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Community-based supplementary feeding for food insecure, vulnerable and malnourished populations – an overview of systematic reviews (Review)

Visser J, McLachlan MH, Maayan N, Garner P

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[Overview of Reviews]

Community-based supplementary feeding for food insecure, vulnerable and malnourished populations – an overview of systematic reviews

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ABSTRACT

Background

Supplementary feeding may help food insecure and vulnerable people by optimising the nutritional value and adequacy of the diet, improving quality of life and improving various health parameters of disadvantaged families. In low- and middle-income countries (LMIC), the problems supplementary feeding aims to address are entangled with poverty and deprivation, the programmes are expensive and delivery is complicated.

Objectives

1. To summarise the evidence from systematic reviews of supplementary feeding for food insecure, vulnerable and malnourished populations, including children under five years of age, school-aged children, pregnant and lactating women, people with HIV or tuberculosis (or both), and older populations.

2. To describe and explore the effects of supplementary feeding given to people in these groups, and to describe the range of outcomes between reviews and range of effects in the different groups.

Methods

In January 2017, we searched the *Cochrane Database of Systematic Reviews,* MEDLINE, Embase and nine other databases. We included systematic reviews evaluating community-based supplementary feeding, and concerning food insecure, vulnerable and malnourished populations. Two review authors independently undertook selection of systematic reviews, data extraction and 'Risk of bias' assessment. We assessed review quality using the AMSTAR tool, and used GRADEpro 'Summary of findings' tables from each review to indicate the certainty of the evidence for the main comparisons. We summarised review findings in the text and reported the data for each outcome in additional tables. We also used forest plots to display results graphically.

Main results

This overview included eight systematic reviews (with last search dates between May 2006 and February 2016). Seven were Cochrane Reviews evaluating interventions in pregnant women; children (aged from birth to five years) from LMIC; disadvantaged infants and young children (aged three months to five years); children with moderate acute malnutrition (MAM); disadvantaged school children; adults and

children who were HIV positive or with active tuberculosis (with or without HIV). One was a non-Cochrane systematic review in older people with Alzheimer's disease. These reviews included 95 trials relevant to this overview, with the majority (74%) of participants from LMIC.

The number of included participants varied between 91 and 7940 adults, and 271 and more than 12,595 children. Trials included a wide array of nutritional interventions that varied in duration, frequency and format, with micronutrients often reported as cointerventions. Follow-up ranged from six weeks to two years; three trials investigated outcomes at four to 17 years of age. All reviews were rated as high quality (AMSTAR score between eight and 11). The GRADE certainty ratings ranged from very low to moderate for individual comparisons, with the evidence often comprising only one or two small trials, thereby resulting in many underpowered analyses (too small to detect small but important differences). The main outcome categories reported across reviews were death, anthropometry (adults and children) and other markers of nutritional status, disease-related outcomes, neurocognitive development and psychosocial outcomes, and adverse events.

Mortality data were limited and underpowered in meta-analysis in all populations (children with MAM, in children with HIV, and in adults with tuberculosis) with the exception of balanced energy and protein supplementation in pregnancy, which may have reduced the risk of stillbirth (risk ratio (RR) 0.60, 95% confidence interval (CI) 0.39 to 0.94; 5 trials, 3408 women). Supplementation in pregnancy also improved infant birth weight (mean difference (MD) 40.96 g, 95% CI 4.66 to 77.26; 11 trials, 5385 participants) and reduced risk of infants born small-for-gestational age (RR 0.79, 95% CI 0.69 to 0.90; 7 trials, 4408 participants). These effects did not translate into demonstrable long-term benefits for children in terms of growth and neurocognitive development in the one to two trials reporting on longer-term outcomes. In one study (505 participants), high-protein supplementation was associated with increased risk of small-for-gestational age babies.

Effects on growth in children were mixed. In children under five years of age from LMIC, one review found that supplementary feeding had a little or no effect on child growth; however, a more recent review in a similar population found that those who received food supplementation gained an average of 0.12 kg more in weight (MD 0.12 kg, 95% CI 0.05 to 0.18; 9 trials, 1057 participants) and 0.27 cm more in height (MD 0.27 cm, 95% CI 0.07 to 0.48; 9 trials, 1463 participants) than those who were not supplemented. Supplementary food was generally more effective for younger children (younger than two years of age) and for those who were poorer or less well-nourished. In children with MAM, the provision of specially formulated food improved their weight, weight-for-height z scores and other key outcomes such as recovery rate (by 29%), as well as reducing the number of participants dropping out (by 70%). In LMIC, school meals seemed to lead to small benefits for children, including improvements in weight z scores, especially in children from lower-income countries, height z scores, cognition or intelligence quotient tests, and maths and spelling performance.

Supplementary feeding in adults who were HIV positive increased the daily energy and protein intake compared to nutritional counselling alone. Supplementation led to an initial improvement in weight gain or body mass index but did not seem to confer long-term benefit.

In adults with tuberculosis, one small trial found a significant benefit on treatment completion and sputum conversion rate. There were also significant but modest benefits in terms of weight gain (up to 2.60 kg) during active tuberculosis.

The one study included in the Alzheimer's disease review found that three months of daily oral nutritional supplements improved nutritional outcomes in the intervention group.

There was little or no evidence regarding people's quality of life, adherence to treatment, attendance at clinic or the costs of supplementary feeding programmes.

Authors' conclusions

Considering the current evidence base included, supplementary food effects are modest at best, with inconsistent and limited mortality evidence. The trials reflected in the reviews mostly reported on short-term outcomes and across the whole of the supplementation trial literature it appears important outcomes, such as quality of life and cost of programmes, are not systematically reported or summarised.

PLAIN LANGUAGE SUMMARY

Supplementary feeding for groups of people that are food insecure, vulnerable and malnourished

What was the aim of this review?

To summarise the effect of supplementary feeding on populations that were food insecure, vulnerable and malnourished. The overview authors found eight systematic reviews examining supplementary feeding in a variety of populations.

Key messages

Across a range of vulnerable populations, supplementary feeding programmes sometimes show modest benefit in nutritional outcomes. In a few studies examining mortality (death), effects were either small or absent, and research mostly looked at short-term effects.

What was studied in the review?

Supplementary feeding means providing extra food to people or families over and above their home diet and has been used in populations that are food insecure (limited access to adequate and nutritious food) and vulnerable (including women and young children; school-aged children; people living with diseases such as tuberculosis, HIV, and Alzheimer's disease; and older people) to improve their health and quality of life.

What are the main results of the review?

The evidence presented here was current to January 2017. We found eight systematic reviews to include in this summary. These reviews included 95 studies (including up to 7940 adults, and more than 12,595 children in a few studies). Most of the included studies lasted from six weeks to two years, with only three studies following people for longer periods of time (up to 17 years). In these reviews, there were a wide range of different types of supplementary feeding given to vulnerable groups over different periods of time, and often in combination with vitamins or minerals.

In pregnancy, we found that energy and protein supplements that were balanced (i.e. providing adequate amounts of energy and nutrients, in this case protein) may have decreased the rate of stillbirth (death or loss of a baby before or during delivery), improved infant birth weight and reduced the risk of infants born small-for-gestational age (infants that are smaller than expected). We observed no long-term benefits for children in terms of growth and cognitive (intellectual) development (although very few studies reported long-term effects). High-protein supplements (containing protein in higher amounts) were associated with risk and harm (increased risk of small-for-gestational age babies).

We found that the effects of supplementary feeding on growth in children were varied. In children under five years of age from low- and middle-income countries, supplementary feeding had a small impact on child growth. We observed some benefits in terms of weight and height gains, especially in younger children (those younger than two years of age) and in those who were poorer or less well-nourished (or both). Some benefit could be seen in children with moderate acute malnutrition in terms of weight gain, other growth factors and recovery rate. School meals seemed to lead to a number of small benefits in school children (including improvements in weight, height, intelligence tests, and maths and spelling performance).

Supplementary feeding in adults who were HIV positive increased the daily intake of energy and protein and led to an early improvement in weight gain or body mass index (measure of whether someone is overweight or underweight), or both, but did not seem to lead to long-term benefits (although few studies reported long-term effects). In adults with tuberculosis (serious infectious lung disease), we observed small benefits in terms of weight gain during active tuberculosis.

In Alzheimer's disease (a type of dementia), providing a daily oral nutrition supplement for three months improved nutritional outcomes (such as weight and energy intake).

There was little or no evidence available regarding people's quality of life, adherence to treatment, attendance at clinic or the costs of supplementary feeding programmes.

BACKGROUND

An adequate diet that includes the required macro- and micronutrients helps ensure human growth, physical and cognitive development, and a healthy immune system. What people need in their diet varies according to age, gender, physical activity and health status (Mahan 2011). Food security is defined as a situation in which "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 1996; FAO 2010). The definition, from the Food and Agriculture Organization (FAO), reinforces the multi-dimensional nature and complexity of food security, which includes food availability, economic and physical access to food, food utilisation and stability of supplies over time (FAO 1996; FAO 2013). Food security is a prerequisite to adequate nutrition. Other factors, including child feeding and care practices, food choices, knowledge about and interest in food preparation, adequate water and a sanitary environment, as well as access to health care and the health status of a person, also play an important role in whether access to food translates into the consumption of an adequate diet and ultimately to adequate nutrition, health and well-being.

Malnutrition, affecting one in three people worldwide, comes in a number of forms that not only affect a person's health and well-being, but also place heavy burdens on families, communities and states (FAO 2017; FAO and WHO 2014; IFPRI 2016). The 'triple burden' of malnutrition include undernutrition, overweight/obesity and micronutrient deficiencies, and these forms can coexist within the same person, household and country (FAO 2017). According to FAO estimates, the prevalence of undernourishment remains high despite adequate food supplies and considerable progress in reducing hunger in some regions. More than 795 million people still presented with chronically inadequate levels of dietary energy intake between 2014 and 2016 (FAO 2015; Sundaram 2015), with women and children being particularly vulnerable. In 2016, stunting affected an estimated 22.9% or 154.8 million children and wasting continued to threaten the lives of an estimated 7.7% or nearly 52 million children under five years of age globally (UNICEF/WHO/World Bank Group 2017). Furthermore, 108 million people globally in 2016 were reported to be facing crisis-level food insecurity or worse, representing a 35% increase compared to 2015 figures (FSIN 2017). Food security in the context of climate change has been highlighted as a significant risk in the 2016 Global Risk Report (WEF 2016). Weather patterns and climate change could jeopardise agricultural production and food security across geographies; the risk to food security is especially great as agriculture is already straining to meet a rapidly growing demand from a finite resource base (WEF 2016).

Ending hunger, achieving food security and improving nutrition have been prioritised as key steps towards sustainable development (UN 2016). The international community has fortunately recognised these challenges. The 2030 Agenda for Sustainable Development provides a vision on how multiple objectives can be combined to define new, sustainable development pathways. The second Sustainable Development Goal (SDG 2) aims at ending hunger, achieving food security and improved nutrition, and promoting sustainable agriculture simultaneously by 2030 (FAO 2017; UN 2015a). On 1 April 2016, the United Nations (UN) General Assembly adopted a resolution proclaiming a United Nations Decade of Action on Nutrition from 2016 to 2025 (UN 2015b). This Decade of Action aims to mobilise intensified action to end hunger and eradicate all forms of malnutrition worldwide, and ensure universal access to healthier and more sustainable diets for everyone (WHO 2016). In addition, and in the local context, strong political commitment (including placing food security and nutrition at the top of the political agenda and creating an enabling environment) is essential for hunger reduction, the latter which requires an integrated approach, including specific nutrition programmes.

Many factors influence vulnerability to malnutrition and food insecurity, with the well-known United Nations Children's Fund (UNICEF) conceptual framework indicating that the causes of malnutrition are multi-sectoral, taking into account food, health and caring practices. Causes are categorised as immediate (inadequate food intake and illness), underlying (poor household food security, inadequate maternal and child care, poor access to basic health services, and an unhealthy environment (with limited access to clean water and safe waste disposal)) and basic (poverty and lack of resources), whereby factors at one level influence other levels (UNICEF 1990). It is important that policymakers and community leaders take into account the causes of malnutrition when planning and prioritising health and nutrition interventions (Black 2013). As such, the multiple causes of malnutrition require a multi-sectoral approach, including both nutrition-specific and nutrition-sensitive approaches (health; basic education; agriculture, forestry and fisheries; and social development at local, provincial and national levels) (Bhutta 2013; Garrett 2011; IFPRI 2014; Ruel 2013). Supplementary feeding programmes, targeting households and vulnerable people, are but one approach to address the complex issues surrounding food security and malnutrition. These programmes, operated by governments and agencies, can be expensive and complicated to deliver. This overview aims to summarise the evidence from existing systematic reviews of effects in the stated target groups.

Description of the condition

In 2014, 805 million people in the world experienced chronic hunger, not having enough food to ensure an optimal nutritional status and lead an active and healthy life (FAO 2014). A further one billion people were considered vulnerable to 'hidden hunger' as a result of micronutrient deficiencies (MI 2009). Many inter-related factors influence vulnerability to food insecurity, including poverty, landlessness and conflict, as well as other factors such as gender, disease and age (FAO 2008).

We defined food security in this overview as a situation in which "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 1996; FAO 2010). Therefore, food insecurity exists when people do not have adequate physical, social or economic access to food.

Populations particularly at risk and vulnerable to food insecurity include:

1. women and young children;
2. school-aged children;
3. people living with infectious diseases, notably tuberculosis and HIV; and
4. disabled and older populations.

Malnutrition is a broad term encompassing both under- and overnutrition. For the purpose of this overview, malnutrition refers to undernutrition. Undernutrition can result from a lack of macronutrients (carbohydrates, protein, fat), micronutrients (vitamins and minerals), or both.

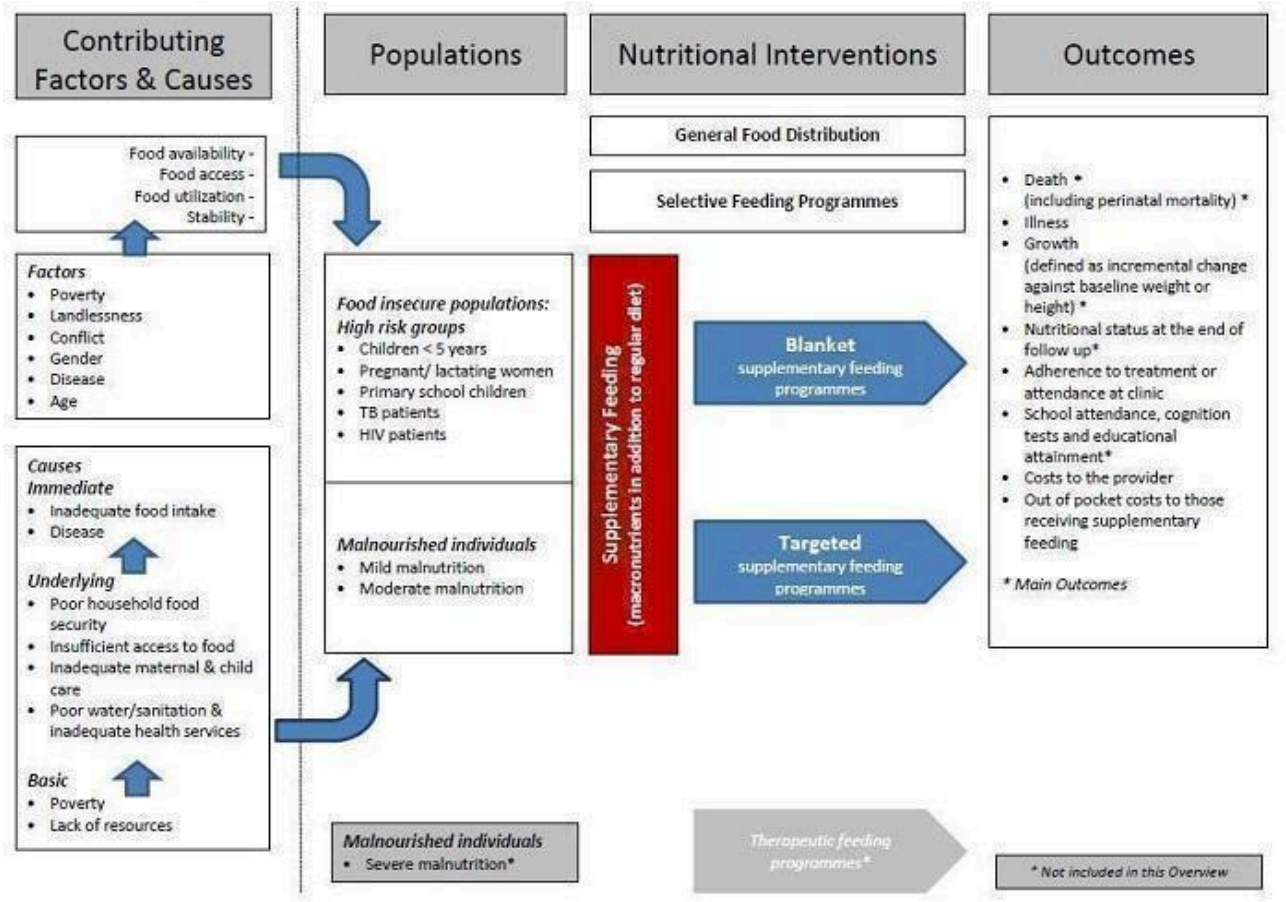
This overview is concerned with low-income groups and populations in low- and middle-income countries (LMIC) where food security for families and communities can be threatened, with consequent impacts on nutritional status, particularly those groups in the population that are vulnerable to malnutrition such as pregnant women, young children, older people or people with chronic diseases. Humanitarian aid (defined as "aid and action designed to save lives, alleviate suffering and maintain and protect human dignity during and in the aftermath of man-made crises and natural disasters"), including emergency, short-term food aid is of crucial importance (Global Humanitarian Assistance 2014), but this is not the topic of this overview.

Description of the interventions

In this overview, we defined supplementary feeding as providing extra food to people or families beyond the normal ration of their home diets (Beaton 1982). Supplementary feeding is used in both emergency and non-emergency situations to address short-term hunger, longer-term food shortage, and to improve the nutritional status (or prevent the nutritional deterioration) of specific populations. Sometimes authorities provide food supplementation to increase use of health services, adherence to treatment regimens or attendance (and performance) at school. In humanitarian disasters, food aid aims to relieve absolute food shortage (although this overview is not concerned with food used in these circumstances). Many questions remain, however, about the cost-effectiveness of supplementary feeding programmes, their design, and the appropriate mix of complementary activities to achieve the intended outcomes (Morris 2008).

Supplementary feeding can be undertaken in two ways (see Figure 1):

Figure 1. Conceptual framework of supplementary feeding to improve nutrition (adapted from UNICEF 1990).



1. blanket supplementary feeding, which aims to prevent malnutrition or its progression in food insecure populations, where the targeting is based on knowing that the population is high risk, and food is given to the whole at-risk population without prior screening (UNHCR/WFP 1999); and
2. targeted supplementary feeding, which is directed at selected people who are at risk; treating mild or moderate malnutrition detected by screening at-risk populations and providing supplementation only to people who fall below a prespecified nutritional status threshold.

We included both categories of supplementary feeding in this overview.

Food is sometimes used to induce people to behave in a particular way; for example, giving food to people with tuberculosis to ensure they attend clinics for treatment, or giving food to children at school to help improve school attendance (Devereux 2018). While this overview was not concerned with the use of food in these circumstances, where food may have been used to both improve nutrition and improve adherence to treatment (for example, in people with tuberculosis), we examined adherence outcomes as a secondary outcome.

We defined supplementary foods as additional foods to the normal diet. Supplementary foods also include specially formulated foods (for example, fortified blended foods) in ready-to-eat or in milled form, which are modified in their energy density, protein, fat or micronutrient composition to help meet the nutritional requirements of specific populations (WHO 2012). Supplementary foods are not intended to be the only source of nutrients in a given population (WHO 2012). They are different from food supplements that refer to vitamin and mineral supplements in unit-dose forms (such as capsules, tablets, powders or solutions), which are not relevant to this overview (WHO 2012). Food fortification (with the aim of increasing the micronutrient content of the overall diet) as well as enteral and parenteral nutrition interventions are also not part of this overview.

How the intervention might work

Supplementary feeding can have direct nutrition and health benefits (Figure 1). It may also contribute to increased service utilisation, with secondary effects on improved health related to increased service uptake. In addition, it may contribute to social goals, such as food supplementation given at schools to improve school attendance.

Supplementary feeding may have negative effects by increasing dependency, creating expectations of food handouts at clinics and services, and impacting negatively on clinic attendance when it is discontinued. It is also expensive, and needs good management systems to ensure delivery and minimise leakage to people for whom it is not intended. In addition, food safety aspects are of crucial importance for safe delivery, especially if local production is encouraged.

Why it is important to do this overview

Although accurate figures are unavailable, a large proportion of development assistance funding allocated to food and nutrition is used for supplementary feeding programmes, including emergency assistance and food aid (Morris 2008). Thus, it is important to know if it is effective. Furthermore, it is important to try and identify the most successful (combination of) interventions for replication, as well as criteria to improve the cost-effectiveness and efficiency of the interventions.

The target audience for this overview includes policymakers and programme implementers working in the fields of food security and public health nutrition. Development partners can also use this overview to inform the design of calls for research and programme proposals and to assist with the evaluation of current and proposed supplementary feeding programmes. Clinicians working in food insecure regions or where malnutrition is common will also find this overview useful in their efforts to advocate for cost-effective preventive and promotional public health strategies.

OBJECTIVES

1. To summarise the evidence from systematic reviews of supplementary feeding for food insecure, vulnerable and malnourished populations, including children under five years of age, school-aged children, pregnant and lactating women, people with HIV or tuberculosis (or both), and older populations.
2. To describe and explore the effects of supplementary feeding given to people in these groups, and to describe the range of outcomes between reviews and range of effects in the different groups. We examined possible influences on effects between reviews, including baseline nutritional status and comorbidities.

METHODS

Criteria for considering reviews for inclusion

Types of studies

Published systematic reviews (with no restriction on date of last search) of supplementary feeding in vulnerable groups.

Inclusion criteria for non-Cochrane Reviews were:

1. predetermined objectives;
2. predetermined eligibility criteria;
3. search conducted in at least two data sources, one of which must have been an electronic database; and
4. data extraction and 'Risk of bias' assessments performed independently and in duplicate by review authors.

Types of participants

Systematic reviews concerning vulnerable (food insecure and malnourished) populations, targeted food insecure populations or those identified as malnourished in these populations (children, school-aged children, pregnant and lactating women, people with HIV or tuberculosis (or both), and older people). We included reviews provided some or all of these conditions (vulnerability, food insecurity and malnutrition) were met. We excluded groups for which specialised therapeutic care was necessary (such as preterm and low birth-weight infants).

Types of interventions

Reviews evaluating community-based, supplementary feeding in vulnerable groups (as defined under Description of the interventions).

Community-based, supplementary feeding programmes were those that provided food to populations or ambulatory people in a non-clinical setting. Supplementary feeding could thus take place at home, at a supervised feeding centre, or at other places adapted for this purpose (for example, healthcare centres and crèches).

Supplementary feeding programmes were where set criteria were applied to a population to determine eligibility for supplementary foods and the foods are provided to them. Supplementary foods were macronutrients (balanced diet or high protein, high carbohydrate, or high fat diets/foods) given as a supplement in addition to the usual diet (not a total dietary replacement). Supplementary foods could contain added micronutrients (vitamins and minerals), however, we excluded reviews of micronutrients only. Food supplements must have

been taken orally. Supplementary feeding options included using additional foods, fortified foods, specially formulated foods (fortified blended foods such as corn-soy blend, ready-to-use foods (RUFs) such as pastes, compressed bars or biscuits), or complementary food supplements (such as powdered complementary food supplements containing a combination of micronutrients, protein, amino acids and enzymes; or lipid-based nutrient supplements (LNS) (120 kcal/day to 250 kcal/day), typically containing milk powder, high-quality vegetable oil, peanut paste, sugar and micronutrients (De Pee 2009)). Ready-to-use therapeutic foods (RUTFs) are typically used for treating severe acute malnutrition (SAM), but in some instances these recipes are modified for use in moderate acute malnutrition (MAM), and thus could have been relevant to this overview (De Pee 2009).

We excluded:

1. reviews reporting on the effects of supplementary feeding in refugee settings or hospitals (after injury or surgery or other acute medical conditions);
2. vitamin and mineral supplements, enteral tube feeding or parenteral feeding products and
3. therapeutic feeds for the treatment of severe malnutrition.

The comparison groups were either those who did not receive the supplement or those who received a different supplement.

Types of outcomes

1. Death (including perinatal mortality).*
2. Illness (or disease-related outcomes).
3. Growth in children (defined as an incremental change against baseline weight or height).*
4. Nutritional status of children (assessed by other anthropometry, biochemical markers and dietary intake) at the end of follow-up.*
5. Nutritional status of adults (assessed by anthropometry, biochemical markers and dietary intake) at the end of follow-up.*
6. Adherence to treatment or attendance at clinic.
7. School attendance, cognition tests and educational attainment.*
8. Costs to the provider.
9. Out-of-pocket costs to people receiving supplementary feeding.

**Main outcomes*

Search methods for identification of reviews

We first searched the electronic sources listed below on 9 July 2013 and updated the searches on 29 January 2017.

1. *Cochrane Database of Systematic Reviews* (CDSR; 2017, Issue 1) in the Cochrane Library.
2. MEDLINE Ovid (searched from 1946).
3. MEDLINE In-Process and Other Non-Indexed Citations Ovid.
4. MEDLINE Epub Ahead of Print Ovid.
5. Embase Ovid (searched from 1980).
6. Database of Abstracts of Reviews of Effects (DARE; 2015, Issue 2. Final issue), part of the Cochrane Library.
7. Health Technology Assessment Database (HTAD; 2016, Issue 4), part of the Cochrane Library.
8. Campbell Collaboration Online Library of Systematic Reviews (www.campbellcollaboration.org/library.html).
9. Virtual Health Library (bvsalud.org/en).
10. Database of Promoting Health Effectiveness Reviews (DoPHER; eppi.ioe.ac.uk/webdatabases4/Intro.aspx?ID=9).
11. 3ie Database of Systematic Reviews (www.3ieimpact.org/en/evidence/systematic-reviews).
12. PROSPERO (www.crd.york.ac.uk/prospero).

The core search strategy consisted of two concepts: supplementary feeding AND systematic reviews. Each concept was described using controlled vocabulary terms and free-text terms. The systematic review filter for MEDLINE was adapted from the Scottish Intercollegiate Guidelines Network (SIGN; www.sign.ac.uk/search-filters.html). We adapted the search terms for each database (Appendix 1). There were no date or language restrictions.

Data collection and analysis

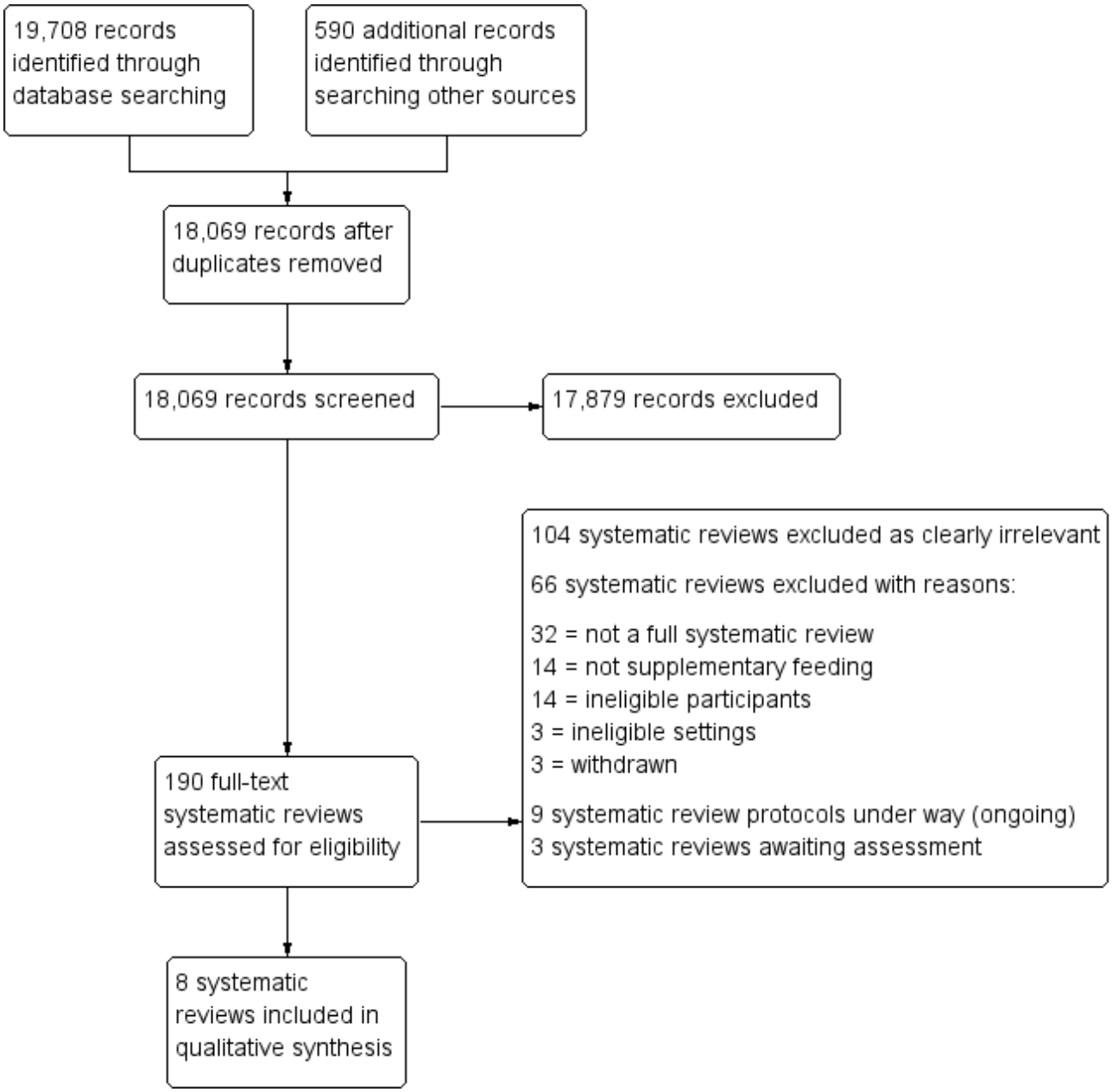
Selection of reviews

For the July 2013 search, one overview author (JV) and one overview reviewer (LN; see Acknowledgements) independently screened titles and abstracts of records yielded by the search for relevance, and rated them as 'for exclusion', 'for inclusion' or 'potentially eligible'. Next, they obtained the full texts of those systematic reviews judged as 'for inclusion' or 'potentially eligible' and independently assessed them against the inclusion criteria (Criteria for considering reviews for inclusion). Two overview authors (JV; PG) and one overview reviewer (LN) resolved any differences of opinion as regards review selection by discussion until a consensus was reached.

For the January 2017 search, one overview author (NM) and two overview reviewers (NH; RW; see Acknowledgements) screened titles, abstracts and full texts using the same methods described above. Two overview authors (NM; JV) and two overview reviewers (NH; RW) resolved differences of opinion by discussion until a consensus was reached. For updated Cochrane Reviews, we included only the most recent publication.

The PRISMA flow diagram in Figure 2 illustrates the study selection process.

Figure 2. PRISMA flow diagram.



Data extraction and management

For the July 2013 search, one overview author (JV) extracted the data and one overview reviewer (LN) checked them for accuracy; one overview author (NM) and two overview reviewers (NH; RW) performed this for the January 2017 search. Reviewers resolved any disagreements by discussion, with assistance from the rest of the overview author team, as necessary.

We used a data collection form that was specifically designed by the overview author team to collect data on the key features of the systematic reviews such as objectives; inclusion and exclusion criteria; and information about participants, interventions and comparisons. We assessed whether each included review was up to date (and reported the date of the last search). We described the reviews in relation to background vulnerability, including equity-related aspects and study characteristics, as available. In this regard, we referred to the relevant economies of the included trials (i.e. LMIC versus high-income countries (HIC)), any summary of socioeconomic status of participants across trials, setting of the trials (community versus hospital or other) and if methods for targeting the interventions were used.

We present the key characteristics of each included systematic review in 'Characteristics of included systematic reviews' tables, the interventions used in the systematic reviews in a 'Summary of interventions' table, and details of the interventions used in separate 'Details of interventions' tables for each included systematic review. In the case of discordant results of included reviews, we presented all; where necessary, we contacted the authors of the primary reviews for clarification and consulted

with a biostatistician experienced in meta-analysis on statistical issues. We also summarised and presented the target groups of each systematic review by outcome in a 'Results matrix', and the results for each target group across included reviews in tables of comparisons by outcome for which data were available.

Assessment of methodological quality of included reviews

Quality of included reviews

For the July 2013 search, one overview author (JV) and one overview reviewer (LN) independently assessed the quality of the included systematic reviews using AMSTAR: A MeaSurement Tool to Assess Systematic Reviews (Shea 2007a; Shea 2007b; Shea 2009); one overview author (NM) and two overview reviewers (NH; RW) performed this for the January 2017 search. The overview author and reviewer(s) resolved any differences by discussion. We included other members of the author team in the discussion (if needed) until we reached a consensus.

AMSTAR assesses the degree to which review methods avoided bias by evaluating the methods against 11 distinct criteria (listed below).

1. Use of an a priori design.
2. Duplicate study selection and data extraction.
3. Comprehensive searching of the literature.
4. Use of publication status as an exclusion criterion.
5. Provision of (included and excluded) studies.
6. Provision of characteristics of included studies.
7. Assessment of methodological quality of included studies.
8. Appropriate use of quality of included studies in formulating conclusions.
9. Appropriate methods for combining results of studies.
10. Assessment of publication bias.
11. Conflict of interest (both review and included studies) stated.

Review authors rated each AMSTAR item as yes (clearly done), no (clearly not done), cannot answer or not applicable, based on the published and included systematic reviews.

We presented the review quality data in two ways. First, as a narrative report across all studies against the 11 criteria above. Second, using the standard scoring system provided by AMSTAR to classify reviews into three categories: high quality (those achieving scores between eight and 11); medium quality (those achieving scores between four and seven) and low quality (those achieving scores between zero and three). We identified and discussed differences in quality between reviews, and used the quality assessment to interpret the results of reviews when synthesised in this overview. We summarised the AMSTAR scores of each included systematic review in a table.

Certainty of evidence from primary studies in included reviews

We used the GRADEpro 'Summary of findings' tables from each review (if reported in the individual reviews) to indicate the certainty of the evidence for the main comparisons.

Data synthesis

We used a narrative approach to summarise the data, and included: the range of vulnerability assessment criteria; the range of types of food supplements given and the effects of supplementation. Because the different reviews were based on different population groups and the interventions were basically the same across reviews (considering variations in type, quantity and length of time that a food or supplement was provided), we did not explore indirect comparisons. For analyses with differing durations of supplementation and dietary compositions of supplements, we described this within and between reviews. We made reference to statistical heterogeneity indirectly via certainty of evidence ratings for outcomes in 'Summary of findings' tables, as reported for each outcome. We summarised the findings in additional tables ('Characteristics of included systematic reviews', 'Summary of interventions' and 'Details of interventions' per systematic review tables; 'Results matrix'; and tables of comparisons by outcome for which data were available). We also used forest plots to graphically display selected results.

RESULTS

The searches identified 18,069 titles and abstracts. After initial screening of titles and abstracts, we retrieved 190 full texts and assessed them for eligibility against our inclusion criteria (Criteria for considering reviews for inclusion). Of these, we excluded 104 texts that clearly did not meet our inclusion criteria, and formally excluded a further 66 with reasons (see Table 1). We included eight systematic reviews. The reviews by Kramer 1996a, Kramer 1996b, and Kramer 1996c were all withdrawn and replaced by Ota 2015 and are listed in Table 1. We also identified nine potentially relevant protocols for reviews that are currently under way and have listed these in Appendix 2, and a further three reviews that are awaiting assessment (we were unable to locate the published reports for two of these reviews at the time of our last search, despite exhaustive efforts, and the third was published after the date of search of this review) (Appendix 3). See Figure 2.

Description of included reviews

This overview of reviews included eight systematic reviews with 128 studies, of which 95 studies were relevant to this overview. All but two reviews included only randomised controlled trials (RCTs): Kristjansson 2007 also included controlled before-and-after (CBA) studies and interrupted time series (ITS) studies, and Kristjansson 2015a also included CBA studies. Five RCTs appeared in both Kristjansson 2015a and Sguassero 2012.

Studies included in the reviews were published between 1926 and 2015. The last date of search of these reviews varied between May 2006 (Kristjansson 2007) and February 2016 (Grobler 2016).

The reviews included:

1. pregnant women (Ota 2015);
2. children (aged birth to five years) from LMIC born at term (37 weeks or greater) (Sguassero 2012);
3. disadvantaged infants and young children (aged three months to five years) (Kristjansson 2015a, which was also published as Kristjansson 2015b and Kristjansson 2015c; however, for the purposes of this review we use Kristjansson 2015a);
4. children (aged six to 60 months) in LMIC with MAM (Lazzerini 2013);
5. disadvantaged children and adolescents (aged five to 19 years) attending primary or high school (Kristjansson 2007);
6. HIV-positive adults and children (Grobler 2013);

7. adults and children with active tuberculosis (with or without HIV) (Grobler 2016); and
8. people with Alzheimer's disease (Droogsma 2014).

The number of participants (relevant to this overview) varied across reviews, ranging from 91 (Droogsma 2014) to 7940 (Ota 2015) adults, and 271 (Grobler 2013) to more than 12,595 (Kristjansson 2007) children. See Table 2 and Table 3 for a summary of the characteristics of included reviews.

The majority of studies (70 studies; 74%) relevant to this overview were conducted in LMIC. Socioeconomic and food security status of participants were poorly reported, and all but one study in one review were conducted in community settings. See Table 4. Studies in four reviews used a combination of blanket (Kristjansson 2007; Kristjansson 2015a) and targeted (Droogsma 2014; Lazzerini 2013) supplementary feeding approaches. See Table 5.

The reviews evaluated a vast array of different nutritional interventions of varying duration, frequency and format, including solids versus liquids, meals, snacks or drinks, specially formulated foods, fortified foods, traditional foods, commercial macronutrient formulas, mixtures and powders, and specific supplements (e.g. L-glutamine, spirulina). We included the latter macronutrient supplements for completeness, since they were compared to placebo, no supplements or usual diet in the relevant studies. Intervention categories (as per the relevant reviews) are reported in Table 3. Details of the interventions are summarised in Table 6, Table 7, Table 8, Table 9, Table 10, Table 11, Table 12, and Table 13. The duration of the intervention varied between 20 days (Kristjansson 2007) and three years (Kristjansson 2007), and follow-up ranged between six weeks (Grobler 2013) and 17 years (Ota 2015). In all but two reviews (Droogsma 2014; Kristjansson 2007), micronutrients were reported as cointerventions in various studies, and associated interventions reported across reviews included nutrition education/counselling, health education, standard medical care, psychosocial stimulation and cash transfers (Table 3).

The main outcome categories reported across reviews were: mortality; anthropometry (adults and children) and other markers of nutritional status assessment; disease-related outcomes; neurocognitive development and psychosocial outcomes; and adverse events. A summary of the specific outcomes reported per review is presented in Table 14.

Methodological quality of included reviews

Quality of systematic reviews

We rated the quality of the eight included systematic reviews using the AMSTAR tool, as described previously under Assessment of methodological quality of included reviews. We found that:

1. all reviews prespecified their clinical question and inclusion criteria;
2. all reviews conducted study selection and data extraction in duplicate;
3. all reviews conducted a comprehensive literature search;
4. seven of the reviews included defined searches of grey literature;
5. all reviews listed included and excluded studies;
6. all reviews described the characteristics of the included studies;
7. all reviews assessed study quality;
8. all reviews appropriately used the quality of included studies in formulating conclusions;
9. all reviews combined the studies using appropriate methods;
10. six reviews formally addressed the risk of publication bias, using a statistical test where appropriate; and
11. all reviews addressed the potential for conflict of interest.

Seven of the eight reviews had conducted a literature search between 2011 and 2016; the one remaining review had an older search date (Kristjansson 2007). We rated all reviews as high quality, as all had scores between eight and 11. See Table 15.

Certainty of evidence from primary studies in included reviews

The included reviews used GRADE methods to rate the certainty of the evidence reported by the primary studies (as reported in 'Summary of findings' tables in the individual reviews). Ratings ranged from very low to moderate for individual comparisons (see Table 16; Table 17; Table 18; Table 19; Table 20; Table 21; Table 22; Table 23; Table 24; Table 25; Table 26; Table 27; Table 28 for details). We reported the certainty of the evidence in the individuals reviews in these tables and in the text, where available; however, ratings may not be directly comparable between reviews due to different approaches. The main reasons for the certainty of the evidence being downgraded across reviews were: inadequate reporting of allocation concealment and randomisation methods; lack of blinding; imprecision and indirectness. The evidence often comprised one or two small trials.

Effect of interventions

The results reported here focused on the pooled analyses as undertaken in the various systematic reviews. We did not report on outcomes where no pooled analyses could be undertaken, but we did make reference to the individual studies, as reported in the reviews. For the Lazzerini 2013 review, we reported comparisons comparing specially formulated foods versus standard care only. We did not report comparisons of various types of specially formulated foods against each other.

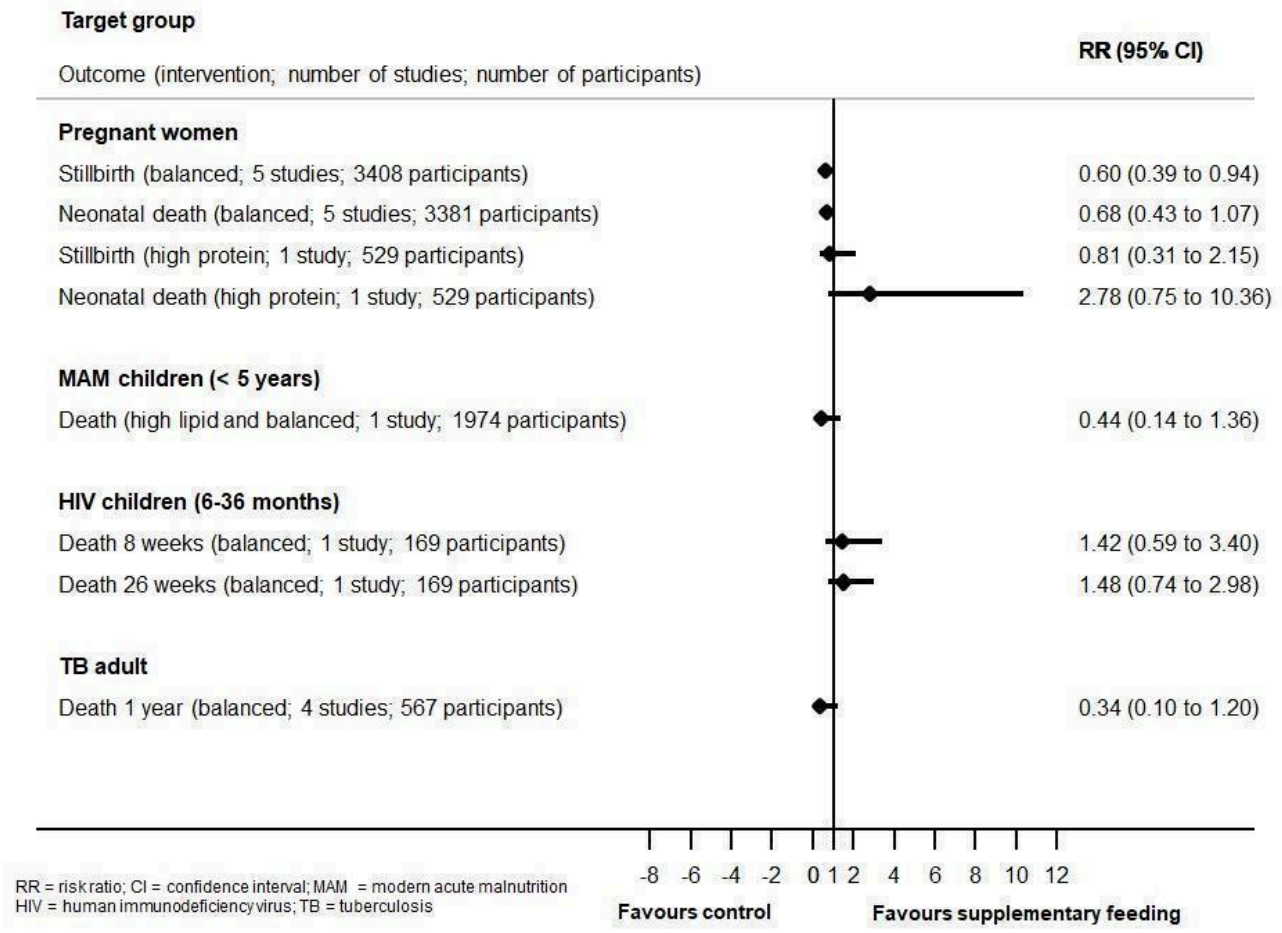
Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice)

Death

Four reviews reported mortality outcomes (Grobler 2013; Grobler 2016; Lazzerini 2013; Ota 2015). Mortality outcomes in the pregnancy review by Ota 2015 included stillbirth (death after 20 weeks' gestation and before birth) and neonatal death (death of a live infant within the first 28 days of life). Lazzerini 2013 reported death in children (aged less than five years) with MAM, and Grobler 2013 reported death (at eight and 26 weeks after study enrolment) for children who were HIV positive (aged six to 36 months) in one study. Grobler 2016 reported death at one-year follow-up in adults with tuberculosis. See Table 16 for details.

Figure 3 displays the meta-analysis estimates for mortality across the four participant groups in the four reviews reporting data on this outcome. Estimates were all underpowered (too small to detect small but important differences), apart from balanced energy and protein supplementation in pregnancy, which suggested potential effects on reducing the risk of stillbirth (risk ratio (RR) 0.60, 95% confidence interval (CI) 0.39 to 0.94; 5 studies, 3408 women; moderate-certainty evidence).

Figure 3. Outcome - mortality: supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice).



In the HIV review, Grobler 2013 provided a narrative description of adult mortality outcomes, indicating that neither supplementary food (Sudarsanam 2011) nor daily supplementation of spirulina (Yamani 2009) significantly altered the risk of death compared with no supplement or placebo, in malnourished, antiretroviral therapy (ART)-naive adults in the two studies that reported data on this outcome.

Illness (or disease-related outcomes)

Three reviews reported illness-related treatment outcomes (Grobler 2016; Kristjansson 2015a; Lazzerini 2013). Outcomes in the review of children with MAM included aspects of recovery, progression to SAM and defaulting (Lazzerini 2013). The tuberculosis review reported cure rate, treatment completion/failure and sputum conversion (Grobler 2016). Kristjansson 2015a narratively reported morbidity outcomes. All included comparisons included only one or two studies. See Table 17.

In the Lazzerini 2013 review on MAM, the provision of complementary foods (Pusti Packet) combined with LNS (Plumpy Doz, Corn-Soy Blend (CSB++)), compared with standard care, increased 'recovery rate' by 29% (RR 1.29, 95% CI 1.20 to 1.38; 2 studies, 2152 children; moderate-certainty evidence). The provision of complementary foods (LNS: Plumpy Doz, Corn-Soy Blend (CSB++)) compared with standard care made little difference to the number recovering, or progression to SAM, but did reduce the number defaulting from the programme (RR 0.30, 95% CI 0.22 to 0.30; 1 study, 1974 children; moderate-certainty evidence).

In the tuberculosis review, Grobler 2016, studies assessing the provision of free food or high energy supplements appeared to make little difference in terms of disease outcomes measured in various ways, although studies were all underpowered. One small study found a significant benefit in terms of treatment completion and sputum conversion, although these findings remain to be confirmed (very low-certainty evidence). See Table 17.

In the review on disadvantaged infants and young children, Kristjansson 2015a provided a narrative description of the morbidity outcome data from six studies (four RCTs; two CBAs). Three RCTs (Bhandari 2001; Iannotti 2014; Isanaka 2009) and two CBAs (Gopalan 1973; Tomedi 2012) found few differences between the provision of food or high-energy supplements and regular diet in the prevalence of morbidity. Roy 2005 (a CBA) reported mixed results; the prevalence of diarrhoea and fever was higher in the 99 children who received balanced protein supplementary food while the prevalence of respiratory infection was higher in the regular diet group (90 children).

Disease-related biochemical parameters

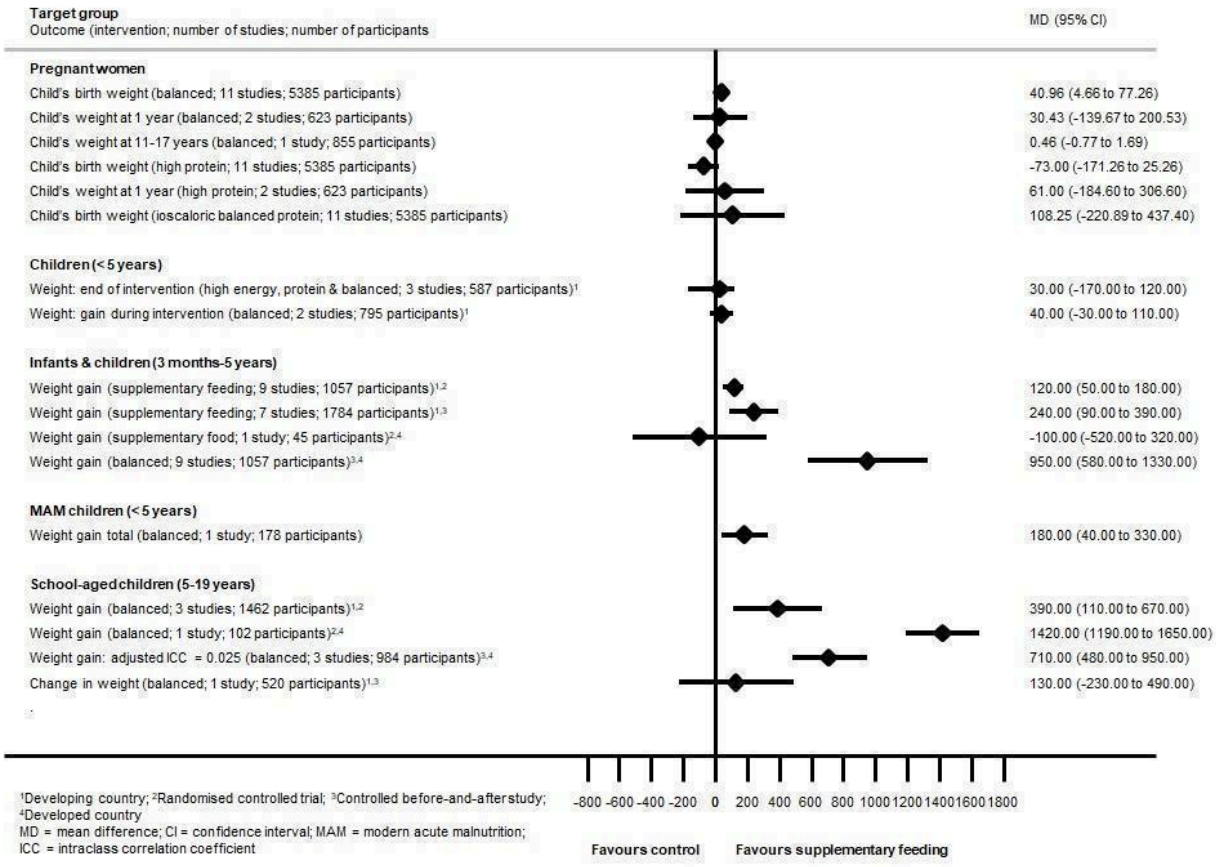
One review reported disease-related biochemical parameters (Grobler 2013). Outcomes in this HIV review included CD4 count and viral load. All comparisons included only one or two very small studies with fewer than 100 participants. None of the comparisons for this outcome were significant. See Table 18.

Growth in children

Weight

Five reviews reported on aspects of children's weight (Kristjansson 2007; Kristjansson 2015a; Lazzerini 2013; Ota 2015; Sguassero 2012). The pregnancy review, Ota 2015, reported birthweight and weight at two time points (aged one year and 11 to 17 years). The other reviews reported change in weight or weight at the end of the intervention. See Table 19 for details and Figure 4.

Figure 4. Outcome - weight (g) in children: supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice).



Except for balanced energy and protein supplementation in the pregnancy review (Ota 2015), and food supplementation in the disadvantaged infants and young children review (Kristjansson 2015a), all comparisons included only one to three studies.

Balanced energy and protein supplementation in the pregnancy review was associated with increases in mean birth weight (mean difference (MD) 40.96 g, 95% CI 4.66 to 77.26; 11 studies, 5385 participants; moderate-certainty evidence) (Ota 2015). Overall, the effects on weight in children as a result of pregnancy supplementation were limited, and not sustained.

Effects on growth in children were mixed. In children under five years of age from LMIC, one review found that supplementary feeding had a negligible impact on child growth (Sguassero 2012). However, a more recent review found that disadvantaged infants and young children in LMIC who received food supplementation gained a mean of 0.12 kg more than those who were not supplemented (MD 0.12 kg, 95% CI 0.05 to 0.18; 9 RCTs, 1057 participants; moderate-certainty evidence) (Kristjansson 2015a). Sensitivity analyses with intracluster correlation coefficient (ICCs) at 0.10 made little difference, and findings from a subgroup analysis were significant for infants younger than 12 months of age and young children aged one to two years, but not in children older than two years of age. Supplementary feeding of 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 in a subgroup analysis of one trial at 0.08 kg (95% CI –0.09 to 0.25) (Thakwalakwa 2010). In further comparisons in CBAs in LMIC, infants and young children who received food supplementation gained a mean of 0.24 kg more than those who

were not supplemented (MD 0.24 kg, 95% CI 0.09 to 0.39; 7 CBAs, 1784 participants). Sensitivity analyses with ICCs at 0.10 made little difference and, in subgroup analysis, findings were only significant for children aged two years. In HIC, one RCT assessed weight gain, and found that children who received supplementation in the form of an iron-fortified cereal showed no additional gain in weight than children who received no supplementation (MD −0.10 kg, 95% CI −0.52 to 0.32; 45 participants) (Ziegler 2009). One CBA in young aboriginal children in Australia found that children receiving hot lunches in day care centres gained a mean of 0.95 kg more than those who did not (MD 0.95 kg, 95% CI 0.58 to 1.33; 116 participants) (Coyne 1980).

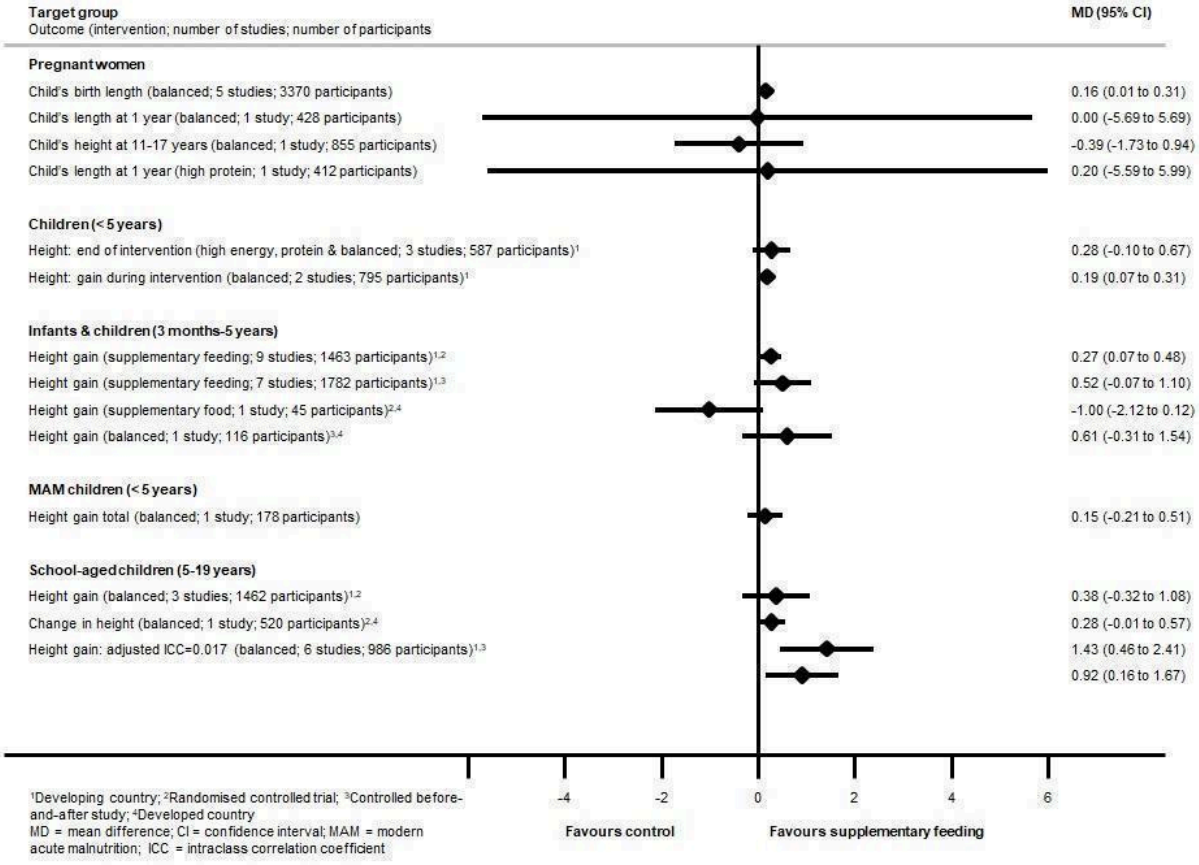
There seemed to be some gains in weight in children with MAM and school children, but the analyses were underpowered (Lazzerini 2013). In the MAM review, total weight gain was higher in children receiving complementary foods (Pusti Packet) when compared to those receiving standard care (MD 0.18 kg, 95% CI 0.04 to 0.33; 1 study, 178 participants; low-certainty evidence) (Lazzerini 2013).

As reported in the Kristjansson 2007 review, disadvantaged school-aged children who were fed at school gained an average of 0.39 kg more than those who were not supplemented (MD 0.39 kg, 95% CI 0.11 to 0.67; 3 RCTs in LMIC, 1462 participants). This translated to a gain of 0.25 kg per year for these children. Sensitivity analyses with ICCs at 0.01, 0.05 and 0.10 made little difference, and findings from a subgroup analysis were significant for undernourished and adequately nourished children, specifically children aged nine to 10 years. In further comparisons, children who received milk at school gained significantly more weight than those who did not (MD 1.42 kg, 95% CI 1.19 to 1.65; 1 CBA in a HIC, 102 participants). Children who were fed at school gained 0.71 kg more weight than controls (MD 0.71 kg, 95% CI 0.48 to 0.95; 3 CBA studies in LMIC, 984 participants). This translated to a gain of 0.75 kg per year for these children. Sensitivity analyses with ICCs at 0.01, 0.05 and 0.10 made little difference, and findings from a subgroup analysis were significant for boys and girls, and specifically for children aged five to six, six to eight and nine to 10 years of age.

Length/height

Five reviews reported on aspects of length/height in children (Kristjansson 2007; Kristjansson 2015a; Lazzerini 2013; Ota 2015; Sguassero 2012). The pregnancy review by Ota 2015 reported birth length and length/height at two time points: one year and 11 to 17 years. The other reviews reported change in length/height or length/height at the end of the intervention. See Table 20 for details and Figure 5.

Figure 5. Outcome - length/height (mm) in children: supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice).



Some gains in height were reported in children under five years of age (Sguassero 2012) and school children (Kristjansson 2007), but again analyses were underpowered (see Table 20 and Figure 5). For

children with MAM, evidence was limited (as reported in one study) and no mean effect demonstrated (Lazzerini 2013).

In the pregnancy review by Ota 2015, birth length was significantly increased in newborns of women given balanced energy protein supplementation (MD 0.16 cm, 95% CI 0.01 to 0.31; 5 studies, 3370 participants). Overall, there was some increase in birth length with pregnancy supplementation but, as with the findings for weight, this was not sustained over time (as reported in one study; Rush 1980).

In the Sguassero 2012 review on children younger than five years of age in LMIC, length/height gain at the end of the intervention was significantly higher in children given supplementary feeding (porridge and yogurt) versus children in the control group (MD 0.19 cm, 95% CI 0.07 to 0.31; 2 studies, 795 participants). Kristjansson 2015a also found that disadvantaged infants and young children who received food supplementation gained a mean of 0.27 cm more in height than children who were not supplemented (MD 0.27 cm, 95% CI 0.07 to 0.48; 9 RCTs in LMIC, 1463 participants; moderate-certainty evidence). A subgroup analysis revealed that supplementary feeding was effective for the youngest age groups (children younger than 12 months and children aged one to two years); there were no significant gains in height in the oldest age group (older than two years of age). In further comparisons of CBAs in LMIC, infants and young children who received food supplementation did not gain significantly more height than those who did not receive supplementation (MD 0.52 cm, 95% CI −0.07 to 1.10; 7 CBAs, 1782 participants). There were no significant effects of supplementation on height in HIC (MD 0.61, 95% CI -0.31 to 1.54; 1 study, 116 participants).

In the Kristjansson 2007 review on disadvantaged school children, compared with children in the control group, height gain was significantly increased in children who received school meals in LMIC (MD 1.43 cm, 95% CI 0.46 to 2.41; 6 CBAs, 986 participants) and HIC (MD 0.92 cm, 95% CI 0.16 to 1.67; 4 CBAs, 703 participants).

Growth z scores

Six of the eight reviews included growth z scores (Grobler 2013; Kristjansson 2007; Kristjansson 2015a; Lazzerini 2013; Ota 2015; Sguassero 2012). Four reviews reported data on weight-for-age z scores (WAZ) (Grobler 2013; Kristjansson 2007; Kristjansson 2015a; Sguassero 2012), four on length/height-for-age z scores (HAZ) (Kristjansson 2007; Kristjansson 2015a; Lazzerini 2013; Sguassero 2012), five on weight-for-height/length z (WHZ) scores (Grobler 2013; Kristjansson 2007; Kristjansson 2015a; Lazzerini 2013; Sguassero 2012), and one on body mass index (BMI) z score (Ota 2015). All comparisons included only one to three studies. See Table 21 for details.

Overall, the systematic reviews found modest improvements in z scores for children under five years of age and school-aged children, but analyses were mostly underpowered.

Weight-for-age z scores

In the Sguassero 2012 review on children younger than five years of age in LMIC, the change in WAZ was higher in the group receiving yoghurt supplementation versus control (MD 0.12, 95% CI 0.05 to 0.19; 1 study, 348 participants; low-certainty evidence). Similarly, RCTs in the Kristjansson 2015a review of disadvantaged infants and young children showed a significant effect on WAZ (MD 0.15, 95% CI 0.05 to 0.24; 8 RCTs in LMIC, 1565 participants; moderate-certainty evidence) and change in WAZ (MD 0.02, 95% CI 0.01 to 0.03; 1 RCT in HIC, 103 participants). Further comparisons of CBAs in LMIC showed no significant improvement in WAZ (MD 0.27, 955 CI −0.13 to 0.68; 4 CBAs, 999 participants; very low-certainty evidence). In the Kristjansson 2007 review on disadvantaged school children, a school breakfast (cheese sandwich or spiced bun and cheese plus milk) versus control demonstrated significant benefit in terms of WAZ (MD 0.07, 95% CI 0.04 to 0.10; 1 RCT in a LMIC, 785 participants). Supplementation with spirulina in children who were HIV positive did not lead to improvements in WAZ scores.

Length/height-for-age z scores

RCTs in the Kristjansson 2015a review on disadvantaged infants and young children showed a significant effect on HAZ (MD 0.15, 95% CI 0.06 to 0.24; 9 RCTs in LMIC, 4544 participants; moderate-certainty evidence) and change in HAZ (MD 0.04, 95% CI 0.04 to 0.05; 1 RCT in HIC, 103 participants). Further comparisons of CBAs in LMIC showed no significant improvement in HAZ (MD 0.01, 95% CI −0.10 to 0.12; 4 CBAs, 999 participants; very low-certainty evidence). In the Kristjansson 2007 review on disadvantaged school children, balanced school-feeding interventions (school breakfast: cheese sandwich or spiced bun and cheese plus milk; githeri and meat versus control) demonstrated a small significant effect on HAZ with a z score difference of 0.04 (95% CI 0.02 to 0.06; 2 RCTs in LMIC, 1021 participants). Supplementation in children younger than five years of age and children with MAM did not lead to improvements in HAZ scores.

Weight-for-height/length z scores

Lazzerini 2013 found that final WHZ (MD 0.20, 95% CI 0.03 to 0.37; 2 studies, 1546 participants; moderate-certainty evidence) and WHZ (MD 0.28, 95% CI 0.06 to 0.49; 1 trial, 178 participants) were significantly higher in the MAM group of children (younger than five years of age) receiving food versus those in the standard care group. Supplementary feeding in other groups (disadvantaged infants and young children, children younger than five years of age, school-aged children and children who were HIV positive) did not lead to improvements in WHZ scores.

BMI z score

In the pregnancy review by Ota 2015, there was a small increase in children's mean BMI z score at 11 to 17 years of age in those receiving supplementary biscuits versus control (MD 0.16, 95% CI 0.01 to 0.31; 1 study, 855 participants). There were no subgroup differences between girls and boys.

Nutritional status of children

Other anthropometry indicators

Four of the included reviews reported on a variety of other anthropometrical indices in children. Two reviews reported on head circumference (Ota 2015; Sguassero 2012); three reviews on mid-upper arm circumference (MUAC) (Kristjansson 2007; Lazzerini 2013; Sguassero 2012); and one review apiece on triceps and subscapular skinfold thickness (Sguassero 2012), mid-upper arm muscle area and mid-upper arm fat area (Kristjansson 2007), and percentage body fat (Ota 2015). Most comparisons included only one small study, except for balanced energy and protein supplementation in the pregnancy review (Ota 2015), which

included seven studies in two comparison (five studies in one comparison and two studies in the other). See Table 22 for details.

Across reviews, supplementary feeding appeared to have little impact on the specified anthropometric indices, but estimates were all underpowered (apart from balanced energy and protein supplementation in pregnancy).

The only significant finding was in disadvantaged school children (aged five to 19 years) in the Kristjansson 2007 review, who were given meat and gained significantly more mid-upper arm muscle area than the children in the control group (MD 68.22 mm^2, 95% CI 39.57 to 96.87; 1 RCT in LMIC, 236 participants).

Biochemical parameters

Three systematic reviews provided a narrative description of biochemical parameters in children (Grobler 2013; Kristjansson 2007; Kristjansson 2015a).

A Kenyan study (Neumann 2003) (reported in Kristjansson 2007) assessed various micronutrient status indicators (including haemoglobin, plasma ferritin, serum iron, serum zinc, serum copper, plasma vitamin B_{12}, folate and retinol, and erythrocyte riboflavin). School children receiving meat demonstrated significant increases in plasma vitamin B_{12} concentrations compared to children in the control group ($P < 0.0001$) after one year-long intervention (Neumann 2003). All other findings were insignificant. Tisdall 1951 (reported in Kristjansson 2007) compared 'good attenders', 'poor attenders' and controls on serum ascorbic acid, serum carotene and serum vitamin A and reported "statistically significant differences" favouring children who received a school lunch.

The Kenyan study by Neumann 2003 found no differences in haemoglobin increase between the meat and control groups. In Devadas 1979 (reported in Kristjansson 2007), school children receiving a vegetable protein mixture reportedly had a greater increase in haemoglobin than the control group (significance level not reported). Tisdall 1951 found no significant difference in increase in haemoglobin between 'good attenders', 'poor attenders' and controls (statistics not given), while Paige 1976 found that school children receiving a high protein drink as a mid-morning snack had a larger increase in percentage haematocrit than the control group ($P < 0.001$) (both studies reported in Kristjansson 2007).

One study in children with rapidly progressing HIV found no significant differences between groups (whey protein concentrate (WPC) versus maltodextrin placebo) for leukocytes, erythrocytes, haemoglobin and platelets (Moreno 2005).

The Kristjansson 2015a review on disadvantaged infants and young children found that children who were supplemented showed positive change in haemoglobin status compared to controls (standardised mean difference (SMD) 0.49 g/L, 95% CI 0.07 to 0.91; 5 RCTs in LMIC, 300 participants). See Table 23 for details. One CBA in an LMIC reported a significant effect of balanced protein supplementation on the risk of anaemia with those who were supplemented having a lower risk of being anaemic (odds ratio (OR) 0.58, 95% CI 0.24 to 0.75; 110 participants) (Lutter 2008). Similarly, another CBA with 250 participants reported that while the prevalence of anaemia decreased by 27% in the intervention group, it decreased by only 13% in the control group (De Romaña 2000). One RCT with 103 children in an HIC found no significant difference between the experimental and control group as regards change in haemoglobin (Yeung 2000); one CBA with 116 children reported an increase in the number of Aboriginal children who had low haemoglobin levels in the experimental group and a decrease in the corresponding number in the control group (Coyne 1980).

Dietary intake

None of the systematic reviews reported dietary intake in children (or individual trials included in these reviews).

Nutritional status of adults

Anthropometry indicators

The pregnancy, HIV and tuberculosis reviews reported weight outcomes in adults. The pregnancy review reported weekly gestational weight gain and maternal weight postpartum (Ota 2015), while the HIV (Grobler 2013) and tuberculosis (Grobler 2016) reviews reported body weight and weight gain at specific time points. See Table 24 for details.

Supplementary feeding had no effect on weight indices in pregnant women, but produced modest increases in weight gain at specific time points in adults with infectious diseases, although it did not seem to convey longer-term benefits in people who were HIV positive. Estimates were mostly underpowered (apart from balanced energy and protein supplementation in pregnancy).

In one study among participants not receiving ART in the HIV review, the group receiving fortified blended foods had a significantly greater mean body weight than the no supplement group at three months (MD 2.82 kg, 95% CI 1.02 to 4.62; $P = 0.0022$, 211 participants) and six months (MD 3.67 kg, 95% CI 1.50 to 5.84; $P = 0.001$, 157 participants) (Grobler 2013). In the same study among participants receiving ART, the supplement group appeared to gain weight more rapidly than the no supplement group at month one (MD 0.90 kg, 95% CI 0.40 to 1.41; 366 participants) and month three (MD 1.12 kg, 95% CI 0.29 to 1.95; 322 participants), as they had a significantly greater change in body weight gain compared to the no supplement group at these time points. After this time point the change in body weight was not significantly different between the groups. Among participants not receiving ART, the supplement group had a significantly greater body weight gain compared with the no supplement group at month one (MD 0.82 kg, 95% CI 0.28 to 1.36; 261 participants), month three (MD 1.22 kg, 95% CI 0.31 to 2.12; 211 participants) and at six-month time point (MD 2.06 kg, 95% CI 0.82 to 3.30; 157 participants). After this time point the change in body weight was not significantly different between the groups. Supplementation with ornithine alpha-ketoglutarate (OKG) and L-glutamine in adults who were HIV positive did not demonstrate any benefit in terms of weight gain.

In one small trial in the HIV review, after eight weeks of receiving an amino acid mixture (including arginine, glutamine and β-hydroxy-β-methylbutyrate (HMB)), the arginine-rich group gained significantly more body weight than the control group (MD 2.63 kg, 95% CI 0.72 to 4.54; 43 participants) (Grobler 2013).

In the tuberculosis review, balanced and high-energy supplementation did seem to improve weight gain at specific time points during treatment (at six weeks: MD 1.73 kg, 95% CI 0.81 to 2.65; 1 study, 34 participants; 12 weeks: MD 2.60 kg, 95% CI 1.74 to

3.46; 1 study, 100 participants; 32 weeks: MD 2.60 kg, 95% CI 0.52 to 4.68; 1 study, 265 participants) (Grobler 2016), although one large study, exclusively in people coinfected with HIV, found no difference at any time point (PrayGod 2011). Review authors concluded that supplementation probably produced a modest increase in weight gain during treatment for active tuberculosis, although this was not seen consistently across all trials (data not pooled; 5 trials, 883 participants, moderate-certainty evidence) (Grobler 2016).

The HIV review by Grobler 2013 reported a few other anthropometrical indices in adults, including BMI, lean body mass (LBM), fat mass and fat-free mass. See Table 25 for details.

Studies assessing supplementary feeding appeared to have little impact on LBM, fat mass and fat-free mass (again estimates were underpowered), with some benefit demonstrated in terms of improvements in BMI in the shorter term.

In one trial among participants receiving ART, mean BMI and change in BMI in the supplement group (receiving fortified blended foods) was significantly higher in the first three months compared to the no supplement group (month one: MD 0.36, 95% CI 0.08 to 0.64; 366 participants; month three: MD 0.43, 95% CI 0.07 to 0.79; 322 participants). After three months, there was no significant difference in BMI or BMI gain between the groups. In the same trial among participants not receiving ART, mean BMI and change in BMI in the supplement group was significantly higher in the first six months compared to the no supplement group (month one: MD 0.39, 95% CI 0.05 to 0.74; 261 participants; month three: MD 0.73, 95% CI 0.31 to 1.15; 211 participants; month six: MD 0.78, 95% CI 0.22 to 1.34; 157 participants). After six months, there was no significant difference in BMI or BMI gain between the groups.

In one small study, after eight weeks of receiving an amino acid mixture (including arginine, glutamine and HMB), the arginine-rich group of participants had a significantly greater increase in fat-free mass than the control group (MD 3.25 kg, 95% CI 1.25 to 5.25; 1 study, 43 participants).

Biochemical parameters

One systematic review provided a narrative description of biochemical parameters (Grobler 2013).

In one study, haemoglobin values decreased in both groups (spirulina versus green clay) between baseline and six months, with no difference between spirulina and placebo groups at the end of the study (Yamani 2009). In the Castleman 2011 study, ART participants receiving supplements (fortified blended food (Insta Foundation Plus), WPC, micronutrients, nutrition counselling) had a significantly higher increase in haemoglobin levels at month three compared to the no supplement (nutrition counselling only) group (P = 0.05). Supplemented pre-ART participants had a significantly higher increase in haemoglobin levels at months three (P = 0.01) and six (P = 0.05) compared to the no supplement group.

There was no difference in changes in serum albumin at three months between the supplement and no supplement groups for either group (Castleman 2011).

Serum protein concentrations increased in both study groups (spirulina versus green clay) in the first three months and then decreased in the following three months. There was a significant increase in serum protein in the spirulina group between baseline and three months (P value not shown) and baseline and six months (P < 0.001). At three (P = 0.01) and six (P < 0.001) months, serum protein concentrations were significantly higher in the spirulina group compared to the placebo group (Yamani 2009).

Serum creatinine levels decreased in both study groups (spirulina versus green clay) at months three and six. At three months, serum creatinine levels were significantly higher in the spirulina group compared to the placebo group (P = 0.01) (Yamani 2009).

Dietary intake

The HIV review reported dietary intake (Grobler 2013), and the review on Alzheimer's disease narratively reported dietary intake (Droogsma 2014). See Table 26 for details.

In the HIV review, compared with no nutritional supplementation or nutrition counselling alone, supplementation with balanced macronutrient formulas significantly improved energy intake in adults with weight loss (MD 393.57 kcal/kg, 95% CI 224.66 to 562.47; 3 studies, 131 participants; low-certainty evidence) and protein intake (MD 23.35 g/day, 95% CI 12.68 to 34.01; 2 studies, 81 participants; low-certainty evidence) (Grobler 2013). OKG supplementation had no effect on energy and protein intake in one, very small study.

The one study included in the Lauque 2004 review on Alzheimer's disease found that three months of daily oral nutrition supplements (ONS) improved nutritional outcomes in the intervention group. The nutritional status of the control group also improved after three months (with standard care), although the intervention group improved more than the control group. There were no changes in clinical and biochemical outcomes.

School attendance, cognition tests and educational attainment

Three reviews reported outcomes related to school attendance, cognition and educational attainment (Kristjansson 2007; Kristjansson 2015a; Ota 2015). See Table 27 for details.

While supplementary feeding had no effect on cognition tests in the descendants of pregnant women (Ota 2015), there were some small benefits with regards to cognition (intelligence quotient (IQ)) and educational attainment (maths and spelling, but not reading) in disadvantaged school children (Kristjansson 2007), but again analyses were underpowered. Supplementary feeding did not affect school attendance in one small study (Powel 1983) (reported in Kristjansson 2007).

In the Kristjansson 2007 review, disadvantaged school children who were given school lunches had an end-of-study, full-scale IQ (adjusted ICC = 0.15) that was 3.8 points higher than children who were not given school lunches (MD 3.80, 95% CI 0.51 to 7.10; 1 study, 231 participants). Sensitivity analyses with ICCs at 0.10 and 0.20 were still significant. Similarly, in the same study, the intervention group also had an end-of-study performance IQ (adjusted ICC = 0.15) that was 5.74 points higher than children who were not given a school lunch (MD 5.74, 95% CI 1.73 to 9.74; 1 study, 231 participants). Again, sensitivity analyses with ICCs at 0.10 and 0.20 were both significant.

Change in maths achievement (ICC = 0.15) was significantly greater for children who received school meals (lunch and breakfast) in two studies (SMD 0.31, 95% CI 0.09 to 0.53; 337 participants). Change

in spelling achievement (ICC = 0.15) was greater for children who received a school breakfast compared to children in the control group (MD 0.24, 95% CI 0.01 to 0.47; 1 study, 106 participants). A sensitivity analysis with an ICC of 0.10 showed much the same results, but the sensitivity analysis with an ICC of 0.20 was not significant.

In the Kristjansson 2015a review on disadvantaged infants and young children in LMIC, cognitive ability improved more in children who were supplemented than in children who had not yet received supplementation (SMD 0.58, 95% CI 0.17 to 0.98; 1 RCT, 99 participants; McKay 1978). A further study in an LMIC measured change on the Bailey Scale of Mental Development (BSMD) and found a non-significant difference (SMD −0.40, 95% CI −0.79 to −0.00; 1 RCT, 113 participants).

Behavioural outcomes

One systematic review provided a narrative description on behavioural outcomes (Kristjansson 2007).

The review presented the results from one study, which showed that playground activity levels, particularly prosocial activity, were higher for children who received school meals (githeri and meat versus no intervention) (P < 0.001; Neumann 2003). Using evidence from three studies, the review found that school feeding may have had positive effects on classroom behaviour in both HIC and LMIC (Bro 1994; Bro 1996; Chang 1996); however, the review authors concluded that effects may have depended on the quality of the educational attainment (Kristjansson 2007). Finally, the review reported one cluster-RCT of breakfast clubs in the UK, which found no significant changes in hyperactivity levels after the intervention (Shemilt 2004).

Quality of life

Two systematic reviews provided a narrative description of quality of life (Grobler 2013; Grobler 2016). In the HIV review by Grobler 2013, only one study reported data on quality of life (Castleman 2011), where in the initial stages of the trial supplementary food had a significant beneficial effect on the quality of life of pre-ART participants in particular. These benefits did not seem to persist over longer periods of follow-up. In the tuberculosis review by Grobler 2016, two studies with 134 participants reported data on quality of life (Jahnavi 2010; Paton 2004). Review authors concluded that supplementation may have increased quality of life scores during the first two months of treatment (low-certainty evidence).

Adverse events

Four reviews reported on adverse events (Grobler 2013; Kristjansson 2015a; Ota 2015; Sguassero 2012), and included serious adverse events (small-for-gestational age (SGA), preterm birth and pre-eclampsia) in the pregnancy review (Ota 2015), and milder adverse events and discomfort (including diarrhoea, vomiting and general gastrointestinal adverse events) in the three remaining reviews (Grobler 2013; Kristjansson 2015a; Sguassero 2012). See Table 28 for details. Additionally, one review described substitution or leakage (where the family cut home rations for the child who has been fed in order to spread food to other family members, or shared the child's supplementary rations with other family members) as an adverse event (Kristjansson 2015a).

Data on adverse events were generally limited or lacking. One exception was the pregnancy review (Ota 2015). It reported the incidence of SGA birth as significantly reduced in women given balanced energy and protein supplementation (RR 0.79, 95% CI 0.69 to 0.90; 7 studies, 4408 participants; moderate-certainty evidence). In contrast, high protein supplementation was associated with a significantly increased risk of SGA babies (RR 1.58, 95% CI 1.03 to 2.41; 1 study, 505 participants; moderate-certainty evidence). Balanced energy and protein supplementation and high protein supplementation had no effect on risk of preterm birth (balanced: moderate-certainty evidence; high protein: low-certainty evidence) and pre-eclampsia (very low-certainty evidence).

The provision of a multi-mixture to children younger than five years of age in one small study had no effect on incidence of diarrhoea and vomiting (Sguassero 2012). In one small study, participants who were HIV positive and receiving OKG reported significantly more gastrointestinal adverse events than participants in the placebo group (RR 1.59, 95% CI 1.06 to 2.39; 46 participants) (Grobler 2013).

One review described substitution or leakage by calculating the net benefit from supplementary feeding (Kristjansson 2015a). This review included seven studies that provided home-delivered rations (RCTs: Bhandari 2001; De Romaña 2000; Grantham-McGregor 1991; Rivera 2004; CBAs: Lutter 2008; Santos 2005; Tomedi 2012), and three day-care and feeding centre studies (RCTs: Husaini 1991; Pollitt 2000; CBA: Devadas 1971). It found differences in the number of calories provided by the supplementary food and the number of extra calories that the children had actually consumed in addition to their regular food. In the take-home studies, the net benefit to children was only 36% of the extra calories provided by the supplement, while in the day-care and feeding centres the net benefit was 85% of the extra calories provided by the supplement.

None of the included reviews reported on the following outcomes: adherence to treatment or attendance at clinic; costs to the provider and out-of-pocket costs to people receiving supplementary feeding.

DISCUSSION

According to FAO estimates, the prevalence of undernourishment remains high, despite adequate food supplies and considerable progress in reducing hunger in some regions. More than 795 million people still present with chronically inadequate levels of dietary energy intake (FAO 2015; Sundaram 2015), with women and children being particularly vulnerable. In 2016, the prevalence of stunting (22.9%) and wasting (7.7%) remained high in children under five years of age globally (UNICEF/WHO/World Bank Group 2017), and 108 million people were reported to be facing crisis-level food insecurity or worse (FSIN 2017). Supplementary feeding is thought to be beneficial in food insecure and vulnerable groups by optimising the nutritional value and adequacy of the diet, improving quality of life and improving various health parameters of disadvantaged families. In LMIC, the problems that supplementary feeding aims to address are entangled with poverty and deprivation, necessitating a multi-dimensional and integrated approach. In addition, appropriate sanitation facilities and safe drinking water are essential components to ensure the effective impact of supplementary feeding. Other relevant contextual factors include availability of basic health services and medical care,

nutrition education, and parenteral knowledge and care (WHO 1999). This overview undertook to describe and explore the effects of supplementary feeding, specifically across an array of vulnerable groups.

Summary of main results

The eight systematic reviews (search dates between May 2006 and February 2016) evaluated interventions in pregnant women, children under five years from LMIC, disadvantaged infants and young children (three months to five years), children with MAM, disadvantaged school children, HIV-positive adults and children, adults and children with active tuberculosis (with or without HIV), and older people with Alzheimer's disease. These reviews included 95 trials relevant to this overview, with the majority of participants from LMIC. Trials included a vast array of different nutritional interventions of varying duration, frequency and format, with micronutrients often reported as cointerventions in various trials. Follow-up ranged from six weeks to two years in the reviews, with three trials investigating outcomes at four to 17 years of age.

Pregnant women: there is a suggestion that supplementing pregnant women may have an effect on stillbirth, infant birth weight and risk of infants born SGA (all moderate-certainty evidence). Although clinically small, supplementation significantly increased birth length. These demonstrated effects did not translate into long-term benefits for the child in terms of growth and neurocognitive development in the one or two trials that reported on longer term outcomes. High-protein supplementation was associated with harm (increased risk of SGA babies) (moderate-certainty evidence), indicating that there is currently no justification to prescribe these supplements to pregnant women (considering that this finding is based on results reported in one trial).

Children: in children under five years of age from LMIC, supplementary feeding had a negligible impact on child growth, with authors warning of interpreting pooled results with caution due to the presence of clinical heterogeneity. However, a review published on 2015 found that children who received food supplementation gained a mean of 0.12 kg more in weight and 0.27 cm more in height than children who were not supplemented (moderate-certainty evidence). In children under five years of age with MAM, the provision of specially formulated food significantly improved weight (low-certainty evidence), WHZ scores (moderate-certainty evidence) and other key outcomes such as recovery rate (by 29%) (moderate-certainty evidence) and a decrease in the number of participants dropping out (by 70%) (moderate-certainty evidence). Other comparisons in this review compared types of specially formulated foods with each other, with authors concluding that both LNS and blended foods (such as CSB++ (corn-soy blended foods)) are effective in treating children with MAM (moderate- to high-certainty evidence). In children school meals seemed to lead to a number of small benefits, including improvements in weight (especially lower-income countries), height, WAZ scores, HAZ scores, mid-upper arm muscle area (reported in one small study), cognition tests (in LMIC), maths and spelling performance (in LMIC), and behaviour (described narratively).

Infectious diseases: supplementary feeding in HIV-positive adults increased daily energy and protein intake when compared to nutritional counselling alone (low-certainty evidence). Supplementation led to an initial improvement in weight gain/BMI, but did not seem to confer long-term benefit. No firm conclusions could be drawn regarding supplementation in children diagnosed with HIV. In adults with tuberculosis, one small trial found a significant benefit on treatment completion and sputum conversion rate (very low-certainty evidence). There were significant but modest benefits in terms of weight gain during active tuberculosis (moderate-certainty evidence). Supplementation may have increased quality of life scores during the first two months of tuberculosis treatment (low-certainty evidence; narratively described).

Alzheimer's disease: the one study included in the Alzheimer's disease review found that three months of daily ONS significantly improved nutritional outcomes in the intervention group. There were no significant changes on the clinical and biochemical outcomes.

None of the systematic reviews reported outcomes related to costs.

Overall: mortality data indicated an effect of supplementation on stillbirth when given to pregnant women; there were data from trials in supplementation for children with MAM, HIV-infected children and adults with tuberculosis, but these studies were few and small. There were mixed effects on weight and weight gain in children. In children under five years of age from LMIC, one review found that supplementary feeding had a negligible impact on child growth, however a more recent review found that children who received food supplementation gained a mean of 0.12 kg more in weight and 0.27 cm more in height than children who were not supplemented. Supplementary food was generally more effective for younger children (less than two years of age) and for those who were poorer/less well-nourished. In children with MAM, there were modest benefits. Pregnancy supplementation did not provide evidence of long-term effects; and in school children, there were bigger apparent effects, but follow-up was 24 months in the study with the longest duration. Length/height gain in children showed a similar pattern. There were modest improvements in z scores for children under five years of age and school children, but mostly analyses were underpowered. There were some small benefits regarding cognition (IQ) and educational attainment (maths and spelling) in children, but again analyses were underpowered. In adults with infectious diseases supplementary feeding did not seem to convey longer-term benefits in terms of weight gain and other anthropometric indices. In disadvantaged school children under five years of age, substitution or leakage was a substantial problem when feeding was given at home (as opposed to when food was given in day-care/feeding centres).

We found good coverage of vulnerable groups by systematic reviews and fewer than expected trials per review (the latter should be considered in the context of probable under-reporting, as many international agencies and NGOs (non-profit organisations) probably have unpublished data that might have been relevant to the individual systematic reviews, and thus also this overview). Furthermore, we found limited evidence overall of an effect on mortality (also considering that we excluded children with SAM from this overview) or nutritional status or school performance.

Overall completeness and applicability of evidence

This overview summarised published systematic reviews of supplementary feeding in vulnerable groups. Although we

intended to include older people as a vulnerable group a priori (Visser 2013), we included just one review (with one trial) investigating community-dwelling older participants with Alzheimer's disease. We consider the overview to be complete, although we also acknowledge that not all systematic reviews included in this overview were up to date. While we found evidence within each of our outcome categories (except for costs), there was often only a small number of reviews and studies within any one category. Some of the reviews did not consider socioeconomic status or nutritional status at baseline in their inclusion criteria or analyses, or did not report this clearly, which could have had an impact on some findings. Many individual studies did not report clinical and other important endpoints (e.g. mortality, quality-of-life aspects and cost-effectiveness), and for many interventions in the various reviews there were too few data to reach a firm conclusion.

Policymakers and programme implementers can use the information summarised in this overview to obtain a 'bird's eye view' of effects demonstrated (and the certainty of the evidence supporting these effects) of supplementary feeding across reviews and groups (including pregnant women, infants, children, adolescents, people living with HIV/AIDS or tuberculosis or both, and older people with Alzheimer's disease), with a view to inform future programme designs and assist with evaluations of supplementary feeding programmes. We also believe this overview highlights areas that need further investigation.

Certainty of the evidence

We included eight systematic reviews (with 95 relevant trials) of supplementary feeding in vulnerable groups in this overview, with the number of relevant included participants across reviews varying between 91 and 7940 adults, and 271 to more than 12,595 children. All systematic reviews included were rated as high quality (with AMSTAR scores between eight and 11). In one review, authors did not formally assess publication bias (Grobler 2013).

The certainty of the evidence reported by the primary studies in the included reviews ranged from very low to moderate for individual comparisons, with the evidence often comprising one or two small trials. We used the GRADEpro 'Summary of findings' tables from each review (if reported in the individual reviews for the main comparisons). Six of the eight reviews included such tables.

There was moderate-certainty evidence was reported for balanced protein energy supplementation in relation to reduction in the stillbirth, increase in infant birth weight and reduction in the risk of infants born SGA in the pregnancy review. In addition, the evidence linking high protein supplementation to increased risk of SGA babies was of moderate certainty. There was moderate-certainty evidence for growth outcomes in disadvantaged infants and young children in LMIC. Furthermore, there was moderate-certainty evidence for the provision of specially formulated food in relation to WHZ scores, recovery rate and defaulting in the MAM review. The benefits demonstrated in terms of weight gain in the tuberculosis review were also considered to be of moderate certainty. All other significant findings were considered to be of low- or very low-certainty evidence as assessed in the individual reviews.

Potential biases in the overview process

There were potential biases in the overview process. Since our data extraction was limited to systematic reviews and not the original studies, it is possible that we may not have captured all minor outcomes. One overview author and one overview reviewer independently applied eligibility criteria, assessed the studies for inclusion, extracted data and assessed the scientific quality of reviews (using the AMSTAR tool), which should have reduced the risk of bias in the overview process. An overlap in included studies between systematic reviews should be noted and considered, since five RCTs appeared in both Kristjansson 2015a and Sguassero 2012, which could potentially influence the overall interpretation of outcomes related to weight and length/height in children.

Agreements and disagreements with other studies or reviews

We are not aware of any other published overviews of reviews of supplementary feeding in vulnerable groups.

AUTHORS' CONCLUSIONS

We have observed modest benefits (mostly in terms of anthropometric parameters) for some outcomes across studies, with a variety of supplementary feeding interventions. Mortality evidence is limited, with some evidence in newborns that supplementing the mother reduces the risk of stillbirth. The certainty of the evidence overall was moderate to very low (often including one or two small trials). Reviews mostly reported on short-term outcomes, with very few trials investigating crucial long-term outcomes. Some important outcomes were scarcely (e.g. quality of life) or not reported (e.g. cost aspects). The findings reinforce the multi-dimensional nature of food insecurity and malnutrition (Figure 1), with supplementary feeding programmes again clear to be but one approach to address these complex issues. An integrated approach seems crucial, with investigations on how best to combine supplementary feeding programmes with other interventions to achieve the desired nutrition and health outcomes. Ultimately it remains unrealistic to expect that a single intervention will be the ultimate solution.

The vast array of nutritional interventions of varying duration, frequency and format in the various systematic reviews and trials make conclusions regarding specific supplementary foods or practices almost impossible. It is clear that aspects such as non-compliance and dietary substitution/leakage, the amount of energy and specific nutrients provided by the supplement/meal/snack as well as the timing thereof, and the provision of additional micronutrients that in itself could impact on the outcomes, are key factors related to outcome. Place of administration (e.g. 'on-site'/feeding centres versus at home) also has an impact on supplementation reaching those it is intended for.

Critical aspects related to the outcomes or benefits (or lack thereof) demonstrated across studies, probably include a combination of factors, including programme design, aspects related to the intervention (see above), the participant inclusion criteria (such as baseline nutritional status or vulnerability), the social environment at home, aspects of sanitation and access to clean water. Given the political economy of supplementary feeding there will continue to be investment in these programmes in the foreseeable future. Paying more attention to supplementary feeding programme

design, being specific about the 'conditions' that they address, and experimenting with different combinations of interventions seems crucially important.

Implications for practice

This overview has demonstrated that supplementary feeding programmes across vulnerable groups are probably not performing as expected. Aspects to consider when designing, planning and prioritising health and nutrition interventions include investigating the causes of malnutrition, identifying the relevant target populations (those that could potentially benefit most), as well as the best combinations of interventions to address the complex and multi-dimensional nature of food insecurity and malnutrition. In addition, strong political commitment (including placing food security and nutrition at the top of the political agenda and creating an enabling environment) is essential for hunger reduction and addressing malnutrition, the latter which requires an integrated approach, including specific nutrition programmes. Proper programme implementation, evaluation and monitoring are key components for success.

Considerations for programme development include the following.

1. Target people who are undernourished and vulnerable.
2. Minimise leakage or substitution by considering place of administration (onsite versus at home) and supervision.
3. Provide sufficient energy and nutrients (some studies suggest at least 30% of the dietary reference intakes).
4. Start early (in infants and children; supplementation earlier in life may optimise benefit).
5. Start with the end in mind (pilot a combination of potentially relevant interventions, assess outcomes in specific contexts, scale the intervention/principles/models that work, rather than specific interventions).
6. Involve stakeholders in the design and piloting of interventions and build capacity for programme implementation, including education and nutritional counselling.
7. Ongoing monitoring and evaluation (including relevant and important outcomes and factors impacting programme success).

Implications for research

It is clear from our findings that many of the key outcomes are rarely reported, and high-quality randomised trials addressing relevant outcomes (rather than specific, narrowly defined 'interventions') may be needed, focusing on those that are nutritionally deprived or malnourished in order to possibly convey the most benefit. This overview does not call for more of the same research, but rather research with a focus on relevant and understudied outcomes, with follow-up over longer periods of time, and investigating a combination of interventions that are needed to address such complex issues as malnutrition and food insecurity.

Better project conceptualisation, design and combinations of interventions (and being much more alert to specific contexts) seem critically important. Well-conducted research, including multi-sectoral efforts to address nutrition challenges, is essential for the optimal allocation of resources and scaling-up of public healthcare interventions. In the meantime, disadvantaged and vulnerable families and children cannot wait indefinitely for future trials and should have access both to appropriate healthcare and sanitation, as well as adequate amounts of nutritious food. Researchers should work with programme implementers (governments, UN and other international agencies, etc.), to build robust evaluation and learning components into existing and planned programs (including RCTs, where appropriate). Considering the complexity of the interventions, component network meta-analysis could be considered in future systematic reviews.

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ADDITIONAL TABLES

Table 1. Excluded reviews and reasons for exclusion

Review author and date	Reason for exclusion
Abdelhamid 2016	Methods: stated that Cochrane methods were used but did not specify that 2 reviewers assessed risk of bias. Participants: majority of participants in care homes (1 in hospital); only 3/43 in community
Allen 2013	Methods: no predetermined eligibility criteria Participants: mainly residing in long-term care establishments (75%)
Arthur 2015	Methods: no 'Risk of bias' assessment
Baldwin 2016	Participants: 5/41 in community, including neurology outpatients and those enrolled at hospital discharge (Protocol published as Gibbs 2012)
Bally 2016	Participants: hospital inpatients
Bandayrel 2011	Methods: no mention that 'Risk of bias' assessment performed in duplicate. Intervention: only 2/15 studies on macronutrient supplementation
Beck 2011	Methods: only 1 database used; single abstract screening; methods for 'Risk of bias' assessment and data extraction not reported.
Beck 2013	Methods: only 1 reviewer assessed trials for inclusion, extracted data and assessed trial quality.
Beck 2016	Methods: single screening of abstracts and single data extraction.
Bhutta 2008	Methods: no 'Risk of bias' assessment
Bibas 2014	Methods: only 1 data source; no 'Risk of bias' assessment
Campbell 2015	Methods: only 1 data source; no 'Risk of bias' assessment
Cawood 2012	Methods: no mention that abstract screening or data extraction performed in duplicate. Participants: hospital and community results reported together, very limited data reported separately for community. Quote: "The populations studied were mostly elderly including those with

Table 1. Excluded reviews and reasons for exclusion *(Continued)*

	hip fractures, pressure ulcers, chronic obstructive pulmonary disease (COPD), cancer, gastro-intestinal disease, and a range of critical and acute illnesses."
Choudhury 2014	Methods: no details on screening; no 'Risk of bias' assessment
Collins 2015	Methods: no mention that data extraction performed in duplicate. Participants: adult inpatients in rehabilitation, geriatric evaluation medicine wards or similar
Coyne-Meyers 2004	Methods: did not report methods; no 'Risk of bias' assessment
Daniels 2010	Methods: no 'Risk of bias' assessment
de van der Schueren 2016	Methods: no 'Risk of bias' assessment; based on 2 previous reviews
Dewey 2008	Methods: search terms and databases not listed; no mention that screening or data extraction performed in duplicate.
Elia 2016	Methods: AMSTAR score of 5; no mention that data extraction or 'Risk of bias' assessment performed in duplicate, though stated Cochrane methods were used to assess risk of bias.
Els 2013	Methods: no mention that data extraction and 'Risk of bias' assessment performed in duplicate.
Fatima 2015	Methods: methods not described
Ferreira 2010	Methods: 2 databases searched; review methods not reported
Goudet 2017	Methods: scoping review Methods: 1 reviewer screened; no 'Risk of bias' assessment
Grantham-McGregor 2014	Methods: no mention that screening or data extraction performed in duplicate; no 'Risk of bias' assessment
Gresham 2014	Methods: not described Intervention: 25 studies on macronutrients reported, combined with 6 studies on micronutrients.
Gresham 2016	Methods: second independent reviewer extracted data from half of the studies. Intervention: dietary intervention, macronutrients, micronutrients; data not reported separately; no information reported on intervention.
Gunaratna 2010	Methods: no mention that screening or data extraction performed in duplicate. No 'Risk of bias' assessment.
Hubbard 2012	Methods: no mention that data extraction performed in duplicate. Participants: included both well-nourished and malnourished participants; mostly elderly (23 participants) with a range of acute and chronic conditions, including those with fractures (4 participants), renal disease (2 participants), cancer (5 participants) and respiratory disease (4 participants) Setting: community and hospital settings
Imdad 2011a	Methods: only 1 database searched; no mention that screening or 'Risk of bias' assessment performed in duplicate.
Imdad 2011b	Methods: no mention that screening or 'Risk of bias' assessment performed in duplicate but did mention that data extraction performed in duplicate. Quote: "Even though we included terms like 'supplementary food' and 'supplementary feed' in our literature search but only those studies were

Table 1. Excluded reviews and reasons for exclusion *(Continued)*

	included where the term supplementary food was used for introduction of additional food to a breastfed child at the age of 6 months i.e. complementary feeding."
Imdad 2012	Methods: only 1 database searched; no mention that screening, data extraction or 'Risk of bias' assessment performed in duplicate.
Kimber 2015	Intervention: only 7/41 meal supplementation Participants: only 2/41 in community
Kramer 1996a	Status: withdrawn and replaced by Ota 2015 Intervention: nutrition advice (not food or supplements)
Kramer 1996b	Status: withdrawn and replaced by Ota 2015
Kramer 1996c	Status: withdrawn and replaced by Ota 2015
Larson 2017	Intervention: majority of included studies had micronutrient interventions.
Lassi 2013a	Methods: method of data extraction and screening not described.
Lassi 2013b	Methods: screening and data extraction performed in duplicate but no mentioned that 'Risk of bias' assessment performed in duplicate. Intervention: education and complementary feeding
Lawson 2012	Methods: did not list electronic sources; no mention that screening or data extraction performed in duplicate; no 'Risk of bias' assessment.
Lenters 2013	Methods: AMSTAR score 7; did not describe that screening, data extraction or 'Risk of bias' assessment performed in duplicate. Participants: includes severe acute malnutrition and moderate acute malnutrition Interventions: ready-to-use supplementary food compared to corn soy blend.
Lerch 2007	Intervention: not community-based supplementary feeding; strategies/intervention to prevent rickets (4 included studies: 3 micronutrient interventions) Outcomes: few outcomes of interest
Liberato 2013	Methods: single screening; no 'Risk of bias' assessment
Loveday 2012	Methods: 'Risk of bias' assessment performed in duplicate but not reported that screening and data extraction performed in duplicate. Participants: acute and tertiary healthcare settings
Manders 2004	Methods: 1 database searched
Marshall 2013	Methods: single screening; second author checked included full texts.
Matsuyama 2017	Methods: no mention that 'Risk of bias' assessment performed in duplicate. Intervention: micronutrient fortified milk
McGrath 2015	Methods: no mention that screening and data extraction performed in duplicate; no 'Risk of bias' assessment.
McHenry 2015	Methods: screening performed in duplicate but no mentioned that data extraction or 'Risk of bias' assessment performed in duplicate. Intervention: only 8/23 macronutrients

Table 1. Excluded reviews and reasons for exclusion *(Continued)*

Milne 2009	Setting: the majority of studies included were in a hospital, long-care or nursing home setting (66%); only 1 subgroup analysis related to community versus hospital (mortality).
Milte 2013	Methods: no mention that 'Risk of bias' assessment performed in duplicate. Participants: hospitalised, residential and aged, care and community dwelling populations (1/6 malnourished studies in community)
Morilla-Herrera 2016	Methods: 'Risk of bias' assessment performed in duplicate; no mention that screening or data extraction performed in duplicate. Setting: hospital and community; 2/7 in community but not reported separately
Potter 1998	Methods: 1 database; no mention that double data extraction performed in duplicate; no 'Risk of bias' assessment. Intervention: oral or enteral protein energy supplementation
Ramakrishnan 2014	Type of publication: abstract; no full-text report available Intervention: mostly micronutrient, but also included balanced protein energy
Schultz 2015	Methods: data extraction performed in duplicate but no mentioned that screening or 'Risk of bias' assessment performed in duplicate Intervention. Quote: "The focus of WIC [Women, Infants, and Children food packages] has transitioned from preventing malnourishment to concerns of childhood obesity and excessive energy consumption combined with a low intake of fruits, vegetables, and whole grains have become the primary dietary concern of WIC participants."
Stevens 2015	Methods: single title and abstract screening (Protocol published as Stevens 2013)
Stratton 2000	Methods: not described
Stratton 2013	Methods: screening and 'Risk of bias' assessment performed in duplicate but no mention that data extraction performed in duplicate. Participants: community, care homes, rehabilitation/community hospitals Outcome: hospital admissions
Thorne 2014	Methods: screening and 'Risk of bias' method not described; data extraction by 1 reviewer.
Trabal 2015	Methods: screening, data extraction and 'Risk of bias' assessment performed by 1 reviewer and checked by a second. Participants: 1/9 studies in community
Tsiami 2013	Type of publication: abstract; full-text report published as Loveday 2012 and excluded.
Valle 2004	Methods: not specified methodology for review; no report of number of reviewers Participants: not specified as vulnerable
Vandenplas 2014	Methods: no systematic review methods described other than database search
Wang 2013	Methods: no mention that screening, data extraction or 'Risk of bias' assessment performed in duplicate

Table 1. Excluded reviews and reasons for exclusion *(Continued)*

Wright 2015	Methods: screening and data extraction performed by 1 reviewer
Wrottesley 2016	Methods: not described other than search

AMSTAR: A Measurement Tool to Assess Systematic Reviews.

Table 2. Characteristics of included systematic reviews: part 1

Review	Vulnerability	Last search date	Population	Included studies (relevant to this overview)	Types of studies included	Participants (relevant to this overview)
Droogsma 2014	Alzheimer's disease	April 2013	Community-dwelling people with Alzheimer's disease	1 (1)	All RCTs	91 adults (all relevant)
Grobler 2013	HIV positive	August 2011	Adults and children who were HIV positive	14 (14)	All RCTs	1725 adults (all relevant)
		February 2012				271 children (all relevant)
Grobler 2016	TB	February 2016	Adults and children with active TB (with/without HIV)	35 (7)[a]	All RCTs	7491 adults (986 relevant)
						792 children (none relevant)
Kristjansson 2007	Disadvantaged school children	May 2006	Children and adolescents (aged 5–19 years) attending primary or high school	18 (18)	7 RCTs	> 12,595 children (not accurately reported) (all relevant)
					9 CBAs	
					2 ITSs	
Kristjansson 2015a	Disadvantaged infants and young children	January 2014	Infants and children aged 3 months to 5 years	32 (32)	21 RCTs (individual and cluster randomised)	11,602 children (all relevant)
					11 CBAs (individual and cluster randomised)	
Lazzerini 2013	Children with MAM (< 5 years of age)	October 2012	Children with MAM (aged 6 to 60 months) in LMIC	8 (8)	All RCTs (individual and cluster randomised)	10,037 children (all relevant)
Ota 2015	Pregnancy	January 2015	Pregnant women	17 (12)[b]	All RCTs (individual and cluster randomised) only[c]	9030 adults (7940 relevant)
Sguassero 2012	Children < 5 years of age in LMIC	January 2011	Children (aged 0–5 years) in LMIC born at term (≥ 37 weeks)	8 (8)	All RCTs (individual and cluster randomised) only[c]	1243 children (all relevant)

Table 2. Characteristics of included systematic reviews: part 1 *(Continued)*

CBA: controlled before-and-after study;**ITS:** interrupted time series; **LMIC:** low- and middle-income countries; **MAM:** moderate acute malnutrition; **RCTs:** randomised controlled trial; **TB:** tuberculosis.

[a]Only seven trials (in adults) assessed macronutrient supplementation.
[b]Only 12 trials assessed macronutrient supplementation.
[c]Quasi-randomised designs were excluded.

Table 3. Characteristics of included systematic reviews: part 2

Review	Vulnerability	Intervention categories (as per the original review)	Duration of intervention	Cointerventions	Associated interventions	Main outcome categories	Length of follow-up
Droogsma 2014	Alzheimer's disease	Oral nutritional supplements (1)	3 months	—	—	Clinical Nutritional Biochemical	3 months
Grobler 2013	HIV positive	Supplementary food (2) Macronutrient formulas providing energy and protein (6) Specific macronutrient supplements (6)	6 weeks to 1 year	Micronutrients	Nutrition counselling	Mortality Anthropometry Dietary intake Disease parameters Adverse events	6 weeks to 1 year
Grobler 2016	TB	Supplementary food (5) Macronutrient formulas providing energy and protein (2) Micronutrients (28)[a]	60 days to 6 months (for macronutrient interventions)	Micronutrients	Nutrition counselling	Mortality Anthropometry Disease-related outcomes Quality of life	8 weeks to 1 year
Kristjansson 2007	Disadvantaged school children	Supplementary food, snacks and drinks (18)	20 days to 3 years	—	—	Anthropometry Psychosocial outcomes	Not consistently reported
Kristjansson 2015a	Disadvantaged infants and young children	Supplementary food (12) Macronutrient formulas providing energy and protein (20)	3–32 months	Micronutrients	Additional rations for family Cash transfers Stimulation Health/nutritional educa-	Growth Anthropometry Psychosocial outcomes	Not consistently reported (up to 8 years)

Table 3. Characteristics of included systematic reviews: part 2 *(Continued)*

					tion for mothers		
					Healthcare, deworming	Adverse events	
Lazzerini 2013	Children with MAM (< 5 years of age)	Specially formulated foods, including LNS, blended foods, complementary LNS and blended foods (8)	8–16 weeks (or upon recovery)	Micronutrients	Nutrition education	Mortality	8–16 weeks (outcomes in 2 trials: 6 months and 12 months)
					Health education	Anthropometry	
					Medical care	Disease-related outcomes	
					Psychosocial stimulation		
Ota 2015	Pregnancy	Balanced protein energy supplementation (12)	2.5–9 months + during pregnancy (not consistently reported)	Micronutrients	—	Mortality	Not consistently reported (up to 17 years)
		High protein supplementation (1)				Anthropometry	
		Isocaloric protein supplementation (2)				Neurocognitive development	
		Nutritional advice (4)[a]				Adverse events	
Sguassero 2012	Children < 5 years of age in LMIC	Supplementary food, snacks and drinks (8)	2–12 months	Micronutrients	—	Anthropometry	2–12 months
						Adverse events	

LMIC: low and middle-income country; **LNS:** lipid-based nutrient supplement; **MAM:** moderate acute malnutrition; **TB:** tuberculosis.

[a]Excluded from this overview.

Table 4. Characteristics of included systematic reviews: economies, socioeconomic status (SES) and setting

Review	Population	Included studies (relevant to this overview)	Economies (relevant to this overview)	SES (relevant to this overview)	Setting

Table 4. Characteristics of included systematic reviews: economies, socioeconomic status (SES) and setting *(Continued)*

			LMIC	HIC	Economically disadvantaged, including undernourished, nutritionally-at-risk, rural	Economically advantaged, including well-nourished	Community (or outpatient setting)	Hospital inpatients and other
Droogsma 2014	Community-dwelling people with Alzheimer's disease	1	0	1	1	0	1	0
Grobler 2013	Adults and children who were HIV positive	14	7	7	NR	NR	14[a]	0
Grobler 2016	Adults and children with TB	35 (7)	33 (6)	2 (1)	NR	NR	24 (6)	11 (1)[b]
Kristjansson 2007	Disadvantaged school children (aged 5–19 years)	18	9	9	18	0	18	0
Kristjansson 2015a*	Disadvantaged infants and young children (aged 3 months to 5 years)	32	29	3[c]	30	2	32	0
Lazzerini 2013	Children with MAM (< 5 years of age)	8	8	0	8	0	8	0
Ota 2015	Pregnant women	17 (12)	10 (8)	7 (4)	7 (6)	10 (6)	17 (12)	0
Sguassero 2012[e]	Children < 5 years of age in LMIC	8	8	0	6[d]	?	8	0

?: unknown; **HIC:** high-income country; **LMIC:** low- and middle-income country; **MAM:** moderate acute malnutrition; **NR:** not reported; **SES:** socioeconomic status.

[a]In one study, Rollins 2007, children were included that were treated on an inpatient and outpatient basis.
[b]Of the seven studies on macronutrients, one study recruited and treated people in a hospital setting (Pérez-Guzmán 2005).
[c]One study included Aboriginal children.
[d]Six studies included nutritionally-at-risk children, whereas in two studies there were no trial entry criteria based on child nutritional status.
[e]Five studies appeared in both Kristjansson 2015a and Sguassero 2012.

Table 5. Summary of interventions

Systematic review	Population	Supplementary feeding	Intervention categories (as per review)	Intervention summary (number of studies)

Table 5. Summary of interventions *(Continued)*

					Supplementary food/ drink[a]		Non-food[b]		Other
					No added micronutrients	Added micronutrients	No added micronutrients	Added micronutrients	
Droogsma 2014	Adults with Alzheimer's disease	—	T	Oral nutritional supplements (1)	0	0	0	1	0
Grobler 2013	Adults who were HIV positive	Children who were HIV positive (3 studies)	B and T	Supplementary food (2) Macronutrient supplements providing energy and protein (6) Specific macronutrient supplements (6)	0	2	5	7	0
Grobler 2016	Adults with TB	Children with TB (3 studies)[c]	B and T	Supplementary food (5) Macronutrient formulas providing energy and protein (2) Micronutrients (28)[d]	3	2	1	1	28 (micronutrients only)
Kristjansson 2007	—	Disadvantaged school children (aged 5 to 19 years)	B	Supplementary food, snacks and drinks (18)	15	1	1	1	0
Kristjansson 2015a	—	Disadvantaged infants and children (aged 3 months to 5 years)	B	Supplementary food, snacks and drinks (32)	12	2	17	1	2 (nutritional counselling) 1 (health-sanitation programme) 1 (day-care centre)

Table 5. Summary of interventions *(Continued)*

									1 (day-care centre + vitamin mineral supplement and sanitation)
									1 (stimulation only)
Lazzerini 2013	—	Children with MAM (< 5 years of age)	T	Supplementary food, including LNS, blended foods, complementary LNS and blended foods (8)	0	0	0	8[e]	0
Ota 2015	Pregnant women	—	B and T	Balanced energy/protein supplementation (12)	4	2	1	5	5 (nutrition advice only)
				High protein supplementation (1)					
				Isocaloric protein supplementation (2)					
				Nutritional advice (4)[d]					
Sguassero 2012	—	Children < 5 years of age in LMIC	B and T	Supplementary food, snacks and drinks (8)	2	2	3	1	0

B: blanket;**LMIC:** low and middle-income country; **LNS:** lipid-based nutrient supplement; **MAM:** moderate acute malnutrition; **T:** targeted; **TB:** tuberculosis.

[a]Supplementary food/drink: actual food to eat or fluid to drink as would be found in a household.
[b]Non-food: any powder, commercially prepared liquid supplement, mixtures.
[c]None relevant to this review.
[d]Excluded from this overview.
[e]This review focused on foods developed for the treatment of MAM, including: LNS, blended food supplements, complementary food supplements.

Table 6. Droogsma 2014: details of interventions (as reported in systematic review)

Review ID	Droogsma 2014
Types of interventions considered	Nutritional intervention (i.e. any intervention that aimed to improve nutritional status (e.g. weight, upper-arm anthropometry), such as oral nutritional supplements, dietary advice, food fortification, nutritional education programmes)
Details regarding interventions	1. **Oral nutritional supplements (ONS)** a. Intervention: ONS in addition to the participants' spontaneous food intake, enriched with proteins, vitamins and minerals (energy = 300–500 kcal) b. Control: care as usual c. Duration: 3 months (intervention and control)
Comments	Information provided as (and if) reported in systematic review.

Table 7. Grobler 2013: details of interventions (as reported in systematic review)

Review ID	Grobler 2013
Types of interventions considered	1. Macronutrient interventions: liquid, powder, tablet form, which could be fortified with micronutrients, providing a combination of protein and energy (through CHO or fat or both), by replacing or supplementing the normal diet. 2. Dietary supplements: may be included; not given specifically to provide energy but rather to test the effectiveness of specific nutritional elements (e.g. AAs, whey protein concentrate and spirulina). 3. Food programmes: replacement food or food stuffs in addition to local staple foods delivered in resource-scare regions where malnutrition is prevalent, in the form of: high-energy, ready-to-use therapeutic foods; corn-soy blend; or fortified blended foods, ready-to-use foods, high-energy biscuits and compressed food bars.
Details regarding the interventions	1. **Liquid supplement (Meritene, Movartis)** a. Intervention: liquid supplement (energy = 2510 kJ, whey protein = 26 g, CHO = 88 g, fat as corn oil = 17 g, electrolytes and micronutrients) + nutrition counselling b. Control: nutrition counselling c. Duration: 12 weeks 2. **AA mixture** a. Intervention: AA mixture (energy = 200 cal/day, arginine = 14 g, glutamine = 14 g, β-hydroxy-β-methylbutyrate (calcium salt) = 3 g, citric acid (powder mixed with fruit juice). The supplement was in powder form and mixed with 8 ounces of fruit juice and taken in 2 equal doses daily for 8 weeks. b. Control: mixture (energy = 200 cal/day, bulk maltodextrin, citric acid). The supplement was prepared in the same manner as the intervention: in powder form and mixed with 8 ounces of fruit juice and taken in 2 equal doses daily for 8 weeks. c. Duration: 8 weeks 3. **Oral supplement (Ensure)** a. Intervention: Ensure (energy = 3329 kJ, protein = 37.2 g/L, CHO = 145 g/L, fat = 37.2 g/L, RDA micronutrients). 3 bottles of 250 mL each were taken daily for 12 weeks (duration: 12 weeks) + nutrition education b. Control: nutrition education c. Duration: 12 weeks (intervention) 4. **Fortified blended food (insta foundation plus + whey protein concentrate)** a. Intervention: blend of maize, soy, vegetable oil, sugar, whey protein concentrate, micronutrients 300 g/day (energy = 1320 kcal/day, protein = 48 g/day) (duration: 6 months) + nutrition counselling (duration: 12 months)

Table 7. Grobler 2013: details of interventions (as reported in systematic review) *(Continued)*

b. Control: nutrition counselling (duration 12 months)
c. Duration: 6 months (intervention) and 12 months (nutrition counselling)

5. **Monohydrated L-ornithine alpha-ketoglutarate (OKG)**
   a. Intervention: OKG = 10 g/day (nitrogen = 1.3 g) + nutrition counselling
   b. Control: isonitrogenous formula (derived milk proteins = 9.1 g) + nutrition counselling
   c. Duration: 12 weeks
6. **Oral supplement**
   a. Intervention 1: 1–2 cans of Ensure plus per day depending on weight (energy = 355 calories, protein = 13 g, CHO = 47.3 g, fat = 12.6 g, arginine = 507 mg, glutamine = 2756 mg, omega-3 FA = 156 mg, vitamin A = 834 IU, vitamin E = 7.5 IU, vitamin C = 50 mg) (duration: 1 year) + nutrition counselling
   b. Intervention 2: 1–2 cans of Advera per day depending on weight (energy = 303 calories, protein = 14.2 g, CHO = 51.2 g, fat = 5.4 g, arginine = 966 mg, glutamine = 3039 mg, omega-3 FA = 467 mg, vitamin A = 960 IU, vitamin E = 91 IU, vitamin C = 90 mg, beta-carotene = 1590 IU) (duration: 1 year) + nutrition counselling
   c. Control: nutrition counselling
   d. Duration: 1 year
7. **Whey protein concentrate**
   a. Intervention: whey protein concentrate from pasteurised skimmed bovine milk (79% protein, 4.9% lactose, 9–12% lipid, 1.8% ash (powder diluted in water or non-proteic cold drinks), increasing dosage to reach 50% of total daily protein requirement
   b. Control 1: maltodextrin
   c. Control 2: no supplement
   d. Duration: 16 weeks
8. **Lipisorb-specialised medium chain triglyceride formula**
   a. Intervention: lipisorb-specialised medium chain triglyceride formula (17% protein, 48% CHO, 35% fat, RDA micronutrients) + nutrition counselling; suitable for HIV + participants with fat malabsorption
   b. Control: nutrition counselling
   c. Duration: 6 weeks (intervention)
9. **Enhanced diet: casein maltodextrin-based milk formula** (**AL110**)
   a. Intervention: standard nutritional support consisting of a casein maltodextrin-based milk formula (AL110) until diarrhoea resolved and appetite re-established. Thereafter, amount of milk formula modified (energy = 150 kcal/kg/day (at least), protein ˜ 4.0–5.5 g/kg/day and 15% of total calories). Depending on age and weight of child, sometimes required addition of powdered protein supplement to other food. Enhanced nutritional support provided until child reached 3 months of age. Children randomised at 3 months to continued enhanced nutritional support received the same milk and supplements until 6 months of age.
   b. Control: standard nutritional support consisted of casein maltodextrin-based milk formula (energy = 67 kcal/100mL offered at least 4 times per day) and a maize porridge/pureed vegetable/oil diet with fermented milk offered at least 4 times per day. This diet provided at least 100–110 kcal/kg/day containing protein ˜2.2 g/kg/day (9.5% of calories as protein) and total lactose content of < 3.2 g/kg.
   c. All children received daily vitamin supplements (A, C, D, thiamine, riboflavin, pyridoxine, nicotinamide and B_{12}) providing approximately twice the USDA-recommended daily requirement for 2 weeks. Children also received folate 5 mg/day for 7 days, zinc sulphate = 15 mg/day for 14 days and a single oral dose of vitamin A (6–12 months: 100,000 IU; > 12 months: 200,000 IU)
   d. Duration: 26 weeks
10. **Range of fortified oral supplements**
    a. Intervention: range of fortified supplements provided as 200 mL drinks or 125 g semi-liquid dessert with soy protein basis (energy = 0.6–1.5 kcal/mL); 1 supplement was a maltodexrin-based fruit drink; participants increased intake by 600 kcal/day of energy using these supplements + nutrition counselling
    b. Control: nutrition counselling
    c. Duration: 8 weeks
11. **L-glutamine (AA) and AOs**

Table 7. Grobler 2013: details of interventions (as reported in systematic review) *(Continued)*

	a. Intervention: glutamine 40 g/day in 4 equal doses + AO (ascorbic acid = 800 mg, alpha-tocopherol = 500 IU, β-carotene = 2700 IU, selenium = 280 µg, N-acetyl cysteine = 2400 mg) + RDA micronutrients + nutrition counselling b. Control: glycine = 40 g/day taken in 4 equal doses + RDA micronutrients + nutrition counselling c. Duration: 12 weeks 12. **Spirulina** a. Intervention: spirulina = 20 g/day (57% protein, 6% lipid) added to traditional meals (millet flour) b. Control: traditional meals (comprising millet flour, fruit and vegetables) c. Duration: 8 weeks 13. **Macronutrient (ready-to-serve powder: locally prepared cereal-lentil mixture) and micronutrient (tablet) supplement** a. Intervention: macronutrient supplement (energy = 930 kcal, protein = 31.5 g/day) in 3 servings + micronutrient once/day tablet (containing copper sulphate = 0.1 mg; D-pantheol = 1 mg; dibasic calcium phosphate = 35 mg; folic acid = 500 µg; magnesium oxide = 0.15 mg; manganese sulphate = 0.01 mg; nicotinamide = 25 mg; potassium iodide = 0.025 mg; vitamins A = 5000 IU, = B_1 2.5 mg, B_{12} = 2.5 µg, B_2 = 2.5 mg, B_6 = 2.5 mg, C = 40 mg, D_3 = 200 IU and E = 7.5 mg; zinc sulphate = 50 mg) + dietary advice b. Control: dietary advice c. Duration: 6 months (intervention and control) 14. **Spirulina** a. Intervention: spirulina = 10 g/day b. Control: green clay = 10 g/day c. All participants received corn flour = 14 kg, corn-soy blend = 500 g, peas = 2 kg, sugar = 500 g, iodised salt = 150 µg and 500 mL of oil from World Food Program d. Duration: 6 months
Comments	Information provided as (and if) reported in systematic review.

AA: amino acid; AO: antioxidant; CHO: carbohydrate; FA: fatty acid; ID: identifier; kcal: kilocalories; kJ: kilojoules; RDA: recommended dietary allowances; USDA: US Department of Agriculture.

Table 8. Grobler 2016: details of interventions (as reported in systematic review)

Review ID	Grobler 2016
Types of interventions considered	1. Any oral nutritional supplement given for ≥ 4 weeks. Trials assessing tube feeding or parenteral nutrition were excluded, as were trials assessing dietary advice alone without the actual provision of supplements.
Details regarding the interventions	1. **Food supplements (sweet balls) + targeted dietary advice** a. Intervention: sweet balls (made of wheat flour, caramel, groundnuts, vegetable ghee, sprouted gram, nuts) each containing protein 6 g, energy = 600 kcal b. Control: standard TB treatment as per RNTCP. General instruction to “increase food intake” (quote). c. Duration: 3 months 2. **Daily meal and food parcel** a. Intervention: daily meal (intensive phase), consisting of a bowl of meat, kidney beans and vegetable stew with rice, followed by food parcel (continuation phase), containing unprepared red kidney beans, rice and oil; adequate for 1 meal/day b. Control: verbal and written nutritional advice concerning locally available food that would constitute a balanced diet c. Duration: 2 months (intensive phase) 3. **High-energy oral nutritional supplements + nutrition advice**

Table 8. Grobler 2016: details of interventions (as reported in systematic review) *(Continued)*

a. Intervention: participants supplied with high-energy oral nutritional supplements (energy = 150 kcal/100 mL, protein = 6.25 g, CHO = 20.2 g, fat = 4.29 g); participants advised to consume 2 packets/day between meals (total 600 kcal of energy), increasing to 3 packets/day if tolerated, until they reached a BMI of 20 or usual body weight; target energy intake was calculated also for each participant and advice given on how to reach this target based on a 24-hour food diary.
b. Control: participants advised to increase food intake and given advice to address any imbalances in their diet based on a 24-hour food diary.
c. Duration: until required weight reached.

4. **Energy-protein biscuits**
   a. Intervention: 5 daily, high energy (4) and vitamin/mineral enriched (1) biscuit bars containing about 1000 kcal of energy with additional vitamins and minerals, including zinc and selenium, provided during first 2 months of TB treatment.
      i. 30 g basic biscuit bar (energy = 615 kJ, protein = 4.5 g, phosphorous = 120 mg, calcium = 120 mg, magnesium = 36 mg, sodium = 70 mg, potassium = 150 mg, iron and zinc traces = < 1 mg)
      ii. 30 g biscuit bar with additional micronutrients (as basic biscuit above + vitamin A = 1.5 mg, thiamin = 20 mg, riboflavin = 20 mg, vitamin B_6 = 25 mg, vitamin B_{12} = 50 µg, folic acid = 0.8 mg, niacin = 40 mg, vitamin C = 200 mg, vitamin E = 60 mg, vitamin D = 5 µg, selenium = 0.2 mg, copper = 5 mg, zinc = 30 mg)
      iii. Duration: 2 months (60 days) (Jeremiah 2014)
   b. Energy-protein biscuits (same composition as basic biscuit above) used in another study but in varying amounts; the intervention group received 6 daily energy protein biscuits for the first 60 days of treatment, 1 of which contained additional micronutrients; the control group received 1 daily energy protein basic biscuit
      i. Duration: 2 months (60 days) (PrayGod 2011)
5. **High cholesterol diet (altered dietary composition)**
   a. Intervention: high cholesterol diet (cholesterol = 850 mg/day) (energy = 2500 kcal/day, 16% protein, 54% CHO, 30% lipids)
   b. Control: normal diet (cholesterol = 250 mg/day) (energy = 2500 kcal/day, 16% protein, 54% CHO, 30% lipids 30%)
   c. Duration: 8 weeks
6. **Macronutrient (ready-to-serve powder) and micronutrient supplementation**
   a. Intervention: macronutrient (ready-to-serve powder) given as monthly rations in 3 divided servings (energy = 930 kcal, protein 31.5 g/day) + micronutrient (multivitamin tablet) given once-a-day (copper sulphate = 0.1 mg, D-pantheol = 1 mg, dibasic calcium phosphate = 35 mg, folic acid = 500 µg, magnesium oxide = 0.15 mg, manganese sulphate = 0.01 mg, nicotinamide = 25 mg, potassium iodide = 0.025 mg, vitamin A = 5000 IU, vitamin B_1 = 2.5 mg, vitamin B_{12} = 2.5 µg, vitamin B_2 = 2.5 mg, vitamin B_6 = 2.5 mg, vitamin C = 40 mg, vitamin D_3 = 200 IU, vitamin E = 7.5 mg, zinc sulphate = 50 mg)
   b. Control: dietary advice alone
   c. Duration: 6 months

Comments	Only 7 trials of macronutrient supplementation were reported here (as relevant for this overview). We excluded 1 macronutrient trial, Pérez-Guzmán 2005, as it was based in a hospital setting (inpatients). Information provided as (and if) reported in systematic review.

BMI: body mass index; CHO: carbohydrate; ID: identifier; kcal: kilocalories; kJ: kilojoules; RNTCP: Revised National TB Control Program; TB: tuberculosis.

Table 9. Kristjansson 2007: details of interventions (as reported in systematic review)

Review ID	Kristjansson 2007
Types of interventions considered	Meals (breakfast or lunch) or snacks (including milk) administered in a school setting

Table 9. Kristjansson 2007: details of interventions (as reported in systematic review) *(Continued)*

Details regarding the interventions	1. **Midday meal** a. Intervention: mid-day meal (energy = 450–500 calories, protein = 10–12 g, % RDA for energy = 25%, DRI for protein = 58%) b. Control: no food c. Duration: 24 months 2. **Mid-morning green gram and palm sugar** a. Intervention: green gram and palm sugar given mid-morning (energy = 195 calories, protein = 12 g, % RDA for energy = 8–10%, % DRI for protein = 35–63%) b. Control: iron = 100 mg c. Duration: 12 months 3. **Milk supplement** a. Intervention: 190 mL milk supplement daily (energy = 126 calories, protein = 6.5 g, % RDA for energy = 6.3%, % DRI for protein = 19–34%) b. Control: no milk c. Duration: 21.5 months 4. **Nutritious, well-balanced breakfast** a. Intervention: nutritious, well-balanced breakfast; details unclear, but large meals provided (energy = NR, protein = NR, % RDA for energy = NR; % DRI for protein = NR) b. Control: participants were their own controls c. Duration: 20 days intervention 5. **Nutritious breakfast in school** a. Intervention: nutritious breakfast; details unclear, but large meals provided (energy = NR, protein = NR, % RDA for energy = NR, % DRI for protein = NR) b. Control: participants were their own controls c. Duration: 21–30 school days 6. **Breakfast in school** a. Intervention: 225 mL of chocolate milk and cheese sandwich (energy = 2174 kJ, protein = 21.3 g, % of RDA for energy = 26%, % of DRI for protein = 63%) b. Control: 1/4 orange c. Duration: feeding 1 week before testing and during testing 7. **Milk supplement** a. Intervention: 1 pint daily (1/2 pint given in morning and 1/2 pint given in afternoon) in addition to basic diet (energy = 388 calories, protein = 18 g, % RDA for energy = NR; % DRI for protein = 19–34%) b. Control: no milk c. Duration: 1 year, 2 years and 3 years, all year round 8. **Vegetable protein mixture** a. Intervention: vegetable protein mixture (energy = 345–395 cal/day, protein = 14 g, % RDA for energy = 17–19%, % DRI for protein = 50%) b. Control: no food c. Duration: 10 months 9. **Milk with added calcium** a. Intervention: milk with added calcium (energy = NR, protein = NR, % RDA for energy = 10%, % DRI for protein = NR) b. Control: no milk c. Duration: 24 months on school days 10. **Breakfast** a. Intervention: 4 cookies and 1 instant drink, sometimes a cake and drinks of different flavours (energy = 600 kcal, protein = 19.5 g, % RDA for energy = 23–33%, % DRI for protein = 57–103%) b. Control: no feeding. All received food in another phase c. Duration: 5-week programme. Data collection started after 2 weeks 11. **Breakfast (traditional and hot)** a. Intervention: traditional and hot breakfast (energy = NR, protein = 3–5 g/breakfast, % RDA for energy = NR but designed to provide 1/4 of the RDA for 9- and 10-year olds, % DRI for protein = NR

Table 9. Kristjansson 2007: details of interventions (as reported in systematic review) *(Continued)*

b. Control: no breakfast
c. Duration: 8 months

12. **Githeri + meat**
a. Intervention: githeri (maize and legumes) and meat (energy = 239 kcal in 1st year and 313 kcal in 2nd year, protein = 19.2 g in 1st year and 21.7 g in 2nd year, % RDA for energy = 15–20%, % DRI for protein = NR
b. Control: nothing
c. Duration: 23 months

13. **Whole milk**
a. Intervention: 3/4 pint to 1 1/4 pint of whole milk depending on age (energy = 213–355 kcal, protein = 13.8–23.6 g, % RDA for energy = 14–17%, % DRI for protein = 44–72%)
b. Control: nothing
c. Duration: 14 months (7 + 7 months over 2 years)

14. **High protein drink supplement**
a. Intervention: high-protein drink supplement (providing iron, calcium, protein, vitamin D) given mid-morning; all children got school lunch and some got school breakfast too (energy = 240 calories, protein = 14.5 g, % RDA for energy = 12–13%, % RDI for protein = 46–73%)
b. Control: no supplement
c. Duration: 9 months

15. **Breakfast**
a. Intervention: patty with meat, vegetables, milk or banana cake (energy = 380–730 kcal (depending on whether children took cake or patty), protein = 17 g (mean), % RDA for energy = 17–20% for boys and 23% for girls, % DRI for protein = 33–50% for boys and 37–50% for girls)
b. Control group 1: syrup drink (energy = 33 kcal)
c. Control group 2: nothing
d. Duration: 3 months

16. **Breakfast in school**
a. Intervention: cheese sandwich or spiced bun and cheese + flavoured milk (energy = 576–703 kcal, protein = 27.1 g, % RDA for energy = 32%, % DRI for protein = 80%)
b. Control: 1/4 orange (energy = 18 kcal)
c. Duration: 8 months

17. **Breakfast club before school**
a. Intervention: school breakfast (energy = 334–695 kcal, protein = 8.9–13.7 g, % RDA for energy = NR; % DRI for protein = NR); case studies of 5 schools, each of which planned its own breakfast club
b. Control: NR
c. Duration: 12 months

18. **Lunch at school**
a. Intervention: school lunch (energy = 705 calories, protein = 26 g, % RDA for energy = 28–39%, % DRI for protein = 77–131%)
b. Control: went home for lunch as usual
c. Duration: 25 months (excluding summers)

Comments	Information provided as (and if) reported in systematic review.

DRI: daily recommended intake; ID: identifier; kcal: kilocalories; kJ: kilojoules; NR: not reported; RDA: recommended dietary allowances.

Table 10. Kristjansson 2015a: details of interventions (as reported in systematic review)

REVIEW ID	Kristjansson 2015a
Types of interventions considered	Provision of energy and macronutrients through: 1. hot or cold meals (breakfast or lunch)

Table 10. Kristjansson 2015a: details of interventions (as reported in systematic review) *(Continued)*

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

Details regarding interventions	1. **Milk cereal supplement** a. Intervention: 50 g milk cereal supplement prepared with 50 mL of water (energy = 941 kJ, fat = 7 g, protein = 8 g, carbohydrates = 30 g, minerals = 2.5 g). Given to mothers to prepare and to give to infants twice daily. Twice-weekly delivery and morbidity assessments b. Control: home feeding as usual c. Duration: 8 months 2. **Hot lunches** a. Intervention: hot lunches in day-care centres, which provided 2/3 of the DRA for nutrients for the age group, and multivitamin supplements (energy = 941 kJ, fat = 7 g, protein = 8 g, carbohydrates = 30 g, minerals = 2.5 g) b. Control: home-feeding as usual. No day care c. Duration: 8 months 3. **Precooked food** a. 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 micronutrients; energy = 33% of requirements for 6- to 36-month-old children, protein 20% of animal protein, reconstituted to provide 1 kcal/g). Also nutrition education but not clear whether both groups received it. b. Control: none c. Duration: 12 months 4. **Skimmed milk and egg supplement** a. Intervention: feeding with adjunctive intervention (nutrition education); supplement comprising skimmed milk 28.4 g given daily and 1 egg given 3 days a week (energy = 123 kcal, protein = 11 g, % DRI for energy = 14.2%, % DRI for protein = 89%). Not clear where it was given, but probably in day-care or feeding centre b. Control: no intervention c. Duration: 6 months 5. **Cereal** a. Intervention: feeding + rations for family; weekly ration of premixed rice, wheat and lentil powder = 450 g, and cooking oil = 90 g (% DRI for energy = 17.6%, % DRI for protein = not enough information). All local ingredients delivered to home. Mothers 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. b. Control: mothers taught how to prepare meals but no feeding c. Duration: 6 months 6. **Fortified cookies** a. Intervention: locally baked fortified cookies given as mid-morning snack in day care (energy = 300 kcal, 40% fat, 8% protein, % DRI for energy at 6–12 months = 42.1%, % DRI for energy at 12–36 months = 34.5%, % DRI for energy at 24–48 months = 20.8%, % DRI for energy at 48–60 months = 19.8%, % DRI for protein at 6–12 months = 68.8%, % DRI for protein at 12–36 months = 60.4%, % DRI for protein at 24–36 months = 48.6%, % DRI for protein at 36–48 months = 41.4%, % DRI for protein at 48–60 months = 36.4%). Given once per day mid-morning for 5 days per week b. Control: home feeding as usual c. Duration: 22 months 7. **Sweet cake supplement** a. Intervention: feeding only; sweet cake supplement consisting of wheat flour = 23 g, sugar = 35 g and edible oil = 10 g (energy = 310 kcal, protein = 3 g, % DRI for energy at 12–24 months = 35.7%, % DRI for energy at 24–36 months = 35.7%, % DRI for energy at 36–48 months = 21.5%, % DRI for energy at 48–60 months = 20.5%, % DRI for protein at 12–24 months = 30.19%, % DRI for protein at 24–36 months = 24.31%, % DRI for protein at 36–48 months = 20.72%, % DRI for protein at 48–60 months = 18.22%, protein energy ratio = 3.87). Given in a feeding centre once daily for 6 days a week

Table 10. Kristjansson 2015a: details of interventions (as reported in systematic review) *(Continued)*

b. Control: regular food at home
c. Duration: 14 months

8. **Milk-based formula**
   a. Intervention: milk-based formula 1 kg/week (energy = 750 kcal (3.15 mJ), protein = 20 g/day). Supplement delivered to home. Supposed to be given once daily
   b. Control: home food and breastfeeding
   c. Duration: 2 years
9. **High-energy supplement**
   a. Intervention: high-energy supplement (energy = 526 kcal, protein = 13.75 g, % DRI for energy = not enough information, % DRI for protein = not enough information). Delivered once a week to home with instructions on how to prepare, and measuring cup
   b. Control: home-feeding as usual. Also received health care and micronutrient supplementation
   c. Duration: 3 months of supplementation
10. **Snacks**
   a. Intervention: snacks, including rice, rice flour, wheat flour, bread, cassava, potatoes, sweet potatoes, coconut milk, refined sugar, brown sugar, and edible oil (on average, energy = 1660 kJ (400 kcal), protein = 5 g, % DRI for energy at 6–12 months = 56.1%, % DRI for energy at 12–20 months = 46.0%, % DRI for protein at 6–12 months = 57.37%, % DRI for protein at 12–20 months = 50.32%, protein energy ratio = 5). Given in day care
   b. Control: usual
   c. Duration: 6 days per week for 3 months
11. **Lipid nutrient supplement**
   a. Intervention: feeding with 2 intervention groups: 3-month lipid nutrient supplement, 6-month lipid nutrient supplement (on average, energy = 108 kcal, 23% protein, % DRI for energy = 15%, % DRI for protein = 23%). Home-delivered; 1 sachet per day. Parents asked to feed children
   b. Control: no supplement
   c. Duration: 6 months
12. **RUTF**
   a. Intervention: feeding only; 92 g packet of RUTF (energy = 500 kcal, % DRI for energy at 6–12 months = 69.8%, % DRI for energy at 12–24 months = 57.5%, % DRI for energy at 24–36 months = 57.5%, % DRI for energy at 36–48 months = 34.7%, % DRI for energy at 48–60 months = 33.0%, % DRI for protein not enough information). Monthly distribution enough for 1 sachet daily
   b. Control: regular meal. No extra supplement
   c. Duration: 3 months
13. **Snacks**
   a. Intervention: supplement included commonly consumed snacks with which the children were familiar such as milk, biscuits, curd and seasonal fruits (energy = 167 kcal, protein = 5.1 g, % DRI for energy at 36–48 months = 11.60%, % DRI for energy at 48–60 months = 11.02%, % DRI for protein at 36–48 months = 35.2%, % DRI for protein at 48–60 months = 31.0%). Each child was served the same quantity of food on a clean plate. Given once daily in kindergarten
   b. Control: no feeding programme
   c. Duration: 7 months
14. **Milk-based and soy-based fortified spread**
   a. Intervention: feeding only with 7 different intervention arms; milk-based fortified spread and soy-based fortified spread of different quantities (5 mg, 25 mg, 50 mg and 75 g of milk-based fortified spread: energy = 96 kcal, 544 kcal, 1105 kcal and 1661 kcal, respectively, protein = 1 g, 4 g, 8 g and 11 g, respectively; 25 g, 50 g and 75 g of soy-based fortified spread: energy = 531 kcal, 1071 kcal and 1615 kcal, respectively, protein = 3 g, 7 g and 10 g, respectively; % DRI for energy at 6–12 months = 28.57% (mean) for milk-based formula, 35.98% (mean) for soy-based formula, % DRI for energy at 12–24 months = 23.44% (mean) for milk-based formula, 29.52% (mean) for soy-based formula, % DRI for protein at 6–12 months = 68.84% (mean) for milk-based formula, 76.50% (mean) for soy-based formula, % DRI for protein at 12–24 months = 60.38% (mean) for milk-based formula, 67.10% (mean) for soy-based formula). Supplements delivered to homes prepackaged weekly for first 4 weeks and biweekly thereafter
   b. Control: no feeding programme
   c. Duration: 12 weeks

Table 10. Kristjansson 2015a: details of interventions (as reported in systematic review) *(Continued)*

15. **Milk-based supplement**
    a. Intervention: feeding with nutrition education; supplement was a dry milk-based product 65 g (energy = 275 kcal/day, protein = 10 g, lipid = 6 g, % DRI for energy at 9–12 months = 38.6%, % DRI for energy at 12–14 months = 31.6%, % DRI for protein at 9–12 months = 108.0%, % DRI for protein at 12–14 months = 114.30%). Given to mothers to prepare once daily
    b. Control: usual diet
    c. Duration: 44 weeks
16. **Milk LNS**
    a. Intervention: milk-LNS, soy-LNS, CSB, and control feeding: the milk-LNS group received an LNS with milk (energy = 285 kcal/day; % DRI for energy = 40%, % DRI for protein = 94.1%)
    b. Control: usual diet
    c. Duration: 12 months
17. **Bread and 'Miltone', a ground-nut, protein-based milk substitute**
    a. Intervention: children received 2 slices of bread and 150 mL milk, infants received 1 slice of bread and 200 mL milk (energy = 250 kcal for child, 200 kcal for infant, % DRI for energy at 6–12 months = 35.1%, % DRI for energy at 12–36 months = 28.8%, % DRI for energy at 36–48 months = 17.4%, % DRI for energy at 48–60 months = 16.5%, % DRI for protein = not enough information)
    b. Control: usual meals
    c. Duration: 18 months
18. **Supplement plus stimulation**
    a. Intervention: 2 or 4 treatments of supplement plus stimulation (T2 and T4, respectively) (energy = enough for 3 times a day; % DRI for energy = 75% of the recommended calories, % DRI for protein = 75% of the recommended protein). Given as part of the programme in centres
    b. Control: compared T4 to T2 at age 63 months before T2 began treatment
    c. Duration: 3.5 years divided into 4 treatment periods of 9 months each
19. **Nutritional supplement (balanced protein)**
    a. Intervention: take-home feeding; 55 g nutritional supplement in packets (100 g of the supplement provided: energy = 360 kcal, protein = 14 g, % DRI for energy at 6–11 months = 27.8%, % DRI for energy at 12–23 months = 22.8%, % DRI for protein at 6–11 months = 88.35%, % DRI for protein at 12–23 months = 77.49%, protein energy ratio = 15.66). Collected once weekly by mother or older sibling at a distribution point. Measuring cup provided. Given once a day
    b. Control: usual diet
    c. Duration: 12 months
20. **Gruel (supplementary food)**
    a. Intervention: feeding only; preprepared gruel (energy = NR, % DRI for energy = NR, % DRI for protein = NR). Home-delivered (seems like once a week) to mothers to mix up; given instructions on how to prepare
    b. Control: no food provided
    c. Duration: 14 months
21. **Dry cereal (supplementary food)**
    a. Intervention: feeding only; supplement of 60 g dry cereal (energy = 1304 kJ, protein = 12 g, fat = 6 g, % DRI for energy at 6–12 months = 42%, % DRI for protein at 6–12 months = 137.69%, protein energy ratio = 15.4); enough for 1.5 weeks delivered to home and mothers instructed on how to prepare
    b. Control: usual diet
    c. Duration: 6 months
22. **Condensed milk + micronutrient**
    a. Intervention: condensed milk + micronutrient (energy = 1171 kJ, iron = 12 mg, % DRI for energy at 6–12 months = 26.1%, % DRI for energy at 12–36 months = 21.4%, % DRI for energy at 36–48 months = 12.9%, % DRI for energy at 48–60 months = 12.3%, % DRI for protein = not enough information)
    b. Control: skimmed milk + placebo
    c. Duration: 12 months
23. **Dry whole milk, sugar, maltodextrins and micronutrient**
    a. 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

Table 10. Kristjansson 2015a: details of interventions (as reported in systematic review) *(Continued)*

consumption (5 daily rations of 44 g provided: energy = 275 kcal/day, protein = 10 g, lipid = 6 g lipid, % DRI for energy at 4–5 months = 38.7%, % DRI at 6–12 months = 27.3%, % DRI for protein at 4–5 months = 69.54%, % DRI at 6–12 months = 66.55%). Packages were distributed at health centres. Mothers given instruction to add 4 spoons of boiled water to 1 ration. Families in programme given incentives to attend health clinic

b. Control: cross-over intervention group

c. Duration: 24 months

24. **Roasted and powdered rice and pulse, molasses and oil**

a. Intervention: feeding; food made of roasted and powdered rice and pulse, molasses, and oil (energy = 300 kcal, protein = 8–9 g, rice = 40 g, pulse = 20 g, molasses = 10 g, oil = 6 g, % DRI for energy at 6–12 months = 42.1%, % DRI for energy at 12–24 months = 34.5%, % DRI for protein at 6–12 months = 103.27%, % DRI for protein at 12–24 months = 90.57%, protein energy ratio = 12), plus nutritional education

b. Control: regular diet and usual care

c. Duration: 3 months

25. **Milk powder and cooking oil**

a. Intervention: feeding + take-home supplements; milk powder and cooking oil to be added to prepared milk (energy = supposed to be 60% of DRI, % DRI for energy 60% of the recommended calories, % DRI for protein 100% of the recommended protein). Milk to be distributed to other children aged < 5 years to avoid redistribution. Supplement delivered to mothers at healthcare centres once a week. Take-home rations

b. Control: no feeding. Deworming given to both groups

c. Duration: 6 months

26. **Prepared food**

a. Intervention: feeding + nutrition education on positive deviant practices (behaviours used by families whose children grow well despite economic poverty). Common local sources of protein, tofu, fish oil, etc. (energy = 300 kcal, % DRI for energy = not enough information, % DRI for protein = not enough information). Carers prepared foods at health centres. All children in both groups dewormed. Breastfeeding in addition to positive deviant local foods

b. Control: no feeding; dewormed

c. Duration: 12 months

27. **Ready-to-use supplement**

a. Intervention: ready-to-use supplement (precooked wheat, maize, millet, soybean flour, milk powder, soybean oil, palm oil and sugar, enriched with minerals and vitamins) (energy at 4–5 months = 103 kcal/meal, energy at 5–7 months = 205 kcal/ meal, % DRI for energy at 4–5 months = 20.6%, % DRI for energy at 5–7 months = 28.8%, % DRI for protein at 4–5 months = 26.98%, % DRI for protein at 5–7 months = 51.64%, protein energy ratio at 4–5 months = 8.74, at 5–7 months = 8.78). Supplements taken home and feeding observed

b. Control: usual diet

c. Duration: 12–13 weeks

28. **LNS**

a. Intervention: 43 g LNS (26% peanut paste, 25% dried skimmed milk, 20% vegetable oil, 27.5% icing sugar, 1.5% premade mineral and vitamin mix from Nutriset) or 71 g CSB (energy = 921 kJ (protein = 10.4 g) or 1189 kJ (protein = 6.0 g)), % DRI for energy at 6–12 months = 39.9% LNS, 30.9 CSB, % DRI for energy at 12–15 months = 32.7% LNS, 25.4% CSB, % DRI for protein at 6–12 months = 68.85% LNS, 68.58% CSB, % DRI for protein at 12–15 months = 119.33% LNS, 118.86% CSB, protein energy ratio = 8.44 LNS, 18.88 CSB)

b. Control: usual diet and breastfeeding

c. Duration: 12 weeks

29. **Monthly rations for family**

a. Intervention: monthly rations given to family for child and the rest of family consisting of 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, % DRI for energy at 6–12 months = 136.2%, % DRI for energy at 12–24 months = 111.7%, % DRI for protein at 6–12 months = inestimable, % DRI for protein at 12–24 months = inestimable)

b. Control: usual diet

c. Duration: 7 months

Table 10. Kristjansson 2015a: details of interventions (as reported in systematic review) *(Continued)*

30. **Weekly food supplements for family**
    a. Intervention: feeding + maternal education; enriched bread, dry skimmed milk, and cooking oil for entire family. Index child given dry skimmed milk, high-protein vegetable mixture, and ferrous sulcate (energy = 623 kcal per day, protein = 30 g, % DRI for energy = not enough information, % DRI for protein = not enough information). Supplements delivered in store-like atmosphere once a week. Trained home visitors worked directly with the children and trained mothers to become more responsive
    b. Control: home-feeding as usual, or education
    c. Duration: 32 months
31. **Puréed meat, iron-fortified infant cereal, and whole cow's milk**
    a. Intervention: puréed meat, iron-fortified infant cereal, and whole cow's milk (energy = not stated, % DRI for energy = NR, % DRI for protein = NR)
    b. Control: usual diet
    c. Duration: 6 months
32. **Wet ration fruit cereal**
    a. Intervention:113 g wet-ration fruit cereal, rice cereal with apple sauce, mixed cereal with apple sauce and bananas, and oatmeal with apple sauce and bananas (Gerber Products Company) (energy = NR, % RDA for energy at 6–12 months = inestimable, % DRI for protein at 6–12 months = inestimable)
    b. Control: usual diet and breastfeeding
    c. Duration: 20 weeks

Comments	Information provided as (and if) reported in systematic review.

CSB: corn-soy blend; DRA: daily recommended amount; DRI: daily recommended intake; ID: identifier; kcal: kilocalories; kJ: kilojoules; LNS: lipid-based nutrient supplement; mJ: millijoules; NR: not reported; RDA: recommended dietary allowance; RUTF: ready-to-use therapeutic feeding; T: time point.

Table 11. Lazzerini 2013: details of interventions (as reported in systematic review)

Review ID	Lazzerini 2013
Types of interventions considered	Any type of food used for children with moderate acute malnutrition, including: 1. improved adequacy of local diet (local foods prepared at home according to a given recipe; home processing of local foods such as soaking, germination, malting and fermentation) 2. LNS (foods with high lipid content, characterised by a high energy density; also called RUTFs) 3. blended food supplements (CSB or other blended foods such as wheat-soy flour, sugar, oil, legumes, or others. These foods are usually solid or semi-solid foods with low water content, which can be cooked every day at home in the form of porridge or soups for children) 4. complementary food supplements (food-based complements to the diet that can be mixed with, or consumed in addition to, the diet. This category can include any of the foods listed above when provided in low doses (i.e. providing only part of the total daily caloric needs))
Details regarding the interventions	1. **LNS (Supplementary Plumpy), blended foods (CSB++, Misola, home foods)** a. Intervention 1: LNS = Supplementary Plumpy, full dose (energy = 500 kcal, MN = yes, duration = 12 weeks) b. Intervention 2: blended foods = CSB++ or Misola (locally produced flour mixture of 60% millet, 20% soy, 10% peanut kernel, 9% sugar and 1% salt), or home foods (millet and cowpea flour + sugar + oil + MN powder) (energy = 500 kcal/day, MN = yes, duration 12 weeks) c. Concomitant interventions: nutrition education, health education, medical care d. Comparison: LNS full dose vs blended foods 2. **LNS (Supplementary Plumpy), blended foods (CSB premix)** a. Intervention 1: LNS = Supplementary Plumpy (energy = 1000 kcal, MN = yes, duration = upon recovery)

Table 11. Lazzerini 2013: details of interventions (as reported in systematic review) *(Continued)*

	b. Intervention 2: blended foods = CSB premix consisting of CSB plus sugar and oil (energy = 1227 kcal/day, MN = yes, duration = variable) c. Concomitant interventions: extra MN, nutrition education, health education, medical care d. Comparison: LNS full dose vs blended foods 3. **Complementary foods (Pusti Packet), standard care** a. Intervention 1: complementary blended foods = Pusti Packet comprising toasted rice powder = 20 g, toasted lentil powder = 10 g, molasses = 5 g, and soy bean oil = 3 g (total energy/packet = 150–300 kcal, MN = yes, duration = 12 weeks) b. Intervention 2: standard care (nutrition education, health education, medical care or MNs) c. Intervention 3: complementary blended foods + standard care + psychosocial stimulation: play session, parenteral counselling, group sessions d. Control: multiple MN e. Comparison: complementary blended vs standard care 4. **LNS (Supplementary Plumpy), blended foods (CSB premix)** a. Intervention 1: LNS = Supplementary Plumpy, complementary dose (energy = 500 kcal, MN = yes, duration = 16 weeks) b. Intervention 2: blended foods = CSB premix consisting of CSB plus sugar and oil (energy = 1413 kcal/day, MN = yes, duration = 16 weeks) c. Concomitant interventions: basic nutrition education, basic health education, basic medical care d. Comparison: LNS complementary dose vs blended foods 5. **LNS (soy LNS, soy/whey LNS (Plumpy'Sup)), blended foods (CSB++)** a. Intervention 1:LNS = soy LNS or soy/whey LNS (Plumpy'Sup) (energy = 75 kcal/kg, MN = yes, duration = 12 weeks) b. Intervention 2: blended food = CSB++ (energy = 75 kcal/kg, MN = yes, duration = 12 weeks) c. Concomitant interventions: nutrition education d. Comparison: LNS full dose vs blended foods 6. **LNS (milk/peanut LNS, soy/peanut LNS), blended foods (CSB)** a. Intervention 1: LNS = milk/peanut LNS or soy/peanut LNS (energy = 75 kcal/kg, MN = yes, duration = 8 weeks) b. Intervention 2: blended food = CSB (energy = 75 kcal/kg, MN = yes, duration = 8 weeks) c. Concomitant interventions: NR or no d. Comparison: LNS full dose vs blended foods 7. **LNS (Plumpy'Nut), blended foods (CSB premix)** a. Intervention 1: LNS = Plumpy'Nut (energy = 1000 kcal, MN = no, duration = upon recovery) b. Intervention 2: blended food = CSB premix consisting of CSB plus sugar and oil (energy = 1231 kcal, MN = yes, duration = upon recovery) c. Concomitant interventions: extra MN, nutrition education, medical care d. Comparison: LNS full dose vs blended foods 8. **LNS (Plumpy'Doz), blended foods (CSB++)** a. Intervention 1: LNS = Plumpy'Doz (energy = 270 kcal, MN = yes, duration = upon recovery) b. Intervention 2: blended food = CSB++ (energy = 273 kcal, MN = yes, duration = upon recovery) c. Intervention 3: children-centred counselling using the “patient-centredness model” d. Concomitant interventions: no e. Comparison: LNS complementary dose vs blended foods
Comments	Information provided as (and if) reported in systematic review.

CSB: corn-soy blend; CSB++: corn-soy blend enriched; ID: identifier; kcal: kilocalories; LNS: lipid-based nutrient supplement; MN: micronutrient; RUTF: ready-to-use therapeutic feeding.

Table 12. Ota 2015: details of interventions (as reported in systematic review)

Review ID	Ota 2015
Types of interventions considered	1. Specific advice to increase dietary energy and protein intakes (N/A to this review) 2. Energy and protein supplementation, including: a. 'balanced' protein energy supplements (i.e. an energy supplement in which < 25% of the energy was from protein) b. high-protein supplements (i.e. an energy supplement in which > 25% of the energy was from protein) c. isocaloric protein supplements (i.e. a supplement in which the protein content was 'balanced' (i.e. provided < 25% of total energy content, but the protein replaced an equal quantity of non-protein energy in the control group)
Details regarding the interventions	1. **Liquid supplement** a. Intervention: chocolate flavoured supplement provided 2 twice per day (energy = 800 kcal, protein = 40 g (20%), fat = 26.6 g (30%), micronutrients) b. Control: supplement containing micronutrients only (given at same times and for same duration) c. Duration: begin after birth and continue during index pregnancy (9 months +) until 15 months' postpartum 2. **Supplement biscuits** a. Intervention: 2 biscuits containing roasted ground nuts, rice flour, sugar and ground nut oil (energy = 4250 kJ (1017 kcal), protein = 222 g (9%), fat = 56 g (50%), calcium = 47 mg, iron = 1.8 mg), consumed daily b. Control: no supplement c. Duration: began at 20 weeks' gestation (5 months) 3. **Milk** a. Intervention: free tokens worth 0.5 pints milk each (1 pint = 568 mL) (protein = 21%, fat = 48%); 1 pint/day for pregnant women and child < 5 years of age b. Control: no intervention c. Duration: pregnancy (9 months) 4. **Oral supplement** a. Intervention: supplement comprising sesame cake 50 g, jaggery 40 g, oil 10 g (energy = 417 kcal, protein = 30 g (29%)) b. Control: normal (unsupplemented) diet c. Duration: from last trimester (3 months) 5. **Antenatal MMN + fortified food supplement** a. Intervention: fortified spread 72 g/day comprising 33% peanut butter, 32% soy flour, 15% vegetable oil, 20% sugar and MMN cocktail (RDA pregnant women) (energy = 372 kcal, protein = 14.7 g (15.8%), fat = 67%, CHO = 15.9%) b. Control: MMN c. Duration: pregnancy duration (9 months) 6. **Oral supplement** a. Intervention: high-energy, dry powder supplement comprising 50% fat, 10% casein, 40% glucose (energy = 465 kcal, protein = 7.1 g (6%)) b. Control: low energy supplement (energy = 52 kcal, protein = 6.2 g (48%)) c. Duration: from 26–28 weeks' gestation (± 3 months) 7. **Oral supplement** a. Intervention: supplement comprising dried skim milk 60 g, enriched bread 150 g, vegetable oil 20 g (energy = 856 kcal, protein = 38.4 g (18%)) b. Control: normal (unsupplemented) diet c. Duration: from 3rd trimester (3 months) 8. **Oral supplements** a. Intervention 1: daily supplement (iron = 60 mg, folic acid = 400 µg) b. Intervention 2: LNS 20 g (energy = 118 kcal, micronutrients = 22) c. Control: MMN

Table 12. Ota 2015: details of interventions (as reported in systematic review) *(Continued)*

	d. Duration: from 20 weeks' gestation 9. **Oral supplements** a. Intervention: 2 types of supplements (energy = 700–800 kcal, protein = 36–44 g (± 22%)): i. high-bulk mixture of beans and maize, given as mush with added vitamins ii. low-bulk porridge containing dried skimmed milk, maize, flour, vitamins and minerals; the high- and low-bulk groups are combined in the intervention group for this review b. Control: placebo tablets c. Duration: from < 20 weeks' gestation (5 months +) 10. **Balanced energy/protein beverage or high-protein beverage** a. Intervention 1 (complement group): 16 ounce, balanced energy/protein beverage (energy = 322 kcal, protein = 6 g (7%), fat = 7.6 g, micronutrients) b. Intervention 2 (supplement group): 16 ounce, high-protein beverage (energy = 470 kcal, protein = 40 g/day (34%), fat = 8.6 g, micronutrients) c. Control: supplement containing micronutrients only d. Duration: from < 30 weeks' gestation (2.5 months +) 11. **Glucose drink** a. Intervention: flavoured carbonated glucose drink (energy = 273 kcal, protein = 11%, vitamins) from 18–38 weeks b. Control: 369 mL flavoured carbonated water (containing iron, vitamin C) c. Duration: 18–38 weeks' gestation (5 months) 12. **Glucose drink + skim milk powder** a. Intervention: flavoured carbonated glucose drink + skim milk powder (26 g) (energy = 425 kcal, protein = 10%, vitamins) from 28–38 weeks b. Control: flavoured carbonated water (iron, vitamin C) c. Duration: 28–38 weeks' gestation (5 months)
Comments	4 trials provided nutrition advice only as intervention and are not reported here (see Ota 2015). Information provided as (and if) reported in systematic review.

CHO: carbohydrate; ID: identifier; kcal: kilocalories; kJ: kilojoules; MMN: multiple micronutrient; N/A: not applicable; RDA: recommended dietary allowance.

Table 13. Sguassero 2012: details of interventions (as reported in systematic review)

Review ID	Sguassero 2012
Types of interventions considered	Supplementary feeding was defined as the provision of extra food to children or families beyond the normal rations of their home diets. The intervention had to be community based in that young children could consume the supplementary food at home, at a supervised feeding centre or at other places adapted for this purpose such as healthcare centres and crèches. Supplementary feeding could comprise: 1. meals (local or imported foods) 2. drinks (juices or milk) 3. snacks (including both food and milk snacks)
Details regarding the interventions	1. **Multi-mixture** a. Intervention: multi-mixture 10 g/day comprising (per 100 g preparation) 47.5% wheat flour; 47.5% cornmeal; 4% melon seed powder, sesame, gourd and peanut; 0.5% cassava leaf powder and 0.5% eggshells (energy = 390 kcal (per 100 g), ashes = 2.7 g, lipids = 5.2 g, proteins = 11.7 g, CHO = 74.2 g, fibres = 6.2 g, iron = 8 mg, calcium = 357 mg, magnesium = 235 mg, potassium = 677 mg, phosphorus = 570 mg, sodium = 7 mg) b. Control: cassava flour 5 g similar to mixture in colour and thickness of grains (energy (centesimal composition) = 336.8 calories, CHO = 81.1 g, proteins = 2.2 g, lipids = 0.05 g, calcium = 21 mg, phosphorus = 105 mg and 0.8 mg iron per 100 g preparation)

Table 13. Sguassero 2012: details of interventions (as reported in systematic review) *(Continued)*

c. Duration: 2 months

2. **Multi-mixture**
   a. Intervention: 2 tablespoons of multi-mixture comprising 80% wheat flour, 10% cassava leaf powder and 10% eggs shells during the child meals. Ingredients cooked over low heat for 5–10 minutes and then the heat was stifled for their homogenisation
   b. Control: no supplementation
   c. Duration: 10 months
3. **Yoghurt**
   a. Intervention: 125 g/cup daily serving (protein = 3.8 g, calcium = 150 mg, vitamin B_2 = 0.19 mg)
   b. Control: no supplementation
   c. Duration: 9 months (Monday–Friday)
4. **High-energy protein drink**
   a. Intervention: atole beverage (energy = 90.5 kcal, protein = 6.3 g/100 mL + micronutrients)
   b. Control: fresco, a low-energy, non-protein drink (energy = 33 kcal/100 mL + micronutrients); atole differed in name, appearance and taste
   c. Duration: on-demand (twice a day, all week)
5. **Snacks**
   a. Intervention: twice-a-day snacks (rice, rice flour, wheat flour, bread, cassava, potatoes, sweet potatoes, coconut milk, refined sugar, brown sugar and edible oil), given 6 days/week for 90 days (on average, energy = 400 kcal (energy content varied between 187 and 216 kcal), protein = 5 g (protein content varied between 1.8 g and 4.4 g))
   b. Control: no food supplementation
   c. Duration: 3 months (90 days)
6. **Condensed milk + micronutrient tablet**
   a. Intervention: 11 teaspoons of condensed milk (energy = 250 kcal, protein = 6 g/ration) + dissolved tablet of micronutrients
   b. Control: 11 teaspoons of skimmed milk (energy = 20 kcal, protein = 1.35 g/ration) + dissolved tablet of micronutrients
   c. Duration: 12 months (twice a day for 6 days/week)
7. **Milk-based formula**
   a. Intervention: milk-based formula 1 kg/week (energy = 525 kcal, protein = 14 g/100 g). In addition, 0.9 kg cornmeal and skimmed-milk powder were given to the family
   b. Control: no food supplementation
   c. Duration: 12 months
8. **Porridge**
   a. Intervention: cereal-based, precooked porridge enriched with micronutrients, which had to be mixed with boiled water for hygienic preparation (per 100 g dry porridge, energy = 410 kcal, protein = 9 g, lipids = 10 g, CHO = 67 g + micronutrients). Introduction was progressive: 25 g dry supplement in 75 mL water/meal (i.e. 103 kcal in 100 g from 4–5 months) and 50 g supplement and 135 mL water/meal (i.e. 205 kcal in 185 g from 5–7 months). No food was given for other family members
   b. Control: no supplementation
   c. Duration: 3 months

Comments	Information provided as (and if) reported in systematic review.

CHO: carbohydrate; ID: identifier; kcal: kilocalories.

Table 14. Results matrix

Systematic reviews	Vulnerability	Outcomes										
		Mortality	Disease-related outcomes	Nutritional status assessment				Cognition tests, educational attainment and school attendance	Behavioural outcomes[a]	Quality of life[a]	Adverse events	Costs
				Growth (weight and length/ height)	Other anthropometry	Biochemistry	Dietary intake					
Droogsma 2014	Alzheimer's disease	—	—	—	—	—	Adults[b]	—	—	—	—	—
Grobler 2013	HIV positive	Adults Children	Adults	Children	Adults Children	Adults Children	Adults	—	—	Adults	Adults	—
Grobler 2016	TB	Adults	Adults	—	Adults	—	—	—	—	Adults	—	—
Kristjansson 2007	Disadvantaged school children	—	Children	Children	Children	Children	—	Children	Children	—	—	—
Kristjansson 2015a	Disadvantaged infants and children	Children	Children	Children	Children	Children	—	Children	Children	—	Children	—
Lazzerini 2013	Children with MAM (< 5 years of age)	Children	—	Children	Children	—	—	—	—	—	Children	—
Ota 2015	Pregnancy	Children	—	Children	Adults Children	—	—	Children	—	—	Adults Children	—
Sguassero 2012	Children < 5 years of age in LMIC	—	—	Children	Children	—	—	—	—	—	Children	—
Total		**2 adults, 4 children**	**2 adults, 2 children**	**6 children**	**3 adults, 6 children**	**1 adult, 3 children**	**2 adults**	**3 children**	**2 children**	**2 adults**	**2 adults, 4 children;**	**0 children or adults**

Table 14. Results matrix *(Continued)*

LMIC: low- and middle-income country; **MAM:** moderate acute malnutrition; **TB:** tuberculosis.

[a]Only reported narratively.

Table 15. AMSTAR scores of included systematic reviews

Criteria	Droogsma 2014	Grobler 2013	Grobler 2016	Kristjansson 2007	Kristjansson 2015a	Lazzerini 2013	Ota 2015	Sguassero 2012
Was an a priori design provided?	Y	Y	Y	Y	Y	Y	Y	Y
Was there duplicate study selection and data extraction?	Y	Y	Y	Y	Y	Y	Y	Y
Was a comprehensive literature search performed?	Y	Y	Y	Y	Y	Y	Y	Y
Was the status of publication (i.e. grey literature) used as an exclusion criterion?[a]	N	N[b]	N	N	N[b]	N	N	Y
Was a list of studies (included and excluded) provided?	Y	Y	Y	Y	Y	Y	Y	Y
Were the characteristics of the included studies provided?	Y	Y	Y	Y	Y	Y	Y	Y
Was the scientific quality of the included studies assessed and documented?	Y	Y	Y	Y	Y	Y	Y	Y
Was the scientific quality of the included studies used appropriately in formulating conclusions?	Y	Y	Y	Y	Y	Y	Y	Y
Were the methods used to combine the findings of studies appropriate?	N/A	Y	Y	Y	Y	Y	Y	Y
Was the likelihood of publication bias assessed? (where relevant)	N/A	N[c]	Y	Y	Y	Y	Y	Y
Was the conflict of interest stated?	Y	Y	Y	Y	Y	Y	Y	Y

Table 15. AMSTAR scores of included systematic reviews *(Continued)*

AMSTAR scores	8	10	11	11	11	11	11	10

Y: yes; **N:** no; **N/A:** not applicable.

[a]For all items except item 4, a rating of 'yes' was considered adequate. For item 4, a rating of 'no' was considered adequate.
[b]Extensive handsearches not undertaken by authors, but trials not excluded if found.
[c]Authors discussed the risk involved; no formal assessment.
AMSTAR ratings (scores out of 11 criteria)
1. High quality: 8–11.
2. Medium quality: 4–7.
3. Lower: low quality: ≤ 3.

Table 16. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: death

Review	Target group	Intervention	Outcome	Assumed risk with comparator	Corresponding risk with intervention	Relative effect (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Grobler 2013	Children with HIV (aged 6–36 months)	Balanced[b]	Death (8 weeks)	120 per 1000	163 per 1000	RR 1.42 (0.59 to 3.40)	169 (1)	NR
			Death (26 weeks)	217 per 1000	291 per 1000	RR 1.48 (0.74 to 2.98)	169 (1)	NR
Grobler 2016	Adults with TB	Balanced[c]	Death (1 year follow-up)	3 per 100	1 per 100 (0 to 4)	RR 0.34 (0.10 to 1.20)[d]	567 (4)	Very low
Lazzerini 2013	Children with MAM (< 5 years of age)	High lipid and balanced[e]	Death	10 per 1000	4 per 1000	RR 0.44 (0.14 to 1.36)	1974 (1)	NR
Ota 2015	Pregnant women	Balanced	Stillbirth	30 per 1000	18 per 1000 (12 to 28)	RR 0.60 (0.39 to 0.94)[f]	3408 (5)	Moderate
			Neonatal death	26 per 1000	18 per 1000 (11 to 28)	RR 0.68 (0.43 to 1.07)	3381 (5)	Low
		High protein	Stillbirth	33 per 1000	27 per 1000 (10 to 72)	RR 0.81 (0.31 to 2.15)	529 (1)	Low
			Neonatal death	11 per 1000	31 per 1000 (8 to 115)	RR 2.78 (0.75 to 10.36)	529 (1)	Low

CI: confidence interval; **MAM:** moderate acute malnutrition; **NR:** not reported; **RR:** risk ratio; **TB:** tuberculosis.

[a]As reported in 'Summary of findings' tables.
[b]Enhanced diet: modified milk formula providing 150 kcal/kg/day and 15% of calories as protein.
[c]Provided as a monthly ration.
[d]No subgroup differences between people who were HIV positive and people who were HIV negative.
[e]Complementary lipid-based nutrient supplement (Plumpy Doz) and blended foods (corn-soy blended foods enriched) versus counselling (two subgroups, one study).
[f]Risk of stillbirth significantly reduced in women given balanced energy and protein supplementation (biscuit (containing roasted groundnuts, rice flour, sugar, groundnut oil); supplement with sesame cake, jaggery, oil; fortified food supplement with peanut butter, soy flour, vegetable oil, sugar, micronutrients; supplement with dried skim milk, enriched bread, vegetable oil; oral supplement (beverage)).

Additional comments

1. Stillbirth refers to death after 20 weeks' gestation and before birth.
2. Neonatal death refers to death of a live infant within the first 28 days of life.
3. 'Balanced' refer to additional energy or protein supplementation or both in 'balanced' proportions (balanced: carbohydrate: 45% to 65%; protein: 10% to 20%; fat: 25% to 35%).
4. High protein refers to a protein content > 20% to 25% of total energy.
5. Isocaloric balanced protein: a supplement in which the protein content is 'balanced', i.e. provides < 25% of total energy content, but the protein replaced an equal quantity of non-protein energy in the control group.
6. High lipid/fat refers to a lipid content > 35% of total energy.
7. Adult mortality outcomes in the Grobler 2013 (HIV) review were reported narratively. Neither supplementary food (Sudarsanam 2011) nor daily supplement of spirulina (Yamani 2009) significantly altered the risk of death compared with no supplement or placebo in malnourished, antiretroviral therapy-naive adults in these two studies.
8. Child mortality outcomes in the Kristjansson 2015a review were reported narratively. One randomised controlled trial reported that there was no significant difference in mortality between children supplemented with ready-to-use therapeutic feeding (1671 children) and children who were not supplemented (1862 children; adjusted hazard ratio 0.76, 95% CI 0.51 to 1.13).

Table 17. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: disease-related treatment outcomes

Review	Target group	Intervention	Outcome	Assumed risk with comparator	Corresponding risk with intervention	Relative effect (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Grobler 2016	Adults with TB	Balanced	Cured (at 6 months)	48 per 100	44 per 100 (28 to 68)	RR 0.91 (0.59 to 1.41)[b]	102 (1)	Very low
		Balanced and high energy	Treatment completion (at 6 months)	79 per 100	85 per 100 (70 to 100)	Not pooled[c]	365 (2)	Very low
		Balanced and high energy	Sputum negative (at 8 weeks)	76 per 100	82 per 100 (65 to 100)	RR 1.08 (0.86 to 1.37)	222 (3)	Very low
Lazzerini 2013	Children with MAM	High lipid and balanced[d]	Recovered	554 per 1000	715 per 1000 (664 to 765)	RR 1.29 (1.20 to 1.38)[e]	2152 (2)	Moderate

Table 17. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: disease-related treatment outcomes *(Continued)*

(< 5 years of age)	High lipid and balanced[f]	Not recovered	111 per 1000	107 per 1000 (82 to 141)	RR 0.97 (0.74 to 1.27)	1974 (1)	Low
		Progression to SAM	116 per 1000	90 per 1000	RR 0.78 (0.59 to 1.03)	1974 (1)	NR
		Defaulted	185 per 1000	55 per 1000 (41 to 72)	RR 0.30 (0.22 to 0.30)[g]	1974 (1)	Moderate

CI: confidence interval; **MAM:** moderate acute malnutrition; **NR:** not reported; **RR:** risk ratio; **SAM:** severe acute malnutrition; **TB:** tuberculosis.

[a]As reported in 'Summary of findings' tables.

[b]No subgroup differences between people who were HIV positive and people who were HIV negative.

[c]Subtotals were only given for people who were HIV negative (RR 1.20, 95% CI 1.04 to 1.37) and people with unknown HIV status (RR 0.98, 95% CI 0.86 to 1.12).

[d]Complementary foods (Pusti Packet) and lipid-based nutrient supplements (LNS) (i.e. Plumpy Doz and corn-soy blend (CSB++)).

[e]The provision of complementary foods (Pusti Packet) and LNS (Plumpy Doz, CSB++) versus standard care significantly increased recovery rate by 29%.

[f]Complementary foods (LNS: Plumpy Doz, CSB++).

[g]The provision of food (complementary foods (LNS: Plumpy Doz, CSB++) versus standard care significantly decreased the number dropping out by 70%.

Additional comments

1. Kristjansson 2015a narratively reported morbidity outcomes in the review. Six studies (four randomised controlled trials (RCTs) and two controlled before-and-after (CBAs) studies) 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 (99 children), while the prevalence of respiratory infection was higher in the control group (90 children).

Table 18. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: disease-related biochemical parameters

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
CD4 (cells/mm3)						
Grobler 2013	Adults with HIV	Balanced	CD4 (12 weeks' follow-up)	MD –114.48 (–233.20 to 4.23)	81 (2)	Low
		Specific (OKG)[b]	Mean CD4 count at study endpoint	MD –28.00 (–134.93 to 78.93)	46 (1)	NR
		Specific (GLN)[c]		MD 66.00 (–53.39 to 185.39)	21 (1)	NR
Viral load (log10 copies/mL)						
Grobler 2013	Adults with HIV	Balanced	Viral load (12 weeks' follow-up)	MD –3.71 (–12.16 to 4.74)	66 (1)	Very low
		Specific (OKG)[b]	Mean viral load at study endpoint	MD 0.20 (–0.58 to 0.98)	46 (1)	NR

CI: confidence interval;**GLN:** L-glutamine; **MD:** mean difference; **NR:** not reported; **OKG:** ornithine alpha-ketoglutarate.

[a]As reported in 'Summary of findings' tables.
[b]Monohydrated L-ornithine alpha-ketoglutarate versus placebo.
[c] L-glutamine versus placebo.
Additional comments
1. Additional, disease-related, biochemical parameter outcomes reported narratively in the Kristjansson 2015a review. One controlled before-and-after (CBA) study in a low- and middle-income country reported a significant effect of supplementation on the risk of anaemia (P = 0.003; 110 participants at final survey); those who were supplemented had a lower risk of being anaemic (odds ratio (OR) 0.58, 95% CI 0.24 to 0.75) (Lutter 2008). Similarly, another CBA with 250 participants reported that while the prevalence of anaemia decreased by 27% in the intervention group, it decreased by only 13% in the control group (De Romaña 2000). In high-income countries, one randomised controlled trial with 103 children found no significant difference between the intervention and the control groups in change in haemoglobin (Yeung 2000). One CBA with 116 children reported an increase in the number of Aboriginal children who had low haemoglobin levels in the intervention group and a decrease in the corresponding number in the control group (Coyne 1980).

Table 19. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: growth in children, weight

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Weight gain (kg)	MD 0.39 (0.11 to 0.67)[b,c]	1462 (3)	NR
				MD 1.42 (1.19 to 1.65)[d,e]	102 (1)	NR
			Change in weight (kg)	MD 0.13 (–0.23 to 0.49)[f]	520 (1)	NR

Table 19. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: growth in children, weight *(Continued)*

			Weight gain (adjusted ICC = 0.025) (kg)	MD 0.71 (0.48 to 0.95)[g,h]	984 (3)	NR
Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplementary feeding[i]	Weight gain (kg)	MD 0.12 (0.05 to 0.18)[j,k]	1057 (9)	Moderate
		Supplementary feeding[l]	Weight gain (kg)	MD 0.24 (0.09 to 0.39)[m]	1784 (7)	NR
		Supplementary food[n]	Weight gain (kg)	MD −0.10 (−0.52 to 0.32)[o]	45 (1)	NR
		Balanced	Weight gain (kg)	MD 0.95 (0.58 to 1.33)[p]	116 (1)	NR
Lazzerini 2013	Children with MAM (< 5 years of age)	Balanced[q]	Weight gain total (kg)	MD 0.18 (0.04 to 0.33)[r]	178 (1)	Low
Ota 2015	Pregnant women	Balanced	Child's birth weight (g)	MD 40.96 (4.66 to 77.26)[s,t]	5385 (11)	Moderate
			Child's weight at 1 year (g)	MD 30.43 (−139.67 to 200.53)	623 (2)	NR
			Child's weight at 11 to 17 years (kg)	MD 0.46 (−0.77 to 1.69)[u]	855 (2)	NR
		High protein	Child's birth weight (g)	MD −73.0 (−171.26 to 25.26)	504 (1)	Low
			Child's weight at 1 year (g)	MD 61.0 (−184.60 to 306.60)	409 (1)	NR
		Isocaloric balanced protein	Child's birth weight (g)	MD 108.25 (−220.89 to 437.4)	184 (2)	Very low
Sguassero 2012	Children < 5 years of age (< 24 years)	High energy, protein and balanced[v]	Weight at end of intervention (kg)	MD −0.03 (−0.17 to 0.12)[w]	587 (3)	NR
		Balanced	Weight gain during the intervention (kg)	MD 0.04 (−0.03 to 0.11)[j,x]	795 (2)	NR

CI: confidence interval;**ICC:** intracluster correlation; **MAM:** moderate acute malnutrition; **MD:** mean difference; **NR:** not reported.

[a]As reported in 'Summary of findings' tables.
[b]Developing country/low- and middle-income country (LMIC) randomised controlled trials (RCTs).
[c]Children who were fed (milk with calcium; githeri and meat; breakfast (patty with meat, vegetables, milk or banana cake)) at school gained significantly more weight (sensitivity analyses with ICCs at 0.01, 0.05 and 0.10 made little difference) (gain of 0.25 kg/year). In subgroup analyses, findings were significant for undernourished and adequately nourished children, as well as children aged 9 to 10 years specifically.

[d]Developed country/high-income country (HIC) controlled before-and-after study (CBA).
[e]Children who received milk at school gained significantly more weight.
[f]Developed country/HIC RCT.
[g]Developing country/LMIC CBAs.
[h]Children who were fed (school lunch; green gram and palm sugar; vegetable protein mixture) at school gained significantly more weight (sensitivity analyses with ICCs at 0.01, 0.05 and 0.10 made little difference) (gain of 0.75 kg/year). In subgroup analyses, findings were significant for boys and girls, and children aged 5 to 6, 6 to 8 and 9 to 10 years specifically.
[i]Balanced (four studies); high energy (two studies); high lipid (one study); supplementary food (two studies).
[j]Analyses include the same RCT: Simondon 1996 (multi-country study).
[k]Low- and middle-income country (LMIC) RCT.
[l]Balanced (two studies); high energy (one study); high lipid (one study); high protein (one study); supplementary food (two studies).
[m]LMIC CBA.
[n]113 g wet ration fruit cereal, rice cereal with apple sauce, mixed cereal with apple sauce and bananas, and oatmeal with apple sauce and bananas (Gerber Products Company).
[o]High-income country (HIC) RCT.
[p]Aboriginal children, HIC CBA.
[q]Complementary foods (Pusti Packet).
[r]Total weight gain significantly higher in group receiving complementary foods (Pusti Packet) than versus standard care.
[s]Balanced energy and protein supplement associated with significant increases in mean birth weight (liquid, chocolate-flavoured supplement; biscuit; milk; supplement with sesame cake, jaggery, oil; fortified food supplement with peanut butter, soy flour, vegetable oil, sugar, micronutrients; supplement as dry powder providing energy, protein, fat; supplement with dried skim milk, enriched bread, vegetable oil; mixture of beans, maize and micronutrients or porridge and micronutrients; oral supplement (beverage); glucose drink; glucose drink and skim milk powder).
[t]No subgroup differences between undernourished and adequately nourished groups (test for subgroup differences: $Chi^2 = 2.35$, degrees of freedom (df) = 1 (P = 0.12), $I^2 = 57.5\%$).
[u]No subgroup differences between boys and girls (test for subgroup differences: $Chi^2 = 0.22$, df = 1 (P = 0.64), $I^2 = 0\%$).
[v]Comparison group: no food or low-protein, kcal supplementation.
[w]No subgroup differences based on age, nutritional status (stunted/wasted versus not) of the children and duration of feeding (< 12 months versus ≥ 12 months).
[x]No subgroup difference based on duration of feeding but subgroup difference based on age (test for subgroup differences: $Chi^2 = 7.24$, df = 1 (P = 0.01), $I^2 = 86\%$): children > 24 months (MD 0.22, 95% CI 0.07 to 0.37).

Additional comments

1. Grobler 2013 described weight outcomes narratively for one trial: children receiving enhanced nutrition support had significantly more weight gain in the first eight weeks than children receiving standard care (P < 0.0001) (Rollins 2007).
2. Kristjansson 2015a narratively reported two additional RCTs in LMIC. One 14-month RCT (60 children) found a large and significant effect of feeding on weight gain for boys (end-of-study difference 3.91 kg; statistically significant) and girls (end-of-study difference 2.55 kg; statistically significant) (Obatolu 2003). One study found that 48 children who received supplementary feeding gained a mean of 39 g more than the 43 children in the control group (six-month intervention: not significant) (Fauveau 1992).

Table 20. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: growth in children, length/height

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Height gain (cm)	MD 0.38 (–0.32 to 1.08)[b]	1462 (3)	NR
			Change in height (cm)	MD 0.28 (–0.01 to 0.57)[c]	520 (1)	NR
			Height gain (adjusted ICC = 0.0016) (cm)	MD 1.43 (0.46 to 2.41)[d,e]	986 (6)	NR
				MD 0.92 (0.16 to 1.67)[f,g]	703 (4)	NR

Table 20. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: growth in children, length/height *(Continued)*

Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplementary feeding[h]	Height gain (cm)	MD 0.27 (0.07 to 0.48)[i,j]	1463 (9)	Moderate
		Supplementary feeding[k]	Height gain (cm)	MD 0.52 (–0.07 to 1.10)[l]	1782 (7)	NR
		Supplementary food[m]	Height gain (cm)	MD –1.00 (–2.12 to 0.12)[n]	45 (1)	NR
		Balanced	Height gain (cm)	MD 0.61 (–0.31 to 1.54)[o]	116 (1)	NR
Lazzerini 2013	Children with MAM (< 5 years of age)	Balanced[p]	Height gain (total) (mm)	MD 1.54 (–2.07 to 5.15)	178 (1)	NR
Ota 2015	Pregnant women	Balanced	Child's birth length (cm)	MD 0.16 (0.01 to 0.31)[q]	3370 (5)	NR
			Child's length at 1 year (cm)	MD 0.00 (–5.69 to 5.69)	428 (1)	NR
		High protein	Child's height at 11–17 years (cm)	MD –0.39 (–1.73 to 0.94)[r]	855 (1)	NR
			Child's length at 1 year (cm)	MD 0.20 (–5.59 to 5.99)	412 (1)	NR
Sguassero 2012	Children < 5 years of age	High energy, protein and balanced[s]	Length/height at the end of the intervention (cm)	MD 0.28 (–0.11 to 0.67)[t]	587 (3)	NR
		Balanced	Length/height gain during the intervention (cm)	MD 0.19 (0.07 to 0.31)[i,u]	795 (2)	NR

CI: confidence interval; **ICC:** intracluster correlation coefficient; **MAM:** moderate acute malnutrition; **MD:** mean difference; **NR:** not reported.

[a]As reported in 'Summary of findings' tables.
[b]Low- and middle-income country (LMIC) randomised controlled trials (RCTs).
[c]High-income country (HIC) RCT.
[d]LMIC controlled before-and-after studies (CBAs).
[e]Height gain significantly increased for children who received school meals (lunch; green gram and sugar; vegetable protein mixture).
[f]HIC CBAs.
[g]Height gain significantly increased for children who received school meals (milk).
[h]Balanced (five studies); high energy (two studies); high lipid (one study); supplementary food (one study).
[i]Analyses include the same RCT: Simondon 1996 (multi-country study).
[j]LMIC RCT.
[k]Balanced (two studies); high energy (one study); high lipid (one study); high protein (one study); supplementary food (two studies).
[l]LMIC CBA.
[m]113 g wet ration fruit cereal, rice cereal with apple sauce, mixed cereal with apple sauce and bananas, and oatmeal with apple sauce and bananas (Gerber Products Company).

[n]HIC RCT
[o]Aboriginal children, HIC CBA.
[p]Complementary foods (Pusti Packet).
[q]Birth length significantly increased in newborns of women given balanced energy, protein supplementation (liquid, chocolate-flavoured supplement; biscuit; milk; supplement with sesame cake, jaggery, oil; fortified food supplement with peanut butter, soy flour, vegetable oil, sugar, micronutrients).
[r]No significant differences for boys and girls.
[s]Comparison group: no food or low-protein, kcal supplement.
[t]No subgroup differences based on age, nutritional status (stunted/wasted versus not) of the children and duration of feeding (< 12 months versus > 12 months).
[u]Length gain significantly increased in children given supplementary feeding (porridge and yogurt).
Additional comments:
1. Kristjansson 2015a narratively reported two additional RCTs in LMIC. Pollitt 2000 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. Obatolu 2003 (60 children) found a significant effect for feeding on length for boys (5.12 cm difference between intervention and control groups; end-of-study difference of 5.02; statistically significant) and girls (6.95 cm difference; end-of-study difference of 5.92 cm; statistically significant).

Table 21. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: growth in children, z scores

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Weight-for-age z scores (WAZ)						
Grobler 2013	Children with HIV	Specific (spirulina)[b]	WAZ	MD 0.00 (–0.44 to 0.44)	84 (1)	NR
Kristjansson 2007	School children (aged 5–19 years)	Balanced	WAZ	MD 0.07 (0.04 to 0.10)[c,d]	785 (1)	NR
Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplementary feeding[e]	WAZ	MD 0.15 (0.05 to 0.24)[f]	1565 (8)	Moderate
		Supplementary feeding[g]	WAZ	MD 0.27 (–0.13 to 0.68)[h]	999 (4)	Very low
		Supplementary food[i]	Change in WAZ	MD 0.02 (0.01 to 0.03)[j]	103 (1)	NR
Sguassero 2012	Children < 5 years of age	Balanced	Change in WAZ during intervention	MD 0.12 (0.05 to 0.19)[k]	348 (1)	Low
			WAZ at end of intervention	MD –0.18 (–0.49 to 0.12)	195 (2)	NR
Length/height-for-age z scores (HAZ)						
Kristjansson 2007	School children (aged 5–19 years)	Balanced	HAZ	MD 0.04 (0.02 to 0.06)[l,m]	1021 (2)	NR

Table 21. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: growth in children, z scores *(Continued)*

Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplementary feeding[n]	HAZ	MD 0.15 (0.06 to 0.24)[f]	4544 (9)	Moderate
		Supplementary feeding[o]	HAZ	MD 0.01 (–0.10 to 0.12)[h]	999 (4)	Very low
		Supplementary food[i]	Change in HAZ	MD 0.04 (0.04 to 0.05)[j]	103 (1)	NR
Lazzerini 2013	Children with MAM (< 5 years of age)	High lipid and balanced[p]	HAZ	MD 0.23 (–0.07 to 0.54)	1546 (2)	Low
Sguassero 2012	Children < 5 years of age	Balanced	HAZ at end of intervention	MD 0.02 (–0.29 to 0.32)	195 (2)	NR
Weight-for-height/length z score (WHZ)						
Grobler 2013	Children with HIV	Specific (spirulina)[b]	WHZ	MD 0.35 (–0.21 to 0.91)	84 (1)	NR
Kristjansson 2007	School children (aged 5–19 years)	Balanced[q]	Change in WHZ	MD 0.20 (–0.24, 0.64)[l]	236 (1)	NR
Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplementary feeding[r]	WHZ	MD 0.10 (–0.02 to 0.22)[f]	4073 (7)	Moderate
		Supplementary feeding[s]	WHZ	MD 0.29 (–0.11 to 0.69)[h]	999 (4)	Very low
		Supplementary food[i]	WHZ	MD –0.06 (–0.07 to –0.05)[j]	103 (1)	NR
Lazzerini 2013	Children with MAM (< 5 years of age)	High lipid and balanced[l]	WHZ (final)	MD 0.20 (0.03 to 0.37)[t]	1546 (2)	Moderate
		Balanced[u]	WHZ gain (total)	MD 0.28 (0.06 to 0.49)[t]	178 (1)	NR
Sguassero 2012	Children (< 5 years of age)	Balanced	WHZ at end of intervention	MD 0.10 (–0.33 to 0.13)[v]	260 (3)	Moderate
BMI z score						
Ota 2015	Pregnant women	Balanced	Child's BMI z score at 11–17 years	MD 0.16 (0.01 to 0.31)[w]	855 (1)	NR

BMI: body mass index; **MAM:** moderate acute malnutrition; **MD:** mean difference; **NR:** not reported.

[a]As reported in 'Summary of findings' tables.
[b]Spirulina supplementation.
[c]Low- and middle-income country (LMIC) randomised controlled trial (RCT).

[d]Significant effect of school breakfast (cheese sandwich or spiced bun and cheese plus milk) versus control on weight-for-age z (WAZ) scores.
[e]Balanced (two studies); high energy (two studies); high lipid (two studies); supplementary food (two studies).
[f]LMIC RCT.
[g]Balanced (one study); supplementary food (three studies).
[h]LMIC controlled before-and-after study (CBA).
[i]Puréed meat, iron-fortified infant cereal and whole cows' milk.
[j]High-income country (HIC) RCT.
[k]Change in WAZ significantly higher in the group supplemented with yoghurt.
[l]A small, significant effect of school feeding on height-for-age z scores (HAZ) scores demonstrated; z score difference = 0.04 (school breakfast: cheese sandwich or spiced bun and cheese plus milk; githeri and meat).
[m]LMIC RCTs.
[n]Balanced (two studies); high energy (three studies); high lipid (two studies); supplementary food (two studies).
[o]Balanced (one study); supplementary food (three studies).
[p]Complementary foods (Pusti Packet) and lipid-based nutrient supplement (LNS) (i.e. Plumpy Doz and corn-soy blend (CSB++)).
[q]LMIC RCT.
[r]Balanced (three studies); high energy (two studies); high lipid (one study); supplementary food (one study).
[s]Balanced (one study); supplementary food (three studies).
[t]Final weight-for-height/length z score (WHZ) score and WHZ gain significantly higher in the group receiving food than in standard care.
[u]Complementary foods (Pusti Packet).
[v]No subgroup differences based on age, nutritional status of the children (stunted/wasted versus not stunted/wasted) and duration of feeding.
[w]Small increase in mean body mass index (BMI) z score for children receiving supplementary biscuits versus children in the control group (no subgroup differences between girls and boys).

Additional comments

1. Kristjansson 2015a narratively reported one additional cluster-RCT in an LMIC. In the 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 in WAZ than the children who received only maternal nutrition education (not significant). One additional CBA in an LMIC was also reported narratively; De Romaña 2000 (250 participants) found no significant difference between intervention and control groups in change in prevalence of stunting (i.e. HAZ scores).

Table 22. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of children, other anthropometry indicators

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Head circumference						
Ota 2015	Pregnant women	Balanced	Child's birth head circumference (cm)	MD 0.04 (–0.08 to 0.17)	3352 (5)	NR
			Head circumference at 1 year (cm)	MD –0.13 (–0.35 to 0.10)	627 (2)	NR
		High protein	Head circumference at 1 year (cm)	MD 0.11 (–0.19 to 0.41)	412 (1)	NR
Sguassero 2012	Children < 5 years of age (stunted; after 12 months)	Balanced	Head circumference at end of the intervention (cm)	MD 0.40 (–0.21 to 1.01)	65 (1)	NR
	Children < 5 years of age (stunted/wasted; after 12 months)	High energy, protein[b]		MD 0.19 (–0.41 to 0.79)	75 (1)	NR

Table 22. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of children, other anthropometry indicators *(Continued)*

Mid-upper arm circumference (MUAC)						
Kristjansson 2007	School children (aged 5–19 years)	Balanced	MUAC (mm)	MD 0.31 (0.16 to 0.46)[c,d]	236 (1)	NR
Lazzerini 2013	Children with MAM (< 5 years of age)	Balanced[c,e]	MUAC gain (total, mm)	MD 0.62 (–1.38 to 2.61)	178 (1)	Very low
Sguassero 2012	Children < 5 years of age (stunted; after 12 months)	Balanced	MUAC at end of intervention (cm)	MD 0.20 (–0.29 to 0.69)	65 (1)	NR
	Children < 5 years of age (stunted/wasted; after 12 months)	High energy, protein[b]		MD 0.10 (–0.22 to 0.42)	75 (1)	NR
	Children < 5 years of age (nutritionally at risk; after 9 months)	Balanced		MD –0.08 (–0.31 to 0.15)	348 (1)	NR
Triceps skinfold thickness						
Sguassero 2012	Children < 5 years of age (stunted; after 12 months)	Balanced	Triceps skinfold thickness at end of intervention (mm)	MD 0.20 (–0.51 to 0.91)	65 (1)	NR
Subscapular skinfold thickness						
Sguassero 2012	Children < 5 years of age (stunted; after 12 months)	Balanced	Subscapular skinfold thickness at end of intervention (mm)	MD 0.20 (–0.34 to 0.74)	65 (1)	NR
Mid-upper arm muscle area						
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Mid-upper arm muscle area (mm^2)	MD 68.22 (39.57 to 96.87)[d,f]	236 (1)	NR
Mid-upper arm fat area						
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Mid-upper arm fat area (mm^2)	MD –0.31 (–26.12 to 25.50)[d]	236 (1)	NR
Percentage body fat						
Ota 2015	Pregnant women	Balanced	Child's % body fat at 11–17 years	MD 0.06 (–0.41 to 0.52)[g]	847 (1)	NR

CI: confidence interval; **MAM:** moderate acute malnutrition; **MD:** mean difference; **NR:** not reported.

[a]As reported in 'Summary of findings' tables.
[b]Comparison group: no food or low protein (kcal) supplementation.
[c]Significant increase in mid-upper arm circumference (MUAC) in the meat group compared to the control group; school feeding (meat versus control) had a greater effect on MUAC for boys than for girls.
[d]Low- and middle-income country (LMIC) randomised controlled trial (RCT).
[e]Complementary foods (Pusti Packet).

[f]Children in the intervention group, who were given meat, gained significantly more in the mid-upper arm muscle area than the control group.
[g]No subgroup differences between boys and girls.

Table 23. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of children, biochemical parameters

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Change in haemoglobin (g/L)						
Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplementary feeding[b]	Change in haemoglobin (g/L)	SMD 0.49 (0.07 to 0.91)[c]	300 (5)	NR

CI: confidence interval; **NR:** not reported; **SMD:** standardised mean difference.

[a]As reported in 'Summary of findings' tables.
[b]Balanced (one study); high energy (two studies); high lipid (one study); supplementary food (one study).
[c]Low- and middle-income country (LMIC) randomised controlled trials (RCTs).

Table 24. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome, nutritional status of adults, weight

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Grobler 2013	Adults with HIV	Balanced[b]	Body weight (6–12 weeks' follow-up)	MD –0.17 (–1.10 to 0.75)	233 (4)	Moderate
		Balanced[c]	Body weight at baseline (ART arm)	MD –0.58 (–1.47 to 0.31)	617 (1)	NR
			Body weight at baseline (pre-ART arm)	MD 0.60 (–0.60 to 1.80)	429 (1)	NR
			Body weight at 1 month (ART arm)	MD 0.58 (–0.62 to 1.78)	366 (1)	NR
			Body weight at 1 month (pre-ART arm)	MD 1.09 (–0.59 to 2.77)	261 (1)	NR
			Body weight at 3 months (ART arm)	MD 0.41 (–0.99 to 1.81)	322 (1)	NR
			Body weight at 3 months (pre-ART arm)	MD 2.82 (1.02 to 4.62)[d]	211 (1)	NR
			Body weight at 6 months (ART arm)	MD 0.17 (–1.50 to 1.84)	237 (1)	NR

Table 24. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome, nutritional status of adults, weight *(Continued)*

			Body weight at 6 months (pre-ART arm)	MD 3.67 (1.50 to 5.84)[d]	157 (1)	NR
			Body weight at 12 months (ART arm)	MD –1.00 (–3.19 to 1.19)	180 (1)	NR
			Body weight at 12 months (pre-ART arm)	MD 2.25 (–0.41 to 4.91)	118 (1)	NR
			Change in body weight at 1 month (ART arm) (kg)	MD 0.90 (0.40 to 1.41)[e]	366 (1)	NR
			Change in body weight at 1 month (pre-ART arm) (kg)	MD 0.82 (0.28 to 1.36)[f]	261 (1)	NR
			Change in body weight at 3 months (ART arm) (kg)	MD 1.12 (0.29 to 1.95)[e]	322 (1)	NR
			Change in body weight at 3 months (pre-ART arm) (kg)	MD 1.22 (0.31 to 2.12)[f]	211 (1)	NR
			Change in body weight at 6 months (ART arm) (kg)	MD 0.89 (–0.30 to 2.08)	237 (1)	NR
			Change in body weight at 6 months (pre-ART arm) (kg)	MD 2.06 (0.82 to 3.30)[f]	157 (1)	NR
			Change in body weight at 12 months (ART arm) (kg)	MD –0.03 (–1.78 to 1.71)	180 (1)	NR
			Change in body weight at 12 months (pre-ART arm) (kg)	MD 0.83 (–0.79 to 2.45)	118 (1)	NR
		Specific (AA mixture)[g]	Mean change in body weight (baseline to 8 weeks) (kg)	MD 2.63 (0.72 to 4.54)[h]	43 (1)	NR
		Specific (OKG)[i]	Mean weight at study endpoint (kg)	MD –5.00 (–11.68 to 1.68)	46 (1)	NR
		Specific (GLN)[j]	Mean weight at study endpoint (kg)	MD –1.30 (–10.18 to 7.58)	21 (1)	NR
Grobler 2016	Adults with TB	Balanced and high energy	Mean weight gain (after 6 weeks) (kg)	MD 1.73 (0.81 to 2.65)[k]	34 (1)	NR
			Mean weight gain (after 8 weeks) (kg)	MD 0.78 (–0.05 to 1.60)	689 (3)	NR
			Mean weight gain (after 12 weeks) (kg)	MD 2.60 (1.74 to 3.46)[k]	100 (1)	NR
			Mean weight gain (after 20 weeks) (kg)	MD –0.20 (–1.34 to 0.94)	306 (1)	NR

Table 24. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome, nutritional status of adults, weight *(Continued)*

			Mean weight gain (after 24 weeks) (kg)	MD 1.78 (–0.25 to 3.81)	26 (1)	NR
			Mean weight gain (after 32 weeks) (kg)	MD 2.60 (0.52 to 4.68)[k]	265 (1)	NR
			Mean weight gain (at 8 weeks) (kg)[l]	Not pooled	731 (4)	Moderate
Ota 2015	Pregnant women	Balanced	Weekly gestational weight gain (g/week)	MD 18.63 (–1.81 to 39.07)	2391 (9)	NR
			Maternal weight 4 weeks' post-partum (kg)	MD –0.90 (–1.92 to 0.12)	354 (1)	NR
		High protein	Weekly gestational weight gain (g/week)	MD 4.50 (–33.55 to 42.55)	486 (1)	NR
		Isocaloric balanced protein	Weekly gestational weight gain (g/week)	MD 110.45 (–82.87 to 303.76)	184 (2)	Very low

AA: amino acid; **ART:** antiretroviral therapy; **CI:** confidence intervals; **GLN:** L-glutamine; **MD:** mean difference; **NR:** not reported; **OKG:** ornithine alpha-ketoglutarate; **TB:** tuberculosis.

[a]As reported in 'Summary of findings' tables.
[b]All commercial balanced macronutrient formulas + nutrition counselling versus nutrition counselling in participants with weight loss.
[c]Fortified blended food + nutrition counselling versus nutrition counselling in malnourished adults on ART and pre-ART.
[d]Among participants not receiving antiretroviral therapy (ART), the supplement group had a significantly greater mean body weight than the non-supplement group at both three months (P = 0.0022) and at six months (P = 0.001).
[e]Among participants receiving ART, the supplement group appeared to gain weight more rapidly than the non-supplement group in the first three months of the trial, as they had a significantly greater change in body weight gain compared to the non-supplement group at these time points. After this time point, the change in body weight was not significantly different between the groups.
[f]Among participants not receiving ART, the supplement group gained significantly more body weight compared with the non-supplement group in the first three months of the trial and at the six-month time point. After this time point, the change in body weight was not significantly different between the groups.
[g]Amino acid mixture (arginine, glutamine, β-hydroxy-β-methylbutyrate versus placebo).
[h]After eight weeks, the arginine-rich group gained significantly more body weight than the control group.
[i]Ornithine alpha-ketoglutarate versus placebo.
[j]L-glutamine versus placebo.
[k]Supplementation did seem to improve weight gain at specific time points during treatment, although one large trial exclusively in people coinfected with HIV found no difference at any time point (PrayGod 2011).
[l]Supplementation probably increases weight gain during treatment. Four studies reported measures of weight gain but at different time points, which prevented meta-analysis.

Table 25. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of adults, anthropometry indicators

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Body mass index (BMI)						

Table 25. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of adults, anthropometry indicators *(Continued)*

Grobler 2013	Adults with HIV	Balanced[b]	BMI at baseline (ART arm)	MD 0.02 (–0.15 to 0.19)	617 (1)	NR
			BMI at baseline (pre-ART arm)	MD 0.17 (–0.07 to 0.41)	429 (1)	NR
			BMI at 1 month (ART arm)	MD 0.36 (0.08 to 0.64)[c]	366 (1)	NR
			BMI at 1 month (pre-ART arm)	MD 0.39 (0.05 to 0.74)[d]	261 (1)	NR
			BMI at 3 months (ART arm)	MD 0.43 (0.07 to 0.79)[c]	322 (1)	NR
			BMI at 3 months (pre-ART arm)	MD 0.73 (0.31 to 1.15)[d]	211 (1)	NR
			BMI at 6 months (ART arm)	MD 0.42 (–0.07 to 0.91)	237 (1)	NR
			BMI at 6 months (pre-ART arm)	MD 0.78 (0.22 to 1.34)[c]	157 (1)	NR
			BMI at 12 months (ART arm)	MD –0.08 (–0.72 to 0.56)	180 (1)	NR
			BMI at 12 months (pre-ART arm)	MD 0.45 (–0.25 to 1.15)	118 (1)	NR
Lean body mass (LBM)						
Grobler 2013	Adults with HIV	Balanced[b]	% LBM at baseline (ART arm)	MD 0.13 (–0.96 to 1.23)	569 (1)	NR
			% LBM at baseline (pre-ART arm)	MD –0.30 (–1.51 to 0.92)	394 (1)	NR
			% LBM at 1 month (ART arm)	MD 0.47 (–1.20 to 2.13)	253 (1)	NR
			% LBM at 1 month (pre-ART arm)	MD 0.41 (–1.40 to 2.22)	185 (1)	NR
			% LBM at 3 months (ART arm)	MD –0.53 (–2.13 to 1.07)	283 (1)	NR
			% LBM at 3 months (pre-ART arm)	MD 1.14 (–0.70 to 2.98)	179 (1)	NR
			% LBM at 6 months (ART arm)	MD 0.32 (–1.48 to 2.12)	202 (1)	NR
			% LBM at 6 months (pre-ART arm)	MD 1.65 (–0.79 to 4.09)	129 (1)	NR
			% LBM at 12 months (ART arm)	MD –1.53 (–3.55 to 0.49)	169 (1)	NR
			% LBM at 12 months (pre-ART arm)	MD 0.67 (–1.82 to 3.16)	107 (1)	NR

Table 25. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of adults, anthropometry indicators *(Continued)*

Fat mass						
Grobler 2013	Adults with HIV	Balanced[e]	Fat mass measured in % of TBW	MD −1.14 (−2.58 to 0.29)	233 (4)	Moderate
		Specific (AA mixture)[f]	Change in fat mass (kg)	MD −0.64 (−2.69 to 1.41)	43 (1)	NR
		Specific (OKG)[g]	Mean fat mass (kg) at study endpoint	MD 0.00 (−2.00 to 2.00)	46 (1)	NR
		Specific (GLN)[h]	Mean fat mass (kg) at study endpoint	MD −1.00 (−32.40 to 30.40)	21 (1)	NR
Fat-free mass						
Grobler 2013	Adults with HIV	Balanced[e]	Fat-free mass	MD −0.37 (−2.77 to 2.03)	218 (3)	Low
		Specific (AA mixture)[f]	Change in fat-free mass	MD 3.25 (1.25 to 5.25)[i]	43 (1)	NR
		Specific (OKG)[g]	Mean fat-free mass (kg) at study endpoint	MD −5.10 (−11.11 to 0.91)	46 (1)	NR

AA: amino acid; **ART:** antiretroviral therapy; **BMI:** body mass index; **CI:** confidence interval; **GLN:** L-glutamine; **LBW:** lean body weight; **MD:** mean difference; **NR:** not reported; **OKG:** ornithine alpha-ketoglutarate; **TBW:** total body weight.

[a]As reported in 'Summary of findings' tables.
[b]Fortified blended food + nutrition counselling versus nutrition counselling in malnourished adults on antiretroviral therapy (ART) and pre-ART.
[c]Among participants receiving ART, mean body mass index (BMI) and change in BMI in the supplement group was significantly higher in the first three months compared to the no supplement group. After three months, there was no significant difference in BMI or BMI gain between the supplement and no supplement groups in the participants receiving ART.
[d]Among participants not receiving ART, mean BMI and change in BMI in the supplement group was significantly higher in the first six months compared to the no supplement group. After six months, there was no significant difference in BMI or BMI gain between the supplement and no supplement groups in the participants not receiving ART.
[e]All commercial balanced macronutrient formulas + nutrition counselling versus nutrition counselling in participants with weight loss.
[f]Amino acid mixture (arginine, glutamine, β-hydroxy-β-methylbutyrate versus placebo).
[g]Ornithine alpha-ketoglutarate versus placebo.
[h]L-glutamine versus placebo.
[i]The increase in fat-free mass was significantly greater in the arginine group compared with the control group.

Table 26. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of adults, dietary intake

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Energy intake						
Grobler 2013	Adults with HIV	Balanced[b]	Energy intake (6–12 weeks' follow-up) (kcal/kg)	MD 393.57 (224.66 to 562.47)[c]	131 (3)	Low

Table 26. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: nutritional status of adults, dietary intake *(Continued)*

		Specific (OKG)[d]	Mean daily energy intake at study endpoint (kcal/kg)	MD 0.66 (–564.63 to 432.63)	46 (1)	NR
Protein intake						
Grobler 2013	Adults with HIV	Balanced[e]	Protein intake (g/day) (6–12 weeks follow-up)	MD 23.35 (12.68 to 34.01)[c]	81 (2)	Low
		Specific (OKG)[d]	Mean daily protein intake at study endpoint	MD –0.70 (–18.71 to 17.31)	43 (1)	NR

CI: confidence interval;**OKG:** ornithine alpha-ketoglutarate; **MD:** mean difference; **NR:** not reported.

[a]As reported in 'Summary of findings' tables.
[b]Macronutrient formulas (Meritene, Ensure, range of fortified oral supplements).
[c]Supplementation with balanced macronutrient formulas significantly improved energy intake and protein intake compared with no nutritional supplementation or nutrition counselling alone in adults with weight loss.
[d]Ornithine alpha-ketoglutarate versus placebo.
[e]Macronutrient formulas (Meritene, Ensure).
Additional comments
1. One systematic review described this outcome narratively (Droogsma 2014). In one study in the review, three months of daily oral nutritional supplements significantly improved nutritional outcomes in the intervention group (Lauque 2004). The nutritional status of the control group also improved after three months, although the intervention group improved significantly more than the control group. There were no significant changes on the clinical and biochemical outcomes.

Table 27. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: school attendance, cognition tests and educational attainment

Review	Target group	Intervention	Outcome	Corresponding risk with intervention (95% CI)	Number of participants (studies)
Cognitive tests					
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Full scale IQ (total) (adjusted ICC = 0.15)	MD 3.90 (–2.88 to 10.68)[a,b]	231 (1)
			Full scale IQ (separated) (cluster size as in analysis) (adjusted ICC = 0.15)	MD 3.80 (0.51 to 7.10)[a,c,d]	231 (1)
			Performance IQ (total) (adjusted ICC = 0.15)	MD 5.00 (–2.60 to 12.6)[a,b]	231 (1)
			Performance IQ (separated) (cluster size as in analysis) (adjusted ICC = 0.15)	MD 5.74 (1.73 to 9.74)[a,c,e]	231 (1)
			Verbal IQ (total) (adjusted ICC = 0.15)	MD 3.10 (–2.99 to 9.19)[a,b]	231 (1)
			Verbal IQ (separated) (cluster size as in analysis) (adjusted ICC = 0.15)	MD 3.35 (–0.21 to 6.92)[a,c]	231 (1)

Table 27. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: school attendance, cognition tests and educational attainment *(Continued)*

Kristjansson 2015a	Disadvantaged infants and young children (aged 3 months to 5 years)	Supplement food	Cognitive ability	SMD 0.58 (0.17 to 0.98)[f,g]	99 (1)
		High energy	Change on Bailey Scale of Mental Development (BSMD)	SMD –0.40 (–0.79 to –0.00)[h]	113 (1)
Ota 2015	Pregnant women	Balanced	Child's Bailey mental score (1 year)	MD –0.74 (–1.95 to 0.47)	411 (1)
			Child's IQ (5 years)	MD 0.00 (–4.98 to 4.98)	153 (1)
		High protein	Child's Bailey mental score (1 year)	MD 0.32 (–0.91 to 1.55)	396 (1)
Educational attainment					
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Maths change overall (ICC = 0.15)	SMD 0.31 (0.09 to 0.53)[a,i]	337 (2)
			Change in reading (ICC = 0.15)	MD 0.09 (–0.11 to 0.29)[a]	106 (1)
			Change in spelling (ICC = 0.15)	MD 0.24 (0.01 to 0.47)[a,h]	106 (1)
School attendance					
Kristjansson 2007	School children (aged 5–19 years)	Balanced	Change in attendance (ICC = 0.15)	MD 4.95 (–3.56 to 13.46)[a]	108 (1)
			End of study attendance (ICC = 0.15)	MD –0.23 (–17.93 to 17.47)[a]	72 (1)

CI: confidence interval; **ICC:** intracluster correlations; **IQ:** intelligence quotient; **MD:** mean difference.

[a]All comparisons: low- and middle-income country (LMIC) controlled before-and-after studies (CBAs).
[b]Sensitivity analyses made very little difference to either the point estimate or the significance.
[c]Four subgroups of one study (Agarwal 1989).
[d]Children who were given school lunches had an end-of-study full-scale intelligence quotient (IQ) that was 3.8 points higher than children who were not given school lunch. Sensitivity analyses with intracluster correlation (ICCs) at 0.10 and 0.20 still significant.
[e]Children who were given school lunches had an end-of-study performance IQ that was 5.74 points higher than children who were not given school lunch. Sensitivity analyses with ICCs at 0.10 and 0.20 both significant.
[f]Trial compared results for time point 4 children (supplemented with stimulation from 42 to 84 months of age) to those of time point 2 children (supplemented from 63 to 84 months of age) at 63 months.
[g]LMIC randomised controlled trial (RCT).
[h]Change in spelling achievement significantly greater for children who received school meals (breakfast). Sensitivity analysis with an ICC of 0.10 showed much the same results, however, the sensitivity analysis with an ICC of 0.20 was non-significant.
[i]Change in maths achievement significantly greater for children who received school meals (lunch and breakfast); results of an analysis with Agarwal 1989 broken down into four nutritional subgroups were similar (standardised mean difference 0.44, 95% confidence interval 0.22 to 0.67). Sensitivity analyses for ICCs of 0.10 and 0.20 made little difference.
Additional comments:

1. An ICC of 0.15 was used for maths, reading, spelling, attendance and intelligence outcomes, with ICCs of 0.10 and 0.20 used for sensitivity analyses (Kristjansson 2007).
2. Kristjansson 2015a narratively reported one additional cluster-RCT in an LMIC (Pollitt 2000). The study found no main effects of supplementation on the Bailey Scales of Mental Development but reported positive effects in a contrast over time for the younger cohort but not for the older cohort (P < 0.05; 53 children).
3. Kristjansson 2015a narratively reported long-term follow-up of cognitive development. Grantham-McGregor 1997 followed up 97% (127 children) of the original cohort of stunted children (Grantham-McGregor 1991; 129 children) 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 supplemented children had higher mean scores than the control group on 14 out of 15 cognitive tests ($P = 0.02$). Pollitt 1997 performed a seven-year follow-up of Husaini 1991. They found no differences between the intervention (125 children) and control (106 children) groups on the Peabody Picture Vocabulary Test, emotionality, and maths. They found small (15-second difference), positive effects of supplementation on working memory performance, although these are unlikely to be clinically significant.

Table 28. Supplementary feeding versus no supplementary feeding (control, placebo, standard care, dietary advice), outcome: adverse events

Review	Target group	Intervention	Outcome	Assumed risk with comparator	Corresponding risk with intervention	Relative effect (95% CI)	Number of participants (studies)	Certainty of evidence (GRADE)[a]
Grobler 2013	Adults with HIV	Specific (OKG)[b]	GI adverse events	542 per 1000	864 per 1000	RR 1.59 (1.06 to 2.39)[c]	46 (1)	NR
Ota 2015	Pregnant women	Balanced	Small-for-gestational age	173 per 1000	137 per 1000 (120 to 156)	RR 0.79 (0.69 to 0.90)[d]	4408 (7)	Moderate
			Preterm birth	112 per 1000	108 per 1000 (90 to 130)	RR 0.96 (0.80 to 1.16)	3384 (5)	Moderate
			Pre-eclampsia	73 per 1000	108 per 1000 (60 to 195)	RR 1.48 (0.82 to 2.66)	463 (2)	Very low
		High protein	Small-for-gestational age	117 per 1000	185 per 1000 (121 to 282)	RR 1.58 (1.03 to 2.41)[e]	505 (1)	Moderate
			Preterm birth	219 per 1000	249 per 1000 (182 to 341)	RR 1.14 (0.83 to 1.56)	505 (1)	Low
Sguassero 2012	Children < 5 years of age	Balanced	Diarrhoea	—	—	OR 1.04 (0.67 to 1.62)	108 (1)	NR
			Vomiting	—	—	OR 0.89 (0.38 to 2.10)	108 (1)	NR

CI: confidence interval; **GI:** gastrointestinal; **NR:** not reported; **OKG:** ornithine alpha-ketoglutarate; **OR:** odds ratio; **RR:** risk ratio.

[a]As reported in 'Summary of findings' tables.

[b]Monohydrated L-ornithine alpha-ketoglutarate (OKG).

[c]OKG associated with significantly more people reporting one or more GI adverse events.

[d]Incidence of small-for-gestational age birth significantly reduced in women given balanced energy and protein supplementation (liquid, chocolate-flavoured supplement; biscuit; milk; supplement with sesame cake, jaggery, oil; fortified food supplement with peanut butter, soy flour, vegetable oil, sugar, micronutrients; supplement with dried skim milk, enriched bread, vegetable oil; oral supplement (beverage)).

[e]High-protein supplementation associated with a significantly increased risk of small-for-gestational age babies (high protein oral supplement (beverage)).

Additional comments

1. Lazzerini 2013 only reported adverse events in relation to lipid-based nutrient supplements (LNS) versus all blended foods and LNS versus specific blended foods.
2. Grobler 2013 poorly reported adverse effects in the included studies and, in general, they were related to tolerance rather than adverse effects. Keithley 2002 found no significant differences for acceptance and tolerance of the formulas (Ensure plus versus Advera). Rabeneck 1998 noted that one participant discontinued the supplement (lipisorb-specialised medium chain triglycerides formula) due to nausea and epigastric pain, and one discontinued as he did not like the taste of the supplement.

3. Kristjansson 2015a calculated the net benefit from supplementary feeding for seven studies that provided home-delivered rations (randomised controlled trials (RCTs): Bhandari 2001; De Romaña 2000; Grantham-McGregor 1991; Rivera 2004; controlled before-and-after studies (CBAs): Lutter 2008; Santos 2005; Tomedi 2012); and three of the day-care/feeding centre studies (RCTs: Husaini 1991; Pollitt 2000; CBA: Devadas 1971). They 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, the net benefit to children was only 36% of the extra calories provide by the supplement. In the day-care/feeding centres, the net benefit was 85% of the extra calories provided by the supplement.

APPENDICES

Appendix 1. Search strategies

Cochrane Database of Systematic Reviews (CDSR) in the Cochrane Library

#1 MeSH descriptor: [Dietary Supplements] this term only
#2 MeSH descriptor: [Dietary Proteins] this term only
#3 MeSH descriptor: [Dietary Fats] 1 tree(s) exploded
#4 MeSH descriptor: [Energy Intake] this term only
#5 MeSH descriptor: [Nutrition Therapy] explode all trees
#6 Any MeSH descriptor with qualifier(s): [Diet therapy - DH]
#7 ((diet* or food* or feed or feeding or meal* or nutrition* or nutrient*) near/3 (additional or extra or supplement*)):ti,ab
#8 MeSH descriptor: [Food, Fortified] this term only
#9 MeSH descriptor: [Foods, Specialized] this term only
#10 MeSH descriptor: [Functional Food] this term only
#11 ((fortif* or special* or functional* or formulat*) near/3 food*):ti,ab
#12 (therapeutic* near/3 (diet* or food* or feeding)):ti,ab
#13 ((ready next to next use near/3 food*) or RUTF* or RTUF* or RUF*):ti,ab
#14 MeSH descriptor: [Food, Formulated] this term only
#15 ((food or feeding) near/3 (intervention* or program*))
#16 (food next secur* or food next insecur* or food next in-secur*):ti,ab
#17 ((nutrient* or nutrition*) near/3 (intervention* or program*)):ti,ab
#18 MeSH descriptor: [Dietary Carbohydrates] this term only
#19 #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 or #16 or #17 or #18

MEDLINE Ovid

1 Dietary Supplements/
2 dietary proteins/
3 dietary carbohydrates/
4 exp dietary fats/
5 energy intake/
6 nutrition therapy/
7 Diet Therapy/
8 diet therapy.fs.
9 ((diet$ or food$ or feed or feeding or meal$ or nutrition$ or nutrient$) adj3 (additional or extra or supplement$)).tw.
10 exp Food, Fortified/
11 (therapeutic$ adj3 (food$ or feeding)).tw.
12 (therapeutic$ adj3 diet$).tw.
13 ((ready- to-use adj3 food$) or RUTF$1 or RTUF$1 or RUF$1).tw.
14 ((food or feeding) adj3 (intervention$ or program$)).tw.
15 (food secur$ or food insecur$ or food in-secur$).tw.
16 ((nutrient$ or nutrition$) adj3 (intervention$ or program$)).tw.
17 or/1-16
18 meta-analysis/
19 meta-analysis as topic/
20 meta analy$.tw.
21 metaanaly$.tw.
22 (systematic adj (review$1 or overview$1)).tw.
23 exp Review Literature as Topic/
24 or/18-23
25 cochrane.ab.
26 embase.ab.
27 (psychlit or psyclit).ab.
28 (psychinfo or psycinfo).ab.
29 (cinahl or cinhal).ab.
30 science citation index.ab.
31 or/25-30
32 hand-search.ab.
33 manual search.ab.
34 relevant journals.ab.

35 reference list$.ab.
36 bibliograph$.ab.
37 or/32-36
38 (selection criteria or data extraction).ab.
39 "Review"/
40 38 and 39
41 randomized controlled trials as topic/
42 24 or 31 or 37 or 40 or 41
43 comment/
44 letter/
45 editorial/
46 animal/
47 human/
48 46 not (46 and 47)
49 or/43-45,48
50 42 not 49
51 17 and 50

MEDLINE In-Process and Other In-Process Citations Ovid

1. (nutriti* adj (advice or assisted or enrich* or intervention* or program* or support)).ti,ab,kf,hw.
2. ((fortif* or supplement*) adj3 (protein or carbohydrate or fat or energy or calorie*)).ti,ab,kf.
3. ((fortif* or formula or formulated or supplement* or therapeutic*) adj (diet* or feed* or fed or food* or meal? or nutriti* or milk)).ti,ab,kf.
4. ((fortif* or supplement*) adj (calcium or phosph* or iron or iodine or magnesium or zinc or vitamin* or mineral*)).ti,ab,kf,hw.
5. or/1-4

MEDLINE EPub Ahead of Print Ovid

1. (nutriti* adj (advice or assisted or enrich* or intervention* or program* or support)).ti,ab,kf,hw.
2. ((fortif* or supplement*) adj3 (protein or carbohydrate or fat or energy or calorie*)).ti,ab,kf.
3. ((fortif* or formula or formulated or supplement* or therapeutic*) adj (diet* or feed* or fed or food* or meal? or nutriti* or milk)).ti,ab,kf.
4. ((fortif* or supplement*) adj (calcium or phosph* or iron or iodine or magnesium or zinc or vitamin* or mineral*)).ti,ab,kf,hw.
5. or/1-4

Embase Ovid

1 diet supplementation/
2 diet therapy/
3 carbohydrate diet/
4 fat intake/
5 protein intake/
6 caloric intake/
7 dietary intake/
8 food availability/
9 nutrition/
10 ((diet$ or food$ or feed or feeding or meal$ or nutrition$ or nutrient$) adj3 (additional or extra or supplement$)).tw.
11 (therapeutic$ adj3 (food$ or feeding)).tw.
12 (therapeutic$ adj3 diet$).tw.
13 ((ready- to-use adj3 food$) or RUTF$1 or RTUF$1 or RUF$1).tw.
14 ((food or feeding) adj3 (intervention$ or program$)).tw.
15 (food secur$ or food insecur$ or food in-secur$).tw.
16 ((nutrient$ or nutrition$) adj3 (intervention$ or program$)).tw.
17 ((fortif* or special$ or functional$ or formulat$) adj3 food$).tw.
18 or/1-17
19 "systematic review"/
20 "systematic review (topic)"/
21 (systematic adj (review$1 or overview$1)).tw.
22 meta analysis/
23 meta analy$.tw.
24 metaanaly$.tw.
25 cochrane.ab.
26 embase.ab.
27 (psychlit or psyclit).ab.
28 (psychinfo or psycinfo).ab.

29 (cinahl or cinhal).ab.
30 science citation index.ab.
31 web of science.ab.
32 manual search$.ab.
33 (hand-search$ or handsearch$).ab.
34 relevant journals.ab.
35 reference list$.ab.
36 bibliograph$.ab.
37 or/19-36
38 "randomized controlled trial (topic)"/
39 review/
40 (selection criteria or data extraction).ab.
41 39 and 40
42 37 or 38 or 41
43 letter.pt.
44 editorial.pt. (431095)
45 note.pt. (562132)
46 or/43-45 (1814268)
47 exp animals/ or exp invertebrate/ or animal experiment/ or animal model/ or animal tissue/ or animal cell/ or nonhuman/
48 human/ or human cell/
49 47 and 48
50 47 not 49
51 46 or 50
52 18 and 42
53 52 not 51

Database of Abstracts of Reviews of Effects (DARE), part of the Cochrane Library

#1 MeSH descriptor: [Dietary Supplements] this term only
#2 MeSH descriptor: [Dietary Proteins] this term only
#3 MeSH descriptor: [Dietary Fats] 1 tree(s) exploded
#4 MeSH descriptor: [Energy Intake] this term only
#5 MeSH descriptor: [Nutrition Therapy] explode all trees
#6 Any MeSH descriptor with qualifier(s): [Diet therapy - DH]
#7 ((diet* or food* or feed or feeding or meal* or nutrition* or nutrient*) near/3 (additional or extra or supplement*)):ti,ab
#8 MeSH descriptor: [Food, Fortified] this term only
#9 MeSH descriptor: [Foods, Specialized] this term only
#10 MeSH descriptor: [Functional Food] this term only
#11 ((fortif* or special* or functional* or formulat*) near/3 food*):ti,ab
#12 (therapeutic* near/3 (diet* or food* or feeding)):ti,ab
#13 ((ready next to next use near/3 food*) or RUTF* or RTUF* or RUF*):ti,ab
#14 MeSH descriptor: [Food, Formulated] this term only
#15 ((food or feeding) near/3 (intervention* or program*))
#16 (food next secur* or food next insecur* or food next in-secur*):ti,ab
#17 ((nutrient* or nutrition*) near/3 (intervention* or program*)):ti,ab
#18 MeSH descriptor: [Dietary Carbohydrates] this term only
#19 #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 or #16 or #17 or #18

Health Technology Assessment Database (HTA), part of the Cochrane Library

#1 MeSH descriptor: [Dietary Supplements] this term only
#2 MeSH descriptor: [Dietary Proteins] this term only
#3 MeSH descriptor: [Dietary Fats] 1 tree(s) exploded
#4 MeSH descriptor: [Energy Intake] this term only
#5 MeSH descriptor: [Nutrition Therapy] explode all trees
#6 Any MeSH descriptor with qualifier(s): [Diet therapy - DH]
#7 ((diet* or food* or feed or feeding or meal* or nutrition* or nutrient*) near/3 (additional or extra or supplement*)):ti,ab
#8 MeSH descriptor: [Food, Fortified] this term only
#9 MeSH descriptor: [Foods, Specialized] this term only
#10 MeSH descriptor: [Functional Food] this term only
#11 ((fortif* or special* or functional* or formulat*) near/3 food*):ti,ab
#12 (therapeutic* near/3 (diet* or food* or feeding)):ti,ab
#13 ((ready next to next use near/3 food*) or RUTF* or RTUF* or RUF*):ti,ab

#14 MeSH descriptor: [Food, Formulated] this term only
#15 ((food or feeding) near/3 (intervention* or program*))
#16 (food next secur* or food next insecur* or food next in-secur*):ti,ab
#17 ((nutrient* or nutrition*) near/3 (intervention* or program*)):ti,ab
#18 MeSH descriptor: [Dietary Carbohydrates] this term only
#19 #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 or #16 or #17 or #18

Campbell Collaboration Online Library of Systematic Reviews (www.campbellcollaboration.org/library.html)

Individual searches were run for each of the following search terms:

TITLE: (food* or feed* or nutrition* or malnutrition or malnourish* or undernourish* or diet* or nutrient* or meal*)

OR

KEYWORD: (food or foods or feeding or nutrition or nutritional or nutrients

Virtual Health Library (bvsalud.org/en/)

tw:((((diet* OR food* OR feed OR feeding OR meal* OR nutrient* OR nutrition*) AND (additional OR extra OR supplement* OR fortif* OR special* OR functional* OR formulat* OR intervention* OR program* OR therap*)) OR (food secur* OR food insecur* OR rutf* OR rtuf* OR ruf*))) AND (instance:"regional") AND (db:("LILACS" OR "WHOLIS" OR "IBECS" OR "REPIDISCA" OR "PAHO" OR "MedCarib" OR "LIS" OR "CUMED" OR "SES-SP" OR "BDENF") AND type_of_study:("systematic_reviews" OR "health_economic_evaluation" OR "health_technology_assessment" OR "evidence_synthesis"))

Database of Promoting Health Effectiveness Reviews (DoPHER; eppi.ioe.ac.uk/webdatabases/Search.aspx)

1. Freetext: “supplementary food*”
2. TI:”supplement*”
3. TI: feeding
4. TI: “nutrition*”
5. TI: “nutrient*”)
6. Freetext: malnourished
7. Freetext: undernourished or “under nourished”
8. TI: “meal*”
9. TI: (”diet*” and “intervention*”)
10. Freetext: “fortifi*”
11. Freetext: RUTF
12. Freetext: RTUF
13. Freetext: RUF
14. or/1-13,

3ie Database of Systematic Reviews (www.3ieimpact.org/en/evidence/systematic-reviews/)

The search was limited to systematic reviews. The following search terms were input individually. Relevant records were selected before being added to the EndNote library.

Food ; Feeding ; Nutrition ; Meals ; Malnourished ; Undernourished ; RUTF; RTUF; RUF

PROSPERO (www.crd.york.ac.uk/prospero/search.asp)

The following search strings were combined using OR.

1. ((diet* OR food* OR feed OR feeding OR meal* OR nutrient* OR nutrition*) AND (additional OR advice OR enrich* OR extra OR supplement* OR fortif* OR special* OR functional* OR formulat* OR intervention* OR program* OR support* OR therap*)):TI
2. ((fortif* or formula or formulated or supplement* or therapeutic*) and (diet* or feed* or fed or food* or meal? or nutriti* or milk)):TI
3. ((fortif* or supplement*) adj (calcium or phosph* or iron or iodine or magnesium or zinc or vitamin* or mineral*)):TI ((supplement* or fortifi*) and (diet* or food* or meal*)):TI
4. (food secur* or food insecure* or food in-secur*):TI
5. (malnourish* or under nourish* or undernourish*):TI,
6. INTERVENTION = ((supplement* or fortifi*) and (diet* or food* or meal*))
7. MeSH DESCRIPTOR NUTRITIONAL SUPPORT
8. MeSH DESCRIPTOR DIETARY SUPPLEMENTS
9. MeSH DESCRIPTOR NUTRITION THERAPY
10. MeSH DESCRIPTOR DIET THERAPY
11. MeSH DESCRIPTOR FOOD, FORTIFIED

12. OR/1-11

Appendix 2. Protocols for future assessment and possible inclusion in this review

Reference	Protocol title
Ashman 2014	The effectiveness of nutrition interventions for pregnant indigenous women: a systematic review
Burns 2010	Community level interventions to improve food security in developed countries
Durao 2015	Community-level interventions for improving access to food in low- and middle-income countries
Goudet 2015	Nutritional interventions for preventing stunting in children (0 to 5 years) living in urban slums in low and middle-income countries (LMIC)
Grobler 2014	Effects of oral supplementary foods or nutrition counselling or both on infants and children (6 – 59m) with severe or moderate under nutrition on linear growth, becoming overweight or obese, developing risk factors for cardiovascular disease or diabetes mellitus, and developing cardiovascular disease or diabetes mellitus later in life
Gwynn 2015	Dietary interventions to improve nutritional status and health outcomes in Aboriginal and Torres Strait Islander peoples in Australia: a systematic review
Oluwaniyi 2015	Impact of lipid based nutrient supplements for prevention of childhood malnutrition: a systematic review
Soboka 2015	The effectiveness of counselling, material support and/or nutritional supplementation on improving adherence to anti-retroviral therapy and clinical outcomes among HIV patients: a systematic review of quantitative evidence protocol
Thorley 2015	Interventions for preventing or treating malnutrition in problem drinkers who are homeless or vulnerably housed: protocol for a systematic review

Appendix 3. Reviews awaiting assessment

Reference	Review title
D'Souza 2005	The effectiveness of food support programmes for low-income women in developed country settings: a systematic review of the evidence
Gera 2016	Lipid-based nutrient supplements for the treatment of 6- to 59-month-old children with moderate acute malnutrition (Only protocol available at the time of the last search; subsequently published as Gera 2017)
Milne 2005	Oral protein and energy supplementation in older people: a systematic review of randomised trials

WHAT'S NEW

Date	Event	Description
6 November 2018	Amended	Amendments to Acknowledgements, Declarations of interests, and Sources of support sections.

HISTORY

Protocol first published: Issue 6, 2013
Review first published: Issue 11, 2018

Date	Event	Description
2 November 2018	Amended	Remarked for publication for immediate open access.

CONTRIBUTIONS OF AUTHORS

JV, MHMcL, PG: conception and design of the protocol, writing of the overview.

NM: screening, data extraction and writing of the overview.

PG: is the guarantor of the overview.

DECLARATIONS OF INTEREST

JV was supported by the Effective Health Care Research Consortium; this support was in the form of grants from the Consortium. This Consortium is funded by UK aid from the UK Government for the benefit of LMIC (Grant: 5242).

MHMcL was previously hired as a Consultant by Synergos Institute to provide technical advice and facilitation services to a private sector/government partnership working on extending a CMAM (Community-based Management of Acute Malnutrition) programme in Nigeria.

NM previously worked for Enhanced Reviews Ltd., a company that conducts systematic reviews, mostly for the public sector. NM was employed by Cochrane Response, an evidence services unit operated by Cochrane. Cochrane Response was contracted by the Effective Health Care Research Consortium (Grant: 5242) to work on this review.

PG is the Director of the Effective Health Care Research Consortium, a Department for International Development (DFID) UK funded research programme to support people carrying out Cochrane Reviews for the benefit of the poor in LMIC (Grant: 5242). DFID had no part in writing this review. PG is the Co-ordinating Editor of the Cochrane Infectious Diseases Group.

Disclaimer: the views expressed in this publication are those of the authors and do not necessarily reflect UK government policy.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- Department for International Development, UK.

  Grant: 5242

INDEX TERMS

Medical Subject Headings (MeSH)

*Food Supply; *Systematic Reviews as Topic; *Vulnerable Populations; Age Factors; Alzheimer Disease [diet therapy]; Child Development; Dietary Proteins [administration & dosage]; Energy Intake; HIV Infections [diet therapy] [mortality]; Malnutrition [*diet therapy] [mortality]; Micronutrients; Nutritional Physiological Phenomena; Pregnancy Complications [diet therapy]; Stillbirth; Tuberculosis, Pulmonary [diet therapy] [mortality]

MeSH check words

Adolescent; Adult; Aged; Child; Child, Preschool; Female; Humans; Infant; Male; Middle Aged; Pregnancy