improvements on parent–child interaction outcomes [47, 48] implemented RCTs to evaluate their home visiting interventions and used observational measures to assess parent–child interaction outcomes. Neither study reported effect sizes or odds ratios. Both Ribaudo, Lawler [45] and

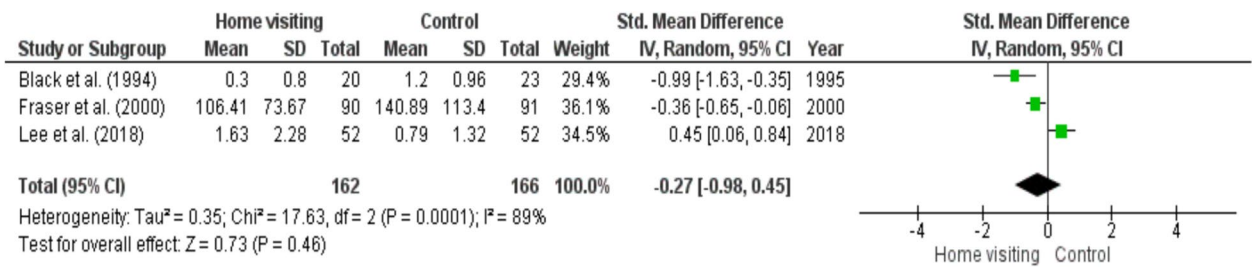

Fig. 3 Forest plot for child abuse potential outcomes. Standardized mean differences are shown with 95% CIs

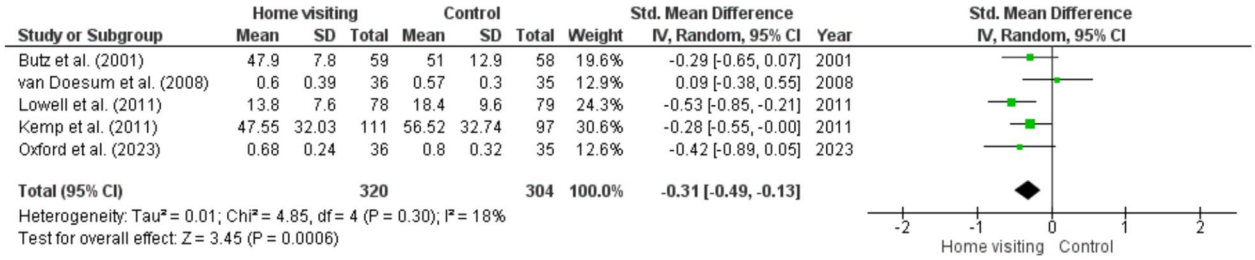

Fig. 4 Forest plot for socioemotional and/or behavioural outcomes. Standardized mean differences are shown with 95% CIs

Starn [47] studies should be interpreted with caution given the quality assessments indicated an unclear risk of bias (the studies did not report on sufficient information to make a clear judgement about bias risk).

Meta-analysis

Four of the five studies looking at parent child interaction outcomes were RCTs. Two of these RCTs had data available that was used to undertake a meta-analysis [41, 48]. The three studies excluded from the meta-analysis had missing means and/or data necessary to calculate means (i.e., standard error, confidence intervals). Results showed that there was significant heterogeneity ($Tau^2 = 0.05$; $Chi^2 = 2.25$, $df = 1$, $P = 0.13$, $I^2 = 55\%$) among studies. The random effects model (standardised mean difference 0.20; 95% CI: −0.20, 0.60; $z = 0.99$, $p = 0.32$) found no significant difference between home visiting and control conditions (Fig. 5).

Discussion

Overall, our results indicate that there is some evidence showing that home visiting interventions may improve child outcomes although there was considerable heterogeneity in interventions delivered and outcomes measured. The review systematically evaluated the literature on home visiting interventions, administered by professionals/paraprofessionals, targeting families with young children, high vulnerability, and complex needs. The review evaluated 22 studies to determine what home visiting interventions are available and the impact of available interventions on child outcomes.

In the 22 identified studies, a total of 18 home visiting interventions were administered with families with young children, high vulnerability, and complex needs. Most studies implemented RCTs (the gold standard method for evaluating interventions), had large sample sizes, and demonstrated positive effects across a range of outcomes (discussed in detail below). The literature was, however, limited by the finding that most interventions have been evaluated in no more than one study, except for right@home ($n = 2$ studies) and the Michigan Model of IMH-HV ($n = 4$).

Of the 22 studies that evaluated child mental health, psychosocial, and/or developmental outcomes, more than half reported statistically significant improvements in outcomes. Approximately 60–70% of studies ($n = 6$) evaluating child abuse potential [27, 28, 37, 40, 42, 43] and socioemotional and/or behavioural outcomes ($n = 5$) [35, 39, 44, 48] showed significantly positive improvements post intervention. In contrast, only 36% ($n = 4$) of studies evaluating cognitive and developmental outcomes [29, 38] and 40% of studies ($n = 2$) evaluating parent–child interaction outcomes [47, 48] showed significantly positive improvements in these outcomes post intervention. Meta-analysis effect sizes ranged from −0.31 to 0.20, with only one of the four significantly different from 0. The meta-analysis evaluating socioemotional and/or behavioural outcomes showed a small to medium home visiting intervention effect. Taken together these findings suggest that home visiting intervention outcomes were more consistent in regard to child protection and social and/or behavioural outcomes compared to child cognitive and developmental outcomes or parent–child

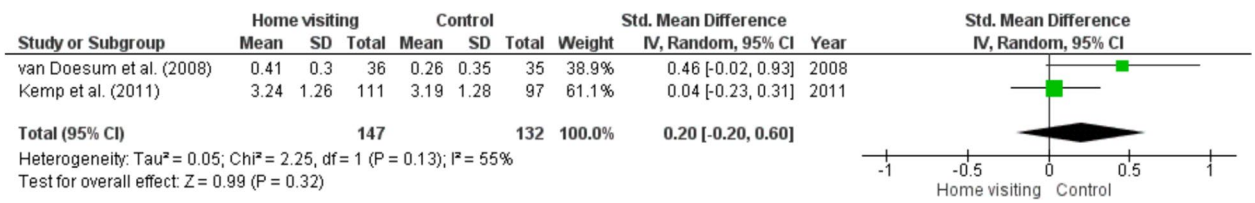

Fig. 5 Forest plot for parent child interaction outcomes. Standardized mean differences are shown with 95% CIs

interaction outcomes. However, given the small number of studies that have evaluated each outcome, the variance in programs delivered and goals of each program, and the small number of studies providing information that could be used for a meta-analysis, more research needs to be undertaken on all outcomes in order for definitive conclusions to be drawn. Of note is that studies reporting on child abuse potential outcomes were often focused on reducing child protection issues while studies reporting on child socioemotional and/or behavioural, cognitive and/or developmental, and parent–child interaction outcomes tended to focus on improving a variety of outcomes. It is possible that if more interventions were focused primarily on improving cognitive and/or developmental outcomes, for example, more studies would have shown significant improvements in these domains. Due to the high variability in programs administered and missing information regarding time/dosage (Supplementary Table 2), it is difficult to determine clear patterns in terms of features of effective and non-effective interventions.

Clinical considerations and expert opinion

This review identified a variety of home visiting interventions that have been implemented with families with young children, high vulnerability, and complex needs. While the literature indicates that most of the identified interventions were effective at improving at least one child outcome, many interventions were only evaluated in one study. Right@home and IMH-HV were the exceptions with each being evaluated in two or more studies. Of these, the right@home studies reported longitudinal outcomes of one cohort. IMH-HV was the intervention that had the most literature evaluating its effectiveness, with 75% (3/4) of studies being RCTs. Studies evaluation both IMH-HV and right@home however did have unclear and high risks of bias, respectively, hence the results should be carefully considered. The heterogeneity of studies and missing data made it difficult to make comparisons regarding treatment components between effective and non-effective innervations. Broad-stroke examination of available data, however, did not reveal any patter of difference between effective and non-effective interventions. Thus, considering the available literature, IMH-HV has the greatest evidence regarding improving parent and child outcomes for families with young children, high vulnerability, and complex needs. Nonetheless, given the diversity of challenges faced by families with young children, high vulnerability, and complex needs additional factors need to be considered when choosing an intervention to implement. For example, although IMH-HV has the greatest evidence base, the three out of the four studies had an unclear risk of bias and the research evaluating child outcomes has focused primarily on child abuse potential. Thus, this may be an intervention to consider if the aim is to improve child abuse potential. However, when the aims are to improve child behavioural and/or developmental outcomes, for example, alternative interventions need to be considered (e.g., Child FIRST which has some evidence showing its effectiveness at improving child developmental and behavioural outcomes).

Strengths and limitations

The use of both narrative synthesis and meta-analysis was a strength of this study. While the narrative synthesis provided a comprehensive overview of the existing literature, the meta-analysis combined quantitative results from multiple studies, allowing for more precise effect estimates. Furthermore, the review followed a rigorous methodological framework for searching, selecting, and analysing studies. The review was also limited by several factors. First, searches were restricted to studies written in the English language, reducing the generalisability of findings and potentially biases the results as relevant studies may have been missed. Second, the inclusivity of studies conducted exclusively in high-income, predominantly English-speaking countries further compromised the generalisability of the results. If studies in languages other than English had been incorporated into the review, there might have been an increased likelihood of identifying studies from lower-income countries, potentially leading to different outcomes. Third, only studies reporting on interventions implemented by professionals or paraprofessionals were reported, and if studies including volunteer home visitors were included, results may have been different. Fourth, there was high heterogeneity among studies. Several factors are likely to have contributed to the heterogeneity of studies including administration of different interventions, inconsistent duration of follow-up among studies, variability in inclusion/exclusion criteria, and variability in outcome measures. Fifth, it was not possible to source information for the meta-analysis if it was not already included in the article (or associated protocol papers). The inclusion of all relevant RCTs in the meta-analysis may have resulted in different findings. Sixth, the descriptions of interventions available in articles were often limited, limiting the reviews' ability to determine treatment components that contribute to successful interventions. Seventh, the term 'health visit', a term used in the United Kingdom to refer to home visiting interventions, was omitted from the broad database terms. To increase the chances of database searches finding all relevant articles, future studies should ensure that all relevant search terms are included. Finally, the exclusion of non-published studies may have

biased the results. However, the decision was made to include only peer-reviewed published studies to ensure a certain standard of quality was maintained.

Conclusion

To conclude, results of this review indicate that home visiting interventions targeting families with young children, high vulnerability, and complex needs may be effective at improving child outcomes and child safety. Due to heterogeneity of study type, meta-analyses however only showed a small to medium home visiting intervention effect in socioemotional and/or behavioural outcomes in children. Positive treatment effects for one or more outcomes were seen for the majority of interventions, though further work is needed to replicate these findings in other samples. Furthermore, standardisation of the reporting of results would enable further meta-analysis and more definitive conclusions regarding treatment outcomes. This would in turn allow for better tailoring of intervention programs.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12887-025-05580-1.

Supplementary Material 1.

Authors' contributions

Authors (SC, WTW, BOA, CLC, SW, JK, RG, LK, PJ, EM, AD, SR, and VE) were involved in the conception and design of the study. SC, WTW, and BOA conducted the analyses and interpreted the data. SC wrote the first draft of the manuscript and all authors (SC, WTW, BOA, CLC, SW, JK, RG, LK, PJ, EM, AD, SR, and VE) contributed to the final draft.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

Not applicable.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]University of New South Wales, Sydney, NSW, Australia. [2]South Western Sydney Local Health District & Ingham Institute, Liverpool, NSW, Australia. [3]Sydney Local Health District, Camperdown, NSW, Australia. [4]Karitane, Carramar, NSW, Australia. [5]Western Sydney University, New South Wales, Australia. [6]New South Wales Ministry of Health, St Leonards, NSW, Australia. [7]Faculty of Medicine and Health, Sydney University, Sydney, Australia.

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