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Food supplementation for improving the physical and psychosocial health of socio-economically disadvantaged children aged three months to five years (Review)

Kristjansson E, Francis DK, Liberato S, Benkhalti Jandu M, Welch V, Batal M, Greenhalgh T, Rader T, Noonan E, Shea B, Janzen L, Wells GA, Petticrew M

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TABLE OF CONTENTS

[Intervention Review]

Food supplementation for improving the physical and psychosocial health of socio-economically disadvantaged children aged three months to five years

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ABSTRACT

Background

Undernutrition contributes to five million deaths of children under five each year. Furthermore, throughout the life cycle, undernutrition contributes to increased risk of infection, poor cognitive functioning, chronic disease, and mortality. It is thus important for decision-makers to have evidence about the effectiveness of nutrition interventions for young children.

Objectives

Primary objective

1. To assess the effectiveness of supplementary feeding interventions, alone or with co-intervention, for improving the physical and psychosocial health of disadvantaged children aged three months to five years.

Secondary objectives

1. To assess the potential of such programmes to reduce socio-economic inequalities in undernutrition.
2. To evaluate implementation and to understand how this may impact on outcomes.
3. To determine whether there are any adverse effects of supplementary feeding.

Search methods

We searched CENTRAL, Ovid MEDLINE, PsycINFO, and seven other databases for all available years up to January 2014. We also searched ClinicalTrials.gov and several sources of grey literature. In addition, we searched the reference lists of relevant articles and reviews, and asked experts in the area about ongoing and unpublished trials.

Selection criteria

Randomised controlled trials (RCTs), cluster-RCTs, controlled clinical trials (CCTs), controlled before-and-after studies (CBAs), and interrupted time series (ITS) that provided supplementary food (with or without co-intervention) to children aged three months to five years, from all countries. Adjunctive treatments, such as nutrition education, were allowed. Controls had to be untreated.

Data collection and analysis

Two or more review authors independently reviewed searches, selected studies for inclusion or exclusion, extracted data, and assessed risk of bias. We conducted meta-analyses for continuous data using the mean difference (MD) or the standardised mean difference (SMD) with a 95% confidence interval (CI), correcting for clustering if necessary. We analysed studies from low- and middle-income countries and from high-income countries separately, and RCTs separately from CBAs. We conducted a process evaluation to understand which factors impact on effectiveness.

Main results

We included 32 studies (21 RCTs and 11 CBAs); 26 of these (16 RCTs and 10 CBAs) were in meta-analyses. More than 50% of the RCTs were judged to have low risk of bias for random selection and incomplete outcome assessment. We judged most RCTS to be unclear for allocation concealment, blinding of outcome assessment, and selective outcome reporting. Because children and parents knew that they were given food, we judged blinding of participants and personnel to be at high risk for all studies.

Growth. Supplementary feeding had positive effects on growth in low- and middle-income countries. Meta-analysis of the RCTs showed that supplemented children gained an average of 0.12 kg more than controls over six months (95% confidence interval (CI) 0.05 to 0.18, 9 trials, 1057 participants, moderate quality evidence). In the CBAs, the effect was similar; 0.24 kg over a year (95% CI 0.09 to 0.39, 1784 participants, very low quality evidence). In high-income countries, one RCT found no difference in weight, but in a CBA with 116 Aboriginal children in Australia, the effect on weight was 0.95 kg (95% CI 0.58 to 1.33). For height, meta-analysis of nine RCTs revealed that supplemented children grew an average of 0.27 cm more over six months than those who were not supplemented (95% CI 0.07 to 0.48, 1463 participants, moderate quality evidence). Meta-analysis of seven CBAs showed no evidence of an effect (mean difference (MD) 0.52 cm, 95% CI -0.07 to 1.10, 7 trials, 1782 participants, very low quality evidence). Meta-analyses of the RCTs demonstrated benefits for weight-for-age z-scores (WAZ) (MD 0.15, 95% CI 0.05 to 0.24, 8 trials, 1565 participants, moderate quality evidence), and height-for-age z-scores (HAZ) (MD 0.15, 95% CI 0.06 to 0.24, 9 trials, 4638 participants, moderate quality evidence), but not for weight-for-height z-scores MD 0.10 (95% CI -0.02 to 0.22, 7 trials, 4176 participants, moderate quality evidence). Meta-analyses of the CBAs showed no effects on WAZ, HAZ, or WHZ (very low quality evidence). We found moderate positive effects for haemoglobin (SMD 0.49, 95% CI 0.07 to 0.91, 5 trials, 300 participants) in a meta-analysis of the RCTs.

Psychosocial outcomes. Eight RCTs in low- and middle-income countries assessed psychosocial outcomes. Our meta-analysis of two studies showed moderate positive effects of feeding on psychomotor development (SMD 0.41, 95% CI 0.10 to 0.72, 178 participants). The evidence of effects on cognitive development was sparse and mixed.

We found evidence of substantial leakage. When feeding was given at home, children benefited from only 36% of the energy in the supplement. However, when the supplementary food was given in day cares or feeding centres, there was less leakage; children took in 85% of the energy provided in the supplement. Supplementary food was generally more effective for younger children (less than two years of age) and for those who were poorer/ less well-nourished. Results for sex were equivocal. Our results also suggested that feeding programmes which were given in day-care/feeding centres and those which provided a moderate-to-high proportion of the recommended daily intake (% RDI) for energy were more effective.

Authors' conclusions

Feeding programmes for young children in low- and middle-income countries can work, but good implementation is key.

PLAIN LANGUAGE SUMMARY

Supplementary feeding for children aged three months to five years: does it work to improve their health and well-being?

Background

Undernutrition is a cause of child mortality; it contributed to the deaths of more than three million children in 2011. Furthermore, it can lead to higher risk of infection, poorer child development and school performance, and to chronic disease in adulthood. Evidence about the effectiveness of nutrition interventions for young children, therefore, is fundamentally important; not only for governments, funding agencies and nongovernmental organisations, but also for the children themselves.

Review question

How effective are supplementary food programmes for improving the health of disadvantaged children? What factors contribute to the effectiveness of such programmes?

Methods

We included studies that compared children who were given supplementary feeding (food, drink) to those who did not receive any feeding.

We followed careful systematic review methodology, including the use of broad searches. At least two people were involved in every stage of the review. Where possible, we performed analyses to combine results of several studies and get an average effect. We looked carefully for factors that may have impacted on the results (child age, sex and disadvantage, family sharing food, amount of energy given, etc.).

The evidence is current to January 2014.

Study characteristics

We included 32 studies; 21 randomised controlled trials (in which children were randomly assigned to receive either supplementary feeding (intervention group) or not (a control group), and 11 controlled before-and-after studies (in which outcomes were observed before and after treatment in a group of children who were not randomly assigned to an intervention and a control group). The number of children in them ranged from 30 to 3166. Most studies were from low- and middle-income countries; three were from high-income countries.

Key findings

We found that, in low- and middle-income countries, providing additional food to children aged three months to five years led to small gains in weight (0.24 kg a year in both RCTs and CBAs) and height (0.54 cm a year in RCTs only; no evidence of an effect in other study designs),and moderate increases in haemoglobin. We also found positive impacts on psychomotor development (skills that involve mental and muscular activity). We found mixed evidence on effects of supplementary feeding on mental development.

In high-income countries, two studies found no benefits for growth. The one effective study involved Aboriginal children.

We found that food was often redistributed ('leakage') within the family; when feeding was home-delivered, children benefited from only 36% of the energy given in the supplement. However, when the supplementary food was given in day care centres or feeding centres, there was much less leakage; children took in 85% of the energy provided in the supplement. When we looked at different groups supplementary food was more effective for younger children (under two years old) and for those who were poorer or less well-nourished. Results for sex were mixed. Feeding programmes that were well-supervised and those that provided a greater proportion of required daily food for energy were generally more effective.

Quality of the evidence

We judged evidence from the RCTs to be of moderate quality and evidence from the CBAs to be of low quality.

SUMMARY OF FINDINGS

Summary of findings for the main comparison. Low- and middle-income countries: Feeding compared to control - growth RCTs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Low- and middle-income countries: Feeding compared to control - growth RCTs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Participants or population: Low- and middle-income children aged 3 months to 5 years
Settings: Low- and middle-income countries
Intervention: Feeding
Comparison: Control - growth RCTs

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants in meta-analyses (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control - growth RCT	Low- and middle-income countries: Feeding				
Weight gain (kg) Follow-up: 3 - 12 months; average 6 months	Weight change of control group ranged from 0.32 to 2.42 kg	The mean weight gain in the intervention group was **0.12 higher** (0.05 to 0.18 higher)		1057 (9 studies)	⊕⊕⊕⊝ **moderate**[1]	
Height gain (cm) Follow-up: 3 - 12 months; average 6 months	Growth in height of control group ranged from 0.90 to 3.4 cm	The mean height gain in the intervention group was **0.27 cm higher** (0.07 to 0.48 higher)		1463 (9 studies)	⊕⊕⊕⊝ **moderate**[1]	
Weight-for-age: z-scores (WAZ) Follow-up: 3 - 24 months; average 6.5 months	Change in WAZ in the control group ranged from -0.30 to 0.98	The mean change in WAZ in the intervention group was **0.15 higher** (0.05 to 0.24 higher)		1565 (8 studies)	⊕⊕⊕⊝ **moderate**[1]	
Height-for-age: z-scores (HAZ) Follow-up: 3 - 24 months; average 6.5 months	Change in HAZ in the control group ranged from -0.84 to 0.11	The mean change in HAZ in the intervention group was **0.15 higher** (0.06 to 0.24 higher)		4544 (9 studies)	⊕⊕⊕⊝ **moderate**[1]	
Weight-for-height: z-scores (WHZ) Follow-up: 3 - 12 months; average 6.5 months	Change in WHZ in the control group ranged from -0.70 to 0.10	The mean change in WHZ in the intervention group was **0.10 higher** (0.02 lower to 0.22 higher)		4073 (7 studies)	⊕⊕⊕⊝ **moderate**[1]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1]Risk of bias rated as moderate because most studies lacked blinding and most studies report a completer analysis rather than intention-to-treat (ITT)

Summary of findings 2. Low- and middle-income countries: Feeding compared to control. CBAs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Low- and middle-income countries: Feeding compared to control. CBAs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Participant or population: Children aged 3 months to 5 years
Settings: Low- and middle-income countries
Intervention: Feeding
Comparison: Control - CBAs

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants in meta-analyses (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control - CBA	Low- and middle-income countries: Feeding				
Weight gain (kg) Follow-up: 6 months - 1.8 years; average 1 year	Weight change of control group ranged from 0.5 to 3.93 kg	The mean weight gain (kg) in the intervention group was **0.24 higher** (0.09 to 0.39 higher)		1784 (7 studies)	⊕⊝⊝⊝ very **low**[1]	
Height gain (cm) Follow-up: 6 months - 1.8 years; average 1 year	Growth in height of control group ranged from 1.88 to 20.1 cm	The mean height gain (cm) in the intervention group was **0.52 higher but non-significant** (0.07 lower to 1.10 higher)		1782 (7 studies)	⊕⊝⊝⊝ **very low**[1]	
Weight-for-age: z-scores (WAZ)	Change in WAZ in the control group ranged from -0.42 to 0.07	The mean change in WAZ in the intervention group was **0.27 higher** (0.13 lower to 0.68 higher)		999 (4 studies)	⊕⊝⊝⊝ **very low**[1]	

Follow-up: 9 - 12 months						
Height-for-age: z-scores (HAZ) Follow-up: 9 - 12 months	Change in HAZ in the control group ranged from -0.82 to 0.26	There was little mean change in HAZ in the intervention group compared to the control group**0.01 higher** (0.10 lower to 0.12 higher)		999 (4 studies)	⊕⊝⊝⊝ **very low**[1]	
Weight- for-height: z-scores (WHZ) Follow-up: 9 - 12 months	Change in WHZ in the control group ranged from -0.92 to -0.01	The mean change in WHZ in the intervention group was **0.29 higher** (0.11 lower to 0.69 higher)		999 (4 studies)	⊕⊝⊝⊝ **very low**[1]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1]Studies are rated at high risk of bias due to lack of randomisation

Summary of findings 3. Low- and middle-income countries: Feeding compared to control - psychosocial development RCTs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Low- and middle-income countries: Feeding compared to control - psychosocial development RCTs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Participant or population: Children aged 3 months to 5 years
Settings: Low- and middle-income countries
Intervention: Feeding
Comparison: Control - psychosocial development RCT

Outcomes	Illustrative comparative risks* (95% CI)		Relative effect (95% CI)	Number of participants in meta-analyses (studies)	Quality of the evidence (GRADE)	Comments
	Assumed risk	Corresponding risk				
	Control - psychosocial development RCT	Low- and middle-income countries: Feeding				

Mental Development Index (total) Follow-up: 3 - 21 months	The mean change in mental development index score for the control group was 15.8 points	The standardised mean mental development index (total) in the intervention group was 0.40 **lower** (-0.79 lower to -0.00) in one study		113 (1 study)	⊕⊕⊕⊝ **moderate**[1]	
		In another study, the standardized mean difference in change in cognitive ability was 0.58 over 21 months of supplementation (0.17 higher to 0.98 higher)		99 (1 study)		
		One study not included in the meta-analysis, intervention group was significantly**higher** ($F_{1,\ 107} = 4.44$, $P < 0.0$)		107 (1 study)		
Psychomotor development Follow-up: 3 months 6 - 24 months for 4 other studies	The mean change in psychomotor development index score for the control group was 2.7 points	The standardised mean psychomotor development in the intervention group was **0.41 higher** (0.10 higher to 0.72 higher)		178 (2 studies)	⊕⊕⊕⊕ **Moderate**	
		Two-year study: Mean gain in psychomotor development was 6.5 points **higher** in supplemented group and 13.4 points **higher** in the supplemented + stimulated group than controls. (Change in control compared to supplemented was -6.5 (-11.1 to -1.9) points; change in control compared to supplemented + stimulated was -13.4 (-17.9 to -8.8) points		94 (1 study)		
		One study: No main effect but change-over-time contrasts found that after 6 months of treatment, younger children in the experimental group showed significantly less decline on the Bayley Motor score than younger children in the placebo group ($F_{1,48} = 6.01$, $P < 0.05$). The differences in Bayley Motor Score disappeared at 12 months of intervention		136; 48 younger children (1 study)		
		One study: Boys who received 2½ years of supplementation beginning at 6 months had better overall scores on the Griffiths Mental Development Scales (GMDS) than those who had no supplementation; this was not true for girls. We could not test significance		114 in analysis (1 study)		
		One study: non-significant		30 (1 study)		
Follow-up. 4 years after the end of supplementation		Supplemented and supplemented + stimulated performed better than controls on 14 out of 15 cognitive tests. Supplementation had a significant effect on the perceptual motor factor for children whose mothers had high baseline scores on the Peabody Picture Vocabulary Test (PPVT)		122 (1 study)	⊕⊕⊕⊝ **moderate**[1]	

*The basis for the **assumed risk** (e.g. the median control group risk across studies) is provided in footnotes. The **corresponding risk** (and its 95% CI) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).
CI: Confidence interval

GRADE Working Group grades of evidence
High quality: Further research is very unlikely to change our confidence in the estimate of effect.
Moderate quality: Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.
Low quality: Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.
Very low quality: We are very uncertain about the estimate.

[1]Risk of bias rated as moderate because of lack of blinding and lack of intention-to-treat (ITT) analysis

BACKGROUND

Programmes that provide supplementary food for preschool-aged children are intended to help address the biggest cause of the global burden of disease: undernutrition (Lopez 2006, p 297). Recent figures indicate that 842 million people globally were chronically undernourished between 2011 and 2013, with the vast majority of them (827 million) in low- and middle-income countries (FAO 2013).

Many of those who are undernourished are children. Child and maternal undernutrition and suboptimal breastfeeding are responsible for about 35% of deaths of children under five years of age, and for 11% of the global burden of disease (Black 2008). Most of this burden falls onto low- and middle-income countries, where 28% and 45% of children are underweight and stunted, respectively (WHO 2013). Most of the child deaths due to undernutrition are preventable (Horton 2008), and yet, distressingly, "Nutrition is a desperately neglected aspect of maternal, newborn, and child health" (Horton 2008, p 179).

Poverty and undernutrition are closely linked (Haddad 2000), with poverty as "the leading cause of hunger" (World Hunger Education Service 2012). In the 1990s, the percentage of underweight preschoolers declined sharply as gross domestic production rose (Haddad 2000). In high-income countries, such as Canada (ONPP 2004) and the United States (Nord 2010), household food insecurity is strongly associated with low income.

Description of the condition

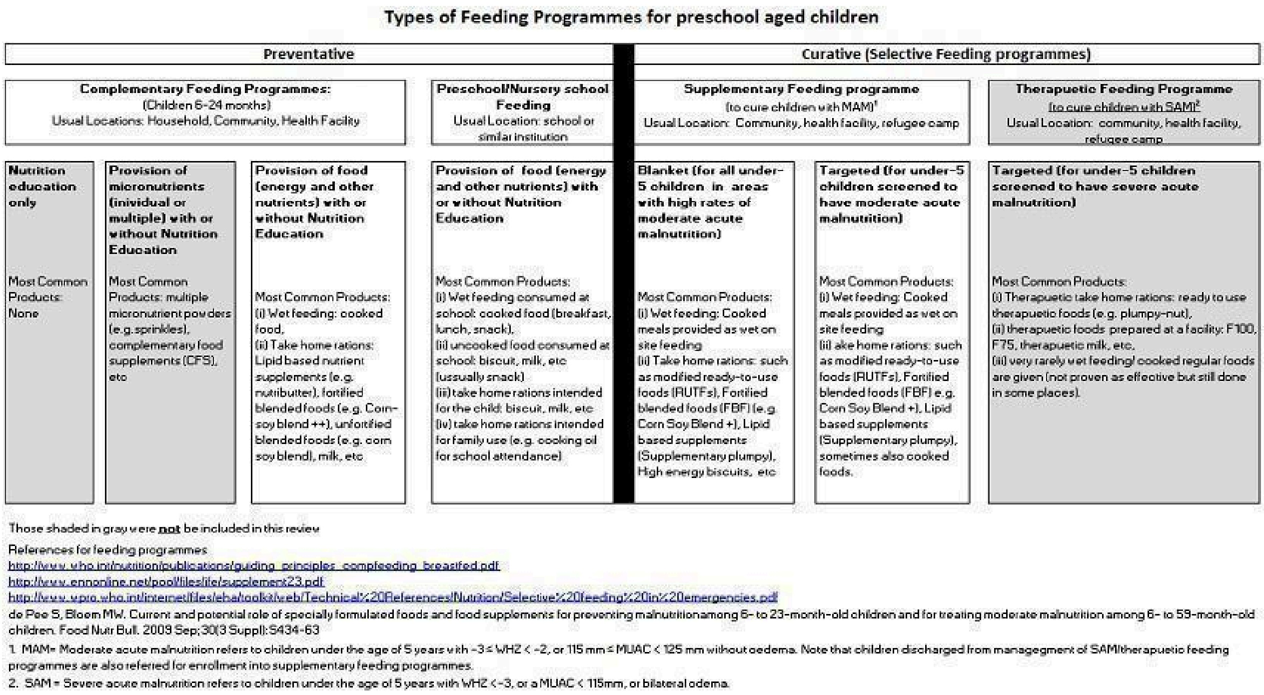
"Undernutrition is the outcome of insufficient food intake and repeated infectious diseases. It includes being underweight for one's age, too short for one's age (stunted), dangerously thin for one's height (wasted) and deficient in vitamins and minerals (micronutrient malnutrition)" (UNICEF 2006). Throughout the life cycle, undernutrition contributes to increased risk of infection, lowered cognitive performance, chronic disease in adulthood, and mortality (United Nations ACC/SCN 2000). The consequences of undernutrition in early childhood are particularly severe; both physical and intellectual development may be affected (Ivanovic 2004; Petrou 2010). The main causes of child deaths are diarrhoea, pneumonia, malaria, measles, AIDS, and perinatal conditions; undernutrition is an underlying cause for most of these (Black 2003a; Black 2003b; Caulfield 2004). Zinc deficiency, for example, contributes to child morbidity and mortality through increased prevalence and severity of diarrhoea and pneumonia (Jones 2003). In turn, severe illness may lead to appetite loss, metabolic changes, and behavioural changes (Tomkins 1989), thus worsening nutritional status and may increase the risk of more prolonged or severe illness episodes (Fishman 2003). Early and persistent undernutrition may cause permanent changes in physiology, metabolism, and endocrine function (Barker 2001; Prentice 2005); it has been increasingly linked to chronic diseases, including obesity, stroke, and coronary heart disease (Barker 1992; Barker 2001; Caballero 2001; Gaskin 2000; Hoffman 2000; López-Jaramillo 2008; Prentice 2005). Undernutrition also increases the risk of mortality from disease (Shankar 2000).

Although the brain continues to grow throughout childhood, the period between birth and three years of age is a time of particularly rapid growth. During these years, the brain is very sensitive to factors that can inhibit brain growth and cognitive development, such as protein-energy malnutrition or micronutrient deficiency (Tanner 2002). Although it is sometimes difficult to disentangle the effects of undernutrition from other deprivations to which children living in poverty are exposed, early undernutrition is linked to lowered cognitive functioning and poorer school performance (Alderman 2004; Grantham-McGregor 2007; Schrimshaw 1998; Tanner 2002; Worobey 1999). In the short term, skipping breakfast can lower performance on memory and verbal fluency tasks (Pollitt 1998). Animal studies show that malnutrition leads to changes in motivation, emotionality, and anxiety (Strupp 1995; Walker 2007). These effects may limit a child's capacity to interact with his or her environment and to learn from these interactions (Beaton 1993; Pollitt 1994; Walker 2007). Chronic malnutrition in early childhood may result in partially irreversible structural and functional brain changes (Morgane 2002). Maternal, foetal, and early childhood undernutrition is also linked to lower educational attainment and lower economic productivity in later life (Grantham-McGregor 2007; Victora 2008).

Description of the intervention

Supplementary feeding involves provision of energy (with nutrients or micronutrients or both) through food (meals/snacks) or beverage to children to ameliorate or prevent undernutrition. This may be given in preschool, day care, or community settings; take-home or home-delivered rations are also included. Programme goals generally include one or more of the following: improved survival, prevention or amelioration of growth failure, lowered morbidity, and promotion of normal cognitive and behavioural development (Beaton 1993). Figure 1 provides an overview of the interventions eligible for inclusion in this review.

Figure 1. Types of feeding programs in the preschool review



How the intervention might work

It is important to intervene in early childhood to maximise developmental potential and lifelong health (Power 1997). Supplementary feeding for disadvantaged young children is designed to accomplish this. According to Beaton 1982, feeding programmes are usually designed to meet 40% to 70% of the estimated energy gap and should exist alongside usual home meals. The food or beverage may improve growth and micronutrient status by providing additional energy, macronutrients, and micronutrients; it may also boost immune status and reduce the risk of infection (Barker 2001; Prentice 2005; Schrimshaw 1998). The energy, nutrients, and micronutrients given may also improve motivation and psychosocial health, including cognitive functions such as intelligence, attention, psychomotor skills, language,and visuospatial skills. Nutrition can influence the development and function of a young child's brain through several mechanisms: development of brain structure, including increased brain volume (Ivanovic 2004), myelination, and neurotransmitter operation (Tanner 2002; Wachs 2000). Feeding may also improve social behaviour, through increased interaction with the world, improved emotional state, and lowered anxiety (Barrett 1985). Increased social interaction may, in turn, enhance cognitive functioning and learning. Better nutrition in the first two years of life is associated with achieving a higher level of schooling (Martorell 2010; Victora 2008).

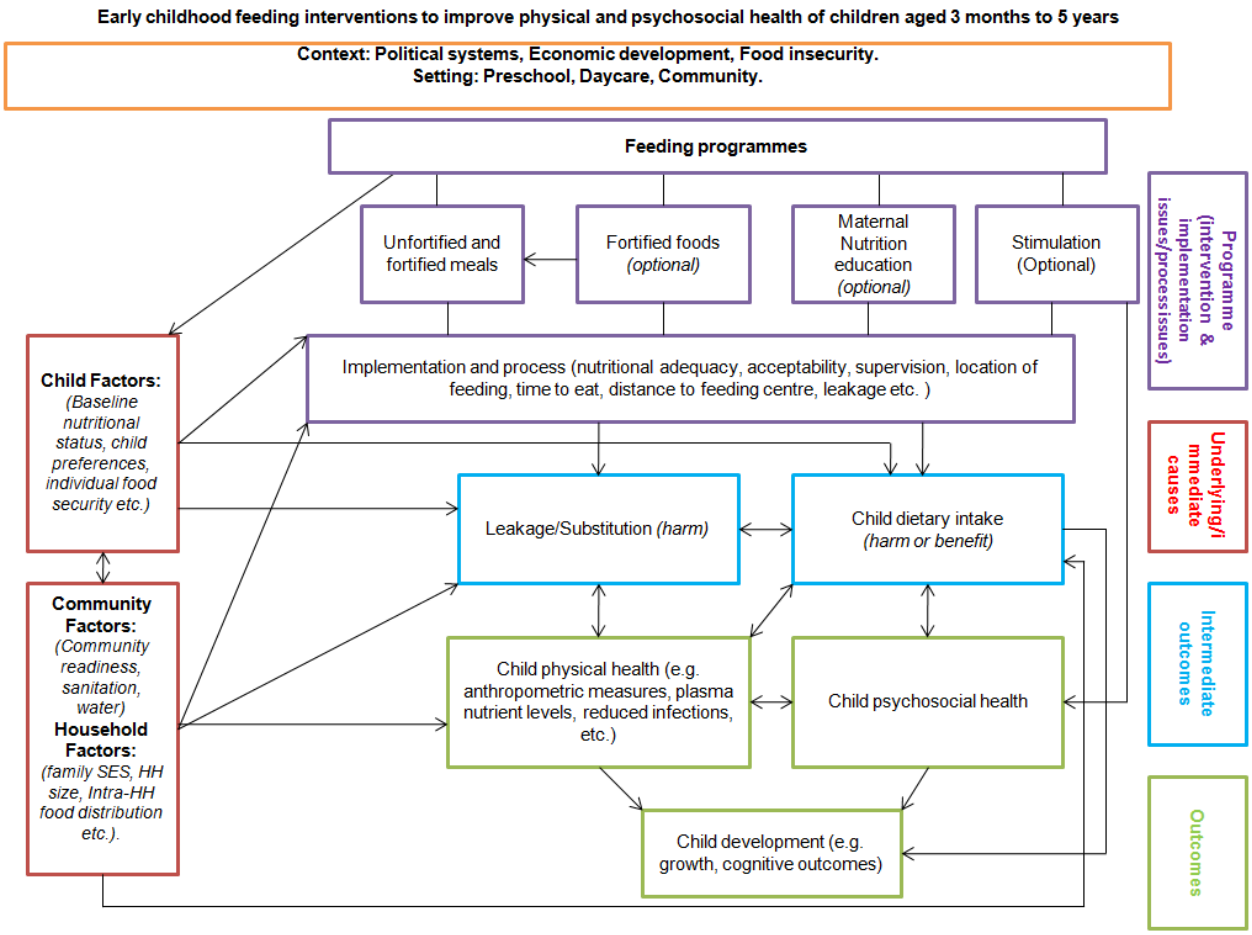
Several factors may affect intervention success. The amount of energy given and the macronutrient and micronutrient composition of the food are critical for achieving adequate growth and meeting physiological needs (Allen 1994; Beaton 1982; Rivera 1991; Rush 1998). The child's age may also be important; effects on growth, particularly linear growth, may be most pronounced for children aged two years and under (Dewey 2008; Schroeder 1995). Substitution and ration-sharing can be a problem in both take-home and on-site feeding programmes (ACC/SCN 1993; Engle 1992b). In take-home feeding programmes, only 40% to 60% of the food distributed appeared to reach targeted children, with the remainder either consumed by other family members or sold (Beaton 1982).

There is a dearth of research on effectiveness by socio-economic status; however, some research has shown that feeding may be more effective for the most undernourished (typically very poor) young (Beaton 1982) and school-aged children (Kristjansson 2007). Related to this, and based on their finding of different patterns of socio-economic inequalities in stunting, Van de Poel 2008 suggested that, in countries with mass deprivation, a universal approach be used, while in situations of exclusion, targeted approaches should be used to improve the health of the poorest children.

However, despite the obvious benefits (reductions in underweight and wasting), supplementary feeding programmes in a few low- and middle-income countries, particularly in Latin America, may be contributing to a slight rise in obesity prevalence (Kain 1998; Uauy 2001).

Our conceptual model of mechanisms through which supplementary feeding may or may not work is in Figure 2.

Figure 2. Conceptual model for feeding interventions to improve physical and psychosocial health of children aged two months to five years *Footnotes* SES - socio-economic status HH - household



Why it is important to do this review

Child undernutrition is a major global health issue that is responsible for lost potential, morbidity, and death. Thus, we need good evidence on which interventions work to reduce childhood undernutrition, and how and why they work. Systematic reviews on supplementary feeding for preschool-aged children are especially timely in an era when governments and leading international organisations are placing increasing emphasis on evidence-based strategies to improve the health of the poor. It is important for governments and non-governmental organisations (NGOs) to have evidence about these programmes in order to make important decisions about the distribution of scarce resources (Irwin 2007).

Our review addresses important evidence gaps in the following ways: first, it is broad; it includes controlled before-and-after (CBA) studies, controlled clinical trials (CCTs), and interrupted time series (ITS). This is because it is increasingly recognised that reviews containing study designs other than randomised controlled trials (RCTs) are advantageous for capturing important population-level (or population health) interventions (Ogilvie 2005; Tugwell 2010). Second, we used a rigorous process evaluation to elucidate pertinent information on factors that impact on effectiveness. Finally, we assessed the effect of the intervention on many outcomes, including physical and psychosocial development, physical activity, and infectious diseases. Thus our review may help to address one of the evidence gaps identified by Bhutta 2008; the lack of evidence about whether adverse effects of undernutrition on cognition and infectious disease may be ameliorated.

OBJECTIVES

Primary objective

1. To assess the effectiveness of supplementary feeding interventions, alone or with co-intervention, for improving the physical and psychosocial health of disadvantaged children aged three months to five years.

Secondary objectives

1. To assess the potential of such programmes to reduce socio-economic inequalities in undernutrition.
2. To evaluate implementation and to understand how this may impact on outcomes.
3. To determine whether there are any adverse effects of supplementary feeding.

METHODS

Criteria for considering studies for this review

Types of studies

Randomised controlled trials (RCTs), clustered RCTs (c-RCTs), controlled clinical trials (CCT), controlled before-and-after (CBA) studies, and interrupted time series (ITS; with three time points before and three after the intervention, with or without a control group) were eligible for inclusion in this review.

We also accepted RCTs with stepped-wedge designs (treatments begun at different times for different groups of participants). In these cases, our baseline was the time at which the 'treated group' (longest treatment) began treatment and our endpoint was the point at which the 'control group' began treatment. We excluded all other study types.

Types of participants

Children aged three months to five years were eligible, from all countries of the world. We divided countries into low- and middle-income and high-income; classification was based on the 2011 World Bank List of Country Economies (World Bank 2011). Low- and middle-income countries include those which the World Bank classified as low income, (USD 1035 Gross National Income (GNI) per capita or less) and lower middle-income (USD 1036 to USD 4085 GNI per capita) countries. High-income countries include both upper middle-income (USD 4086 to USD 12,615 GNI per capita) and high-income (USD 12,616 GNI per capita or more) countries. We analysed results separately for low- and middle-income countries and high-income countries.

Studies had to comprise children from:

1. Socio-economically disadvantaged groups; OR
2. All socio-economic groups if results are or can be stratified by some indicator of socio-economic status (for example, high or low income, high or low education, rural or urban).

Studies also had to follow the same children.

Definition of socio-economic disadvantage for low- and middle-income countries and high-income countries:

Low- and middle-income countries: from rural areas, villages, provinces, or deprived urban areas OR parents have low average education (primary school or below) OR parents were manual workers (including small farmers) or unemployed OR families were materially disadvantaged or of low socio-economic status (SES) OR children were described as low-income, malnourished, undernourished, underweight or stunted.

High-income countries: families or children described as low SES, low income, low education (high school or below), or from low-income areas (ghettos).

We excluded severely malnourished children (those with a weight-for-height (WfH) z-score of three standard deviations (SDs) or more below the mean). We also excluded studies that focused exclusively on children with diagnosed illnesses (e.g. HIV) or that fed children in emergency and refugee settings. Finally, we excluded interventions that provided supplementary food or drink to mothers in the prenatal period.

Types of interventions

Provision of energy and macronutrients through:

1. Hot or cold meals (breakfast or lunch);
2. Snacks (including both food and beverages such as milk or milk substitutes);
3. Meals or snacks in combination with take-home rations;
4. Take-home rations.

Studies had to compare children who received feeding (with or without co-intervention such as maternal education) to a no-feeding control. We accepted either no-treatment controls (no feeding) or placebo controls (e.g. low-energy foods (less than 5% of the energy provided by the intervention) or drinks (without fortification)). For example, a low-energy, unfortified (e.g. 30 kcal) drink was acceptable as a control.

We excluded food stamps, food banks, and modifications to meals to lower the energy, fat or sodium content. We also excluded therapeutic feeding designed for children with severe acute malnutrition and illness. Feeding could not take place in a hospital setting.

Figure 1 shows the types of feeding programmes included in the review.

Types of outcome measures

The outcomes in this review cover both physical health and psychosocial health (including behaviour).

Primary outcomes

Physical health

1. Growth (weight, height, weight-for-age, height-for-age, weight-for-height).

Psychosocial health

1. Psychomotor development (the progressive attainment of skills that involve both mental and muscular activity; e.g. the ability to turn over, crawl, and walk).
2. Cognitive development or mental development (development of thought processes, including memory, reasoning, information processing, intelligence (the ability to learn or understand or deal with new or trying situations), and language).
3. Attention (the ability to apply one's mind to something or the condition of readiness for attention, including a selective narrowing of consciousness).
4. Language (the ability to comprehend receptive language and apply expressive language to communicate).
5. Memory (the ability to recover information about past events or knowledge).

Adverse effects

1. Substitution or leakage (the family cuts home rations for the child who has been fed in order to spread food to other family members, or shares the child's supplementary rations with other family members).

We used primary outcomes in physical health and psychosocial health to populate the 'Summary of findings' tables.

Secondary outcomes

Physical health

1. Biochemical markers of nutrition (Vitamin A, haemoglobin, hematocrit).
2. Physical activity (body movements that work muscles and require more energy than resting, for example, running, jumping, playing ball, walking around school yard).
3. Morbidity (physician diagnosis of acute illness such as pneumonia, diarrhoea, malaria).
4. Mortality (death).
5. Overweight or obesity (adverse outcome).

Psychosocial outcomes

1. Stigmitisation (adverse effect, involves being shamed).
2. Behaviour problems (aggression, disruptive behaviour).

Where possible, we extracted data on cost and resource use.

We excluded reduction of dental caries and increased nutritional knowledge (although the latter was included in the data extraction form to help elucidate findings). We also excluded intermediate health outcomes such as reduction of hunger and nutrient intake.

For cognitive and behavioural outcomes, we accepted reliable and valid psychometric measures (e.g. Wechsler Intelligence Scale for Children (WISC), Raven's Progressive Matrices (RPM)). For physical outcomes, we accepted clinical measures of growth (e.g. length or height boards, digital or balance beam weighing scales, skinfold thickness, mid-upper-arm circumference (MUAC)), biochemical nutritional status (e.g. blood tests), and morbidity (diagnosis by physician).

Equity outcomes

To assess equity, we conducted subgroup analyses, examining results that compared boys to girls and poor (or more undernourished) to less poor.

Search methods for identification of studies

Electronic searches

We ran the initial searches in July 2011, and updated them most recently on 28 January 2014 (Appendix 1), except where stated otherwise. We did not apply any date or language limits.

1. Cochrane Central Register of Controlled Studies (CENTRAL), 2014, Issue 1, part of The Cochrane Library.
2. Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to present.
3. Cochrane Database of Systematic Reviews (CDSR), 2014 Issue 1, part of The Cochrane Library.
4. Database of Abstracts of Reviews of Effects (DARE), 2014 Issue 1, part of The Cochrane Library.
5. Social Sciences Citation Index (SSCI) (Web of Science) 1970 to the present.
6. Conference Proceedings Citation Index-Science (CPCI-S) (Web of Science) 1990 to the present.
7. Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH) (Web of Science) 1990 to the present.
8. ERIC – Education Resources Information Centre via Proquest, 1994 to the present.
9. Proquest Dissertations and Theses.
10. PsycINFO (Ovid) 1806 to January Week 3 2014.
11. Clinicaltrials.gov (clinicaltrials.gov/).

Searches last updated 3 May 2012 (Appendix 2)

1. EMBASE Classic and EMBASE (OVID) 1947 to 1 May 2012.
2. CINAHL (EBSCOhost) 1981 to 3 May 2012.
3. Healthstar (OVID) 1966 to 3 May 2012.
4. LILACS Last searched 10 May 2012.

Searches last updated 5 July 2011 (Appendix 3)

1. Social Services Abstracts (CSA).

Searching other resources

We searched the following grey literature sources:

1. OpenGrey (www.opengrey.eu/). Accessed: January 2014.
2. WHOLIS (dosei.who.int/uhtbin/cgisirsi/Wed+May+21+19:32:01+MEST+2014/0/49). Accessed: January 2014.
3. WHO nutrition databases (www.who.int/nutrition/databases/en/). Accessed: January 2014.

We sought information about ongoing and unpublished trials through members of our advisory panel of experts in nutrition and child development. We also scanned the references of included articles, relevant reviews, and annotated bibliographies for eligible studies, and searched the websites of selected development agencies or research firms (IDEAS: ideas.repec.org/, IFPRI www.ifpri.org/; JOLIS/World Bank: external.worldbankimflib.org/external.htm; NBER: www.nber.org/, USAID; www.usaid.gov/) in January 2014.

Data collection and analysis

Selection of studies

At least two review authors (SL, BK, DF), working independently, scanned all titles and abstracts of articles retrieved by the searches. One of the review authors retrieved copies of all those deemed eligible. Two review authors (SL and EK) reviewed the full text of all retrieved studies against the inclusion and exclusion criteria, with disagreements settled by a third author (DF).

The team comprised review authors fluent in Portuguese, Spanish, French, and English, and we were therefore able to assess articles written in these languages.

Data extraction and management

Four people (MBJ, SL, DF, and KM), working in pairs, extracted data. They compared their work and resolved discrepancies. We pilot-tested the data extraction form on two studies by having these four review authors extract data and compare extractions.

Our data extraction forms were based on the data collection forms from the Cochrane Effective Practice and Organisation of Care (EPOC) review group (EPOC 2012) modified for this review. We extracted data on study design, description of the intervention (including process), details about participants (including number in each group, age, and socio-economic status), length of intervention and follow-up, definition of disadvantage, all primary and secondary outcomes, the process factors listed below, costs and resource use, risk of bias, and statistical analysis. Where possible, we recorded effects by socio-economic status, geographic location, gender, race or ethnicity, and age.

Process evaluation

We assessed the following process elements (list modified from Arblaster 1996 and Kristjansson 2007, and based on our knowledge of the literature and our conceptual model).

1. Type of meal.
2. Energy provided, % of the dietary reference intake (DRI), and level of nutritional adequacy.
3. Multifaceted approaches (were other supports (nutrition education etc.) used in addition to providing food?).
4. Where the food was given: preschool, day care, community, home-delivered, take-home.
5. Agent administering the intervention (e.g. community, government).
6. Agent delivering intervention (e.g. mother, healthcare worker, day-care worker).
7. Provision of material support (was food provided free of charge or for a reduced price according to income?).
8. Type of food given.
9. Control treatment.
10. Supervision: whether or not intake was monitored. Categorised into low, moderate, and strict (see below).
11. Total net energy intake of experimental and control participants. The comparison of this to energy given in the supplement allowed us to assess leakage.
12. Implementation fidelity.

Nutritional adequacy

A nutritionist (SL) assessed the nutritional adequacy of the meals provided to the children. Two other nutritionists (DF and MB) helped to develop the approach.

Methodology for calculating energy content, protein content, % DRI:

Energy: when the total kilocalories or % DRI of energy were provided in the text of the study, we used this figure. When this information was not provided but the descriptions of food were sufficient (quantity and type of food), we estimated energy content (kilocalories) of the meal or snack using the Food and Agriculture Organization (FAO) international food composition table.

Calculating % DRI for energy: we calculated the % DRI for energy by dividing the given or estimated average kilocalorie content of the meal or snack by the DRI for the age- or sex-specific target group in each study. For children aged three years and older, we identified the estimated energy requirement assuming an active physical activity level. When the intervention group comprised different age and sex groups, and outcomes were given for the entire group only, we used a weighted average of the % DRI for each group to calculate the overall % DRI. When the number of boys and girls was not reported, we assumed that equal proportions took part in the study, and estimated an average DRI for both sexes.

Categorisation of the level of energy in the supplementary food: we categorised % DRI for energy into three levels: low (0 to 29%), moderate (30 to 59%), and high (60% and above). We used this categorisation in subgroup analyses. When different levels of energy were provided in one study, we used the highest level of energy to categorise the level of energy provided. When the same amount of food was provided to different age groups, we based calculations on the oldest age groups, as these had the highest energy requirements.

Protein: when the total protein or % DRI of protein was provided in the text of the study, we used this figure. When the amount of protein was not provided but the descriptions of food were sufficient (quantity and type of food), we estimated the protein content of the meal or snack using the FAO international food composition table.

Calculating % DRI for protein: we calculated the % DRI for protein by dividing the average protein content of the meal or snack by the DRI for the age- or sex-specific target group in each study (DRI from Health Canada). DRI for protein is given in g/kg/d, and weight provided in the study was used to calculate DRI. When weight was not provided in the study, we considered World Health Organization (WHO) weight (average of boys and girls) to estimate the DRI.

Assessing leakage

Where possible, we used information on the energy content in the supplement as well as information on the reported energy intakes of the experimental and control children to calculate the net benefit that the children actually received from the supplement. We calculated this as follows: (Difference in energy intake between experimental and control at end of study) / total energy content of the supplement.

Level of supervision

We divided the studies into strict versus moderate versus low supervision (i.e. monitoring) of the supplementary feeding intake in the following manner.

Strict supervision. To be categorised as strictly supervised, the feeding had to be:

1. In day cares, preschools or feeding centres; OR
2. At home, with visits every two weeks (at least) AND collection of food packets or questions to parents, or both.

Moderate supervision. We characterised studies as moderately supervised if they:

1. Provided monthly home visits; OR
2. Delivered rations every week or every two weeks, but did not ask mothers about consumption.

Low supervision. We characterised studies as low supervision if they provided fewer than monthly home visits.

Organization of process findings

We created an EXCEL file that contained process elements for all studies. The studies were in rows, and the columns contained: type of study, cluster or not, whether it was corrected for clustering, setting, country, feeding duration, the final 'n' rate of attrition, whether the intervention was single or multiple, the type of food and energy provided, programme delivery site, level of supervision, and the outcome measures covered.

We performed subgroup analyses by factors that could impact on effectiveness, including child's age, sex and income level, nutritional adequacy of supplement, level of supervision, location of feeding, and single versus multiple interventions.

Assessment of risk of bias in included studies

Two review authors (EK and BS) independently assessed the risk of bias for most studies; EK and SL did this for a few of the later studies.

We used the Cochrane 'Risk of bias' tool (Higgins 2011b) to assess risk of bias in RCTs and c-RCTs; there were no CCTs. Each component is covered by one or more items, and a dictionary gives thorough definitions for each item. Most items are scored as 'high risk', 'low risk' or 'unclear risk'. We gave component ratings, but did not give an overall rating. For CBAs, we used the 'Risk of bias' tool from the Cochrane EPOC group (EPOC 2009), in addition to the domains covered by the Cochrane 'Risk of bias' tool - allocation, blinding, incomplete outcome data, selective reporting, and other risks of bias. See Table 1 - it includes similarity of baseline outcome measurement, similarity of baseline characteristics, and protection against contamination.

We included 'Risk of bias' assessments for the RCTs and CBAs in the 'Risk of bias' tables, beneath the 'Characteristics of included studies' tables.

Measures of treatment effect

We performed statistical analyses using Review Manager 5 (RevMan) (Review Manager 2012).

Continuous data

If continuous outcomes were measured identically across studies, we calculated an overall mean difference (MD) and 95% confidence interval (CI). If the same continuous outcome was measured differently across studies, we calculated an overall standardised mean difference (SMD) and 95% CI (Higgins 2011a).

We analysed continuous data from means and standard deviations wherever possible. When means and standard deviations were not reported, we used other available data (for example, confidence intervals, T values, P values) and appropriate methods as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (*Cochrane Handbook*, Section 9.4.5, Higgins 2011b) to calculate the means and standard deviations, in consultation with our statistician. Where other available data were not sufficient to calculate standard deviations, we contacted the trial authors.

Change data

We used change data in all analyses. Data were either taken directly from the papers or calculated from other information presented. When we calculated change scores, we used means and standard deviation from baseline and end-of-study according to the methods described in section 16.1 of the *Cochrane Handbook* (Higgins 2011b). We used before-and-after correlations of 0.9 for height, weight, height-for-age z-score (HAZ), weight-for-age z-score (WAZ), and weight-for-height z-score (WHZ). These correlations for growth are based on those provided by Zhang 2006 [pers comm]. For mental and psychomotor development, we used correlations of 0.71 and 0.69. We took these correlations from a publication on test-retest reliability of the Bayley Scales of Infant Development (BSID, Cook 1989).

When studies provided insufficient data to calculate an effect estimate, we selected regression analyses, multilevel analyses, or analyses of variance (ANOVA) as providing the better estimate of effect because: (a) multilevel analyses account for clustering, and (b) other ANOVAs and regressions provided results that were corrected for important covariates.

We conducted separate meta-analyses for RCTS and CBAs and, within those, for each outcome. We also separated low- and middle-income countries and high-income countries, as the two settings are very different in terms of the prevalence and severity of undernutrition; they also differ in many other ways, including political climate, traditions, and food delivery mechanisms.

Within each outcome, we assessed whether the tests used to assess that income were conceptually similar; in cases where the tasks covered by the test were too different, we did not combine them in a meta-analysis.

Unit of analysis issues

Methods of analysis for cluster-randomised trials

Studies allocated by village, neighbourhood, or day care could have unit of analysis errors if they did not adjust for between-cluster correlations. Where trials used clustered allocation, we determined whether or not they had controlled appropriately for clustering (e.g. variance-inflated standard errors, hierarchical linear models). If they had used appropriate methods, we used these data in our analyses. If they had not, we corrected for clustering where possible. Table 2 provides a summary of clustered studies.

Methods used to correct for design effect in clustered trials or CBAs that were not adjusted for clustering

1. When we used a standardised mean difference (SMD) as the pooled estimate (because of varying metrics), we applied the methods outlined in Section 16.3 of the *Cochrane Handbook* (Higgins 2011b) to inflate the standard error. First, we calculated the unadjusted SMD and 95% confidence interval. We entered the unadjusted SMD as the effect estimate in the generic inverse variance method, and then we inflated the standard error of the effect estimate by multiplying by the square root of the variance inflation factor, calculated as: 1 + ((M - 1) multiplied by ICC), where M is the average cluster size. We calculated the standard error as the confidence interval divided by 3.92.
2. When the pooled estimate was the mean difference (MD), we used the variance inflation factor (VIF) to adjust the standard deviations in the treatment and control groups separately. We then used these standard deviations in the meta-analysis, and so incorporated them in the standard error of the mean difference and the weighting procedures. The result of this analysis is equivalent to the method outlined in the *Cochrane Handbook* when the variance inflation factors are the same in the treatment and control groups.
3. We used this approach because final cluster sizes often differed between the treatment and control groups and therefore the VIF, which depends on cluster size, would be different. As far as we know, the *Cochrane Handbook* does not provide for this eventuality.

Calculating the variance inflation factor

1. First, we calculated cluster size. When the number of participants in each analysis was provided, we divided this by the number of clusters to calculate cluster size. Otherwise, we used the number of participants provided in the Methods sections of the primary studies divided by the number of clusters.
2. Next, we found appropriate intra-cluster correlation coefficients (ICCs).
   a. For growth outcomes (weight, height, WAZ, HAZ, WHZ), we used ICCs of 0.025; these were based on those published in Du's 2005 letter to the editor of the *British Journal of Nutrition* (Du 2005). We conducted sensitivity analyses with ICCs of 0.10.
   b. For the psychosocial outcomes, we used ICCs of 0.15, with sensitivity analyses at 0.20. These were based on the Schochet report (Schochet 2005) for maths and reading.
3. Then, for experimental and control groups separately, we calculated the VIF as follows:

1+ ((M - 1) multiplied by ICC), where M is the average cluster size (Ukoumunne 1999). We then multiplied the original standard deviation by the square root of the VIF for experimental and control groups separately. We then entered these adjusted standard deviations into the Review Manager 5 data tables, combining them with estimates from individual level trials.

Dealing with missing data

Where possible (e.g. studies conducted after 1995), we contacted trial authors to supply any missing or unreported data such as group means, standard deviations, details of attrition or details of interventions received by the control groups. We describe missing data and attrition for each included study in the Characteristics of included studies tables.

Assessment of heterogeneity

We considered clinical (variation in participants, interventions, outcomes) and methodological (i.e. study design, risk of bias) heterogeneity as well as statistical heterogeneity. We assessed statistical heterogeneity using a standard Chi^2 test to assess whether observed differences in results were compatible with chance alone. We used the I^2 test to assess the impact of heterogeneity on the meta-analysis. It shows the percentage of variability in effect estimates that are due to heterogeneity rather than to chance; values over 75% indicate a high level of heterogeneity (Higgins 2003).

If heterogeneity existed, we examined potential sources.

We obtained an estimate of the between-studies variance component (Tau^2) through a random-effects meta-analysis.

Assessment of reporting biases

We had planned to draw funnel plots to assess the presence of possible publication bias, as well as the relationship between effect size and study precision, but did not have the recommended minimum number of studies (10) for any analysis (see Differences between protocol and review).

Data synthesis

We conducted separate meta-analyses for RCTS and CBAs. If we could not conduct meta-analysis, we reported studies narratively.

In cases where studies provided insufficient data for meta-analysis, we selected analyses of variance (ANOVA) as providing the better estimate of effect because they corrected for important covariates. We included one regression in a meta-analysis using the generic inverse variance method. Grantham-McGregor 1991 presented the regression coefficients of contrasts between groups over 24 months. We considered this contrast an effect size, and calculated the standard deviation from the 95% confidence limits, then calculated the standardized mean difference by dividing by the standard deviation, using the formulae provided in the *Cochrane Handbook (* Higgins 2011a). We entered this standardized mean difference into the generic inverse variance analysis to allow pooling with Husaini 1991, which also measured psychomotor development, with a different scale.

Randomised controlled trials (RCTs), cluster-randomised controlled trials (c-RCTs), controlled before-and-after studies (CBAs)

For continuous data, we incorporated data on means, standard deviations, and the number of participants for each outcome in the two groups. While we did not adjust these means and standard deviations for confounders, we adjusted them for clustering when needed.

In performing our meta-analyses, we used the inverse-variance random-effects model. We calculated SMDs using Hedges *g,* taking the direction of effect into account. Following the *Cochrane Handbook* (Section 9.2.3.2), we interpreted results using clinical as well as statistical significance.

We compared the most intensive intervention (e.g. highest energy, co-intervention) to a non-intervention control. We also entered comparisons between baseline and the end of the feeding.

Interrupted time series (ITS)

We did not have any ITS studies in this review. However, should we find any suitable ITS studies in future updates, we will analyse them according to the methods in Appendix 4 (see also Kristjansson 2007).

'Summary of findings' tables

We constructed 'Summary of findings' tables and rated the quality of evidence using GRADE (Grades of Recommendation, Assessment, Development and Evaluation) (Guyatt 2011) for all primary outcomes in physical and psychological health. GRADE categorises the quality of the evidence as high, moderate, low, or very low. Randomised controlled trials start out at high or medium quality, and observational studies (including CBAs) are low or very low. Evidence from RCTs is downgraded if there is a high risk of bias across studies, if results are inconsistent or imprecise or in the presence of publication bias. Observational studies with no limitations can be upgraded if there is a large magnitude of effect, dose-response or if plausible confounders would have reduced the effect.

Subgroup analysis and investigation of heterogeneity

We had planned to conduct subgroup analyses across six categories (Kristjansson 2012).

1. Age: three months to two years versus greater than two years to five years.
2. Sex: male versus female.
3. Socio-economically disadvantaged: more versus less.
4. Undernourished (1 SD below mean) versus normal weight. We are using this definition as participants in the sample are limited in the range of underweight they will exhibit (none below -3). This will give us a reasonable proportion in each group.
5. Percentage of daily requirements for energy provided (less than 15%, 15% to 30%, 30% to 50%, above 50%).
6. Micronutrients added versus not added.

We hypothesised that feeding would be more effective for:

1. Younger children;
2. The most disadvantaged, poorest, lowest SES;
3. Those with the poorest nutritional status (underweight, stunted); and
4. Children who received a higher percentage of the daily energy requirements.

In the review, we conducted analyses one, two and five and combined analyses three and four, as undernourishment was seen as a proxy for low income. We did not perform analysis six. Furthermore, after learning more about other potential impacts on effectiveness, we added three more subgroup analyses; location of feeding, level of supervision, and single versus multiple interventions.

We hypothesised that feeding would be more effective if:

1. It was delivered in day cares or feeding centres;
2. It was strictly supervised (i.e. well-monitored); and
3. If multiple interventions were given rather than single interventions.

In total, we performed subgroup analyses across seven categories.

1. Age: three to 12 months, one to two years, and two years and older for RCTs.
2. Sex: male versus female.
3. Socio-economically disadvantaged: poor versus less poor; undernourished versus well-nourished.
4. Nutritional adequacy: percentage of daily requirements (RDI) for energy provided by the supplement (low (0% to 29%), moderate (30% to 59%), and high (60% +)).
5. Location of feeding: take-home rations versus feeding centre, or day care or preschool, or both.
6. Level of supervision (i.e. monitoring): low supervision versus moderate supervision versus strict supervision.
7. Single versus multiple interventions.

Assessing impact on socio-economic inequities in health and psychosocial outcomes

We assessed this potential for primary outcomes. Our assessment of the potential for reductions in socio-economic inequities in health was classified as: effective for reducing inequities in health; potentially effective for reducing inequities in health; ineffective for reducing inequities in health; or uncertain.

1. Effective: we rated an intervention as effective if the intervention worked, and if improvements in health were greater for children in lower socio-economic groups than in higher groups.
2. Potentially effective: we classified an intervention as potentially effective if delivered only to children of lower socio-economic groups, and if it showed statistically significant and meaningful effects.
3. Ineffective: we classified an intervention as ineffective for reducing socio-economic inequities in health if it resulted in greater improvements for children in higher socio-economic groups than for children in lower socio-economic groups, or if it was not effective.
4. Uncertain: there is not enough evidence to judge.

Sensitivity analysis

We conducted sensitivity analyses to consider the impact of:

1. ICCs of 0.10 for height, weight, WAZ, HAZ, and WHZ; and
2. ICCs of 0.20 for psychosocial outcomes.

RESULTS

Description of studies

Included studies are described below.

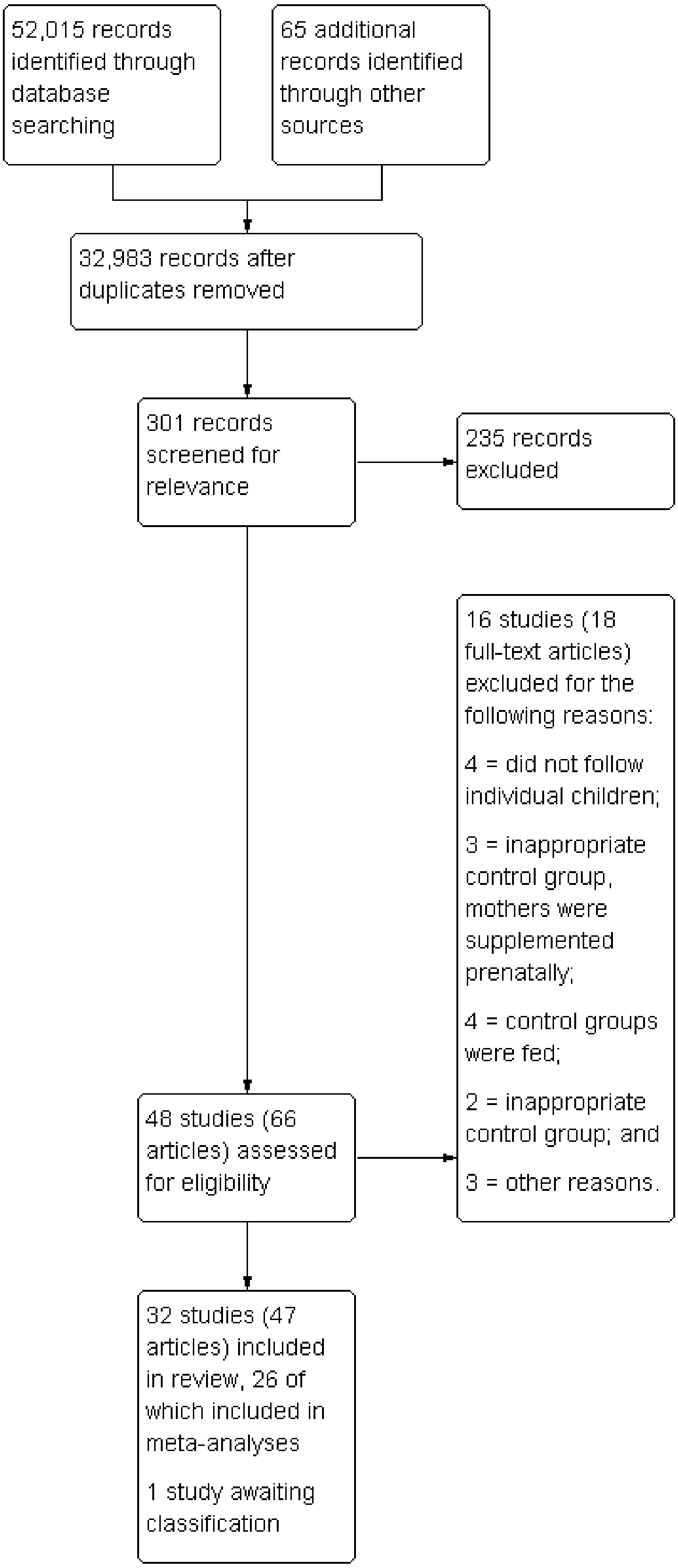
Results of the search

Three electronic searches yielded 52,015 records from all databases in all years, and we identified an additional 65 records from other sources; this resulted in 32,983 articles after duplicates were removed. After initial screening of titles and abstracts, we retrieved 301 articles. Review authors agreed that 48 studies were potentially relevant, and of the appropriate design, and read each in full. Of these, 32 studies met the inclusion criteria; we excluded 16.

Twenty-one of the included studies were randomised controlled trials (RCTs) and 11 were controlled before-and-after studies (CBAs).

We were able to include 26 studies (16 RCTs and 10 CBAs) in one or more meta-analyses. The study flow diagram is shown in Figure 3.

Figure 3. Study flow diagram



Included studies

Study setting

Twenty-nine studies were from low- and middle income countries; three were from high-income countries. Within low- and middle-income countries, six were performed in India (Bhandari 2001; Devadas 1971; Gopalan 1973; Joshi 1988; Manjrekar 1986; Mittal 1980), two in Bangladesh (Fauveau 1992; Roy 2005), two in Jamaica (Grantham-McGregor 1991; Heikens 1989), two in Indonesia (Husaini 1991; Pollitt 2000a), two in Columbia (McKay 1978; Waber 1981), three in Malawi (Kuusipalo 2006; Mangani 2014; Thakwalakwa 2010), and one each in Niger (Isanaka 2009), Nigeria (Obatolu 2003), Kenya (Tomedi 2012), Peru (De Romana 2000), South Africa (Oelofse 2003), Vietnam (Schroeder 2002), Thailand (Gershoff 1988), Brazil (Santos 2005), Ecuador (Lutter 2008), Haiti (Iannotti 2014), and Mexico (Rivera 2004). One study (Simondon 1996) was performed in four countries: Bolivia, Caledonia, Congo, and Senegal. All were conducted in poorer settings; these included urban and suburban slums and poor rural areas. Of the three studies from high-income countries, one was implemented in Australia with Aboriginal children (Coyne 1980), one was performed in Canada (Yeung 2000), and one was performed in the United States (Ziegler 2009).

Participants

The participants comprised children aged three months to five years. In almost all studies in low- and middle-income countries, a high proportion of children had low weight-for-age z-scores (WAZ) or height-for-age z-scores (HAZ). Eight studies allocated children on the basis of mild to moderate malnourishment or low WAZ. Very few children in these studies were severely malnourished (< 3 standard deviations (SDs) for WAZ or HAZ) or ill. Many children came from low income areas and had parents with low education or low income, or both. Many parents were employed as labourers, farmers, or fishermen; other parents were unemployed. The number of participants per study ranged from 30 (Obatolu 2003) to 3166 (Isanaka 2009).

In high-income countries, two studies were aimed at low-income children and one did not select on the basis of income.

Interventions

All interventions comprised supplementary food, with or without added micronutrients.

Single versus multiple interventions

In sixteen of the programmes in low- and middle-income countries (De Romana 2000; Gopalan 1973; Heikens 1989; Husaini 1991; Iannotti 2014; Isanaka 2009; Joshi 1988; Kuusipalo 2006; Mangani 2014; Manjrekar 1986; Mittal 1980; Obatolu 2003; Oelofse 2003; Pollitt 2000a; Simondon 1996; Thakwalakwa 2010), and two programmes in high-income countries (Yeung 2000; Ziegler 2009), supplementary feeding was the only difference between experimental and control groups.

Thirteen studies in low- and middle-income countries provided adjunctive interventions. Seven programmes provided additional rations for the family (Bhandari 2001; Fauveau 1992; Grantham-McGregor 1991; Rivera 2004; Santos 2005; Tomedi 2012; Waber 1981) to reduce redistribution of the child's supplement. The Progresa programme in Mexico (Rivera 2004) also provided cash transfers to families if they complied with healthcare requirements. Two studies (McKay 1978; Waber 1981) provided stimulation as well as supplementation. Four studies (Devadas 1971; Gershoff 1988; Lutter 2008; Schroeder 2002) provided health/nutrition education programmes for mothers as well as supplementation. Roy 2005 compared children who received supplementation + maternal education to children who received maternal education alone and to controls who received no treatment.

Some of these programmes (including Fauveau 1992; Heikens 1989; Roy 2005) provided health care, deworming or nutritional advice to both groups.

In Coyne 1980, a high-income country, the children who received supplementation were in day care; the controls were not.

Location and supervision of supplementary feeding

Location. Nine studies in low- and middle-income countries delivered the supplement at day-care centres (Gershoff 1988; Husaini 1991; Pollitt 2000a) or feeding centres (Devadas 1971; Gopalan 1973; Joshi 1988; McKay 1978; Manjrekar 1986; Schroeder 2002). One study in high-income countries (Coyne 1980) provided supplementation in day care. Take-home rations were provided in the remaining 22 studies with different levels of supervision (i.e. monitoring).

Supervision (monitoring)

Strict supervision. Fourteen studies in low- and middle-income countries (Bhandari 2001; Devadas 1971; Gershoff 1988; Gopalan 1973; Heikens 1989; Husaini 1991; Joshi 1988; Lutter 2008; Mangani 2014; Manjrekar 1986; McKay 1978; Pollitt 2000a; Schroeder 2002; Simondon 1996) and one study in a high-income country (Coyne 1980) were judged to have strict supervision.

Moderate supervision. Ten studies (De Romana 2000; Fauveau 1992; Grantham-McGregor 1991; Iannotti 2014; Isanaka 2009; Kuusipalo 2006; Oelofse 2003; Rivera 2004; Thakwalakwa 2010; Tomedi 2012) conducted in low- and middle-income countries and two studies in high-income countries (Yeung 2000; Ziegler 2009) provided moderate supervision.

Low supervision. Five studies in low- and middle-income countries (Mittal 1980; Obatolu 2003; Roy 2005; Santos 2005; Waber 1981) were judged to have low supervision.

Intervention length

Intervention length ranged from three months (Heikens 1989; Husaini 1991; Isanaka 2009; Kuusipalo 2006; Roy 2005; Simondon 1996; Thakwalakwa 2010) to 32 months (Waber 1981). The average was 10 months and the median was nine months.

Food provided

Across all programmes in low- and middle-income countries, a wide variety of food was provided. Eleven studies provided Ready-to-Use Theraputic Feeding (RUTF) with or without other foods. Six studies offered sweetened condensed milk, powdered milk or milk-based formula (often high energy). One study provided bread with milk. Four studies gave cereal, flours or vegetable mixture, usually with milk. Seven others provided locally available foods such as fruit, vegetables, rice and lentils, or provided a fortified cookie.

Two of the studies in high-income countries provided iron-fortified cereal; one also provided meat. Food in a study in Australian day cares comprised "hot lunches, nutritious snacks, and vitamin supplementation" (Coyne 1980, p 369).

Sixteen studies in low- and middle-income countries provided fortified foods.

Energy and RDI for energy of the Supplementary Food

The daily energy in the supplements offered was as follows:

- For children under six months of age, energy in the supplementary food ranged from 103 kcal to 450 kcal;
- For children aged 6 to 12 months, energy in the supplementary food ranged from 130 kcal to 899 kcal;
- For children aged one to two years, energy in the supplementary food ranged from 130 kcal to 750 kcal;
- For children aged two to three years, energy in the supplementary food ranged from 123 kcal to 500 kcal from 167 kcal;
- For children aged three to four years, energy in the supplementary food ranged from 167 kcal to 960 kcal; and
- For children aged four to five years, energy in the supplementary food ranged from 167 kcal to 1010 kcal.

The average amount of energy across the studies in low- and middle-income countries was 398 kcal.

Table 3 shows the percentage (%) dietary reference intake (DRI) provided by the supplement for each age group. The % DRI for energy ranged from a low of 7.9 (Joshi 1988) in the oldest age group to 111.7 (Tomedi 2012) for the 6- to 12-month-old age group.

Six studies (Heikens 1989; Obatolu 2003; Schroeder 2002; Waber 1981; Yeung 2000; Ziegler 2009) did not provide enough information to estimate energy or percent DRI.

Controls

In most of the studies, nothing was provided for children in control groups. Bhandari 2001 provided nutrition education, while three others (Heikens 1989; Isanaka 2009; Manjrekar 1986) provided health care, and Fauveau 1992 provided both health care and nutritional counselling. In all five of these latter studies, the experimental group also received the treatments given to the control children.

One study in a high-income country (Yeung 2000) provided families of control children with vouchers for clothes and laundry so that they received the same economic benefit as families of the children who were given supplementation.

Outcomes

Nutritional outcomes

In low- and middle-income countries, 28 out of 29 studies provided data on nutritional outcomes; 25 studies reported on weight and 23 studies reported on height. Twelve studies provided outcome data for WAZ, 13 for HAZ, and 12 for WHZ. Finally, eight studies reported on blood haemoglobin.

All three studies in high-income countries provided data on nutritional outcomes. Coyne 1980 and Ziegler 2009 provided data on weight, height, and haemoglobin. Yeung 2000 provided data on WAZ, HAZ, WHZ, and haemoglobin.

Psychosocial outcomes

In low- and middle-income countries, five studies provided outcome data on psychomotor development (Grantham-McGregor 1991; Husaini 1991; Oelofse 2003; Pollitt 2000a; Waber 1981); three of these studies (Iannotti 2014; Mangani 2014: Pollitt 2000a) provided data on attainment of motor milestones. Three studies provided data on mental or cognitive development (Husaini 1991; McKay 1978; Pollitt 2000a).

Table 4, Table 5, Table 6, and Table 7 all provide an overview of outcomes reported in the included studies, split by study type and by low- and middle-income country/high-income country. Additional information on the included studies can be found in the Characteristics of included studies tables.

Sixteen studies were allocated by cluster (regions, neighbourhoods, or day cares). Of these 16, six (Isanaka 2009; Lutter 2008; Rivera 2004; Roy 2005; Santos 2005; Tomedi 2012) adjusted for clustering in some or all of their analyses. We performed this adjustment for eight studies: Coyne 1980; Devadas 1971; Gershoff 1988; Husaini 1991; Lutter 2008 (not all of their numbers were adjusted); McKay 1978; Schroeder 2002, and for the weight analyses in Pollitt 2000a (Beckett 2000). We did not adjust for clustering in the De Romana 2000, Fauveau 1992, Joshi 1988, and Pollitt 2000a studies, as appropriate data were not available. Table 2 provides a summary of the clustered studies.

Excluded studies

The Excluded studies table contains 16 studies. We excluded four studies because control groups received foods or drinks with energy; three studies because the sample included children whose mothers were supplemented prenatally; and another four because they did not follow specific children, but measured all children who resided in the area at the time of testing (and these may have been quite different children at follow-up). We excluded two studies because the control groups were self-selected, and three more because they included older children, had no outcomes of interest, or had too little information.

Risk of bias in included studies

For the 21 RCTs and 11 CBAs, we summarise judgements about the risk of bias in the 'Risk of bias' graph (Figure 4).

Figure 4. Risk of bias summary for RCTs: review authors' judgements about each risk of bias item for each included study

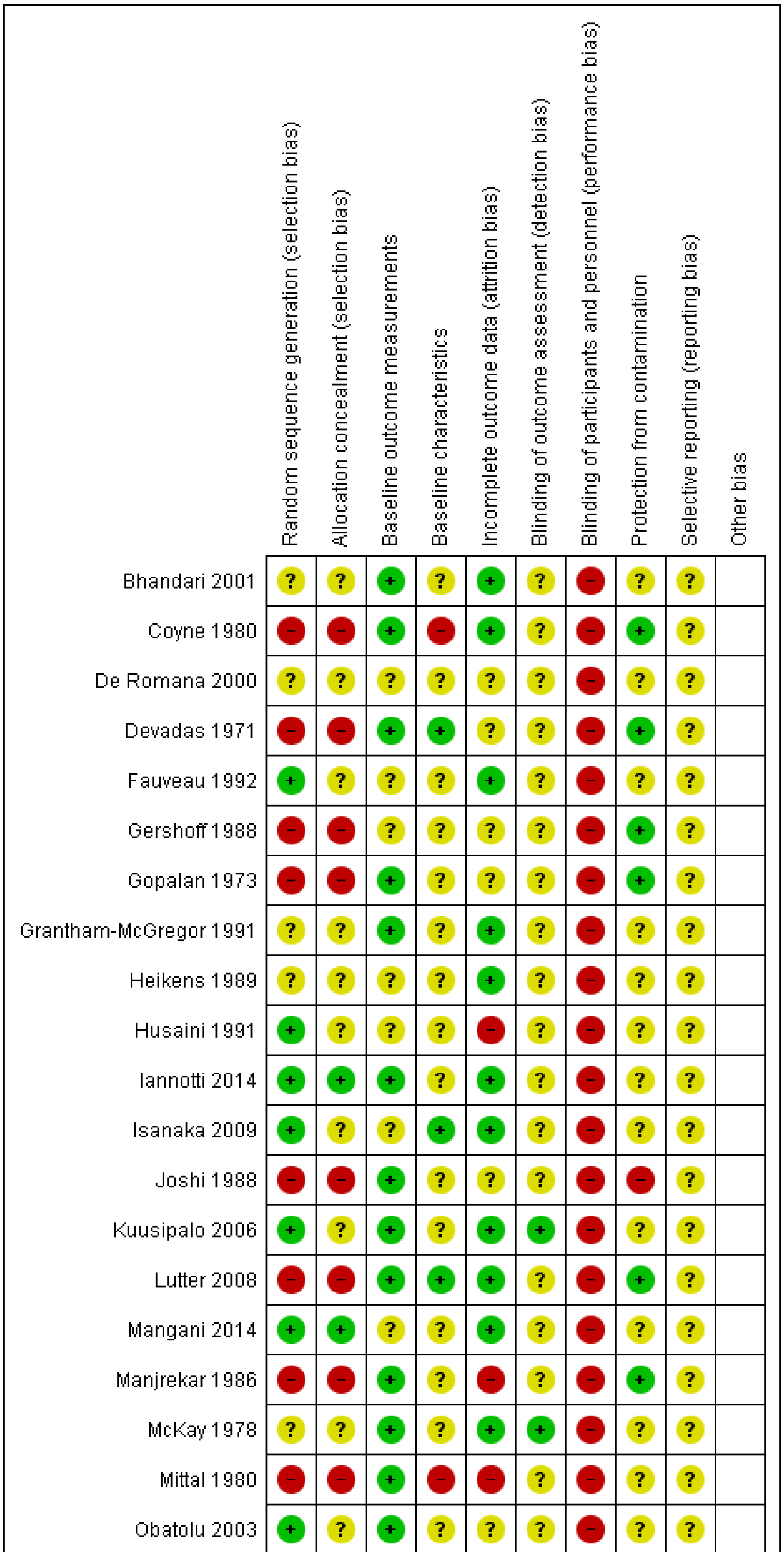
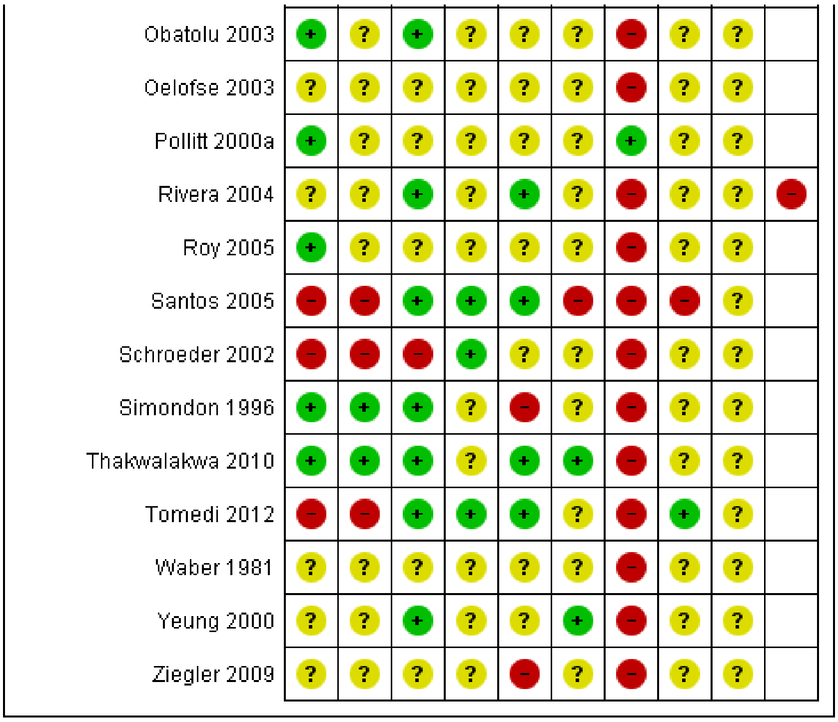


Figure 4. (Continued)



Allocation

We judged 11 RCTs (Fauveau 1992; Husaini 1991; Iannotti 2014; Isanaka 2009; Kuusipalo 2006: Mangani 2014; Obatolu 2003; Pollitt 2000a; Roy 2005; Simondon 1996; Thakwalakwa 2010) from low- and middle-income countries to have a low risk of bias for random sequence generation, while the other eight from low- and middle-income countries (Bhandari 2001; De Romana 2000; Grantham-McGregor 1991; Heikens 1989; McKay 1978; Oelofse 2003; Rivera 2004; Waber 1981) we judged to have an unclear risk of bias for random sequence generation.

We judged both RCTs from high-income countries (Yeung 2000; Ziegler 2009) to have an unclear risk of bias for random sequence generation.

We rated four RCTs from low- and middle-income countries (Iannotti 2014; Mangani 2014; Simondon 1996; Thakwalakwa 2010) as having a low risk of bias for allocation concealment, while the other 15 were judged to have an unclear risk of bias.

We judged that both RCTs from high-income countries (Yeung 2000; Ziegler 2009) had an unclear risk of bias for allocation concealment.

Due to the fact that these studies were not randomised, we rated all 11 CBAs at a high risk for random sequence generation and allocation concealment.

Blinding

In low- and middle-income countries, we judged one RCT (Pollitt 2000a) to have a low risk of bias and the other 18 RCTs and 10 CBAs to have a high risk of bias because it is usually not possible to blind participants, parents, and personnel to supplementary feeding. This knowledge may lead to sharing of food within the family and changed behaviour, since providing food may lead to increased interaction with children.

In high-income countries, we judged two RCTs (Yeung 2000) (Ziegler 2009 and one CBA (Coyne 1980) to have a high risk of bias for blinding of personnel and participants

For blinding of outcome assessment in low- and middle-income countries, we judged three RCTs (Kuusipalo 2006; McKay 1978; Thakwalakwa 2010) to have a low risk of bias. We judged nine CBAs (Devadas 1971; Gershoff 1988; Gopalan 1973; Lutter 2008; Manjrekar 1986; Mittal 1980; Santos 2005; Schroeder 2002; Tomedi 2012) and the other 16 RCTs to have an unclear risk of bias. We judged the remaining CBA to have a high risk of bias (Joshi 1988).

In high-income countries, we judged one RCT to have a low risk of bias (Yeung 2000) and one to have an unclear risk of bias (Ziegler 2009) for blinded outcome assessment. We also judged one CBA to have an unclear risk of bias (Coyne 1980).

Incomplete outcome data

We judged 11 RCTs in low- and middle-income countries (Bhandari 2001; Fauveau 1992; Grantham-McGregor 1991; Heikens 1989; Iannotti 2014; Isanaka 2009; Kuusipalo 2006; Mangani 2014; McKay 1978; Rivera 2004; Thakwalakwa 2010) and three CBAs from low- and middle-income countries (Lutter 2008; Santos 2005; Tomedi 2012) to have a low risk of bias due to attrition. We rated six RCTs (De Romana 2000; Obatolu 2003; Oelofse 2003; Pollitt 2000a; Roy 2005; Waber 1981) and five CBAs (Devadas 1971; Gershoff 1988; Gopalan 1973; Joshi 1988; Schroeder 2002) at an unclear risk of bias. The remaining two RCTs (Husaini 1991; Simondon 1996) and two CBAs (Manjrekar 1986; Mittal 1980) we judged to have a high risk of bias due to attrition.

In high-income countries, we judged one RCT (Yeung 2000) to have an unclear risk of bias and one RCT (Ziegler 2009) to have a high risk of bias due to attrition. We judged one CBA to have a low risk of bias (Coyne 1980).

Selective reporting

In low- and middle-income countries, we judged 19 RCTs (Bhandari 2001; Fauveau 1992; De Romana 2000; Grantham-McGregor 1991; Heikens 1989; Husaini 1991; Iannotti 2014; Isanaka 2009; Kuusipalo 2006; Mangani 2014; McKay 1978; Obatolu 2003; Oelofse 2003; Pollitt 2000a; Rivera 2004; Roy 2005; Simondon 1996; Thakwalakwa 2010; Waber 1981) and 10 CBAs to have an unclear risk of bias due to selective reporting.

In high-income countries, we judged both RCTs (Yeung 2000 ; Ziegler 2009) and one CBA (Coyne 1980) to have an unclear risk of bias for selective reporting.

Other potential sources of bias

We judged Rivera 2004 to be at a high risk of bias due to the fact that 10% of the controls received treatment. We did not judge other sources of bias for the other RCTs or any of the CBAs.

Additional risk of bias domains assessed for CBAs

Baseline outcome measurement

This assesses whether the experimental groups were similar at baseline on the study outcomes. We scored nine CBAs from low- and middle-income countries at a low risk of bias, as most or all of the baseline outcome measurements in each study were similar between the two groups. However, we rated Gershoff 1988 at an unclear risk of bias.

In high-income countries, we judged Coyne 1980 to be at a low risk of bias.

Baseline characteristics

This assesses whether or not the baseline characteristics of study and control providers were similar. We judged five CBAs from low- and middle-income countries (Devadas 1971; Lutter 2008; Mittal 1980; Schroeder 2002; Tomedi 2012) to have a low risk of bias. We rated three CBAs at an unclear risk of bias (Gershoff 1988; Gopalan 1973: Manjrekar 1986), and two studies at a high risk of bias (Joshi 1988; Santos 2005).

In high-income countries, we judged Coyne 1980 to be at a low risk of bias.

Protection against contamination

This assesses the extent to which controls had access to treatments. We rated six CBAs in low- and middle-income countries (Devadas 1971; Gershoff 1988; Gopalan 1973; Lutter 2008; Manjrekar 1986; Tomedi 2012) as being at a low risk of bias, three (Mittal 1980; Santos 2005; Schroeder 2002) as being at an unclear risk of bias, and one (Joshi 1988) as being at a high risk of bias.

In high-income countries, we judged Coyne 1980 to be at a low risk of bias.

Effects of interventions

See: **Summary of findings for the main comparison** Low- and middle-income countries: Feeding compared to control - growth RCTs for improving the physical and psychosocial health of disadvantaged children aged three months to five years; **Summary of findings 2** Low- and middle-income countries: Feeding compared to control. CBAs for improving the physical and psychosocial health of disadvantaged children aged three months to five years; **Summary of findings 3** Low- and middle-income countries: Feeding compared to control - psychosocial development RCTs for improving the physical and psychosocial health of disadvantaged children aged three months to five years

Primary outcomes: Growth

Weight gain

Low- and middle-income countries: RCTs

We included nine RCTs with 1057 children (Bhandari 2001; Grantham-McGregor 1991 (see Walker 1991); Heikens 1989; Kuusipalo 2006; Mangani 2014; Oelofse 2003; Pollitt 2000a; Simondon 1996; Thakwalakwa 2010) in a meta-analysis for weight. The average period of feeding in these studies was six months. Our meta-analysis showed a small significant effect of feeding. Children who were given supplementation gained an average of 0.12 kg more than those who were not supplemented (95% confidence interval (CI) 0.05 to 0.18; Analysis 1.1). There was no heterogeneity (Chi^2 = 3.92, df = 8, P value = 0.86, I^2 = 0%). Sensitivity analyses using an intraclass correlation coefficient (ICC) of 0.10 made little difference (Analysis 2.1).

The 14-month Obatolu 2003 RCT (60 children) found a large and significant effect of feeding on weight gain for boys (end-of-study difference of 3.91 kg statistically significant) and girls (end-of-study difference of 2.55 kg statistically significant).

The Fauveau 1992 study found that 48 children who received supplementary feeding gained an average of 39 grams more than the 43 controls (six-month intervention: not significant).

Low- and middle-income countries: CBAs

Seven CBAs in low- and middle-income countries (Devadas 1971; Gopalan 1973; Gershoff 1988; Lutter 2008; Manjrekar 1986; Mittal 1980; Santos 2005) with 1784 children were included in this meta-analysis. The average length of feeding was one year. There was a significant effect of feeding on weight. Children who were given supplementation gained an average of 0.24 kg more than those who were not supplemented (95% CI 0.09 to 0.39). There was moderate heterogeneity (Chi^2 = 30.07, df = 15, P value = 0.01, I^2 = 50%; Analysis 3.1). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 5.1).

High-income countries: RCTs

Only one RCT in high-income countries assessed weight gain (Ziegler 2009). Our analyses found that children who received supplementation in the form of an iron-fortified cereal gained slightly less weight than children who received no supplementation (mean difference (MD) -0.10, 95% CI -0.52 to 0.32, n = 45; Analysis 4.1).

High-income countries: CBAs

We analysed results from Coyne 1980; 116 Aboriginal children were included. There were significant effects of four months of supplementation on weight (MD 0.95, 95% CI 0.58 to 1.33; Analysis 7.1).

Height gain

Low- and middle-income countries: RCTs

Nine RCTS (Bhandari 2001; Grantham-McGregor 1991 (see Walker 1991); Heikens 1989; Kuusipalo 2006; Mangani 2014; Oelofse 2003; Rivera 2004; Simondon 1996; Thakwalakwa 2010), with 1463 children, contributed to this meta-analysis. The average period of supplementation was six months. This analysis demonstrated that children who were given supplementation grew an average of 0.27 cm (95% CI 0.07 to 0.48) more than those who were not supplemented. There was little heterogeneity (Chi^2 = 11.33, df = 8, P value = 0.18, I^2 = 29%; Analysis 1.2). We did not perform a sensitivity analyses because no adjustments for clustering were needed.

Pollitt 2000a studied effectiveness for two age cohorts, 12 and 18 months old. They found that supplementary feeding had a significant effect on height for the younger (12-month-old) cohort only (see Beckett 2000). Obatolu 2003 (60 children) found a significant effect of feeding on length for boys (difference between experimental and controls: 5.12 cm; end-of-study difference of 5.02 statistically significant) and girls (difference: 6.95 cm; end-of-study difference of 5.92 cm statistically significant).

Low- and middle-income countries: CBAs

We included seven CBAs in low- and middle-income countries (Devadas 1971; Gopalan 1973; Gershoff 1988; Lutter 2008; Manjrekar 1986; Mittal 1980; Santos 2005) with 1782 children in this meta-analysis. The average duration of feeding was one year. Overall, there was a non-significant effect of feeding on height (MD 0.52, 95% CI -0.07 to 1.10). Heterogeneity was high (Chi^2 = 97.02 df = 15, P < 0.00001, I^2 = 85%; Analysis 3.2). A sensitivity analysis with the ICCs at 0.10 showed significant positive effects (MD 0.57, 95% CI 0.06 to 1.07) (Analysis 5.2) for height.

High-income countries: RCTs

One RCT (Ziegler 2009) (45 children) studied height. Our analysis indicates that there was no significant difference between children who received iron-fortified cereal and those who received no supplementation (MD -1.00, 95% CI -2.12 to 0.12; Analysis 4.2).

High-income countries: CBAs

Our analysis of Coyne 1980 found no significant effects of supplementation on height (MD 0.61, 95% CI -0.31 to 1.54, n = 116; Analysis 7.2).

Change in Weight for Age z-score (WAZ)

Low- and middle-income countries: RCTs

We included eight RCTs (Husaini 1991; Iannotti 2014; Kuusipalo 2006; Mangani 2014; McKay 1978; Oelofse 2003; Rivera 2004; Thakwalakwa 2010) and 1565 children in the meta-analysis for WAZ. The average duration was six months. There were statistically significant differences between the supplemented and non-supplemented groups (MD 0.15, 95% CI 0.05 to 0.24; Analysis 1.3). Heterogeneity was moderate (Chi^2 = 14.68, df = 7, P value = 0.04, I^2 = 52%). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 2.2).

In a cluster-RCT with 282 children, Roy 2005 found significant effects of supplementation with maternal nutrition education. Those children in the intervention group gained 0.71 more in WAZ than the children who received no treatment (P < 0.001) and 0.26 more than the children who received only maternal nutrition education (not significant).

Low- and middle-income countries: CBAs

Four CBAs (Lutter 2008; Santos 2005; Schroeder 2002; Tomedi 2012) with 999 children contributed to the meta-analysis for WAZ. The average study period was eight months. There was no statistically significant difference between children who received supplementation and those who did not (MD 0.27; 95% CI -0.13 to 0.68). There was significant heterogeneity (Chi^2 = 87.47, df = 3, P < 0.00001, I^2 = 97%; Analysis 3.3). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 5.3).

High-income countries: RCTs

One RCT (Yeung 2000) in 103 children in a high-income country assessed WAZ; infants who received iron-fortified cereals had a z-score change of 0.02 (95% CI 0.01 to 0.03; Analysis 4.3).

High-income countries: CBA

No CBAs assessed the change in WAZ in a high-income country.

Change in height-for-age z-scores (HAZ)

Low- and middle-income countries: RCTs

We included nine RCTs (Husaini 1991; Iannotti 2014; Isanaka 2009; Kuusipalo 2006; Mangani 2014; McKay 1978; Oelofse 2003; Rivera 2004; Thakwalakwa 2010) with 4544 children in this analysis. The average study duration was six months. we found a significant effect of supplementation (MD 0.15, 95% CI 0.06 to 0.24). Heterogeneity was moderate (Chi^2 = 20.96, df = 8, P value = 0.007, I^2 = 62%; Analysis 1.4). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 2.3).

Low- and middle-income countries: CBAs

Four studies (Lutter 2008; Santos 2005; Schroeder 2002; Tomedi 2012) with 999 children contributed to this meta-analysis. The average study period was eight months. There was no effect (MD 0.01; 95% CI -0.10 to 0.12) and little heterogeneity (Chi^2 = 3.95 df = 3, P value = 0.27, I^2 = 24%; Analysis 3.4). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 5.4).

De Romana 2000 (n = 250) found no significant difference between the experimental and the control groups in change in prevalence of stunting (i.e. height-for-age z scores (HAZ)).

High-income countries: RCTS

One RCT (Yeung 2000) with 103 children assessed HAZ. Infants who received iron-fortified cereals had a z-score change of 0.04 (95% CI 0.04 to 0.05; Analysis 4.4).

High-income countries: CBAs

No CBAs assessed the change in HAZ scores in a high-income country.

Change in weight-for-height z-scores (WHZ)

Low- and middle-Income countries: RCTs

Seven RCTs (Grantham-McGregor 1991; Isanaka 2009; Kuusipalo 2006; Mangani 2014; Oelofse 2003; Rivera 2004; Thakwalakwa 2010) with 4073 children contributed to this meta-analysis. The average study duration was six months. There was no effect of supplementation (MD 0.10, 95% CI -0.02 to 0.22; Analysis 1.5). Heterogeneity was high (Chi^2 = 18.39, df = 6, P < 0.005, I^2 = 67%). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 2.4).

Low- and middle-income countries: CBAs

Four studies (Lutter 2008; Santos 2005; Schroeder 2002; Tomedi 2012) with 999 children contributed to this meta-analysis for WHZ. The average study period was eight months. We found a non-significant difference between children who received supplementation and those who did not (MD 0.29, 95% CI -0.11 to 0.69, Analysis 3.5). There was significant heterogeneity (Chi^2 = 67.31, df = 3, P < 0.00001, I^2 = 96%). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 5.5).

High-income countries: RCTS

One RCT (Yeung 2000) assessed WHZ. There was a very small, statistically significant effect: infants in the control group fared better than children who received supplementation (MD -0.06, 95% CI -0.07 to -0.05, n = 103; Analysis 4.5).

High-income countries: CBAs

No CBAs assessed change in WHZ scores in a high-income country.

Primary outcomes: Psychosocial

Psychomotor development

Low- and middle-income countries: RCTs

Four RCTs in low- and middle-income countries assessed the effect of supplementary feeding on psychomotor development.

Our meta-analysis of two studies (Husaini 1991; Grantham-McGregor 1991) found that children who received supplementary feeding had greater improvement on tests of psychomotor functioning than children who did not receive any supplementary food (SMD 0.41, 95% CI, 0.10 to 0.72; n = 178; Analysis 6.1). There was no heterogeneity (Chi^2 = 0.1, df = 1, P value = 0.75, I^2 = 0%).

Waber 1981 reported that children who received 2.5 years of supplementation (Group B; n = 60) beginning at six months of age had better overall scores at the end of the study on the Griffiths Mental Development Scales (GMDS) than those who received no supplementation (n = 54), but significance was not given.

Pollitt 2000a reported no main effect of supplementary feeding on children's psychomotor performance in a Repeated Measures ANOVA (experimental group: n = 53 in 12-month cohort; n = 83 in 18-month cohort), but did find significant differences in change over time contrasts.

None of the CBAs in low- and middle-income countries or RCTs and CBAs in high-income countries assessed psychomotor development.

Motor milestones

Findings concerning the effect of supplementation on achievement of motor milestones are equivocal. Pollitt 2000a found that significantly more of the supplemented children walked by 18 months (100% compared to 50%: P^2 *(Kruskal-Wallace)* = 11.4, df = 2, P < 0.01). Iannotti 2014 (n = 420) and Mangani 2014 (n = 840) found no significant effects.

None of the CBAs in low- and middle-income countries or RCTs and CBAs in high-income countries assessed motor milestones.

Cognitive development

Low- and middle-Income countries: RCTs

Three RCTs in low- and middle-income countries assessed change in cognitive development. The outcome measures in these studies were too different conceptually to be included in a meta-analysis.

For McKay 1978, we compared results for T4 children (supplemented with stimulation from 42 to 84 months of age) to those of T2 children (supplemented from 63 to 84 months of age) at 63 months. Our analysis (n = 99) found that cognitive ability of the supplemented children improved more than the children who were not yet supplemented (SMD 0.58, 95% CI 0.17 to 0.98; Analysis 6.2).

Our analysis of Husaini 1991 (n = 113) found a non-significant difference in change on the Bailey Scales of Mental Development (BSMD) (SMD -0.40, 95% CI -0.79 to -0.00); Analysis 6.3).

Pollitt 2000a found no main effects of supplementation on the BSMED (Bailey Scales of Mental Development). They reported positive effects in a contrast over time for the younger cohort but not for the older cohort ($F_{2, 48}$= 4.58, P < 0.05; n = 53).

None of the CBAs in low- and middle-income countries or RCTs and CBAs in high-income countries assessed cognitive development.

Long-term follow-up of cognitive development

Low- and middle-Income countries: RCTs

Grantham-McGregor 1997 followed up 97% (n = 127) of the original cohort of stunted children (Grantham-McGregor 1991; n = 129) after four years and tested them on a battery of cognitive and perceptual tests. A multiple regression found effects on perceptual motor tasks, but not on general cognition or memory. Interestingly, stimulation had a significant effect on later perceptual motor skills for all children (P < 0.05), but supplementation only had a significant effect for children whose mothers had higher scores on a test of verbal intelligence. (P < 0.05). Grantham-McGregor 2007 also found that the supplemented children had higher average scores than the controls on 14 out of 15 cognitive tests (P value = 0.02).

Pollitt 1997 performed a seven-year follow-up of Husaini 1991. They found no differences between the experimental (n = 125) and control (n = 106) groups in the Peabody Picture Vocabulary Test (PPVT), emotionality, and maths. They did find small, (15-second difference) positive effects of supplementation on working memory performance, although these are unlikely to be clinically significant.

None of the CBAs in low- and middle-income countries or RCTs and CBAs in high-income countries assessed long-term follow-up of cognitive development.

General development

Low- and middle-Income countries: RCTs

Oelofse 2003 (n = 60) found no significant differences on the Denver Developmental Screening Test (DDST) between the group of South African infants (aged six months at baseline) given a micronutrient-fortified supplement for six months and control infants.

None of the CBAs in low- and middle-income countries or RCTs and CBAs in high-income countries assessed general development.

Attention, Language and Memory

We found no reports of effects on attention or memory. For language, Pollitt 2000a reported that supplemented children in the younger cohort (n = 53) had greater increases in vocalisations over time than those who were not given supplementary feeding.

Primary outcomes: Adverse effects

Substitution or leakage

We were able to calculate the net benefit from supplementary feeding for seven studies that provided home-delivered rations (RCTs: Bhandari 2001; De Romana 2000; Grantham-McGregor 1991 Rivera 2004; CBAs: Lutter 2008; Santos 2005; Tomedi 2012) and three of the day-care/feeding centre studies (RCTs: Husaini 1991; Pollitt 2000a; CBA: Devadas 1971). We found important differences in the number of calories provided by the supplementary food and the number of extra calories that the children actually consumed in addition to their regular food. In the take-home studies, we found that the net benefit to children was only 36% of the extra calories provide by the supplement. In the day-care and feeding centres, the net benefit was 85% of the extra calories provided by the supplement.

Secondary outcomes: Physical health

Biochemical markers of nutrition

Low- and middle-income countries: RCTs

Five RCTs (300 children) in low- and middle-income countries (Husaini 1991; Kuusipalo 2006; Oelofse 2003; Rivera 2004; Thakwalakwa 2010) contributed to the meta-analysis for haemoglobin. We found a significant effect of supplementation (SMD 0.49, 95% CI 0.07 to 0.91; Analysis 8.1); children who were supplemented showed positive change in haemoglobin status compared to controls. There was significant heterogeneity (Chi^2 = 10.78, df = 4, P value = 0.03; I^2 = 63%).

Low- and middle-income countries: CBAs

Among the CBAs, Lutter 2008 reported a significant effect of supplementation on the risk of anaemia (P value = 0.003; n = 110 at final survey); those who were supplemented had lower risk of being anaemic (OR 0.58, 95% CI 0.24 to 0.75). Similarly, De Romana 2000 (n = 250) reported that while the prevalence of anaemia decreased by 27% in the intervention group, it decreased by only 13% in the control group.

High-income countries: RCTs

Yeung 2000 (103 children) found no significant difference between the experimental and control group in change in haemoglobin.

High-income countries: CBAs

Coyne 1980 (116 children) reported an increase in the number of children who had low haemoglobin levels in the experimental group and a decrease in the corresponding number in the control group.

Physical activity

Low- and middle-income countries: RCTs

Pollitt 2000a (see Jahari 2000) reported a significant main effect of supplementation on motor activity in the youngest (12-month-old; n = 53) cohort ($F_{2,48}$ = 4.8, P < 0.05). Over the 12-month period of the supplementation, the supplemented group had significantly greater increases in high energy cost motor activity that began at 18 months of age and continued to the end of the study (24 months) (P < 0.05).

Grantham-McGregor 1991 found no significant effect of supplementation alone (n = 26) or supplementation plus stimulation (n = 26) on changes in motor activity in stunted children (see Meeks Gardner 1999).

No CBAs in low- and middle-income countries and no RCTs or CBAs in high-income countries assessed physical activity.

Morbidity

Six studies (four RCTs; two CBAs) reported on morbidity. Three RCTs (Bhandari 2001; Iannotti 2014; Isanaka 2009) and two CBAS (Gopalan 1973; Tomedi 2012) found few differences between the supplemented group and the control group in the prevalence of morbidity. Roy 2005 (a CBA) reported mixed results; the prevalence of diarrhoea and fever was higher in the children who received supplementation (n = 99), while the prevalence of respiratory infection was higher in the control group (n = 90).

Mortality

Low- and middle-income countries: RCTs

Isanaka 2009 reported that there was no significant difference in mortality between children supplemented with ready-to-use therapeutic feeding (RUTF; n = 1671) and those who were unsupplemented (adjusted hazard ratio (HR) 0.76, 95% CI 0.51 to 1.13; n = 1862).

No CBAs in low- and middle-income countries and no RCTs or CBAs in high-income countries assessed mortality.

Overweight or obesity

There were no reports of overweight or obesity in the included studies.

Secondary outcomes: Psychosocial outcomes

Stigmitisation and behaviour problems

There were no reports of stigmatisation or behaviour problems in the included studies.

Subgroup analyses

We conducted subgroup analyses across seven categories: age, sex, socio-economic disadvantage (poor versus less poor or undernourished versus well-nourished), nutritional adequacy, location of feeding, level of supervision (monitoring), and single intervention versus multiple interventions.

Age

We conducted subgroup analyses to explore the possible impact of age on weight and height. For the RCTs, we compared the following age groups: < 12 months, one to two years, and > 2 years. The age groups for the CBAs were: < 1 year, 1 year, 2 years, and > 2 years.

Weight

We found no significant differences in either the subgroup analyses of nine RCTs (Chi^2 = 1.95, df = 2, P value = 0.38, I^2 = 0%; n = 1057; Analysis 1.1) or that of seven CBAs (Chi^2 = 5.7, df = 3, P value = 0.13, I^2 = 47.4%; n = 1784; Analysis 3.1).

Height

This analysis showed significant subgroup differences (Chi^2 = 6.01, df = 2, P value = 0.05, I^2 = 66.7%). Supplementary feeding was effective for the youngest age groups (< 12 months: MD 0.22, 95% CI 0.05 to 0.39, 7 trials, n = 1316; and 1 to 2 years: MD 0.9, 95% CI 0.33 to 1.47, 1 trial, n = 65), while the height gains in the oldest age group (> 2 years old) were non-significant (1 trial, n = 82; Analysis 1.2).

Seven CBAs (n = 1782) in low- and middle-income countries contributed to this subgroup analysis. There were no significant differences among subgroups (Chi^2 = 0. 63, df = 3, P value = 0.89, I^2 = 0%) and no discernible pattern by age (Analysis 3.2).

Psychomotor performance

Pollitt 2000a reported that supplementation had greater impacts on psychomotor development for the younger (12-month-old) cohort (n = 53; see Jahari 2000).

Sex

Our subgroup analysis to explore effectiveness by sex comprised two CBAs from low- and middle-income countries (Gershoff 1988; Mittal 1980) and 840 children. There were no significant subgroup differences in either the analysis for weight (Chi^2 = 0.06, df = 1, P value = 0.80, I^2 = 0%; Analysis 9.1) or height (Chi^2 = 0.54, df = 1, P value = 0.46, I^2 = 0%; Analysis 9.2).

Pollitt 2000a found stronger effects on weight and height for girls (n = 58) than for boys (n = 57); the interaction was significant only at the 0.10 level (see Beckett 2000). Coyne 1980 found that supplemented girls (n = 61) benefited from the intervention, but that supplemented boys (n = 55) did not.

Socio-economic disadvantage: poor versus less poor; undernourished versus well-nourished

Growth

Weight: we compared subgroups from Thakwalakwa 2010 and found significant differences in effectiveness between undernourished and well-nourished children (Chi^2 = 4.76, df = 1, P value = 0.03 I^2 = 79%; 1 trial, n = 192; Analysis 10.1). Supplementary feeding of the undernourished children resulted in significant weight gain of 0.34 kg, (95% CI 0.18 to 0.50) relative to controls, while the intervention was ineffective for well-nourished children at 0.08 kg. (95% CI -0.09 to 0.25). Gopalan 1973 found that children with low baseline WAZ gained more weight than controls while those whose WAZ was higher did not (n = 293) (see Rao 1977).

Height: we compared subgroups from Thakwalakwa 2010 and found non-significant differences in effectiveness between undernourished and well-nourished children (Chi^2 = 0.79, df = 1, P value = 0.38 I^2 = 0%; 1 trial, n = 192; Analysis 10.2). Rivera 2004 (n = 631) and Schroeder 2002 (n = 232 (but with no denominators reported for that particular analysis) both reported significant interactions between age, nutritional status and feeding; supplemented children who were poorer AND younger (< 6 months of age) at baseline grew more in height (Rivera 2004).

Grantham-McGregor 1991(n = 129) found that children who were more undernourished at baseline were more likely to gain more skinfold thickness than controls.

Two studies (one RCT: Husaini 1991; n = 113) and one CBA: Gershoff 1988) found no relationship between initial nutritional status, supplementation, and growth. Finally, Joshi 1988 (n = 247) reported that supplementary feeding was more effective for children living in areas of moderate socio-economic status than for children living in slums. He suggested that poor environmental conditions may have reduced the effectiveness of the intervention.

Psychosocial outcomes

Husaini 1991 (n = 113) found no significant interaction between baseline nutritional status and treatment.

Nutritional adequacy

We explored the hypothesis that interventions which provided better nutritional adequacy (more calories) would be more effective.

Weight

The subgroup analysis for weight included eight RCTs with 975 children. There were no significant subgroup differences (Chi^2 = 0.63, df = 2, P value = 0.73, I^2 = 0%; Analysis 10.3).

There were seven CBAs (1784 children) in the subgroup analysis for nutritional adequacy and weight. These included: Devadas 1971; Gershoff 1988; Gopalan 1973; Lutter 2008; Manjrekar 1986; Mittal 1980; and Santos 2005. There was no significant subgroup effect (Chi^2 = 3.35, df = 2, P value = 0.19, I^2 = 40.3%; Analysis 9.3).

Height

The subgroup analysis for height contained eight RCTs (Bhandari 2001; Grantham-McGregor 1991; Kuusipalo 2006; Mangani 2014; Oelofse 2003; Rivera 2004; Simondon 1996; Thakwalakwa 2010) with 1381 children. There were no significant subgroup differences (Chi^2 = 2.72, df = 2, P value = 0.26, I^2 = 26.4%; Analysis 10.4).

Seven CBAS (1782 children) contributed to the subgroup analysis for nutritional adequacy and height. These included: Devadas 1971; Gershoff 1988; Gopalan 1973; Lutter 2008; Manjrekar 1986; Mittal 1980; Santos 2005. This analysis showed no subgroup effects (Chi^2 = 2.29, df = 2, P value = 0.32, I^2 = 12.5%; Analysis 9.4).

Location of feeding (day care or preschool or feeding centre versus home)

Weight

The subgroup analysis for weight contained one RCT in day care (Pollitt 2000a) and eight RCTs that provided take-home or home-delivered rations. There was no significant subgroup effect (Chi^2 = 0.62, df = 1, P value = 0.43, I^2 = 0%; n = 1057; Analysis 10.5).

The subgroup analysis for CBAs compared four studies in preschools or feeding centres (Devadas 1971; Gershoff 1988; Gopalan 1973; Manjrekar 1986; n = 967) with three studies that gave take-home rations (Lutter 2008; Mittal 1980; Santos 2005; n = 817). We found no significant subgroup effects (Chi^2 = 1.84, df = 1, P value = 0.18, I^2 = 45.6%; Analysis 9.5). Sensitivity analyses with ICCs at 0.10 made no significant difference (Analysis 9.11).

Height and location

We were unable to perform this subgroup analysis for RCTs as there were no suitable data for meta-analysis.

The subgroup analysis for height and location for the CBAs compared four studies in preschools or feeding centres (Devadas 1971; Gershoff 1988; Gopalan 1973; Manjrekar 1986) with three studies that provided take-home rations (Lutter 2008; Mittal 1980; Santos 2005). There were no significant subgroup differences (Chi^2 = 2.52, df = 1, P value = 0.11 I^2 = 60.3%; n = 1782; Analysis 9.6). Sensitivity analyses with ICCs at 0.10 made little difference (Analysis 9.12).

Level of supervision

The studies were divided into strict, moderate, and no supervision (i.e. monitoring) of the supplementary feeding according to the principles outlined above in the Methods section.

Weight and supervision

Among the RCTs, five studies (Bhandari 2001; Heikens 1989; Mangani 2014; Pollitt 2000a; Simondon 1996) were classified as strictly supervised and four (Grantham-McGregor 1991; Kuusipalo 2006; Oelofse 2003; Thakwalakwa 2010) were classified as moderately supervised. There were no significant subgroup differences (Chi^2 = 0.50, df = 1, P value = 0.48, I^2 = 0%; n = 1056; Analysis 10.6).

Among the CBAs, five studies were strictly supervised (Devadas 1971; Gershoff 1988; Gopalan 1973; Lutter 2008; Manjrekar 1986), one was moderately supervised (Mittal 1980), and one had little supervision (Santos 2005). This analysis showed non-significant differences among the subgroups (Chi^2 = 3.04, df = 2, P value = 0.22, I^2 = 34.4%; n = 1784; Analysis 9.7).

Height

Four studies (Bhandari 2001; Heikens 1989; Mangani 2014; Simondon 1996) were classified as strictly supervised and five (Grantham-McGregor 1991; Kuusipalo 2006; Oelofse 2003; Rivera 2004; Thakwalakwa 2010) were classified as moderately supervised. There were no significant subgroup differences (Chi^2 = 0.11, df = 1, P value = 0.74; n = 1463 children; Analysis 10.7).

Among the CBAs, five studies were strictly supervised (Devadas 1971; Gershoff 1988; Gopalan 1973; Lutter 2008; Manjrekar 1986), one was moderately supervised (Mittal 1980), and one provided little supervision (Santos 2005). This analysis showed no significant differences among subgroups (Chi^2 = 1.41, df = 2, P value = 0.49, I^2 = 0%; n = 1782; Analysis 9.8).

Single intervention versus multiple interventions

Weight

Nine RCTs (Bhandari 2001; Grantham-McGregor 1991 (feeding only); Heikens 1989; Kuusipalo 2006; Mangani 2014; Oelofse 2003; Pollitt 2000a; Simondon 1996; Thakwalakwa 2010; n = 1040) were classified as single interventions and one study (Grantham-McGregor 1991: supplementation + stimulation; n = 49) was classified as a multiple intervention. There were no significant subgroup effects (Chi^2 = 2.59 df = 1, P value = 0.11, I^2 = 61.3%; Analysis 10.8).

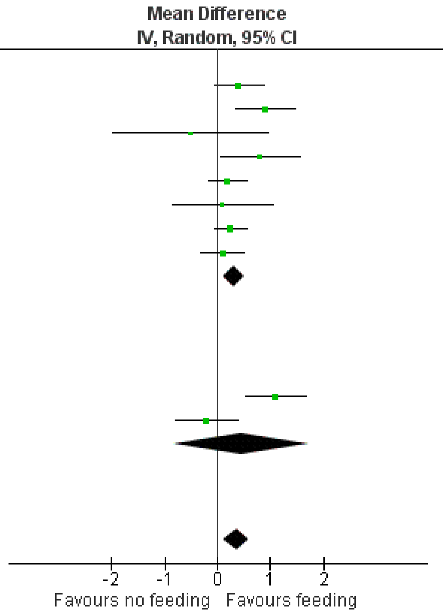
Four CBAs (Gopalan 1973; Manjrekar 1986; Mittal 1980; Santos 2005) were classified as single interventions while three (Devadas 1971; Gershoff 1988; Lutter 2008) provided multiple interventions. There were no significant subgroup differences (Chi^2 = 0.00, df = 1, P value = 0.99, n = 1784; Analysis 9.9).

Height

Eight RCTs (Bhandari 2001; one arm of Grantham-McGregor 1991; Heikens 1989; Kuusipalo 2006; Mangani 2014; Oelofse 2003; Simondon 1996; Thakwalakwa 2010) provided feeding only and two RCTs (Grantham-McGregor 1991 (supplementation + stimulation); Rivera 2004) were classified as multiple interventions. There were no significant subgroup differences for height (Chi^2 = 0.04, df = 1, P value = 0.84, I^2 = 0%; n = 1512; Analysis 10.9; Figure 5).

Figure 5. Forest plot of comparison: 11 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT. Outcome: 11.9 Single food intervention vs multifaceted intervention: height gain in cm

Study or Subgroup	Feeding Mean	Feeding SD	Feeding Total	Control Mean	Control SD	Control Total	Weight	Mean Difference IV, Random, 95% CI
10.9.1 Single food intervention								
Bhandari 2001	10.3	1.6	87	9.9	1.6	93	12.0%	0.40 [-0.07, 0.87]
Grantham-McGregor 1991	11.6	1.25	32	10.7	1.1	33	9.9%	0.90 [0.33, 1.47]
Heikens 1989	2.7	3.4	39	3.2	3.4	43	2.5%	-0.50 [-1.97, 0.97]
Kuusipalo 2006	2.5	0.93	18	1.7	1.3	18	7.3%	0.80 [0.06, 1.54]
Mangani 2014	13.2	1.7	188	13	2	185	14.2%	0.20 [-0.18, 0.58]
Oelofse 2003	10	0.79	16	9.9	1.63	14	5.2%	0.10 [-0.84, 1.04]
Simondon 1996	4.89	0.83	65	4.64	0.9	62	16.1%	0.25 [-0.05, 0.55]
Thakwalakwa 2010	3.4	1.1	66	3.3	1.2	58	13.5%	0.10 [-0.31, 0.51]
Subtotal (95% CI)			**511**			**506**	**80.6%**	**0.32 [0.12, 0.52]**
Heterogeneity: Tau² = 0.02; Chi² = 8.76, df = 7 (P = 0.27); I² = 20%								
Test for overall effect: Z = 3.12 (P = 0.002)								
10.9.2 Multifaceted intervention								
Grantham-McGregor 1991	11.8	1.01	32	10.7	0.96	17	9.8%	1.10 [0.52, 1.68]
Rivera 2004	14.3	3.34	261	14.5	3	185	9.5%	-0.20 [-0.79, 0.39]
Subtotal (95% CI)			**293**			**202**	**19.4%**	**0.45 [-0.82, 1.73]**
Heterogeneity: Tau² = 0.76; Chi² = 9.52, df = 1 (P = 0.002); I² = 89%								
Test for overall effect: Z = 0.70 (P = 0.49)								
Total (95% CI)			**804**			**708**	**100.0%**	**0.36 [0.11, 0.61]**
Heterogeneity: Tau² = 0.07; Chi² = 18.81, df = 9 (P = 0.03); I² = 52%								
Test for overall effect: Z = 2.87 (P = 0.004)								
Test for subgroup differences: Chi² = 0.04, df = 1 (P = 0.84), I² = 0%								



Four CBAs (Gopalan 1973; Manjrekar 1986; Mittal 1980; Santos 2005) were classified as single interventions while three (Devadas 1971; Gershoff 1988; Lutter 2008) provided multiple interventions. There were no significant subgroup differences (Chi^2 = 0.32 df = 1, P value = 0.57, n = 1782; (Analysis 9.10).

Psychosocial outcomes

We compared two RCTs that provided feeding only (Grantham-McGregor 1991, n = 32; Husaini 1991, n = 75) with the supplementation + stimulation group from Grantham-McGregor 1991 (n = 32) and found non-significant subgroup differences (Chi^2 = 2.34, df = 1, P value = 0.13, I^2 = 57.3%; Analysis 10.10).

Exploring heterogeneity

Analysis 3.3, Analysis 3.5, Analysis 5.3, and Analysis 9.10 were highly heterogeneous with I^2 values above 90%. We checked this in several ways. First, we examined any potential errors in data entry and found none. Second, we performed sensitivity analyses, taking out each study in these analyses one by one. We found that deleting Tomedi 2012 resulted in the largest drop in heterogeneity in analyses Analysis 3.3, Analysis 3.5, Analysis 5.3. We then compared Tomedi 2012 to the other studies and found that it had very good implementation procedures, including a provision of a high percentage of the recommended daily allowance, nutrition education, and take-home rations for other children in the family. For Analysis 9.10 , we found the largest drop in heterogeneity when we deleted Gopalan 1973, but heterogeneity was still high at 70%.

DISCUSSION

Summary of main results

After screening almost 33,000 references, we included 32 studies. These studies spanned the years from 1971 to 2014 and covered 22 countries.

Below, we summarise the major findings from the review.

Growth

Supplementary feeding young children has a small effect on gain in weight and weight-for-age z-scores (WAZ) in low- and middle-income countries

Of the randomised controlled trials (RCTs) in low- and middle-income countries, meta-analyses of weight gain (nine trials, 1057 children) and WAZ gain (eight trials, 1565 children) showed increases for children who were supplemented compared to those who were unsupplemented. However, these differences were small (0.12 kg for weight and 0.15 for WAZ over a period of six months).

Results from high-income countries were mixed. An American study of infants from predominantly middle-class families found no effects. However, large gains of 0.95 kg relative to controls over four months were realized in a study among 116 Aboriginal children in remote Australian communities; if a similar trajectory were maintained for a year, the children who were fed would have gained 2.85 kg. This may be because the Aboriginal children were less well nourished at baseline than those in the American study. In Australia, Aboriginal families are more likely to suffer food insecurity than non-Aboriginal families (24% compared to 5%; Browne 2009).

Supplementary feeding for young children has a small effect on linear growth in low- and middle-income countries

The meta-analysis of the RCTs (nine trials, 1463 children) revealed that those who received supplementary food grew 0.27 cm more than controls over an average of six months. Results for height-for-age z-scores (HAZ) in the RCTs also revealed a small impact: over five months children who received food supplementation (nine trials, 4638 children) gained 0.15 more than controls.

Psychosocial development

Supplementary feeding may have a moderate positive effect on psychomotor development in low- and middle-income countries

While nearly all of the studies assessed growth, only eight assessed psychosocial outcomes in response to supplementary feeding.

Our meta-analysis of two RCTs in low- and middle-income countries (178 children) found greater gains in psychomotor development for children who were supplemented. Two other RCTs reported equivocal results.

The evidence on attainment of motor milestones is equivocal. Two studies (249 children) revealed that supplemented children reached motor milestones earlier, but the effects in one of them disappeared after maternal education was entered into the equation. Another study (747 children) found no differences.

The evidence of effects on cognitive development in low- and middle-income countries is sparse and mixed

Our analyses of one study found effectiveness, our analysis of another study did not, and evidence from a third study was mixed.

There is sparse evidence that feeding may result in long-term gains in intelligence or cognition in low- and middle-income countries

One RCT (n = 129) found long-term effects of supplementation and stimulation on perceptual motor skills. The effects of supplementation alone were limited to those children whose mothers had high scores on verbal intelligence at baseline while the effects of supplementation AND stimulation extended to all children. This suggests that supplementary feeding may be most effective if mothers have higher capacity to feed and stimulate their children. Another study (73 children) found that supplementation had very small long-term positive impacts on working memory but not on reaction time or math performance.

Supplementary feeding results in increased haemoglobin and lowered anaemia in low- and middle-income countries

Evidence from five RCTS (300 children) revealed a positive effect of supplementary feeding on haemoglobin that was equal to half of a standard deviation. Evidence from two controlled before-and-after studies (CBAs) (261 children) found that supplementary feeding reduced the risk of anaemia.

Overall completeness and applicability of evidence

We believe that our review provides very comprehensive coverage of the literature. We screened almost 33,000 studies from a well-designed literature search and we carefully scanned reference lists of included studies and of reviews. Our included studies covered many countries and regions, including Latin America, Africa, Asia, North America, and Australia. Studies in low- and middle-income countries predominated; this is not surprising, as 81% of the world's people who suffer from hunger live in them (World Hunger Education Service 2012). However, it does mean that results of the review are probably not generalisable to high-income countries.

We found a range of feeding interventions, a variety of foods and a range of nutritional adequacy, different modes of delivery, and methods for implementation. Effects on outcomes are mixed and complex but subgroup analyses suggested some important hypotheses.

The effect sizes for weight and height were smaller than we expected. However, our finding of small effects on growth is consistent with Beaton 1982. In the past, the failure to show consistent effects on growth has been attributed to the use of inappropriate indicators of growth as well as to poor targeting of the intervention (Rivera 1991). In our review, we considered several indicators of growth and separately analysed interventions targeted at children under two years of age, a period in which linear growth velocity is highest (Baumgartner 1986). Many of the newer interventions were based on the latest scientific findings about composition of the supplements. However, for programmes to effect changes in growth and to be sustainable, there has to be a balance between nutritional science and feasibility of implementation (Griffiths 2000). For example, in three included studies (Bhandari 2001; Grantham-McGregor 1991; Kuusipalo 2006), with particularly good implementation (moderate or strict supervision of feeding, provision of moderate to high nutritional adequacy), we found an average height gain of 0.76 cm (95% CI 0.30 to 1.22; n = 281) over nine months (Analysis 10.11). This finding supports the postulation that there is potential for a substantially larger effect on growth if feeding programmes are well implemented (Dewey 2008).

The evidence base on psychosocial effects of supplementation is rather sparse; we found that only eight of 32 studies assessed psychosocial outcomes. We found some evidence for positive effects of feeding on psychomotor development and sparse mixed reports on cognition. Our findings on psychomotor development support Pollitt 1994. Interestingly, the effect sizes for psychomotor development were overall larger than those found for growth. There could be several reasons for this. First, most of the studies on motor development were among those that demonstrated better implementation, including higher nutritional adequacy. Second, they were relatively small studies and so were able to have tighter control over the intervention. Third, there were fewer studies on psychomotor development; it is possible that with more studies, effects might be diluted. Finally, the pathways between psychosocial development are probably different. It is possible that psychosocial outcomes are more sensitive to nutritional intervention (Dewey 2008). The concept of 'brain sparing' may be relevant here. This refers to the hypothesis that when nutritional resources are scarce early in life, they are preferentially directed to the developing brain at the expense of other parts of the body (Auestad 2000; Lumbers 2001). This is supported by animal studies (Seidler 1990). Brain sparing has been shown to occur during intra-uterine growth and the neonatal period, resulting in slowed body growth (height and weight) with normal brain growth. Brain sparing has also been shown in the context of micronutrient deficiencies (Golub 1995). This suggests that supplementary energy, protein and micronutrients given to a child may be used for brain development first and then for growth and other aspects of health.

The possible link between increased nutrition and psychomotor and mental development is complex and involves a number of possible mechanisms. Such mechanisms include increased mylenation, increased alertness and curiosity (Meeks Gardner 1995), and increased motor activity resulting in enhanced motor development and consequently improved mental development (Pollitt 2000b). This latter mechanism is somewhat controversial;

while support for this was found in the Tea Plantation study (Pollitt 2000b), the Jamaican study (Grantham-McGregor 1991, reported in Meeks Gardner 1995), found that supplementation did not increase motor activity; they also found no effect of motor activity on later development. They suggested that effects of nutrition on increased motor activity might be dependent on context or age of the child, or both, and hypothesised that the quality of play and exploration might be more important for child development than the quantity of increased activity. Clearly, there is a need for more carefully developed studies on the mechanisms that link improved nutrition to psychosocial development.

Quality of the evidence

Feeding interventions for young children are complex interventions that are difficult and fairly costly to implement. Studying them therefore requires consideration of a number of factors pertaining to the context, the family, and the children.

Our judgements on the quality of the evidence ranged from very low (CBAs) to moderate (RCTs). However, it is important to note there are many old studies in the review, and that the quality of the studies, in terms of both design and implementation, has improved markedly in the last 10 to 15 years. In general, we placed more weight on the RCTs when drawing our conclusions.

One important problem was attrition rates. Among those that provided them, these rates ranged from 1% to 78%; 10 studies had attrition rates above 20%. Correspondingly, most of the analyses were conducted on completers rather than on an intention-to-treat (ITT) principle.

Another issue is that authors of several studies did not mention whether those who assessed study outcomes were blinded to the allocation status of the children. Blinding of outcome assessment is crucial in order to ensure that the outcome measurement is not influenced by assessors whose knowledge of the expected outcome may subtly influence their assessment (Viera 2007).

Finally, 10 study authors did not adequately control for clustering in their analyses. We adjusted for clustering for eight of them, but could not do so for the other two as we did not have access to the standard deviations.

Factors that may impact on effectiveness

As mentioned above, the findings of the review are mixed and complex. Furthermore, many of the effects are small, and we believe could be larger with improved implementation. Our process evaluation and related subgroup analyses shed some light on the reasons for this. In interpreting the subgroup analyses, we considered the evidence from both RCTs and CBAs to be important, but put slightly more emphasis on evidence from the RCTs as they provide stronger evidence for causation.

Age

Children who were younger at the start of the study may grow more in height/length than older children in response to supplementary feeding; results were mixed for weight

Our hypothesis that younger children would grow more in response to supplementary feeding was largely upheld. For example, our subgroup analysis for height (1463 children) was significant. Children in the two younger subgroups (< 12 months and ages one to two years; 1057 children; Analysis 1.2) gained significant amounts of weight, but those in the older age groups did not. There was no evidence of subgroup differences for weight, but the children in the two younger subgroups were the only ones who gained significant amounts of weight.

The meta-analysis of the CBAs showed no subgroup differences for either weight (1784 children) or height (1782 children). For weight, children who were two years old gained more weight than controls, while the older and younger groups did not.

Our findings are consistent with those of Beaton 1992 and Dewey 2008, who concluded that feeding interventions can have maximum impact on linear growth if they are started in infancy, as the period between six and 24 months is a period of rapid growth (Dewey 2008). It is important to note that feeding can also have an impact on linear growth in older children (Beaton 1992). In fact, our review of school meals found that linear growth in school-aged children increased by 0.25 to 1.47 cm per year (Galloway 2009; Kristjansson 2007). But it does mean that, for greatest impact on growth, and to help slow the rate of growth faltering, feeding should start when children are well below two years of age.

Only one of the studies (n = 53) reporting psychosocial outcomes assessed the impact of age; the authors report that feeding only benefited younger children (< 18 months).

Sex

The evidence is sparse but generally indicates few sex differences

Gender equity is an important consideration in low- and middle-income countries. In some contexts, there is a family preference for favouring male adults and children in the distribution of food within the family. This was found in a qualitative study in Guatemala (Engle 1992b), in surveys in Bangladesh and the Philippines (Haanga 1987), and was reported in one of our included studies (Roy 2005). Thus, the question of whether boys and girls benefit equally from feeding interventions is an important one.

Our subgroup analyses of two CBAS (840 children) found no difference in effectiveness by sex. However, two CBAs (211 children) reported stronger effects on growth for girls than for boys. This latter finding is consistent with analyses from the Oriente Longitudinal Study, which found that girls benefited from supplementation more than boys in terms of growth and cognition (Engle 1992b). We cannot draw firm conclusions from this data as only two studies were included in the analysis. This should be explored further, both quantitatively and qualitatively, in future research.

Socioeconomic status or initial nutritional status

Children who are poorer or more undernourished at baseline may grow more in response to supplementary food

Our hypothesis that feeding would be more effective for children who were poorer or more undernourished was generally supported. For example, our analysis of one study (196 children) found greater effectiveness for weight gain if children were undernourished at baseline. Analyses from two primary studies also found greater effectiveness for undernourished children: one for weight and another for skinfold thickness. Two other studies (863 children) found that young undernourished children had greater height and WAZ gain in response to feeding, but that older undernourished children did not. Further evidence comes from the fact that the only study in a high-income country that reported beneficial effects of feeding was performed among Aboriginal children, who are generally far more marginalised than non-Aboriginals. For example, Australian Aboriginal families are much more likely to be food-insecure (24% food-insecure) than non-Aboriginals (5% food-insecure) (Browne 2009; Rosier 2011).

In contrast, as mentioned above, one primary study (n = 247) found that children living in very poor socio-economic conditions did not respond as well to supplementary feeding as those living in better socio-economic conditions. The author suggested that poor environmental conditions may have reduced effectiveness. Furthermore, in the follow-up of the Jamaican study, supplemented children only experienced long-term cognitive benefits if their mothers had higher verbal ability at baseline. Others have found that maternal education and intelligence are important contributors to infants' dietary intake and nutritional status (Wachs 2005).

It makes biological sense that the children who are poorer or undernourished would benefit more from supplementary feeding. Our findings concur with those of Beaton 1982 and Kennedy 1987. We suggest that, in general, poorer children are more likely to benefit from feeding, but that feeding may not be all that is needed to overcome the effects of deprived environments.

It is important to point out that we were not able to assess whether or not the food actually reached those children who were most in need. Beaton 1982 and Rondo 1990 both noted that feeding programmes in developing countries often fail to do this.

Nutritional Adequacy

There is sparse evidence that programmes which provide more energy may more effective

Our hypothesis that higher nutritional adequacy would result in better outcomes was partially supported. Among the RCTs, there were few differences among subgroups for weight (eight trials, 975 children). For height, there was no evidence of subgroup differences in the RCTs, but the subgroup that provided high nutritional adequacy was the only group which found positive effects for feeding; the differences between high and low and moderate nutritional adequacy subgroups were 0.37 cm and 0.46 cm respectively. We believe that this subgroup analysis may have been non-significant because of the low number of trials in the high (two trials, n = 254) and low (one trial, n = 127) nutritional adequacy groups.

Among the CBAs, there were no significant subgroup differences, but programmes which provided moderate nutritional adequacy (four trials, 651 children) had significant positive gains in weight after supplementary feeding, while the group who received low nutritional adequacy (five trials, 961 children) did not, but differences between the two groups were small. The mean difference for the moderate adequacy group was also 0.32 kg higher than that of the high-energy group. It is important to note that the high-energy intervention group for the CBAs contained only the Santos 2005 trial (n = 191), which had substantial issues with unreliable delivery and leakage within the family. In this study, 50% of the caregivers reported 'gaps in delivery'; 36% of caregivers reported that these gaps occurred more than twice. Furthermore, only 32.5% of the participating children received the full ration. For the remainder of the children, the ration was shared with one to three other children and one to two adults. Despite the fact that the ration should have provided a high amount of energy, the supplemented group actually took in fewer calories than the control group.

The CBA results for height found no subgroup differences and the mean difference for the low-energy group (five studies, n = 959) was higher than that for the moderate-energy (four studies, n = 651) and high-energy (one study, n = 172) groups.

Mode of delivery, amount of supervision of the supplementary feeding, leakage, and substitution

Location of feeding. There is some evidence that feeding given in day-care may be more effective than that given at home

There were not enough data to fully test this in the RCTs, as only one study provided feeding on the spot. Among the CBAs, there was no evidence of subgroup differences but children who were fed in day-care or feeding centres were the only ones who gained significant amounts of weight relative to controls (seven trials, 1784 children). For height, there was no evidence of an effect for any of the subgroups, but the subgroup who was fed 'on-the spot' had a mean that was 0.93 cm higher than those who were fed in day-cares. We believe that the lack of subgroup differences may have been due to other differences in implementation. An exploratory sensitivity analysis showed that when Manjrekar 1986 (whose results were markedly different from those of the other studies) was removed from the subgroup analyses for weight and height, heterogeneity was slightly lower, there was evidence of an effect for both subgroup analyses, and the effects in the day-care group were stronger. It is notable that this study had a very high drop-out rate.

Relatedly, our analysis in EXCEL found that when supplementary food was take-home or home-delivered, the children took in an average of only 36% of the energy provided by the supplement. In day-cares and feeding centres, however, the children benefited from an average of 85% of this energy. This is consistent with findings reported in a synthesis by Kennedy 1987; 'on-site' feeding resulted in higher intakes than did 'take-home' feeding.

It is likely that this reduction in energy benefits from the home-delivered food or poorly-supervised programmes was at least partially due to 'leakage' within the family. In interviews with mothers, Santos 2005 found that the target child only received the full ration one-third of the time; Tomedi 2012 reported that children in the experimental group received "at least" 50% of the supplement. This is an important issue for feeding programmes in developing countries (Patel 2005). With home-based delivery, some of the food provided for one child often gets redistributed within poor families or sold to augment the family's income; this is one type of 'leakage'. When food is given at school or at day-care, families may give that child less at home so that other family members can have more; this is known as 'substitution'.

Although, "this is understandable in the context of food-insecure families" (Patel 2005, p 4), the result of such leakage is that the targeted child gets less food, and therefore less impact on growth and development can be expected. However, other researchers have pointed out that supplementary feeding may be seen as a net benefit to the whole family, and not just to one child.

Level of supervision. Our analyses suggest that stricter supervision of feeding may produce better child outcomes

Our hypothesis that programmes with stricter supervision would be more effective was partially supported. There was no evidence of subgroup differences for RCTs. For height, the supplemented children in the subgroup with the strictest supervision (four trials, 762 children) were the only ones who grew more than controls, although differences in means between subgroups were small. This analysis only compared moderate to strict supervision. There was no evidence of an effect in the CBAs, but we did find that children in the studies with the strictest supervision (five trials, 1286 children) gained more in weight from feeding than did children in the studies with moderate or little supervision (0.24 kg and 0.29 kg respectively). The same was true for height (0.54 cm and 0.85 cm difference between high and moderate and low supervision respectively). We believe that the lack of evidence for an effect in the CBA subgroup analyses may have been due to other differences in study implementation. An exploratory sensitivity analysis showed that when Manjrekar 1986 (whose results were markedly different from those of the other studies) was removed from the subgroup analyses for weight and height, heterogeneity was slightly lower and there was evidence of a subgroup effect for weight. It is notable that Manjrekar 1986 had a very high drop-out rate.

Leakage in the supply chain

Two of our studies reported breakdowns in the supply chain; the supplements only reached the families part of the time. Such failures in delivery have been reported by others who have reviewed preschool feeding programmes (Kennedy 1987) and school feeding programmes (Galloway 2009).

Multiple interventions.There is little evidence to support our hypothesis that multiple interventions would be more effective for growth than single interventions

Our hypothesis that multiple interventions would be more effective for growth was unsupported. There were no subgroup differences. Among the RCTs, both single and multiple interventions were effective for weight gain but the effect size for multiple interventions was higher. For height, two RCTs that provided multiple interventions (495 children) did not show effects while the seven RCTs that provided single interventions (952 children) were effective for increasing height. Among the CBAs (1782 children), neither single nor multiple interventions were effective for increasing height.

For psychosocial outcomes, there was no evidence of subgroup differences, but the effect size for the supplementation + stimulation group in one study (n = 65) was twice as high as effects for feeding only in two studies (n =178). It is likely that stimulation combined with feeding is especially effective for psychosocial development.

Disruption of breastfeeding

When food is given to infants, it is important to ensure that it does not disrupt breastfeeding, as this could lead to a rise in morbidity (Dewey 2008). Only three studies in our review examined whether or not the feeding intervention interfered with breastfeeding, and they had contradictory results. Findings from a survey done in conjunction with the Ecuador study found that supplementary feeding did not interfere with breastfeeding practices (Lutter 2008; n = 110 at final survey). In Indonesia, supplementation did not interfere with breastfeeding boys (Pollitt 2000a; n = 47), but it did seem to decrease breast feeding of girls (n = 48). However, Bhandari 2001 found that the proportion of infants who were breastfed was lower in the food supplementation group (n = 96) compared with the visitation-only group (n = 96).

Potential biases in the review process

We tried to reduce bias through careful attention to standard systematic review methodology. For example, we had at least two review authors involved in every aspect of identifying potential studies, deciding on inclusion and exclusion of studies, extracting data, and conducting analyses. However, a few potential sources of bias may remain.

Publication bias

We have searched websites of relevant agencies and found a number of reports of evaluations of feeding programmes, but it is possible that we have missed some. However, this is probably not too serious as the reports found on the websites that we searched did not meet our inclusion criteria. Furthermore, we did not handsearch any relevant journals. Although this must be acknowledged as a potential limitation, we believe that our coverage of the literature was thorough; we used many key databases and searched websites of relevant organisations.

Bias in correcting for clustering

As noted above, we corrected for clustering in a number of studies. This was vital in ensuring that confidence intervals were not inappropriately narrow. However, these corrections are highly dependent on the chosen intraclass correlation coefficients (ICCs). Having said that, we carried out a sensitivity analysis with different ICCs and were reassured that it made little difference.

Agreements and disagreements with other studies or reviews

We found one Cochrane review of RCTs of the effectiveness of supplementary feeding on growth (Sguassero 2012), two systematic reviews on complementary feeding (Dewey 2008: Lassi 2013), two earlier reviews of the effectiveness of supplementary feeding on growth (Beaton 1982) and other outcomes (Beaton 1993), and one short review and meta-analysis of nutrition and cognition (Pollitt 1994).

Our review has a wider scope than the above reviews and is somewhat more recent. Nonetheless, our conclusions that feeding interventions for young children can be effective for growth are fairly consistent with those of the Beaton 1982, Dewey 2008 and Pollitt 1994 reviews, somewhat consistent with Lassi 2013, and inconsistent with Sguassero 2012. For example, like Beaton 1982 and Dewey 2008, we found small effects on growth and concluded that feeding interventions are currently underperforming. Our findings that feeding interventions were generally more effective for growth in younger children concur with those of Beaton 1982 and Beaton 1993. However, we feel that there has not been enough research on their effectiveness in older children. We also agree with Beaton 1993 that the pathways between feeding and growth and feeding and psychosocial development are quite different, and that feeding can have an important impact on psychosocial development beyond the age of two. Finally, we concur with

Pollitt 1994 that feeding has positive impacts on psychomotor development.

Our findings on factors that can impact on success are very similar to some of those described by Kennedy 1987. For example, our findings concur with their paper on leakage within the family and substitution. Our results also support their findings that 'on site' feeding can markedly curtail leakages.

AUTHORS' CONCLUSIONS

Implications for practice

Our review has found that child-feeding interventions are underperforming. Although we provide evidence that feeding interventions can work, our results indicate that good implementation is key. This leads to several suggestions for programme development, implementation, and monitoring.

Target the poorest or most undernourished children or areas, if targeting is necessary. Our review provides some evidence that poorer and more undernourished children may be more responsive to supplementary feeding. Thus, when funding is limited, it is both an ethical imperative and necessary from a cost-effectiveness point of view to target poorer areas, families, and children. However, careful attention needs to be paid to the other conditions in which the children are living. As previously noted, very poor environmental conditions may negate the positive effects of supplementary feeding.

Closely supervise the distribution and child's intake of the supplement. Our work suggests that feeding may be more effective if delivered in a supervised feeding centre, day-care centre, or preschool. We have also found that children in day-cares or preschools benefit from more of the supplement. Another advantage to delivery in these settings is that feeding could easily be combined with hands-on training for groups of mothers on topics such as child stimulation, nutrition, and breastfeeding (Kennedy 1987).

Providing extra rations for other family members may be helpful. Beaton 1982 suggests that instead of viewing 'leakage' as totally undesirable, it may be seen as a benefit to the whole family. He noted that, at the least, feeding interventions increase family purchasing power. We concur with the view that the net benefit to the entire family should be measured. However, we believe that emphasis should still be placed on providing adequate nutrition to the children most in need within the family. One way to facilitate this may be to provide some rations for the entire family in order to reduce redistribution of the target child's supplement. Seven studies in the current review gave the family extra rations to reduce sharing of the target child's supplement. Similarly, the World Food Program's school feeding programmes are increasingly using take-home rations to ensure that children, especially girls, are able to go to school regularly.

*Build family capacity. E*vidence from our review, and from other studies on household food distribution, suggests that education is essential for parents on the importance of feeding all children according to their needs.

Consider providing at least 30% of the RDI for energy. We found some suggestion that children may grow more in programmes that

provide moderate (30% to 59%) or high (60% or more) percentage of the dietary reference intake (DRI) for energy. This is consistent with findings from Kennedy 1987; programmes which gave only a few hundred calories were less effective than those that provided more energy. According to Kennedy 1987, it is important for programmes to account for leakage by providing more energy than needed to fill the 'existing calorie deficit' (the difference between the amount taken in and the amount needed).

Supplementation should begin early in the child's life. Our findings are somewhat supportive of other authors who have shown that younger children benefit more than older children in terms of growth. On this basis, we suggest that when it is to be given, supplementation should begin in infancy after a period of exclusive breastfeeding. As it may take time for supplementation to affect certain aspects of growth (Rivera 2013 [pers comm]) and cognitive development (see, for example, Grantham-McGregor 1991), supplementation should continue for at least 18 months (Sguassero 2012) to two years (Rivera 2013 [pers comm]).

Monitor and evaluate on a continual basis. In addition to evaluating a range of appropriate outcomes, our review highlights the importance of evaluation that assesses all factors that can impact on the success of feeding. It is also important to monitor children's dietary intake, growth, and development on a regular basis.

Implications for research

It seems inevitable that review authors will call for more research, and we follow this trend. However, we are not calling for more of the same research, but for research on relatively understudied areas. Furthermore, we believe that there should be guidelines for such research, and that process evaluation as well as outcome evaluation needs to be undertaken. We have identified the following research needs:

More research is needed on the impact of preschool feeding on psychosocial development. It is quite concerning that only eight out of 32 studies assessed effectiveness for psychosocial development. Yet, as Dewey 2008 noted, psychosocial outcomes may be particularly sensitive to nutrition intervention. Indeed, findings from our review indicate that feeding interventions can have positive effects on psychomotor and possibly cognitive development. Relatedly, we concur with Bhutta 2008 that it is important to learn to what extent the cognitive deficits caused by early undernutrition are reversible. We know that an individual's life chances are dependent on adequate motor, behavioural, and mental development in the first years of life. For example, early cognitive and social-emotional development are major determinants of school progress in developed and developing countries, which in turn is related to adult employment status and income, and contributions to family, community, and society (Grantham-McGregor 2007). We realise that psychomotor and mental testing can be time-consuming and expensive to do on a large scale. However, more feasible and valid tests have been developed (Khan 2010). It is time that psychosocial development is given higher priority as an outcome of interventions.

More research is needed on the impact of feeding on older children. Our meta-analyses on growth seem to show that feeding may not be effective at increasing the height or weight of children above two years of age. However, there is a dearth of research on feeding interventions for this age group; we only found four studies that assessed effectiveness for weight and height, and they were all conducted before 1990. Therefore, we believe that the jury is still out on the question of effectiveness of feeding interventions for growth after two years of age, and we concur with Bhutta 2008 that this is a major gap in our knowledge.

More research is needed on the impact of feeding on gender and income equity in growth and psychological development. Our review has provided some evidence that supplementary feeding might be more effective for poorer children and possibly for girls. Surprisingly few studies addressed this question. Relatedly, more research is needed on how to reduce inequities in the distribution of household food.

More high-quality research is needed on the implementation of large-scale programmes. Another area in which there is a dearth of high-quality research is in the evaluation of large-scale feeding programmes. Most of the evidence presented here is from small-scale studies; only four evaluations of large-scale studies met our inclusion criteria (Brazil's Milk Supplement Program (Santos 2005); PANN in Ecuador (Lutter 2008); Progresa in Mexico (Rivera 2004); and Vietnam's Integrated Health and Nutrition Program (Schroeder 2002)). While knowledge from these studies has contributed to the review and to our process analyses, there is a need for more high-quality RCTs of such large-scale programmes; we found a number of evaluations of such programmes in the literature but these evaluations were not rigorous enough to meet our inclusion criteria. In the future, we recommend cluster-RCTS and process evaluations.

More research is needed on interventions of high quality. Many studies in this review were of relatively low quality in terms of implementation and design. It is encouraging that the more recent studies were generally of much better quality, although there are still issues concerning implementation. There is a need for careful attention to outcome measurement that is guided by theory and logic. Attention must also be paid to methods of randomisation, allocation concealment, blinding of outcome assessment, and to attrition. We need research that examines the causes of attrition and that determines how to reduce it.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Bhandari 2001

Methods	Study date: 2001. Study design: RCT. Individual randomisation, stratified. Feeding of home-delivered rations. Delivered twice-weekly
Participants	SES or context: Low- and middle-income country: South Dehli, India. Urban slum of Nehru place. 80% of women and 40% of men have never been to school. Most families were migrants from rural areas. Median family income is 2000 Rupees (USD 50) per month. Live in dwellings made of mud, concrete or a mixture of both Nutritional status: 22% - 25% had HAZ < 2 SD below mean Age: Children were enrolled at the age of 4 months Number: Supplemented = 87; nutritional counselling = 97; no intervention = 93; visitation = 91 Sex: Both. 42% - 54% boys
Interventions	Intervention: Feeding alone: 50 g milk cereal supplement prepared with 50 ml water. Given to mothers to prepare and to give to infants twice daily. Twice-weekly delivery and morbidity assessments Energy: 941 kj, 7 g fat, 8 g protein, 30 g carbohydrates, 2.5 g minerals Duration: 8 months % DRI for energy: 4 - 5 months = 89.9%, 6 - 11 months = 126% % DRI for protein: 4 - 5 months = 191.84%, 6 - 11 months = 354.63%. Protein energy ratio 14.21 Control: Home-feeding as usual Provider: UNICEF Supervised: Twice-weekly visits by staff. Asked mothers about consumption and collected packets Compliance: Empty containers collected to measure compliance
Outcomes	Physical: Weight and length
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Not clear how randomisation was done
Allocation concealment (selection bias)	Unclear risk	Not clear
Baseline outcome measurements	Low risk	No difference in weight between group that was fed and controls
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias)	Low risk	Follow-up rate was good, and not much different between experimental and control group

Bhandari 2001 *(Continued)*

All outcomes		
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Personnel who distributed the food were not blind, participant's mothers would have also known
Protection from contamination	Unclear risk	Not assessed
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Coyne 1980

Methods	Study date: 1980. Study Design: Cluster-CBA. 5 communities with preschools were selected for the experimental group. 5 comparable communities were selected as controls
Participants	SES or context: High-income country. Aboriginal children in remote communities. Low SES, marginalised population. Weight and height consistently below average Nutritional status: Initial height, weight, nutrients below "acceptable levels" Age: Average of 4 years Number: 180 enrolled initially. 116 available at follow-up, experimental = 73, control = 43 Sex: Both. More girls than boys in experimental group, slightly more boys in control group
Interventions	Intervention: Feeding with adjunctive intervention: Hot lunches in day cares. Provided 2/3 of the DRA for nutrients for the age group. Multivitamin supplements Energy: 941 kj, 7 g fat, 8 g protein, 30 g carbohydrates, 2.5 g minerals Duration: 8 months % DRI for energy: 4 - 5 months = 89.9%, 6 - 11 months = 126% % DRI for protein: Not enough information to calculate Control: Home-feeding as usual. No day care Provider: Save The Children Supervised: Yes. In preschool
Outcomes	Physical: Height, weight, biochemical outcomes
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement

Coyne 1980 *(Continued)*

Random sequence generation (selection bias)	High risk	Non-randomised study
Allocation concealment (selection bias)	High risk	Non-randomised study
Baseline outcome measurements	Low risk	No statistically significant differences in age, weight, height at baseline
Baseline characteristics	High risk	Intervention is children attending preschool and control is children not in preschool, so the provider setting is different
Incomplete outcome data (attrition bias) All outcomes	Low risk	The mean height, weight, age, and haemoglobin did not differ from those included in the study vs those who did not return for a second visit
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants are aware of intervention
Protection from contamination	Low risk	Preschool setting was unit of allocation, unlikely to contaminate non-preschool control group
Selective reporting (reporting bias)	Unclear risk	No protocol available

De Romana 2000

Methods	Study date: 2000. Study design: Cluster-RCT, communities were chosen randomly as intervention or control communities (impact evaluation longitudinal with evaluations before and after the intervention)
Participants	SES or context: Low- and middle-income country: Peru. Area with high prevalence of infant malnutrition Nutritional status: 51% malnutrition in infants. High prevalence of diarrhoea, inadequate infant feeding practices, low prevalence of exclusive breastfeeding, and use of inadequate foods for complementary feeding Age: 6 - 36 months Number: Experimental = 125, control = 125 Sex: Both
Interventions	Intervention: Feeding only. Precooked food with instant preparation and high nutritional value. 100% of the iron, zinc, iodine, vitamin A and vitamin C requirements, and 60% of the other micronutrient Feeding compared to controls. Nutrition education, but not clear whether both groups got it Energy: 33% of energy requirements for 6 - 36-month-old children, 20% of animal protein Reconstituted to provide 1 kcal/g

De Romana 2000 *(Continued)*

	Intensity: Daily Duration: 12 months % DRI for energy: 6 - 12 months = 56.1%, 12 - 24 months = 21.4% % DRI for protein: 6 - 12 months = 148.86%, 12 - 24 months = 130.55% Control: None Provider: Government of Peru and private sector Supervised: Not mentioned Compliance: Not mentioned
Outcomes	Physical: Haemoglobin, height, and weight
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Unclear risk	Says randomly chosen, but does not say how
Allocation concealment (selection bias)	Unclear risk	Not much information given in paper on how allocation was done
Baseline outcome measurements	Unclear risk	Some shown but not clear whether these are significantly different
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Data on initial numbers were reported, but outcome data were by percentage, very few numbers
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not really discussed, but probably difficult to blind as they gave food
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Devadas 1971

Methods	Study date: 1971. Study design: Controlled Cohort Study. 25 children selected from community preschool for experimental group and similar number chosen from another village of comparable background as controls
Participants	SES or context: Low- middle-income country: India. Vulnerable groups in a community development block at Perianaickenpalayam, Coimbatore district, India Nutritional status: Not mentioned Age: Preschool (no age mentioned) Sex: Both Number: Experimental = 25, control = 25
Interventions	Intervention: Feeding with adjunctive intervention (nutrition education). Supplement, including 28.4 g of skimmed milk given daily and 1 egg given 3 days a week. Not clear where it was given, but probably in day-care or feeding centre Energy: 123 kcal and 11 g of protein % DRI for energy: 14.2 % DRI for protein: 89 Duration: 6 months Control: No intervention Provider: UNICEF, WHO, FAO Supervised: Supplement was provided at a feeding centre Compliance: Children's eating habits were evaluated
Outcomes	Physical: Height, weight, and haemoglobin
Notes	Nutrition education to children and mothers through songs, skits, discussions, and demonstration programmes

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non-randomised study
Allocation concealment (selection bias)	High risk	Non-randomised study
Baseline outcome measurements	Low risk	Initial heights and weights seem comparable
Baseline characteristics	Low risk	An identical group of 25 preschool children in Thaliyur village was selected as controls. The nutrient intake of both the group was deficient in calories, iron, ascorbic acid and vitamin A, while the non ANP group did not consume adequate quantities of calcium
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not specified in the study

Devadas 1971 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified in the study
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were aware of intervention
Protection from contamination	Low risk	2 different preschool settings were used for allocation 1.5 km apart
Selective reporting (reporting bias)	Unclear risk	No protocol available

Fauveau 1992

Methods	Study date: 1992. Study design: Cluster-RCT. Allocated by courtyard
Participants	SES or context: Low- and middle-income country: Urban slum in Bangladesh. 75% of slum dwellers were 'daily labourers'. Income per day less than USD 2. Among sample, only 22% of mothers employed; all with 'low wages'. Almost all of the sample had parents with wages less than USD 2 a day Nutritional status: Mid-upper arm circumference between 110 and 129 mm, at risk of malnutrition Age: Average of almost 8 months in both groups Number: 127 entered. Experimental = 48, control = 43 (completed) Sex: Both. 60% - 70% girls
Interventions	Intervention: Feeding + rations for family: Weekly ration of 450 g of pre-mixed rice, wheat and lentil powder, and 90 g of cooking oil. Delivered to home. All local ingredients. Mothers were taught how to prepare the cereal Mothers of children in both groups received health education that focused on frequency of feedings and caloric content of food Duration: 6 months % DRI for energy: 17.6% % DRI for protein: Not enough information Control: Mothers taught how to prepare meals, but no feeding Provider: USDA Supervised: Visited every 2 weeks to assess. 6-hour family food-intake observation Compliance: Not mentioned Intervention: Home-delivered rations to mothers
Outcomes	Physical: Weight gain
Notes	
Risk of bias	

Fauveau 1992 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Used computerised random number generation
Allocation concealment (selection bias)	Unclear risk	Nothing mentioned about allocation concealment
Baseline outcome measurements	Unclear risk	Not given
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	They lost 36 children out of 127 due to illness or movement out of area. Reasons seem to be unrelated to intervention or outcome
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	None mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Children and parents knew that they were fed. Personnel delivering the interventions also knew
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Gershoff 1988

Methods	Study date: 1988. Study design: CBA. Conducted in day-care centres where children were enrolled for full day. Children brought lunches
Participants	SES or context: Low- and middle-income country: Thailand. 24 villages in Northern Thailand. Children delayed in growth compared to middle-class children Nutritional status: Not provided Age: Children were enrolled between the ages of 6 months and 5 years Number and sex: 123 boys and 146 girls supplemented and full data; 144 boys and 121 girls day care no other intervention, full data Sex: Both
Interventions	Intervention: 5 groups: 1 = no intervention, 2 = health-sanitation programme, 3 = day-care centre only, 4 = day-care centre + vitamin mineral supplement and sanitation, 5 = day-care centre + everything and snack. We used 3 as the control group and 5 as the experimental Feeding: Locally-baked fortified cookies given as mid-morning snack in day care Energy: 300 kcal with 40% of fat and 8% of protein. Given once per day mid-morning for 5 days per week

Gershoff 1988 *(Continued)*

	Duration: 22 months % DRI for energy: 6 - 12 months = 42.1%, 12 - 36 months = 34.5%, 24 - 48 months = 20.8%, 48 - 60 months = 19.8% % DRI for protein: 6 - 12 months = 68.8%, 12 - 36 months = 60.4%, 24 - 36 months = 48.6%, 36 - 48 months = 41.4%, 48 - 60 months = 36.4% Control: Home-feeding as usual Provider: Thrasher Research Fund, Salt Lake City, Utah, and UNICEF Supervised: Yes. Feeding was done in day care Compliance: Records were kept for each child as to whether the cookies were eaten, partially eaten, or not eaten
Outcomes	Physical: Head, arm and chest circumference, triceps and subscapular skin folds, weight and length, WAZ, HAZ, WHZ
Notes	Sanitary water provided to the family and health worker to family

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Unclear risk	Not mentioned
Baseline characteristics	Unclear risk	We compared day care with feeding to day care without, but staff not specified
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not specified in the study
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants are aware of intervention
Protection from contamination	Low risk	Day-care centres were used for allocation. Not likely to contaminate other groups
Selective reporting (reporting bias)	Unclear risk	No protocol available

Gopalan 1973

Methods	Study date: 1973. Study design: CBA. Not cluster
Participants	SES or context: Low- and middle-income country: India. 9 villages near Hyderabad. Children from low-income groups Nutritional status: Does not really say, but ingested 700 kcal/day in their regular diet Age: 1 - 5 years Sex: Both Number: Experimental = 306 (211 reported), control = 108 (83 reported)
Interventions	Intervention; Feeding only, Sweet cakes supplement consisted of wheat flour (23 g), sugar (35 g), and edible oil (10 g). Given in a feeding centre once daily for 6 days a week Energy: 310 kcal, 3 g protein Duration: 14 months. Feeding was timed so that it would not interfere with home meals % DRI for energy: 12 - 24 months = 35.7%, 24 - 36 months = 35.7%, 36 - 48 months = 21.5%, 48 - 60 months = 20.5% % DRI for protein: 12 - 24 months = 30.19%, 24 - 36 months = 24.31%, 36 - 48 months = 20.72%, 48 - 60 months = 18.22%. Protein energy ratio 3.87 Control: Regular food at home. No supplement Provider: Not mentioned Supervised: Yes Compliance: It was ensured that children consumed all the supplement. 85% attendance rate
Outcomes	Physical: Weight and height
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Low risk	The groups were matched initially with respect to sex, height and weight, and the prevalence of nutritional deficiency signs were therefore comparable. No significant difference in the intakes of home diets between the two periods were noticed
Baseline characteristics	Unclear risk	Not specified in the study
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	During the course of the study, there was an outbreak of measles, with 114 of the 415 children being affected. Of these, 32 belonged to the control group and 82 to the experimental group.This provided an opportunity to examine the effect of food supplements on the response to the disease

Gopalan 1973 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified in the study
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants aware of intervention
Protection from contamination	Low risk	All children in the experimental group were assembled daily at a central place in the village and were fed the supplement 6 days a week. It was ensured that all children consumed the entire supplement
Selective reporting (reporting bias)	Unclear risk	No protocol available

Grantham-McGregor 1991

Methods	Study date: 1991. Study design: RCT
Participants	SES or context: Low- and middle income country: Jamaica. Poor urban neighbourhoods in Kingston. Stunted children randomly assigned. A small group of non-stunted children was used as a reference, but they are not included in the review Nutritional status: Below -2 SD. NCHS reference data for age and sex for height Age: 19 - 24 months Number: 129 (control = 33, stimulated = 30, supplemented = 32, both = 32) Sex: Both
Interventions	Intervention: Three study arms. Feeding only, feeding + stimulation, stimulation only + control. We compared feeding only to control Feeding: 1 kg milk-based formula per week. Supplement delivered to home. Supposed to be given once daily Energy: 750 kcal (3.15 MJ) per day, 20 g protein per day Duration: 2 years % DRI for energy: 9 - 12 months = 105.2%, 12 - 24 months = 86.3% % DRI for protein: 6 - 12 months = 215.96%, 12 - 20 months = 201.27%. Protein energy ratio 10.67 Control: Home food and breastfeeding Provider: Ford Foundation USA, Population Council Cow and Gate, Grace Kennedy Jamaica, and Seprod Jamaica Supervised: Weekly visits to encourage use Compliance: Community health workers made weekly visits to deliver supplement and encourage use
Outcomes	Physical: Weight, height, weight, mid-upper arm circumference, WHZ Psychological: Developmental Quotient (locomotor, hearing and speech, hand and eye, and performance)

Grantham-McGregor 1991 *(Continued)*

Notes	Additional 0.9 kg cornmeal and skimmed milk powder were given to the family to minimise sharing of the supplement, stimulation done by community health aides 1-hour per week, mothers taught how to play with child to promote development and made homemade toys for children

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Random assignment; nothing else mentioned
Allocation concealment (selection bias)	Unclear risk	None mentioned
Baseline outcome measurements	Low risk	Weight, WHZ almost identical
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	Almost all followed up
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Unclear for height and weight. Low risk for cognitive as they were blinded
Blinding of participants and personnel (performance bias) All outcomes	High risk	No mention of blinding and impossible to blind participants
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Heikens 1989

Methods	Study date: 1989. Study design: RCT. Individually randomised
Participants	SES or context: Low- and middle-income country: Kingston, Jamaica Nutritional status: Malnourished children enrolled in community rehabilitation. < 80% of NCHS weight-for-age Age: 3 - 36 months Number: Supplemented = 39, unsupplemented = 43 Sex: Both. 42% - 54% boys
Interventions	Intervention: Feeding only. High-energy supplement, delivered to home with instructions on how to prepare, and measuring cup Energy 526 kcal, 13.75 g protein. Delivered once a week

Heikens 1989 *(Continued)*

	Duration: 3 months of supplementation, 3 months of follow-up % DRI for energy: Not enough information % DRI for protein: Not enough information Control: Home-feeding as usual. Also received health care and micronutrient supplementation Provider: Ministry of Health, Jamaica Supervised: Some monitoring through food frequency questionnaires Compliance: Supplemented children took in more kcal
Outcomes	Physical: Weight, height, BMI
Notes	Difference in weight gain was significant during supplementation, but disappeared once supplementation stopped. Difference in height still remained

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Says children were allocated randomly but no information on how
Allocation concealment (selection bias)	Unclear risk	Little information
Baseline outcome measurements	Unclear risk	Not mentioned
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	Says 82 enrolled. 14 admitted to hospital. Equal numbers in each group
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not possible to blind participants, caregivers, or personnel
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Husaini 1991

Methods	Study date: 1991. Study design: Cluster-RCT; stepwise by pairs. Randomised, except that they added 2 control day cares afterwards

Husaini 1991 *(Continued)*

Participants	SES or context. Low- and middle-income country: Indonesia. Tea plantations in Java, Indonesia. Tea plantation workers. Low education: fathers about 5 years, mothers about 3 years Nutritional status: Weight z-scores average were -1.57 and -1.66 and height z-scores were -2.34 and -2.42 Age: 6 - 59 months (but up to 20 months are the only ones included in this paper) Number: 113. Experimental = 75, control = 38 Sex: Both. Boys experimental = 43, boys control = 19, girls experimental = 32, girls control = 19
Interventions	Intervention: feeding only: Snacks, including rice, rice flour, wheat flour, bread, cassava, potatoes, sweet potatoes, coconut milk, refined sugar, brown sugar, and edible oil. Given in day care Energy: On average, the daily supplements provided 1660 kJ (400 kcal) and 5 g protein Duration: 6 days per week for 3 months. 6 months for haemoglobin % DRI for energy: 6 - 12 months = 56.1%, 12 - 20 months = 46.0% % DRI for protein: 6 - 12 months = 57.37%, 12 - 20 months = 50.32%. Protein energy ratio 5 Control: Usual Provider: Indonesian Government Supervised: Not mentioned Compliance: Mothers were encouraged to use supplements along with usual diet
Outcomes	Physical: WAZ, HAZ, skinfold thickness, arm circumference, head circumference, and chest circumference measured but not reported Psychological: Psychomotor Development Index and Mental Development Index
Notes	32 tested recipes, 20 were used for intervention

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Unclear
Allocation concealment (selection bias)	Unclear risk	Cannot really tell how allocation was done
Baseline outcome measurements	Unclear risk	Low for WAZ, HAZ, Cognitive. For psychomotor, scores at baseline 8 points apart
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	High risk	Only used the youngest cohort
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Low for PDI and MDI. Unclear for height or weight

Husaini 1991 *(Continued)*

Blinding of participants and personnel (performance bias) All outcomes	High risk	Children certainly did not know study goals, or whether they were in experimental or control. Day-care centre personal certainly did
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Iannotti 2014

Methods	Study date: 2014. Study Design: RCT
Participants	SES or context: Urban slums of Haiti Nutritional status: The average WAZ ranged from -0.70 -0.85 Age: 6 - 11 months at start of study Sex: Both. Slightly more girls than boys in all groups Number: 589 recruited to 3 groups (after 6 months follow-up there were: control = 144, intervention = 150, other treatment = 126)
Interventions	Intervention: Feeding + 2 intervention groups: 3 month Lipid nutrient supplement, 6 month LIpid Nutritent supplement. Home-delivered; 1 sachet per day. Parents asked to feed children Energy: On average, the daily supplements provided 108 kcal and 23% of protein Duration: 6 month% DRI for energy: 15% % DRI for protein: 23% Control: No supplement Provider: Researchers with funding from Bill & Melinda Gates Foundation, the Inter-American Development Bank, the World Bank, and the United Nations World Food Program Supervised: Once monthly Compliance: 98% of mothers reported that the children ate all of the supplement
Outcomes	Physical: LAZ, WAZ, WHZ
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Says infants were randomly assigned. Drawn from container
Allocation concealment (selection bias)	Low risk	Sealed paper forms were drawn from a container

Iannotti 2014 *(Continued)*

Baseline outcome measurements	Low risk	WAZ, HAZ, WHZ not significantly different
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	Approximately the same proportion missing in each group and reasons unlikely to be related to outcome (most moved to country)
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not mentioned
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Isanaka 2009

Methods	Study date: 2009. Study design: Cluster-RCT
Participants	SES or context: Low- and middle-income country: Niger. 12 villages with a 15% or higher prevalence of wasting. Low income, diet dependent on annual crop harvest Nutritional status: Height for weight 80% or more of NCHS median Age: 6 - 60 months. No longer fed once they reached 60 months Number: 3166; down to 3026 after 7 months Sex: Both
Interventions	Intervention: Feeding only. 92 g packet of RUTF. Monthly distribution enough for 1 sachet daily Energy: 500 kcal Duration: Intervention was 3 months long. Followed up for 32 weeks % DRI for energy: 6 - 12 months = 69.8%, 12 - 24 months = 57.5%, 24 - 36 months = 57.5%, 36 - 48 months = 34.7%, 48 - 60 months = 33.0% % DRI for protein: Not enough information Control: Regular meal. No extra supplement Provider: MSF Supervised: Not mentioned Compliance: Not mentioned

Isanaka 2009 *(Continued)*

Outcomes	Physical: Weight, length, HAZ, WAZ
Notes	Adequate control for clustering

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Villages drawn from a hat; first 3 in each district went to experimental, second went to control
Allocation concealment (selection bias)	Unclear risk	Selection was made by a field worker not involved in identification of eligible villages
Baseline outcome measurements	Unclear risk	Not applicable
Baseline characteristics	Low risk	HAZ, WHZ not significantly different
Incomplete outcome data (attrition bias) All outcomes	Low risk	Drop out was similar in both groups; did an all-available-data analysis
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Does not say blinded
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and personnel distributing the supplement had to know whether they were in the intervention or control group. But unlikely to affect anthropometrics
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Joshi 1988

Methods	Study date: 1988. Study design: Cluster-CBA. 2 Balwadies (preschools) selected (1 = poor, 1 = middle class). 2 kindergartens were selected per community (1 experimental and 1 control in each). 1 was implementing a feeding programme. They were chosen on the basis of implementing or not implementing a feeding programme
Participants	SES or context: Low- and middle-income country: India. 4 Balwadies in Pune City, India. 2 were in a poor living area consisting of families of low socioeconomic classes, slum dwellers and illiterate parents, without facilities for sanitation, sewage systems, and personal hygiene (LSE). 2 were in middle, socio-economic classes with higher income and education level with enough space and clean surroundings (MSE) Participants were all children who had just enrolled in the schools. So there was a baseline Nutritional status: Ranged from normal to severe Age: 30 months - 5 years

Joshi 1988 *(Continued)*

	Sex: Both Number: Experimental = 50 low SES and 74 middle SES, control = 42 low SES and 81 middle SES
Interventions	Intervention. Feeding only. Supplement included commonly consumed snacks with which the children were familiar such as milk, biscuits, curd, and seasonal fruits. Each child was served the same quantity of food on a clean plate. Given once daily in kindergarten Energy: 167 kcal and 5.1 g protein Duration: 7 months. 151 days of feeding in LSE area out of 210. 129 in MSE area % DRI for energy: 36 - 48 months = 11.60%, 48 - 60 months = 11.02% % DRI for protein: 36 - 48 months = 35.2%, 48 - 60 months = 31.0% Control: No feeding programme Provider: Not mentioned Supervised: Teachers monitored consumption as food was distributed in kindergarten Compliance: Not mentioned
Outcomes	Physical: Height and weight
Notes	Gomez classification used for assessing impact of the intervention

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Low risk	Initial weights and heights of the group that was fed and those that were unfed were very similar and the confidence intervals overlapped, meaning that differences were non-significant
Baseline characteristics	Unclear risk	No information to judge
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Not specified in the study
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified in the study
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants, parents, staff aware of intervention
Protection from contamination	High risk	Unit of allocation is the children; was consumed on the spot under the supervision of the teachers

Joshi 1988 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	No protocol available

Kuusipalo 2006

Methods	Study date: 2006. Study design: RCT, not cluster, with 7 intervention arms and 1 control. Intervention arms were varying intensity of spreads with 2 different formulations: soy and milk
Participants	SES or context: Low- and middle-income country: Rural Malawi. Most children were undernourished. Study conducted during rainy season when food security is the lowest and weight and height gain of the children is poorer than the rest of the year. Exclusive breastfeeding is almost non-existent and diet is complemented with maize Nutritional status: Weight-for-age < -2, weight greater than 5.5 kg, and WHZ greater than -3 Age: 6 - 17 months Number: Total: 128 started (18, 18, 18, and 9 children received 5, 25, 50, and 75 g of milk-based fortified spread, respectively; 20, 18, and 9 children received 25, 50, and 75 g of soy-based fortified spread, respectively). 125 finished. 18 - 19 in each group, control = 18 Sex: Both
Interventions	Intervention: Feeding only with seven different intervention arms: Milk-based fortified spread and soy-based fortified spread of different quantities Energy: Supplementation provided 96, 544, 1105, and 1661 kcal and 1, 4, 8, and 11 g of protein in 5, 25, 50, and 75 g of milk-based fortified spread, respectively. It provided 531, 1071, and 1615 kcal and 3, 7, and 10 g of protein in 25, 50, and 75 g of soy-based fortified spread, respectively. Supplements delivered to homes prepackaged weekly for first 4 weeks and bi-weekly thereafter Duration: 12 weeks % DRI for energy: Milk-based formula 6 - 12 months = 28.57% (avg.), soy-based formula 6 - 12 months = 35.98% (avg.), milk-based formula 12 - 24 months = 23.44% (avg.), soy-based formula 12 - 24 months = 29.52% (avg.) % DRI for protein: Milk-based formula 6 - 12 months = 68.84% (avg), soy-based formula 6 - 12 months = 76.50% (avg.), milk-based formula 12 - 24 months = 60.38% (avg.), soy-based formula 12 - 24 months = 67.10% (avg.) *Because it provided more of the DRI for energy, we used the children who received the 75 g soy-based formula as our experimental group Control: No feeding programme Provider: Foundation for Paediatric, Research in Finland, and Medical Research Fund of Tampere Supervised: No, but empty sachets from the previous week were collected. Sometimes nurses visited homes during feeding time Compliance: No, but empty sachets from the previous week were collected
Outcomes	Physical: Haemoglobin, height, weight, WAZ, HAZ, WHZ
Notes	At a daily dose of 25 and 50 g, spreads are somewhat more expensive than micronutrient-fortified corn-soy flour, tablets or sprinkles. USD 0.10 - 0.20/day vs USD 0.02 - 0.04/day

Risk of bias

Kuusipalo 2006 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Randomised by computer-generated lists
Allocation concealment (selection bias)	Unclear risk	Nothing mentioned
Baseline outcome measurements	Low risk	Very little (and non-significant) difference in weight, heights, WAZ, HAZ, WHZ
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	Only 3 dropped out
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Said that research assistant and lab assistant performing outcome assessment remained blinded until end of study
Blinding of participants and personnel (performance bias) All outcomes	High risk	For the comparison against the "untreated" group, there was no placebo, but within different energy-densities, participants were blinded. "Thus, in total, 7 different supplementation groups and 1 unsupplemented group (that received no placebo spread) were included in the study. Soy-containing formulas tasted slightly sweeter than the milk-containing ones, but otherwise the look, taste and packing of different formulas were identical"
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Lutter 2008

Methods	Study date: 2008. Study design: CBA
Participants	SES or context: Low- and middle-income country: Ecuador. Urban, peri-urban and rural communities, low and insecure income, poor housing, and a general lack of 1 or more essential services (piped water, reliable electricity supply, sewage disposal) Nutritional status: Included all children in communities Age: 9 - 14 months at enrolment Number: Experimental = 338 for anthropometry, 170 at end; 324 for morbidity, 324 at end. Control = 296 for anthropometry, 149 at end; 262 for morbidity, 262 at end
Interventions	Intervention: Feeding with nutrition education. Supplement was a 65 g dry milk-based product. Given to mothers to prepare once daily Energy: Provided 275 kcal/day and 10 g of protein, 6 g lipid Duration: 44 weeks % DRI for energy: 9 - 12 months = 38.6%, 12 - 14 months = 31.6%

Lutter 2008 *(Continued)*

	% DRI for protein: 9 - 12 months = 108.0%, 12 - 14 months = 114.30% Control: Usual diet Provider: National Food Nutrition Program administered by Ministry of Public Health Supervised: Yes. Weekly home visits with dietary recall Compliance. The supplement was consumed 73% of the time. Based on dietary recall, consumption was ½ of the daily ration Difference between study and control groups at end of study was 180 kcal. But says that daily energy increased by 240 kcal and iron by 9 mg
Outcomes	Physical: Weight, length, anaemia, HAZ, WAZ, WHZ
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Low risk	At baseline, program and control groups were similar with respect to many but not all variables (Table 3)
Baseline characteristics	Low risk	Field workers were trained and standardized using WHO guidelines
Incomplete outcome data (attrition bias) All outcomes	Low risk	The 80% follow-up by the team responsible for weekly morbidity surveillance was due to the fact that it was done by community health workers who could easily revisit the home to collect complete data. In contrast, the other teams travelled from the capital to the evaluation area for baseline and final measurements in the health clinics and had less flexibility to follow up with children who did not come to the clinic. Loss to measurement did not appear to bias these results; this was determined using the method described in the ''Methods'' in which a dummy variable indicating loss to follow-up status was regressed on the variables in the regression models
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified in the study
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants aware of intervention
Protection from contamination	Low risk	Health centres in communities where the program began served as the program group and health centres in neighbouring, apparently similar communities, where the program was to be implemented 1 year later, served as the control group
Selective reporting (reporting bias)	Unclear risk	No protocol available

Mangani 2014

Methods	Study date: 2014. Study design: RCT
Participants	SES or context: Low- and middle-income country: Rural Malawi Nutritional status: Not severely malnourished. Average WAZ of -0.70 to -0.80 Age: 6 months Number: 840 randomised into 4 groups. 183 - 191 finished in each of the 4 groups Sex: 53% boys
Interventions	Intervention. Children randomised into 4 groups. Milk-LNS, Soy-LNS, Corn-soy blend, and control Feeding: The Milk-LNS group received a LNS with milk. There was also a Soy-LNS, but we used milk Energy: provided 285 kcal/day for Milk-LNS Duration: 12 months % DRI for energy: 40% % DRI for protein: 94.1% Control: Usual diet Provider: Academy of Finland, Foundation for Pediatric Research in Finland, Medical Research Fund of Tampere University Hospital, the American people, the Office of Health, Infectious Disease and Nutrition, Bureau for Global Health, United States Agency for International Development (USAID), Foundation and Singapore Ministry of Health's National Medical Research Council Supervised: Yes, every 2 weeks visits were made and packets retrieved. Also asked mothers about compliance Compliance. All mothers reported that the infants consumed all of the packet. They also reported that the children were the only ones who received the supplement in almost all cases
Outcomes	Physical: Weight, length, HAZ, WAZ, WHZ
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Opaque envelopes shuffled and guardian was asked to choose 1
Allocation concealment (selection bias)	Low risk	Opaque envelopes shuffled and guardian was asked to choose 1
Baseline outcome measurements	Unclear risk	Weight, height, WAZ, HAZ, WHZ similar and non-significant differences
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	Number of drop outs not significantly different between groups

Mangani 2014 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not clear. Says that they did rotate outcome assessors so that they did not remember previous measurements
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not possible to blind participants
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Manjrekar 1986

Methods	Study date: 1986. Study design: CBA
Participants	Context: Low- and middle-income country: India. Mysore City in India for experimental food distribution centres SES: Control taken from a semi-urban village in the vicinity of Mysore city where socio-economic conditions were comparable to intervention group Nutritional status: Not clear Age: 0 - 5 years Number: Experimental = 72 (13 = < 1 year, 14 = 1 - 2 years, 10 = 2 - 3 years, 19 = 3 - 4 years, and 16 = 4 - 5 years), control = 51 (8 = < 1 year, 9 = 1 - 2 years, 10 = 2 - 3 years, 6 = 3 - 4 years, and 18 = 4 - 5 years) Sex: Both
Interventions	Intervention: Feeding only. Bread and 'Miltone', a groundnut protein-based milk substitute. Children received 2 slices of bread and 150 ml milk, infants received 1 slice of bread and 200 ml milk Energy: Child 250 kcal and infant 200 kcal. Given 6 days a week Duration: 18 months % DRI for energy: 6 - 12 months = 35.1%, 12 - 36 months = 28.8%, 36 - 48 months = 17.4%, 48 - 60 months = 16.5% % DRI for protein: Not enough information Control: Usual meals Provider: Government Supervised: In 2 centres the supplement was consumed under strict supervision at the centre. In the third centre, supplement was home-delivered 'On the spot' consumption was strictly supervised
Outcomes	Physical: Height and weight
Notes	Deworming, after stool examinations, was done at 6-monthly interval

Manjrekar 1986 *(Continued)*

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Low risk	No statistically significant difference was found between the initial and final measurements in the supplement and control children except between the weights of the children in the age group 4 - 5 years and this difference was in favour of the control group
Baseline characteristics	Unclear risk	Not mentioned
Incomplete outcome data (attrition bias) All outcomes	High risk	High drop-out rate in a longitudinal study was felt a serious set-back. With a turnover of 509 nutritionally assessed children, only 111 fulfilled the requisites till the final examination and still less for the follow-up of height and weight. The average attendance of the centres throughout the feeding period was 207. For a regular follow-up the control formed a still greater problem, since the children and their guardians were not motivated by regular food distribution and further prevented by superstitions, though medical care was given during the visit
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified in the study
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were aware that they were being fed
Protection from contamination	Low risk	Not specified in the study
Selective reporting (reporting bias)	Unclear risk	No protocol available

McKay 1978

Methods	Study date: 1978. Study design:Cluster-RCT. 6 different groups with different treatment times. T1a = 1 treatment of supplementation + stimulation, T1b = 1 treatment of supplementation + stimulation, but prior nutritional supplementation + health care, T2 = 2 treatments; T3 = 3 treatments; T4 = 4 treatments; and T0 = 0 treatments, but only measured at end. Sectors of the community were randomly chosen to be in each group. We compared T4 to T2 at 63 months before T2 receive supplementation
Participants	SES or context: Low- and middle-income country: Cali, Colombia. Low-income urban community Nutritional status: Subnormal (undernourished), except for T0 who were average Age: ~ 3 years Sex: Both

McKay 1978 *(Continued)*

	Number: T2 = 64, T4 = 62
Interventions	Intervention: Feeding + simulation for different lengths of time (Groups given above). Given as part of the programme in centres Energy: Enough for 3 times a day Duration: 3.5 years divided into 4 treatment periods of 9 months each % DRI for energy: 75% of the recommended calories % DRI for protein: 75% of the recommended protein Control: Compared T4 to T2 at age 63 months before the T2 began treatment Provider: Human Ecology Research Foundation Supervised: Yes, provided at the treatment centre Compliance: Yes, provided at the treatment centre. Attendance above 95% for all groups
Outcomes	Physical: Weight and length reported in Perez-Escamilla, WAZ, HAZ Psychological: Cognitive development
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Says randomised, but not clear how it was done
Allocation concealment (selection bias)	Unclear risk	Stratified according to initial height and weight and then randomised into groups
Baseline outcome measurements	Low risk	T4 and T2 the same on cognition
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	53 lost; 2 died and 51 moved out of area. This is out of a total of 301. They report that there were no initial differences between those who dropped out and those who remained
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Say specifically that outcome assessors were randomly assigned and that they were blinded to allocation
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants and people delivering the programme could not be blinded as they were getting fed and delivering the intervention
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Mittal 1980

Methods	Study date: 1980. Study design: CBA
Participants	SES or context: Low- and middle-income country: India. Single community block, low and insecure income, poor housing, and a general lack of 1 or more essential services (piped water, reliable electricity supply, sewage disposal) Age: 6 - 24 months, pregnant in the last trimester and lactating women in the first 6 months Sex: Both Number: Experimental = 201, control = 125
Interventions	Intervention: Feeding only. Take-home feeding. 55 g nutritional supplement in packets collected by mother or older sibling at a distribution point. Collected once weekly. Measuring cup provided Energy: 100 g of the supplement provided 14 g of protein and 360 kcal. Given once a day Duration: 12 months % DRI for energy: 6 - 11 months = 27.8%, 12 - 23 months = 22.8% % DRI for protein: 6 - 11 months = 88.35%, 12 - 23 months = 77.49%. Protein energy ratio 15.66 Control: Usual diet Provider: Government of India in collaboration with World Bank and the Swedish International Development Agency Supervised: Not mentioned Compliance: Collection rate of 75% weekly at 4 distribution points. But do not know whether the targeted children consumed them
Outcomes	Physical: Weight and length Time-points: Measured at baseline and end of study
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Low risk	Both these groups were comparable in all respects, including nutritional status (as reflected by lack of significant difference between their heights and weights at the beginning of the study)
Baseline characteristics	High risk	Different staff for nutrition component
Incomplete outcome data (attrition bias) All outcomes	High risk	High rate of dropout

Mittal 1980 *(Continued)*

Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not specified in the study
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants were aware of intervention
Protection from contamination	Unclear risk	Unit of allocation was children within a block that was divided into experimental and control zone
Selective reporting (reporting bias)	Unclear risk	No protocol available

Obatolu 2003

Methods	Study date: 2003. Study design: RCT. Individually randomised
Participants	SES or context: Low- and middle-income country: Nigeria. Low-income group had low and insecure income. Most parents had no formal education or only primary education Age: 4 months at baseline Number: Experimental = 30 in low-income feeding group; 15 boys and 15 girls. Control = 30 in low-income non-feeding group and 30 in high-income non-feeding group
Interventions	Intervention: Feeding only. Home-delivered. Seems like once a week. Pre-prepared gruel given to mothers to mix up. Instructions on how to prepare Energy: Not mentioned Duration: 14 months % DRI for energy: Not mentioned % DRI for protein: Not mentioned Control: No food provided Provider: International Development Research Centre, Canada Institute of Agricultural Research and Training, and International Institute of Tropical Agriculture Supervised: Not clear. Seems like once a week Compliance: Not clear. Nothing mentioned
Outcomes	Physical: Height and weight
Notes	Little information on implementation, especially on compliance and attrition

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Table of random numbers used after children were stratified. 15 boys and 15 girls

Obatolu 2003 *(Continued)*

Allocation concealment (selection bias)	Unclear risk	Nothing mentioned
Baseline outcome measurements	Low risk	Weight and length nearly identical
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Nothing mentioned about attrition. Said that 30 were selected in each group. Had end-of-study data for 30 in each group. But too much information is lacking to make a clear judgement
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Nothing mentioned about blinding at all. Participants must be aware of food being provided so we judged this as high risk
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Oelofse 2003

Methods	Study date: 2003. Study design: RCT. Feeding at home. Home-delivered
Participants	SES or context. Low- and middle-income country: South Africa. Urban disadvantaged black community, low SES indicated by type of housing, possession of household appliances, and access to basic amenities. Most of the inhabitants work in industries in the city or as domestic workers in private homes Nutritional status: Birth weight ≧ 2.5 kg Age: 6 months Sex: Both Number: Experimental = 25, control = 21 at 6 months. Experimental = 16, control = 14 at 12 months
Interventions	Intervention: Feeding only. Supplement of 60 g dry cereal. Enough for 1½ weeks delivered to home Mothers instructed on how to prepare Energy: 1304 kj, 12 g protein, and 6 g fat Intensity: Once daily Duration: 6 months % DRI for energy: 6 - 12 months 42% % DRI for protein: 6 - 12 months 137.69%. Protein energy ratio 15.4 Control: Usual diet

Oelofse 2003 *(Continued)*

	Provider: Researchers (Nutrition Intervention Unit, MRC South Africa) Supervised: Some supervision (research assistant visited once a week to check cereal consumption) Compliance: Not mentioned
Outcomes	Physical: Weight, length, WAZ, HAZ, WHZ
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Authors mentioned that children were randomly allocated but no explanation of how this was done
Allocation concealment (selection bias)	Unclear risk	Allocation method was not described
Baseline outcome measurements	Unclear risk	No significant difference on any outcome variable
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Lost 35% of study infants to follow-up. Reasons for 'default' were given and were plausible. Many moved out of the study area. It is unclear whether these reasons were the same for experimental and control groups
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Says research assistants conducted the test. Does not indicate if they were blinded
Blinding of participants and personnel (performance bias) All outcomes	High risk	Study participants and their mothers could not be blinded as they received supplements. Unlcear if personnel were blinded
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Pollitt 2000a

Methods	Study date: 2002. Study design: Cluster-RCT. Randomised by day care. 3 Groups: Condensed milk + micronutrient. (2 of each age cohort). Skimmed milk + micronutrient (2 of each age cohort). Skimmed milk + placebo (3 groups for 6 months each. One 12-month, one 18-month, one 24-month)
Participants	SES or context: Low- and middle-income country: Indonesia. Rural West Java. Children in government day care. Workers on tea plantation. Most were tea pickers; some were factory workers. A few had supplementary income. Income low; at time of study average was USD 68 - USD 83 a month. Parental education averaged 3 years. Most families were Sudanese Nutritional status: Length for age ≦1 SD below mean. WFA between -1 and -2 SD of median

Pollitt 2000a *(Continued)*

	Age: 2 cohorts. 12 and 18 months at enrolment Sex: Both Number: Experimental = 53 in 12-month cohort, 83 in 18-month cohort
Interventions	Intevention: Feeding only. 2 intervention groups (see above) Energy: E group: 1171 kj + 12 mg iron; M Group: 209 kj + 12 mg iron, or S group: 104 kj with placebo pill (no micro-nutrients). We compared E group to S group Duration: 12 months % DRI for energy: 6 - 12 months = 26.1%, 12 - 36 months = 21.4%, 36 - 48 months = 12.9%, 48 - 60 months = 12.3% % DRI for protein: Not enough information Control: Placebo Provider: Nestlé Foundation Supervised: Day-care workers Compliance: Given at day care
Outcomes	Physical: Weight Psychological: Standardised mental and cognitive assessment
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	By day care. Success was tested through inter-group comparisons
Allocation concealment (selection bias)	Unclear risk	Not mentioned
Baseline outcome measurements	Unclear risk	Means look the same for height and weight
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Difficult and complex to ascertain. No mention of attrition
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Tried to blind testers, but they noticed differences. However, they did switch testers around to avoid bias
Blinding of participants and personnel (performance bias) All outcomes	Low risk	Controls received skimmed milk and experimental received condensed with micronutrient, and they were on different plantations, so they probably did not notice

Pollitt 2000a *(Continued)*

Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Rivera 2004

Methods	Study date: 2004. Study design: Cross-over RCT
Participants	SES or context: Low- and middle-income country: Mexico. Participants were from low-income households in poor rural communities in 6 central Mexican states. Children and pregnant and lactating women in participating households received fortified nutrition supplements, and the families received nutrition education, health care, and cash transfers. Families enrolled in the programme (Progresa families) received 2 types of cash transfers every 2 months: A universal cash amount for all families and a specific cash transfer associated with school attendance Nutritional status: Included all children in communities Age: 12 months or younger at enrolment Number: 650 children (intervention group = 373, cross-over intervention group = 277)
Interventions	Intervention. Feeding +take-home rations + cash incentive for attending clinic. 240 g dry whole milk, sugar, maltodextrins, and micronutrient given in 3 flavours that required hydration before consumption. Packages were distributed at health centres. Mothers given instruction to add 4 spoons of boiled water to 1 ration. Families in program given incentives to attend health clinic Energy: 5 daily rations of 44 g provided 275 kcal/day and 10 g of protein, 6 g lipid Duration: 24 months % DRI for energy: 4 - 5 months = 38.7%, 6 - 12 months = 27.3% % DRI for protein: 4 - 5 months = 69.54%, 6 - 12 months = 66.55% Control: Cross-over intervention group Provider: National Institute of Public Health, Ministry of Health Supervised: Not mentioned Compliance: Not mentioned
Outcomes	Physical: Weight, height, WAZ, HAZ, WHZ, haemoglobin levels (anaemia)
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Does not say how randomisation was done
Allocation concealment (selection bias)	Unclear risk	No mention of how it was done or concealed

Rivera 2004 *(Continued)*

Baseline outcome measurements	Low risk	No significant differences between groups on any outcome variable
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Low risk	They were very clear about attrition rates. At the first follow-up 10% dropped out. Very little difference
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Low for anaemia; could not reasonably affect outcome. Unclear for growth
Blinding of participants and personnel (performance bias) All outcomes	High risk	Hard to blind. Mothers were given food packages at daycare, so judged as high risk of bias
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol
Other bias	High risk	There was some leakage. 10% of control communities got food

Roy 2005

Methods	Study date: 2005. Study design: RCT
Participants	SES or context. Low- and middle-income country: Chandpur, Bangladesh. Most of the children came from families of low SES Nutritional status: WAZ between 61% and 75% of median of the NCHS standard Age: 6 - 24 months Sex: Both Number: Supplementation + nutrition education = 94, nutrition education alone = 94, control = 94
Interventions	Intervention: Feeding: Food made of roasted and powdered rice and pulse, molasses, and oil. One group feeding + education, one group nut. education only, control group. We compared to both groups Energy: 300 kcal (8 - 9 g protein, 40 g rice, 20 g pulse, 10 g molasses, and 6 g oil) Intensity: Once a day for 6 days a week Duration: 3 months and followed up for 24 weeks % DRI for energy: 6 - 12 months = 42.1%, 12 - 24 months = 34.5% % DRI for protein: 6 - 12 months = 103.27%, 12 - 24 months = 90.57%. Protein energy ratio 12 Control: Regular diet and usual care Provider: Bangladesh Integrated Nutrition Project, Government of Bangladesh Supervised: Not mentioned

Roy 2005 *(Continued)*

	Compliance: Not mentioned
Outcomes	Physical: Weight and length
Notes	Mothers received intensive nutrition education on food security, caring practices, personal hygiene, and control for child nutrition. Intervention also included cooking demonstrations. Focus group discussions on mothers' perception of child feeding practices, food taboos, and health-seeking behaviour during illnesses

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Random number table
Allocation concealment (selection bias)	Unclear risk	No report of how this was done
Baseline outcome measurements	Unclear risk	No significant differences in outcome measures at baseline
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	Reported numbers only at beginning of study
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Hard to blind as participants know what they received and as personnel needed to know too
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Santos 2005

Methods	Study date: 2005. Study Design: CBA
Participants	SES or context: Low- and middle-income country: Brazil. 20 municipalities in the State of Alagoas Nutritional status: Below 10th percentile of WFA Age: 6 - 18 months Sex: Both Number: 191. Experimental = 99, control = 92

Santos 2005 *(Continued)*

Interventions	Intervention: Feeding + take-home supplements. Milk powder and cooking oil to be added to prepared milk. MIlk to be distributed to other children < 5 to avoid redistribution. Supplement delivered to mothers at healthcare centres once a week. Take-home rations. Mothers had to prepare them Energy: Supposed to be 60% of RDI Duration: 6 months % DRI for energy: 60% of the recommended calories % DRI for protein: 100% of the recommended protein Control: no feeding. Deworming given to both groups Provider: Brazilian government Supervised: Does not seem like there was much at all. A great deal of leakage Compliance: Reported that only 32.5% of children received the full supplement; for the others, it was shared between 1 and 3 other children and 1 and 2 other adults. Furthermore, 63.2% of the mothers did not add the oil to the supplement as directed, but rather used it for cooking family meals
Outcomes	Physical: Weight, length, WAZ, HAZ, WHZ
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non randomised study
Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	Low risk	No significant differences in outcome measures at baseline
Baseline characteristics	Low risk	No significant differences in outcome measures
Incomplete outcome data (attrition bias) All outcomes	Low risk	To prevent the effect of misclassification error, 28 children were excluded for being above the 10th percentile of the weight-for-age index at enrolment (15 supplemented and 13 non-supplemented). Analyses were restricted to 191 children who met the inclusion criterion satisfactorily. From the first to the second visit, 17 children were lost (6 supplemented and 11 controls), mainly due to change of address to a different city. 2 children died, both in the supplemented group. No migration from control to intervention group occurred during the study
Blinding of outcome assessment (detection bias) All outcomes	High risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants aware of intervention

Santos 2005 *(Continued)*

Protection from contamination	High risk	Gaps in delivery were reported by nearly 50.0% of the mothers, thereby preventing their full access to the Program. Regarding utilization, it was clear at the second visit that the mean intake of calories (270kcal/d) and nutrients (14.7g protein, 524.4g calcium, 0.26mg iron, 1.87mg zinc, and 179mg retinol) from milk were considerably lower than the amount made available from the supplement, indicating major under-utilization by beneficiary children
Selective reporting (reporting bias)	Unclear risk	No protocol available

Schroeder 2002

Methods	Study date: 2002. Study design: Cluster-CBA. Was RCT, but added 41 children
Participants	SES or context: Low- and middle-income country: Vietnam. 12 rural communes Nutritional status: Between -2 and -3 SD on WAZ; some nearer to normal Age: 5 months - 30 months on entry Sex: Both Number: 238 at entry. Experimental = 119, control = 119. At month 6, experimental = 114, control = 118
Interventions	Intervention: Feeding + nutrition education on positive deviant practices (behaviours used by families whose children grow well despite economic poverty). All children in both groups de-wormed. Breastfeeding in addition to positive deviant local foods. Common local sources of protein, tofu, fish oil, etc. Caregivers prepared foods at health centres. Sounds like they prepared it in rotation Energy: 300 kcal Intensity: ONLY 12 days a month, but all day. 1 full meal Duration: 12 months. Data in meta-analysis is from 6-month follow-up % DRI for energy: Not enough information % DRI for protein: Not enough information Control: No feeding. Dewormed Provider: Partnership between federal government, Save the Children and USAID linkages. But mothers asked to bring a handful of positive deviant foods Supervised: Mothers and children attended health centres all day. Sounds like pretty strict supervision, but not clear that intake was monitored
Outcomes	Physical: WAZ, HAZ, WHZ
Notes	Seems like quite a good programme, but it was limited to every other day. The method was based on local behaviours that resulted in good child development. However, it is difficult to determine how randomisation and child selection were done

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	High risk	Non randomised study

Schroeder 2002 *(Continued)*

Allocation concealment (selection bias)	High risk	Non randomised study
Baseline outcome measurements	High risk	Despite matching of communes and random selection, the intervention families were somewhat better off on a number of characteristics, although this differential only reached statistical significance for child wasting
Baseline characteristics	Low risk	The field workers and supervisors, affiliated with the Research and Training Center for Community Development (RTCCD) in Hanoi, were bachelor's level physicians and sociologists with previous health data collection experience in rural Vietnam. Every evening, the field workers reviewed forms for completeness and accuracy. Supervisors reviewed all forms and discussed any discrepancies. If necessary and logistically feasible, households were revisited to reconcile these discrepancies
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	241 children were enrolled in the study at baseline, including 2 children younger than 5 months and 2 children older than 25 months who were excluded from these analyses (table 1). At month 6, there were a total of 232 children with complete data
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Because participants, personnel, and parents couldn't be blinded as children received food
Protection from contamination	Unclear risk	Participants were randomised by commune and they were chosen to be non-contiguous. But only half of participants attended and feeding was only 12 days a month
Selective reporting (reporting bias)	Unclear risk	No protocol available

Simondon 1996

Methods	Study date: 1996. Study design: RCT. All babies born in selected hospital in 4 countries during certain time. Not cluster
Participants	SES or context: Low- and middle-income country. 4 areas in Central (peri-urban) and West Africa (poor rural area), South America (peri-urban), and the South Pacific (farming community) Nutritional status at baseline: HAZ ≧ -2.5 SD, WHZ ≧ -2 SD Age: 4 months Sex: Both Number: Congo: experimental = 74 (53 completed) and control = 74 (67 completed). Senegal: experimental = 66 (53 completed) and control = 68 (57 completed). Bolivia: experimental = 78 (65 completed) and control = 82 (62 completed). New Caledonia: experimental = 63 (43 completed) and control = 53 (47 completed)

Simondon 1996 *(Continued)*

Interventions	Intervention: Feeding only. Ready-to-use supplement (precooked wheat, maize, millet, soybean flour, milk powder, soybean oil, palm oil, and sugar, enriched with minerals and vitamins). Supplements taken home and feeding observed Energy: 4 - 5 months 103 kcal/meal, and at 5 - 7 months 205 kcal/ meal Intensity: twice daily for 7 days/week (1st meal at 0800 - 1100; 2nd meal at 1500 - 1900) Duration: 12 - 13 weeks % DRI for energy: 4 - 5 months = 20.6%, 5 - 7 months = 28.8% % DRI for protein: 4 - 5 months = 26.98%, 5 - 7 months = 51.64%. Protein energy ratio 8.74 and 8.78 respectively Control: Usual diet Provider: Grant from French Ministry of Research Supervised: Female field workers assigned to 7 families each and visited daily for preparation and consumption of supplement Compliance: Female field workers assigned to 7 families each and visited daily for preparation and consumption of supplement
Outcomes	Physical: Weight and length
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Low risk	Said that randomisation was accomplished by drawing lots
Allocation concealment (selection bias)	Low risk	With drawing lots, it is unlikely that researchers or participants could have foreseen who was going to be drawn
Baseline outcome measurements	Low risk	No significant differences at baseline on outcome measures
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	High risk	In Congo, Senegal, and New Caledonia, far more families in the experimental group dropped out due to refusal. In Bolivia, it was the opposite. The authors say that the baseline statistics were no different for those who dropped out and for those who stayed
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	This is not stated anywhere in the article
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants' parents were aware of their status, as their children were given supplements. It is unlikely that this affected performance. Study personnel were probably also aware
Protection from contamination	Unclear risk	Not applicable

Simondon 1996 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	No access to protocol

Thakwalakwa 2010

Methods	Study date: 2010. Study design: RCT. Three groups: Lipid nutrient supplement (LNS), Corn-Soy Blend (CSB).
Participants	SES or context: Low- and middle-income country: Malawi. Small African farming community. Underweight is very common, and study conducted during growing season when food levels are low Nutritional status: WAZ < -2 SD Age: 6 - 15 months Sex: Both Number: Control = 59, LNS = 66, CBS = 67
Interventions	Intervention: Feeding ONLY: 43 g LNS (peanut paste (26%), dried skimmed milk (25%), vegetable oil (20%), icing sugar (27.5%), and a pre-made mineral and vitamin mix (1.5%) from Nutriset) or 71 g CSB Energy: 921 kj (10.4 g protein) or 1189 kj (6.0 g protein) Intensity: Twice daily. Food delivered to their homes Duration: 12 weeks % DRI for energy: 6 - 12 months LNS = 39.9%, CBS = 30.9%, 12 - 15 months LNS = 32.7%, CBS = 25.4% % DRI for protein: 6 - 12 months LNS = 68.85%, CBS 68.58%, 12 - 15 months LNS = 119.33%, CBS = 118.86%. Protein energy ratio LNS 8.44 and CBS 18.88 Control: Usual diet and breastfeeding Provider: Academy of Finland, stipends for researchers provided by Nestlé Supervised: Weekly home visits by trained research assistants Compliance: Not mentioned
Outcomes	Physical: Head circumference, mid-upper arm circumference, weight, length, WAZ, HAZ, WHZ
Notes	

Risk of bias

Bias	**Authors' judgement**	**Support for judgement**
Random sequence generation (selection bias)	Low risk	Had opaque envelopes in a cabinet. Then guardian picked an envelope
Allocation concealment (selection bias)	Low risk	Envelopes were opaque. Kept in a cabinet until they were selected by guardians
Baseline outcome measurements	Low risk	No significant differences in outcome measures at baseline
Baseline characteristics	Unclear risk	Not applicable

Thakwalakwa 2010 *(Continued)*

Incomplete outcome data (attrition bias) All outcomes	Low risk	188 out of 192 completed the trial (98%). No differences between groups
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Research assistants who assessed weight and height were blinded to allocation
Blinding of participants and personnel (performance bias) All outcomes	High risk	Participants could not be blinded. However, investigator was blinded
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Tomedi 2012

Methods	Study date: 2012. Study design: Quasi-experimental design. Cluster controlled cohort. 20 villages intervention and 20 villages control
Participants	SES or context: Low- and middle-income country: Rural Kenya. Subsistence farmers who rely on rain-fed agriculture (maize and beans as staple foods as well as cowpeas and pigeon peas). Small-scale horticulture and animal husbandry are also practised. 23.9% unemployment in household. 98.1% and 96.6% of the caregivers attended school and had 7.8 years and 8.0 years of school in intervention and control areas, respectively Nutritional status: All children with WHZ ≧ -2 at baseline. Average WAZ was -0.51 and -0.37 Average HAZ was -1.23 and -1.21 Age: 6 - 20 months Sex: Both Number: Experimental = 139, control = 147
Interventions	Intervention: Feeding: Monthly rations given to family for child and the rest of family. Millet (150 g), pigeon peas (25 g), milk (125 g), eggs (50 g), vegetable oil (10 g), mango (100 g), and sugar (15 g) Energy: 4058 kj Intensity: Monthly but no information on time of day Duration: 7 months % DRI for energy: 6 - 12 months = 136.2%, 12 - 24 months = 111.7% % DRI for protein: Inestimable in all groups Control: Usual diet Provider: Global Health Partnership Supervised: Workers visited monthly

Tomedi 2012 *(Continued)*

	Compliance: Caregiver reported that the index child was given at least 50% of the food. The index child was the only person in the household consuming the milk 79% of the time and the only person consuming eggs 78% of the time Intervention included education session on appropriate complementary feeding and hygiene
Outcomes	Physical: Weight, length, WAZ, HAZ, WHZ
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	High risk	Non-randomised
Allocation concealment (selection bias)	High risk	Non-randomised
Baseline outcome measurements	Low risk	No significant differences in outcome measures at baseline
Baseline characteristics	Low risk	Both sub-locations are governed by the same local chief and have community health workers (CHW) who participate in the screening of the households with children under 5 years of age for acute malnutrition
Incomplete outcome data (attrition bias) All outcomes	Low risk	For the children who were lost to follow-up, there were no significant differences in anthropometric measurements at baseline between those in the intervention group and those in the non-intervention group
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Parents, children, and personnel not blinded to the fact that children were being fed
Protection from contamination	Low risk	Allocated by village. Food was given at home so unlikely that it was shared between villages
Selective reporting (reporting bias)	Unclear risk	No protocol available

Waber 1981

Methods	Study date: 1981. RCT. Different arms. A = control, A1 = maternal education only, B = fed from 6 months, B1 = fed + maternal education from 6 months, D = mothers fed from third trimester
Participants	SES or context: Low- and middle-income country: Southern slums in Bogata, Colombia Nutritional status: Half of children in family below 85% percentile for weight Age: 6 months - 3 years

Waber 1981 *(Continued)*

	Sex: Approximately equal in both groups Number: 433
Interventions	Intervention: Feeding: Enriched bread, dry skimmed milk, and cooking oil for entire family. Index child given dry skimmed milk, high protein vegetable mixture, and ferrous sulcate. Supplements delivered in store-like atmosphere once a week Maternal education. Trained home visitors worked directly with the children and trained mothers to become more responsive Energy: 623 kcal per day. 30 g protein Duration: 32 months % DRI for energy: Not enough information % DRI for protein: Not enough information Control: Home-feeding as usual, or education Provider: Not clear Supervised: Not clear. However, home visitors worked with children and educated mothers Compliance: Not mentioned
Outcomes	Psychological: Griffiths Mental Development Scales and Einsten IQ test
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Simply noted that study was randomised
Allocation concealment (selection bias)	Unclear risk	No detail
Baseline outcome measurements	Unclear risk	No significance given
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	Unclear risk	433 started trial; 318 reported. Does not say who or why
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Training mentioned, blinding not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Blinding not possible for participants
Protection from contamination	Unclear risk	Not applicable

Waber 1981 *(Continued)*

Selective reporting (reporting bias)	Unclear risk	No access to protocol

Yeung 2000

Methods	Study date: 2000. Study design: RCT
Participants	SES or context: High-income country: Toronto, Canada. Urban community, maternal education level: 51% primary or secondary school, 28.7% college, 20.2% university Nutritional status: Not stated Age: 6 months Sex: Both Number: Experimental = 49, control = 52
Interventions	Intervention: Feeding: Puréed meat, iron-fortified infant cereal, and whole cow's milk Energy: Not stated Intensity: Not stated Duration: 6 months % DRI for energy: Neither energy nor protein was provided % DRI for protein: Neither energy nor protein was provided Control: Usual diet Provider: Dairy farmers of Ontarario and the Ministry of Agriculture, Food and Rural Affairs Ontario Supervised: Monthly compliance questionnaire administered by trained nurses Compliance: Families of 6 infants were non-compliant with intervention
Outcomes	Physical: Head circumference, weight, and length
Notes	

Risk of bias

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Does not say how randomisation was done
Allocation concealment (selection bias)	Unclear risk	Does not say how randomisation was done
Baseline outcome measurements	Low risk	No significant differences in outcome measures at baseline
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias)	Unclear risk	Reported well, and same reasons for dropping out, but significantly higher numbers in intervention

Yeung 2000 *(Continued)*

All outcomes		
Blinding of outcome assessment (detection bias) All outcomes	Low risk	Low risk for blood tests
Blinding of participants and personnel (performance bias) All outcomes	High risk	Parents knew that they got coupons for the food
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

Ziegler 2009

Methods	Study date: 2009. Study design: Prospective, randomised, open-label trial
Participants	SES or context: High-income country. Predominantly white population (< 10% African American, Asian, and Hispanic), middle-income community Nutritional status: Birth weight > 2500 g Age: Enrolment 1 month but intervention at 4 months Sex: Both Number: Iron in medicine = 48, iron in cereal = 45, control = 59
Interventions	Intervention: Feeding: 113 g wet ration fruit cereal, rice cereal with applesauce, mixed cereal with applesauce and bananas, and oatmeal with applesauce and bananas (Gerber Products Company) Energy: Not mentioned Intensity: Once daily Duration: 20 weeks % RDA for energy: 6 - 12 months inestimable % DRI for protein: 6 - 12 months inestimable Control: Usual diet and breastfeeding Provider: NIH, Gerber Products Company, and Mead Johnson Supervised: Monthly visits to lab Compliance: Empty containers collected at the time of visit
Outcomes	Physical: Weight and length
Notes	No information on energy content of supplement provided
Risk of bias	

Ziegler 2009 *(Continued)*

Bias	Authors' judgement	Support for judgement
Random sequence generation (selection bias)	Unclear risk	Open-label
Allocation concealment (selection bias)	Unclear risk	Open-label
Baseline outcome measurements	Unclear risk	No significant differences in outcome measures at baseline
Baseline characteristics	Unclear risk	Not applicable
Incomplete outcome data (attrition bias) All outcomes	High risk	Not much attrition, but it was related to side effects of the iron
Blinding of outcome assessment (detection bias) All outcomes	Unclear risk	Not mentioned
Blinding of participants and personnel (performance bias) All outcomes	High risk	Not mentioned. Seems that parents could not be blinded. Not sure about study personnel
Protection from contamination	Unclear risk	Not applicable
Selective reporting (reporting bias)	Unclear risk	No access to protocol

ANP - advanced nutrition programme
AVG. - average
BMI - body mass index
CBA - controlled before-and-after
CBS - corn-soy blend
CHW - community health worker
DRA - daily recommended amounts
DRI - daily recommended intake
FAO - Food and Agriculture Organization
HAZ - height-for-age z-scores
LAZ - length-for-age z-scores
LNS - lipid-based nutrient supplement
LSE - low socio-economic status
MDI - mental development index
MRC - Medical Research Council
MSE - middle socio-economic status
MSF - Médecins Sans Frontières
NCHS - National Center for Health Statistics
NIH - National Institutes of Health
PDI - psychomotor development index
RCT - randomised controlled trial
RUTF - ready-to-use therapeutic foods
SD - standard deviation
SES - socio-economic status
UNICEF - United Nations Children's Fund
USD - United States dollars

USDA - United States Department of Agriculture
VS. - versus
WAZ - weight-for-age z-scores
WFA - weight for age
WHO - World Health Organization
WHZ - weight-for-height z-scores

Characteristics of excluded studies *[ordered by study ID]*

Study	Reason for exclusion
Baertl 1970	Did not follow specific children. Survey of whole population before and after
Das Gupta 2005	Did not follow specific children. Based on survey data
Gartner 2007	Did not follow specific children. Survey of whole population before and after
Hanafy 1967	All groups received feeding
Hicks 1982	Intervention included supplementation for mothers prior to birth of child. Also, no appropriate control group
Hillis 1992	No clear starting point of feeding and entry into day care. Children could have been in day care for a long time. No information on food supplement
Huybregts 2012	Children were given RUTF in addition to a general food distribution programme
Khan 2011	Supplemented mothers prenatally
Leroy 2008	Control group not appropriate. They were the children of eligible families who opted not to take part in the Opportunades programme
Matilsky 2009	All groups were fed
Meller 2012	Inappropriate control group. Regression discontinuity design
Mora 1981	Subset of McKay 1978, but only reported on the children whose mothers were supplemented before birth. In addition, children included were older than 5 years of age with no disaggregated data presented
Rivera 1991	The INCAP study in Guatemala. Some were supplemented prenatally, some were supplemented from birth
Rosado 2010	Control groups received more than 100 kcal
Van Hoan 2009	No primary or secondary outcome of interest. Focused on energy intake and the effect on breastfeeding
Vermeersch 2004	Did not follow same children. Examined test scores in schools

INCAP - Institute of Nutrition of Central America and Panama
RUTF - ready-to-use therapeutic food

Characteristics of studies awaiting assessment *[ordered by study ID]*

He 2005

Methods	Chose 7 schools, randomly divided all kindergarten children into yogurt supplementation and control group. One page of the methods is blank, as are some results tables
Participants	402 preschool children
Interventions	Yogurt supplementation with 125 g of yogurt 5 days a week
Outcomes	Height, weight
Notes	

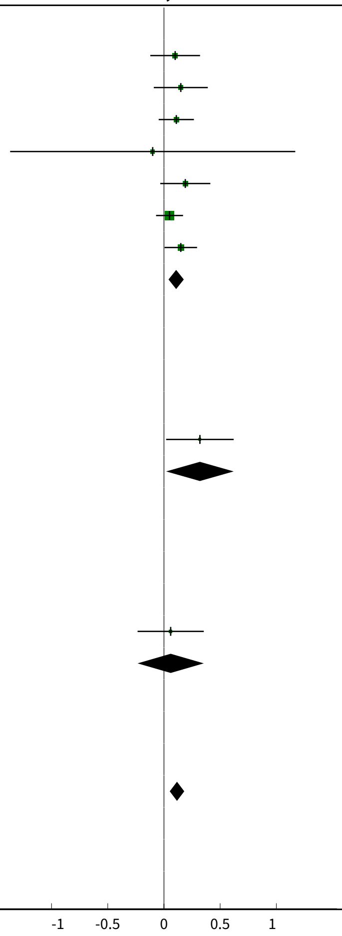
DATA AND ANALYSES

Comparison 1. Low- and middle-income countries: feeding vs control - growth. RCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Weight gain	9	1057	Mean Difference (IV, Random, 95% CI)	0.12 [0.05, 0.18]
1.1 Subgroup analysis by age: < 12 months	7	910	Mean Difference (IV, Random, 95% CI)	0.11 [0.04, 0.18]
1.2 Subgroup analysis by age: 1 - 2 years	1	65	Mean Difference (IV, Random, 95% CI)	0.32 [0.02, 0.62]
1.3 Subgroup analysis by age: > 2 years	1	82	Mean Difference (IV, Random, 95% CI)	0.06 [-0.23, 0.35]
2 Height gain	9	1463	Mean Difference (IV, Random, 95% CI)	0.27 [0.07, 0.48]
2.1 Subgroup analysis by age: < 12 months	7	1316	Mean Difference (IV, Random, 95% CI)	0.22 [0.05, 0.39]
2.2 Subgroup analysis by age: 1 - 2 years	1	65	Mean Difference (IV, Random, 95% CI)	0.90 [0.33, 1.47]
2.3 Subgroup analysis by age: > 2 years	1	82	Mean Difference (IV, Random, 95% CI)	-0.5 [-1.97, 0.97]
3 Weight-for-age z-scores (WAZ)	8	1565	Mean Difference (IV, Random, 95% CI)	0.15 [0.05, 0.24]
4 Height-for-age z-scores (HAZ)	9	4544	Mean Difference (IV, Random, 95% CI)	0.15 [0.06, 0.24]
5 Weight-for-height z-scores (WHZ)	7	4073	Mean Difference (IV, Random, 95% CI)	0.10 [-0.02, 0.22]

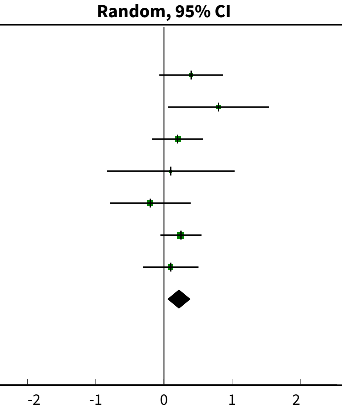
Analysis 1.1. Comparison 1 Low- and middle-income countries: feeding vs control - growth. RCT, Outcome 1 Weight gain.

Study or subgroup	Feeding N	Feeding Mean(SD)	No feeding N	No feeding Mean(SD)	Weight	Mean Difference Random, 95% CI
1.1.1 Subgroup analysis by age: < 12 months						
Bhandari 2001	87	2.1 (0.8)	93	2 (0.7)	8.55%	0.1[-0.12,0.32]
Kuusipalo 2006	18	0.7 (0.4)	18	0.5 (0.3)	7.25%	0.15[-0.09,0.39]
Mangani 2014	191	2.5 (0.8)	185	2.4 (0.8)	17.05%	0.11[-0.05,0.27]
Oelofse 2003	16	2 (1.2)	14	2.1 (2.2)	0.26%	-0.1[-1.37,1.17]
Pollitt 2000a	17	0.8 (0.3)	20	0.6 (0.4)	8.43%	0.19[-0.03,0.41]
Simondon 1996	65	1.3 (0.3)	62	1.3 (0.4)	29.03%	0.05[-0.07,0.17]
Thakwalakwa 2010	66	0.6 (0.5)	58	0.5 (0.4)	19.96%	0.15[0.01,0.29]
Subtotal ***	**460**		**450**		**90.54%**	**0.11[0.04,0.18]**
Heterogeneity: Tau²=0; Chi²=1.97, df=6(P=0.92); I²=0%						
Test for overall effect: Z=3.13(P=0)						
1.1.2 Subgroup analysis by age: 1 - 2 years						
Grantham-McGregor 1991	32	2.6 (0.7)	33	2.2 (0.5)	4.64%	0.32[0.02,0.62]
Subtotal ***	**32**		**33**		**4.64%**	**0.32[0.02,0.62]**
Heterogeneity: Not applicable						
Test for overall effect: Z=2.09(P=0.04)						
1.1.3 Subgroup analysis by age: > 2 years						
Heikens 1989	39	1.6 (0.7)	43	1.5 (0.7)	4.83%	0.06[-0.23,0.35]
Subtotal ***	**39**		**43**		**4.83%**	**0.06[-0.23,0.35]**
Heterogeneity: Not applicable						
Test for overall effect: Z=0.4(P=0.69)						
Total ***	**531**		**526**		**100%**	**0.12[0.05,0.18]**
Heterogeneity: Tau²=0; Chi²=3.92, df=8(P=0.86); I²=0%						
Test for overall effect: Z=3.52(P=0)						
Test for subgroup differences: Chi²=1.95, df=1 (P=0.38), I²=0%						



Analysis 1.2. Comparison 1 Low- and middle-income countries: feeding vs control - growth. RCT, Outcome 2 Height gain.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
1.2.1 Subgroup analysis by age: < 12 months						
Bhandari 2001	87	10.3 (1.6)	93	9.9 (1.6)	13.19%	0.4[-0.07,0.87]
Kuusipalo 2006	18	2.5 (0.9)	18	1.7 (1.3)	6.58%	0.8[0.06,1.54]
Mangani 2014	188	13.2 (1.7)	185	13 (2)	17.26%	0.2[-0.18,0.58]
Oelofse 2003	16	10 (0.8)	14	9.9 (1.6)	4.35%	0.1[-0.84,1.04]
Rivera 2004	261	14.3 (3.3)	185	14.5 (3)	9.37%	-0.2[-0.79,0.39]
Simondon 1996	65	4.9 (0.8)	62	4.6 (0.9)	21.75%	0.25[-0.05,0.55]
Thakwalakwa 2010	66	3.4 (1.1)	58	3.3 (1.2)	15.76%	0.1[-0.31,0.51]
Subtotal ***	**701**		**615**		**88.26%**	**0.22[0.05,0.39]**
Heterogeneity: Tau²=0; Chi²=5.31, df=6(P=0.5); I²=0%						
Test for overall effect: Z=2.54(P=0.01)						



Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
1.2.2 Subgroup analysis by age: 1 - 2 years							
Grantham-McGregor 1991	32	11.6 (1.3)	33	10.7 (1.1)		9.86%	0.9[0.33,1.47]
Subtotal ***	**32**		**33**			**9.86%**	**0.9[0.33,1.47]**
Heterogeneity: Not applicable							
Test for overall effect: Z=3.08(P=0)							
1.2.3 Subgroup analysis by age: > 2 years							
Heikens 1989	39	2.7 (3.4)	43	3.2 (3.4)		1.88%	-0.5[-1.97,0.97]
Subtotal ***	**39**		**43**			**1.88%**	**-0.5[-1.97,0.97]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.67(P=0.51)							
Total ***	**772**		**691**			**100%**	**0.27[0.07,0.48]**
Heterogeneity: Tau²=0.03; Chi²=11.33, df=8(P=0.18); I²=29.38%							
Test for overall effect: Z=2.6(P=0.01)							
Test for subgroup differences: Chi²=6.01, df=1 (P=0.05), I²=66.74%							

Favours no feeding -2 -1 0 1 2 Favours feeding

Analysis 1.3. Comparison 1 Low- and middle-income countries: feeding vs control - growth. RCT, Outcome 3 Weight-for-age z-scores (WAZ).

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Oelofse 2003	16	1.3 (0.5)	14	1 (0.7)		3.8%	0.28[-0.17,0.73]
Thakwalakwa 2010	66	0 (1.1)	59	0.3 (0.5)		7.21%	-0.3[-0.6,0]
Kuusipalo 2006	18	0.2 (0.4)	18	0 (0.3)		10.42%	0.2[-0.03,0.43]
Husaini 1991	75	0.3 (0.5)	38	0 (0.5)		13.47%	0.28[0.1,0.46]
McKay 1978	57	0.2 (0.5)	53	-0 (0.4)		14.75%	0.27[0.11,0.43]
Rivera 2004	276	-0.7 (0.8)	184	-0.9 (0.9)		15.16%	0.16[0,0.32]
Mangani 2014	191	-0.2 (0.8)	185	-0.3 (0.7)		15.72%	0.09[-0.06,0.24]
Iannotti 2014	159	-0 (0.5)	156	-0.1 (0.5)		19.46%	0.1[-0.01,0.21]
Total ***	**858**		**707**			**100%**	**0.15[0.05,0.24]**
Heterogeneity: Tau²=0.01; Chi²=14.68, df=7(P=0.04); I²=52.31%							
Test for overall effect: Z=3.01(P=0)							

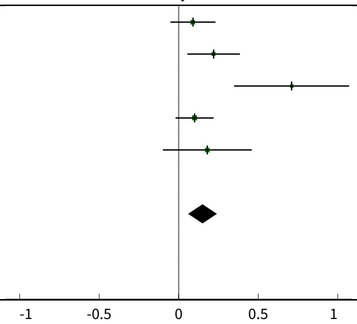
Favours no feeding -0.5 -0.25 0 0.25 0.5 Favours feeding

Analysis 1.4. Comparison 1 Low- and middle-income countries: feeding vs control - growth. RCT, Outcome 4 Height-for-age z-scores (HAZ).

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Husaini 1991	75	0.2 (0.6)	35	-0.1 (0.6)		9.05%	0.26[0.04,0.48]
Iannotti 2014	159	-0.3 (0.5)	156	-0.3 (0.6)		14.84%	-0.02[-0.14,0.1]
Isanaka 2009	1436	0 (1.4)	1564	-0 (1.4)		16.13%	0.06[-0.04,0.16]
Kuusipalo 2006	18	-0 (0.4)	18	-0.3 (0.4)		7.85%	0.25[-0,0.5]

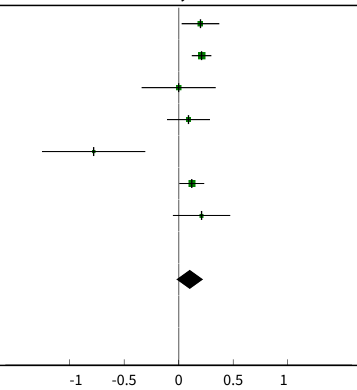
Favours no feeding -1 -0.5 0 0.5 1 Favours feeding

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Mangani 2014	191	-0.2 (0.7)	185	-0.3 (0.7)		13.48%	0.09[-0.05,0.23]
McKay 1978	57	0.1 (0.4)	53	-0.1 (0.5)		12.06%	0.22[0.05,0.39]
Oelofse 2003	16	0.6 (0.5)	14	-0.1 (0.5)		4.78%	0.71[0.35,1.07]
Rivera 2004	258	-0.9 (0.6)	184	-1 (0.7)		14.9%	0.1[-0.02,0.22]
Thakwalakwa 2010	66	0.3 (1.1)	59	0.1 (0.4)		6.9%	0.18[-0.1,0.46]
Total ***	**2276**		**2268**			**100%**	**0.15[0.06,0.24]**
Heterogeneity: Tau²=0.01; Chi²=20.96, df=8(P=0.01); I²=61.83%							
Test for overall effect: Z=3.24(P=0)							



Analysis 1.5. Comparison 1 Low- and middle-income countries: feeding vs control - growth. RCT, Outcome 5 Weight-for-height z-scores (WHZ).

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Grantham-McGregor 1991	32	0.2 (0.4)	33	0 (0.4)		16.72%	0.2[0.03,0.37]
Isanaka 2009	1436	-0.5 (1.3)	1564	-0.7 (1.2)		22.06%	0.21[0.12,0.3]
Kuusipalo 2006	18	0.1 (0.5)	18	0.1 (0.5)		8.56%	0[-0.34,0.34]
Mangani 2014	191	-0.6 (1)	185	-0.7 (0.9)		15.19%	0.09[-0.11,0.29]
Oelofse 2003	16	-1.5 (0.5)	14	-0.7 (0.8)		5.28%	-0.78[-1.25,-0.31]
Rivera 2004	257	-0.3 (0.7)	184	-0.4 (0.6)		20.54%	0.12[0.01,0.23]
Thakwalakwa 2010	66	-0.3 (0.8)	59	-0.5 (0.7)		11.63%	0.21[-0.05,0.47]
Total ***	**2016**		**2057**			**100%**	**0.1[-0.02,0.22]**
Heterogeneity: Tau²=0.02; Chi²=18.39, df=6(P=0.01); I²=67.38%							
Test for overall effect: Z=1.62(P=0.11)							



Comparison 2. Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control - growth. RCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Weight gain	9	1057	Mean Difference (IV, Random, 95% CI)	0.12 [0.05, 0.18]
1.1 Subgroup analysis by age: < 12 months	7	910	Mean Difference (IV, Random, 95% CI)	0.11 [0.04, 0.18]
1.2 Subgroup analysis by age: 1 - 2 years	1	65	Mean Difference (IV, Random, 95% CI)	0.32 [0.02, 0.62]
1.3 Subgroup analysis by age: > 2 years	1	82	Mean Difference (IV, Random, 95% CI)	0.06 [-0.23, 0.35]
2 WAZ scores	8	1565	Mean Difference (IV, Random, 95% CI)	0.15 [0.08, 0.23]
3 HAZ scores	9	4544	Mean Difference (IV, Random, 95% CI)	0.14 [0.05, 0.24]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4 WHZ scores	7	4073	Mean Difference (IV, Random, 95% CI)	0.10 [-0.02, 0.22]

Analysis 2.1. Comparison 2 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control - growth. RCT, Outcome 1 Weight gain.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
2.1.1 Subgroup analysis by age: < 12 months							
Bhandari 2001	87	2.1 (0.8)	93	2 (0.7)		8.64%	0.1[-0.12,0.32]
Kuusipalo 2006	18	0.7 (0.4)	18	0.5 (0.3)		7.56%	0.2[-0.04,0.44]
Mangani 2014	191	2.5 (0.8)	185	2.4 (0.8)		17.24%	0.09[-0.07,0.25]
Oelofse 2003	16	2 (1.2)	14	2.1 (2.2)		0.26%	-0.1[-1.37,1.17]
Pollitt 2000a	17	0.8 (0.4)	20	0.6 (0.4)		7.23%	0.19[-0.05,0.43]
Simondon 1996	65	1.3 (0.3)	62	1.3 (0.4)		29.34%	0.05[-0.07,0.17]
Thakwalakwa 2010	66	0.6 (0.5)	58	0.5 (0.4)		20.17%	0.15[0.01,0.29]
Subtotal ***	**460**		**450**			**90.44%**	**0.11[0.04,0.18]**
Heterogeneity: Tau²=0; Chi²=2.4, df=6(P=0.88); I²=0%							
Test for overall effect: Z=3.09(P=0)							
2.1.2 Subgroup analysis by age: 1 - 2 years							
Grantham-McGregor 1991	32	2.6 (0.7)	33	2.2 (0.5)		4.69%	0.32[0.02,0.62]
Subtotal ***	**32**		**33**			**4.69%**	**0.32[0.02,0.62]**
Heterogeneity: Not applicable							
Test for overall effect: Z=2.09(P=0.04)							
2.1.3 Subgroup analysis by age: > 2 years							
Heikens 1989	39	1.6 (0.7)	43	1.5 (0.7)		4.88%	0.06[-0.23,0.35]
Subtotal ***	**39**		**43**			**4.88%**	**0.06[-0.23,0.35]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.4(P=0.69)							
Total ***	**531**		**526**			**100%**	**0.12[0.05,0.18]**
Heterogeneity: Tau²=0; Chi²=4.36, df=8(P=0.82); I²=0%							
Test for overall effect: Z=3.48(P=0)							
Test for subgroup differences: Chi²=1.96, df=1 (P=0.37), I²=0%							

Favours no feeding -1 -0.5 0 0.5 1 Favours feeding

Analysis 2.2. Comparison 2 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control - growth. RCT, Outcome 2 WAZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Oelofse 2003	16	-1.3 (0.5)	14	-1 (0.7)		2.77%	-0.28[-0.73,0.17]
Mangani 2014	191	-0.2 (0.8)	185	-0.3 (0.7)		17.86%	0.09[-0.06,0.24]
Iannotti 2014	159	-0 (0.5)	156	-0.1 (0.5)		26.81%	0.1[-0.01,0.21]
Rivera 2004	276	-0.7 (0.8)	184	-0.9 (0.9)		16.78%	0.16[0,0.32]

Favours no feeding -0.5 -0.25 0 0.25 0.5 Favours feeding

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Kuusipalo 2006	18	0.2 (0.4)	18	0 (0.3)		9.74%	0.17[-0.05,0.39]
McKay 1978	57	0.2 (0.6)	53	-0 (0.7)		9.01%	0.27[0.04,0.5]
Thakwalakwa 2010	66	-0 (1.1)	59	-0.3 (0.5)		5.85%	0.3[-0,0.6]
Husaini 1991	75	0.3 (0.5)	38	-0 (0.5)		11.18%	0.3[0.09,0.51]
Total ***	**858**		**707**			**100%**	**0.15[0.08,0.23]**
Heterogeneity: Tau²=0; Chi²=9, df=7(P=0.25); I²=22.22%							
Test for overall effect: Z=3.94(P<0.0001)							

Favours no feeding -0.5 -0.25 0 0.25 0.5 Favours feeding

Analysis 2.3. Comparison 2 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control - growth. RCT, Outcome 3 HAZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Husaini 1991	75	0.2 (0.7)	35	-0.1 (0.6)		8.13%	0.26[0,0.52]
Iannotti 2014	159	-0.3 (0.5)	156	-0.3 (0.6)		15.79%	-0.02[-0.14,0.1]
Isanaka 2009	1436	0 (1.4)	1564	-0 (1.4)		17.22%	0.06[-0.04,0.16]
Kuusipalo 2006	18	-0 (0.4)	18	-0.3 (0.4)		8.24%	0.25[-0,0.5]
Mangani 2014	191	-0.2 (0.7)	185	-0.3 (0.7)		14.31%	0.09[-0.05,0.23]
McKay 1978	57	0.1 (0.7)	53	-0.1 (0.7)		8.22%	0.22[-0.03,0.47]
Oelofse 2003	16	0.6 (0.5)	14	-0.1 (0.5)		4.99%	0.71[0.35,1.07]
Rivera 2004	258	-0.9 (0.6)	184	-1 (0.7)		15.86%	0.1[-0.02,0.22]
Thakwalakwa 2010	66	0.3 (1.1)	59	0.1 (0.4)		7.23%	0.18[-0.1,0.46]
Total ***	**2276**		**2268**			**100%**	**0.14[0.05,0.24]**
Heterogeneity: Tau²=0.01; Chi²=19.41, df=8(P=0.01); I²=58.79%							
Test for overall effect: Z=3.07(P=0)							

Favours no feeding -1 -0.5 0 0.5 1 Favours feeding

Analysis 2.4. Comparison 2 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control - growth. RCT, Outcome 4 WHZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Grantham-McGregor 1991	32	0.2 (0.4)	33	0 (0.4)		16.65%	0.2[0.03,0.37]
Isanaka 2009	1436	-0.5 (1.3)	1564	-0.7 (1.2)		21.96%	0.21[0.12,0.3]
Kuusipalo 2006	18	0.1 (0.5)	18	0.1 (0.5)		8.98%	0[-0.33,0.33]
Mangani 2014	191	-0.6 (1)	185	-0.7 (0.9)		15.13%	0.09[-0.11,0.29]
Oelofse 2003	16	-1.5 (0.5)	14	-0.7 (0.8)		5.26%	-0.78[-1.25,-0.31]
Rivera 2004	257	-0.3 (0.7)	184	-0.4 (0.6)		20.45%	0.12[0.01,0.23]
Thakwalakwa 2010	66	-0.3 (0.8)	59	-0.5 (0.7)		11.58%	0.21[-0.05,0.47]
Total ***	**2016**		**2057**			**100%**	**0.1[-0.02,0.22]**
Heterogeneity: Tau²=0.02; Chi²=18.46, df=6(P=0.01); I²=67.49%							
Test for overall effect: Z=1.61(P=0.11)							

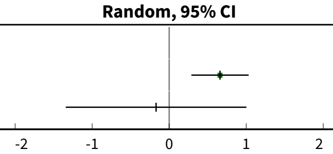
Favours no feeding -1 -0.5 0 0.5 1 Favours feeding

Comparison 3. Low- and middle-income countries: feeding vs control. CBA

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Weight gain (kg)	7	1784	Mean Difference (IV, Random, 95% CI)	0.24 [0.09, 0.39]
1.1 Subgroup analysis by age: < 12 months	6	722	Mean Difference (IV, Random, 95% CI)	0.18 [-0.03, 0.39]
1.2 Subgroup analysis by age: 1 year	4	330	Mean Difference (IV, Random, 95% CI)	0.16 [-0.15, 0.46]
1.3 Subgroup analysis by age: 2 years	3	186	Mean Difference (IV, Random, 95% CI)	0.59 [0.29, 0.89]
1.4 Subgroup analysis by age: > 2 years	3	546	Mean Difference (IV, Random, 95% CI)	0.17 [-0.24, 0.59]
2 Height gain (cm)	7	1782	Mean Difference (IV, Random, 95% CI)	0.52 [-0.07, 1.10]
2.1 Subgroup analysis by age: < 12 months	6	722	Mean Difference (IV, Random, 95% CI)	0.11 [-1.20, 1.42]
2.2 Subgroup analysis by age: 1 year	4	330	Mean Difference (IV, Random, 95% CI)	0.79 [-0.51, 2.09]
2.3 Subgroup analysis by age: 2 years	3	185	Mean Difference (IV, Random, 95% CI)	0.70 [-0.51, 1.91]
2.4 Subgroup analysis by age: > 2 years	3	545	Mean Difference (IV, Random, 95% CI)	0.58 [-0.29, 1.45]
3 WAZ scores	4	999	Mean Difference (IV, Random, 95% CI)	0.27 [-0.13, 0.68]
4 HAZ scores	4	999	Mean Difference (IV, Random, 95% CI)	0.01 [-0.10, 0.12]
5 WHZ scores	4	999	Mean Difference (IV, Random, 95% CI)	0.29 [-0.11, 0.69]

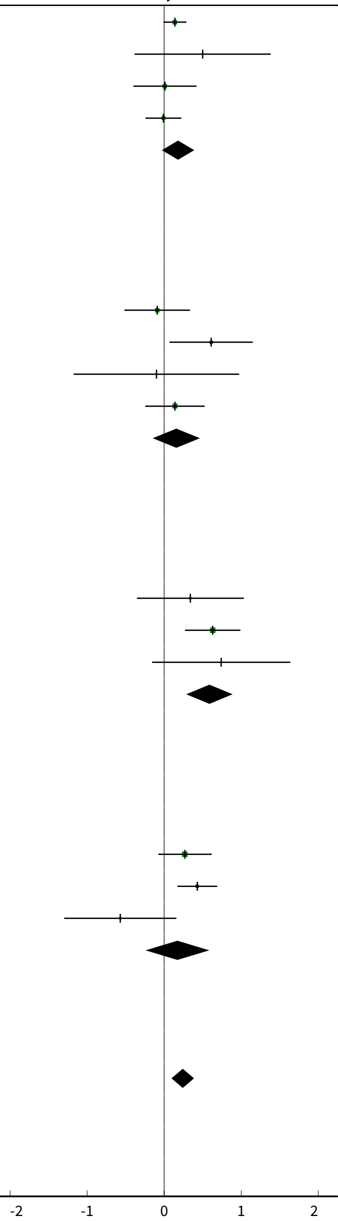
Analysis 3.1. Comparison 3 Low- and middle-income countries: feeding vs control. CBA, Outcome 1 Weight gain (kg).

Study or subgroup	Exp.erimental		Control		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI		Random, 95% CI
3.1.1 Subgroup analysis by age: < 12 months							
Devadas 1971	25	1.3 (0.5)	25	0.7 (0.8)		7.79%	0.66[0.29,1.03]
Gershoff 1988	16	3.8 (1.6)	15	3.9 (1.7)		1.42%	-0.17[-1.34,1]



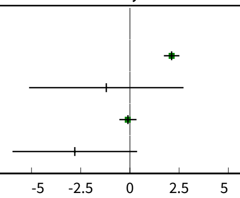
Favours no feeding | Favours feeding

Study or subgroup	Exp.erimental N	Exp.erimental Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	2.6 (0.7)	149	2.5 (0.7)		13.46%	0.14[-0.01,0.29]
Manjrekar 1986	13	1 (0.5)	4	0.5 (0.9)		2.34%	0.5[-0.38,1.38]
Mittal 1980	72	2.3 (1.2)	61	2.3 (1.2)		7.02%	0.01[-0.4,0.42]
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)		11.19%	-0.01[-0.24,0.22]
Subtotal ***	**387**		**335**			**43.22%**	**0.18[-0.03,0.39]**
Heterogeneity: Tau²=0.03; Chi²=10.38, df=5(P=0.07); I²=51.81%							
Test for overall effect: Z=1.68(P=0.09)							
3.1.2 Subgroup analysis by age: 1 year							
Gershoff 1988	45	2.8 (1.1)	38	2.9 (0.9)		6.74%	-0.09[-0.52,0.34]
Gopalan 1973	25	2.4 (0.7)	9	1.7 (0.7)		5%	0.61[0.07,1.15]
Manjrekar 1986	14	2.3 (0.9)	6	2.4 (1.2)		1.67%	-0.1[-1.17,0.97]
Mittal 1980	129	2 (1.3)	64	1.9 (1.3)		7.49%	0.14[-0.25,0.53]
Subtotal ***	**213**		**117**			**20.9%**	**0.16[-0.15,0.46]**
Heterogeneity: Tau²=0.03; Chi²=4.21, df=3(P=0.24); I²=28.7%							
Test for overall effect: Z=1.01(P=0.31)							
3.1.3 Subgroup analysis by age: 2 years							
Gershoff 1988	40	2.8 (2)	51	2.5 (1.2)		3.47%	0.34[-0.35,1.03]
Gopalan 1973	50	2.3 (0.8)	26	1.7 (0.8)		8.04%	0.63[0.27,0.99]
Manjrekar 1986	11	2.2 (1)	8	1.5 (1)		2.28%	0.74[-0.16,1.64]
Subtotal ***	**101**		**85**			**13.8%**	**0.59[0.29,0.89]**
Heterogeneity: Tau²=0; Chi²=0.65, df=2(P=0.72); I²=0%							
Test for overall effect: Z=3.83(P=0)							
3.1.4 Subgroup analysis by age: > 2 years							
Gershoff 1988	158	2.9 (1.6)	151	2.7 (1.5)		8.34%	0.27[-0.08,0.62]
Gopalan 1973	136	2 (0.8)	48	1.5 (0.8)		10.52%	0.43[0.17,0.69]
Manjrekar 1986	36	1.9 (0.8)	17	2.4 (1.4)		3.22%	-0.57[-1.3,0.16]
Subtotal ***	**330**		**216**			**22.08%**	**0.17[-0.24,0.59]**
Heterogeneity: Tau²=0.09; Chi²=6.48, df=2(P=0.04); I²=69.15%							
Test for overall effect: Z=0.81(P=0.42)							
Total ***	**1031**		**753**			**100%**	**0.24[0.09,0.39]**
Heterogeneity: Tau²=0.04; Chi²=30.07, df=15(P=0.01); I²=50.12%							
Test for overall effect: Z=3.22(P=0)							
Test for subgroup differences: Chi²=5.7, df=1 (P=0.13), I²=47.41%							



Analysis 3.2. Comparison 3 Low- and middle-income countries: feeding vs control. CBA, Outcome 2 Height gain (cm).

Study or subgroup	Exp.erimental N	Exp.erimental Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
3.2.1 Subgroup analysis by age: < 12 months							
Devadas 1971	25	4 (0.7)	25	1.9 (0.7)		8.86%	2.12[1.73,2.51]
Gershoff 1988	16	20.1 (5.6)	15	21.3 (5.6)		1.79%	-1.2[-5.12,2.72]
Lutter 2008	170	12.5 (2)	149	12.6 (2)		8.78%	-0.1[-0.53,0.33]
Manjrekar 1986	13	1.5 (2.8)	4	4.3 (2.8)		2.49%	-2.8[-5.97,0.37]



Study or subgroup	Exp.erimental N	Exp.erimental Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
Mittal 1980	72	8.9 (3.7)	61	8.5 (3.9)	6.35%	0.41[-0.89,1.71]
Santos 2005	91	6.3 (2.8)	81	6.6 (3)	7.63%	-0.23[-1.11,0.65]
Subtotal ***	**387**		**335**		**35.9%**	**0.11[-1.2,1.42]**
Heterogeneity: Tau²=1.98; Chi²=70.45, df=5(P<0.0001); I²=92.9%						
Test for overall effect: Z=0.17(P=0.87)						
3.2.2 Subgroup analysis by age: 1 year						
Gershoff 1988	45	14.8 (2.5)	38	15 (2.5)	7.05%	-0.19[-1.26,0.88]
Gopalan 1973	25	9.3 (2)	9	6.5 (2)	5.7%	2.8[1.28,4.32]
Manjrekar 1986	14	10.7 (2.9)	6	10 (2.6)	3.35%	0.7[-1.85,3.25]
Mittal 1980	129	7.3 (3.5)	64	7.1 (3)	7.43%	0.18[-0.77,1.13]
Subtotal ***	**213**		**117**		**23.52%**	**0.79[-0.51,2.09]**
Heterogeneity: Tau²=1.2; Chi²=10.89, df=3(P=0.01); I²=72.45%						
Test for overall effect: Z=1.19(P=0.23)						
3.2.3 Subgroup analysis by age: 2 years						
Gershoff 1988	40	13.3 (2)	51	13.1 (1.8)	7.9%	0.23[-0.56,1.02]
Gopalan 1973	50	9.5 (2.1)	26	7.8 (2.1)	7.36%	1.7[0.73,2.67]
Manjrekar 1986	10	10.3 (2.7)	8	10.7 (2.5)	3.61%	-0.4[-2.8,2]
Subtotal ***	**100**		**85**		**18.86%**	**0.7[-0.51,1.91]**
Heterogeneity: Tau²=0.72; Chi²=6.22, df=2(P=0.04); I²=67.84%						
Test for overall effect: Z=1.14(P=0.26)						
3.2.4 Subgroup analysis by age: > 2 years						
Gershoff 1988	158	11.7 (2.2)	151	11.4 (2.1)	8.68%	0.31[-0.17,0.79]
Gopalan 1973	136	8.7 (2)	48	7.4 (2.1)	8.21%	1.3[0.62,1.98]
Manjrekar 1986	35	9.2 (3.9)	17	9.7 (2.8)	4.82%	-0.49[-2.33,1.35]
Subtotal ***	**329**		**216**		**21.71%**	**0.58[-0.29,1.45]**
Heterogeneity: Tau²=0.38; Chi²=6.84, df=2(P=0.03); I²=70.76%						
Test for overall effect: Z=1.3(P=0.19)						
Total ***	**1029**		**753**		**100%**	**0.52[-0.07,1.1]**
Heterogeneity: Tau²=0.97; Chi²=97.02, df=15(P<0.0001); I²=84.54%						
Test for overall effect: Z=1.73(P=0.08)						
Test for subgroup differences: Chi²=0.63, df=1 (P=0.89), I²=0%						

Favours no feeding -5 -2.5 0 2.5 5 Favours feeding

Analysis 3.3. Comparison 3 Low- and middle-income countries: feeding vs control. CBA, Outcome 3 WAZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	-0 (0.6)	149	-0.2 (0.6)	25.36%	0.19[0.06,0.32]
Santos 2005	91	0.3 (0.7)	81	0.3 (0.7)	24.22%	0.07[-0.15,0.29]
Schroeder 2002	114	-0.4 (0.5)	118	-0.4 (0.6)	25.18%	-0.03[-0.17,0.11]
Tomedi 2012	129	0 (0.6)	147	-0.8 (0.6)	25.23%	0.85[0.71,0.99]
Total ***	**504**		**495**		**100%**	**0.27[-0.13,0.68]**
Heterogeneity: Tau²=0.17; Chi²=87.47, df=3(P<0.0001); I²=96.57%						
Test for overall effect: Z=1.31(P=0.19)						

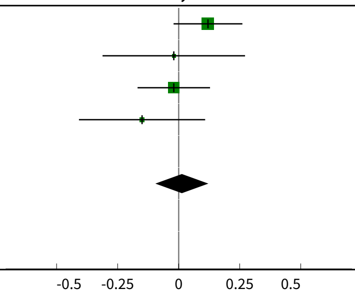
Favours no feeding -2 -1 0 1 2 Favours feeding

Analysis 3.4. Comparison 3 Low- and middle-income countries: feeding vs control. CBA, Outcome 4 HAZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	-0.3 (0.6)	149	-0.4 (0.7)		37.58%	0.12[-0.02,0.26]
Santos 2005	91	0.1 (1)	81	0.1 (1)		12.2%	-0.02[-0.31,0.27]
Schroeder 2002	114	-0 (0.5)	118	0 (0.6)		35.15%	-0.02[-0.17,0.13]
Tomedi 2012	129	-0.5 (1)	147	-0.3 (1.2)		15.06%	-0.15[-0.41,0.11]
Total ***	**504**		**495**			**100%**	**0.01[-0.1,0.12]**

Heterogeneity: Tau^2=0; Chi^2=3.95, df=3(P=0.27); I^2=23.96%

Test for overall effect: Z=0.24(P=0.81)

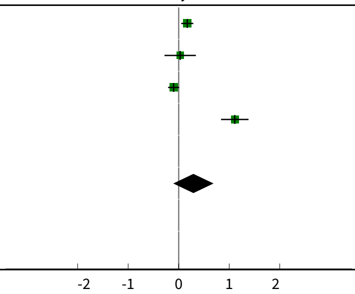


Analysis 3.5. Comparison 3 Low- and middle-income countries: feeding vs control. CBA, Outcome 5 WHZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	0 (0.5)	149	-0.1 (0.6)		26.36%	0.17[0.05,0.29]
Santos 2005	91	0 (1)	81	-0 (1.1)		23.2%	0.03[-0.28,0.34]
Schroeder 2002	114	-0.6 (0.4)	118	-0.5 (0.5)		26.45%	-0.1[-0.21,0.01]
Tomedi 2012	129	0.2 (1)	147	-0.9 (1.3)		23.98%	1.11[0.84,1.38]
Total ***	**504**		**495**			**100%**	**0.29[-0.11,0.69]**

Heterogeneity: Tau^2=0.15; Chi^2=67.31, df=3(P<0.0001); I^2=95.54%

Test for overall effect: Z=1.43(P=0.15)



Comparison 4. High-income countries: feeding vs control. RCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Weight gain	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
2 Height gain	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
3 WAZ scores	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
4 HAZ scores	1		Mean Difference (IV, Random, 95% CI)	Totals not selected
5 WHZ scores	1		Mean Difference (IV, Random, 95% CI)	Totals not selected

Analysis 4.1. Comparison 4 High-income countries: feeding vs control. RCT, Outcome 1 Weight gain.

Study or subgroup	Feeding		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI	Random, 95% CI
Ziegler 2009	19	2 (0.5)	26	2.1 (0.9)		-0.1[-0.52,0.32]
				Favours no feeding	-4 -2 0 2 4	Favours feeding

Analysis 4.2. Comparison 4 High-income countries: feeding vs control. RCT, Outcome 2 Height gain.

Study or subgroup	Feeding		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI	Random, 95% CI
Ziegler 2009	19	8.5 (0.7)	26	9.5 (2.8)		-1[-2.12,0.12]
				Favours no feeding	-10 -5 0 5 10	Favours feeding

Analysis 4.3. Comparison 4 High-income countries: feeding vs control. RCT, Outcome 3 WAZ scores.

Study or subgroup	Feeding		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI	Random, 95% CI
Yeung 2000	49	-0 (0)	54	-0 (0)		0.02[0.01,0.03]
				Favours no feeding	-0.1 -0.05 0 0.05 0.1	Favours feeding

Analysis 4.4. Comparison 4 High-income countries: feeding vs control. RCT, Outcome 4 HAZ scores.

Study or subgroup	Feeding		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI	Random, 95% CI
Yeung 2000	49	0 (0)	54	-0 (0)		0.04[0.04,0.05]
				Favours no feeding	-0.05 -0.025 0 0.025 0.05	Favours feeding

Analysis 4.5. Comparison 4 High-income countries: feeding vs control. RCT, Outcome 5 WHZ scores.

Study or subgroup	Feeding		Control		Mean Difference	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI	Random, 95% CI
Yeung 2000	49	-0 (0)	54	0 (0)		-0.06[-0.07,-0.05]
				Favours no feeding	-0.05-0.025 0 0.025 0.05	Favours feeding

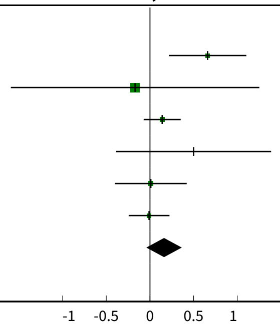
Comparison 5. Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control. CBA

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Weight gain (kg)	7	1784	Mean Difference (IV, Random, 95% CI)	0.25 [0.11, 0.39]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Subgroup analysis by age: < 12 months	6	722	Mean Difference (IV, Random, 95% CI)	0.16 [-0.04, 0.36]
1.2 Subgroup analysis by age: 1 year	4	330	Mean Difference (IV, Random, 95% CI)	0.22 [-0.07, 0.51]
1.3 Subgroup analysis by age: 2 years	3	186	Mean Difference (IV, Random, 95% CI)	0.54 [0.23, 0.86]
1.4 Subgroup analysis by age: > 2 years	3	546	Mean Difference (IV, Random, 95% CI)	0.27 [-0.08, 0.62]
2 Height gain (cm)	7	1782	Mean Difference (IV, Random, 95% CI)	0.57 [0.06, 1.07]
2.1 Subgroup analysis by age: < 12 months	6	722	Mean Difference (IV, Random, 95% CI)	0.21 [-0.90, 1.31]
2.2 Subgroup analysis by age: 1 year	4	330	Mean Difference (IV, Random, 95% CI)	0.80 [-0.53, 2.13]
2.3 Subgroup analysis by age: 2 years	3	185	Mean Difference (IV, Random, 95% CI)	0.75 [-0.48, 1.98]
2.4 Subgroup analysis by age: > 2 years	3	545	Mean Difference (IV, Random, 95% CI)	0.65 [-0.22, 1.53]
3 WAZ scores	4	999	Mean Difference (IV, Random, 95% CI)	0.27 [-0.15, 0.69]
4 HAZ scores	4	999	Mean Difference (IV, Random, 95% CI)	0.02 [-0.10, 0.14]
5 WHZ scores	4	999	Mean Difference (IV, Random, 95% CI)	0.29 [-0.11, 0.69]

Analysis 5.1. Comparison 5 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control. CBA, Outcome 1 Weight gain (kg).

Study or subgroup	Exp.erimental		Control		Mean Difference	Weight	Mean Difference
	N	Mean(SD)	N	Mean(SD)	Random, 95% CI		Random, 95% CI
5.1.1 Subgroup analysis by age: < 12 months							
Devadas 1971	25	1.3 (0.8)	25	0.7 (0.8)		7%	0.66[0.22,1.1]
Gershoff 1988	16	3.8 (2.3)	15	3.9 (1.7)		0.96%	-0.17[-1.59,1.25]
Lutter 2008	170	2.6 (0.9)	149	2.5 (1)		14.77%	0.14[-0.07,0.35]
Manjrekar 1986	13	1 (0.5)	4	0.5 (0.9)		2.3%	0.5[-0.39,1.39]
Mittal 1980	72	2.3 (1.2)	61	2.3 (1.2)		7.75%	0.01[-0.4,0.42]
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)		13.8%	-0.01[-0.24,0.22]
Subtotal ***	**387**		**335**			**46.59%**	**0.16[-0.04,0.36]**
Heterogeneity: Tau^2=0.02; Chi^2=8.04, df=5(P=0.15); I^2=37.83%							



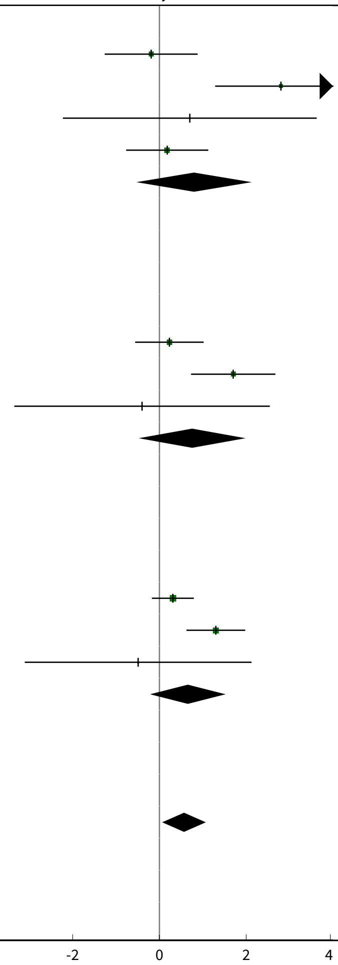
Favours no feeding | Favours feeding

Study or subgroup	Exp.erimental N	Exp.erimental Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Test for overall effect: Z=1.56(P=0.12)							
5.1.2 Subgroup analysis by age: 1 year							
Gershoff 1988	45	2.8 (2.3)	38	2.9 (0.9)		3.27%	-0.09[-0.82,0.64]
Gopalan 1973	25	2.4 (0.7)	9	1.7 (0.7)		5.26%	0.61[0.07,1.15]
Manjrekar 1986	14	2.3 (0.9)	6	2.4 (1.4)		1.23%	-0.1[-1.34,1.14]
Mittal 1980	129	2 (1.3)	64	1.9 (1.3)		8.37%	0.14[-0.25,0.53]
Subtotal ***	**213**		**117**			**18.14%**	**0.22[-0.07,0.51]**
Heterogeneity: Tau²=0; Chi²=3.12, df=3(P=0.37); I²=3.79%							
Test for overall effect: Z=1.48(P=0.14)							
5.1.3 Subgroup analysis by age: 2 years							
Gershoff 1988	40	2.8 (2.3)	51	2.5 (1.2)		2.92%	0.34[-0.43,1.11]
Gopalan 1973	50	2.3 (0.8)	26	1.7 (0.8)		9.12%	0.63[0.27,0.99]
Manjrekar 1986	11	2.2 (1)	8	2.1 (1.5)		1.4%	0.1[-1.06,1.26]
Subtotal ***	**101**		**85**			**13.44%**	**0.54[0.23,0.86]**
Heterogeneity: Tau²=0; Chi²=1.05, df=2(P=0.59); I²=0%							
Test for overall effect: Z=3.39(P=0)							
5.1.4 Subgroup analysis by age: > 2 years							
Gershoff 1988	158	2.9 (2.3)	151	2.7 (1.5)		7.34%	0.27[-0.16,0.7]
Gopalan 1973	136	2 (0.8)	48	1.5 (0.8)		12.74%	0.43[0.17,0.69]
Manjrekar 1986	36	1.9 (1.1)	17	2.4 (2)		1.75%	-0.57[-1.6,0.46]
Subtotal ***	**330**		**216**			**21.83%**	**0.27[-0.08,0.62]**
Heterogeneity: Tau²=0.04; Chi²=3.57, df=2(P=0.17); I²=43.93%							
Test for overall effect: Z=1.5(P=0.13)							
Total ***	**1031**		**753**			**100%**	**0.25[0.11,0.39]**
Heterogeneity: Tau²=0.02; Chi²=22.76, df=15(P=0.09); I²=34.11%							
Test for overall effect: Z=3.44(P=0)							
Test for subgroup differences: Chi²=4.1, df=1 (P=0.25), I²=26.87%							
				Favours no feeding	-1 -0.5 0 0.5 1	Favours feeding	

Analysis 5.2. Comparison 5 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control. CBA, Outcome 2 Height gain (cm).

Study or subgroup	Exp.erimental N	Exp.erimental Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
5.2.1 Subgroup analysis by age: < 12 months							
Devadas 1971	25	4 (1.3)	25	1.9 (1.3)		8.88%	2.12[1.39,2.85]
Gershoff 1988	16	20.1 (5.6)	15	21.3 (5.6)		1.43%	-1.2[-5.12,2.72]
Lutter 2008	170	12.5 (2)	149	12.6 (2)		10.07%	-0.1[-0.53,0.33]
Manjrekar 1986	13	1.5 (3.1)	4	4.3 (3.1)		1.76%	-2.8[-6.28,0.68]
Mittal 1980	72	8.9 (3.7)	61	8.5 (3.9)		6.32%	0.41[-0.89,1.71]
Santos 2005	91	6.3 (2.8)	81	6.6 (3)		8.17%	-0.23[-1.11,0.65]
Subtotal ***	**387**		**335**			**36.63%**	**0.21[-0.9,1.31]**
Heterogeneity: Tau²=1.28; Chi²=32.36, df=5(P<0.0001); I²=84.55%							
Test for overall effect: Z=0.37(P=0.71)							
				Favours no feeding	-4 -2 0 2 4	Favours feeding	

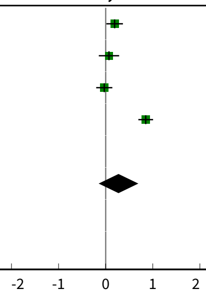
Study or subgroup	Exp.erimental N	Exp.erimental Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
5.2.2 Subgroup analysis by age: 1 year							
Gershoff 1988	45	14.8 (2.5)	38	15 (2.5)		7.29%	-0.19[-1.26,0.88]
Gopalan 1973	25	9.3 (2)	9	6.5 (2)		5.48%	2.8[1.28,4.32]
Manjrekar 1986	14	10.7 (3.2)	6	10 (3)		2.33%	0.7[-2.22,3.62]
Mittal 1980	129	7.3 (3.5)	64	7.1 (3)		7.86%	0.18[-0.77,1.13]
Subtotal ***	**213**		**117**			**22.96%**	**0.8[-0.53,2.13]**
Heterogeneity: Tau²=1.23; Chi²=10.88, df=3(P=0.01); I²=72.44%							
Test for overall effect: Z=1.18(P=0.24)							
5.2.3 Subgroup analysis by age: 2 years							
Gershoff 1988	40	13.3 (2)	51	13.1 (1.8)		8.59%	0.23[-0.56,1.02]
Gopalan 1973	50	9.5 (2.1)	26	7.8 (2.1)		7.75%	1.7[0.73,2.67]
Manjrekar 1986	10	10.3 (2.7)	8	10.7 (3.5)		2.31%	-0.4[-3.34,2.54]
Subtotal ***	**100**		**85**			**18.64%**	**0.75[-0.48,1.98]**
Heterogeneity: Tau²=0.71; Chi²=5.93, df=2(P=0.05); I²=66.25%							
Test for overall effect: Z=1.2(P=0.23)							
5.2.4 Subgroup analysis by age: > 2 years							
Gershoff 1988	158	11.7 (2.2)	151	11.4 (2.1)		9.9%	0.31[-0.17,0.79]
Gopalan 1973	136	8.7 (2)	48	7.4 (2.1)		9.1%	1.3[0.62,1.98]
Manjrekar 1986	35	9.2 (5.4)	17	9.7 (4)		2.77%	-0.49[-3.1,2.12]
Subtotal ***	**329**		**216**			**21.77%**	**0.65[-0.22,1.53]**
Heterogeneity: Tau²=0.35; Chi²=6.15, df=2(P=0.05); I²=67.51%							
Test for overall effect: Z=1.47(P=0.14)							
Total ***	**1029**		**753**			**100%**	**0.57[0.06,1.07]**
Heterogeneity: Tau²=0.61; Chi²=57.35, df=15(P<0.0001); I²=73.84%							
Test for overall effect: Z=2.21(P=0.03)							
Test for subgroup differences: Chi²=0.64, df=1 (P=0.89), I²=0%							



Favours no feeding | Favours feeding

Analysis 5.3. Comparison 5 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control. CBA, Outcome 3 WAZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	-0 (0.8)	149	-0.2 (0.8)		25.06%	0.19[0.01,0.37]
Santos 2005	91	0.3 (0.7)	81	0.3 (0.7)		24.52%	0.07[-0.15,0.29]
Schroeder 2002	114	-0.4 (0.7)	118	-0.4 (0.7)		25.12%	-0.03[-0.2,0.14]
Tomedi 2012	129	0 (0.6)	147	-0.8 (0.8)		25.29%	0.85[0.69,1.01]
Total ***	**504**		**495**			**100%**	**0.27[-0.15,0.69]**
Heterogeneity: Tau²=0.18; Chi²=67.33, df=3(P<0.0001); I²=95.54%							
Test for overall effect: Z=1.27(P=0.21)							



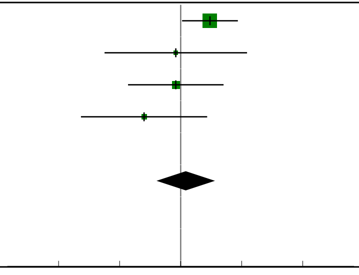
Favours no feeding | Favours feeding

Analysis 5.4. Comparison 5 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control. CBA, Outcome 4 HAZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	-0.3 (0.5)	149	-0.4 (0.5)		44.58%	0.12[0.01,0.23]
Santos 2005	91	0.1 (1)	81	0.1 (1)		13.75%	-0.02[-0.31,0.27]
Schroeder 2002	114	-0 (0.7)	118	0 (0.8)		24.98%	-0.02[-0.22,0.18]
Tomedi 2012	129	-0.5 (1)	147	-0.3 (1.2)		16.68%	-0.15[-0.41,0.11]
Total ***	**504**		**495**			**100%**	**0.02[-0.1,0.14]**

Heterogeneity: Tau^2=0; Chi^2=4.45, df=3(P=0.22); I^2=32.62%

Test for overall effect: Z=0.34(P=0.73)

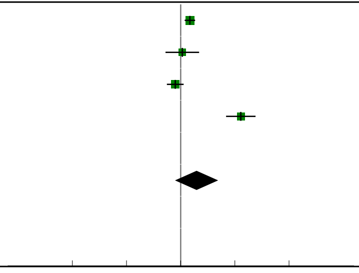


Analysis 5.5. Comparison 5 Sensitivity analysis ICC 0.10: low- and middle-income countries: feeding vs control. CBA, Outcome 5 WHZ scores.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	0 (0.4)	149	-0.1 (0.4)		26.66%	0.17[0.07,0.27]
Santos 2005	91	0 (1)	81	-0 (1.1)		23.26%	0.03[-0.28,0.34]
Schroeder 2002	114	-0.6 (0.6)	118	-0.5 (0.6)		26.02%	-0.1[-0.25,0.05]
Tomedi 2012	129	0.2 (1)	147	-0.9 (1.3)		24.05%	1.11[0.84,1.38]
Total ***	**504**		**495**			**100%**	**0.29[-0.11,0.69]**

Heterogeneity: Tau^2=0.15; Chi^2=58.4, df=3(P<0.0001); I^2=94.86%

Test for overall effect: Z=1.44(P=0.15)



Comparison 6. Low- and middle-income countries: feeding vs control - psychosocial development. RCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Psychomotor development	2	178	Std. Mean Difference (Random, 95% CI)	0.41 [0.10, 0.72]
2 Cognitive development: test battery	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected
3 Cognitive development: Bayley's Mental Development Index (BMDI)	1		Std. Mean Difference (IV, Random, 95% CI)	Totals not selected

Analysis 6.1. Comparison 6 Low- and middle-income countries: feeding vs control - psychosocial development. RCT, Outcome 1 Psychomotor development.

Study or subgroup	Feeding N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Grantham-McGregor 1991	32	33	0.4 (0.25)		39.02%	0.35[-0.14,0.84]
Husaini 1991	75	38	0.5 (0.2)		60.98%	0.45[0.06,0.84]
Total (95% CI)					**100%**	**0.41[0.1,0.72]**
Heterogeneity: Tau²=0; Chi²=0.1, df=1(P=0.75); I²=0%						
Test for overall effect: Z=2.63(P=0.01)						
			Favours no feeding	-2 -1 0 1 2	Favours feeding	

Analysis 6.2. Comparison 6 Low- and middle-income countries: feeding vs control - psychosocial development. RCT, Outcome 2 Cognitive development: test battery.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Std. Mean Difference Random, 95% CI
McKay 1978	50	3.6 (2.7)	49	2.2 (2)		0.58[0.17,0.98]
				Favours no feeding	-2 -1 0 1 2	Favours feeding

Analysis 6.3. Comparison 6 Low- and middle-income countries: feeding vs control - psychosocial development. RCT, Outcome 3 Cognitive development: Bayley's Mental Development Index (BMDI).

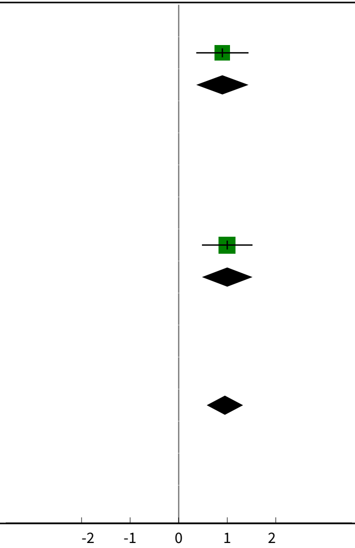
Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Std. Mean Difference Random, 95% CI
Husaini 1991	75	10.9 (11.8)	38	15.8 (13.3)		-0.4[-0.79,-0]
				Favours no feeding	-2 -1 0 1 2	Favours feeding

Comparison 7. High-income countries. CBA

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Weight	1	116	Mean Difference (IV, Random, 95% CI)	0.95 [0.58, 1.33]
1.1 Boys	1	55	Mean Difference (IV, Random, 95% CI)	0.90 [0.36, 1.44]
1.2 Girls	1	61	Mean Difference (IV, Random, 95% CI)	1.0 [0.48, 1.52]
2 Height	1	116	Mean Difference (IV, Random, 95% CI)	0.61 [-0.31, 1.54]
2.1 Boys	1	55	Mean Difference (IV, Random, 95% CI)	0.40 [-0.96, 1.76]
2.2 Girls	1	61	Mean Difference (IV, Random, 95% CI)	0.80 [-0.47, 2.07]

Analysis 7.1. Comparison 7 High-income countries. CBA, Outcome 1 Weight.

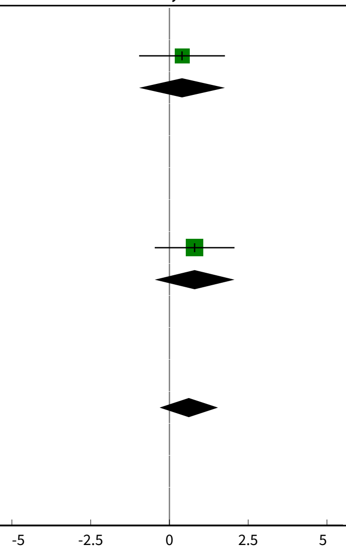
Study or subgroup	Feeding N	Feeding Mean(SD)	No feeding N	No feeding Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
7.1.1 Boys							
Coyne 1980	32	1.9 (1.1)	23	1 (0.9)		48.31%	0.9[0.36,1.44]
Subtotal ***	**32**		**23**			**48.31%**	**0.9[0.36,1.44]**
Heterogeneity: Not applicable							
Test for overall effect: Z=3.28(P=0)							
7.1.2 Girls							
Coyne 1980	41	2 (1)	20	1 (1)		51.69%	1[0.48,1.52]
Subtotal ***	**41**		**20**			**51.69%**	**1[0.48,1.52]**
Heterogeneity: Not applicable							
Test for overall effect: Z=3.77(P=0)							
Total ***	**73**		**43**			**100%**	**0.95[0.58,1.33]**
Heterogeneity: Tau²=0; Chi²=0.07, df=1(P=0.79); I²=0%							
Test for overall effect: Z=4.99(P<0.0001)							
Test for subgroup differences: Chi²=0.07, df=1 (P=0.79), I²=0%							



Favours no feeding | Favours feeding

Analysis 7.2. Comparison 7 High-income countries. CBA, Outcome 2 Height.

Study or subgroup	Feeding N	Feeding Mean(SD)	No feeding N	No feeding Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
7.2.1 Boys							
Coyne 1980	32	4.9 (2.6)	23	4.5 (2.5)		46.34%	0.4[-0.96,1.76]
Subtotal ***	**32**		**23**			**46.34%**	**0.4[-0.96,1.76]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.58(P=0.56)							
7.2.2 Girls							
Coyne 1980	41	5.5 (2.3)	20	4.7 (2.4)		53.66%	0.8[-0.47,2.07]
Subtotal ***	**41**		**20**			**53.66%**	**0.8[-0.47,2.07]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.24(P=0.22)							
Total ***	**73**		**43**			**100%**	**0.61[-0.31,1.54]**
Heterogeneity: Tau²=0; Chi²=0.18, df=1(P=0.67); I²=0%							
Test for overall effect: Z=1.3(P=0.19)							
Test for subgroup differences: Chi²=0.18, df=1 (P=0.67), I²=0%							



Favours no feeding | Favours feeding

Comparison 8. Low- and middle-income countries: feeding vs control - biochemical markers. RCT

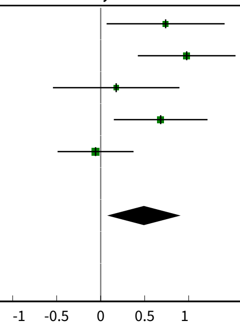
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Change in haemoglobin (g/L)	5	300	Std. Mean Difference (IV, Random, 95% CI)	0.49 [0.07, 0.91]

Analysis 8.1. Comparison 8 Low- and middle-income countries: feeding vs control - biochemical markers. RCT, Outcome 1 Change in haemoglobin (g/L).

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Std. Mean Difference Random, 95% CI	Weight	Std. Mean Difference Random, 95% CI
Husaini 1991	17	0.6 (1.1)	20	-0.1 (0.8)		17.64%	0.74[0.07,1.41]
Kuusipalo 2006	56	15.5 (12.7)	18	1 (20)		20.59%	0.98[0.42,1.53]
Oelofse 2003	16	108 (9)	14	106 (13)		16.52%	0.18[-0.54,0.9]
Rivera 2004	41	0 (0.7)	22	-0.4 (0.7)		21.21%	0.68[0.15,1.21]
Thakwalakwa 2010	66	-4 (17.8)	30	-3.1 (12)		24.05%	-0.06[-0.49,0.37]
Total ***	**196**		**104**			**100%**	**0.49[0.07,0.91]**

Heterogeneity: Tau^2=0.14; Chi^2=10.78, df=4(P=0.03); I^2=62.9%

Test for overall effect: Z=2.31(P=0.02)



Favours no feeding   Favours feeding

Comparison 9. Low- and middle-income countries: subgroup analysis - feeding vs control. CBA

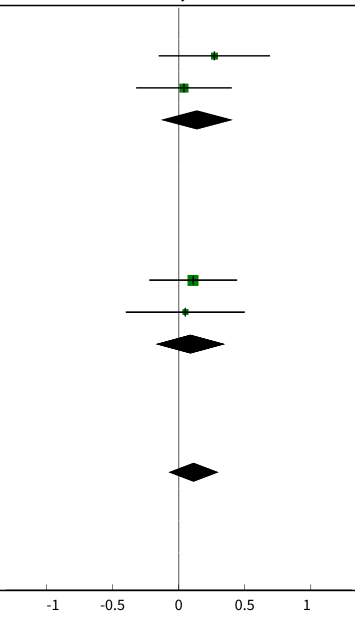
Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Subgroup analysis: weight by sex	2	840	Mean Difference (IV, Random, 95% CI)	0.11 [-0.08, 0.30]
1.1 Boys	2	453	Mean Difference (IV, Random, 95% CI)	0.14 [-0.14, 0.41]
1.2 Girls	2	387	Mean Difference (IV, Random, 95% CI)	0.09 [-0.18, 0.36]
2 Subgroup analysis: height by sex	2	840	Mean Difference (IV, Random, 95% CI)	0.27 [-0.27, 0.80]
2.1 Boys	2	453	Mean Difference (IV, Random, 95% CI)	0.10 [-0.59, 0.79]
2.2 Girls	2	387	Mean Difference (IV, Random, 95% CI)	0.51 [-0.33, 1.35]
3 Nutritional adequacy. Low vs moderate vs high: weight gain in kg	7	1784	Mean Difference (IV, Random, 95% CI)	0.24 [0.06, 0.41]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.1 Low nutritional adequacy (0% - 29% energy)	5	961	Mean Difference (IV, Random, 95% CI)	0.24 [-0.06, 0.53]
3.2 Moderate nutritional adequacy (30% - 59% energy)	4	651	Mean Difference (IV, Random, 95% CI)	0.31 [0.02, 0.59]
3.3 High nutritional adequacy (60% or higher energy)	1	172	Mean Difference (IV, Random, 95% CI)	-0.01 [-0.24, 0.22]
4 Nutritional adequacy. Low vs moderate vs high: height gain in cm	7	1782	Mean Difference (IV, Random, 95% CI)	0.50 [-0.21, 1.21]
4.1 Low nutritional adequacy (0% - 29% energy)	5	959	Mean Difference (IV, Random, 95% CI)	0.77 [-0.18, 1.73]
4.2 Moderate nutritional adequacy (30% - 59% energy)	4	651	Mean Difference (IV, Random, 95% CI)	0.25 [-1.06, 1.56]
4.3 High nutritional adequacy (60% or higher energy)	1	172	Mean Difference (IV, Random, 95% CI)	-0.23 [-1.11, 0.65]
5 Day-care/feeding centre vs take-home ration: weight gain in kg	7	1784	Mean Difference (IV, Random, 95% CI)	0.20 [0.01, 0.40]
5.1 Day-care/feeding centre	4	967	Mean Difference (IV, Random, 95% CI)	0.31 [0.01, 0.62]
5.2 Take-home ration	3	817	Mean Difference (IV, Random, 95% CI)	0.09 [-0.03, 0.20]
6 Day-care/feeding centre vs take-home ration: height gain in cm	7	1782	Mean Difference (IV, Random, 95% CI)	0.43 [-0.45, 1.31]
6.1 Day-care/feeding centre	4	965	Mean Difference (IV, Random, 95% CI)	0.84 [-0.25, 1.93]
6.2 Take-home ration	3	817	Mean Difference (IV, Random, 95% CI)	-0.09 [-0.44, 0.26]
7 Strict supervision of feeding vs moderate supervision vs low supervison: weight gain in kg	7	1784	Mean Difference (IV, Random, 95% CI)	0.20 [0.01, 0.40]
7.1 Strict supervision of feeding	5	1286	Mean Difference (IV, Random, 95% CI)	0.28 [0.03, 0.52]
7.2 Moderate supervision of feeding	1	326	Mean Difference (IV, Random, 95% CI)	0.04 [-0.24, 0.32]
7.3 Low supervision of feeding	1	172	Mean Difference (IV, Random, 95% CI)	-0.01 [-0.24, 0.22]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
8 Strict supervision of feeding vs moderate supervision vs low supervison: height gain in cm	7	1782	Mean Difference (IV, Random, 95% CI)	0.43 [-0.45, 1.31]
8.1 Strict supervision of feeding	5	1284	Mean Difference (IV, Random, 95% CI)	0.62 [-0.47, 1.70]
8.2 Moderate supervision of feeding	1	326	Mean Difference (IV, Random, 95% CI)	0.08 [-0.72, 0.88]
8.3 Low supervision of feeding	1	172	Mean Difference (IV, Random, 95% CI)	-0.23 [-1.11, 0.65]
9 Single food intervention vs multifaceted intervention: weight gain in kg	7	1784	Mean Difference (IV, Random, 95% CI)	0.32 [0.01, 0.62]
9.1 Single food intervention	4	901	Mean Difference (IV, Random, 95% CI)	0.32 [-0.42, 1.07]
9.2 Multifacted intervention	3	883	Mean Difference (IV, Random, 95% CI)	0.32 [0.03, 0.61]
10 Single food intervention vs multifaceted intervention: height gain in cm	7	1782	Mean Difference (IV, Random, 95% CI)	0.43 [-0.45, 1.31]
10.1 Single food intervention	4	899	Mean Difference (IV, Random, 95% CI)	0.17 [-0.96, 1.31]
10.2 Multifaceted intervention	3	883	Mean Difference (IV, Random, 95% CI)	0.74 [-0.83, 2.30]
11 Sensitivity analysis: day care: weight	7	1784	Mean Difference (IV, Random, 95% CI)	0.21 [0.01, 0.40]
11.1 Day-care/feeding centre	4	967	Mean Difference (IV, Random, 95% CI)	0.33 [0.04, 0.63]
11.2 Take-home ration	3	817	Mean Difference (IV, Random, 95% CI)	0.09 [-0.03, 0.20]
12 Sensitivity analysis: daycare: height	7	1782	Mean Difference (IV, Random, 95% CI)	0.47 [-0.41, 1.35]
12.1 Day-care/feeding centre	4	965	Mean Difference (IV, Random, 95% CI)	0.97 [-0.07, 2.00]
12.2 Take-home ration	3	817	Mean Difference (IV, Random, 95% CI)	-0.09 [-0.44, 0.26]

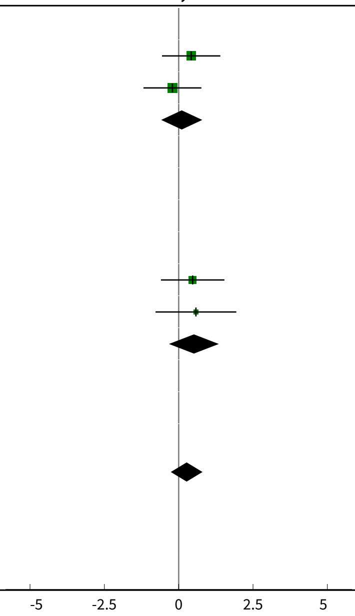
Analysis 9.1. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 1 Subgroup analysis: weight by sex.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.1.1 Boys							
Gershoff 1988	123	3 (1.8)	134	2.7 (1.6)		20.69%	0.27[-0.15,0.69]
Mittal 1980	118	2.2 (1.3)	78	2.1 (1.3)		28.01%	0.04[-0.32,0.4]
Subtotal ***	**241**		**212**			**48.7%**	**0.14[-0.14,0.41]**
Heterogeneity: Tau²=0; Chi²=0.66, df=1(P=0.42); I²=0%							
Test for overall effect: Z=0.98(P=0.33)							
9.1.2 Girls							
Gershoff 1988	136	2.9 (1.5)	121	2.8 (1.2)		33.18%	0.11[-0.22,0.44]
Mittal 1980	83	2.1 (1.3)	47	2.1 (1.2)		18.11%	0.05[-0.4,0.5]
Subtotal ***	**219**		**168**			**51.3%**	**0.09[-0.18,0.36]**
Heterogeneity: Tau²=0; Chi²=0.04, df=1(P=0.83); I²=0%							
Test for overall effect: Z=0.65(P=0.52)							
Total ***	**460**		**380**			**100%**	**0.11[-0.08,0.3]**
Heterogeneity: Tau²=0; Chi²=0.76, df=3(P=0.86); I²=0%							
Test for overall effect: Z=1.15(P=0.25)							
Test for subgroup differences: Chi²=0.06, df=1 (P=0.8), I²=0%							



Analysis 9.2. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 2 Subgroup analysis: height by sex.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.2.1 Boys							
Gershoff 1988	123	12.8 (4.2)	134	12.4 (3.8)		29.59%	0.42[-0.56,1.4]
Mittal 1980	118	7.9 (3.5)	78	8.1 (3.3)		30.02%	-0.21[-1.18,0.76]
Subtotal ***	**241**		**212**			**59.61%**	**0.1[-0.59,0.79]**
Heterogeneity: Tau²=0; Chi²=0.8, df=1(P=0.37); I²=0%							
Test for overall effect: Z=0.29(P=0.77)							
9.2.2 Girls							
Gershoff 1988	136	13.9 (4)	121	13.4 (4.7)		24.97%	0.47[-0.6,1.54]
Mittal 1980	83	7.8 (3.8)	47	7.2 (3.8)		15.43%	0.58[-0.78,1.94]
Subtotal ***	**219**		**168**			**40.39%**	**0.51[-0.33,1.35]**
Heterogeneity: Tau²=0; Chi²=0.02, df=1(P=0.9); I²=0%							
Test for overall effect: Z=1.2(P=0.23)							
Total ***	**460**		**380**			**100%**	**0.27[-0.27,0.8]**
Heterogeneity: Tau²=0; Chi²=1.36, df=3(P=0.72); I²=0%							
Test for overall effect: Z=0.98(P=0.32)							
Test for subgroup differences: Chi²=0.54, df=1 (P=0.46), I²=0%							



Analysis 9.3. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 3 Nutritional adequacy. Low vs moderate vs high: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
9.3.1 Low nutritional adequacy (0% - 29% energy)						
Devadas 1971	25	1.3 (0.5)	25	0.7 (0.5)	10.67%	0.66[0.36,0.96]
Gershoff 1988	158	2.9 (1.6)	151	2.7 (1.5)	9.64%	0.27[-0.08,0.62]
Gopalan 1973	136	2 (0.8)	48	1.5 (0.8)	11.61%	0.43[0.17,0.69]
Manjrekar 1986	61	2 (0.8)	31	2.3 (1.1)	7.85%	-0.32[-0.76,0.12]
Mittal 1980	201	2.2 (1.3)	125	2.1 (1.3)	11.05%	0.04[-0.24,0.32]
Subtotal ***	**581**		**380**		**50.82%**	**0.24[-0.06,0.53]**
Heterogeneity: Tau²=0.09; Chi²=17.47, df=4(P=0); I²=77.1%						
Test for overall effect: Z=1.58(P=0.11)						
9.3.2 Moderate nutritional adequacy (30% - 59% energy)						
Gershoff 1988	101	3 (1.6)	104	2.9 (1.3)	8.69%	0.12[-0.27,0.51]
Gopalan 1973	75	2.3 (0.7)	35	1.7 (0.7)	10.73%	0.62[0.32,0.92]
Lutter 2008	170	2.6 (0.7)	149	2.5 (0.7)	13.99%	0.14[-0.01,0.29]
Manjrekar 1986	13	1 (0.5)	4	0.5 (0.8)	3.61%	0.5[-0.3,1.3]
Subtotal ***	**359**		**292**		**37.01%**	**0.31[0.02,0.59]**
Heterogeneity: Tau²=0.05; Chi²=8.77, df=3(P=0.03); I²=65.8%						
Test for overall effect: Z=2.13(P=0.03)						
9.3.3 High nutritional adequacy (60% or higher energy)						
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)	12.17%	-0.01[-0.24,0.22]
Subtotal ***	**91**		**81**		**12.17%**	**-0.01[-0.24,0.22]**
Heterogeneity: Not applicable						
Test for overall effect: Z=0.08(P=0.93)						
Total ***	**1031**		**753**		**100%**	**0.24[0.06,0.41]**
Heterogeneity: Tau²=0.05; Chi²=30.84, df=9(P=0); I²=70.82%						
Test for overall effect: Z=2.69(P=0.01)						
Test for subgroup differences: Chi²=3.35, df=1 (P=0.19), I²=40.34%						

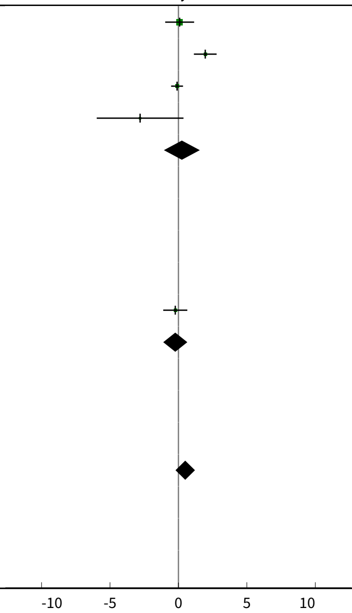
Favours no feeding -1 -0.5 0 0.5 1 Favours feeding

Analysis 9.4. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 4 Nutritional adequacy. Low vs moderate vs high: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
9.4.1 Low nutritional adequacy (0% - 29% energy)						
Devadas 1971	25	4 (0.7)	25	1.9 (0.7)	11.88%	2.12[1.73,2.51]
Gershoff 1988	158	11.7 (2.2)	151	11.4 (2.1)	11.66%	0.31[-0.17,0.79]
Gopalan 1973	136	8.7 (2)	48	7.4 (2.1)	11.09%	1.3[0.62,1.98]
Manjrekar 1986	59	9.7 (3.5)	31	10 (2.7)	8.71%	-0.27[-1.57,1.03]
Mittal 1980	201	7.9 (3.7)	125	7.8 (3.5)	10.68%	0.08[-0.72,0.88]
Subtotal ***	**579**		**380**		**54.03%**	**0.77[-0.18,1.73]**
Heterogeneity: Tau²=1.04; Chi²=46.59, df=4(P<0.0001); I²=91.41%						
Test for overall effect: Z=1.58(P=0.11)						
9.4.2 Moderate nutritional adequacy (30% - 59% energy)						

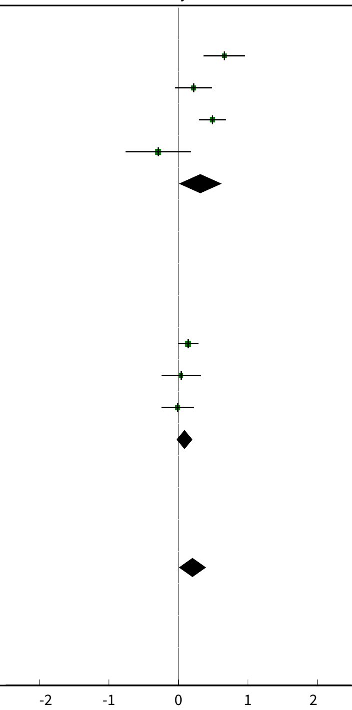
Favours no feeding -10 -5 0 5 10 Favours feeding

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Gershoff 1988	101	15.1 (3.8)	104	15 (4)		9.69%	0.09[-0.97,1.15]
Gopalan 1973	75	9.4 (2)	35	7.5 (2.1)		10.56%	1.96[1.13,2.79]
Lutter 2008	170	12.5 (2)	149	12.6 (2)		11.78%	-0.1[-0.53,0.33]
Manjrekar 1986	13	1.5 (3)	4	4.3 (2.8)		3.57%	-2.8[-5.97,0.37]
Subtotal * **	**359**		**292**			**35.6%**	**0.25[-1.06,1.56]**
Heterogeneity: Tau²=1.35; Chi²=22.44, df=3(P<0.0001); I²=86.63%							
Test for overall effect: Z=0.37(P=0.71)							
9.4.3 High nutritional adequacy (60% or higher energy)							
Santos 2005	91	6.3 (2.8)	81	6.6 (3)		10.37%	-0.23[-1.11,0.65]
Subtotal * **	**91**		**81**			**10.37%**	**-0.23[-1.11,0.65]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.51(P=0.61)							
Total * **	**1029**		**753**			**100%**	**0.5[-0.21,1.21]**
Heterogeneity: Tau²=1.07; Chi²=90.91, df=9(P<0.0001); I²=90.1%							
Test for overall effect: Z=1.37(P=0.17)							
Test for subgroup differences: Chi²=2.29, df=1 (P=0.32), I²=12.51%							



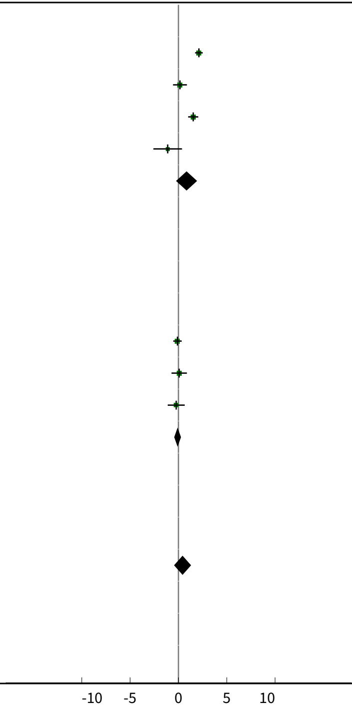
Analysis 9.5. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 5 Day-care/feeding centre vs take-home ration: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.5.1 Day-care/feeding centre							
Devadas 1971	25	1.3 (0.5)	25	0.7 (0.5)		13.4%	0.66[0.36,0.96]
Gershoff 1988	259	3 (1.6)	255	2.7 (1.5)		14.36%	0.22[-0.05,0.49]
Gopalan 1973	211	2.1 (0.8)	83	1.6 (0.8)		16.33%	0.49[0.29,0.69]
Manjrekar 1986	74	1.8 (0.9)	35	2.1 (1.3)		9.17%	-0.29[-0.76,0.18]
Subtotal * **	**569**		**398**			**53.27%**	**0.31[0.01,0.62]**
Heterogeneity: Tau²=0.07; Chi²=13.73, df=3(P=0); I²=78.15%							
Test for overall effect: Z=2(P=0.05)							
9.5.2 Take-home ration							
Lutter 2008	170	2.6 (0.7)	149	2.5 (0.7)		17.57%	0.14[-0.01,0.29]
Mittal 1980	201	2.2 (1.3)	125	2.1 (1.3)		13.88%	0.04[-0.24,0.32]
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)		15.28%	-0.01[-0.24,0.22]
Subtotal * **	**462**		**355**			**46.73%**	**0.09[-0.03,0.2]**
Heterogeneity: Tau²=0; Chi²=1.26, df=2(P=0.53); I²=0%							
Test for overall effect: Z=1.5(P=0.13)							
Total * **	**1031**		**753**			**100%**	**0.2[0.01,0.4]**
Heterogeneity: Tau²=0.05; Chi²=26.48, df=6(P=0); I²=77.34%							
Test for overall effect: Z=2.03(P=0.04)							
Test for subgroup differences: Chi²=1.84, df=1 (P=0.18), I²=45.56%							



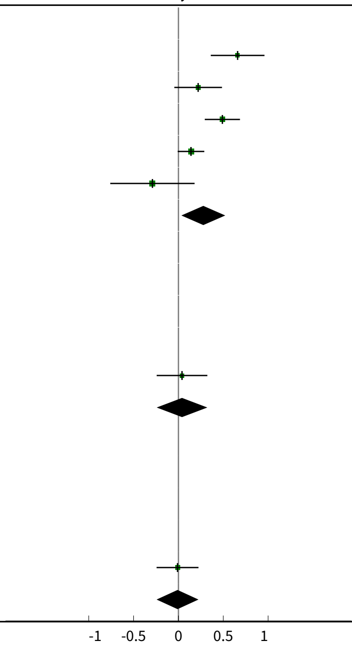
Analysis 9.6. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 6 Day-care/feeding centre vs take-home ration: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.6.1 Day-care/feeding centre							
Devadas 1971	25	4 (0.7)	25	1.9 (0.7)		15.59%	2.12[1.73,2.51]
Gershoff 1988	259	13 (4)	255	12.9 (4.3)		14.54%	0.16[-0.56,0.88]
Gopalan 1973	211	9 (2)	83	7.4 (2.1)		15.23%	1.53[1.01,2.05]
Manjrekar 1986	72	8.2 (4.6)	35	9.4 (3.1)		11.07%	-1.11[-2.59,0.37]
Subtotal ***	**567**		**398**			**56.42%**	**0.84[-0.25,1.93]**
Heterogeneity: Tau²=1.06; Chi²=34.83, df=3(P<0.0001); I²=91.39%							
Test for overall effect: Z=1.51(P=0.13)							
9.6.2 Take-home ration							
Lutter 2008	170	12.5 (2)	149	12.6 (2)		15.49%	-0.1[-0.53,0.33]
Mittal 1980	201	7.9 (3.7)	125	7.8 (3.5)		14.22%	0.08[-0.72,0.88]
Santos 2005	91	6.3 (2.8)	81	6.6 (3)		13.87%	-0.23[-1.11,0.65]
Subtotal ***	**462**		**355**			**43.58%**	**-0.09[-0.44,0.26]**
Heterogeneity: Tau²=0; Chi²=0.27, df=2(P=0.87); I²=0%							
Test for overall effect: Z=0.48(P=0.63)							
Total ***	**1029**		**753**			**100%**	**0.43[-0.45,1.31]**
Heterogeneity: Tau²=1.26; Chi²=84.38, df=6(P<0.0001); I²=92.89%							
Test for overall effect: Z=0.95(P=0.34)							
Test for subgroup differences: Chi²=2.52, df=1 (P=0.11), I²=60.34%							



Analysis 9.7. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 7 Strict supervision of feeding vs moderate supervision vs low supervison: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.7.1 Strict supervision of feeding							
Devadas 1971	25	1.3 (0.5)	25	0.7 (0.5)		13.4%	0.66[0.36,0.96]
Gershoff 1988	259	3 (1.6)	255	2.7 (1.5)		14.36%	0.22[-0.05,0.49]
Gopalan 1973	211	2.1 (0.8)	83	1.6 (0.8)		16.33%	0.49[0.29,0.69]
Lutter 2008	170	2.6 (0.7)	149	2.5 (0.7)		17.57%	0.14[-0.01,0.29]
Manjrekar 1986	74	1.8 (0.9)	35	2.1 (1.3)		9.17%	-0.29[-0.76,0.18]
Subtotal ***	**739**		**547**			**70.84%**	**0.28[0.03,0.52]**
Heterogeneity: Tau²=0.06; Chi²=19.84, df=4(P=0); I²=79.84%							
Test for overall effect: Z=2.22(P=0.03)							
9.7.2 Moderate supervision of feeding							
Mittal 1980	201	2.2 (1.3)	125	2.1 (1.3)		13.88%	0.04[-0.24,0.32]
Subtotal ***	**201**		**125**			**13.88%**	**0.04[-0.24,0.32]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.28(P=0.78)							
9.7.3 Low supervision of feeding							
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)		15.28%	-0.01[-0.24,0.22]
Subtotal ***	**91**		**81**			**15.28%**	**-0.01[-0.24,0.22]**



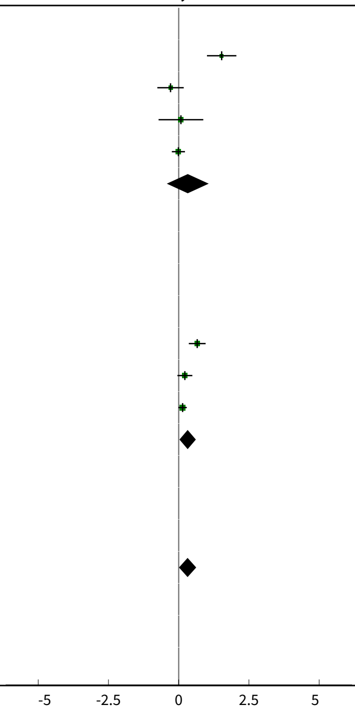
Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Heterogeneity: Not applicable							
Test for overall effect: Z=0.08(P=0.93)							
Total ***	**1031**		**753**			**100%**	**0.2[0.01,0.4]**
Heterogeneity: Tau²=0.05; Chi²=26.48, df=6(P=0); I²=77.34%							
Test for overall effect: Z=2.03(P=0.04)							
Test for subgroup differences: Chi²=3.04, df=1 (P=0.22), I²=34.3%							
				Favours no feeding	-1 -0.5 0 0.5 1	Favours feeding	

Analysis 9.8. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 8 Strict supervision of feeding vs moderate supervision vs low supervison: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.8.1 Strict supervision of feeding							
Devadas 1971	25	4 (0.7)	25	1.9 (0.7)		15.59%	2.12[1.73,2.51]
Gershoff 1988	259	13 (4)	255	12.9 (4.3)		14.54%	0.16[-0.56,0.88]
Gopalan 1973	211	9 (2)	83	7.4 (2.1)		15.23%	1.53[1.01,2.05]
Lutter 2008	170	12.5 (2)	149	12.6 (2)		15.49%	-0.1[-0.53,0.33]
Manjrekar 1986	72	8.2 (4.6)	35	9.4 (3.1)		11.07%	-1.11[-2.59,0.37]
Subtotal ***	**737**		**547**			**71.91%**	**0.62[-0.47,1.7]**
Heterogeneity: Tau²=1.38; Chi²=72.59, df=4(P<0.0001); I²=94.49%							
Test for overall effect: Z=1.11(P=0.27)							
9.8.2 Moderate supervision of feeding							
Mittal 1980	201	7.9 (3.7)	125	7.8 (3.5)		14.22%	0.08[-0.72,0.88]
Subtotal ***	**201**		**125**			**14.22%**	**0.08[-0.72,0.88]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.2(P=0.84)							
9.8.3 Low supervision of feeding							
Santos 2005	91	6.3 (2.8)	81	6.6 (3)		13.87%	-0.23[-1.11,0.65]
Subtotal ***	**91**		**81**			**13.87%**	**-0.23[-1.11,0.65]**
Heterogeneity: Not applicable							
Test for overall effect: Z=0.51(P=0.61)							
Total ***	**1029**		**753**			**100%**	**0.43[-0.45,1.31]**
Heterogeneity: Tau²=1.26; Chi²=84.38, df=6(P<0.0001); I²=92.89%							
Test for overall effect: Z=0.95(P=0.34)							
Test for subgroup differences: Chi²=1.41, df=1 (P=0.49), I²=0%							
				Favours no feeding	-5 -2.5 0 2.5 5	Favours feeding	

Analysis 9.9. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 9 Single food intervention vs multifaceted intervention: weight gain in kg.

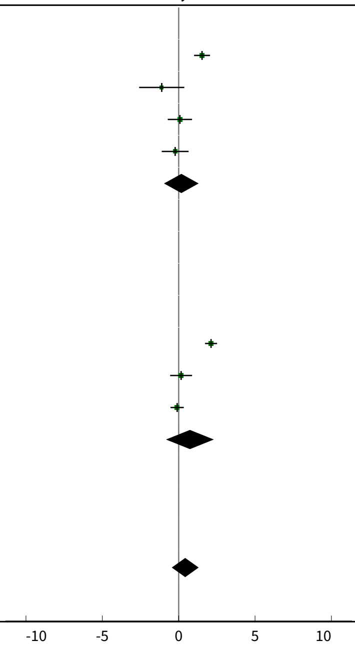
Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.9.1 Single food intervention							
Gopalan 1973	211	9 (2)	83	7.4 (2.1)		12.07%	1.53[1.01,2.05]
Manjrekar 1986	74	1.8 (0.9)	35	2.1 (1.3)		12.94%	-0.29[-0.76,0.18]
Mittal 1980	201	7.9 (3.7)	125	7.8 (3.5)		8.26%	0.08[-0.72,0.88]
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)		16.79%	-0.01[-0.24,0.22]
Subtotal ***	**577**		**324**			**50.06%**	**0.32[-0.42,1.07]**
Heterogeneity: Tau²=0.51; Chi²=31.92, df=3(P<0.0001); I²=90.6%							
Test for overall effect: Z=0.85(P=0.4)							
9.9.2 Multifacted intervention							
Devadas 1971	25	1.3 (0.5)	25	0.7 (0.5)		15.8%	0.66[0.36,0.96]
Gershoff 1988	259	3 (1.6)	255	2.7 (1.5)		16.32%	0.22[-0.05,0.49]
Lutter 2008	170	2.6 (0.7)	149	2.5 (0.7)		17.82%	0.14[-0.01,0.29]
Subtotal ***	**454**		**429**			**49.94%**	**0.32[0.03,0.61]**
Heterogeneity: Tau²=0.05; Chi²=9.32, df=2(P=0.01); I²=78.55%							
Test for overall effect: Z=2.14(P=0.03)							
Total ***	**1031**		**753**			**100%**	**0.32[0.01,0.62]**
Heterogeneity: Tau²=0.13; Chi²=41.84, df=6(P<0.0001); I²=85.66%							
Test for overall effect: Z=2.03(P=0.04)							
Test for subgroup differences: Chi²=0, df=1 (P=0.99), I²=0%							



Favours no feeding | Favours feeding

Analysis 9.10. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 10 Single food intervention vs multifaceted intervention: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.10.1 Single food intervention							
Gopalan 1973	211	9 (2)	83	7.4 (2.1)		15.23%	1.53[1.01,2.05]
Manjrekar 1986	72	8.2 (4.6)	35	9.4 (3.1)		11.07%	-1.11[-2.59,0.37]
Mittal 1980	201	7.9 (3.7)	125	7.8 (3.5)		14.22%	0.08[-0.72,0.88]
Santos 2005	91	6.3 (2.8)	81	6.6 (3)		13.87%	-0.23[-1.11,0.65]
Subtotal ***	**575**		**324**			**54.38%**	**0.17[-0.96,1.31]**
Heterogeneity: Tau²=1.12; Chi²=22.04, df=3(P<0.0001); I²=86.39%							
Test for overall effect: Z=0.3(P=0.76)							
9.10.2 Multifaceted intervention							
Devadas 1971	25	4 (0.7)	25	1.9 (0.7)		15.59%	2.12[1.73,2.51]
Gershoff 1988	259	13 (4)	255	12.9 (4.3)		14.54%	0.16[-0.56,0.88]
Lutter 2008	170	12.5 (2)	149	12.6 (2)		15.49%	-0.1[-0.53,0.33]
Subtotal ***	**454**		**429**			**45.62%**	**0.74[-0.83,2.3]**
Heterogeneity: Tau²=1.84; Chi²=60.95, df=2(P<0.0001); I²=96.72%							
Test for overall effect: Z=0.92(P=0.36)							
Total ***	**1029**		**753**			**100%**	**0.43[-0.45,1.31]**
Heterogeneity: Tau²=1.26; Chi²=84.38, df=6(P<0.0001); I²=92.89%							



Favours no feeding | Favours feeding

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Test for overall effect: Z=0.95(P=0.34)							
Test for subgroup differences: Chi²=0.32, df=1 (P=0.57), I²=0%							
				Favours no feeding	-10 -5 0 5 10	Favours feeding	

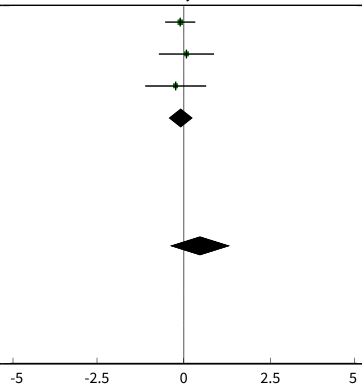
Analysis 9.11. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 11 Sensitivity analysis: day care: weight.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.11.1 Day-care/feeding centre							
Devadas 1971	25	1.3 (0.5)	25	0.7 (0.5)		13.53%	0.66[0.36,0.96]
Gershoff 1988	259	3 (1.6)	255	2.7 (1.5)		14.52%	0.22[-0.05,0.49]
Gopalan 1973	211	2.1 (0.8)	83	1.6 (0.8)		16.58%	0.49[0.29,0.69]
Manjrekar 1986	74	1.8 (1.1)	35	2.1 (1.4)		7.98%	-0.29[-0.82,0.24]
Subtotal ***	**569**		**398**			**52.61%**	**0.33[0.04,0.63]**
Heterogeneity: Tau²=0.06; Chi²=11.93, df=3(P=0.01); I²=74.86%							
Test for overall effect: Z=2.21(P=0.03)							
9.11.2 Take-home ration							
Lutter 2008	170	2.6 (0.7)	149	2.5 (0.7)		17.88%	0.14[-0.01,0.29]
Mittal 1980	201	2.2 (1.3)	125	2.1 (1.3)		14.02%	0.04[-0.24,0.32]
Santos 2005	91	1.5 (0.8)	81	1.5 (0.8)		15.49%	-0.01[-0.24,0.22]
Subtotal ***	**462**		**355**			**47.39%**	**0.09[-0.03,0.2]**
Heterogeneity: Tau²=0; Chi²=1.26, df=2(P=0.53); I²=0%							
Test for overall effect: Z=1.5(P=0.13)							
Total ***	**1031**		**753**			**100%**	**0.21[0.01,0.4]**
Heterogeneity: Tau²=0.05; Chi²=25.5, df=6(P=0); I²=76.47%							
Test for overall effect: Z=2.11(P=0.03)							
Test for subgroup differences: Chi²=2.31, df=1 (P=0.13), I²=56.72%							
				Favours feeding	-5 -2.5 0 2.5 5	Favours no feeding	

Analysis 9.12. Comparison 9 Low- and middle-income countries: subgroup analysis - feeding vs control. CBA, Outcome 12 Sensitivity analysis: daycare: height.

Study or subgroup	Favours feeding N	Favours feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
9.12.1 Day-care/feeding centre							
Devadas 1971	25	4 (0.7)	25	1.9 (0.7)		16.03%	2.12[1.73,2.51]
Gershoff 1988	259	13 (4)	255	12.9 (4.3)		14.92%	0.16[-0.56,0.88]
Gopalan 1973	211	9 (2)	83	7.4 (2.1)		15.65%	1.53[1.01,2.05]
Manjrekar 1986	72	8.2 (5.7)	35	9.4 (4.8)		8.66%	-1.11[-3.18,0.96]
Subtotal ***	**567**		**398**			**55.27%**	**0.97[-0.07,2]**
Heterogeneity: Tau²=0.9; Chi²=28.78, df=3(P<0.0001); I²=89.58%							
Test for overall effect: Z=1.83(P=0.07)							
9.12.2 Take-home ration							
				Favours feeding	-5 -2.5 0 2.5 5	Favours control	

Study or subgroup	Favours feeding N	Favours feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Lutter 2008	170	12.5 (2)	149	12.6 (2)		15.92%	-0.1[-0.53,0.33]
Mittal 1980	201	7.9 (3.7)	125	7.8 (3.5)		14.59%	0.08[-0.72,0.88]
Santos 2005	91	6.3 (2.8)	81	6.6 (3)		14.22%	-0.23[-1.11,0.65]
Subtotal ***	**462**		**355**			**44.73%**	**-0.09[-0.44,0.26]**
Heterogeneity: Tau²=0; Chi²=0.27, df=2(P=0.87); I²=0%							
Test for overall effect: Z=0.48(P=0.63)							
Total ***	**1029**		**753**			**100%**	**0.47[-0.41,1.35]**
Heterogeneity: Tau²=1.22; Chi²=80.93, df=6(P<0.0001); I²=92.59%							
Test for overall effect: Z=1.05(P=0.3)							
Test for subgroup differences: Chi²=3.54, df=1 (P=0.06), I²=71.79%							



Comparison 10. Low- and middle-income countries: subgroup analysis - feeding vs control. RCT

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Baseline WAZ lower than median vs higher than median: weight gain in kg	1	192	Mean Difference (IV, Random, 95% CI)	0.21 [-0.04, 0.47]
1.1 Lower than median WAZ	1	96	Mean Difference (IV, Random, 95% CI)	0.34 [0.18, 0.50]
1.2 Higher than median WAZ	1	96	Mean Difference (IV, Random, 95% CI)	0.08 [-0.09, 0.25]
2 Baseline WAZ lower than median vs higher than median: height gain in cm	1	192	Mean Difference (IV, Random, 95% CI)	0.15 [-0.18, 0.48]
2.1 Lower than median WAZ	1	96	Mean Difference (IV, Random, 95% CI)	0.30 [-0.17, 0.77]
2.2 Higher than median WAZ	1	96	Mean Difference (IV, Random, 95% CI)	0.0 [-0.46, 0.46]
3 Nutritional adequacy. Low vs moderate vs high: weight gain in kg	8	975	Mean Difference (IV, Random, 95% CI)	0.11 [0.04, 0.17]
3.1 Low nutritional adequacy (0 - 29% energy)	2	164	Mean Difference (IV, Random, 95% CI)	0.09 [-0.03, 0.21]
3.2 Moderate nutritional adequacy (30 - 59% energy)	4	566	Mean Difference (IV, Random, 95% CI)	0.11 [0.02, 0.20]
3.3 High nutritional adequacy (60% or higher energy)	2	245	Mean Difference (IV, Random, 95% CI)	0.19 [-0.02, 0.40]
4 Nutritional adequacy. Low vs moderate vs high: height gain in cm	8	1381	Mean Difference (IV, Random, 95% CI)	0.29 [0.08, 0.50]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
4.1 Low nutritional adequacy (0 - 29% energy)	1	127	Mean Difference (IV, Random, 95% CI)	0.25 [-0.05, 0.55]
4.2 Moderate nutritional adequacy (30 - 59% energy)	5	1009	Mean Difference (IV, Random, 95% CI)	0.16 [-0.09, 0.41]
4.3 High nutritional adequacy (60% or higher energy)	2	245	Mean Difference (IV, Random, 95% CI)	0.62 [0.13, 1.11]
5 Day-care/feeding centre vs take-home ration: weight gain in kg	9	1057	Mean Difference (IV, Random, 95% CI)	0.10 [0.04, 0.17]
5.1 Day-care/feeding centre	1	37	Mean Difference (IV, Random, 95% CI)	0.19 [-0.03, 0.41]
5.2 Take-home ration	8	1020	Mean Difference (IV, Random, 95% CI)	0.10 [0.03, 0.16]
6 Strict supervision of feeding vs moderate supervision vs low supervison: weight gain in kg	9	1056	Mean Difference (IV, Random, 95% CI)	0.11 [0.04, 0.17]
6.1 Strict supervision of feeding	5	802	Mean Difference (IV, Random, 95% CI)	0.09 [0.01, 0.17]
6.2 Moderate supervision of feeding	4	254	Mean Difference (IV, Random, 95% CI)	0.14 [0.03, 0.25]
7 Strict supervision of feeding vs moderate supervision vs low supervison: height gain in cm	9	1463	Mean Difference (IV, Random, 95% CI)	0.27 [0.07, 0.48]
7.1 Strict supervision of feeding	4	762	Mean Difference (IV, Random, 95% CI)	0.25 [0.04, 0.46]
7.2 Moderate supervision of feeding	5	701	Mean Difference (IV, Random, 95% CI)	0.33 [-0.10, 0.76]
8 Single food intervention vs multifaceted intervention: weight gain in kg	9	1089	Mean Difference (IV, Random, 95% CI)	0.11 [0.05, 0.18]
8.1 Single food intervention	9	1040	Mean Difference (IV, Random, 95% CI)	0.10 [0.04, 0.17]
8.2 Multifaceted intervention	1	49	Mean Difference (IV, Random, 95% CI)	0.37 [0.05, 0.69]
9 Single food intervention vs multifaceted intervention: height gain in cm	9	1512	Mean Difference (IV, Random, 95% CI)	0.36 [0.11, 0.61]
9.1 Single food intervention	8	1017	Mean Difference (IV, Random, 95% CI)	0.32 [0.12, 0.52]
9.2 Multifaceted intervention	2	495	Mean Difference (IV, Random, 95% CI)	0.45 [-0.82, 1.73]

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
10 Single food intervention vs multifaceted intervention: psychomotor development	2		Std. Mean Difference (Random, 95% CI)	0.58 [0.36, 0.80]
10.1 Single intervention	2		Std. Mean Difference (Random, 95% CI)	0.41 [0.10, 0.72]
10.2 Multifaceted intervention	1		Std. Mean Difference (Random, 95% CI)	0.72 [0.47, 0.96]
11 Exploratory analysis of well-implemented studies (Bhandari, Grantham-MacGregor, Kuuisiaplo)	3	281	Mean Difference (IV, Random, 95% CI)	0.76 [0.30, 1.22]
11.1 Height gain	3	281	Mean Difference (IV, Random, 95% CI)	0.76 [0.30, 1.22]

Analysis 10.1. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 1 Baseline WAZ lower than median vs higher than median: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
10.1.1 Lower than median WAZ						
Thakwalakwa 2010	66	0.8 (0.5)	30	0.5 (0.3)	50.92%	0.34[0.18,0.5]
Subtotal ***	**66**		**30**		**50.92%**	**0.34[0.18,0.5]**
Heterogeneity: Not applicable						
Test for overall effect: Z=4.22(P<0.0001)						
10.1.2 Higher than median WAZ						
Thakwalakwa 2010	67	0.5 (0.5)	29	0.5 (0.3)	49.08%	0.08[-0.09,0.25]
Subtotal ***	**67**		**29**		**49.08%**	**0.08[-0.09,0.25]**
Heterogeneity: Not applicable						
Test for overall effect: Z=0.91(P=0.36)						
Total ***	**133**		**59**		**100%**	**0.21[-0.04,0.47]**
Heterogeneity: Tau²=0.03; Chi²=4.76, df=1(P=0.03); I²=78.99%						
Test for overall effect: Z=1.63(P=0.1)						
Test for subgroup differences: Chi²=4.76, df=1 (P=0.03), I²=78.99%						

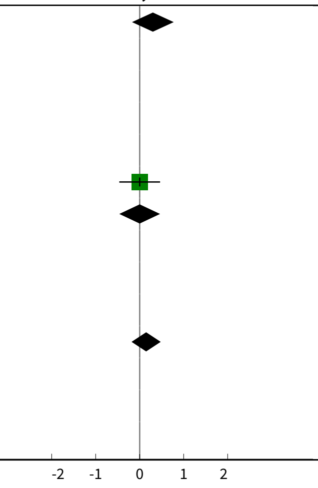
Favours no feeding -1 -0.5 0 0.5 1 Favours feeding

Analysis 10.2. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 2 Baseline WAZ lower than median vs higher than median: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
10.2.1 Lower than median WAZ						
Thakwalakwa 2010	66	3.4 (1)	30	3.1 (1.1)	48.91%	0.3[-0.17,0.77]

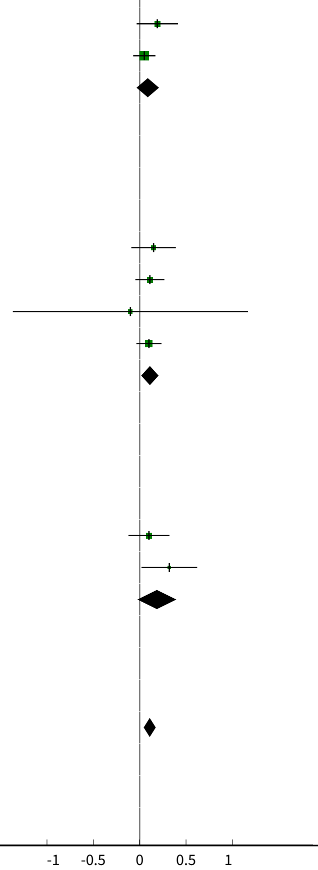
Favours no feeding -2 -1 0 1 2 Favours feeding

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Subtotal ***	**66**		**30**			**48.91%**	**0.3[-0.17,0.77]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.24(P=0.21)							
10.2.2 Higher than median WAZ							
Thakwalakwa 2010	67	3.4 (1.2)	29	3.4 (1)		51.09%	0[-0.46,0.46]
Subtotal ***	**67**		**29**			**51.09%**	**0[-0.46,0.46]**
Heterogeneity: Not applicable							
Test for overall effect: Not applicable							
Total ***	**133**		**59**			**100%**	**0.15[-0.18,0.48]**
Heterogeneity: Tau²=0; Chi²=0.79, df=1(P=0.38); I²=0%							
Test for overall effect: Z=0.87(P=0.39)							
Test for subgroup differences: Chi²=0.79, df=1 (P=0.38), I²=0%							



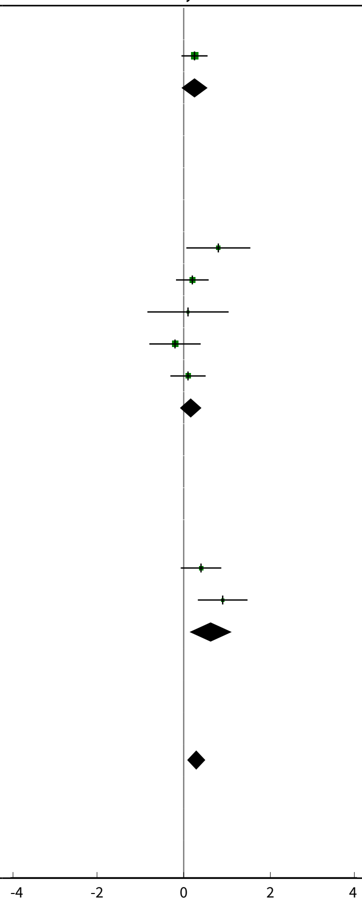
Analysis 10.3. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 3 Nutritional adequacy. Low vs moderate vs high: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.3.1 Low nutritional adequacy (0 - 29% energy)							
Pollitt 2000a	17	0.8 (0.3)	20	0.6 (0.4)		8.6%	0.19[-0.03,0.41]
Simondon 1996	65	1.3 (0.3)	62	1.3 (0.4)		29.62%	0.05[-0.07,0.17]
Subtotal ***	**82**		**82**			**38.23%**	**0.09[-0.03,0.21]**
Heterogeneity: Tau²=0; Chi²=1.18, df=1(P=0.28); I²=14.9%							
Test for overall effect: Z=1.41(P=0.16)							
10.3.2 Moderate nutritional adequacy (30 - 59% energy)							
Kuusipalo 2006	18	0.7 (0.4)	18	0.5 (0.3)		7.4%	0.15[-0.09,0.39]
Mangani 2014	191	2.5 (0.8)	185	2.4 (0.8)		17.4%	0.11[-0.05,0.27]
Oelofse 2003	16	2 (1.2)	14	2.1 (2.2)		0.27%	-0.1[-1.37,1.17]
Thakwalakwa 2010	66	0.6 (0.4)	58	0.5 (0.4)		23.24%	0.1[-0.04,0.24]
Subtotal ***	**291**		**275**			**48.31%**	**0.11[0.02,0.2]**
Heterogeneity: Tau²=0; Chi²=0.23, df=3(P=0.97); I²=0%							
Test for overall effect: Z=2.3(P=0.02)							
10.3.3 High nutritional adequacy (60% or higher energy)							
Bhandari 2001	87	2.1 (0.8)	93	2 (0.7)		8.73%	0.1[-0.12,0.32]
Grantham-McGregor 1991	32	2.6 (0.7)	33	2.2 (0.5)		4.73%	0.32[0.02,0.62]
Subtotal ***	**119**		**126**			**13.46%**	**0.19[-0.02,0.4]**
Heterogeneity: Tau²=0.01; Chi²=1.34, df=1(P=0.25); I²=25.1%							
Test for overall effect: Z=1.73(P=0.08)							
Total ***	**492**		**483**			**100%**	**0.11[0.04,0.17]**
Heterogeneity: Tau²=0; Chi²=3.57, df=7(P=0.83); I²=0%							
Test for overall effect: Z=3.25(P=0)							
Test for subgroup differences: Chi²=0.63, df=1 (P=0.73), I²=0%							



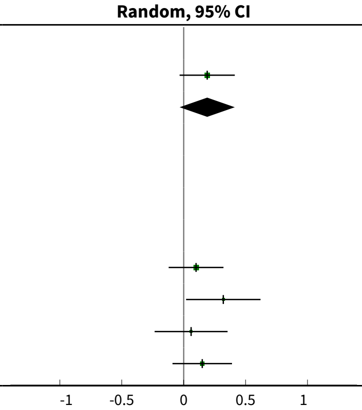
Analysis 10.4. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 4 Nutritional adequacy. Low vs moderate vs high: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.4.1 Low nutritional adequacy (0 - 29% energy)							
Simondon 1996	65	4.9 (0.8)	62	4.6 (0.9)		22.16%	0.25[-0.05,0.55]
Subtotal ***	**65**		**62**			**22.16%**	**0.25[-0.05,0.55]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.63(P=0.1)							
10.4.2 Moderate nutritional adequacy (30 - 59% energy)							
Kuusipalo 2006	18	2.5 (0.9)	18	1.7 (1.3)		6.71%	0.8[0.06,1.54]
Mangani 2014	188	13.2 (1.7)	185	13 (2)		17.59%	0.2[-0.18,0.58]
Oelofse 2003	16	10 (0.8)	14	9.9 (1.6)		4.43%	0.1[-0.84,1.04]
Rivera 2004	261	14.3 (3.3)	185	14.5 (3)		9.55%	-0.2[-0.79,0.39]
Thakwalakwa 2010	66	3.4 (1.1)	58	3.3 (1.2)		16.06%	0.1[-0.31,0.51]
Subtotal ***	**549**		**460**			**54.34%**	**0.16[-0.09,0.41]**
Heterogeneity: Tau²=0.01; Chi²=4.45, df=4(P=0.35); I²=10.04%							
Test for overall effect: Z=1.28(P=0.2)							
10.4.3 High nutritional adequacy (60% or higher energy)							
Bhandari 2001	87	10.3 (1.6)	93	9.9 (1.6)		13.44%	0.4[-0.07,0.87]
Grantham-McGregor 1991	32	11.6 (1.3)	33	10.7 (1.1)		10.05%	0.9[0.33,1.47]
Subtotal ***	**119**		**126**			**23.49%**	**0.62[0.13,1.11]**
Heterogeneity: Tau²=0.05; Chi²=1.76, df=1(P=0.19); I²=43.02%							
Test for overall effect: Z=2.5(P=0.01)							
Total ***	**733**		**648**			**100%**	**0.29[0.08,0.5]**
Heterogeneity: Tau²=0.03; Chi²=10.28, df=7(P=0.17); I²=31.88%							
Test for overall effect: Z=2.72(P=0.01)							
Test for subgroup differences: Chi²=2.72, df=1 (P=0.26), I²=26.41%							

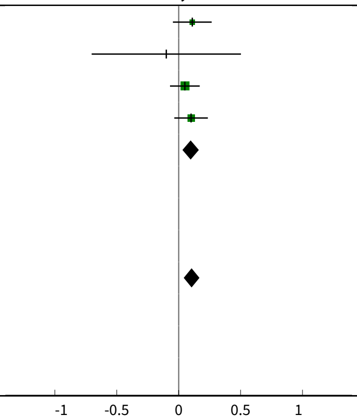


Analysis 10.5. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 5 Day-care/feeding centre vs take-home ration: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.5.1 Day-care/feeding centre							
Pollitt 2000a	17	0.8 (0.3)	20	0.6 (0.4)		8.13%	0.19[-0.03,0.41]
Subtotal ***	**17**		**20**			**8.13%**	**0.19[-0.03,0.41]**
Heterogeneity: Not applicable							
Test for overall effect: Z=1.67(P=0.09)							
10.5.2 Take-home ration							
Bhandari 2001	87	2.1 (0.8)	93	2 (0.7)		8.24%	0.1[-0.12,0.32]
Grantham-McGregor 1991	32	2.6 (0.7)	33	2.2 (0.5)		4.47%	0.32[0.02,0.62]
Heikens 1989	39	1.6 (0.7)	43	1.5 (0.7)		4.65%	0.06[-0.23,0.35]
Kuusipalo 2006	18	0.7 (0.4)	18	0.5 (0.3)		6.99%	0.15[-0.09,0.39]

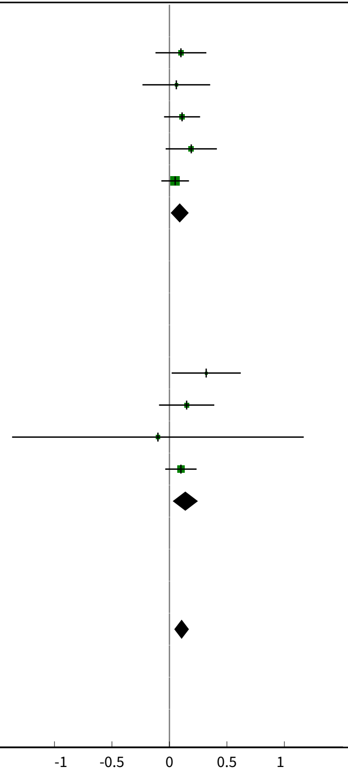


Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
Mangani 2014	191	2.5 (0.8)	185	2.4 (0.8)	16.44%	0.11[-0.05,0.27]
Oelofse 2003	16	2 (0.8)	14	2.1 (0.9)	1.11%	-0.1[-0.7,0.5]
Simondon 1996	65	1.3 (0.3)	62	1.3 (0.4)	27.99%	0.05[-0.07,0.17]
Thakwalakwa 2010	66	0.6 (0.4)	58	0.5 (0.4)	21.96%	0.1[-0.04,0.24]
Subtotal ***	**514**		**506**		**91.87%**	**0.1[0.03,0.16]**
Heterogeneity: Tau²=0; Chi²=3.39, df=7(P=0.85); I²=0%						
Test for overall effect: Z=2.86(P=0)						
Total ***	**531**		**526**		**100%**	**0.1[0.04,0.17]**
Heterogeneity: Tau²=0; Chi²=4.01, df=8(P=0.86); I²=0%						
Test for overall effect: Z=3.21(P=0)						
Test for subgroup differences: Chi²=0.62, df=1 (P=0.43), I²=0%						



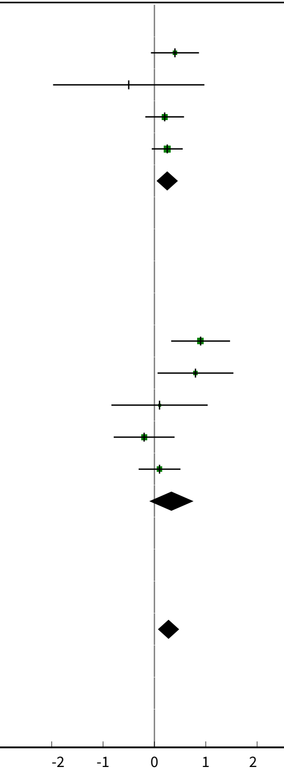
Analysis 10.6. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 6 Strict supervision of feeding vs moderate supervision vs low supervison: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Weight	Mean Difference Random, 95% CI
10.6.1 Strict supervision of feeding						
Bhandari 2001	87	2.1 (0.8)	93	2 (0.7)	8.33%	0.1[-0.12,0.32]
Heikens 1989	39	1.6 (0.7)	43	1.5 (0.7)	4.7%	0.06[-0.23,0.35]
Mangani 2014	191	2.5 (0.8)	185	2.4 (0.8)	16.62%	0.11[-0.05,0.27]
Pollitt 2000a	17	0.8 (0.3)	20	0.6 (0.4)	8.22%	0.19[-0.03,0.41]
Simondon 1996	65	1.3 (0.3)	62	1.3 (0.4)	28.29%	0.05[-0.07,0.17]
Subtotal ***	**399**		**403**		**66.16%**	**0.09[0.01,0.17]**
Heterogeneity: Tau²=0; Chi²=1.31, df=4(P=0.86); I²=0%						
Test for overall effect: Z=2.23(P=0.03)						
10.6.2 Moderate supervision of feeding						
Grantham-McGregor 1991	32	2.6 (0.7)	33	2.2 (0.5)	4.52%	0.32[0.02,0.62]
Kuusipalo 2006	18	0.7 (0.4)	18	0.5 (0.3)	7.07%	0.15[-0.09,0.39]
Oelofse 2003	16	2 (1.2)	14	2.1 (2.2)	0.25%	-0.1[-1.37,1.17]
Thakwalakwa 2010	65	0.6 (0.4)	58	0.5 (0.4)	22.01%	0.1[-0.04,0.24]
Subtotal ***	**131**		**123**		**33.84%**	**0.14[0.03,0.25]**
Heterogeneity: Tau²=0; Chi²=1.85, df=3(P=0.6); I²=0%						
Test for overall effect: Z=2.47(P=0.01)						
Total ***	**530**		**526**		**100%**	**0.11[0.04,0.17]**
Heterogeneity: Tau²=0; Chi²=3.67, df=8(P=0.89); I²=0%						
Test for overall effect: Z=3.25(P=0)						
Test for subgroup differences: Chi²=0.5, df=1 (P=0.48), I²=0%						



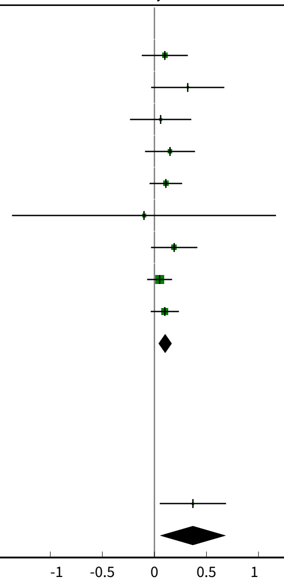
Analysis 10.7. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 7 Strict supervision of feeding vs moderate supervision vs low supervison: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.7.1 Strict supervision of feeding							
Bhandari 2001	87	10.3 (1.6)	93	9.9 (1.6)		13.19%	0.4[-0.07,0.87]
Heikens 1989	39	2.7 (3.4)	43	3.2 (3.4)		1.88%	-0.5[-1.97,0.97]
Mangani 2014	188	13.2 (1.7)	185	13 (2)		17.26%	0.2[-0.18,0.58]
Simondon 1996	65	4.9 (0.8)	62	4.6 (0.9)		21.75%	0.25[-0.05,0.55]
Subtotal ***	**379**		**383**			**54.08%**	**0.25[0.04,0.46]**
Heterogeneity: Tau²=0; Chi²=1.46, df=3(P=0.69); I²=0%							
Test for overall effect: Z=2.35(P=0.02)							
10.7.2 Moderate supervision of feeding							
Grantham-McGregor 1991	32	11.6 (1.3)	33	10.7 (1.1)		9.86%	0.9[0.33,1.47]
Kuusipalo 2006	18	2.5 (0.9)	18	1.7 (1.3)		6.58%	0.8[0.06,1.54]
Oelofse 2003	16	10 (0.8)	14	9.9 (1.6)		4.35%	0.1[-0.84,1.04]
Rivera 2004	261	14.3 (3.3)	185	14.5 (3)		9.37%	-0.2[-0.79,0.39]
Thakwalakwa 2010	66	3.4 (1.1)	58	3.3 (1.2)		15.76%	0.1[-0.31,0.51]
Subtotal ***	**393**		**308**			**45.92%**	**0.33[-0.1,0.76]**
Heterogeneity: Tau²=0.14; Chi²=9.81, df=4(P=0.04); I²=59.21%							
Test for overall effect: Z=1.51(P=0.13)							
Total ***	**772**		**691**			**100%**	**0.27[0.07,0.48]**
Heterogeneity: Tau²=0.03; Chi²=11.33, df=8(P=0.18); I²=29.38%							
Test for overall effect: Z=2.6(P=0.01)							
Test for subgroup differences: Chi²=0.11, df=1 (P=0.74), I²=0%							

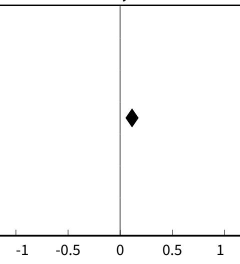


Analysis 10.8. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 8 Single food intervention vs multifaceted intervention: weight gain in kg.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.8.1 Single food intervention							
Bhandari 2001	87	2.1 (0.8)	93	2 (0.7)		8.09%	0.1[-0.12,0.32]
Grantham-McGregor 1991	32	2.6 (0.7)	16	2.2 (0.5)		3.2%	0.32[-0.03,0.67]
Heikens 1989	39	1.6 (0.7)	43	1.5 (0.7)		4.57%	0.06[-0.23,0.35]
Kuusipalo 2006	18	0.7 (0.4)	18	0.5 (0.3)		6.86%	0.15[-0.09,0.39]
Mangani 2014	191	2.5 (0.8)	185	2.4 (0.8)		16.14%	0.11[-0.05,0.27]
Oelofse 2003	16	2 (1.2)	14	2.1 (2.2)		0.25%	-0.1[-1.37,1.17]
Pollitt 2000a	17	0.8 (0.3)	20	0.6 (0.4)		7.98%	0.19[-0.03,0.41]
Simondon 1996	65	1.3 (0.3)	62	1.3 (0.4)		27.47%	0.05[-0.07,0.17]
Thakwalakwa 2010	66	0.6 (0.4)	58	0.5 (0.4)		21.55%	0.1[-0.04,0.24]
Subtotal ***	**531**		**509**			**96.1%**	**0.1[0.04,0.17]**
Heterogeneity: Tau²=0; Chi²=3.13, df=8(P=0.93); I²=0%							
Test for overall effect: Z=3.15(P=0)							
10.8.2 Multifaceted intervention							
Grantham-McGregor 1991	32	2.6 (0.6)	17	2.2 (0.5)		3.9%	0.37[0.05,0.69]
Subtotal ***	**32**		**17**			**3.9%**	**0.37[0.05,0.69]**

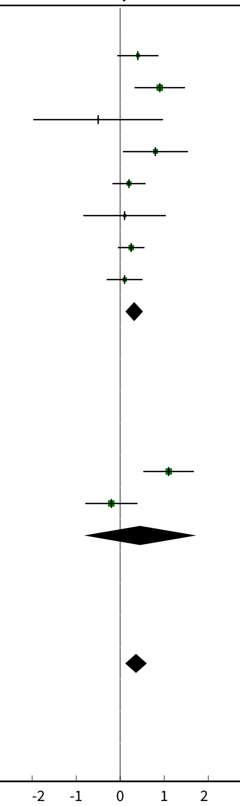


Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
Heterogeneity: Not applicable							
Test for overall effect: Z=2.28(P=0.02)							
Total ***	**563**		**526**			**100%**	**0.11[0.05,0.18]**
Heterogeneity: Tau²=0; Chi²=5.72, df=9(P=0.77); I²=0%							
Test for overall effect: Z=3.54(P=0)							
Test for subgroup differences: Chi²=2.59, df=1 (P=0.11), I²=61.34%							



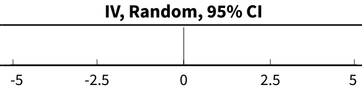
Analysis 10.9. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 9 Single food intervention vs multifaceted intervention: height gain in cm.

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.9.1 Single food intervention							
Bhandari 2001	87	10.3 (1.6)	93	9.9 (1.6)		12.03%	0.4[-0.07,0.87]
Grantham-McGregor 1991	32	11.6 (1.3)	33	10.7 (1.1)		9.87%	0.9[0.33,1.47]
Heikens 1989	39	2.7 (3.4)	43	3.2 (3.4)		2.46%	-0.5[-1.97,0.97]
Kuusipalo 2006	18	2.5 (0.9)	18	1.7 (1.3)		7.29%	0.8[0.06,1.54]
Mangani 2014	188	13.2 (1.7)	185	13 (2)		14.2%	0.2[-0.18,0.58]
Oelofse 2003	16	10 (0.8)	14	9.9 (1.6)		5.19%	0.1[-0.84,1.04]
Simondon 1996	65	4.9 (0.8)	62	4.6 (0.9)		16.15%	0.25[-0.05,0.55]
Thakwalakwa 2010	66	3.4 (1.1)	58	3.3 (1.2)		13.45%	0.1[-0.31,0.51]
Subtotal ***	**511**		**506**			**80.64%**	**0.32[0.12,0.52]**
Heterogeneity: Tau²=0.02; Chi²=8.76, df=7(P=0.27); I²=20.05%							
Test for overall effect: Z=3.12(P=0)							
10.9.2 Multifaceted intervention							
Grantham-McGregor 1991	32	11.8 (1)	17	10.7 (1)		9.84%	1.1[0.52,1.68]
Rivera 2004	261	14.3 (3.3)	185	14.5 (3)		9.52%	-0.2[-0.79,0.39]
Subtotal ***	**293**		**202**			**19.36%**	**0.45[-0.82,1.73]**
Heterogeneity: Tau²=0.76; Chi²=9.52, df=1(P=0); I²=89.5%							
Test for overall effect: Z=0.7(P=0.49)							
Total ***	**804**		**708**			**100%**	**0.36[0.11,0.61]**
Heterogeneity: Tau²=0.07; Chi²=18.81, df=9(P=0.03); I²=52.14%							
Test for overall effect: Z=2.87(P=0)							
Test for subgroup differences: Chi²=0.04, df=1 (P=0.84), I²=0%							

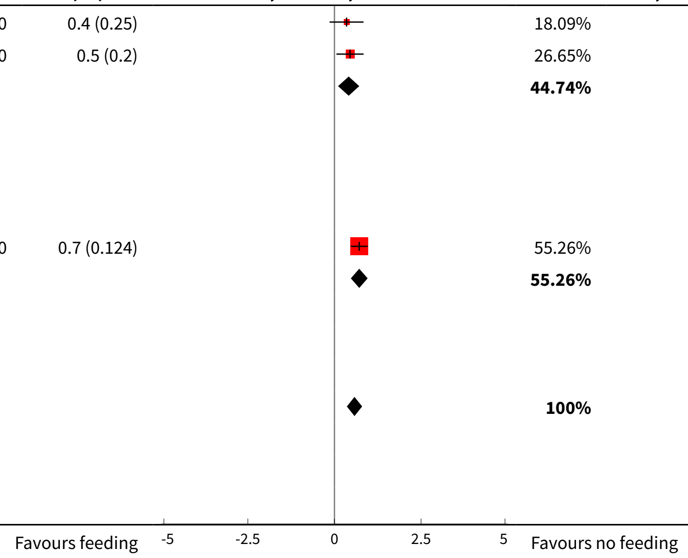


Analysis 10.10. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 10 Single food intervention vs multifaceted intervention: psychomotor development.

Study or subgroup	Feeding N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
10.10.1 Single intervention						

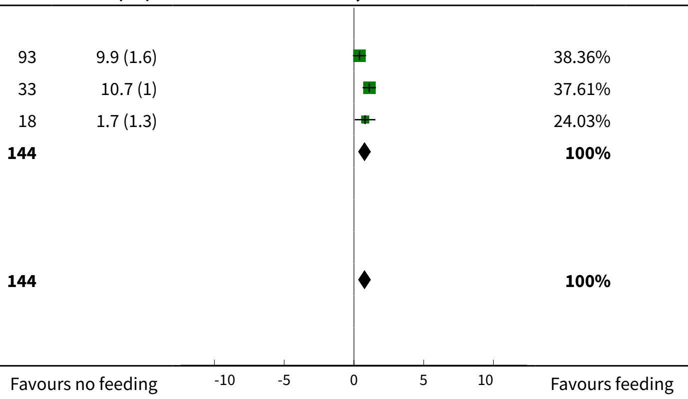


Study or subgroup	Feeding N	Control N	Std. Mean Difference (SE)	Std. Mean Difference IV, Random, 95% CI	Weight	Std. Mean Difference IV, Random, 95% CI
Grantham-McGregor 1991	0	0	0.4 (0.25)		18.09%	0.35[-0.14,0.84]
Husaini 1991	0	0	0.5 (0.2)		26.65%	0.45[0.06,0.84]
Subtotal (95% CI)					**44.74%**	**0.41[0.1,0.72]**
Heterogeneity: Tau²=0; Chi²=0.1, df=1(P=0.75); I²=0%						
Test for overall effect: Z=2.63(P=0.01)						
10.10.2 Multifaceted intervention						
Grantham-McGregor 1991	0	0	0.7 (0.124)		55.26%	0.72[0.47,0.96]
Subtotal (95% CI)					**55.26%**	**0.72[0.47,0.96]**
Heterogeneity: Not applicable						
Test for overall effect: Z=5.77(P<0.0001)						
Total (95% CI)					**100%**	**0.58[0.36,0.8]**
Heterogeneity: Tau²=0.01; Chi²=2.44, df=2(P=0.3); I²=17.94%						
Test for overall effect: Z=5.14(P<0.0001)						
Test for subgroup differences: Chi²=2.34, df=1 (P=0.13), I²=57.26%						



Analysis 10.11. Comparison 10 Low- and middle-income countries: subgroup analysis - feeding vs control. RCT, Outcome 11 Exploratory analysis of well-implemented studies (Bhandari, Grantham-MacGregor, Kuuisiaplo).

Study or subgroup	Feeding N	Feeding Mean(SD)	Control N	Control Mean(SD)	Mean Difference Random, 95% CI	Weight	Mean Difference Random, 95% CI
10.11.1 Height gain							
Bhandari 2001	87	10.3 (1.6)	93	9.9 (1.6)		38.36%	0.4[-0.07,0.87]
Grantham-McGregor 1991	32	11.8 (1)	33	10.7 (1)		37.61%	1.1[0.62,1.58]
Kuusipalo 2006	18	2.5 (0.9)	18	1.7 (1.3)		24.03%	0.8[0.06,1.54]
Subtotal ***	**137**		**144**			**100%**	**0.76[0.3,1.22]**
Heterogeneity: Tau²=0.09; Chi²=4.22, df=2(P=0.12); I²=52.57%							
Test for overall effect: Z=3.25(P=0)							
Total ***	**137**		**144**			**100%**	**0.76[0.3,1.22]**
Heterogeneity: Tau²=0.09; Chi²=4.22, df=2(P=0.12); I²=52.57%							
Test for overall effect: Z=3.25(P=0)							



ADDITIONAL TABLES

Table 1. Risk of bias domains and criteria for judgement*

Risk of bias domain	Criteria for judgement
1. Was the allocation sequence adequately generated?	Score “Low risk” if a random component in the sequence generation process is described (e.g. Referring to a random number table). Score "High risk” when a nonrandom method is used (e.g. performed by date of admission). NRCTs and CBA studies should be scored “High risk”. Score “Unclear risk” if not specified in the paper

Table 1. Risk of bias domains and criteria for judgement* *(Continued)*

2. Was allocation concealed	Score “Low risk” if the unit of allocation was by institution, team or professional and allocation was performed on all units at the start of the study; or if the unit of allocation was by patient or episode of care and there was some form of centralised randomisation scheme, an on-site computer system or sealed opaque envelopes were used. CBA studies should be scored “High risk". Score “Unclear risk” if not specified in the paper
3. Were baseline outcome measurements similar?	Score “Low risk” if performance or patient outcomes were measured prior to the intervention, and no important differences were present across study groups. In RCTs, score “Low risk” if imbalanced but appropriate adjusted analysis was performed (e.g. Analysis of covariance). Score “High risk” if important differences were present and not adjusted for in analysis. If RCTs have no baseline measure of outcome, score “Unclear risk”
4. Were baseline characteristics similar?	Score “Low risk” if baseline characteristics of the study and control providers are reported and similar. Score “Unclear risk” if it is not clear in the paper (e.g. characteristics are mentioned in text but no data were presented). Score “High risk” if there is no report of characteristics in text or tables or if there are differences between control and intervention providers. Note that in some cases imbalance in patient characteristics may be due to recruitment bias whereby the provider was responsible for recruiting patients into the trial
5. Were incomplete outcome data adequately addressed?	Score “Low risk” if missing outcome measures were unlikely to bias the results (e.g. the proportion of missing data was similar in the intervention and control groups or the proportion of missing data was less than the effect size i.e. unlikely to overturn the study result). Score “High risk” if missing outcome data was likely to bias the results. Score “Unclear risk” if not specified in the paper (Do not assume 100% follow up unless stated explicitly)
6. Was knowledge of the allocated interventions adequately prevented during the study?	Score “Low risk” if the authors state explicitly that the primary outcome variables were assessed blindly, or the outcomes are objective, e.g. length of hospital stay. Primary outcomes are those variables that correspond to the primary hypothesis or question as defined by the authors. Score “High risk” if the outcomes were not assessed blindly. Score “Unclear risk” if not specified in the paper
7. Was the study adequately protected against contamination?	Score “Low risk” if allocation was by community, institution or practice and it is unlikely that the control group received the intervention. Score “High risk” if it is likely that the control group received the intervention (e.g. if patients rather than professionals were randomised). Score “Unclear risk” if professionals were allocated within a clinic or practice and it is possible that communication between intervention and control professionals could have occurred (e.g. physicians within practices were allocated to intervention or control)
8. Was the study free from selective outcome reporting?	Score “Low risk” if there is no evidence that outcomes were selectively reported (e.g. all relevant outcomes in the methods section are reported in the results section). Score “High risk” if some important outcomes are subsequently omitted from the results. Score “Unclear risk” if not specified in the paper
9. Was the study free from other risks of bias?	Score “Low risk” if there is no evidence of other risk of biases
10. Were participants unaware of allocation?	Score " Low risk" if control participants were given a placebo. Score "Unclear risk" if it is hard to tell. Score "High risk" if participants were aware of the allocation, even if this could not be prevented

Domains one to nine taken directly from: EPOC risk of bias criteria. We added the tenth domain.

Table 2. Summary of studies with clustered design

RCTs

Table 2. Summary of studies with clustered design *(Continued)*

Study	Adjusted clustering appropriately?	Our adjustments
Fauveau 1992	No	Not corrected because no standard deviations. Not in meta-analysis. Reported narratively
Husaini 1991	No	Cluster size: intervention = 7, control = 5. Used ICC of 0.025 for weight and length, used 0.15 for psychosocial outcomes
Isanaka 2009	Yes	Not applicable
De Romana 2000	No	Not corrected because there were no standard deviations. Not in meta-analysis. Reported narratively
McKay 1978	No	Cluster size: intervention = 16 and control = 16. Used ICC of 0.15 for psychological outcomes
Pollitt 2000a	No	Cluster size: intervention = 6 and control = 6. Used ICC of 0.025 for weight. For psychosocial outcomes, did not correct for clustering as did not have the appropriate data. Used ANOVAs from the papers as they controlled for covariates
Rivera 2004	Yes	Not applicable
Roy 2005	Yes	Not applicable
CBAs		
Study	**Adjusted clustering appropriately?**	**Our adjustments**
Coyne 1980	No	Cluster size: intervention = 15 and control = 9. Used ICC of 0.025 for weight and length
Devadas 1971	No	Cluster size: intervention = 25 and control = 25. Used ICC of 0.025 for weight and length
Gershoff 1988	No	Cluster size: 43 in intervention and control groups. Used ICC of 0.025 for weight and length
Joshi 1988	No	Adjusted for clustering for % of children who improved nutritional status (reported narratively as outcome couldn't be combined with other). Cluster size 50 in intervention group and 42 in control group. Used ICC of 0.025
Lutter 2008	Yes, but the numbers we used were not adjusted	Cluster size: intervention = 17 and control = 25. Used ICC of 0.025
Santos 2005	Yes	Not applicable
Schroeder 2002	No	Cluster size: 20 Used ICC of 0.025 for weight and length
Tomedi 2012	Yes	Not applicable

CBAs = controlled before-and-after trials
ICC = intraclass correlation coefficient
RCTs = randomised controlled trials

Table 3. Adequacy of energy content of supplementation given

Study	Level of energy classified as low (L: 0 - 29%), moderate (M: 30 - 60%), and high (H: 60%+) of the dietary reference intake (% DRI) by children's age					
	4 - 5 months	6 - 12 months	12 - 24 months	24 - 36 months	36 - 48 months	48 - 60 months
Bhandari 2001	H (89.9%)	H (94.7%)	-	-	-	-
Simondon 1996	L (20.6%)	L (28.8%)	-	-	-	-
Rivera 2004	M (38.7%)	L (27.4%)	-	-	-	-
Fauveau 1992	-	L (17.6%)	-	-	-	-
Oelofse 2003	-	M (42%)	-	-	-	-
Iannotti 2014	-	L (15%)	-	-	-	-
Mangani 2014	-	M (40%)	-	-	-	-
Grantham-McGregor 1991	-	H (105.2%)	H (86.3%)	-	-	-
-Husaini 1991	-	M (48.1%)	M (39.5%)	-	-	-
Lutter 2008	-	M (38.6%)	M (31.6%)	-	-	-
Mittal 1980	-	L (27.8%)	L (22.8%)	-	-	-
Roy 2005	-	M (42.1%)	M (34.5%)	-	-	-
Thakwalakwa 2010	-	M (30.9%)	L (25.4%)	-	-	-
Kuusipalo 2006	-	M (55%)	M (44%)	-	-	-
De Romana 2000	-	M (56.1)	M (46%)	-	-	-
Santos 2005	-	H (60%)	H (60%)	-	-	-
Tomedi 2012	-	H (136.2%)	H (111.7%)	-	-	-
Pollitt 2000a	-	-	L (24.7%)	-	-	-
Isanaka 2009	-	H (69.8%)	M (57.5%)	M (57.5%)	M (34.7%)	M (33%)
Manjrekar 1986	-	M (35.1%)	L (28.8%)	L (28.8%)	L (17.4%)	L (16.5%)
Gershoff 1988	-	M (42.1%)	M (34.5%)	M (34.5%)	L (20.8%)	L (19.8%)
Gopalan 1973	-	-	M (30.6%)	M (30.6%)	L (18.5%)	L (17.5%)
Devadas 1971	-	-	-	L (14.2%)	-	-
McKay 1978	-	-	-	-	M (53.6%)	-
Joshi 1988	-	-	-	-	L (8.3%)	L (7.9%)

Table 3. Adequacy of energy content of supplementation given *(Continued)*

Coyne 1980	-	-	-	-	M (47.6%)	M (47.6%)

This calculation was only done if the primary studies provided enough information. Therefore, six studies are missing as they did not provide enough information.
DRI - dietary reference intake
H - high
L - low
M - moderate

Table 4. Summary of reported outcomes for RCTs in low- and middle-income countries

Outcome measure	Systematic review		Meta-analysis	
	No. of studies	No. of participants	No. of studies	No. of participants
Weight gain	11	1356	9	1057
Height gain	11	1814	9	1698
WAZ	9	2029	8	1747
HAZ	9	4837	9	4837
WHZ	6	4399	6	4399
Psychomotor development	5	430	1	113
Cognitive development	3	357	1	137
Follow-up of cognitive functioning	3	505	1	142
Language	1	136	0	0
Memory	1	231	0	0
Leakage and substitution	5	1589	0	0
Haemoglobin	5	866	5	866
Physical activity	3	201	0	0
Morbidity	6	4099	0	0
Mortality	1	3103	0	0

CBAs - controlled before-and-after trials
HAZ - height-for-age z-score
No. - number
RCT - randomised controlled trial
WAZ - weight -for-age z-score
WHZ - weight-for-height z-score

Table 5. Summary of reported outcomes for RCTs in high-income countries

Outcome measure	Systematic review		Meta-analysis	
	No. of studies	No. of participants	No. of studies	No. of participants
Weight gain	1	45	1	45
Height gain	1	45	1	45
WAZ	1	97	1	97
HAZ	1	97	1	97
WHZ	1	97	1	97

HAZ - height-for-age z-score
No. - number
RCT - randomised controlled trial
WAZ - weight-for-age z-score
WHZ - weight-for-height z-score

Table 6. Summary of reported outcomes for CBAs in low- and middle-income countries

Outcome measure	Systematic review		Meta-analysis	
	No. of studies	No. of participants	No. of studies	No. of participants
Weight gain	7	1574	7	1574
Height gain	7	1573	7	1573
WAZ	4	790	4	790
HAZ	5	873	4	790
WHZ	4	790	4	970
Psychomotor development	0	0	0	0
Cognitive development	0	0	0	0
Follow-up of cognitive functioning	0	0	0	0
Language	0	0	0	0
Memory	0	0	0	0
Leakage and substitution	5	924	0	0
Haemoglobin	1	110	0	0
Physical activity	0	0	0	0
Morbidity	1	34	0	0

Table 6. Summary of reported outcomes for CBAs in low- and middle-income countries *(Continued)*

Mortality	0	0	0	0

CBAs - controlled before-and-after trials
HAZ - height-for-age z-score
No. - number
WAZ - weight-for-age z-score
WHZ - weight-for-height z-score

Table 7. Summary of reported outcomes for CBAs in high-income countries

Outcome measure	Systematic review		Meta-analysis	
	No. of studies	No. of participants	No. of studies	No. of participants
Weight gain	1	116	1	116
Height gain	1	116	1	116
WAZ	0	0	0	0
HAZ	0	0	0	0
WHZ	0	0	0	0

CBAs - controlled before-and-after trials
HAZ - height-for-age z-score
No. - number
WAZ - weight-for-age z-score
WHZ - weight-for-height z-score

APPENDICES

Appendix 1. Strategies for searches last updated in January 2014

Cochrane Central Register of Controlled Studies (CENTRAL), Cochrane Database of Systematic Reviews (CDSR), and Database of Abstracts of Reviews of Effects (DARE)

CENTRAL 2014 Issue 1 of 12. Limited to 2012 to 2014. Searched 28 January 2014 [187 records].
CENTRAL May 2012. Limited to 2011 to 2012. Searched 3 May 2012 [140 records].
CENTRAL 2011 Issue 7. Searched 18 July 2011.

CDSR, 2014 Issue 1 of 12. Searched 28 January 2014 [111 records].

DARE, Issue 1 of 4. Searched 28 January 2014 [20 records].
DARE, May 2012. Limited to 2011 to 2012 Searched 3 May 2012 [12 records].

#1MeSH descriptor: [Dietary Supplements] this term only
#2MeSH descriptor: [Diet Therapy] this term only#3MeSH descriptor: [Food, Fortified] this term only
#4MeSH descriptor: [Functional Food] this term only
#5MeSH descriptor: [Nutrition Therapy] explode all trees
#6((extra or take-home or take home) and (food* or feed* or ration*)):ti,ab
#7MeSH descriptor: [Nutrition Policy] this term only
#8((feed* or food*) and program*):ti,ab
#9((fortif* or enrich*) and (food* or diet* or spread* or flour* or cereal*)):ti,ab
#10(lunch* or dinner* or break-fast* or breakfast* or break fast* or supper* or snack* or meal* or milk):ti,ab
#11(plumpy* or nutri spread*):ti,ab

#12((supplement* or complement*) and (food* or feed* or diet* or nutrition* or nutrient* or micronutrient* or micro-nutrient*)):ti,ab
#13(blended and food*):ti,ab
#14(energy and supplement*):ti,ab
#15(lipid based and supplement*):ti,ab
#16(#1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15)
#17MeSH descriptor: [Infant] explode all trees
#18MeSH descriptor: [Child, Preschool] explode all trees
#19toddler*:ti,ab
#20(baby or babies or infant* or preschool* or pre-school* or child*):ti,ab
#21(#17 or #18 or #19 or #20)
#22(#16 and #21)
#23MeSH descriptor: [Growth and Development] this term only
#24*Growth
#25MeSH descriptor: [Child Development] this term only
#26milestone*:ti,ab
#27MeSH descriptor Motor Skills explode all trees in MeSH products
#28MeSH descriptor: [Psychomotor Performance] this term only
#29MeSH descriptor: [Psychomotor Disorders] this term only
#30(psychomotor and development):ti,ab
#31psychosocial:ti,ab
#32MeSH descriptor: [Stress, Psychological] this term only
#33MeSH descriptor: [Adaptation, Psychological] this term only
#34MeSH descriptor: [Social Support] this term only
#35MeSH descriptor: [Cognition] this term only
#36MeSH descriptor: [Cognition Disorders] this term only
#37MeSH descriptor: [Learning Disorders] this term only
#38(cognit* and ability):ti,ab
#39cognit*:ti,ab
#40MeSH descriptor: [Attention] this term only
#41MeSH descriptor: [Attention Deficit Disorder with Hyperactivity] this term only
#42MeSH descriptor: [Child Behavior Disorders] this term only
#43(on task and behavio*r):ti,ab
#44MeSH descriptor Vocabulary explode all trees in MeSH products
#45MeSH descriptor Language Development explode all trees in MeSH products
#46MeSH descriptor Intelligence explode all trees in MeSH products
#47MeSH descriptor Intelligence Tests explode all trees in MeSH products
#48MeSH descriptor Bone Density explode all trees in MeSH products
#49(bone and mineral and test*):ti,ab
#50MeSH descriptor Motor Activity explode all trees in MeSH products
#51(physical and activit*):ti,ab
#52*Exercise
#53MeSH descriptor Morbidity explode all trees in MeSH products
#54MeSH descriptor Stereotyping explode all trees in MeSH products
#55stigma*:ti,ab
#56MeSH descriptor: [Aggression] this term only
#57(bully or bullying):ti,ab
#58victimization:ti,ab
#59disruptive behavio*r:ti,ab
#60MeSH descriptor: [Obesity] this term only
#61MeSH descriptor: [Weight Loss] this term only
#62(excess* and weight and loss):ti,ab
#63MeSH descriptor: [Memory] this term only
#64MeSH descriptor: [Logic] this term only
#65MeSH descriptor: [Problem Solving] this term only
#66reasoning:ti,ab
#67MeSH descriptor: [Psychometrics] this term only
#68height:ti,ab
#69weight:ti,ab
#70length:ti,ab
#71MeSH descriptor: [Anthropometry] this term only
#72MeSH descriptor: [Body Weight] this term only
#73MeSH descriptor: [Body Height] this term only

#74MeSH descriptor: [Body Size] this term only
#75MeSH descriptor: [Weight Gain] this term only
#76MeSH descriptor: [Body Composition] this term only
#77MeSH descriptor: [Physical Fitness] this term only
#78fitness:ti,ab
#79#23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43 or #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78
#80(#22 and #79)

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R)

Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1946 to Present. Limited to 2012 to 2014. Searched 28 January 2014 [1799 records].
Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1948 to Present. Limited to 2011 to 2012. Searched 1 May 2012 [1050 records].
Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations and Ovid MEDLINE(R) 1948 to Present. Searched July 2011 [10937 records].

1 Dietary Supplements/
2 Diet Therapy/
3 Food, Fortified/
4 Functional Food/
5 Nutrition Therapy/
6 ((extra or take-home or takehome) adj3 (food$ or feed$ or ration$)).tw.
7 Nutrition Policy/ 5882)
8 ((feed$ or food$) adj3 program$).tw. 3245)
9 ((fortif$ or enrich$) adj3 (food$ or diet$ or spread$ or flour$ or cereal$)).tw.
10 (lunch$ or dinner$ or break-fast$ or breakfast$ or break fast$ or supper$ or snack$ or meal$ or milk).tw.
11 (plumpy$ or nutri spread$).tw.
12 ((supplement$ or complement$) adj3 (food$ or feed$ or diet$ or nutrition$ or nutrient$ or micronutrient$ or micro-nutrient$)).tw.
13 (blended adj3 food$).tw.
14 (energy adj3 supplement$).tw.
15 (lipid based adj3 supplement$).tw.
16 or/1-15
17 Infant/
18 Child, Preschool/
19 toddler$.tw.
20 (baby or babies or infant$ or preschool$ or pre-school$ or child$).tw.
21 or/17-20
22 16 and 21
23 "Growth and Development"/
24 *Growth/
25 Child Development/
26 milestone$.tw.
27 exp Motor Skills/
28 Psychomotor Performance/
29 Psychomotor Disorders/
30 (psychomotor adj3 development).tw.
31 psychosocial.tw.
32 Stress, Psychological/
33 Adaptation, Psychological/
34 Social Support/
35 Cognition/
36 Cognition Disorders/
37 Learning Disorders/
38 (cognit$ adj4 ability).tw.
39 cognit$.tw.
40 Attention/
41 Attention Deficit Disorder with Hyperactivity/
42 Child Behavior Disorders/
43 (on task adj4 behavio$r).tw.
44 exp Vocabulary/

45 exp Language Development/
46 exp Intelligence/
47 exp Intelligence Tests/
48 exp Bone Density/
49 (bone adj3 mineral adj3 test$).tw.
50 exp Motor Activity/
51 (physical adj3 activit$).tw.
52 *Exercise/ (43388)
53 exp Morbidity/
54 exp Stereotyping/
55 stigma$.tw.
56 Aggression/
57 (bully or bullying).tw.
58 victimization.tw.
59 disruptive behavio$r.tw.
60 Obesity/
61 Weight Loss/
62 (excess$ adj3 weight adj3 loss).tw.
63 Memory/
64 Logic/
65 Problem Solving/
66 reasoning.tw.
67 Psychometrics/
68 height.tw.
69 weight.tw.
70 length.tw.
71 Anthropometry/
72 Body Weight/
73 Body Height/
74 Body Size/
75 Weight Gain/
76 Body Composition/
77 Physical Fitness/
78 fitness.tw.
79 or/23-78
80 22 and 79

Social Sciences Citation Index (SSCI) (Web of Science), Conference Proceedings Citation Index-Science (CPCI-S) (Web of Science), and Conference Proceedings Citation Index-Social Science & Humanities (CPCI-SSH) (Web of Science)

The following databases were searched via Web of Science on 28 January 2014 [1005 records].

SSCI 1970 to present.
CPCI-S 1990 to present.
CPCI-SSH 1990 to present.

Title=(lunch* OR dinner* OR breakfast* OR snack* OR meal OR milk OR meat OR egg OR food OR feed) AND Title=(toddler* OR baby OR babies OR infant* OR preschool OR preschool OR child*)

Education Resources Information (ERIC) (Proquest)

ERIC 1994 to present. Searched 28 January 2014 [83 records].

TI(lunch* OR dinner* OR breakfast* OR snack* OR meal OR milk OR meat OR egg OR food OR feed) AND TI(toddler* OR baby OR babies OR infant* OR preschool OR preschool OR child*)

Proquest Dissertations and Theses

Proquest Dissertations and Theses. Searched 28 January 2014 [74 records].
Proquest Dissertations and Theses. Searched 18 July 2011 [6141 records].

TI(lunch* OR dinner* OR breakfast* OR snack* OR meal OR milk OR meat OR egg OR food OR feed) AND TI(toddler* OR baby OR babies OR infant* OR preschool OR preschool OR child*)

PsycINFO (Ovid)

PsycINFO 1806 to January Week 3 2014. Searched 28 January 2014.

1 Dietary Supplements/
2 Diets/
3 (Diet adj3 therapy).tw.
4 Food/
5 Food Intake/
6 Nutrition/
7 fortifi$.tw.
8 (Functional adj3 Food).tw.
9 (fortified adj3 food).tw.
10 (Nutrition adj3 Therapy).tw.
11 ((extra or take-home or takehome) adj3 (food$ or feed$ or ration$)).tw.
12 Nutrition Policy.tw.
13 ((feed$ or food$) adj3 program$).tw.
14 ((fortif$ or enrich$) adj3 (food$ or diet$ or spread$ or flour$ or cereal$)).tw.
15 (lunch$ or dinner$ or break-fast$ or breakfast$ or break fast$ or supper$ or snack$ or meal$).tw.
16 plumpy$.tw.
17 (supplement$ adj3 (food$ or feed$ or diet$ or nutrition$ or nutrient$)).tw.
18 or/1-17
19 Infant.tw.
20 Preschool Students/
21 (baby or babies or infant$ or preschool$ or pre-school$ or child$ or toddler$).tw.
22 19 or 20 or 21
23 18 and 22

Clinicaltrials.gov via National Institutes of Health (NIH)

Advanced Search

Intervention: (feed or food or meal)

Age Group: 0 to 17

Accessed: 28 January 2014

Appendix 2. Strategies for searches last updated in May 2012

EMBASE Classic and EMBASE (OVID)

Embase Classic and Embase 1947 to 1 May 2012. Searched 3 May 2012. Limited to 2011 to 2012 [257 records].

Embase Classic and Embase 1947 to 1 May 2012. Search 18 July 2011 [5611 records].

1 exp Dietary Supplements/

2 Diet Therapy/

3 Food, Fortified/

4 Food/

5 (Functional adj3 Food).tw.

6 Nutrition Therapy/

7 Diet Therapy/

8 ((extra or take-home or takehome) adj3 (food$ or feed$ or ration$)).tw.

9 Nutrition Policy/

10 ((feed$ or food$) adj3 program$).tw.

11 ((fortif$ or enrich$) adj3 (food$ or diet$ or spread$ or flour$ or cereal$)).tw.

12 (lunch$ or dinner$ or break-fast$ or breakfast$ or milk or break fast$ or supper$ or snack$ or meal$).tw.

13 (plumpy$ or nutri spread$).tw.

14 (blend$ food$ or lipid based supplement$).tw.

15 (energy adj3 supplement$).tw.

16 (supplement$ adj3 (food$ or feed$ or diet$ or nutrition$ or nutrient$)).tw.

17 or/1-16

18 exp Infant/

19 Child, Preschool/

20 (baby or babies or infant$ or preschool$ or pre-school$ or child$).tw.

21 or/18-20

22 17 and 21

23 "Growth and Development"/

24 *Growth/

25 Child Development/

26 exp Motor Skills/

27 Psychomotor Performance/

28 Psychomotor Disorders/

29 (psychomotor adj3 development).tw.

30 Cognition/

31 Cognition Disorders/

32 Learning Disorders/

33 (cognit$ adj4 ability).tw.

34 Attention/

35 Attention Deficit Disorder with Hyperactivity/

36 Child Behavior Disorders/

37 (on task adj4 behavio$r).tw.

38 exp Vocabulary/

39 exp Language Development/

40 exp Intelligence/

41 exp Intelligence Tests/

42 exp Bone Density/

43 (bone adj3 mineral adj3 test$).tw.

44 exp Motor Activity/

45 (physical adj3 activit$).tw.

46 *Exercise/

47 exp Morbidity/

48 exp Stereotyping/

49 stigma$.tw.

50 Aggression/

51 (bully or bullying).tw.

52 victimization.tw.

53 disruptive behavio$r.tw.

54 Obesity/

55 Weight Loss/

56 (excess$ adj3 weight adj3 loss).tw.

57 or/23-56

58 22 and 57

CINAHL (Ebscohost)

CINAHL 1981 to current. Searched 3 May 2012. Limited to 2011 to 2012 [27 records].
CINAHL 1981 to current. Searched 15 July 2011 [4582 records].

S15 (S1 or S2 or S3 or S4 or S7 or S9) and (S13 and S14)
S14 S1 or S2 or S3 or S4 or S7 or S9
S13 S10 or S11 or S12
S12 "toddler"
S11 (MH "Infant")
S10 (MH "Child, Preschool") OR (MH "Schools, Nursery") OR (MH "Child")
S9 (MH "Infant Feeding") OR (MH "Infant Food") OR (MH "Infant Nutrition")
S8 ""food program""
S7 "feeding program"
S6 "feed$ program or food$ program$"
S5 "((feed$ or food$) adj3 program$)"
S4 (MH "Diet Therapy")
S3 (MH "Nutrition Policy")
S2 (MH "Food") OR (MH "Snack Foods") OR (MH "Functional Food") OR (MH "Infant Food")

Healthstar (OVID)

Healthstar 1966 to 3 May 2012. Limited to 2011 to 2012 [348 records].

Healthstar 1966 to 18 July 2011 [3106 records].

1 exp Dietary Supplements/
2 Diet Therapy/
3 Food, Fortified/
4 Food/
5 (Functional adj3 Food).tw.
6 Nutrition Therapy/
7 Diet Therapy/
8 ((extra or take-home or takehome) adj3 (food$ or feed$ or ration$)).tw.
9 Nutrition Policy/
10 ((feed$ or food$) adj3 program$).tw.
11 ((fortif$ or enrich$) adj3 (food$ or diet$ or spread$ or flour$ or cereal$)).tw.
12 (lunch$ or dinner$ or break-fast$ or breakfast$ or milk or break fast$ or supper$ or snack$ or meal$).tw.
13 (plumpy$ or nutri spread$).tw.
14 (blend$ food$ or lipid based supplement$).tw.
15 (energy adj3 supplement$).tw.

16 (supplement$ adj3 (food$ or feed$ or diet$ or nutrition$ or nutrient$)).tw.
17 or/1-16
18 exp Infant/
19 Child, Preschool/
20 (baby or babies or infant$ or preschool$ or pre-school$ or child$).tw.
21 or/18-20
22 17 and 21
23 "Growth and Development"/
24 *Growth/
25 Child Development/
26 exp Motor Skills/
27 Psychomotor Performance/
28 Psychomotor Disorders/
29 (psychomotor adj3 development).tw.
30 Cognition/
31 Cognition Disorders/
32 Learning Disorders/
33 (cognit$ adj4 ability).tw.
34 Attention/
35 Attention Deficit Disorder with Hyperactivity/
36 Child Behavior Disorders/
37 (on task adj4 behavio$r).tw.
38 exp Vocabulary/
39 exp Language Development/
40 exp Intelligence/
41 exp Intelligence Tests/
42 exp Bone Density/
43 (bone adj3 mineral adj3 test$).tw.
44 exp Motor Activity/
45 (physical adj3 activit$).tw.
46 *Exercise/
47 exp Morbidity/
48 exp Stereotyping/
49 stigma$.tw.
50 Aggression/
51 (bully or bullying).tw.
52 victimization.tw.
53 disruptive behavio$r.tw.
54 Obesity/
55 Weight Loss/
56 (excess$ adj3 weight adj3 loss).tw.
57 or/23-56
58 22 and 57

LILACS

LILACS. Searched 10 May 2012. Limited to 2011 to 2012 [42 records].
LILACS. Searched 15 July 2011.

(Dietary Supplements or Diet Therapy or Food, Fortified or Functional Food or Nutrition Therapy or Nutrition Policy or feed$ or food$ or fortif$ or enrich or food$ or diet$ or spread$ or flour$ or cereal$ or lunch$ or dinner$ or break-fast$ or breakfast$ or break fast$ or supper $ or snack$ or meal$ or plumpy$ or supplement$ or diet$ or nutrition$ or nutrient$) AND (Infant or Child, Preschool or baby or babies or infant$ or preschool$ or pre-school$ or child$)

Appendix 3. Strategies for searches last updated in 2011

Social Services Abstracts (CSA)

Social Services Abstracts. Last searched 15 July 2011 [423 records].

((DE=("food" or "food security" or "food stamps" or "diet")) or(KW=(meal$ or breakfast$ or (break fast$)) or KW=(lunch$ or snack$ or dinner$) or KW=(supper$ or ration$)) or(KW=(supplement$ or fortified or fortify) or KW=(enriched or milk or bread) or KW=plumpy)) and((DE=("preschool children" or "child care services" or "children" or "pediatrics" or "preschool education")) or(KW=((nursery school) or baby or babies) or KW=(infant or toddler)) or(DE="infants"))

Appendix 4. Methods for Interrupted time series (ITS) trials in future updates of this review

If our update of this review contains any interrupted time series (ITS) trials, we will analyse them in the following ways: we will calculate relative and absolute mean difference in before and after values. When possible, we will use time series regression to calculate mean change in level and mean change in slope.

For discrete outcomes (e.g. undernourished versus well-nourished), we will present the relative risk (RR) of the outcome compared to the control group. We will also calculate the risk difference (RD), which is the absolute difference in the proportions in each treatment group. Finally, we will calculate the number needed-to-treat (NTT) to achieve one person with the desired outcome.

When possible, comparisons will be reported by socio-economic group as well as by other relevant socio-demographic variables, including baseline nutritional status, gender, race or ethnicity, and place of residence. Where results by socio-economic variables are not available in the primary articles and reports, we will request these data from the authors and recalculate effect sizes and P values.

HISTORY

Protocol first published: Issue 6, 2012
Review first published: Issue 3, 2015

Date	Event	Description
20 March 2014	Amended	The comments from the statisticians have been addressed. Furthermore, an updated search has been conducted.

CONTRIBUTIONS OF AUTHORS

Elizabeth Kristjansson - led the review. She led the funding application and development of the protocol, writing much of it. Dr. Kristjansson also screened studies, decided on inclusion and exclusion of studies, assessed risk of bias, oversaw data extraction and analyses (conducting many of them), and wrote the results and discussion sections.
Damian K Francis - was involved in proposal development and writing the protocol. He helped to assess the nutritional composition and quality of the meals (intervention) administered to the participants. He also extracted data, performed much of the data analysis, and helped with writing and knowledge translation.
Selma Liberato - contributed to the proposal and protocol writing. She screened studies, decided on inclusion and exclusion of retrieved studies, helped with data extraction and writing. She led the assessment of the nutritional composition and nutrition (intervention) administered to the participants; she also judged the amount of supervision in each programme.
Maria Benkhalti Jandu - was involved in writing the protocol and the development of the logic model. She also developed the data extraction sheet, performed data extraction, and edited the review.
Vivian Welch - contributed to the policy influence plan, proposal development, and development of the search strategy. She carried out the correction for clustering and advised on all analyses. She was also involved in the implementation analysis.
Malek Batal - was involved in the proposal and protocol writing and drafting the logic model. He also provided input into the assessment of nutritional quality of food or drink given and helped to edit the review.
Trish Greenhalgh - contributed to proposal writing and lead the process evaluation. She also contributed to writing and editing the final review.
Tamara Rader - developed and ran search strategies according to the *Cochrane Handbook for Systematic Reviews of Interventions* and in collaboration with subject experts. She also drafted the sections on searching.
Eamonn Noonan - assisted with development of the policy Influence plan, wrote the plain language summary, and helped with policy briefs and with knowledge translation. He also edited the review.
Beverley Shea - reviewed the protocol, assessed risk of bias, and edited the review.
Laura Janzen - contributed to the proposal and protocol writing, assessed the quality of the psychological measures, and contributed to the discussion of the cognitive and behavioural results.
George A Wells - provided statistical advice on analyses.
Mark Petticrew - reviewed the proposal and edited the final review.

DECLARATIONS OF INTEREST

Elizabeth Kristjansson - none known.
Damian K Francis - none known.

Selma Liberato - none known.
Maria Benkhalti Jandu - none known.
Vivian Welch - none known.
Malek Batal - none known.
Trish Greenhalgh - none known.
Tamara Rader - none known.
Eamonn Noonan - none known.
Beverley Shea - none known.
Laura Janzen - none known.
George A Wells - none known.
Mark Petticrew -none known.

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Internal sources

- No sources of support supplied

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- 3ie, UK.

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- Canadian Institutes of Health Research, Canada.

  Partial support for Tamara Rader's salary to work on several reviews, including this one.
- Department of Health, UK.

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DIFFERENCES BETWEEN PROTOCOL AND REVIEW

The original protocol can be read in Kristjansson 2012.

Outcomes

We changed the names of some psychosocial outcomes (mental and cognitive development to mental development) and reordered them (we put psychomotor development first). We also put intelligence under cognitive development.

Searches

In some cases we amended the choice of database or replaced it with an equivalent source from the source listed in the protocol due to availability of the resource. For example, we searched Social Sciences Citation Index (SSCI) instead of Sociofile, as the coverage was comparable and it was available in our institution. Similarly, Health Management Information Consortium (HMIC) and Dissertation Abstracts International were not available but have similar coverage to OVID Medline and Proquest Dissertations and Theses. We did not search SCOPUS as originally planned, neither did we run supplementary citation searches.

We added Clinicaltrials.gov for all years in January 2014.

We had planned to identify key researchers in the field and to write to them to ask about any unpublished or forthcoming works. However, we did not carry this out. We believe that the risk of missing key studies was low because of the extensive searching in many different databases (more than 30,000 references identified).

Subgroup Analyses

We added two subgroup analyses to those in the protocol: location of feeding (take-home rations versus feeding centre or day-care or preschool, or both) and level of supervision (i.e. monitoring). We added these analyses because it became evident from consultation with each other and from gaining a better understanding of the context that these were potentially important factors in success/failure.

We also used the EPOC 2009 risk of bias criteria to change the age groups in the analyses due to data constraints.

Risk of bias

We had planned to use the Effective Public Health Practice Project tool (EPHPP 2009) in addition to the Cochrane and EPOC tools to assess bias; however this proved to be too time-consuming.

There were no ITS studies, so we could not assess their risks of bias. Our appraisal criteria for ITS studies were adapted from the 'Risk of bias' checklist developed by the EPOC Group (EPOC 2009). In assessing risk of bias in the ITS designs, we would have considered protection against secular changes, predefined shape of effect, effect on data collection, knowledge of allocated interventions, incomplete outcome data, selective outcome reporting, and other biases.

Analyses

We had planned to do an intention-to-treat (ITT) analysis, but nearly all studies reported only on completers. We wrote to some authors for other information but received very few replies. Our analyses, therefore, are completion analyses.

If scales had been measured in different directions (high on some representing greater disease severity while high on others represents less severity), we would have multiplied the mean values from one set of studies by –1 to ensure that all the scales measured in the same direction.

We would have analysed categorical and continuous data separately had there been any categorical data. We would have analysed categorical data using odds ratios (ORs) and risk ratios (RRs).

We had planned to draw funnel plots to assess the presence of possible publication bias as well as the relationship between effect size and study precision. However, we did not have the recommended minimum number of studies (10) for any analysis. Furthermore, while funnel plot asymmetry may indicate publication bias, this is not inevitably the case (Egger 1997).

We had planned to do sensitivity analyses by five factors: reliable primary outcome measure/not, placebo versus no treatment control, allocation concealment, attrition (< 10% versus > 10%), and imputed correlation coefficient. However, we did not do these and only did sensitivity analyses to check whether more conservative ICCs in the clustering adjustments would make a difference.

Finally, due to the high number of potential variables and insufficient number of studies, we were unable to conduct a meta-regression as planned.

INDEX TERMS

Medical Subject Headings (MeSH)

*Feeding Methods; *Vulnerable Populations; Child Nutritional Physiological Phenomena; Controlled Before-After Studies; Energy Intake; Malnutrition [*diet therapy]; Randomized Controlled Trials as Topic; Sex Factors

MeSH check words

Child, Preschool; Female; Humans; Infant; Male