

The role of early childhood education programmes in the promotion of child and adolescent mental health in low- and middle-income countries

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Background There is growing evidence that early childhood education (ECE) interventions can reduce the loss of developmental potential of disadvantaged children in low- and middle-income countries (LAMIC). Less attention has been paid to the potential of these programmes to prevent child mental health problems and promote child well-being.

Methods Peer-reviewed journal articles describing controlled evaluations of ECE interventions in LAMIC were reviewed to identify studies with child mental health outcomes. Studies with proximal outcomes for child mental health including caregiver practices and caregiver mental health were also reviewed.

Results Of 63 studies identified, 21 (33.33%) included child mental health outcomes; 12 of 16 studies with short-term measures showed benefits; 6 studies included a longer-term follow-up and all found benefits; 25 studies included caregiver outcomes: consistent benefits were found for caregiver practices (21 studies) and 6 of 9 studies that measured caregiver mental health reported benefits. Gains to child mental health may be most likely when ECE interventions include three main elements: (i) activities to increase child skills including cognition, language, self-regulation and social-emotional competence; (ii) training caregivers in the skills required to provide a cognitively stimulating and emotionally supportive environment; and (iii) attention to the caregivers' mental health, motivation and self-efficacy. Recommendations for the design and implementation of programmes are provided.

Conclusion ECE interventions are an important component of mental health prevention and promotion in LAMIC, and promoting child and caregiver well-being is a fundamental aspect of interventions to improve child development.

Keywords Early intervention (education), mental health, parenting education, preschool, child day care centres

Introduction

More than 200 million children under age 5 years in low- and middle-income countries (LAMIC) are not fulfilling their developmental potential due to poverty, poor nutrition and lack of stimulation.¹ Mental health problems affect 10–20% of children and adolescents worldwide and almost 90% of the world's population of children and adolescents live in LAMIC.² Interventions to improve child development, prevent mental health problems and promote well-being are thus a global health priority.

Experiences in early childhood have long-term effects on brain function, cognition and psychosocial functioning.³ Exposure to disadvantaged environments during the first few years of life predicts lower IQ and academic achievement, increased antisocial behaviour, lower economic productivity⁴ and poor health and chronic disease in adulthood.⁵ Child characteristics of behaviour and self-control as early as age 3 years predict psychopathology,⁶ health, wealth and convictions in adulthood.⁷ Hence, the foundations of adult physical and mental health, behaviour and achievement are laid during the early childhood years.

Protective factors lessen the deleterious effects of risk exposure on child development and increase resilience.⁸ Masten⁹ identifies four factors associated with resilience: connections to competent and caring adults, cognitive and self-regulation skills, positive views of self and motivation. The presence of these factors influences multiple domains of child functioning including academic performance, antisocial and prosocial behaviour and mental health.⁹ All four factors are modifiable through intervention. Quality of parenting and child IQ are two of the most potent protective factors for disadvantaged children.⁹ Quality of parenting is determined by caregiver skills and education and caregiver mental health,⁸ with evidence of negative effects of maternal depression on parenting quality and child development for mothers of varying socio-economic status (SES) levels across different countries.¹⁰ The quality of the early childhood classroom environment is also a risk and protective factor for child behaviour and adjustment. Key indicators include the quality of the instructional and emotional classroom climate,^{11,12} teacher-child relationships,¹³ and peer relationships.¹⁴

High quality early childhood education (ECE) interventions for disadvantaged children in the USA have shown long-term benefits to child schooling trajectories, cognitive development, antisocial behaviour, depression, economic productivity and/or health risk behaviours. These interventions vary in the mode of intervention delivery and include home visiting from pregnancy to age 2 years,¹⁵ educational day care from infancy to age 5 years¹⁶ and attendance at high quality preschool.¹⁷ The majority of programmes with evidence for long-term effects across multiple domains included a parenting component. Despite the potential

of ECE programmes, large-scale public programmes in the USA have shown less consistent results, and it is important to know whether ECE programmes can be effective in the low-resource settings of LAMIC.¹⁸

ECE interventions comprise parent training programmes (which involve teaching parents how to promote their child's development) and/or centre-based interventions (for example the provision of day care or preschool for young children). There is growing evidence from LAMIC that ECE interventions are effective in promoting children's cognitive development and some evidence that these gains are sustained over time;^{19,20} however, little emphasis has been given to the effect of ECE programmes on child mental health. There are a number of recent reviews of relevant interventions in LAMIC including reviews on early childhood development,^{8,19,20–22} parenting,^{23,24} day care²⁵ and child and adolescent mental health.^{2,26} However, no previous review has focused explicitly on the effects of ECE interventions on child behaviour and mental health. This review thus examines ECE interventions through a new lens and is unique in several ways: (i) it has an explicit focus on child behaviour and child mental health; (ii) it encompasses all early childhood education interventions including parenting interventions, provision of day care and preschool for young children, interventions aimed at improving the quality of preschools and multicomponent interventions which combine ECE with health and/or nutrition services; and (iii) it includes ECE interventions for children with a range of biological and psychosocial risks in LAMIC. Information is also provided on how ECE interventions in LAMIC may be enriched to maximize the strength and sustainability of benefits to child mental health.

Results

The main body of the review is divided into the following sections:

- (i) A review of the effect of ECE interventions on child mental health over the short and longer term;
- (ii) A review of the effect of ECE studies on proximal outcome measures relevant to child mental health;
- (iii) A discussion of potential mechanisms through which ECE programmes may affect child mental health using the studies reviewed for (i) and (ii);
- (iv) An exploration of key issues around the design and implementation of effective ECE programmes, using information from the studies included in (i) and (ii) above in combination with information from published reports, chapters and working papers of ECE interventions in LAMIC.

The effect of ECE interventions on child behaviour and mental health in LAMIC

Studies with short-term outcomes

Sixteen studies describing the effect of an ECE intervention on child behaviour or mental health over the short term were identified (Table 1). Studies varied across several dimensions including the: mode of delivery (e.g. parent training vs centre-based) and duration (from 10 weeks to 2 years) of the intervention; age of the child (e.g. prenatal, newborn, infants over 6 months, children between 3 and 6 years); 'risk status' of the mother (e.g. HIV-infected, internally displaced); and the health status of the child (e.g. stunted, iron-deficiently anaemic, term low birth-weight, moderately or severely undernourished). Nine studies (56%) involved a parent training intervention and seven (44%) involved a centre-based intervention. Centre-based interventions generally included children aged 3 years or over (85.7% of centre-based studies) whereas parent training was most often used for children up to age 2 years (66.67% of parent training studies). Staffing also varied, with 10 studies (62.5%) utilizing paraprofessional staff to deliver the intervention and the others using the research team (12.5%), university graduates (6.25%) or teachers (18.5%). Outcome measurements included: (i) observations of child behaviour including observations during a developmental test session (25% of studies), during a free play scenario (12.5%) or during ongoing classroom activities (12.5%); (ii) use of the Strange Situation procedure for child attachment (12.5%); and (iii) assessments of child mental health by parent (31.25%), teacher (18.75%), child (12.5%) and tester (6.25%) report (see Table 2).

Twelve studies (75%) reported benefits to one or more aspects of child behaviour or mental health. Effect sizes for each outcome are given in Table 2 (four (25%) of the studies provided insufficient data for effect sizes to be calculated). A quantitative review of the studies was not undertaken given the heterogeneity of the studies in terms of programme content, intensity and duration, target population (e.g. child age and nutritional status, maternal psychosocial well-being) and outcome measures used, in addition to the lack of adequate data in some studies.

For the parent training interventions, four involved home visiting alone^{28–31} and five combined home visits with group meetings.^{32–36} Four studies described interventions targeting children at nutritional risk,^{29,30,33,34} one targeted HIV-infected mothers and their children³⁵ and one was for displaced families.³⁶ Benefits from parent training interventions were found in six studies (66.6%) including benefits to child attachment,²⁸ ratings of child behaviour during a developmental test session,^{29,30,33} and parent^{31,36} and self³⁶ reported behaviour.

For the centre-based interventions, three studies compared attendance at preschool³⁷ or educational day care^{38,39} with no attendance and four compared

attendance at an improved preschool with attendance at a regular preschool.^{40–43} Six (85.7%) reported benefits to child behaviour and/or mental health. Attendance at centre-based services benefited child psychosocial skills,³⁸ and observed social play behaviour.^{37,39} However, two studies found negative effects for children's disruptive and aggressive behaviour during play.^{37,39} Benefits were larger for children with longer exposure to the programme and for younger children (<24 months).^{38,39} Four studies involved improving the quality of existing preschools through training teachers in instructional techniques,⁴⁰ behaviour management^{42,43} and/or teaching a social-emotional curriculum^{41,43} and benefits were found to child behaviour by observation^{42,43} and/or teacher,^{41,42,44} parent⁴² and self⁴¹-report.

Studies with long-term outcomes

Only six studies were identified that evaluated the effect of an ECE intervention on child mental health over the longer-term follow-up (3 years or more): four involved parent training and two were centre-based ECE services (Table 3). The age of the children ranged from 9–24 months to 3–5 years on enrolment and 4/6 (66.7%) of the interventions lasted 2 years, with one lasting one year and one three months. Of the four parent training interventions, two described interventions for children at nutritional risk.^{45,46} All six studies reported benefits to child mental health and/or behaviour by parent report,^{46–48} self-report^{45,49,50} or classroom observations.⁵¹

Two studies followed children up to young adulthood. In Jamaica (see Panel 2 for a detailed description of the intervention) a 2-year, home visiting intervention with stunted children, starting in the first 2 years of life, reduced self-reported anxiety ($d=0.47$) and depression ($d=0.43$) and enhanced self-esteem ($d=0.40$) at age 17–18 years,⁴⁵ and reduced self-reported depression ($d=0.12$), social inhibition ($d=0.37$) and serious violent behaviour (odds ratio=0.33) at age 22 years.⁴⁹ However, no benefits were found for self-reported antisocial behaviour ($d=0.13$), parent-reported attention problems ($d=0.41$) or hyperactivity ($d=0.06$) at age 17–18 years,⁴⁵ nor to self-reported anxiety ($d=0.19$) at age 22 years.⁴⁹ In addition, no benefits were found for child mental health by teacher or parent report using the Rutter Scales at age 11–12 years.⁵²

A study in Mauritius⁵⁰ compared children who attended specially constructed high quality preschools for 2 years with children who attended low quality community preschools. The intervention involved educational activities, nutrition and physical exercise and resulted in reduced self-reported schizotypal personality ($d=0.29$), cognitive disorganization ($d=0.34$), conduct disorder ($d=0.44$), psychotic behaviour ($d=0.31$) and motor excess ($d=0.38$) at age 17 years, and less criminal offending ($d=0.26$) at age 23 years, with the largest benefits for children who

Panel 1 Search strategy and selection criteria

Systematic reviews of interventions to promote early child development (ECD) and to prevent and treat child and adolescent mental health problems in LAMIC were conducted for the *Lancet* series on global child development^{8,19} and the *Lancet* series on global mental health.² These searches included literature up to December 2010. The studies identified through these reviews were revisited to identify educational interventions targeting children up to age 6 years that included child behaviour and/or mental health as an outcome measure. As a secondary analysis, studies which included caregiving outcomes likely to promote child mental well-being (e.g. caregiving behaviours, the caregiving environment and caregiver mental health) were also identified. The previous searches were updated by conducting an additional search for papers published between January 2011 and March 2013. Searches were conducted in English using Psycinfo, PubMed, Google Scholar and the Cochrane library. The terms used were: 'parenting', 'preschool', 'pre-primary', 'day care', 'early learning', 'stimulation', 'media', 'television' and 'educational intervention'. The terms for outcome measures were 'early child development', 'behaviour', 'socio-emotional development' and 'mental health' for the child outcomes, and 'mother-child interaction', 'mother practices' 'HOME', 'classroom environment' 'mother' 'depression'/mood/stress/mental health' for the caregiver outcomes. Alternatives to 'mother' in the above terms were 'caregiver', 'teacher', 'parent', 'child care worker', 'daycare worker'. In addition, recent reviews of interventions to improve parenting practices^{23,24} and child mental health^{25,26} in LAMIC were hand-searched for relevant papers and experts in the field were consulted. The full text of all controlled studies of early childhood education interventions in LAMIC were read to identify relevant outcomes.

Educational interventions were defined as parent training, educational day care and preschool provision, teacher-training interventions to improve the quality of existing centre-based services, media interventions or a combination of these. Interventions with children living in institutions and interventions for children with mental retardation with cognitive outcomes only were excluded. Multi-component interventions including nutritional and/or health care services in addition to educational services and interventions for children with psychosocial or biological risks for poor development (e.g. undernourished children, children with depressed mothers, internally displaced children) were also included.

Studies were included in the main review if they included child mental health and/or behaviour as an outcome measure and: (i) were published in a peer review journal from 1990 to the present; (ii) described a randomized trial (at the cluster or individual level) or a quasi-experimental study with a control condition (no intervention, service as usual, alternative service or different levels exposure to the intervention); (iii) targeted children from conception to age 6 years; and (iv) were undertaken in LAMIC. Twenty-one studies met these inclusion criteria (see Figure 1).

Studies describing ECD interventions and meeting the inclusion criteria 1–4 above with outcome measures of caregiver mental health and/or caregiver practices (e.g. mother-child interaction, stimulation in the home, discipline strategies used, teacher behaviours, classroom environment) were also reviewed in a secondary analysis. Twenty-five studies met these inclusion criteria: nine included caregiver mental health as an outcome measure and 21 included caregiver practices (Figure 1).

The following information was extracted for all eligible studies using a standardized format: (i) country (classified using World Bank criteria), (ii) study design, (iii) nature of control condition, (iv) sample size and sample characteristics, (v) child age, (vi) staff used, (vii) number and type of interventions sessions, (viii) duration of intervention, (ix) content of intervention, (x) outcomes measured and (xi) findings and size of effect. When effect sizes were not reported, and sufficient data were provided, they were calculated by the author. Studies were rated for quality using the McMaster University Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies.²⁷

The published reports, chapters and working papers of early childhood interventions identified during the searches were also read to provide additional information on design and implementation issues of early childhood programmes and how these may vary across contexts. Papers describing the design, content and process of implementation were also reviewed where available.

were undernourished at age 3 years. No benefits were found to self-reports of attention problems ($d = -0.07$) and anxiety ($d = 0.01$) at age 17 years nor to schizotypal personality ($d = -0.02$) at age 23 years.

The effect of ECE interventions on caregiver practices and mental health in LAMIC

Twenty-five studies were identified that evaluated the effect of an ECE intervention on caregiver outcomes

Table 1 Effect of early childhood education interventions on child behaviour and mental health

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Quality rating ^a
Parent training interventions										
Cooper <i>et al.</i> 2009 ²⁸	RCT Women randomized to intervention or untreated control condition	N = 449; I = 220 C = 229	Pregnant women	Paraprof (community women)	16 home visits lasting 1h: two antenatal visits, weekly for 8 weeks postpartum, fortnightly for 2 months and monthly for 2 months	Until 5 months of age	Promoting sensitive, responsive mother-child interactions and sensitizing mothers to their infant's abilities using the Neonatal Behavioural Assessment Schedule.	At 18 months: Infant attachment using strange situation procedure.	At 18 months: Benefits to infant attachment: Odds ratio = 1.70 ^b ($P = 0.029$).	Strong
Jamaica Upper middle income [Cognition -]	RCT Randomized to intervention or control. Both groups were visited weekly.	N = 140 term low birthweight infants (<2,500 g and >37 weeks of gestation); I = 70 C = 70	Birth	Paraprofs (community health aides)	8 home visits from birth to 8 weeks	2 months	Promoting sensitive responsive interactions and early stimulation activities in first 2 months of life.	At 7 months: Behaviour ratings during two problem-solving tests: activity, cooperation, emotional tone, vocalizations.	At 7 months: Benefits to infant cooperation ($P < 0.01$) and positive emotionality ($P < 0.05$) at 7 months. Trend for benefits to vocalizations ($P = 0.067$). No benefits to activity ($P > 0.1$).	Strong
Lozoff <i>et al.</i> 2010 ³⁰	RCT Infants randomized to intervention or control group. Both groups were visited weekly.	N = 277 infants with iron-deficiency anaemia (IDA) and non-anaemic infants: I = 136 C = 141	6 months and 12 months	Professional educators	Weekly home visits lasting 1 hour	1 year	Focus on improving mother-child relationship and introducing verbal and nonverbal activities. All IDA infants received iron supplementation.	Behaviour rating scale: positive social responsiveness. Negative affect was measured but not reported.	Benefits to positive social responsiveness for iron-deficient anaemic infants: $d = 0.33^R$ ($P = 0.002$) for 6-month, $d = 0.30^R$ ($P = 0.01$) for 12-month cohort. No benefits of intervention for non-anaemic infants.	Strong
Magwaza and Edwards 1991 ³¹	RCT Children randomly assigned to intervention, a control group who were visited weekly or a non-visited control	N = 90; I = 30 C1 = 30 (visited weekly) C2 = 30 (not visited)	4 years	Research assistants	10 sessions of home visiting	Over 10 weeks	Promoting verbal stimulation using demonstration and practice and feedback.	Mother-reported child behaviour: task-oriented behaviour, positive social behaviour, distractible behaviour (all $P < 0.05$). No benefits to social hostility or introversion-extroversion.	Benefits to task-oriented behaviour, positive social behaviour and distractible behaviour (all $P < 0.05$). No benefits to social hostility or introversion-extroversion.	Weak
South Africa Upper middle income [Cognition ✓]	RCT Mothers assigned to intervention or to receive an educational talk on attachment during 3 rd trimester of pregnancy	N = 100; I = 50 C = 50	Pregnant mothers	Research team members	10 sessions: six 2-h group sessions in pregnancy and four 1-h individual sessions during 1st year	Until 12 months of age	Improving maternal sensitivity, 'secure attachment programme'.	Child attachment using Strange Situation Assessment.	No benefits to child attachment: $d = 0.17^R$ ($P = 0.139$).	Moderate
Chile Upper middle income [Cognition -]	Cluster RCT Clinics randomized to intervention or standard care	206 undernourished children (WAZ < -2z scores) I = 104 C = 102 From 20 nutrition clinics	6-24 months	Paraprofs (community women)	Weekly group meetings for 10 months; fortnightly for 2 months Home visits twice per week for 8 months and weekly for 4 months	1 year	Teaching play activities to mother and child using demonstration and practice. Both groups received standard nutritional services.	Child behaviour ratings during test session: vocalization, cooperation, response to examiner, emotional tone and activity.	Benefits of intervention were found for: Response to examiner: $d = 0.4^A$ ($P = 0.03$), Cooperation: $d = 0.28^A$ ($P = 0.005$). Emotional tone: $d = 0.22^A$ ($P < 0.001$), Vocalization: $d = 0.27^A$ ($P = 0.001$). No changes to child activity: $d = 0.18^B$ ($P = 0.09$).	Strong
Hamadani <i>et al.</i> 2006 ³³	Cluster RCT Clinics randomized to intervention or standard care	206 undernourished children (WAZ < -2z scores) I = 104 C = 102 From 20 nutrition clinics	6-24 months	Paraprofs (community women)	Weekly group meetings for 10 months; fortnightly for 2 months Home visits twice per week for 8 months and weekly for 4 months	1 year	Teaching play activities to mother and child using demonstration and practice. Both groups received standard nutritional services.	Child behaviour ratings during test session: vocalization, cooperation, response to examiner, emotional tone and activity.	Benefits of intervention were found for: Response to examiner: $d = 0.4^A$ ($P = 0.03$), Cooperation: $d = 0.28^A$ ($P = 0.005$). Emotional tone: $d = 0.22^A$ ($P < 0.001$), Vocalization: $d = 0.27^A$ ($P = 0.001$). No changes to child activity: $d = 0.18^B$ ($P = 0.09$).	Strong

(continued)

Table 1 Continued

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Quality rating ^a
Nahar <i>et al.</i> 2009 ³⁴ Bangladesh Low income [Cognition ✓]	Quasi-experimental time-lagged controlled trial, control children evaluated in year 1 and intervention introduced in year 2.	N = 133 severely malnourished children (WAZ <-3z scores); I = 77 C = 56	6–24 months	Paraprof (female health worker)	Daily 30-min group and 30-min individual sessions for 2 weeks in hospital followed by 11 home visits	6 months	Teaching play activities to mother and child using demonstration and practice. Both groups received medical and nutritional care.	Child behaviour ratings during test session: response to examiner, activity, emotional tone, vocalization, cooperation.	No benefits to child behaviour: Response to examiner: $d = 0.1^a$ ($P = 0.73$). Activity: $d = -0.31^b$ ($P = 0.37$). Cooperation: $d = 0.0^b$ ($P = 0.30$). Emotional tone: $d = 0.1^a$ ($P = 0.18$). Vocalization: $d = 0.13^b$ ($P = 0.53$).	Moderate
Boivin <i>et al.</i> 2013 ³⁵ Uganda Low income [Cognition ✓]	RCT Intervention vs health and nutrition curriculum.	N = 119 uninfected preschool children born to HIV-infected mothers and their caregivers	2–4 years	Graduates of psychology or social work	Biweekly 1-h sessions alternating between home and clinic	1 year	Mediational Intervention for Sensitizing Caregivers (MISC): training caregivers in strategies to enhance child development through everyday interactions and experiences.	After 6 and 12 months: Achenbach Child Behaviour Checklist: internalizing, externalizing and total symptoms.	benefits of MISC intervention to child internalizing ($P = 0.854$), externalizing ($P = 0.198$) or total ($P = 0.150$) symptoms.	Strong
Dybdahl 2001 ³⁶ Bosnia Upper middle income [Cognition -]	RCT Intervention vs non-treated control group	N = 87 internally displaced mother-child dyads: I = 42, C = 45	5–6 years	Preschool teachers and a medical student	Weekly group meetings lasting 2 h (with approx 5 mothers/ group) and one home visit lasting 1 h	Five months	Psychosocial intervention plus medical care. Topics covered involved child development, mothers' awareness of their child, promoting sensitive and stimulating mother-child interactions, trauma- and coping-strategies. Control group received medical care only.	Mothers' reports of their child's anxiety/sadness, withdrawal and psychosomatic symptoms, child concentration problems and description of child. Children's reports of depression and well-being. Psychologists' observations of child problems and child strengths.	Trend for benefits of intervention to mothers' reports of child anxiety/sadness: $d = 0.4^b$, $P < 0.1$. No benefits to mothers' reports of child withdrawal: $d = 0.17^b$ ($P > 0.05$). Psychosomatic symptoms: $d = 0.19^b$ ($P > 0.05$) and concentration problems: $d = 0.17^b$ ($P > 0.05$). No benefits to child reports of depression: $d = 0.23^b$ ($P > 0.05$) and well-being: $d = 0.32^b$ ($P > 0.05$). Benefits to psychologist's observations of child problems: $d = 0.59^b$ ($P < 0.05$). No benefits for child strengths: $d = -0.16^b$ ($P > 0.05$).	Strong
Aboud 2006 ³⁷ Bangladesh Low income [Cognition ✓]	Quasi-experimental, compared children attending pre-schools with children from villages with no preschool.	N = 401 I = 213 (from 22 villages) C = 188 (from 22 villages)	4–6 years	Paraprof teachers (minimum grade 10 education) and volunteer mother	Half day programme, 6 days/week	10 months of preschool attendance	Attending preschool: mix of child-initiated free play, structured group games and rhymes and teacher-directed instruction in literacy and maths.	Play Observation Scale: sociability during play (3 levels: solitary, parallel and interactive play), aggression, onlooker, unoccupied. Conversations with peers.	Benefits to interactive play conversations with peers: $d = 0.72^k$ ($P = 0.001$), and $d = 0.54^k$ ($P = 0.0002$). Less onlooker behaviour for intervention children: $d = 0.58^k$ ($P < 0.0001$). No difference in unoccupied behaviour: $d = 0.51^c$.	Weak

(continued)

Table 1 Continued

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Quality rating ^a
Behrman <i>et al.</i> 2004 ³⁸	Quasi-experimental, compared children participating in the programme with children living in non-programme areas.	N = 1531; I = 1198 C = 333	6–72 months	Paraprofs (community women)	Full-time child care	From 6 to 72 months	Ratio of 12 children: 1 adult Childcare is provided in homes of women living in programme areas. Each centre has up to 15 children and a staff:child ratio of 1:5. Food is provided to meet 70% of children's nutritional needs. Children's health and nutrition are monitored and educational activities provided.	Child test scores: Psychosocial skills	($P > 0.05$). Preschool children were significantly more aggressive: $d = -0.32^R$ ($P > 0.0005$). Benefits to psychosocial skills for children who had participated in the programme for at least 7 months Benefits were larger for children younger than 24 months than for children older than 24 months.	Moderate
Bernal and Fernandez 2013 ³⁹	Quasi-experimental, compared children with different levels of exposure to programme	Exposure levels: more than 15 months 5–15 months 2–4 months < 1 month as control group N = 7649 for parent reports: I = 6497C = 1152 N = 2661 for caregiver ratings: I = 2278 C = 383	3–6 years	Paraprofs (community women)	Full-time and part-time child care	Varying levels of exposure.	Home-based childcare programme for children aged 6 months to 6 years involving psychosocial stimulation and supplemental nutrition (50–70% of daily allowance). Each centre has up to 15 children.	Penn Interactive Peer Scale (rated by childcare providers); play interaction, play disruption, play disconnection. Parent-reported socio-emotional development.	Benefits to play interaction for children with 16 or more months of programme exposure: $d = 0.12^R$ ($P < 0.05$) for children 49+ months with 16+ months of exposure; $d = 0.45^R$ ($P < 0.05$) for children 36–48 months with 16+ exposure. Benefits for play disconnection for younger children with 16+ months in the programme: $d = 0.33^R$ ($P < 0.05$) for children 36–48 months with 16+ months of exposure. Children with longer programme exposure were more disruptive during play; $d = -0.17^R$ ($P < 0.05$) for children aged 36–48 months with 5+ months of exposure. No benefits to parent-reported socio-emotional development for any age group or programme exposure duration.	Moderate
Moore <i>et al.</i> 2008 ⁴⁰	Quasi-experimental, compared children attending enriched preschools with those attending regular preschools.	N = 138; I = 71 from 6 schools C = 67 from 6 schools	5–6.5 years	Paraprof teachers	Attendance at improved preschool, half-day sessions. Control group attended regular preschool	Over 7 months	Improved curriculum to promote language and literacy, more small-group and child-led activities. Reasoning rather than rote learning was promoted.	Child play behaviour: sociability (interactive or solitary play), aggression.	No benefits to child interactive play; $d = 0.33^R$ ($P > 0.05$) or solitary play: $d = 0.10^R$ ($P > 0.05$). Aggression not reported.	Weak
Mishara and Ystgaard 2006 ⁴¹	Quasi-experimental, compared children in schools with and	N = 418; I = 314 (from 11 schools)	6 years	Teachers	24 weekly lessons delivered by teachers	Over a school year	'Zippy's Friends': a curriculum to teach social-emotional	Teacher reported social skills (cooperation, assertion and self-	Benefits to teacher-reported: assertion: $d = 0.55^R$ ($P < 0.001$), self-control:	Weak

(continued)

Table 1 Continued

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Quality rating ^a
Lithuania Upper middle income [Cognition -]	without the programme	C=104 (from 6 schools)	6				and coping skills to young children.	control), problem behaviours (externalizing, internalizing and hyperactivity) and coping strategies. Child-reported social skills (cooperation, assertion, self-control, empathy) and coping strategies used.	d = 0.58 ^b ($P < 0.001$), $co-$ operation: d = 0.17 ^b ($P < 0.05$), externalizing behaviour problems: d = 1.90 ^b ($P < 0.001$), hyperactivity: d = 0.43 ^b ($P < 0.001$), coping strategies used by children: d = 0.21 ^b ($P < 0.001$). No benefits to internalizing problems: d = 0.53 ^b ($P > 0.5$). Benefits to child-reported self-control: d = 0.29 ^b ($P < 0.05$), empathy: d = 0.22 ^b ($P < 0.05$), coping strategies: d = 0.11 ^b ($P < 0.001$). No benefits to child-reported assertion: d = 0.26 ^b ($P > 0.05$) or cooperation: d = 0.20 ^b ($P > 0.05$).	Strong
Baker-Henningham <i>et al.</i> , 2012 ^{2c}	Cluster RCT Preschools randomized to receive intervention or standard treatment. Both groups received educational materials.	N = 225 (children with the highest level of conduct problems at baseline by teacher report (3/class)); I = 113 from 37 classrooms in 12 schools, C = 112 from 36 classrooms in 12 schools	3–6 years	Paraprof teachers trained by research team	8 full-day teacher workshops plus four 1-h sessions of in-class support. Control teachers attended regular government workshops	Over 1 year	Training teachers in classroom behaviour management techniques and in how to promote children's social-emotional competence. Control teachers attended monthly government training workshops.	Observed child conduct problems and friendship skills. Teacher-reported child behaviour difficulties and social skills. Parent-reported child behaviour difficulties.	Benefits to observed conduct problems: d = 0.42 ^k ($P = 0.006$) and observed friendship skills: d = 0.74 ^k ($P < 0.0001$). Benefits to teacher-reported behaviour difficulties: d = 0.47 ^k ($P = 0.001$) and social skills: d = 0.59 ^k ($P < 0.0001$). Benefits to parents' reports of their children's behaviour difficulties: d = 0.22 ^k ($P = 0.03$).	Strong
Baker-Henningham <i>et al.</i> , 2009a, ^{4b} 2009b ^{4a}	Cluster RCT Schools randomized to receive intervention or standard treatment. Both groups received educational materials.	5 preschools, (I = 3, C = 2), 27 classrooms (I = 15, C = 12) 135 children with behaviour problems (approx. 5/class) as nominated by teacher: I = 69 C = 66	3–6 years	Paraprof teachers and research team	7 full-day teacher workshops, 14 curriculum lessons in each class. Control teachers attended regular government workshops	Over 1 year	Training teachers in classroom behaviour management techniques and teaching social-emotional skills to children. Control teachers attended monthly government training workshops	Observations of classroom-level observations of child interest and engagement (P = 0.012), and appropriate behaviour: d = 1.82 ^k ($P = 0.018$). Benefits to conduct problems: d = 0.26 ^k ($P = 0.05$), hyperactivity: d = 0.36 ^k ($P = 0.046$) and peer problems: d = 0.71 ^k ($P = 0.0007$). No benefits to emotional problems: d = 0.25 ^k ($P = 0.277$) or prosocial behaviour: d = 0.33 ^k ($P = 0.236$).	Moderate	
Jamaica Upper middle income [Cognition -]										

Cognition: ✓, significant benefits to cognitive and/or language development; -, cognition and/or language not measured.
 N, total number; RCT, randomized controlled trial; I, intervention, C, control; paraprofs: paraprofessionals; WAZ, weight for age.
 Effect sizes: ^areported, ^bregression coefficient/pooled standard deviation(SD) at baseline, ^cdifference in mean change from baseline to post-test/pooled SD at baseline, ^ddifference in post-test mean/SD control group.
^eStudies were rated for quality using the McMaster University Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies.²⁷ Studies are rated for selection bias, study design, confounders, blinding, data collection methods and withdrawals and drop-outs: no weak ratings = strong, one weak rating = moderate, two or more weak ratings = weak.

Table 2 Measures of child mental health used in the evaluation of early childhood education interventions in LAMIC

Study	Country	Child age	Concept measured	Instruments used
Parent training interventions				
Cooper <i>et al.</i> 2009 ²⁸	South Africa	18 months	Child attachment	Strange Situation Procedure ⁹³
Santelices <i>et al.</i> 2011 ³²	Chile	12 months	Child attachment	Strange Situation Procedure ⁹³
Gardner <i>et al.</i> 2003 ²⁹	Jamaica	7 months	Child behaviour	Observer rating scales of child activity, cooperation, emotional tone and vocalisations on a 9-point scale (based on rating scales by Wolke) ⁹⁴ during a developmental test session.
Hamadani <i>et al.</i> 2006 ³³	Bangladesh	18–36 months	Child behaviour	As above with an additional rating scale 'response to examiner'.
Nahar <i>et al.</i> 2009 ³⁴	Bangladesh	12–30 months	Child behaviour	As above
Lozoff <i>et al.</i> 2010 ³⁰	Chile	12 and 18 months	Child positive social responsiveness	Observer rating scale during a developmental test session based on the behaviour scales in the Bayley Scales of Infant Development. ⁹⁵
Magwaza and Edwards 1991 ³¹	South Africa	4 years	Task-oriented behaviour Distractable behaviour	Mother report using the Home Behaviour Inventory. ⁹⁶
Boivin <i>et al.</i> 2013 ³⁵	Uganda	2–4 years	Externalizing and internalizing problems	Mother report using Achenbach Child Behaviour Checklist. ⁹⁷
Dybadl 2001 ³⁶	Bosnia	5–6 years	(1) General description of child (2) Psychological and psychosomatic problems of traumatized children (3) Concentration problems (4) Depression (5) Well-being (6) Child problems (7) Child strengths	(1) Mothers' reports of 11 child characteristics (e.g. sad-happy; aggressive-peaceful) (2) Mothers' reports of 10 psychological problems (e.g. bedwetting, sleep problems, headaches, anxiety) on a four-point scale (3) Mothers' reports of concentration problems in 8 everyday situations (4) Child reports using an adapted version of the Beck Depression Inventory ⁹⁸ (5) Child reports using a 7-point scale showing faces ranging from sad to happy (based on Andrews and Withey 1976 ⁹⁹) (6) Psychologist ratings of child during interview session: based on 8 undesirable behavioural characteristics (e.g. withdrawn) (7) Psychologist ratings of child during interview session based on 6 positive behavioural characteristics (e.g. active and interested).

(continued)

Table 2 Continued

Study	Country	Child age	Concept measured	Instruments used
Centre-based early childhood interventions				
About 2006 ³⁷	Bangladesh	4–6 years	Sociability during play behaviour Unoccupied behaviour Conversations with peers	Observations of child play behaviour during a 40-min period of free play on two separate days using the Play Observation Scale ¹⁰⁰
Moore <i>et al.</i> 2008 ⁴⁰	Bangladesh	5–6.5 years	As above	As above
Behrman <i>et al.</i> 2004 ³⁸	Bolivia	6–72 months	Psychosocial skills	Unclear how this was measured
Bernal and Fernandez 2013 ³⁹	Columbia	3–6 years	Play interaction (e.g. helping others) Play disruption (e.g. aggression) Play disconnection (e.g. non-participation)	Childcare providers rate children's behaviour using the Penn Interactive Peer Play Scale ¹⁰¹
Mishara and Ystgaard 2006 ⁴¹	Lithuania	6 years	(1) Child social skills. (2) Externalising, internalising and hyperactivity problems (3) Child coping strategies	(1) Teacher and child reports using the Social Skills Questionnaire, Elementary Level: subscales on cooperation, assertion and self-control (plus empathy for child report only) ¹⁰² (2) Teacher reports: scale unclear (3) Child reports using the Schoolagers' Coping Strategies Inventory ¹⁰³ and teacher reports using an adapted version of the same instrument
Baker-Henningham <i>et al.</i> 2012 ⁴²	Jamaica	3–6 years	(1) Classwide child behaviour (2) Child conduct problems, hyperactivity, peer problems, emotional problems and prosocial behaviour	(1) Observer ratings of the level of appropriate behaviour and the level of interest and enthusiasm shown in learning activities by a class of children over a minimum of four 30-min sessions (based on rating scales used by the Conduct Problems Prevention Research Group) ¹⁰⁴ (2) Mothers' report using the Strengths and Difficulties Questionnaire ¹⁰⁵
Baker-Henningham <i>et al.</i> 2009a, ⁴³ 2009b ⁴⁴	Jamaica	3–6 years	(1) Observed conduct problems (2) Observed friendship skills (3) Teacher reported behaviour difficulties (4) Teacher reported social skills (5) Parent reported behaviour difficulties	(1) Composite score: event recording of child aggression, scan sampling of disruptive behaviour and observer ratings of child conduct problems, activity level, off-task behaviour and rule-breaking behaviour over 1 h of observation spread over 4 school days—based on categories in MOOSE ¹⁰⁶ (2) Event recording of child friendship behaviours over a 1 h of observation spread over 4 school days—as above (3) Composite score: teacher reports of: conduct problems: Sutter-Eyberg Child Behaviour Inventory ¹⁰⁷ ADHD: Connor's short form ¹⁰⁸ total difficulties: Strengths and Difficulties Questionnaire (SDQ) ¹⁰⁵ (4) Composite score: teacher reports of: social skills: Preschool Kindergarten Behaviour Scale ¹⁰⁹ prosocial behaviour: SDQ ¹⁰⁵ (5) Composite score: parent reports of: conduct problems: Eyberg Child Behaviour Inventory ¹¹⁰ total difficulties: SDQ ¹⁰⁵ minus prosocial behaviour: SDQ ¹⁰⁵

Table 3 Long-term follow-up of the effects of early childhood education interventions on child behaviour and mental health

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ¹
Parent training programmes										
Chang <i>et al.</i> 2002, ⁵² Walker <i>et al.</i> 2006, ⁴⁵ Walker <i>et al.</i> 2011 ⁴⁹	RCT Children randomized to one of four groups (including control group) were visited weekly	N = 129 stunted children (HAZ < -2z scores) Stimulation: n = 32 Nutritional supplementation: n = 32 Stimulation and Supplementation: n = 32 Control: n = 33	9–24 months	Paraprofessionals (community health aides)	Weekly home visits lasting 1 h	2 years	Teaching play activities to mother and child using demonstration and practice. Home-made books, toys, puzzles and pictures used. A developmentally sequenced curriculum was used. All groups received weekly home visits from health workers.	At age 11–12 years: teacher and parent reports of child behaviour (Rutter scales: conduct disorders, hyperactivity/inattention, emotional difficulties, prosocial). At age 17–18 years: self-reported anxiety (what I think and feel questionnaire) depression (short mood and feelings questionnaire), self-esteem (how I think about myself questionnaire), anti-social behaviour (behaviour and activities checklist). Parent-reported attention problems, hyperactivity and oppositional behaviour (short Connor's rating scale). At age 22 years: self reported depression (as above), anxiety (State-Trait Anxiety Inventory), social inhibition (Inventory on Interpersonal Problems), serious violent behaviour, physical fights and use of weapons.	Age 11–12 years: No benefits to child behaviour. At 17–18 years: Significant benefits to self-reports of anxiety: d = 0.47 ^c (P = 0.01), depression: d = 0.43 ^c (P = 0.02), self-esteem: d = 0.40 ^c (P = 0.04). No significant benefits to self-reports of antisocial behaviour: d = 0.13 ^c (P = 0.53). No benefits to parents' reports of attention problems: d = 0.41 ^c (P = 0.22), hyperactivity: d = 0.06 ^c (P = 0.77), oppositional behaviour: d = 0.32 ^c (P = 0.10). Benefits to depression: d = 0.12 ^c (P = 0.03) and social inhibition: d = 0.37 ^c (P = 0.05). No benefits to anxiety: d = 0.19 ^c (P = 0.40). Benefits to less serious violent behaviour: odds ratio = 0.33 ^k (P = 0.037); trend towards less involvement in physical fights: odds ratio = 0.36 ^k (P = 0.061). No benefits to weapon use: odds ratio = 0.59 ^k (P = 0.22).	Strong
[Cognition ✓]	In this analysis early stimulation (n = 64) is compared with no early stimulation (n = 65)									
Kagitcibasi <i>et al.</i> 2001 ⁴⁷	RCT Children attending custodial day care, educational day care or no day care were randomized to receive mother training or no mother training	N = 225; I = 83 (mother training) C = 134 (no mother training)	3–5 years	Paraprofessionals (community women with little education for home visiting and women with at least high school education for groups)	Mother training: 60 fortnightly group meetings, 60 weekly home visits (from October to May each year) Day care: child attended educational or custodial day care while mother worked	Over 2-year time period.	Mother training consisted of a cognitive programme for children (HIPPI programme) and mother enrichment programme to support mother in her parenting role.	6 years after end of intervention: mother-reported child behaviour (Parent Acceptance and Rejection), autonomous/dependent behaviour, aggression, self-concept, school adjustment and emotional problems.	6 years after end of intervention: Benefits of mother training to child aggression, no benefits from educational day care. No benefits of educational day care or mother training to autonomous/dependent behaviour, self-concept, school adjustment or emotional problems.	Moderate
Turkey Upper middle income [Cognition ✓]										
Walker <i>et al.</i> 2010 ⁴⁶	RCT Randomized to intervention or control Both groups were visited weekly	N = 140 term low birth weight infants (< 2.500 g > 37 weeks gestation): I = 70 C = 70	Birth	Paraprofessionals (community health aides)	8 home visits from birth to 8 weeks Weekly home visits from 7 to 24 months.	2 years	Promoting sensitive responsive interactions and early stimulation activities in first 2 months of life. Teaching play activities to mothers with their children using demonstration, practice	At 6 years: mother-reported child behaviour using the Strengths and Difficulties Questionnaire (SDQ): total difficulties = sum of emotional problems, conduct problems, peer problems and hyperactivity.	At 6 years: Benefits to total difficulties on SDQ: d = 0.44 ^k	Strong
Jamaica Upper middle income [Cognition ✓]										

(continued)

Table 3 Continued

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ¹
Klein and Rye 2004 ⁴⁸ Ethiopia/Low income [Cognition ✓]	Quasi-experimental. Families participating in programme in one community compared with those from a second community	N = 96; I = 49 C = 47	1–3 years	Paraprofessionals (community health workers, social workers)	Five 1½-h home visits, five 2-3-h group meetings	Over 3-month time period	7–24 months. Mediational Intervention for Sensitizing Caregivers: videotaping maternal child interactions and giving feedback plus role play.	Child behaviour at 6 year follow-up (Rutter Scales of Social and Emotional Development).	Intervention children reported to be less hostile and aggressive, less anxious, less hyperactive and less distractible at 6-year follow-up.	Weak
Centre-based early childhood interventions										
Berlinski <i>et al.</i> 2009 ⁵¹ Argentina Upper middle income [Cognition -]	Quasi-experimental compared children with and without preschool experience	Large scale survey – aggregate class level data	3–5 years	Not reported	3½ h/day, 5 days/week for 9 months a year	1 year of preschool	Attendance at preschool	In third grade of primary school: teacher reports of classroom behaviour: pay attention, put a lot of effort, well disciplined, participate regularly.	In third grade of primary school: If all students in a class attend a year of preschool, likelihood that at least half of them will: Pay a lot of attention, increases by 12%; Put in a lot of effort, increases by 21%; Be well-disciplined, increases by 11%; Participate regularly, increases by 16.5%.	Moderate
Raine <i>et al.</i> 2003 ⁹⁰ Mauritius Upper middle income [Cognition -]	Quasi-experimental: randomly selected children to attend high quality preschool	N = 455; I = 100 C = 355 (I = 83 followed up)	3 years	Student teachers	Attendance at high quality preschool: 7 h/day 5 days/week during the school year	2 years	High quality preschool with 3 main elements: preschool education, nutrition and exercise. Control children attended regular preschools.	At 17 years: self-reported schizotypal personality (positive schizotypal personality and cognitive disorganization) behaviour problems (Revised Behaviour Problem Checklist): conduct disorder, motor excess, attention problems, psychotic behaviour, anxiety, socialised aggression. At 23 years: self-reported schizotypal personality (Schizotypal Personality Questionnaire) and criminal offending history. Court records of property, drug and serious driving offences.	At 17 years: Benefits of intervention to: conduct disorder: d = 0.44 ^k (P = 0.003), psychotic behaviour: d = 0.31 ^k (P < 0.04), motor excess: d = 0.38 ^k (P < 0.02), positive schizotypal personality: d = 0.29 ^k (P < 0.04) and disorganization: d = 0.34 ^c (P < 0.02). No benefits to: attention problems: d = 0.07 ^c (P > 0.12), anxiety: d = 0.01 ^c (P > 0.12), socialized aggression: d = -0.08 ^c (P > 0.12). At 23 years: No benefits to schizotypal personality: d = -0.02 ^c (P = 0.34). Reductions in self-reported criminal offending: d = 0.26 ^k (P < 0.05), trend for benefits to court records of criminal offending: d = 0.22 ^k (P = 0.07)	Strong

Cognition: ✓, significant benefits to cognitive and/or language development; x, no significant benefits to cognition and/or language development - , cognition and/or language not measured. N, total number; RCT, randomized controlled trial; I, intervention; C, control; paraprofessionals; HAZ, height for age.

Effect sizes: ^kreported; ^aregression coefficient/pooled standard deviation(SD) at baseline; ^bdifference in mean change from baseline to post-test/pooled SD at baseline; ^cdifference in post-test mean/SD control group.

¹Studies were rated for quality using the McMaster University Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies.²⁷ Studies are rated for selection bias, study design, confounders, blinding, data collection methods and withdrawals and drop-outs: no weak ratings = strong, one weak rating = moderate, two or more weak ratings = weak.

Panel 2 The Jamaica Early Stimulation Programme

The Jamaican stimulation programme is a home-visiting intervention that uses a structured curriculum of developmentally sequenced play activities introduced using home-made toys and books. There is a strong focus on the mother's use of language: using songs, rhymes, books and pictures in addition to encouraging the mother to talk with her child during everyday routine activities and play activities. There is also significant emphasis on teaching concepts (e.g. in/out, fast/slow, top/bottom, colours etc.). Home visits are conducted by community health aides (CHAs) (paraprofessionals) who are provided with 1–2 weeks of initial training followed by ongoing supervision. During the home visit, CHAs demonstrate the play activities to the mothers and mothers are then encouraged to do the activities with their child and receive praise, encouragement and supportive feedback from the health aide. The play materials are left in the home and mothers are encouraged to play with their child every day. The following week, new activities are introduced and the play materials are exchanged for different ones. This cognitively focused curriculum is delivered in an emotionally supportive way involving praise and encouragement for the mother for her parenting efforts and encouraging the mother to praise and encourage her child. A stated aim of the programme is to build the self-esteem of both mother and child and to promote their enjoyment of the programme. Mothers are shown how to scaffold the child to ensure he/she is successful in the tasks and, although the curriculum involves structured activities, mothers are encouraged to follow their child's lead in exploring the materials prior to conducting the activity and not to force a child to do an activity against their will. CHAs receive supervision from a supervisor who monitors the developmental appropriateness of the activities for each child and adjusts the level when necessary. CHAs are also trained to take an interest in the family as a whole and positive relationships between the home visitor and the family are considered essential for the success of the programme. This programme has been adapted and evaluated in early childhood programmes in Bangladesh and Columbia and is currently being used in a large-scale programme in Peru.

relevant to child mental health (Table 4). Outcomes include caregiver behaviour, the caregiving environment and caregiver mental health. The majority of these studies described parent training ECE interventions (92%).

Some interventions had a very specific focus: an intervention for depressed women used cognitive behaviour therapy techniques⁵³; a study for internally displaced children combined training in child development with training around trauma and coping strategies³⁶; and a study for adolescent mothers included support for the mother's personal development and relationships with those around her in addition to the needs of her infant.⁵⁴ A description of the design and content of an intervention targeting depressed mothers in Pakistan⁵⁵ is given in Panel 3. Paraprofessionals delivered the intervention in 14/25 (56%) of studies. The age range of offspring varied from pregnancy to age 6 years and duration varied from one individual 50-min session to home visiting for 3 years.

Nine studies included measures of maternal mental health and six found benefits. Four of these studies included an explicit focus on the mother's mental health^{36,53,56} or personal development,⁵⁴ and two studies focused on improving parenting practices, for example improving maternal sensitivity²⁸ and cognitive stimulation,⁵⁷ suggesting that non-therapeutic home visiting interventions also have the potential to promote maternal mental health. Increased social support, positive reinforcement, increased self-efficacy

and/or the new skills learned through the intervention (e.g. problem solving, planning) are plausible mechanisms for improved maternal health. However, benefits to maternal well-being from non-therapeutic interventions are not consistently found^{35,58,59} and hence explicit attention to maternal well-being in ECE programmes is recommended.

Seventeen studies included concurrent measures of parenting and all found benefits. Benefits were found to observations of mothers' interaction with their child,^{28,35,48,58,60,61} to stimulation provided in the home by a combination of maternal report and observation^{56,61–68} and to mother-reported parenting practices.^{64,68–71}

Five studies included a longer-term follow-up (3 years or more) and four found benefits including benefits to mothers' reports of parenting practices,^{47,72,73} and to observed mother-child interaction.⁴⁸ One study found no benefits to stimulation in the home using a combination of mother report and observation at age 6 years.⁴⁶

Only two studies of centre-based interventions included measures of caregiving and no studies evaluated the effect of caregiver training on caregiver mental health. Teacher training in effective instructional strategies led to improvements in the preschool learning environment in Bangladesh⁴⁰ and training teachers in behaviour management led to a more emotionally supportive and nurturing environment in Jamaican preschools.⁴³ Interventions to improve the quality of preschools were well accepted by

Panel 3 Designing an intervention for depressed women in Pakistan

Rahman (2007)⁵⁵ developed, piloted and evaluated a psychosocial community intervention for women with depression in the perinatal period. The intervention was developed using the principles of cognitive behaviour therapy adapted for use by paraprofessionals (lady health workers (LHWs)) working in a low-resource setting. Data from qualitative and quantitative studies were used to develop the intervention, including information from in-depth interviews with perinatally depressed women and primary care health staff and focus groups with LHWs combined with information from an epidemiological study investigating the risks associated with pre- and postnatal depression.

The intervention was delivered through home visits and covered three main areas identified from the formative research - the mother's health, the mother-infant relationship and support from family. These three areas were addressed using a three-step approach: (i) identifying unhealthy thoughts; (ii) learning to replace unhealthy with healthy thinking, with the assistance of family members; and (iii) 'homework' activities to encourage mothers to practise healthy thinking. Illustrations were used to provide visual clues and a health calendar was given to each mother to monitor progress. These programme characteristics gave a clear structure to the programme, made it easier to use in areas of low literacy, and ensured that there were tangible outcomes that could be recognized by the mother, the family and the LHW. Regular supervision was provided for groups of LHWs and they were encouraged to share difficulties, recognize success and generate solutions to problems faced. Incorporating ideas of the LHWs also helped to maintain their interest and motivation in the programme. The intervention was labelled as a training intervention to promote infant development (rather than therapy for depression), to make it more acceptable to mothers, to encourage participation of the other family members and to avoid stigmatization. The programme was designed to be culturally appropriate and to have sufficient flexibility to be tailored to individual needs. The skills required by the LHWs to deliver the programme were generalizable to other aspects of their work and hence could enhance their skills and self-efficacy in their role.

teachers^{41,74} and led to teachers reporting feeling less stressed, more confident, enjoying teaching more and having better relationships with parents, in addition to reporting benefits to child behaviour.⁷⁴

Potential pathways linking ECE programmes to improved mental health

No studies included mediator analyses to investigate the mechanism through which ECE programmes benefit child and adolescent mental health although several mechanisms are possible. Ten studies in Table 1 and four studies in Table 3 measured children's mental and/or language development and all found benefits. Improved cognition may be one pathway to improved mental health. ECE programmes also increased school achievement,^{47,49,75} reduced school drop-out⁷⁵ and improved children's classroom behaviour.⁵¹ It is possible that improved cognition increases the likelihood of success in school, which may in turn be an active ingredient on the pathway to improved mental health. School success may also promote other protective factors such as increased bonding to school, higher self-esteem and reduced deviant behaviour. Changes to parent and caregiver behaviour may be another mechanism to improve mental health. The benefits of warm, responsive caregiving and positive teacher relationships within a supportive emotional environment are well documented. In addition, parents who participated in a parent training ECE programme sent their young children to infant school earlier than

non-participating parents⁷² and provided more reading materials⁷³ and school books⁷² but not more play materials,^{72,73} gave more help with homework⁷³ and engaged their children in a wider variety of activities⁷³ during the school-age years. Parent training may alter the mother's perception of her child's potential,⁷⁶ and mother's self-efficacy in her ability to assist her child may also increase, and both these factors could increase maternal motivation to invest time and resources in her child's education. This parental investment, combined with improved child cognition, may work together to benefit child schooling: in Turkey, mother training benefited child cognition, schooling and child aggression whereas educational day care benefited child cognition only,⁴⁷ suggesting parent training may be important for comprehensive gains. Benefits from ECE interventions have also been reported for maternal mental health,^{28,36,53,54,56,57} which is a risk factor for poor parenting and child mental health problems. Attendance at high quality preschool increased child psychophysiological orienting and arousal at age 11 years,⁷⁷ suggesting changes to brain and autonomic functioning may underpin the cognitive and behavioural changes.

Hypothesized pathways through which ECE programmes lead to improved mental health are shown in Figure 2. Teaching caregivers the skills required to provide a cognitively stimulating and emotionally supportive environment, while also supporting their mental health, may enable them to provide a more stimulating,

Table 4 Effect of early childhood education interventions on caregiver mental health and caregiver practices

Country reference	Study/design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ^a
Parent training early childhood interventions										
Rahman <i>et al.</i> 2008 ²³ Pakistan Lower middle income [Cognition -]	Cluster RCT Villages randomized to receive intervention or to enhanced routine care	N = 903: I = 463 (from 20 Union Council clusters) C = 440 (from 20 clusters)	Depressed women in 3 rd trimester of pregnancy	Paraprofessionals (lady health workers)	16 home visits: Four weekly visits in last month of pregnancy, three visits in 1st postnatal month followed by nine monthly visits	Until infant was 10 months	Thinking Healthy Programme: uses cognitive behaviour therapy techniques and homework practice. Both groups received equal numbers of home visits.	At 6 and 12 months: Prevalence of maternal depression. Symptoms of maternal depression and perceived social support.	At 6 and 12 months: Lower prevalence of DSM-IV major depressive episodes: Odds ratio = 0.22 ⁸ ($P < 0.0001$) at 6 months and 0.23 ⁸ ($P < 0.0001$) at 12 months. Benefits to depression score: $d = 0.79^B$ ($P < 0.0001$) at 6 months and $d = 0.82^B$ ($P < 0.0001$) at 12 months. Benefits to perceived social support: $d = 0.43^B$ ($P < 0.0001$) at 6 months and $d = 0.57^B$ ($P < 0.0001$) at 12 months.	Strong
Rahman <i>et al.</i> 2009 ²⁴ Pakistan Lower middle income [Cognition -]	Cluster RCT Villages randomized to intervention or standard care	N = 309 from 48 villages: I = 163 C = 146	Pregnant mothers	Paraprofessionals (lady health workers)	One half-day group session and fortnightly 15–20-min home visits	Until 12 weeks of age	Promote parental involvement and child learning and attachment.	Maternal mental distress	No benefits to maternal mood: $d = 0.09^B$ ($P = 0.45$).	Strong
Dybdahl 2001 ¹⁶ Bosnia Upper middle income [Cognition -]	RCT Intervention vs non-treated control group	N = 87 internally displaced mother-child dyads: I = 42 C = 45	5–6 years	Preschool teachers and a medical student	Weekly group meetings lasting 2 h (with approx 5 mothers/group) and one home visit lasting 1 h	5 months	Psychosocial intervention plus medical care. Topics covered involved child development, mothers' awareness of their child, promoting sensitive and stimulating mother-child interactions, trauma and coping strategies. Control group received medical care only.	Mother-reported social support, post-traumatic stress disorder (PTSD), and well-being.	Benefits for mothers' PTSD: $d = 0.50^B$ ($P < 0.05$) and well-being: $d = 0.9^B$ ($P < 0.05$). Trend for benefits to mothers' social support: $d = 0.48^B$ ($P < 0.1$).	Strong
Aracena <i>et al.</i> 2009 ³⁴ Chile Upper middle income [Cognition x]	RCT Adolescents randomized to receive intervention or standard care	N = 90 adolescents: I = 45 C = 45	Pregnant women	Health educators	12 1-h home visits starting in pregnancy	Until 1 year of age	Encourage mothers' personal development, reinforce parenting skills and strengthen mothers social relationships. Both groups received standard prenatal care.	Mothers' mental health. Indicators of child abuse from health centre records.	Benefits to maternal mental health: $d = 0.28^B$ ($P = 0.031$). No indicators of abuse found in either intervention or control group.	Strong
Cooper <i>et al.</i> 2002 ²⁸ South Africa Upper middle income [Cognition -]	Quasi-experimental Mothers receiving intervention compared with untreated matched controls from an adjacent area	N = 64: I = 32 C = 32	Pregnant women	Paraprofessionals (community workers)	22 home visits: two antenatal, twice weekly for 4 weeks postnatally, weekly for 8 weeks, fortnightly for a month, then monthly for 2 months	Until 6 months of age	Promoting sensitive, responsive mother child interactions and sensitizing mothers to their infant's abilities using the Neonatal Behavioural Assessment Schedule.	At 6 months: Maternal mood, maternal sensitivity during play, affective expression during feeding, sensitivity during feeding	No benefits to maternal mood. Benefits to maternal sensitivity during feeding ($P = 0.02$). There was a trend towards improvements in affective expression during feeding ($P = 0.08$) and greater sensitivity during play ($P = 0.1$).	Strong
Cooper <i>et al.</i> 2009 ²⁸ South Africa Upper middle income [Cognition -]	RCT Women randomized to intervention or untreated control condition	N = 449: I = 220 C = 229	Pregnant women	Paraprofessionals (community women)	16 home visits lasting 1 h: two antenatal visits, weekly for 8 weeks postpartum, fortnightly for 2	Until 5 months of age	Promoting sensitive, responsive mother child interactions and sensitizing mothers to their infant's abilities using the	At 6 and 12 months: Maternal depressive symptoms, maternal sensitivity, maternal intrusiveness	At 6 and 12 months: No reduction in prevalence of maternal depression at 6 months: odds ratio: 0.753 ($P = 0.36$) or 12 months: odds ratio: 0.669 ($P = 0.21$).	Strong

(continued)

Table 4 Continued

Country reference	Studydesign	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ^a
Powell <i>et al.</i> 2004, ⁶⁹ Baker-Henningham <i>et al.</i> 2005 ⁷⁷ Jamaica Upper middle income [Cognition ✓]	Cluster RCT Clinics randomized to intervention or standard care	N = 139 under-nourished children (WAZ < -1.5x scores); I = 70 (9 clinics) C = 69 (9 clinics)	6–30 months	Paraprofessionals (community health aides working in government health centres)	Weekly home visits (mean = 32.5) for 2 months	1 year	Teaching play activities to mother and child using demonstration and practice. Both groups received standard nutritional care.	Maternal depressive symptoms. Mother reported parenting practices.	Benefits to maternal depressive symptoms at 6 months: d = 0.19 ^c (P = 0.041); No benefits at 12 months: d = 0.13 ^c (P = 0.813). Benefits to maternal sensitivity: d = 0.24 ⁸ (P = 0.037) at 6 months, d = 0.26 ⁸ (P = 0.043) at 12 months and maternal intrusiveness; d = 0.26 ⁸ (P = 0.024) at 6 months, d = 0.24 ⁸ (P = 0.023) at 12 months. Benefits to maternal depressive symptoms: d = 0.43 ⁸ (P = 0.017). Benefits to mother's parenting practices: d = 0.53 ⁸ (P = 0.0006).	Strong
Morris <i>et al.</i> 2012 ⁷⁶ Uganda Low income [Cognition -]	Quasi-experimental Mothers participating in intervention compared with mothers from camps with no intervention. All children received nutritional rehabilitation	N = 237: internally displaced, undernourished children in 5 camps I = 132 from 3 sites (70 followed up) C = 105 (77 followed up) from 2 sites	6–30 months	University graduates	Six weekly group mother and baby sessions lasting 90 min to 2 h and 1 home visit lasting 1–2 h	6 weeks	Intervention involved community-based nutrition service and a psychosocial intervention involving teaching and practising simple play activities, group discussion and toy making. Control groups received the nutrition services only.	Maternal mood: 3 subscales: –sadness/worry, irritability, somatic complaints. Stimulation in the home (HOME): maternal involvement, play materials, emotional responsibility and acceptance subscales.	Benefits to mothers' sadness/worry: d = 0.5 ^A (P = 0.02). No benefits to mothers' irritability: d = 0.43 ^A (P = 0.07) or somatic complaints: d = 0.15 ² (P = 0.185). Benefits to 2 subscales of HOME: Play materials: d = 1.36 ^A (P < 0.0001); Maternal involvement: d = 0.55 ^A (P = 0.02). No benefits to emotional responsibility: d = 0.54 ^A (P = 0.15) and acceptance: d = -0.21 ^B (P = 0.197) subscales of HOME.	Moderate
Boivin <i>et al.</i> 2013 ³⁵ Uganda Low income [Cognition ✓]	RCT Intervention vs health and nutrition curriculum with mothers and their caregivers	N = 119 uninfected preschool children born to HIV-infected mothers and their caregivers	2–4 years	Graduates of psychology or social work	Biweekly 1-h sessions alternating between home and clinic	1 year	Mediational Intervention for Sensitizing Caregivers (MISC): training caregivers to enhance child development through everyday interactions and experiences. Both groups received home and clinic visits.	Maternal depression and anxiety symptoms (Hopkins Symptom Checklist-25). Videotaped observations of mothers' use of mediation strategies. HOME stimulation.	No differences between the groups on maternal depression (P = 0.766) and anxiety (P = 0.537). Benefits of MISC intervention to observed mediated interactions (P = 0.0001) and HOME stimulation (P = 0.0001).	Strong
Sharma and Nagar 2009 ⁶⁶ India Lower middle income [Cognition ✓]	Quasi-experimental Mothers from one intervention village compared with mothers in a control village	N = 145 I = 69 C = 76	Birth to 18 months	Not available	Not available	Over 18-month time period	Mothers and infants attend village crèche for play sessions.	Stimulation in the home (HOME).	Benefits to HOME: d = 1.8 ^B (P = 0.01).	Weak
Pearson <i>et al.</i> 2008 ⁶⁸ Paraguay	Quasi-experimental Compared	N = 106: I = 60 C = 46	Birth to 24 months	Volunteer community leaders	Monthly meetings (Some home visits)	Until age 5 years	Focus on promoting child development through play	Stimulation in the home [Infant	Intervention mothers reported playing with their child more	Weak

(continued)

Table 4 Continued

Country reference	Studydesign	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ^a
Lower middle income [Cognition ✓]	mothers participating in the programme with mothers from non-programme areas				conducted but no information on how frequent)	evaluated children who had participated for half of their lives	and language; also has health, nutrition and parent empowerment.	Toddler (IT-HOME). Mothers' reports of parenting practices.	frequently and made more efforts to teach their child. Benefits to IT-HOME; $d = 1.25^c$ ($P < 0.0001$).	Strong
Oveis <i>et al.</i> 2010 ⁷⁰ Iran Upper middle income [Cognition -]	RCT Mothers randomized to receive intervention or to an untreated control group	N = 224 I = 108 C = 116	2–6 years	Physician	Two 2-h sessions during child health clinic	Over 2 weeks	Focus on child behaviour management techniques, used video clips, discussion and role-play.	8 weeks after training: Mothers' reports of dysfunctional parenting practices. Mothers' reports of physical and emotional abuse.	Fewer dysfunctional parenting practices among intervention parents: $d = 0.78^{bc}$ ($P = 0.001$) and less physical and emotional abuse: $d = 0.44^b$ ($P = 0.002$).	Strong
About 2007 ⁷⁷ Bangladesh Low income [Cognition x]	Quasi-experimental Mothers who participated in a programme compared with mothers in non-programme areas	N = 329; I = 170 C = 159	2–3 years	Paraprofs (community women)	Average of 16 90-min group sessions attended (range 0–40 sessions)	Over 1-year time period	Teaching mothers about health, nutrition and child development.	Stimulation in the home (HOME). Observations of maternal verbal stimulation during picture task.	Benefits to HOME: $d = 0.34^c$ ($P = 0.02$). Mothers in intervention group talked less during picture task ($P = 0.02$). No difference in the quality of verbal interaction.	Strong
Al-Hassan and Lansford 2011 ⁷¹ Jordan Upper middle income [Cognition -]	RCT Mothers randomized to participate in intervention or to a waiting list control	N = 337	Birth to 8 years	Mix of professionals and paraprofs	16 h of lessons	Varied according to facilitator preference (3–4 days, weekly for 1 month, twice a week for 2 weeks)	Workshops on parenting knowledge, attitude and behaviours	Mothers' reports of parenting activities done with child: 6 items. Expressing contentment towards child: 6 items (e.g. hugging, rewarding, thanking child). Discipline strategies used: 15 items. Perceptions of abuse and neglect: 15 items.	Differences in two of six parenting activities (more time playing and reading stories with child). No differences in expressions of contentment. Benefits to two out of 15 discipline strategies (explaining reasons to child and showing the child things to do). Benefits to three out of 15 perceptions of abuse and neglect.	Weak
Aboud and Akhter 2011 ⁶¹ Bangladesh Low income [Cognition ✓]	Cluster RCT Villages randomized to one of two intervention conditions or to a control group receiving standard services	N = 302; responsive feeding: $n = 92$ (15 villages); responsive feeding plus sprinkles: $n = 100$ (14 villages) Control: $n = 110$ (16 villages)	8–20 months	Paraprofs (peer educators with grade 9 education)	6 sessions: 5 weekly group sessions in groups of 3–10 (median = 6) and a booster session 4 months later	6 months	Six messages on responsive parenting discussed and practised. One responsive stimulation and one responsive feeding activity were introduced in each session. Involved practice, problem-solving, coaching and peer support. All groups received a 12-session programme on child development	Post-test and 5 months later: Stimulation in the home (HOME). Observations of maternal responsiveness in a picture task: responsive talk and directive talk. Observations of mothers' verbal responsivity during feeding.	Benefits to HOME: $d = 0.50^B$ ($P = 0.004$) at post-test and $d = 0.2^B$ ($P = 0.007$) at 5-month follow-up. Benefits in responsive talk during picture task: $d = 0.54^B$ ($P < 0.001$) at post-test and $d = 0.75^B$ ($P = 0.003$) at 5-month follow-up. No benefits to directive talk: $d = 0.35^B$ ($P = 0.81$) at post-test and $d = 0.14^B$ ($P = 0.34$) at follow-up. No benefits to mothers' verbal responsivity during feeding: $d = 0.25^B$ ($P = 0.21$) at post-test and $d = 0.14^B$ ($P = 0.45$) at follow-up.	Strong
Ertem <i>et al.</i> 2006 ⁶² Turkey Upper middle income [Cognition -]	Quasi-experimental Sequentially conducted controlled trial	N = 233; I = 120 C = 113	<24 months	Paediatrician	2 sessions during child health clinic	Over 2 weeks	'Care for Development' promoting mother-child interaction and reading and play activities	1 month after clinic visit HOME.	No benefits to HOME total score ($P = 0.262$). More intervention mothers had optimal HOME scores (>38) ($P < 0.05$).	Strong

(continued)

Table 4 Continued

Country reference	Studydesign	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ^a
Wendland-Carro <i>et al.</i> , 1999 ⁶⁰ Brazil Upper middle income [Cognition -]	RCT Newborns of randomized to receive intervention, or a placebo control group	N = 38: I = 19 C = 19	Newborn	Researcher	One 50-min session	Before hospital discharge	Video and discussion about infant's potential for social interaction + how to interact in a sensitive, responsive way. Control mothers watched an alternative video and discussed basic caregiving skills.	At 1 month of age: Observations of mother-child interaction: synchronous and asynchronous behaviours.	Intervention mothers displayed more synchronous than asynchronous behaviours.	Strong
Nahar <i>et al.</i> , 2012 ⁶⁴ Bangladesh Low income [Cognition ✓]	RCT Children randomly assigned to one of 5 groups: stimulation, supplementation, both, clinic control or hospital control. Groups receiving stimulation were compared with those not receiving stimulation	N = 507 severely malnourished children (WAZ < -3z scores). Psychosocial stimulation n = 205 Control: n = 302	6–24 months	Praprofs (female health workers)	Nine sessions at a community clinic: fortnightly for 3 months and then monthly for 3 months.	6 months	Teaching play activities to mother and child using demonstration and practice. All groups received growth monitoring, health education and micronutrient supplementation.	Stimulation in the home (HOME). Mother-reported parenting practices. Benefits to parenting practices: d = 1.1 ^h to d = 1.5 ^h (P < 0.0001), depending on comparison group.	Benefits of stimulation to HOME score: d = 0.33 ^h to d = 0.66 ^h (P < 0.0001) (depending on comparison group). Benefits to parenting practices: d = 1.1 ^h to d = 1.5 ^h (P < 0.0001), depending on comparison group.	Moderate
Walker <i>et al.</i> , 2004 ⁶⁵ Jamaica Upper middle income [Cognition ✓]	RCT Randomized to intervention or control. Both groups were visited weekly	N = 140 term low-birthweight infants (<2,500 g and >37 weeks' gestation): I = 70 C = 70	Birth	Paraprofs (community health aides)	8 home visits from birth to 8 weeks Weekly home visits from 7–24 months	2 years	Promoting sensitive responsive interactions and early stimulation activities in first 2 months of life. Teaching play activities to mothers with their children using demonstration, practice and feedback from 7–24 months.	At 12 months: Stimulation in the home (HOME). At 6 years: Stimulation in the home (HOME).	At 12 months: Benefits to HOME at 12 months: d = 0.38 ^c (P < 0.05). At 6 years: No benefits to the Middle Childhood HOME: d = 0.07 ^c (P > 0.1).	Strong
Grantham-McGregor <i>et al.</i> , 1991 ⁶³ 1997, ¹¹ Walker <i>et al.</i> , 2000 ⁷³ Jamaica Upper middle income [Cognition ✓]	RCT Children randomized to one of 4 groups. All groups (including control group) were visited weekly	N = 129 stunted children (HAZ < -2z scores): stimulation: n = 32, nutritional supplementation n = 32, stimulation + supplementation n = 32, control: n = 33 In this analysis early stimulation (n = 64) is compared with no early stimulation (n = 65)	9–24 months	Paraprofs (community health aides)	Weekly home visits lasting 1 h	2 years	Teaching play activities to mother and child using demonstration and practice. Home-made books, puzzles and pictures used and a developmentally sequenced curriculum. All groups received weekly home visits from health workers.	Post test: HOME stimulation. At age 7–8 years: Mother-reported stimulation. At age 11–12 years: Mother-reported stimulation.	Post test: Benefits to HOME stimulation: d = 0.49 ^h (P < 0.05). Age 7–8 years: No benefits to mothers' reports of stimulation in the home. Age 11–12 years: Benefits to availability of reading material, variety of activities and mother helps with homework. No benefits to availability of toys.	Strong
Klein and Rye 2004 ⁴⁸ Ethiopia Low income [Cognition ✓]	Quasi-experimental Families participating in programme in one community compared with those from a second community	N = 96: I = 49 C = 47	1–3 years	Paraprofs (community workers, social workers)	Five 1½-h home visits + five 2–3 h group meeting	Over 3-month time period	'Mediational intervention for Sensitizing Caregivers': videotaping maternal-child interactions and giving feedback plus role play.	At 3 months and 1 year: Observed mother-child interaction. At age 6 years: Observed mother-child interaction.	At 3 months and 1 year: Benefits to mother-child interaction at both time points. At age 6 years: Mothers in intervention group have more positive interactions with their child.	Weak

(continued)

Table 4 Continued

Country reference	Study design	Sample size	Child age	Staffing	Number/type of sessions	Duration	Intervention	Outcomes	Findings and size of effect	Study quality ^a
Kaglicibasi <i>et al.</i> 2001 ⁴⁷ Turkey Upper middle income [Cognition ✓]	RCT Children attending custodial day care, educational day care or no day care were randomized to receive mother training or no mother training	N = 225; I = 83 (mother training) C = 134 (no mother training)	3–5 years	Paraprofessionals (community women with little education for home visiting + women with at least high school education for care while mother worked)	Mother training: 60 fortnightly group meetings + 60 weekly home visits (from Oct–May each year) Day care: child attended educational or custodial day care while mother worked	Over 2-year time period	Mother training consisted of a cognitive programme for children (HIPPI programme) and mother enrichment programme to support mother in her parenting role.	6 years after end of intervention: Benefits of mother training to parenting practices. No benefits from educational day care Less punitive discipline practices and more positive discipline strategies for mother training No benefits from educational day care	Moderate	
Grantham-McGregor <i>et al.</i> 1994 ⁷² Jamaica Upper middle income [Cognition ✓]	Quasi-experimental Time lagged controlled study. Control children recruited in year 1 and intervention children recruited in year 2	N = 35 severely undernourished children: I = 19 C = 17	6–24 months	Paraprofessionals (community health aides)	Daily play activities in hospital followed by home visits: weekly fortnightly for 1 year	3 years	Teaching play activities to mother and child using demonstration and practice. Both groups received medical and nutritional care.	11 years after end of intervention: Benefits to number of school books: $d = 1.75^c$ ($P < 0.008$) and time spent at infant school: $d = 1.08^c$ ($P < 0.02$). No benefits to availability of play materials: $d = -0.22^c$ ($P > 0.1$) and home stimulation: $d = 0^c$ ($P > 0.1$).	Strong	
Centre-based early childhood interventions										
Moore <i>et al.</i> 2008 ⁴⁰ Bangladesh Low income [Cognition ✓]	Quasi-experimental Compared children attending enriched preschools with those attending regular preschools	N = 138; I = 71 from 6 schools C = 67 from 6 schools	5–6.5 years	Paraprofessionals	Attendance at improved preschool, half-day sessions, control group attended regular preschool	Over 7 months	Improved curriculum to promote language and literacy, more small group and child-led activities. Reasoning rather than rote learning was promoted.	Observations of classroom environment: Activities and Program Structure subscales from ECERS. Early Childhood Environment Rating Scale-Revised (ECERS).	Benefits to Activities: $d = 0.55^b$ ($P < 0.05$) and Programme structures: $d = 0.67^b$ ($P < 0.05$) subscales of ECERS.	Weak
Baker-Henningham <i>et al.</i> 2009a ⁴³ Upper middle income [Cognition -]	Cluster RCT Schools randomized to receive intervention or standard treatment Both groups received educational materials	5 preschools, (I = 3, C = 2), 27 classrooms (I = 15, C = 12) 135 children with behaviour problems (approx. 5/ class) as nominated by teacher: I = 69 C = 66	3–6 years	Paraprofessionals + research team	7 full day teacher workshops, 14 curriculum lessons in each class Control teachers attended regular government workshops	Over 1 year	Training teachers in classroom behaviour management techniques and teaching social-emotional skills to children. Control teachers attended monthly government training workshops.	Observations of teacher classroom practices: Positive behaviour, promoting social-emotional skills, use of commands, teacher warmth and opportunities provided to share and help. Teacher-reported positive and negative contacts with parents.	Benefits to the following teacher classroom practices: Positives: $d = 3.85^a$ ($P = 0.0004$), Negatives: $d = 2.02^a$ ($P = 0.03$), Promoting social-emotional skills: $d = 1.73^a$ ($P = 0.01$), Opportunities to share and help: $d = 1.29^a$ ($P = 0.0009$), Warmth: $d = 1.84^a$ ($P < 0.0001$). No benefits to number of commands: $d = 0.86^a$ ($P = 0.11$). Benefits to positive teacher-parent contacts: odds ratio: 0.95 ($P < 0.0001$), no benefits to negative teacher-parent contacts: odds ratio: 1.06 ($P = 0.28$).	Moderate

Cognition: ✓, significant benefits to cognitive and/or language development; -, cognition and/or language not measured.

RCT, randomized controlled trial; I, intervention; C, control; Paraprofessionals, WAZ, weight for age; HAZ, height for age.

Effect sizes: reported, γ , regression coefficient/pooled standard deviation (SD) at baseline, ^a difference in mean change from baseline to post-test/pooled SD at baseline, ^b difference in mean change from baseline to post-test/pooled SD at baseline, ^c difference in post-test mean/SD control group.

*Studies were rated for quality using the McMaster University Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies.²⁷ Studies are rated for selection bias, study design, confounders, blinding, data collection methods and withdrawals and drop-outs: no weak ratings = strong, one weak rating = moderate, two or more weak ratings = weak.

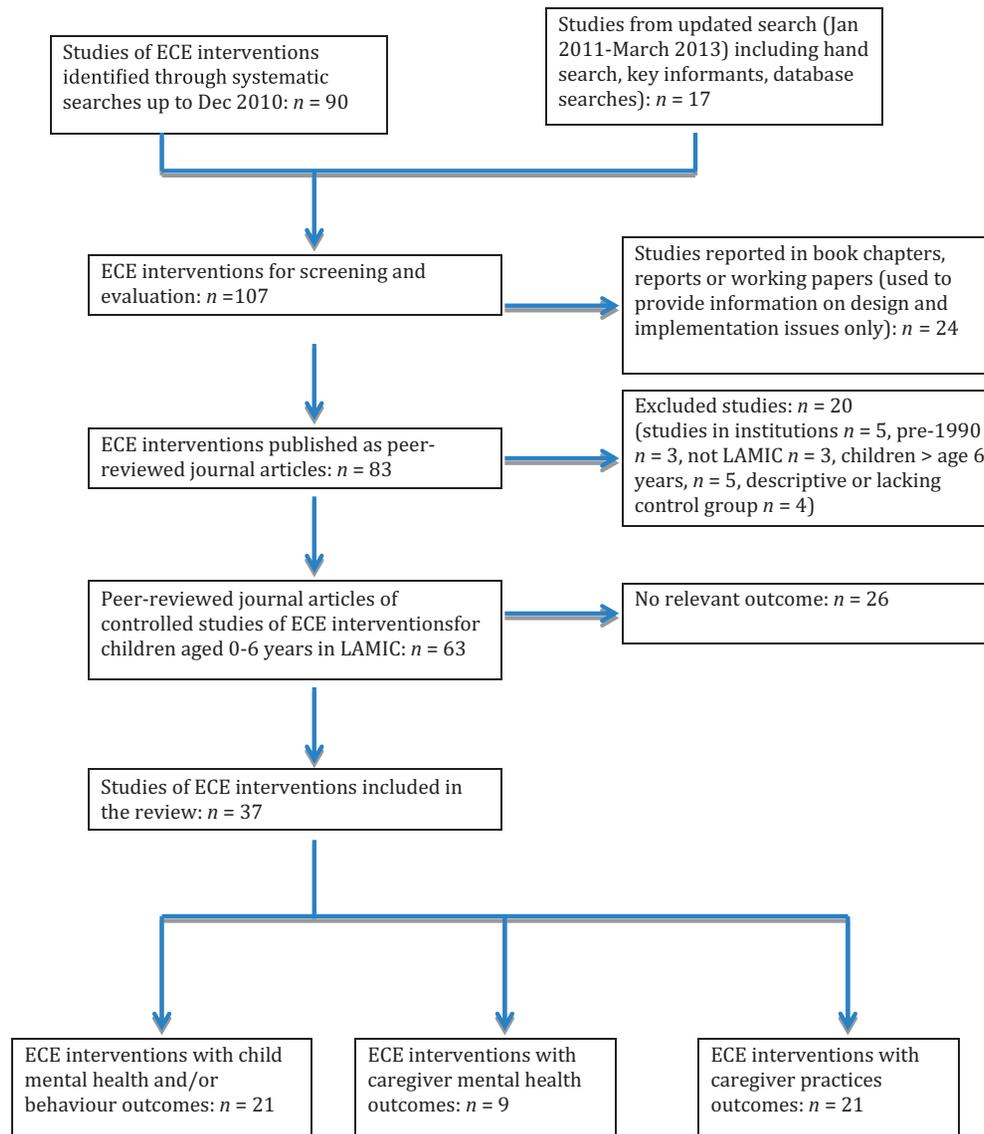


Figure 1 Flowchart of studies included in the review

The numbers given here refer to individual studies: several studies were reported in more than one paper

nurturing environment at home and/or school. Exposure to developmentally appropriate activities within a supportive environment improves child functioning in the domains of cognition, language and social-emotional development which may serve to positively reinforce the caregiver and also acts as the foundation for success in the next set of developmental tasks, thus setting the child on a more positive developmental trajectory. These positive adaptations over time are hypothesized to act as protective factors in the prevention of mental health problems and promotion of well-being.

The diversity of the studies included in this review makes it difficult to make recommendations regarding programme duration and intensity. However, of

the five studies demonstrating long-term benefits to child mental health, four involved an intensive intervention (weekly parenting sessions^{46,47,49} or daily attendance at preschool^{50,51}) over a 1- or 2-year period. Similarly, three of the four studies showing long-term benefits to parenting practices involved weekly parenting sessions over 2 or 3 years.^{47,72,73}

Design and implementation issues to maximize benefits to child mental health

Choosing an intervention

Benefits have been obtained from interventions specifically designed to match the cultural and economic context and specific needs of a particular target

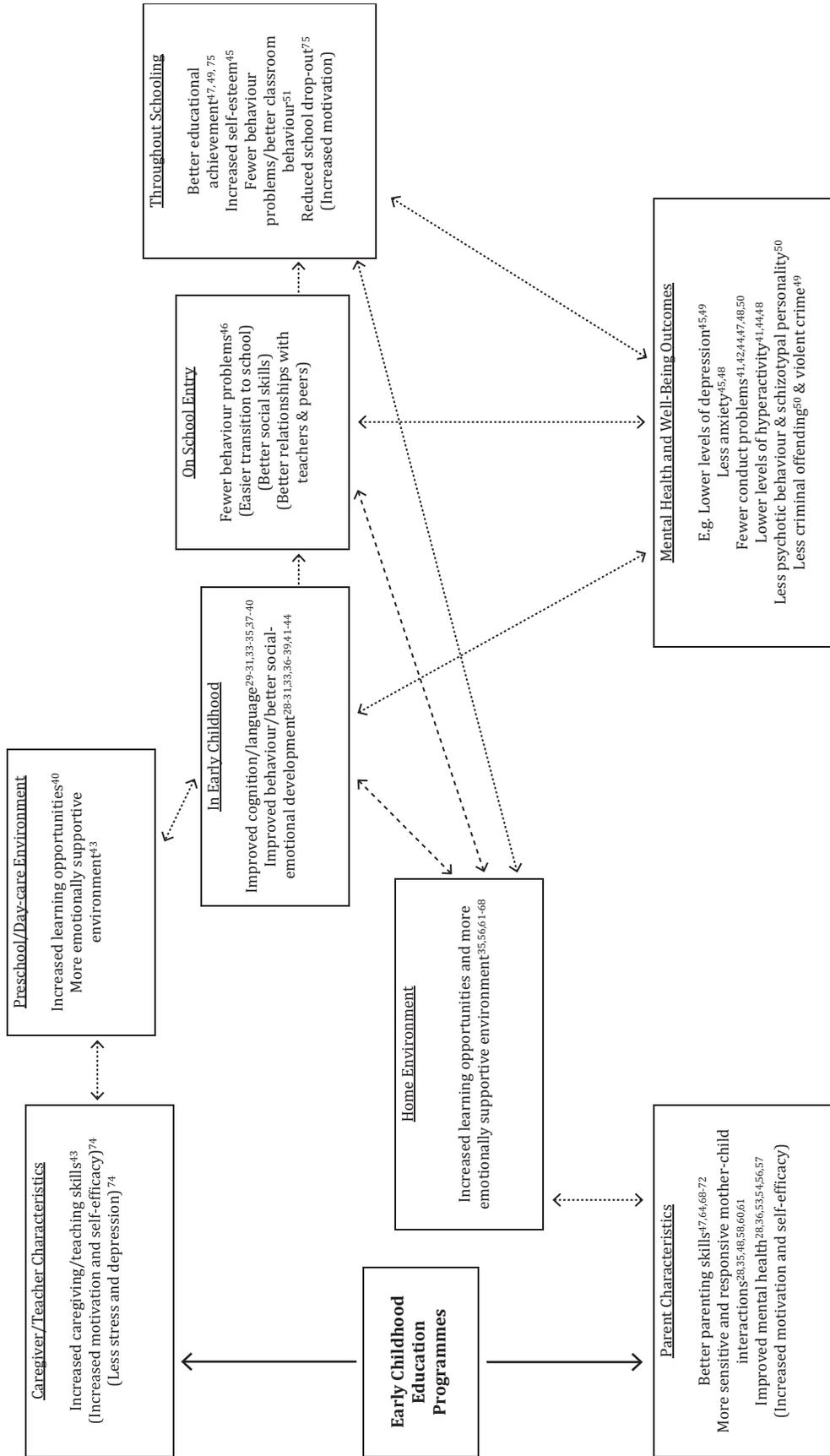


Figure 2 Potential pathways linking early childhood education programmes to child and adolescent mental health. ECE interventions in LAMIC have been shown to benefit the outcomes referenced. For items in parenthesis, there is no empirical evidence for the effect of ECE interventions on this outcome in LAMIC. No studies of ECE interventions were identified that examined pathways to improved mental health and the dashed lines indicate hypothesised pathways

group^{53,63} and from interventions that have been imported from high-income countries^{28,56,70} or from other LAMIC.^{33,64} In addition, two interventions are available that have been specifically designed for LAMIC.^{78,79} Whether bespoke or existing interventions are used, careful piloting of interventions is important to ensure the programme is easy to use, culturally appropriate, acceptable and feasible for the programme participants and programme staff.^{55,80,81} Interventions need to build on the existing practices and strengths of caregivers and should address a recognized need.^{55,81,82} Ownership by the community can be promoted by including key stakeholders in the design or choice of the intervention, framing the intervention in an acceptable way and encouraging community responsibility for and participation in the programme.^{83,84} An intervention manual with a structured curriculum, a training guide and monitoring instruments are important for maintaining the quality of intervention delivery.¹⁹ Paraprofessional staff benefit from fairly didactic materials that have some in-built flexibility to allow the programme to be tailored to individual families and children. The choice of type of intervention and mode of delivery will depend on many factors including the existing infrastructure and the pre-existing government and community services of a region, the financial and human resources available and the social and cultural context. For parent training interventions, group training facilitates group discussion, shared problem-solving and peer support⁸⁰ whereas individual training facilitates a more individualized approach and allows for more practice with feedback. Parent training is usually less costly⁸⁵ and has more comprehensive and consistent benefits^{85,86} than centre-based care and is most appropriate for children aged under 3 years. However, in areas where a high proportion of mothers are in work, provision of high quality day care may also be necessary.

Service and staffing issues

Large-scale ECE programmes in LAMIC generally use paraprofessional staff,¹⁹ and paraprofessionals can effectively deliver these interventions provided adequate training and supervision are available (Tables 1–3). Integrating the early childhood intervention into existing government or community services (e.g. into health services, existing parent groups, community or government preschools) can enhance the reach and sustainability of programmes. Adding a stimulation component to existing services for children at risk (e.g. conditional cash transfer programmes, nutritional supplementation programmes) may extend the benefits of other programmes⁶¹ and may promote enrolment and retention. For example, food supplementation for undernourished children led to greater retention than psychosocial stimulation alone.⁶⁴ Conversely, ECE programmes can provide an access point for health and social interventions for vulnerable children,⁸³ including providing a mechanism for

identifying and intervening with children with mental disorder.

Existing staff can be trained^{42,43,53,62,69} or a new cadre of early childhood worker can be employed^{33,48,56,63,64} and both strategies have been successful in changing caregivers' practices,^{56,64,69} caregiver mental health^{56,57} and child mental health.^{42,46,48,49} Where existing staff are used, it is important to ensure that the intervention does not compromise their ability to perform their primary duties effectively.⁶² For educational, centre-based programmes, training existing staff in the skills necessary to provide emotionally supportive and cognitively stimulating environments will be an integral component of the intervention.

Interventions are most likely to be sustained when there are clear benefits not only to the participants but also for the staff delivering the programme. This may be especially important when interventions are integrated into existing services using existing staff. For example, interventions need to fit within the remit of their current responsibilities, enhance their self-efficacy in their work role, and/or make their daily work activities easier and less stressful.^{55,74} Interventions that are perceived as burdensome and involving 'extra' duties are less likely to be sustained without additional incentives.

Ensuring and maintaining quality

The quality of intervention implementation is likely to be critical to programme success although no studies of parenting interventions were identified with empirical measures of quality. The quality of the day care and preschool environments is positively associated with children's cognitive and social development,^{37,87} and attending high quality preschool predicts better cognitive development and achievement in primary school,^{88,89} although there is no evidence of the effect of quality on later behaviour and mental health in LAMIC. Centre-based interventions can increase child antisocial behaviour,^{37,39} indicating a need for caregiver training in behaviour management and promoting social skills, which has shown to successfully reduce aggression in LAMIC.^{41–43} Using effective behaviour change techniques increases the likelihood of programme success. Interventions are most effective at changing caregiver behaviour when they involve hands-on practice and role play, supportive feedback and practice activities ('homework'), and when a strength-based approach is used and caregivers are actively involved in identifying and solving problems.^{55,61,74} Interventions should have tangible outcomes that can be observed by caregivers (e.g. mothers, teachers) and intervention staff.⁵⁵ Intervention staff should be trained to identify and point out successes to participants, to promote self-efficacy and motivation.^{55,74} Training sessions for intervention staff need to include these same elements, so the intervention techniques are modelled

during training. This not only facilitates learning but also helps the staff understand the rationale for the methods used and the value of them. Building positive relationships is the cornerstone of successful interventions^{55,80} and this includes relationships at each level: child-caregiver, caregiver-intervention staff and intervention staff-supervisor.

Targeting interventions

Disadvantaged children are at heightened risk for mental health problems, and benefits have been found for children exposed to various psychosocial and biomedical risks. Identifying strategies to reach those most in need is a challenge, and one strategy is to integrate early childhood stimulation into services already accessed by these families (e.g. health and nutrition services, poverty alleviation programmes). Whether to offer the intervention in a community setting or in a health or education institutional setting will partly depend on the nature of the risk condition. Interventions for children with biomedical risk have been successfully conducted in health settings^{33,64,69} whereas interventions for families with psychosocial risk factors (e.g. exposure to war, maternal depression) may be more appropriately delivered in the community.^{36,53} However, this is likely to differ across cultures. Benefits of ECE programmes may be particularly strong for children at nutritional risk, with studies demonstrating long-term benefits to child mental health from home visiting programmes^{45,46,49} and undernutrition in early childhood moderating the effect of an enriched preschool intervention on mental health in adolescence and young adulthood.⁵⁰ A home visiting stimulation intervention improved social responsiveness and development for Chilean infants with iron deficiency anaemia (IDA) but no benefits were found for non-anaemic infants.³⁰ Social responsiveness declined in infants with IDA in the absence of intervention.³⁰ Fewer evaluations with other vulnerable groups have been conducted and no relevant intervention studies were identified with disabled children, HIV-infected children, cerebral malaria survivors or victims of child abuse or neglect. Interventions for children living in institutions were beyond the scope of this review, but there is evidence that combining caregiver training in sensitive, responsive interactions with structural changes to allow increased opportunity for caregiver child interaction benefits caregiver behaviour^{90,91} and infant behaviour and attachment status.⁹⁰

Content of interventions

The evidence presented indicates that ECE interventions do have the potential to improve child behaviour and mental health and there is some, albeit limited, evidence that these gains are maintained over time. ECE interventions consistently benefit caregiver competencies and less consistently caregiver mental health. To maximize the gains of ECE interventions

to child behaviour and mental health, it is recommended that three main elements are included: (i) structured activities to increase child skills especially in terms of child cognition, school readiness, executive functioning and self-regulation; (ii) teaching children's caregivers new skills including how to provide a cognitive stimulating and emotionally supportive environment with a strong focus on promoting positive social and emotional interactions between caregiver and child (and for centre-based services between peers); and (iii) attention to the caregiver's mental health, social support and self-efficacy. It is possible to systematically incorporate these elements into parent training interventions (Panel 3) and into training for daycare workers and preschool teachers.

Future research directions

Benefits to child mental health over the short term were found in 75% of the studies included in the review (Table 1) and all studies with long-term follow-up found benefits (Table 3). This is encouraging, although the traditional bias against the publication of negative results in addition to the difficulties in publishing research from LAMIC in peer-reviewed journals should be noted.

From 63 studies of ECE interventions published in peer-reviewed journals and conducted in LAMIC with children up to age 6 years, only 21 (33.33%) included child mental health and/or behaviour outcomes. The studies reviewed vary in quality but there are a number of high quality studies of parenting training interventions,^{28–30,33,36} although only two high quality studies included a long-term follow-up.^{46,49} Fewer centre-based interventions were identified; only two were high quality^{42,50} and one of these included a longer-term follow-up.⁵⁰ High quality research, with longer-term follow-up that includes child mental health outcomes and measures of variables on the pathway to improved mental health, is required. No interventions using media or mobile phones were identified and it is possible that child educational programming and parenting messages could be delivered via these media for child mental health promotion at the population level. The advantages of combining ECE with other interventions shown to benefit child behaviour and mental health, (e.g. conditional cash transfer programmes,⁹² nutrition programmes), also need to be explored.

Further research is also required to investigate the optimal timing and duration of ECE programmes for child mental health gains and whether benefits generalize to other children in the family. Preschool provision for young children in Mozambique led to better school attendance for older siblings;⁸³ it is not known whether the mental health and well-being of siblings is also increased, although this is a very reasonable hypothesis for parent training programmes. ECE interventions are not a panacea and investments to

promote child development and mental health across the age span are likely to be necessary. The cost-effectiveness of additional and/or booster interventions during later childhood and adolescence, and strategies for using ECE programmes as an entry point for the identification and treatment of young children with mental health problems, require further investigation.

Conclusions

ECE interventions are an important component of programmes and policies to prevent child and adolescent mental health problems and promote well-being in

LAMIC, and it is likely that high quality programmes of sufficient duration and intensity can play a role in preventing psychopathology in adulthood. Key goals for early childhood programmes are the improvement of child skills, improvement of caregiver's child rearing skills and increasing the motivation, self-efficacy and mental well-being of caregivers to strengthen their capacity to deliver quality care. Intervening in the early childhood years to improve child cognition, social-emotional development and behaviour is likely to have long-term benefits across multiple domains of functioning, including mental health.

Conflict of interest: None declared.

KEY MESSAGES

- Early childhood education programmes build child and caregiver competencies during a critical period for child development, and these child competencies form the foundation for future learning and adjustment and may place the child on a positive developmental trajectory which is protective for child and adolescent mental health.
- It is hypothesized that long term gains to mental health are most likely when early childhood interventions include three main elements: (i) an emphasis on increasing child skills (e.g. cognition, school readiness, executive function, self control, social-emotional competence); (ii) training children's caregivers in the skills required to provide a cognitively stimulating and emotionally supportive environment including training in appropriate caregiver-child interactions; and (iii) attention to the mental health, motivation and self-efficacy of children's caregivers to strengthen their capacity to provide optimal care.
- The importance of early childhood education initiatives in the prevention of child and adolescent mental health problems and promotion of well-being in low- and middle-income countries needs to be incorporated into the global mental health agenda.
- The promotion of child mental health needs to be incorporated in a systematic way into early childhood education programming.

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