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The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

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[Intervention Review]

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries

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ABSTRACT

Background

Undernutrition in the critical first 1000 days of life is the most common form of childhood malnutrition, and a significant problem in low- and middle-income countries (LMICs). The effects of undernutrition in children aged under five years are wide-ranging and include increased susceptibility to and severity of infections; impaired physical and cognitive development, which diminishes school and work performance later in life; and death. Growth monitoring and promotion (GMP) is a complex intervention that comprises regular measurement and charting of growth combined with promotion activities. Policymakers, particularly in international aid agencies, have differing and changeable interpretations and perceptions of the purpose of GMP. The effectiveness of GMP as an approach to preventing malnutrition remains a subject of debate, particularly regarding the added value of growth monitoring compared with promotion alone.

Objectives

To evaluate the effectiveness of child growth monitoring and promotion for identifying and addressing faltering growth, improving infant and child feeding practices, and promoting contact with and use of health services in children under five years of age in low- and middle-income countries.

Search methods

We used standard, extensive Cochrane search methods. The latest search date was 3 November 2022.

Selection criteria

We included randomised controlled trials (RCTs), cohort studies, and controlled before-after studies that compared GMP with standard care or nutrition education alone in non-hospitalised children aged under five years.

Data collection and analysis

We used standard Cochrane methods to conduct a narrative synthesis. Our primary outcomes were anthropometric indicators, infant and child feeding practices, and health service usage. Secondary outcomes were frequency and severity of childhood illnesses, and mortality. We used GRADE to assess the certainty of evidence for each primary outcome.

Main results

We included six studies reported in eight publications. We grouped the findings according to intervention.

Community-based growth monitoring and promotion (without supplementary feeding) versus standard care

We are unsure if GMP compared to standard care improves infant and child feeding practices, as measured at 24 months by the proportion of infants who have fluids other than breast milk introduced early (49.7% versus 70.5%; 1 study; 4296 observations; very low-certainty evidence). We are unsure if GMP improves health service usage, as measured at 24 months by the proportion of children who receive vitamin A (72.5% versus 62.9%; 1 study; 4296 observations; very low-certainty evidence) and the proportion of children who receive deworming (29.2% versus 14.6%; 1 study; 4296 observations; very low-certainty evidence). No studies reported selected anthropometric indicators (weight-for-age z-score or height-for-age z-score) at 12 or 24 months, infant and child feeding practices at 12 months, or health service usage at 12 months.

Community-based growth monitoring and promotion (with supplementary feeding) versus standard care

Two studies (with 569 participants) reported the mean weight-for-age z-score at 12 months, providing very low-certainty evidence: in one study, there was little or no difference between GMP and standard care (mean difference (MD) -0.07 , 95% confidence interval (CI) -0.19 to 0.06); in the other study, mean weight-for-age z-score worsened in both groups, but we were unable to calculate a relative effect. GMP versus standard care may make little to no difference to the mean height-for-age z-score at 12 months (MD -0.15 , 95% CI -0.34 to 0.04 ; 1 study, 337 participants; low-certainty evidence). Two studies (with 564 participants) reported a range of outcome measures related to infant and child feeding practices at 12 months, showing little or no difference between the groups (very low-certainty evidence). No studies reported health service usage at 12 or 24 months, feeding practices at 24 months, or selected anthropometric indicators at 24 months.

Authors' conclusions

There is limited uncertain evidence on the effectiveness of GMP for identifying and addressing faltering growth, improving infant and child feeding practices, and promoting contact with and use of health services in children aged under five years in LMICs. Future studies should explore the reasons for the apparent limited impact of GMP on key child health indicators. Reporting of GMP interventions and important outcomes must be transparent and consistent.

PLAIN LANGUAGE SUMMARY

The impact of growth monitoring and promotion in children under five years of age in low- and middle-income countries

What is growth monitoring and promotion?

Many children under five years of age who live in low- and middle-income countries are not receiving adequate nutrition. This can lead to increased illnesses, impaired mental development (which diminishes school and work performance later in life) and death. Growth monitoring and promotion (GMP) is a complex intervention that involves measuring a child's growth at regular intervals and plotting the measurements on a chart, combined with different nutrition promotion activities. However, there are no standard guidelines explaining how to implement GMP or how to design the promotion activities, and even the purpose of GMP remains unclear.

What did we want to find out?

We aimed to assess the effectiveness of child GMP for identifying and addressing slow growth, improving infant and child feeding practices, and promoting contact with and use of health services in children under five years of age in low- and middle-income countries.

What did we do?

We searched different databases that contain both published and unpublished results. We included randomised controlled trials (where investigators randomly allocate participants to different treatment groups); controlled before-after studies (where investigators measure results in different treatment groups before and after the intervention to see whether they have changed); and cohort studies (where investigators monitor people with and without a particular exposure over time; in this case the exposure would be GMP). We combined the results narratively to provide an overview of the findings.

What did we find?

We included six studies. They were conducted in resource-poor rural settings with high levels of malnutrition. We grouped the findings according to the type of intervention, which varied across studies.

Key results

There is limited and uncertain evidence on the effectiveness of GMP.

GMP programmes delivered in community health centres and meeting spaces compared to standard care

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2

Three studies assessed the impact of a GMP programme delivered in community health centres and meeting spaces compared to standard care.

When looking at infant and child feeding practices at 24 months, we are unsure if GMP has any impact on the percentage of infants who had fluids other than breast milk introduced early (this was the case for 49.7% of infants in the GMP group and 70.5% of infants in the control group in one study). When looking at health service usage at 24 months, we are unsure if GMP has any impact on the percentage of children who receive vitamin A (72.5% of the GMP group and 62.9% of the control group in one study), or on the percentage of children who receive deworming (29.2% of the GMP group and 14.6% of the control group in one study). No studies reported child growth at 12 or 24 months, infant and child feeding practices at 12 months, or health service usage at 12 months.

GMP programmes delivered in community health centres and meeting spaces, providing extra food to children, compared to standard care

Two studies assessed the impact of a GMP programme delivered in community health centres and meeting spaces, providing extra food to children, compared to standard care.

When looking at infant and child growth at 12 months, we are unsure if GMP makes any difference to average weight-for-age (one study), and GMP may make little or no difference to the average height-for-age (one study). Two studies reported a range of outcome measures related to infant and child feeding practices at 12 months, and we are unsure if GMP had any impact. No studies reported health service usage at 12 or 24 months, feeding practices at 24 months, or infant and child growth at 24 months.

What are the limitations of the evidence?

We are not confident in the evidence because we have serious concerns about the reliability of the reported results. This is because in all studies, it is likely that the participants were aware of which treatment their village had been assigned to before they chose to participate. Findings should be interpreted with caution.

How up to date is this evidence?

The evidence is current to 3 November 2022.

SUMMARY OF FINDINGS

Summary of findings 1. Community-based growth monitoring and promotion (no supplementary feeding) versus standard care

Intervention: GMP (nutrition education without supplementary feeding)

Comparison: standard care only

Population and setting: children under 3 years old, in areas with high levels of malnutrition in rural Senegal

Outcome		Absolute effects	Relative effect (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Comments
Mean weight-for-age z-score	12 months postintervention	No data				
	24 months postintervention	No data				
Mean height-for-age z-score	12 months postintervention	No data				
	24 months postintervention	No data				
Infant and child feeding practices	12 months postintervention	No data				
	24 months postintervention	Early introduction of fluids other than breast milk reduced in both groups (77.5% to 49.7% in the intervention group vs 79.6% to 70.5% in the control group)	—	220 clusters; 4296 observations in 2004 vs 6144 observations in 2006 (1 RCT) ^a	⊕○○○ Very low^b	The evidence is very uncertain about the effects of GMP on feeding practices at 24 months.
Health service usage	12 months postintervention	No data				
	24 months postintervention	Vitamin A supplementation improved in both groups (from 64.0% to 72.5% in the intervention group vs from 57.9% to 62.9% in the control group); and provision of deworming medicine improved in both groups (from 7.0% to	—	220 clusters; 4296 observations in 2004 vs 6144 observations in 2006 (1 RCT) ^a	⊕○○○ Very low^b	The evidence is very uncertain about the effects of GMP on health service usage at 24 months.

29.2% in the intervention group vs from 7.6% to 14.6% in the control group).

CI: confidence interval; **GMP:** growth monitoring and promotion; **RCT:** randomised controlled trial.

^a Trial did not report the number of participants for this outcome; the total number of observations was available.

^b Downgraded one level for high risk of bias, one level for imprecision (no relative effect could be calculated), and one level for indirectness (only one included study, conducted in rural Senegal; results may apply only to rural contexts in Western Africa).

Summary of findings 2. Community-based growth monitoring and promotion (with supplementary feeding) versus standard care

Intervention: GMP (nutrition education with supplementary feeding)

Comparison: standard care only

Population and setting: children under 3 years old, in poor rural areas of Vietnam with high levels of malnutrition, and rural areas of Zambia with high levels of malnutrition

Outcome	Absolute effects	Relative effect (95% CI)	Number of participants (studies)	Certainty of the evidence (GRADE)	Comments	
Mean weight-for-age z-score	12 months postintervention	In 1 RCT, there was little or no difference in WAZ between the intervention and control groups (MD -0.07, 95% CI -0.19 to 0.06). In another RCT, WAZ worsened in both groups, but it was not possible to calculate a relative effect.	—	569 participants (2 RCTs)	⊕⊕⊕⊕ Very low^a	The evidence is very uncertain about the effects of GMP on WAZ at 12 months.
	24 months postintervention	No data				
Mean height-for-age z-score	12 months postintervention	There was little or no difference in HAZ between the intervention and control groups (MD -0.15, 95% CI -0.34 to 0.04).	—	337 participants (1 RCT)	⊕⊕⊕⊕ Low^b	GMP versus standard care may make little to no difference to mean HAZ at 12 months.
	24 months postintervention	No data				
Infant and child feeding practices	12 months postintervention	2 studies reported a range of outcome measures related to food consumption and breastfeeding, showing little or no difference between groups.	—	564 participants (2 RCTs)	⊕⊕⊕⊕ Very low^c	The evidence is very uncertain about the effects of GMP on infant and

child feeding practices
at 12 months.

	24 months post-intervention	No data
Health service usage	12 months post-intervention	No data
	24 months post-intervention	No data

CI: confidence interval; **GMP:** growth monitoring and promotion; **HAZ:** height-for-age z-score; **RCT:** randomised controlled trial; **WAZ:** weight-for-age z-score.

^a Downgraded one level for high risk of bias, one level for imprecision (one study not adjusted for clustering; no relative effect could be calculated), and one level for indirectness (two included studies were conducted in Vietnam and Zambia; findings may only be applicable to rural contexts in Asia and Southern Africa).

^b Downgraded one level for high risk of bias and one level for indirectness (only one included study, conducted in Zambia; findings may only be applicable to rural contexts in Southern Africa).

^c Downgraded one level for high risk of bias, one level for imprecision (effect estimates from both studies not adjusted for clustering), one level for indirectness (two included studies were conducted in Vietnam and Zambia; findings may only be applicable to rural contexts in Asia and Southern Africa), and one level for inconsistency (heterogeneity in direction of effect).

BACKGROUND

Description of the condition

Undernutrition in the critical first 1000 days of life is the most common form of childhood malnutrition, particularly in low-income countries and in poor households in middle-income countries (Victora 2021). Globally, 148 million (or one in five) children under five years old are stunted, which means their height-for-age is more than two standard deviations (SDs) below the World Health Organization (WHO) child growth standards median (UNICEF 2023; WHO 2020a). Meanwhile, 45 million children (7%) are wasted, which means their weight-for-height is more than two SDs below the WHO child growth standards median (UNICEF 2023; WHO 2020a). An estimated 80% of stunted children and 75% of wasted children reside in South Asia and sub-Saharan Africa alone (UNICEF 2023). Childhood undernutrition results from multiple factors, including the following (UNICEF 2020).

- Preconceptual, prenatal, and postnatal deficiencies in protein, energy, and micronutrients
- Recurrent infections
- Poor infant feeding practices
- Food insecurity
- Inadequate access to health services, water, sanitation, and hygiene in the context of poverty

The wide-ranging effects of undernutrition in children aged under five years include increased susceptibility to and severity of infections; impaired physical and cognitive development, which diminishes school and work performance later in life; and death (Martins 2011). Undernourished children who survive to adulthood have an increased risk of cardiovascular and metabolic diseases. Undernutrition causes nearly half of all deaths in children aged under five years, which translates to three million avoidable deaths per year (WHO 2020b). Therefore, optimising child growth and nutrition is a key strategy for reducing undernutrition in this age group as part of the United Nations (UN) Sustainable Development Goal 2, and for addressing the under-five mortality rate as part of Sustainable Development Goal 3 (UN 2020).

Description of the intervention

There is an urgent need for appropriate programmes and policies that support the prevention and treatment of undernutrition in children who are not reaching their growth milestones. Growth monitoring and promotion (GMP) comprises regular charting of a child's growth in combination with follow-up activities. WHO recommends GMP as a key component of child health and nutrition strategies (WHO 2017). Currently, 39 countries have a designated GMP programme, typically delivered alongside routine immunisations (WHO 2017). In addition, a growing school of thought suggests that GMP may be an appropriate intervention for reducing childhood overnutrition and obesity. This is relevant because an estimated two-thirds of LMICs currently bear the double burden of under- and overnutrition (Popkin 2020). However, overnutrition is rarely the focus of GMP programmes or of the studies designed to assess their effectiveness. Moreover, the important health consequences of overnutrition tend to occur in adulthood. Consequently, this review will focus on childhood undernutrition, which currently represents a much greater burden

in LMICs. For the purpose of this review, we used the World Bank classification of LMICs (World Bank 2020).

Throughout this review, the term GMP refers to the following four steps (Mangasaryan 2011).

- Measurement: regular recording of a child's weight and sometimes their height, head measurements, or mid-upper-arm circumference during visits to healthcare providers over at least three months
- Assessment: conversion of these measures to weight-for-age, height-for-age, or weight-for-height; and plotting weight against age, height against age, or weight against height on a growth chart
- Analysis: interpretation of the child's growth pattern against the reference population
- Action related to the analysis, such as counselling, providing nutritional supplements, or examining the child for illness

In the 1960s, Dr David Morley introduced the concept of growth monitoring, referring to the use of anthropometric indicators to monitor child growth in LMICs (Morley 1973). Different types of growth charts emerged in the subsequent years. In 1978, the National Center for Health Statistics (NCHS) developed a growth chart based on reference data from healthy children in the USA; WHO adapted this chart to a format that reflected the majority preference of 55 countries (de Onis 1996; WHO 1978). Multi-country data inform the current WHO child growth standards and provide more representative standardised growth references for children aged under five years (WHO/UNICEF 2009). Policymakers regarded the development of standardised charts to be a milestone of growth monitoring development (Mangasaryan 2011). In the early 1980s, the UN Children's Emergency Fund (UNICEF) developed a number of primary healthcare strategies known collectively as the child survival and development revolution. One such strategy (labelled GOBI-FFF) targeted growth monitoring, oral rehydration therapy, breastfeeding promotion, immunisation, food supplementation, family planning, and female education (Claeson 2000).

Policymakers introduced the concept of GMP in the mid-1980s. GMP emphasises the importance of implementing actions (i.e. promotion, including nutrition counselling, provision of supplements, early disease detection, and treatment) in response to the results of monitoring, to improve individual child nutritional and health outcomes, and reduce child deaths (Caulfield 2006; Mason 2006; Pearson 1995). GMP is a key component of UNICEF's overall nutrition strategy (UNICEF 2007), and a core activity in most community-based health and nutrition programmes (Mason 2006).

In 1996, WHO and UNICEF promoted a broad child-saving strategy called Integrated Management of Childhood Illness (IMCI), and policymakers in more than 100 countries responded by integrating GMP into practice guidelines for frontline healthcare workers (WHO/UNICEF 2009). IMCI recommends assessing child nutrition status by weight-for-age and providing counselling and follow-up services; however, recommendations for the counselling and follow-up are not clearly defined. In 2009, IMCI was renamed Integrated Management of Child Health (IMCH) for the WHO Eastern Mediterranean region to highlight the health promotion component of the strategy (WHO EMRO 2021).

In the 1990s, researchers began to call into question the effectiveness of GMP. The coverage was relatively low, and the implementation was considered weak, with poor linkage between GMP activities due to factors such as poor organisational structure of child health programmes, staff shortages, and inadequate staff training and monitoring (Ashworth 2008; Gerein 1991). Studies found that healthcare centres were not making effective use of a tool called the Road to Health Card, which was designed to monitor growth and vaccination status over several decades (Tarwa 2007). Some centres used GMP incorrectly to identify childhood acute malnutrition rather than as a strategy to prevent growth faltering in the first year of life, and concluded that early interventions would be the most effective (Shrimpton 2001); however, the study authors enrolled many children after infancy (Mangasaryan 2011). To date, the effectiveness of GMP remains unclear.

How the intervention might work

Growth monitoring is not an intervention as such; weighing a child can only lead to health improvements when associated with activities to address signs of faltering before malnutrition occurs. GMP was created to make the concept of this 'package' more explicit. However, whilst WHO guidelines recommend GMP (WHO 2017), no standard guideline explains appropriate actions to correct faltering (i.e. promotional activities).

GMP is a complex intervention that includes a range of possible activities and outcomes. As a result, policymakers, particularly in international aid agencies, have differing and changeable interpretations and perceptions of the purpose of GMP. Some consider that the main aim is to reduce mortality or increase immunisation uptake, while others see GMP as a vehicle for nutrition education. Furthermore, there are inconsistent definitions of GMP and different understandings of the range of follow-up actions or interventions that constitute promotion (Mangasaryan 2011). Promotion components vary, and many programmes provide promotion activities and services that are unrelated to the growth monitoring results, including

immunisations and curative healthcare services (Mangasaryan 2011). This lack of understanding of the need for a combined approach may explain the discourse surrounding the benefits of GMP. Therefore, we intended to investigate whether the complete GMP package was effective for improving health and nutrition indicators in children under five years of age, with a view to informing future recommendations. Due to the complexity of the intervention, the monitoring and promotion components are interdependent. Whilst we acknowledge that promotional activities affect outcomes directly, we argue that monitoring is a crucial part of the intervention because it enables healthcare providers to set goals for the promotion component.

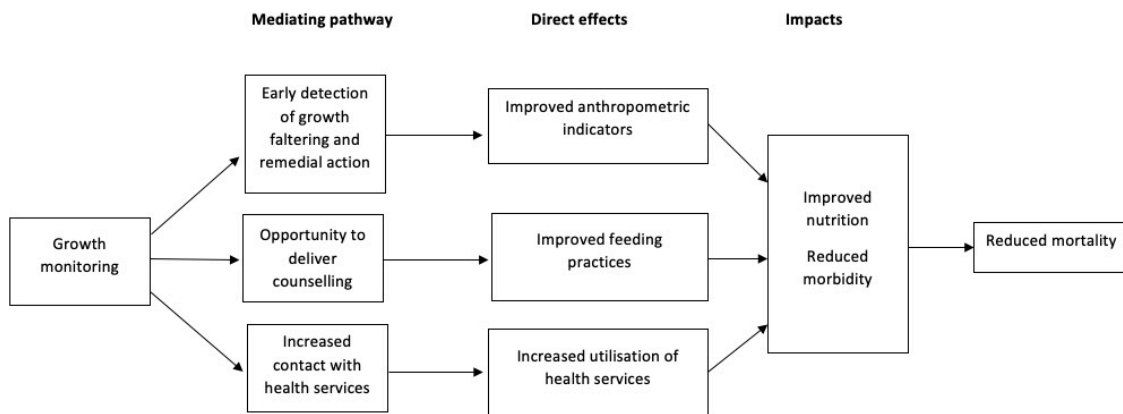
The beneficial effects of GMP, as reported in the literature, can be divided into the following three areas.

- It provides an opportunity to identify faltering growth and take medical remedial action.
- It provides an opportunity to discuss nutrition and promote optimal infant/child feeding and care practices.
- Although not strictly related to nutrition, GMP can promote the uptake of additional childhood interventions (e.g. vaccinations, deworming) by increasing contact with health services.

Studies have described these benefits since 1988 (Lofti 1988). Although improved health outcomes in people receiving GMP may be due to a combination of these three mechanisms, we find it helpful to conceptualise them as separate components to define relevant outcomes of the intervention.

Some experts consider that GMP also includes strategies that try to address the underlying socio-economic factors associated with undernutrition at the population level (e.g. community mobilisation; Ashworth 2008). Another possible benefit of the intervention is improved self-esteem in mothers who are able to seek guidance and receive positive feedback on their child's health (Ashworth 2008). However, as quantitative assessment of these items is problematic, we decided not to include them in our logic model (Figure 1).

Figure 1. Logic model: potential pathways of impact from growth monitoring and promotion.



Early detection of growth faltering and remedial action

Through GMP, health workers can track children's growth to identify those who are faltering or at risk of faltering, and intervene at

an earlier stage. This may lead to supplementary activities such as home visits, referrals to specialist health facilities, provision of nutritional supplements, or detection and treatment of common

diseases (such as anaemia, diarrhoea, and respiratory infection). It is possible to detect such benefits in individually randomised or cluster-randomised trials.

Delivery of nutrition counselling

Nutrition counselling may take the form of tailored nutrition advice. With growth information, health workers can tailor nutrition promotion and guidance to the individual's needs and underlying problems. However, the measuring process may also provide an opportunity to discuss the importance of nutrition and the relationship between nutrition and health. The interaction between healthcare workers and mothers is expected to raise maternal awareness and knowledge of good childcare practices, leading to changes in health behaviour (Mangasaryan 2011). However, in practice, the quality of nutrition counselling is variable. One study in Ghana suggested that healthcare workers often do not provide feedback on the child's growth and have limited time to go into any detail with their clients (Nsiah-Asamoah 2019). In addition, knowledge uptake depends on the relationship between healthcare workers and mothers, as well as on socio-economic factors.

Increased contact with health workers

Regular GMP increases the frequency of contact and thus strengthens the relationship between mothers and health services or community health teams. This may result in increased use of preventive and curative health services such as vaccinations, screening, deworming, and vitamin A supplementation at the health facility level. However, health workers can also deliver GMP as part of a community outreach programme that targets populations with limited access to primary health centres due to socio-economic or physical barriers. In this case, people who receive GMP are less likely to seek out preventive or curative health services.

Why it is important to do this review

Since the 1970s, opinions on GMP have ranged from untempered enthusiasm to doubts about whether it has any benefit (Bentley 1993; Chopra 1997; Hossain 2005; Morley 1973; Nabarro 1988; Shekar 1992). The effectiveness of GMP as an approach to preventing malnutrition and, more specifically, the added value of growth monitoring in a promotion intervention, remains a subject of debate. Some field studies found that introducing GMP in areas where malnutrition is common dramatically reduced mortality (Alderman 1978), whilst other publications describe national programmes that did not improve child growth (Hossain 2005). As child health clinics all over the world dedicate considerable time to GMP, it is crucial to measure its beneficial effects. Even when delivered as part of a care package, GMP services have resource implications in terms of healthcare worker and parent time (Fiedler 2003; Reid 1984), costs of equipment (e.g. scales, charts, manuals), training and supervision, ensuring follow-up, and actions to correct faltering growth (Mason 2006). Thus, GMP has considerable direct costs, opportunity costs, and knock-on costs, especially for facility-based programmes (Fiedler 2003).

A narrative review by Ashworth and colleagues analysed the impact of GMP programmes on child nutrition and other intermediate outcomes (Ashworth 2008). Whilst the overall message was supportive of GMP, it is unclear whether the authors' prior beliefs about the intervention may have influenced

their conclusions. They included no systematic appraisal of the risk of bias in the studies or the quality of the evidence. In particular, most of the evidence was from programmes carried out in uncontrolled, natural conditions (including cross-sectional comparisons and pre-post comparisons with or without control groups). Moreover, half of the evaluations investigated the effectiveness of GMP in comprehensive, community-based programmes without distinguishing the impact of different programme components from the impact of GMP (Mangasaryan 2011). Other activities may have had confounding effects on the analysis. For example, regular contact with health workers and socialising between mothers at clinics, rather than GMP itself, could lead to health improvements in mothers and children.

This Cochrane Review is intended to supersede the published Cochrane Review on growth monitoring in children (Panpanich 1999). Parts of the [Background](#) and [Methods](#) have been adapted and updated from the 2012 review protocol (Liu 2012). These publications adopted a narrow, medicalised view of GMP as a tool for detecting malnutrition to allow for targeted treatment. In reality, GMP is a complex intervention with several possible outcomes and intermediate activities. Ashworth 2008 built on this concept and included a logic model to illustrate the potential holistic benefits of GMP programmes. We followed this line of thinking when developing our logic model (Figure 1).

OBJECTIVES

To evaluate the effectiveness of child growth monitoring and promotion for identifying and addressing faltering growth, improving infant and child feeding practices, and promoting contact with and use of health services in non-hospitalised children under five years of age in low- and middle-income countries.

METHODS

Criteria for considering studies for this review

Types of studies

We included randomised controlled trials (RCTs) and quasi-RCTs (trials that allocate participants to trial arms using a method that is not truly random, e.g. alternation or date of birth). We considered trials with individual and cluster allocation. We also included non-randomised study designs (controlled before-after studies and cohort studies).

Types of participants

We included non-hospitalised children aged under five years residing in LMICs (according to the [World Bank 2020](#) classification) and their caregivers. Severely malnourished children presenting to routine maternal and child health services would likely be referred to nutrition rehabilitation inpatient or outpatient programmes, so these children were ineligible for inclusion in the review. GMP is designed to identify children with faltering growth and enable early intervention to prevent progression to malnutrition and associated conditions such as stunting and wasting. Therefore, studies conducted in hospital settings and recruiting only malnourished children were also ineligible.

Types of interventions

Experimental intervention

The intervention of interest was GMP, which comprises the following components.

- Measurement: regular recording of a child's weight and sometimes their height, head measurements, or mid-upper-arm circumference
- Assessment: conversion of these measures to weight-for-age, height-for-age, or weight-for-height; and plotting weight against age, height against age, or weight against height on a growth chart
- Analysis: interpretation of the child's growth pattern against the reference population
- Action related to the analysis (promotional activities, such as counselling, providing nutritional supplements, or examining the child for illness; [Mangasaryan 2011](#)) provided to all children or only those with faltering growth

Growth monitoring (i.e. regular charting of a child's growth) requires at least three readings over at least three months to establish a growth curve, so we excluded studies that assessed growth based on one or two readings or readings taken over a shorter period of time. Studies had to record follow-up outcome measures until at least six months after the intervention.

We included studies that investigated GMP delivered through routine child and maternal health services or through community-based programmes.

Comparator interventions

- Growth monitoring without health promotion
- General health promotion without growth monitoring
- No growth monitoring and no health promotion activity (i.e. standard care).

Types of outcome measures

Primary outcomes

The following three primary outcomes correspond to the three main proposed benefits of GMP (identifying and addressing faltering growth, improving infant and child feeding practices, and promoting contact with and use of health services)

- Anthropometric indicators of nutrition (e.g. weight, height, weight-for-age, height-for-age, weight-for-height, or z-score for these measures)
- Infant and child feeding practices (improvements in children's diets and how mothers provide milk and food, documented by external observations)
- Health service usage (e.g. visit rate, vaccination rate, or delayed presentation rate)

Secondary outcomes

- Frequency and severity of childhood illnesses
- Mortality

In the logic model, we demonstrated that mortality is substantially distant from the intervention of GMP and is subject to numerous confounders ([Figure 1](#)). For this reason, mortality is an unsuitable

outcome for assessing the impact of GMP in general. However, the effect of GMP on mortality may have important implications for policymakers, so we intended to include these data to inform the recommendations of the review.

Search methods for identification of studies

Electronic searches

We searched the following databases and trial registers using the strategies reported in [Appendix 1](#).

- Cochrane Central Register of Controlled Trials Register (CENTRAL; 2022, Issue 10) in the Cochrane Library, which includes the Developmental, Psychosocial and Learning Problems Specialised Register (searched 3 November 2022)
- MEDLINE, MEDLINE In-Process and Other Non-Indexed Citations, and MEDLINE Epub Ahead of Print (Ovid; 1946 to 3 November 2022)
- Embase (Ovid; 1974 to 3 November 2022)
- CINAHL Plus (EBSCOhost; 1937 to 3 November 2022)
- Global Index Medicus, WHO (www.globalindexmedicus.net/; searched 3 November 2022)
- Web of Science Core Collection Clarivate (Science Citation Index-Expanded; Social Sciences Citation Index; Conference Proceedings Citation Index - Science; Conference Proceedings Citation Index - Social Science & Humanities; 1970 to 3 November 2022)
- Cochrane Database of Systematic Reviews (CDSR; 2021, Issue 9) in the Cochrane Library (searched 3 November 2022)
- Epistemonikos (www.epistemonikos.org/en/; searched 3 November 2022)
- ProQuest Dissertations and Theses Global (all available years; searched 3 November 2022)
- US National Institutes of Health Ongoing Trials Register ClinicalTrials.gov (clinicaltrials.gov/; searched 3 November 2022)
- WHO International Clinical Trials Registry Platform (trialsearch.who.int; searched 3 November 2022)

Searching other resources

We examined reference lists of included studies, systematic reviews, and other reviews published since the inception of GMP in the 1980s. Additionally, we searched OpenGrey (www.opengrey.eu/) for further unpublished data and the WHO Institutional Repository for Information Sharing (IRIS; apps.who.int/iris/) on 3 November 2022. We contacted individuals in the field to identify ongoing studies. We searched for retractions and corrections of included studies, and we contacted the study authors to obtain full-text records when necessary.

Data collection and analysis

Selection of studies

Two of four review authors (JT, MT, IA, LQ) independently assessed the eligibility of each article using [Covidence 2021](#), in accordance with the *Cochrane Handbook for Systematic Reviews of Interventions* ([Lefebvre 2021](#)). Initially, we screened the titles and abstracts to exclude trials that were clearly ineligible. We obtained the full-text reports of all potentially eligible studies and further assessed these for inclusion using a predesigned eligibility form based on the

inclusion criteria. We resolved different opinions about eligibility by discussion or, where necessary, by consulting a third review author. We produced a [Characteristics of excluded studies](#) table to document reasons for excluding studies at the full-text stage (i.e. studies that readers may reasonably expect to be included in the review). We produced a PRISMA flow diagram to summarise the selection process, detailing the number of studies identified in the search and subsequently excluded and included at each stage (Moher 2009). We assessed inter-rater reliability using the Kappa statistic described by Landis and Colleagues (Landis 1977), as recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2021a). We collated multiple reports of individual studies, so that the study rather than the report was the unit of interest.

Data extraction and management

Two review authors independently extracted data using a predesigned data extraction form in [Microsoft Excel 2018](#), in accordance with the *Cochrane Handbook for Systematic Reviews of Interventions* (Li 2021). The form was based on the Template for Intervention Description and Replication for population health and policy interventions (TIDieR-PHP; [Campbell 2018](#)). To pilot the form, two review authors independently extracted data from three studies (one for each eligible study design) and calculated inter-rater reliability; as this was over 80% agreement (i.e. kappa below 0.8; [Landis 1977](#)), we made no further changes and continued to extract data from the remaining studies.

Socio-economic status and access to timely and quality health care are key factors that determine whether communities access and benefit from GMP. For example, in the context of gender disempowerment, racial or ethnic discrimination and conflict leading to humanitarian crises, mothers and their children may not have equitable access to these interventions. We therefore intended to apply an equity lens, using PROGRESS (Place of residence, Race/ethnicity/culture/language, Occupation, Gender/sex, Religion, Education, Socioeconomic status, and Social capital) to guide data extraction for factors that would disadvantage one community accessing GMP over another (O'Neill 2013).

Two review authors (MT and IA) consulted a third review author (HN) to resolve any disagreements. Once the extraction process was complete, we compiled data into Review Manager Web for analysis ([RevMan Web 2023](#)). We checked all entered data for accuracy.

Assessment of risk of bias in included studies

Randomised trials

Two review authors (MT and JT) independently assessed the risk of bias for the primary outcomes of this review using the revised Cochrane risk of bias tool (RoB 2; [Sterne 2019](#)), according to the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2021b). A third review author (HN) resolved any disagreements. RoB 2 covers the following five domains.

- Bias arising from the randomisation process
- Bias due to deviations from intended interventions
- Bias due to missing outcome data
- Bias in measurement of the outcome
- Bias in selection of the reported result

For cluster-RCTs, we used the modified RoB 2 tool for cluster-randomised trials, which considers bias arising from the timing of identification or recruitment of participants, in addition to the five domains listed above ([Eldridge 2021](#)). We also followed the recommendations provided in the *Cochrane Handbook for Systematic Reviews of Interventions* to assess bias in this type of study ([Higgins 2021c](#)).

We assessed the risk of bias for outcomes measured at 12 and 24 months after the intervention, as these were the longest and also most commonly reported measurement time points in the included studies.

The included studies reported our primary outcomes using a variety of measures. For anthropometric indicators, we selected weight-for-age z-score (WAZ) and height-for-age z-score (HAZ), which we considered the most clinically relevant. For infant and child feeding practices and health service usage, no reported measure was more clinically important than any other, so we narratively summarised the available evidence in the summary of findings tables. All studies that contributed data to these summaries were eligible for risk of bias assessment.

We were interested in quantifying the effect of assignment to the interventions at baseline, regardless of whether the interventions were received as intended (the intention-to-treat (ITT) effect). To implement RoB 2, we used the RoB 2 Excel tool (available at www.riskofbias.info/welcome/rob-2-0-tool/current-version-of-rob-2). For each domain, we used the signalling questions provided by the RoB 2 tool, answering 'yes', 'probably yes', 'no', 'probably no', or 'no information'. The RoB 2 tool automatically generates a judgement regarding bias for each domain and overall, based on these responses. We also checked all judgements and amended them if necessary. Generally, the overall score is based on the least favourable assessment made for any of the domains. However, when 'some concerns' arose in multiple domains, we assigned an overall high risk of bias judgement for that outcome. Two review authors independently assessed risk of bias, resolving any disagreements by consulting a third review author (HN). The supplementary data associated with the review includes a full risk of bias table with our consensus judgement and reasoning for each domain, including answers to the signalling questions.

Non-randomised studies

We planned to assess the risk of bias of included cohort and controlled before-after studies using the Risk of Bias In Non-randomised Studies – of Interventions tool (ROBINS-I; [Sterne 2016](#)). However, no such studies provided usable data for our primary outcomes.

Measures of treatment effect

For dichotomous data, we calculated risk ratios (RRs) with 95% confidence intervals (CIs) by dividing the number of events by the number of participants when possible. It would also have been appropriate to use the odds ratio (OR); however, the RR is more commonly used, is easier for health professionals to interpret, and is less likely to lead to overestimation of effect size ([Deeks 2021](#)).

For continuous data, we calculated mean differences (MDs) with 95% CIs when studies used same scale of measurement. If studies had assessed a continuous outcome using different measures, we would have reported the standardised mean difference (SMD),

calculated by dividing the difference in means by the SD, with the corresponding 95% CI. We included both change and end scores in our analysis, but calculated MDs based on end scores only.

Unit of analysis issues

Cluster-randomised trials

We expected that authors of cluster-randomised trials would have controlled for clustering; where this had occurred, we detailed the methods used in the study design row of our data extraction form. In accordance with the *Cochrane Handbook for Systematic Reviews of Interventions*, we intended to use the intracluster correlation coefficients (ICCs) reported in the study to control for clustering when the study authors had not already done so (Higgins 2021c). However, no cluster-randomised trials reported ICCs. We contacted the study authors for further information but received no response. In addition, we could not find ICC estimates in similar studies, so we presented unadjusted results. It is good practice to conduct a sensitivity analysis of trials with imputed ICC estimates, but this was not possible because we synthesised the results narratively. We were therefore cautious in our interpretation of all unadjusted cluster-randomised data, and considered this in our GRADE assessment.

Non-randomised studies

In accordance with the *Cochrane Handbook for Systematic Reviews of Interventions*, we used the same measures of treatment effect as for randomised studies (Reeves 2021). We also extracted information about how study authors had derived the estimate (e.g. confounders they had controlled for in the analyses; see [Data extraction and management](#)). When a study reported both unadjusted and adjusted intervention effects, we extracted the adjusted effects. When a study reported multiple adjusted estimates of the intervention effect, we selected the estimate that minimised risk of bias due to confounding.

Multiple outcome measures

We did not encounter any multiplicity in the reporting of outcome measures.

Multiple time points

We analysed different lengths of follow-up in separate analyses and grouped follow-up time points as follows.

- Up to six months after the intervention
- More than six months and up to 12 months after the intervention
- More than 12 months and up to 24 months after the intervention
- More than 24 months after the intervention.

We included the earliest time point (up to six months) as it is most appropriate for detecting changes in breastfeeding practices. Normally, the impact of improved solid feeding practices is discernible after a longer time period.

Studies with multiple intervention groups

For trials with three or more arms, we placed eligible intervention arms in different comparisons, as per the *Cochrane Handbook for Systematic Reviews of Interventions* (McKenzie 2021a).

Dealing with missing data

There were no missing outcome or summary data for this version of the review. If we encounter issues with missing data in future updates, we will follow guidance in the *Cochrane Handbook for Systematic Reviews of Interventions* (Deeks 2021). First, we will contact corresponding authors of studies to request clarification and data where necessary to reach a decision on study eligibility or to appropriately describe the study results. We will describe and quantify missing data in a risk of bias table. If we are unable to obtain the data we need, we will analyse the available data. We will contact trial authors to ask whether missing data can be assumed to be 'missing at random'. The absence of data deemed 'not missing at random' may lead to bias in the reporting of results; therefore, we will address the potential impact of the missing information on the robustness of findings of the review in the discussion section.

For missing summary statistics, we will first attempt to calculate the values from available data. For example, the SD can be calculated from the standard error, CI, t-statistic or P value, as described in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2021b). However, if these data are not available, we will instead use imputation methods described in Higgins 2021b. We will use summary statistics for the same outcome measure from other studies in the review that are comparable in measurement scale, degree of measurement error, and population.

Assessment of heterogeneity

Because we synthesised the data narratively, we were unable to assess statistical heterogeneity. However, we constructed detailed study characteristic tables to describe the variation in study design and context, and to assess the impact of this on the robustness of results in the [Discussion](#) section and GRADE assessment. There was considerable heterogeneity between trials in the types of intervention implemented. For this reason, we grouped the studies according to intervention design to limit the effects of heterogeneity and aid comparison.

Assessment of reporting biases

Because we synthesised the data narratively, and because we included fewer than 10 studies, we were unable to formally assess publication bias by creating funnel plots. Instead, we described the nature of publication of all included studies and assessed the impact of this on the robustness of results in the [Discussion](#) section and GRADE assessment. We attempted to assess selective reporting by comparing the reported outcomes to those specified in the study protocol or methods section (this was a component of the RoB 2 assessments).

Data synthesis

We synthesised data from all studies irrespective of their risk of bias. Due to the substantial heterogeneity in study design and context, meta-analysis was not possible. We therefore summarised the data narratively, drawing on guidance from the *Cochrane Handbook for Systematic Reviews of Interventions* (McKenzie 2021b) and the Synthesis Without Meta-analysis (SWiM) reporting guideline (Campbell 2020), both of which promote transparent and complete reporting. We adhered to the following checklist when summarising data.

- Grouping studies for synthesis: we began by grouping the studies. In the protocol, we planned to group the data first

by comparator, then by outcomes, and finally by study design (Liu 2021). We assumed there would be one intervention and multiple comparators. However, after selecting the eligible studies, we observed significant variation in implementation methods and in the content of the promotion component. For this reason, we grouped the studies first according to the style of intervention, then by their comparator; this approach produced four comparisons. Within these groups, we describe the data first by outcome and then by study design, in line with the review protocol (Liu 2021).

- Describing the standardised metric and transformation method used: for each outcome measure, we selected a standardised metric for reporting of the outcome based on the most common measure across the included studies, the most clinically appropriate measure, and the measure used in the study with the largest sample size. Hence, for anthropometric outcomes, we used WAZ and HAZ; for feeding practices, we used proportion of infants who had liquids introduced early; and for health service usage, we used proportion of children who had received vitamin A supplements or deworming in the previous six months. To aid comparison and tabulation of results, we transformed any data expressed with a measure other than the standardised metric according to guidance provided in the *Cochrane Handbook for Systematic Reviews of Interventions* (Higgins 2021a). If we could not transform the data, we excluded the study from the summary of findings tables but included it in a narrative synthesis.
- Describing the synthesis methods: we intended to calculate summary statistics of intervention effect estimates (e.g. median and interquartile range) and a direction of effect (e.g. by combining P values or performing vote counting), but we were unable to do so owing to insufficient data.
- Criteria used to prioritise results for summary and synthesis: we did not prioritise the reporting of any study over the others to avoid bias due to selective reporting.
- Investigating heterogeneity in reported effects: we conducted an informal investigation of heterogeneity, as described in [Subgroup analysis and investigation of heterogeneity](#).
- Certainty of the evidence: we performed a GRADE assessment for each outcome.
- Data presentation methods: we presented outcome data in tables, with a column to highlight any important issues (for those included in narrative syntheses) and a further column to describe the certainty of the evidence associated with the outcome (for those included in summary of findings tables). We organised the tables first by intervention, then by outcome measure, and finally by study design, as in the narrative text, to aid navigation of the evidence.
- Reporting results: for intervention group and study design group, we described the synthesis findings, including a list of contributing studies, a description of study characteristics guided by the PROGRESS and TIDieR-PHP tools, and a descriptive summary of effect measures, accompanied by a CI where possible and a statement regarding certainty of effect. We discussed the perceived strengths, weaknesses, and contributions of each included study and its effects. We had intended to discuss the impacts on health equity guided by the PROGRESS lens, but the studies contained limited information to do so, and subgroup analysis by factors was not possible

due to the limited number of included studies per intervention group.

- Limitations of the synthesis: we discussed any limitations of the synthesis, including limitations of the narrative synthesis method, deviations from protocol, limitations of the standardised metrics and data synthesis methods, limitations or availability of data, certainty of the evidence, and heterogeneity of effect measures.

Subgroup analysis and investigation of heterogeneity

We intended to conduct an informal assessment of heterogeneity by ordering tables according to possible modifiers; however, this was not possible owing to limited data. Had there been sufficient data, we would have evaluated the following modifiers.

1. Study design (RCTs versus non-RCTs)
2. Group versus individual promotion activities
3. Single-component versus multi-component promotional activities

Sensitivity analysis

Because we synthesised the data narratively, we were unable to perform any sensitivity analyses.

Summary of findings and assessment of the certainty of the evidence

We created summary of findings tables for the following two comparisons, which we considered the most clinically relevant for readers of this review.

- Community-based GMP (without supplementary feeding) compared to standard care
- Community-based GMP (with supplementary feeding) compared to standard care

We used [GRADEpro GDT](#) software to create the tables, following the guidance provided in the *Cochrane Handbook for Systematic Reviews of Interventions* (Schünemann 2021). We included our three primary outcomes (anthropometric indicators, infant and child feeding practices, health service usage). We selected the anthropometric indicators that we considered most clinically useful (mean WAZ and mean HAZ). However, for infant and child feeding practices and health service usage, no specific/individual measure was more clinically important than any other, so we decided to narratively summarise these two primary outcomes.

We chose to present data for the time points of 12 and 24 months, as these were the most common and the longest time points reported across the studies. Due to the heterogeneity in reporting of outcome measures, we chose to select the two longest time points (as opposed to one) to maximise the information appropriate for presentation in the summary of findings tables.

We assessed the certainty of the evidence for each outcome using the GRADE approach, which covers five domains (risk of bias, inconsistency of effect, imprecision, indirectness, and publication bias). The risk of bias domain was based on our overall judgement using the RoB 2 tool, as indicated in [Assessment of risk of bias in included studies](#). For all studies, the initial level of evidence was 'high certainty', and we downgraded as appropriate to 'moderate', 'low', or 'very low' certainty for serious concerns

related to any of the five GRADE domains. In the new ROBINS-I tool, the level of evidence for non-randomised studies starts at 'high certainty', as with RCTs. However, the evidence from non-randomised studies will generally be downgraded by two levels due to the inherent risk of bias associated with the lack of randomisation. We justified all decisions to downgrade the certainty of the evidence in the footnotes of each table. Two review authors (MT and QL) independently assessed the certainty of the evidence and consulted a third review author (HN) to resolve any disagreements.

RESULTS

Description of studies

Results of the search

Figure 2 shows the summary of the trial selection process. We identified 12,041 records from electronic database searching, and

two additional records from handsearching or reference lists (Marsh 2002; Viraviadyha 1989). After removal of duplicates, 8968 records remained. We considered 65 articles potentially eligible after title and abstract screening. During full-text assessment, we excluded 51 articles (Characteristics of excluded studies), identified three ongoing studies (Characteristics of ongoing studies), and listed two studies as awaiting classification because we could not find the full text (Characteristics of studies awaiting classification). Six studies (reported in eight records) met our inclusion criteria (Characteristics of included studies). The kappa statistic was between 0.15 and 0.24 for the title and abstract screen and 0.12 for the full-text review.

Figure 2. PRISMA diagram of study selection process.

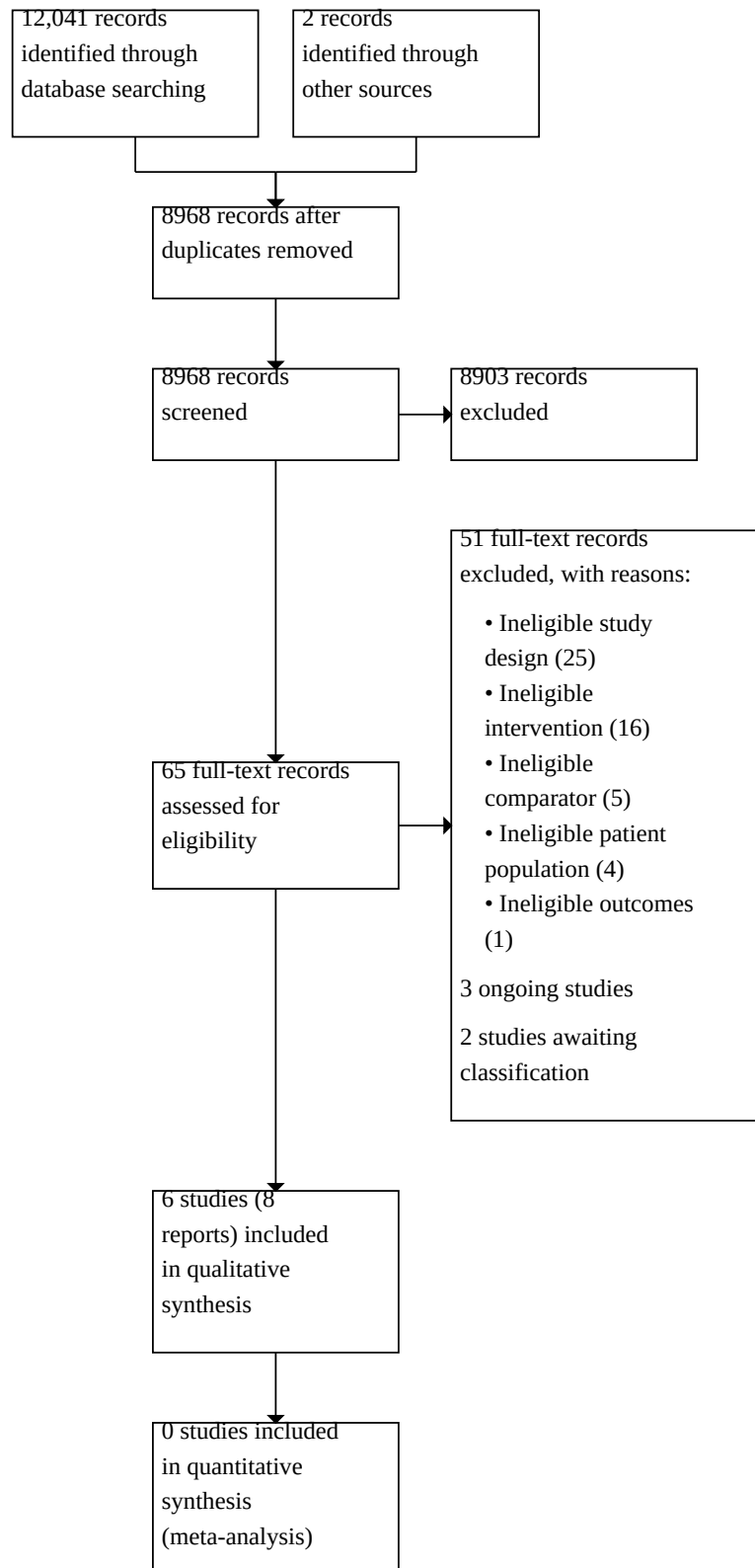


Figure 2. (Continued)

(meta-analysis)

Included studies**Study design**

Most studies were cluster-RCTs (Alderman 2009; Fink 2017; George 1993; Marsh 2002). One study had a cohort design (Laurie 2008), and another had a controlled before-after design (Viraviadyha 1989).

Participants

All trials evaluated preschool children and their caregivers. Three trials evaluated children under five years of age (Viraviadyha 1989; George 1993; Laurie 2008); two trials evaluated children under three years of age (Alderman 2009; Marsh 2002); and Fink 2017 studied children between six and 24 months of age.

Setting

Three studies were conducted in Africa, specifically Senegal (Alderman 2009), Zambia (Fink 2017), and South Africa (Laurie 2008). The other three studies were conducted in South Asia or East Asia, specifically India (George 1993), Vietnam (Marsh 2002), and Thailand (Viraviadyha 1989). All studies took place in rural settings and were community-based. Fink 2017 had both community-based and home-based intervention groups, which we analysed separately. Four studies provided information on socio-economic context: three described the setting as "poor" (George 1993; Fink 2017; Marsh 2002), two described the setting as "agricultural" (George 1993; Marsh 2002), and all four mentioned high malnutrition rates (Fink 2017; Marsh 2002; Viraviadyha 1989).

Interventions

Five studies implemented GMP in a community setting, whereas Fink 2017 also provided families with educational posters to monitor growth at home. In most studies, promotion activities consisted of nutrition education delivered either at the time of growth monitoring or in independent group sessions (Alderman 2009; George 1993; Laurie 2008; Viraviadyha 1989). For one study, these sessions also included demonstrations of vegetable cultivation (Laurie 2008). Two studies provided supplementary feeding as part of their promotion activities, which targeted children with faltering growth (Fink 2017; Marsh 2002).

Comparators

Five studies compared the intervention to standard care in the region (i.e. usual services provided by the government as part of the national programme), whereas George 1993 evaluated the full GMP package versus nutrition education alone.

Outcomes

Regarding our primary outcomes, five studies assessed anthropometric changes (Alderman 2009; Fink 2017; George 1993;

Marsh 2002; Viraviadyha 1989); four studies assessed changes in feeding practices (Alderman 2009; Fink 2017; Laurie 2008; Marsh 2002); and one study assessed changes in health service usage (Alderman 2009).

For our secondary outcomes, Marsh 2002 assessed the frequency and severity of childhood illnesses, and no studies assessed mortality.

Ongoing studies

We retrieved three ongoing studies, all of which are RCTs. The comparisons are home-based growth monitoring charts versus standard care in Indonesia (NCT04222998); community-based GMP versus standard care in Malaysia (Chek 2022); and community-based GMP versus community-based GMP with food supplementation, food supplementation alone, and standard care in Zambia (NCT05120427).

Excluded studies

During the full-text review, we excluded 51 studies due to ineligible study design (N = 25), ineligible intervention (N = 16), ineligible comparator (N = 5), ineligible study population (N = 4), and ineligible outcomes (N = 1). The [Characteristics of excluded studies](#) table provides further information.

Risk of bias in included studies

We assessed risk of bias for the three studies that contributed results to the summary of findings tables (Alderman 2009; Fink 2017; Marsh 2002). We did not judge risk of bias for Viraviadyha 1989, George 1993, or Laurie 2008, as they reported no usable data for our prioritised outcomes. The RoB 2 judgements for all study results per outcome and for all domains are available in an interactive risk of bias table (see zenodo.org/record/7261527).

Overall risk of bias by study

We judged all studies at overall high risk of bias. We did not exclude studies with an overall high risk of bias from the analysis, but these judgements influenced all GRADE ratings. The main reasons for high risk of bias judgements were the timing of identification or recruitment of participants.

Overall risk of bias by outcome

The following sections summarise the risk of bias for all outcomes included in [Summary of findings 1](#) and [Summary of findings 2](#). Visual summaries are presented in [Figure 3](#), [Figure 4](#), [Figure 5](#), [Figure 6](#), and [Figure 7](#).

Figure 3. Risk of bias: community-based growth monitoring and promotion (with supplementary feeding) versus standard care. Outcome: weight-for-age z-score at 12 months.

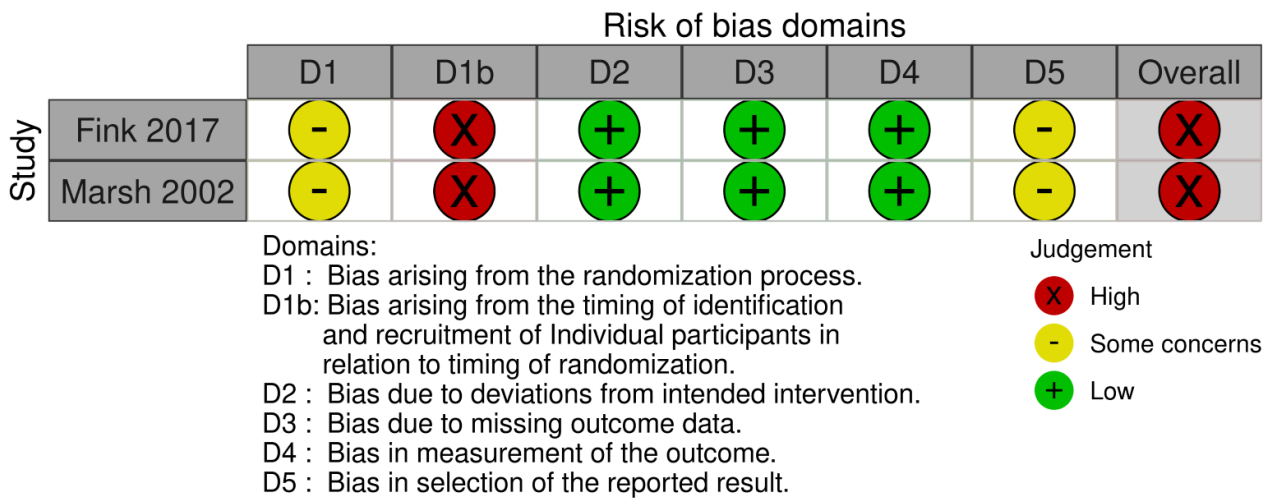


Figure 4. Risk of bias: community-based growth monitoring and promotion (with supplementary feeding) versus standard care. Outcome: height-for-age z-score at 12 months.

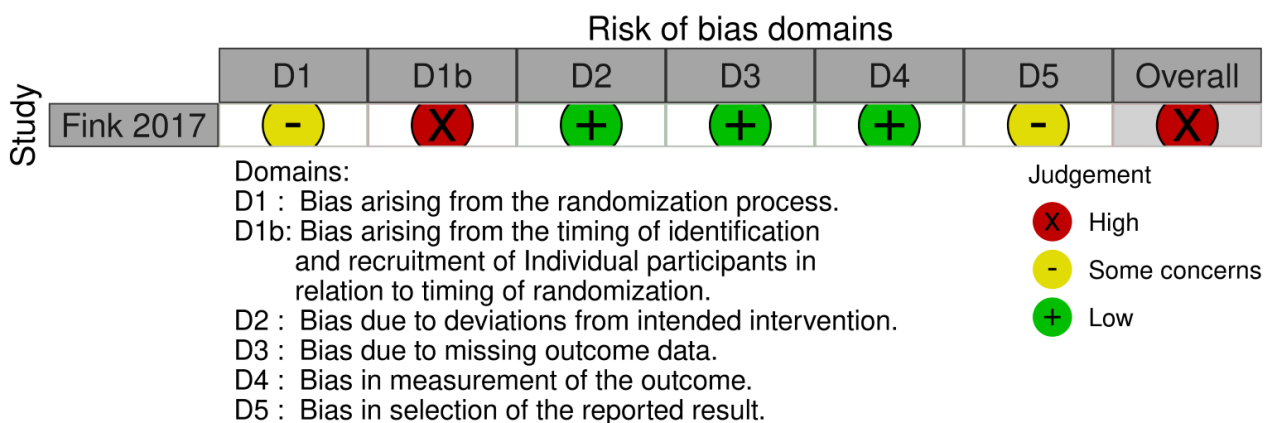


Figure 5. Risk of bias: community-based growth monitoring and promotion (with supplementary feeding) versus standard care. Outcome: infant and child feeding practices at 12 months.

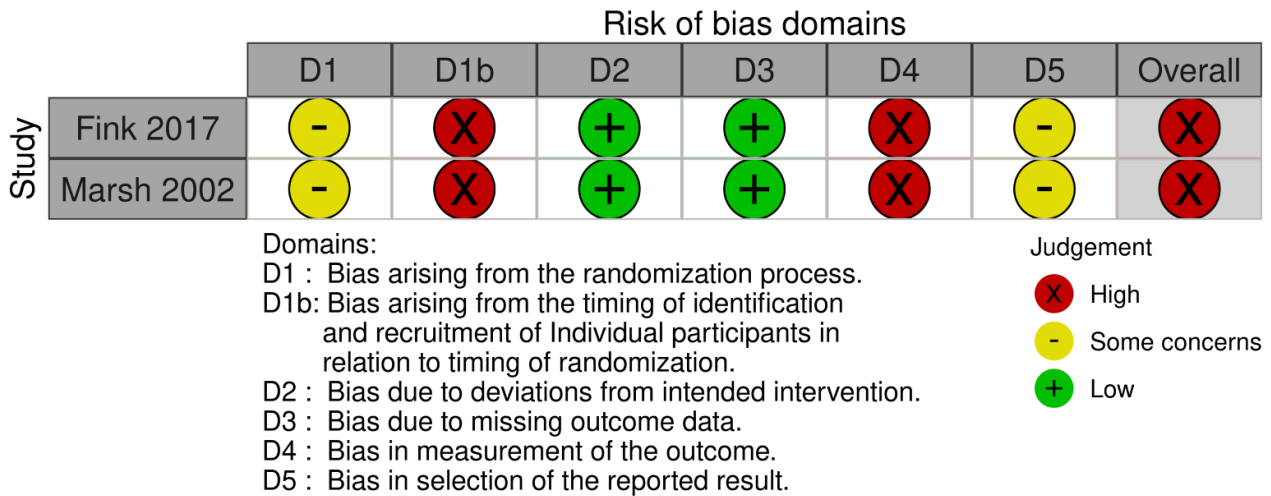


Figure 6. Risk of bias: community-based growth monitoring and promotion (without supplementary feeding) versus standard care. Outcome: infant and child feeding practices at 24 months.

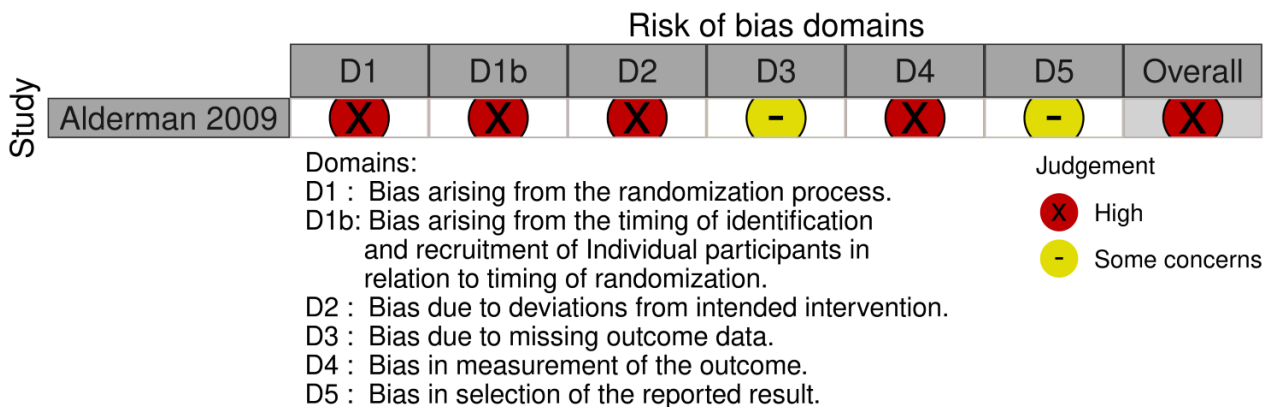
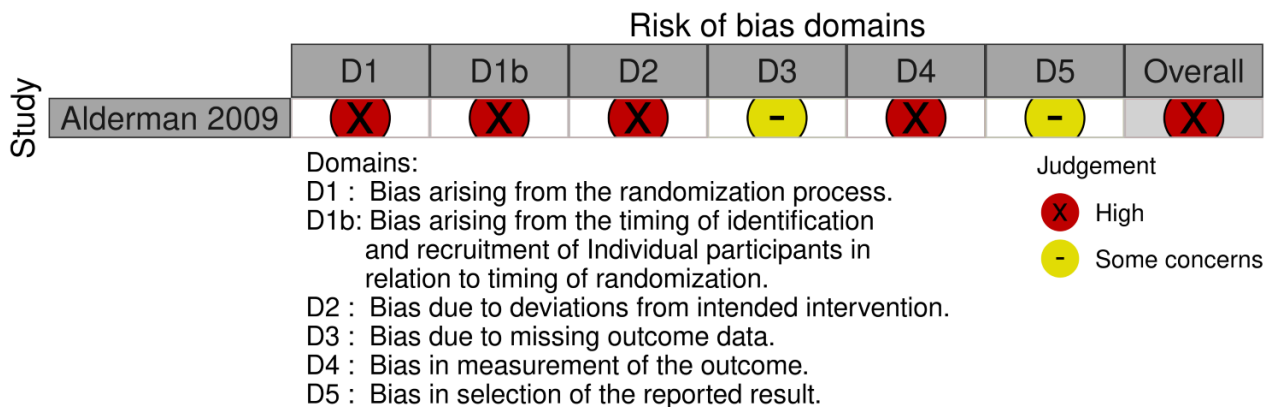


Figure 7. Risk of bias: community-based growth monitoring and promotion (without supplementary feeding) versus standard care. Outcome: health service usage at 24 months.



Mean difference in weight-for-age z-score (12 months after the intervention)

Two studies contributed results to WAZ at 12 months (Fink 2017; Marsh 2002). The overall risk of bias was high (Figure 3). There were some concerns regarding randomisation processes for both studies due to small differences in several baseline characteristics. Risk of bias was high for both studies regarding timing of identification or recruitment of participants, as individuals were recruited after cluster randomisation. Risk of bias was low regarding deviations from the intended interventions, missing outcomes, and measurement of the outcome. There were some concerns for both studies regarding selection of reported results due to the lack of a prespecified analysis plan.

Mean difference in weight-for-age z-score (24 months after the intervention)

No studies reported data for WAZ at 24 months.

Mean difference in height-for-age z-score (12 months after the intervention)

One study contributed results to HAZ at 12 months (Fink 2017). The overall risk of bias was high (Figure 4). There were some concerns regarding randomisation processes due to small differences in several baseline characteristics. We considered the outcome at high risk of bias related to timing of identification or recruitment of participants, as individuals were recruited after cluster randomisation. Risk of bias was low regarding deviations from the intended interventions, missing outcomes, and measurement of the outcome. There were some concerns regarding selection of reported results due to the lack of a prespecified analysis plan.

Mean difference in height-for-age z-score (24 months after the intervention)

No studies reported data for HAZ at 24 months.

Infant and child feeding practices (12 months after the intervention)

Two studies contributed results to infant and child feeding practices at 12 months (Fink 2017; Marsh 2002). The overall risk of bias was

high (Figure 5). There were some concerns regarding randomisation processes for both studies due to small differences in baseline characteristics. Risk of bias was high for timing of identification or recruitment of participants, as individuals were recruited after cluster randomisation. Risk of bias was high for both studies regarding measurement of the outcome, as survey responses may have been influenced by parents' knowledge of assignment. Risk of bias was low for missing outcome data and deviations from intended interventions. There were some concerns for both studies regarding selection of reported results due to the lack of a prespecified analysis plan.

Infant and child feeding practices (24 months after the intervention)

Only Alderman 2009 contributed data to infant and child feeding practices at 24 months. The overall risk of bias was high (Figure 6). Risk of bias was high for the randomisation process (due to unclear allocation concealment and a slightly higher proportion of children receiving deworming at baseline), the timing of identification or recruitment of participants (as individual participants were recruited after assignment of clusters), and deviations from intended interventions (as 30% of the villages to be provided interventions did not receive them, and eight of the intended controls received the intervention). We had some concerns regarding missing outcome data, as the trial did not report the numbers of participants in summary measures. Risk of bias was high for measurement of the outcome, as some participants were aware of assignment to intervention, which may have affected survey responses. We had some concerns for selection of reported results, as there was no mention of a predesigned analysis plan.

Health service usage (12 months after the intervention)

No studies reported data for health service usage at 12 months.

Health service usage (24 months after the intervention)

Only Alderman 2009 contributed results for health service usage at 24 months. The overall risk of bias was high (Figure 7). Risk of bias was high for the randomisation process (due to unclear allocation concealment and a slightly higher proportion of children receiving deworming at baseline), timing of identification or recruitment of participants (as individual participants were

recruited after assignment of clusters), and deviations from intended interventions (as 30% of the villages to be provided interventions did not receive them, and eight of the intended controls received GMP). We had some concerns regarding missing outcome data, as the trial did not report the numbers of participants in summary measures. Risk of bias was high for measurement of the outcome, as some participants were aware of assignment to intervention, which may have affected survey responses. We had some concerns for selection of reported results, as there was no mention of a predesigned analysis plan.

Effects of interventions

See: [Summary of findings 1 Community-based growth monitoring and promotion \(no supplementary feeding\) versus standard care](#); [Summary of findings 2 Community-based growth monitoring and promotion \(with supplementary feeding\) versus standard care](#)

Comparison 1: community-based growth monitoring and promotion (without supplementary feeding) versus standard care

Three studies evaluated community-based GMP (without supplementary feeding) versus standard care: one cluster-RCT based in Senegal ([Alderman 2009](#)), one cohort study from South Africa ([Laurie 2008](#)), and one controlled before-after study based in Thailand ([Viraviadyha 1989](#)). See [Summary of findings 1](#) and [Table 1](#).

Primary outcomes

Anthropometric indicators of nutrition

[Alderman 2009](#) reported the proportion of malnourished children (children with WAZ more than two SDs below international norms). After two years, the proportion of malnourished children decreased from 33.3% to 29% in the GMP group and from 28.6% to 27.6% in the standard care group. However, it was not possible to calculate a relative effect between groups due to missing participant numbers for this outcome, although 4296 observations were recorded across the study.

[Viraviadyha 1989](#) reported the proportion of children with normal nutritional status after six months. The proportion increased from 197/447 to 249/447 in the GMP group and from 102/218 to 109/218 in the standard care group. There was little to no difference between the groups at endpoint (RR 1.11, 95% CI 0.95 to 1.30; 665 participants; [Analysis 1.1](#)).

No studies evaluated anthropometric indicators such as weight, height, weight-for-age, height-for-age, weight-for-height, or z-scores for these measures.

Infant and child feeding practices

[Alderman 2009](#) reported the proportion of infants who had fluids other than breast milk introduced early. Over 24 months, this proportion reduced from 77.5% to 49.7% in the GMP group, and from 79.6% to 70.5% in the standard care group (very low-certainty evidence; [Summary of findings 1](#)). However, it was not possible to calculate a relative effect between groups due to missing participant numbers for this outcome, although 4296 observations were recorded across the study overall.

[Laurie 2008](#) monitored the consumption of beta-carotene-rich foods. At three years, there was little or no difference in the

proportion of children who had consumed beta-carotene-rich foods (paw-paw) the day before interview (3/219 in the GMP group versus 2/223 in the standard care group; RR 1.53, 95% CI 0.26 to 9.05; 442 households; [Analysis 1.2](#)).

Health service usage

[Alderman 2009](#) reported that after 24 months, the proportion of infants who had received vitamin A in the last six months increased from 64.0% to 72.5% in the GMP group compared with 57.9% to 62.9% in the standard care group (very low-certainty evidence; [Summary of findings 1](#)). Additionally, the proportion of infants who had received deworming medicine in the past six months improved from 7.0% to 29.2% in the GMP group compared with 7.6% to 14.6% in the standard care group (very low-certainty evidence; [Summary of findings 1](#)). However, it was not possible to calculate a relative effect between groups due to missing participant numbers for this outcome, although 4296 observations were recorded across the study overall.

Secondary outcomes

Frequency and severity of childhood illness

At three years of follow-up, [Laurie 2008](#) found little to no difference between the groups in the proportion of households with children who had experienced vomiting in the two weeks before the survey (6/219 in the GMP group versus 13/223 in the standard care group; RR 0.47, 95% CI 0.18 to 1.21; 442 households; [Analysis 1.3](#)).

Mortality

No studies reported mortality.

Comparison 2: community-based growth monitoring and promotion (with supplementary feeding) versus standard care

Two cluster RCTs evaluated community-based GMP (with supplementary feeding) versus standard care: one conducted in Zambia ([Fink 2017](#)), and one conducted in Vietnam ([Marsh 2002](#)). See [Summary of findings 2](#) and [Table 2](#).

Primary outcomes

Anthropometric indicators of nutrition

[Marsh 2002](#) reported that after six months, mean WAZ had worsened in both groups, from -1.51 to -1.92 in the GMP group and from -1.68 to -2.06 in the standard care group. There was little or no difference between groups at endpoint (MD 0.14, 95% CI -0.06 to 0.34; 232 participants; [Analysis 2.1](#)). Mean HAZ had barely changed in both groups after six months, from -1.65 to -1.66 in the GMP group and from -1.67 to 1.66 in the standard care group. There was little or no difference between the groups at endpoint (MD 0.00, 95% CI -0.24 to 0.24; 232 participants; [Analysis 2.2](#)). The mean weight-for-height z-score (WHZ) had also worsened in both groups after six months, from -0.66 to -1.25 in the GMP group and from -0.90 to -1.39 in the standard care group. There was little or no difference between the groups at endpoint (MD 0.14, 95% CI -0.03 to 0.31; 232 participants; [Analysis 2.3](#)).

[Marsh 2002](#) also found that after 12 months, mean WAZ had worsened in both groups, from -1.51 to -1.90 in the GMP group and from -1.68 to -2.00 in the standard care group. It was not possible to calculate the relative effect between groups due to missing participant numbers for the outcome.

[Fink 2017](#) reported adjusted estimates of mean HAZ and mean WAZ up to 12 months. There was little or no difference between the GMP and standard care groups in mean HAZ at endpoint (MD -0.15, 95% CI -0.34 to 0.04; 337 participants; low-certainty evidence; [Summary of findings 2](#)) or in mean WAZ at endpoint (MD -0.07, 95% CI -0.19 to 0.06; 337 participants; very low-certainty evidence; [Summary of findings 2](#)).

Infant and child feeding practices

[Marsh 2002](#) reported a series of infant and child feeding practice outcomes. For ease of understanding, we decided to describe the most clinically useful outcome here; [Table 2](#) shows full details of all outcomes assessed in [Marsh 2002](#). After 12 months, energy intake had improved from 692.2 kcal to 826.9 kcal in the GMP group and from 596.6 kcal to 718.4 kcal in the standard care group. The results of the analysis favoured the GMP group (MD 108.50 kcal, 95% CI 23.37 to 193.63; 227 participants; [Analysis 2.4](#)).

[Fink 2017](#) assessed the proportion of caregivers reporting child consumption of breast milk in the past seven days. At 12 months, there was little or no difference between the groups (MD 0.042, 95% CI -0.037 to 0.121; 337 participants).

Across both studies, the evidence is very uncertain about the effects of GMP with supplementary feeding versus standard care on feeding practices at 12 months.

Health service usage

Neither study reported any measures of health service usage.

Secondary outcomes

Frequency and severity of childhood illness

Neither study reported any measures of frequency or severity of childhood illness.

Mortality

Neither study reported mortality.

Comparison 3: home-based growth monitoring and promotion (without supplementary feeding) versus standard care

Only [Fink 2017](#) evaluated home-based GMP (without supplementary feeding) versus standard care. See [Table 3](#).

Primary outcomes

Anthropometric indicators of nutrition

[Fink 2017](#) reported adjusted estimates of mean HAZ and mean WAZ up to 12 months. There was little or no difference between the GMP and standard care groups in HAZ at endpoint (MD 0.127, 95% CI -0.107 to 0.361; 336 participants). There was a small difference in WAZ favouring GMP at endpoint (MD 0.183, 95% CI 0.037 to 0.328; 336 participants).

Infant and child feeding practices

[Fink 2017](#) evaluated the proportion of caregivers reporting child consumption of breast milk in the past seven days. At 12 months, there was little or no difference between groups (MD 0.045, 95% CI -0.031 to 0.121; 336 participants).

Health service usage

[Fink 2017](#) reported no measures of health service usage.

Secondary outcomes

Frequency and severity of childhood illness

[Fink 2017](#) reported no measures of frequency or severity of childhood illness.

Mortality

[Fink 2017](#) did not report mortality.

Comparison 4: community-based growth monitoring and promotion (without supplementary feeding) versus nutrition education

One cluster RCT based in India evaluated community-based GMP (without supplementary feeding) versus nutrition education ([George 1993](#)). See [Table 4](#).

Primary outcomes

Anthropometric indicators of nutrition

[George 1993](#) found that at 28 months, mean WAZ had slightly improved in a subset of individuals from both groups aged between three and 23 months, from -2.24 to -1.94 in the intervention group and from -2.04 to -1.80 in the education group. Mean HAZ had also improved in this subset, from -1.91 to -1.58 in the GMP group and from -1.51 to -1.28 in the education group. Mean weight gain had improved in both groups (374 participants), from 130 g per month to 180 g per month in the GMP group, and from 116 g per month to 190 g per month in the education group. Due to incomplete data, we were unable to calculate the relative effects of these outcomes. Mean length gain did not change in either group, so there was no difference between the GMP and education for this outcome (MD -0.02 cm per month, 95% CI -0.08 to 0.04; 374 participants; [Analysis 3.1](#)).

Infant and child feeding practices

[George 1993](#) reported no measures of infant and child feeding practices.

Health service usage

[George 1993](#) reported no measures of health service usage.

Secondary outcomes

Frequency and severity of childhood illness

[George 1993](#) reported no measures of frequency or severity of childhood illness.

Mortality

[George 1993](#) did not report mortality.

DISCUSSION

Summary of main results

We included six studies reported in eight publications. The studies implemented GMP in a variety of ways, and we grouped the results into the following comparisons.

1. Community-based GMP programme, with promotion activities consisting of nutrition education (without supplementary feeding), versus standard care (three studies)
2. Community-based GMP, where promotion activities also included supplementary feeding to underweight children, versus standard care (two studies)
3. Home-based GMP aided by educational posters (without supplementary feeding) versus standard care (one study)
4. Comprehensive community-based GMP package (without supplementary feeding) versus nutrition education alone (one study)

Community-based GMP (without supplementary feeding) versus standard care

There is very low-certainty evidence that GMP (without supplementary feeding) compared with standard care improves infant and child feeding practices, assessed at 24 months by the proportion of children who have fluids other than breast milk introduced early. There is very low-certainty evidence that GMP (without supplementary feeding) compared with standard care improves health service usage, measured at 24 months by the proportion of children who have received vitamin A and the proportion of children who have received deworming. No study reported the selected anthropometric outcomes (mean WAZ or HAZ) at 12 or 24 months, infant and child feeding practices at 12 months, or health service usage at 12 months.

Community-based GMP (with supplementary feeding) versus standard care

There is very low-certainty evidence that GMP (with supplementary feeding) compared with standard care has little or no effect on mean WAZ at 12 months, and infant and child feeding practices across a range of outcome measures at 12 months. There is low-certainty evidence that GMP has little or no effect on mean HAZ at 12 months. No study reported health service usage at 12 or 24 months, anthropometric measures at 24 months, or infant and child feeding practices at 24 months.

Overall completeness and applicability of evidence

The included studies were conducted in LMICs in Africa and South East Asia. The studies were broadly comparable in context (low-resource, rural areas with existing high levels of malnutrition). Therefore, the findings of this review may be broadly applicable to similar settings in the same continents, but may not translate to urban settings or areas/regions with more resources or better access to primary health care. We found no eligible studies conducted in Latin America or the Caribbean. Few studies conducted since the 1990s have disaggregated the contribution of GMP as defined in this review from other activities in health and nutrition programmes. We excluded studies that used packages or multiple interventions implemented under growth monitoring programme conditions, and studies of programmes that monitored growth but did not use the results to implement promotion activities, which may have limited the generalisability of our findings. No studies evaluated the effects of GMP on mortality, and only one reported any measure of health service usage. No studies investigated the impact of growth monitoring independent of promotion activities, so we were unable to assess the relative impact of each component. We identified no unpublished studies;

however, since all included studies reported minimal or no benefits of GMP, publication bias is unlikely to have affected our results.

Certainty of the evidence

We assessed the certainty of the evidence using the GRADE approach and presented the results in two summary of findings tables ([Summary of findings 1](#); [Summary of findings 2](#)). The certainty of the evidence was low or very low for all the included primary outcomes, indicating that further research is very likely to change our findings.

Community-based GMP (without supplementary feeding) versus standard care

For infant and child feeding practices as well as health service usage at 24 months, we downgraded the certainty of the evidence for risk of bias concerns (all studies were at overall high risk of bias), imprecision (unable to calculate a relative effect), and indirectness (results may apply only to rural contexts in Western Africa).

Community-based GMP (with supplementary feeding) versus standard care

For mean WAZ at 12 months, we downgraded the certainty of the evidence for risk of bias concerns (both studies were at overall high risk of bias), imprecision (one study did not adjust for clustering, and we were unable to calculate a relative effect), and indirectness (the findings may only be applicable to rural contexts in Southern Africa and Asia).

For mean HAZ at 12 months, we downgraded the certainty of the evidence for risk of bias concerns (the study was at overall high risk of bias) and indirectness (the findings may only be applicable to rural contexts in Southern Africa).

For infant and child feeding practices at 12 months, we downgraded the certainty of the evidence for risk of bias concerns (both studies were at overall high risk of bias), imprecision (neither study adjusted their effect estimates for clustering), indirectness (the findings may only be applicable to rural contexts in Southern Africa and Asia), and inconsistency (there was heterogeneity in the direction of effect between outcome measures).

Potential biases in the review process

We employed multiple techniques to minimise potential biases in the review process. Two review authors independently extracted data with the same data extraction sheet and assessed risk of bias with the same tools. We checked all extracted data and discussed all disagreements. To minimise publication bias in this review, we also searched the grey literature. Due to the heterogeneity in the interventions and comparators between studies, we were unable to conduct any meta-analyses to produce pooled effect estimates. In view of the limited evidence provided by RCTs, we included cohort and controlled before-after studies. However, these study designs tend to be less rigorous than RCTs, which impacts our confidence in the review findings. Some RCTs included minimal information regarding the randomisation procedure, allocation concealment, confounding, and control for clustering, which made it difficult to detect biases. Nevertheless, we judged all studies at overall high risk of bias, so findings should be interpreted with caution.

Agreements and disagreements with other studies or reviews

Ashworth 2008 narratively analysed the impact of GMP programmes on child nutrition, utilisation of health services, and mortality. It did not critically appraise risk of bias in the studies, which may have led to underestimation or overestimation of the true intervention effect. Most included studies were from GMP programmes conducted in natural conditions, including cross-sectional comparisons and pre-post comparisons without a control group; we excluded both study designs from our review. Ashworth 2008 found no unequivocal evidence that growth monitoring is beneficial for nutritional status in children, although some evidence showed improvements in utilisation of health services; these findings are in line with ours. Ashworth 2008 pointed out that growth monitoring can provide an entry point to preventive and curative health care and is an integral part of programmes against malnutrition and mortality, although it may not constitute the best use of limited resources in countries with inadequate health budgets. Growth promotion activities may be preferable in this case.

AUTHORS' CONCLUSIONS

Implications for practice

There is limited and uncertain evidence on the effectiveness of growth monitoring and promotion (GMP). Promotion activities, such as targeted food supplementation, appear to offer little benefit over nutrition education, but more robust evidence is required to inform any changes in policy. GMP delivered without sufficient health system strengthening does not appear to have yielded the expected gains. There is a need for further exploratory research of alternative strategies.

Implications for research

Further robust evaluation of this intervention is required to establish whether it improves child health and growth outcomes and is cost-effective. Future studies should include the following elements to improve the certainty of evidence.

- Clear definition of the intervention, including growth measurement, assessment, and analysis, and actions implemented to improve outcomes

- Careful identification and definition of outcomes with standardised outcome measures to allow for pooled analysis
- Clear description of any adjustment for clustering and reporting of intracluster correlation coefficient estimates

In addition, studies that explore growth monitoring alone may provide insight into the relative impact of identifying faltering growth, as opposed to identifying and addressing faltering growth.

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* Indicates the major publication for the study

CHARACTERISTICS OF STUDIES
Characteristics of included studies [ordered by study ID]

Alderman 2009
Study characteristics

Methods

Study design: cluster-RCT

Cluster corrected: yes, but no details provided

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

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Alderman 2009 (Continued)

	Confounders: N/A
Participants	<p>Sample size: 211 villages (220 clusters); 4296 observations in 2004; 6144 observations in 2006</p> <p>Child demographics: age < 3 years; no baseline characteristics provided</p> <p>Parent demographics: no baseline characteristics provided</p>
Interventions	<p>Brief name: GMP versus usual core services</p> <p>What materials: none reported</p> <p>What and how: "To provide growth monitoring services and counselling to all mothers of young children in selected communities and encourage pregnant women and caregivers to seek preventive health care such as antenatal and postnatal care and coordinate with health personnel for delivery of essential health services, such as vaccination, deworming and micronutrient supplementation on a biannual basis."</p> <p>No further information provided on delivery (presumed face-to-face) or specific promotional components.</p> <p>Who provided: "Delivered through non-governmental organisation (NGO) service providers under the direction of the Cellule de Lutte contre la Malnutrition (CLM), the multisectoral coordination commission responsible for the implementation of the national nutrition policy. In collaboration with local government authorities and district health workers, NGO organised communities, which in turn mobilised community health and nutrition workers."</p> <p>No information on training and expertise of community health workers.</p> <p>Where: community-based. Delivered to rural districts in 3 regions of Senegal (Fatick, Kaolack, and Kold). No country context provided.</p> <p>When and how often: service provision commenced in mid-June 2004 and expanded rapidly. No information on number, duration, or scheduling of measurements.</p> <p>Planned variation: none reported</p> <p>Unplanned variation: "[...] about 30 % of the villages chosen to receive the programme in the first wave were not prioritised by March 2006. Conversely, eight of the intended control villages were provided the services."</p> <p>How well: none reported</p>
Outcomes	<p>Anthropometric indicators: proportion of children with WAZ -2 SDs of international norms, measured up to 24 months</p> <p>Infant and child feeding practices: proportion of children who had liquids other than breast milk introduced early, measured up to 24 months</p> <p>Health service usage: proportion of children who received vitamin A supplementation in previous 6 months, measured up to 24 months; proportion of children who received deworming in previous 6 months, measured up to 24 months</p> <p>Number and severity of childhood illnesses: proportion of children experiencing vomiting in past 2 weeks, measured up to 24 months</p>
Funding sources	The study was funded through the Cellule de Lutte contre la Malnutrition, Dakar, Senegal, with support from the World Bank's Research committee (RF-PO87558. RESE-BB).
Conflicts of interest	All authors indicated that they had no conflicts of interest.
Start and end date	2004 to 2006

Alderman 2009 (Continued)

Notes

Fink 2017
Study characteristics

Methods	<p>Study design: cluster-RCT</p> <p>Cluster corrections: corrected for residual correlation at cluster level using cluster-robust variance estimator</p> <p>Confounders: N/A</p>
Participants	<p>Sample size: 127 clusters, 547 children (control: 43 clusters, 188 children; home-based GMP: 42 clusters, 177 children; community-based GMP: 42 clusters, 182 children)</p> <p>Child demographics</p> <ul style="list-style-type: none"> Sex (female): control: 50.8%; home-based GMP: 54.9%; community-based GMP: 53.9% Mean age: control: 13.9 years; home-based GMP: 13.9 years; community-based GMP: 14 years <p>Parent demographics</p> <ul style="list-style-type: none"> Caregiver primary education status: control: 58%; home-based GMP: 53.7%; community-based GMP: 64.8% Caregiver secondary school: control: 16.5%; home-based GMP: 23.2%; community-based GMP: 21.4% Asset quintile <ul style="list-style-type: none"> 2: control: 20.7%; home-based GMP: 24.3%; community-based GMP: 18.7% 3: control: 23.4%; home-based GMP: 18.1%; community-based GMP: 24.2% 4: control: 17%; home-based GMP: 20.3%; community-based GMP: 18.7% 5: control: 19.1%; home-based GMP: 18.1% community-based GMP 20.3%
Interventions	<p>Brief name: home-based GMP versus usual core services versus community-based GMP with food supplementation</p> <p>What materials</p> <ul style="list-style-type: none"> Home-based GMP: growth chart poster with nutrition information Community-based GMP: "2 kg Yummy Soy, a locally manufactured food supplement based on soybeans and maize that contains vitamin A, thiamin, riboflavin, niacin, folate, vitamin C, vitamin B-12, iron, calcium, and zinc" <p>What and how</p> <ul style="list-style-type: none"> Home-based GMP: "Growth chart showed growth curves at the bottom and a series of happy children of different ages at the top of the chart. Promotional activities: 3 key messages highlighted the importance of feeding young children 4–5 times/d, even if the quantities are not very large; the importance of protein in children's diets; and the use of roller meal (coarsely ground maize flour including the shells, which contain some protein) instead of the usual maize flour." Community-based GMP: "In all community meetings, the 3 key messages highlighted the importance of feeding young children 4–5 times/d, even if the quantities are not very large; the importance of protein in children's diet; and the use of roller meal (coarsely ground maize flour including the shells, which contain some protein) instead of the usual maize flour. Equipment used to measure height and weight was rented from the National Food and Nutrition. nutritional supplements were provided to all children aged 2 years who were classified during community meetings as having stunted growth. Specifically, all children aged 2 years with HAZ <-2 were given 2 kg

Fink 2017 (Continued)

Yummy Soy, a locally manufactured food supplement based on soybeans and maize that contains vitamin A, thiamin, riboflavin, niacin, folate, vitamin C, vitamin B-12, iron, calcium, and zinc."

- Usual core services: interview visit at baseline and interview visit at the end of the study

Who provided: "All meetings were organized and run by the study staff, who received anthropometric assessment training from the Ministry of Health's District Nutrition Officer."

Where

- Type of location: home or community
- Geographical scope: district level
- Socioeconomic context: the study was conducted in Chipata District, Zambia. This district is part of Zambia's Eastern Province, which has traditionally been one of the poorer areas of the country.

When and how often

- Community-based GMP: a first visit in October 2014, a second visit in January 2015, and a third visit in April 2015
- Home-based GMP: parents encouraged to take measurements every three months

Planned variation: none reported

Unplanned variation: none reported

How well: "delivery team to fill in the dates when children reached these age milestones. These prefilled dates were meant as prompts for parents and were not enforced in any way by the project team, who did not visit households after posters were installed and instructions given to parents. Nutritional supplements intended to encourage parents to attend GMP sessions in community arm."

Outcomes	<p>Anthropometric indicators: mean HAZ, mean INTER-NDA development score, mean WAZ. All indicators measured up to 12 months postintervention.</p> <p>Infant and child feeding practices: proportion of caregivers reporting child consumption of breast milk in past 7 days (up to 12 months)</p>
Funding sources	Bill and Melinda Gates Foundation
Conflicts of interest	None reported
Start and end date	2014 to 2015
Notes	

George 1993
Study characteristics

Methods	<p>Study design: cluster-RCT</p> <p>Cluster corrected: yes, authors state they used "mixed-methods" but do not report intracluster correlation for each outcome</p> <p>Confounders: N/A</p>
Participants	<p>Sample size: 12 villages, 6 assigned to intervention and 6 to control. 558 children in intervention group and 535 children in control group</p> <p>Age ranges of children^a</p>

George 1993 (Continued)

- 3–11 months: intervention: 16.3%, control: 15.0%
- 12–23 months: intervention: 21.9%, control: 19.2%
- 24–35 months: intervention: 19.4%, control: 20.2%
- 36–47 months: intervention: 20.2%, control: 19.6%
- 48–59 months: intervention: 22.1%, control: 25.9%

Baseline demographics of the two groups^a

- Social
 - Harjian caste: intervention: 164 (29.1%); control: 181 (32.9%)
 - Other castes: intervention: 400 (70.9%); control: 370 (67.2%)
 - Nuclear family: intervention: 303 (53.7%); control: 305 (55.5%)
 - Consanguinity: intervention: 237 (50.8%); control: 248 (55.5%)
 - Landless: intervention: 132 (28.3%); control: 121 (27.1%)
- Participant characteristics
 - Mean number of preschool children per mother: intervention: 823 (1.5%); control: 811 (1.5%)
 - Mean birth order of the study child: intervention: 823 (2.8%); control: 811 (2.8%)
 - Mothers reporting stillbirth: intervention: 28 (5%); control: 27 (4.9%)
 - Mothers reporting abortions: intervention: 55 (11.7%); control: 66 (12.5%)
 - Mothers reporting deaths of children: intervention: 164 (29%); control: 144 (26%)
- Service use
 - Mothers with 3 tetanus toxoids in pregnancy: intervention: 335 (40.7%); control: 368 (45.4%)
 - Home delivery: intervention: 582 (70.7%); control: 562 (69.3%)
 - BCG immunisation: intervention: 583 (70.8%); control: 646 (79.7%)
 - Tubal ligation: intervention: 180 (31.9%); control: 138 (25.1%)

Interventions

Brief name: GMP versus usual core services

What materials: growth charts used in GMP. Educational films for both study arms.

What and how: "The intervention was planned using extensive field work for 9 months. Also, the intervention group was named GMP but, no specific promotional activities were described in the GMP group and the only difference was the use of growth charts to deliver the counselling. The counselling was delivered face to face, at home individually every month. The NGM package that was delivered to all villages included a twice monthly visit by the nutrition worker to provide education on health and nutrition using educational films. Immunisations were provided in the village, antenatal services at the rural clinic, and family planning services at the rural hospital. Children aged between 1 and 5 years were de-wormed with albendazole or pyrantel pamoate about every 4 months. Vegetable and fruit seeds and saplings were distributed to home gardens"

Who provided: "The intervention was delivered by nutrition workers (one mother who was selected from each village after consultation with the community and local health workers), while data including anthropometric measurements, were obtained by trained field workers. There were two supervisors, one for GMP and one for NGM villages. A paediatric surgeon examined all children in the last year and children with severe congenital abnormalities were excluded. The nutrition workers had 2 months of training from RUHSA health educators. Initially, each nutrition worker visited homes and weighed children with the supervisor before the growth charts were used."

Where: "community-based intervention implemented locally in K V Kuppam block in the state of Tamil Nadu, India. The Rural Unit for Health and Social Affairs (RUHSA) of the Christian Medical College and Hospital, Vellore, has provided primary health care in this block through rural clinics in each of the 18 peripheral service units. The 12 study villages were non-adjointing, poor agricultural communities that were distributed among 10 peripheral service units. Each had a population of about 13,000. Growth monitoring had not been conducted in the villages before. 70% of families lived in mud huts with one or two rooms, about 99.5 % defecated in fields, and fewer than 0-5% used kerosene or petroleum gas as the primary cooking fuel (the rest used bio-mass)."

When and how often: "The intervention was implemented between July 1987 to December 1989. However, there was extensive field work that started in September 1986. Children were weighed in

George 1993 (Continued)

April 1987, to ascertain the willingness of the communities to accept weighing, and then at baseline in July 1987 and end of follow-up in December 1989, with intermediate assessments every 4–5 months to a total of 6 points of anthropometrics assessments. Growth monitoring was done every month in GMP villages and the nutrition worker visited all households twice monthly in both the GMP and NGM groups."

Planned variation: none reported

Unplanned variation: "The interventions were started in July 1987. However, growth monitoring was not started when planned because many community members were unwilling to allow their children to be weighed. From July 1987 to January 1988, each nutrition worker visited homes and weighed children with the supervisor. These visits were used to motivate mothers to appreciate the significance of weighing."

How well: not reported; however, we could not access the study protocol

Outcomes	Anthropometric indicators: mean WAZ, mean HAZ, monthly weight gain, monthly length gain. All indicators measured after 24 months.
Funding sources	This work was supported, in part, by grants from the Thrasher Research Fund, UNICEF, India, and the Rockefeller Foundation. The paediatric surgeon's visit was made possible by grants from the CMC Research Committee and from the Department of Paediatric Surgery, CMC Hospital, Vellore, India
Conflicts of interest	None reported
Start and end date	1986 to 1989
Notes	^a Demographics as reported by study investigators

Laurie 2008
Study characteristics

Methods	<p>Study design: cohort</p> <p>Cluster correction: no controlling for clustering</p> <p>Confounders: no confounders listed</p>
Participants	<p>Sample size: 219 intervention households and 223 control households. The average household in both groups had 8 people.</p> <p>Child demographics: age 1–5 years; no baseline characteristics provided</p> <p>Parent demographics:</p> <ul style="list-style-type: none"> • Mean age: intervention: 35.5 (SD 10.9) years; control: 34.9 (SD 12.8) years • Toilet facilities: intervention: 81%; control: 73% • Access to tap water: intervention: 44%; control: 42% control • Electricity: intervention: 45%; control: 44% • Food security <ul style="list-style-type: none"> ○ Always enough to eat: intervention: 10%; control: 10% ○ Sometimes enough to eat: intervention: 80%; control: 80% ○ Often not enough to eat: intervention: 9%; control: 10%
Interventions	Brief name: GMP versus no GMP

Laurie 2008 (Continued)

What materials: "Demonstration gardens were used and the seeds, fertilisers and agricultural lime for the gardens and nurseries were provided by ARC-VOPI. Community-based, orange fleshed sweet potato nurseries were established to ensure that people have access to planting materials."

What and how: "The intervention was delivered as monthly sessions for growth monitoring of children aged 1–5 years, referring children with faltering growth to the clinic, cooking of β -carotene-rich vegetables for the children and nutrition education. The intervention was delivered to groups containing an average of 120–150 children per session. The intervention also included demonstration gardens for the cultivation of β -carotene-rich vegetables and a field nursery for orange sweet potatoes that gardens served as centres for training in vegetable gardening during monthly and bi monthly visits"

Who provided: "The project was delivered by extension officers from the local office of Department of Agriculture alongside nurses and staff from the integrated nutrition program of the local Department of Health and project health volunteers (identified community members). The extension workers were trained during a 5-day course on vegetable production to serve as agriculture advisors. While, the project health volunteers were trained during a 2-day session growth monitoring and nutrition education by the Department of Health at the beginning of the project, and followed by one day refreshment training in the second year of the project. The health volunteers also received training in cultivation of vegetables during a two-day practical course by Agricultural Research Council-Vegetable and Ornamental Plant institute (ARC-VOPI). They also received a 3-day training workshop on questionnaire completion."

Where: "Creches, the chief's residence, church or the health volunteer's house. The study population resided in seven villages in Lusikisiki, a rural community predominately of the Xhosa, situated in the Pondoland Coastal Plateau in the Eastern Cape, South Africa. The number of households per village ranged from 200 to 700"

When and how often: "The intervention was delivered as monthly growth monitoring and nutrition education sessions and monthly or bimonthly training in vegetable gardens in demonstration gardens. The intervention remained in place for 3 years and was evaluated after. The data was collected from April to June 2005."

Planned variation: none reported

Unplanned variation: 31% of control households reported having attended the growth monitoring session at some stage

How well: none reported

Outcomes	<p>Infant and child feeding practices: proportion of children eating beta-carotene rich foods (paw-paw) the day before interview, measured at 3 years postintervention</p> <p>Frequency and severity of childhood illnesses: proportion of children experiencing vomiting in past 2 weeks, measured at 3 years postintervention</p>
Funding sources	No explicit mention of funding institute, but ARC-VOPI supplied the fertilisers and seeds and provided training and supervision. Also, Lusikisiki Agricultural Office and District Health Office and Gateway Hospital were acknowledged.
Conflicts of interest	None reported
Start and end date	2002 to 2005
Notes	

Marsh 2002
Study characteristics

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

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Marsh 2002 (Continued)

Methods	<p>Study design: cluster-RCT</p> <p>Cluster corrections: no mention of cluster corrections</p> <p>Confounders: N/A</p>
Participants	<p>Sample size: 12 communes (6 assigned to intervention and 6 assigned to control; 238 participants (119 per arm))</p> <p>Child demographics</p> <ul style="list-style-type: none"> • Mean age: intervention: 14.9 (SD 5.1) months; control: 15.1 (SD 5.1) months • Female sex: intervention: 52 (43.7%); core services: 59 (49.6%) • Currently breastfeeding: intervention: 86 (72.3%); control: 78 (65.5%) <p>Parent demographics</p> <ul style="list-style-type: none"> • Mother's age: intervention: 26.2 (4.7%) years; control: 26.9 (5.4) years • Mother's BMI < 18.5: intervention: 29 (24.4%); control: 28 (23.5%) • Mother did not complete secondary school: intervention: 56 (47.1%); control: 68 (57.1%) • Mother with 2 or fewer children: intervention: 104 (87.4%); control: 93 (78.2%) • Mother a farmer: intervention: 111 (93.3%); control: 114 (95.8%) • Family's mean yearly income, x 1000 VND: intervention: 6527.0 (SD 7109.5); control: 6777.7 (SD 6391.9) • Family's mean socioeconomic status: intervention: -0.01 (SD 1.03); control: 0.04 (SD 1.15) • Ever attended a nutrition education and rehabilitation programme (NERP): intervention: 53 (44.5%) yes; control: N/A • Mean number of months of NERP attendance: intervention: 4.5 (SD 1.7); control: N/A
Interventions	<p>Brief name: GMP versus usual core services</p> <p>What materials: "data collection forms, pilot tested translated questionnaires, video taping equipment, digital reading scales, photographs for dietary re-call."; "Key NERP education tools included "food squares" and "clover leaf diagrams." Food squares listed the four recipes to be prepared and fed to children as extra daily meals during the 12 days. Cloverleaf diagrams showed the commune's ideal behaviors under the headings: good food, good child care, and good health care"</p> <p>What and how</p> <ul style="list-style-type: none"> • Positive deviance inquiry: "The first GMP sessions served to identify positive deviant children (well-nourished children from poor families) and negative deviant children (malnourished children from better off families). Staff collected demographic information, feeding behaviours, health seeking behaviours, and caring behaviours from selected families and used these to inform subsequent NERP and GMP sessions." • GMP/NERP sessions: "The intervention consisted of GMP sessions every two months, monthly NERP sessions as long as the number of malnourished children warranted them for up to nine months, deworming after the second GMP session. Children less than -2 WAZ were referred to NERP sessions and all children received GMP sessions." • NERP: "In the spirit of "learning by doing," mothers and caretakers were told to bring a handful of positive deviant foods each day as the "price of admission" to the NERP. Health volunteers taught hygiene, child development, and the preparation and feeding of calorie- and nutrient-dense meals from locally available, affordable foods. Participants learnt six key messages concerning breastfeeding, food variety, complementary feeding, health care, and taking care of healthy children at home. On each of the 12 NERP days each participating child received a nutritious meal prepared by two or more caregivers in rotation. The meal was designed as additional to the usual diet, but in practice it may have substituted for another meal. Health volunteers allowed mothers to take home the unconsumed food if the child was reluctant to eat at the NERP session" <p>Who provided: "Study staff worked with government counterparts to select intervention communes, conducted the training of trainers, and advised the training and situation analyses. The</p>

Marsh 2002 (Continued)

field workers and supervisors, affiliated with the Research and Training Center for Community Development (RTCCD) in Hanoi, were bachelor's level physicians and sociologists with previous health data collection experience in rural Viet Nam"

Where: "The study took place in Phu Tho Province, 98 km northwest of Hanoi. This north central ecological region has the worst child nutrition profile (47% underweight, 46.5% stunted, and 9.9% wasted) in the country. The province has 1.3 million rural lowland, midland, and highland inhabitants in thousands of hamlets in 249 communes in eight districts. The main ethnic group is Kinh, the predominant national majority, with some Muong, Dao, San Chay, and San Diu minorities. The population is poor and principally agricultural with a tropical climate. The province serves as a regional transportation hub for road, rail, and inland waterways and has some industry. There are two rice harvests (May and June and September and October). Diarrhea season is May and June; respiratory infection season is September to December. The rainy season is February to July, and the dry season is August to January. We excluded extremely poor communes, which belonged to the government's "Phase One 10,000 Poorest Communes" and were already targeted by the government for special intervention programs"

When and how often: "Beginning in December 1999, we used a longitudinal, prospective design to gather anthropometry on children at baseline, monthly between months 1 to 6, and again at month 12 of the study. Data collection spanned the rainy and dry seasons (February to July and August to January, respectively)."

Planned variation: none mentioned

Unplanned variation: "Communes had baseline levels of malnutrition that were far less than officially reported. In response, we included moderately malnourished children in the NERPs and revised graduation criteria. Meanwhile, NERP implementation deviated from protocol in that daily contributions were not the norm, and home-delivered meals were common, perhaps because the population was dispersed, or caregivers were less concerned about moderate malnutrition than they would have been about severe malnutrition."

How well: "We succeeded in teaching district Ministry of Health partners to train local implementers to conduct a complex set of interventions: GMP, PDI, and NERP. Despite the implementers' characteristic enthusiasm, some field realities prompt caution"

Outcomes	<p>Anthropometric indicators: mean WAZ, mean HAZ, and mean WHZ at 6 months; mean WAZ at 12 months</p> <p>Infant and child feeding practices: frequency of consuming positive deviant foods, quantity of food consumed, meal time frequency, energy intake, proportion of children who met energy requirements, proportion breastfed previous day, breastfeeding frequency. All outcomes measured at 6 and 12 months.</p>
Funding sources	This research was supported by the LINKAGES: Breastfeeding, LAM, Complementary Feeding, and Maternal Nutrition Program. LINKAGES is supported by G/PHN/HN, Global, the United States Agency for International Development (USAID) under the terms of Grant No. HRN-A-00-97-00007-00 and is managed by the Academy for Educational Development, Washington DC.
Conflicts of interest	None mentioned
Start and end date	1999 to 2000
Notes	

Viraviadyha 1989
Study characteristics

Methods **Study design:** controlled before-after study

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Viraviadyha 1989 (Continued)

	<p>Cluster correction: no information on controlling for clusters</p> <p>Confounders: potential confounder listed as seasonal food availability, which was not statistically controlled for</p>
Participants	<p>Sample size: intervention 1: 119; intervention 2: 447; control: 218</p> <p>Child demographics: age < 5 years; no baseline characteristics provided</p>
Interventions	<p>Brief name: GMP (intervention 1) versus GM (intervention 2) versus no intervention</p> <p>What materials: nondescript weighing devices used and growth charts supplied to parents in experimental areas</p> <p>What and how: 7 villages were allocated into 5 experimental villages and 2 control villages in each province (total 2 provinces), and the experimental villages were further divided into 2 intervention groups.</p> <ul style="list-style-type: none"> • Intervention 1: nutritional surveillance activities (monthly weighing) • Intervention 2: nutritional surveillance activities (monthly weighing) and nutrition education • Control: neither intervention <p>Who provided: "The nutrition division working in conjunction with provincial health staff held a two-day conference in September 1980 to design and define growth chart and promotional messages, and weighing tools. Training of village health volunteers and village health communicators in techniques of nutritional surveillance and education for 1-2 weeks was conducted by tambon health staff working under the supervision of provincial health office staff"</p> <p>Where:</p> <ul style="list-style-type: none"> • Type of location: community-based • Geographical scope: provincial level (Maha Sarakham and Supan Buri) • Context: none provided <p>When and how often: intervention implemented for 6 months (October 1980 to March 1981)</p> <p>Planned variation: "The study commenced in October during harvest time and by the end of the study it was the dry/hot season. This may account for some of the fluctuation in month-by-month figures. However, food availability preceded the beginning of the experimental period by nearly three to four months as the rainy season commences in May/June and so study participants may have already experienced weight gain due to increased food availability prior to the initial round of weighing."</p> <p>Unplanned variation: none reported</p> <p>How well: not reported</p>
Outcomes	<p>Anthropometric indicators: proportion of children with normal nutrition status, proportion of children with 1st degree malnutrition, proportion of children with 2nd degree malnutrition, proportion of children with 3rd degree malnutrition. All outcomes assessed at 6 months.</p>
Funding sources	None reported
Conflicts of interest	None reported
Start and end date	1980-1981
Notes	Only data for intervention group 2 met the criteria defined for GMP.

ARC-VOPI: Agricultural Research Council-Vegetable and Ornamental Plant Institute (South Africa); BMI: body mass index; BCG: Bacillus Calmette–Guérin (TB vaccine); GMP: growth monitoring and promotion; N/A: not applicable; NGM: non-growth-monitoring package; INTER-

NDA: INTERGROWTH-21st Neurodevelopmental Assessment; HAZ: height-for-age z-score; RCT: randomised controlled trial; SD: standard deviation; WAZ: weight-for-age z-score; WHZ: weight-for-height z-score.

Characteristics of excluded studies [ordered by study ID]

Study	Reason for exclusion
Acharya 2019	Ineligible study design: pilot study.
Agbozo 2016	Ineligible study design: cross-sectional survey.
Akamine 2011	Ineligible study design: 2 national surveys.
Alderman 1978	Ineligible patient population: malnourished children who were in poor condition.
Atukunda 2021	Ineligible intervention: education intervention emphasising nutrition, hygiene (including oral hygiene) and stimulation (cooking and oral hygiene demonstrations together with making of play toys to promote child stimulation).
Bradford 2020	Ineligible study design: no control population.
Charlton 2009	Ineligible comparison: children who attended healthcare centres where healthcare workers received GMP training versus children who attended healthcare centres where healthcare workers received no GMP training.
Chaudhuri 1988	Ineligible study design: evaluation of a programme.
CTRI/2018/03/012512	Ineligible intervention: nutrition education, no GMP.
CTRI/2020/03/024183 2020	Ineligible interventions: <ul style="list-style-type: none"> • Improvised or modified Take Home Ration integrated into complementary feeding • Regular and longitudinal growth monitoring • Regular feedback and alerts with a checklist-based approach to management of growth faltering • Regular nutrition and WASH education
CTRI/2021/11/037881	Recruiting pre-term and low birth weight infants
Dixon 1993	Ineligible study design: commentary article.
Enel 2006	Ineligible study design: secondary data analysis.
Fahmida 2020	Ineligible intervention: health system strengthening and behaviour change.
Gartner 2006	Ineligible patient population: children who had participated in the first 2 years of the CNP in Keur Cheikh Ibra.
Gartner 2007	Ineligible patient population: children who had participated in the CNP in Keur Cheikh Ibra, Senegal.
Genece 1988	Ineligible study design: evaluation to demonstrate how the programme has evolved.
Gerein 1988	Ineligible study design: community-based interview used to assess the outcomes.
Gopaldes 1990	Ineligible study design: analysis of survey data.
Griffiths 1988	Ineligible study design: cross-sectional survey.

Study	Reason for exclusion
Gupta 1984	Ineligible study design: cross-sectional study.
Hendratta 1988	Ineligible study design: programme evaluation, not intervention study.
Kang 2017	Ineligible intervention: community nutrition education and supplementary feeding programme, no growth monitoring.
Kapil 1994	Ineligible study design: narrative review.
Malekafzali 2000	Ineligible intervention: analysing the feeding habits, deworming environmental sanitation, promotion of home-grown vegetables.
Meegan 1994	Ineligible intervention: use of TALC direct recording scale.
Melville 1995	Ineligible study design: a community volunteer programme was initiated and evaluated after 2 years.
Miller 2017	Ineligible intervention: GMP was the control; intervention was additional interventions such as live-stock and social capital.
Miller 2020	Ineligible interventions: <ul style="list-style-type: none"> • Full Package community development activities, delivered via women's groups • Livestock training and nutrition education alone (Partial Package)
Mobasser 2016	Ineligible study design: survey.
Msefula 1993	Ineligible study design: evaluation study, not an intervention study.
NCT01612442	Ineligible intervention: nutrition education intervention, no growth monitoring.
NCT03824756 2019	Ineligible comparison: community clinics where an NGO-funded programme is supporting GMP implementation versus community clinics where GMP is not operational.
Nemerimana 2020	Ineligible intervention: evaluation of an mHealth tool, no GMP.
Nikièma 2017	Ineligible comparator: routine preventive, promotional, and curative services provided to pregnant and lactating women and children aged < 5 years.
Pyle 1986	Ineligible study design: not an intervention study.
Qazi 2003	Ineligible study design: prospective cohort study ("Design: Prospective observation and intervention" [page 1]).
Ross 2005	Ineligible study design: not an RCT and the observed results could be because they all had routine growth monitoring.
Roy 2005	Ineligible interventions: <ul style="list-style-type: none"> • Intensive nutrition education twice a week for 3 months • Intensive nutrition education twice a week for 3 months plus additional supplementary feeding for children
Roy 2007	Ineligible intervention: nutrition education intervention, no GMP.
Sahangamu 2017	Ineligible study design: cross-sectional study.

Study	Reason for exclusion
Shekar 1992	Ineligible study design: used data from an epidemiological study.
Silva 2000	Ineligible study design: analytical cross-sectional study.
Sinaga 2015	Ineligible comparison: modified growth chart versus normal chart.
Sinaga 2018	Ineligible outcomes: maternal knowledge levels; review's pre-defined outcomes of interest not measured.
Susanto 2019	Ineligible intervention: no growth monitoring.
Tandon 1989	Ineligible intervention: integrated child development services programme for the delivery of healthcare.
Thaver 1993	Ineligible study design: not an intervention study.
Walsh 2002	Ineligible intervention: community-based nutrition education programme.
Yasir 2017	Ineligible study design: cross-sectional analysis of growth monitoring records.
Zaman 2008	Ineligible intervention: training health workers in nutrition counselling.

CNP: Community Nutrition Project; GMP: growth monitoring and prevention; NGO: non-governmental organisation; RCT: randomised controlled trial; TALC: Teaching Aids at Low Cost; WASH: water, sanitation, and hygiene.

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

[Fairbank 2022](#)

Methods	"Evaluation studies"
Participants	
Interventions	
Outcomes	
Notes	Unable to obtain complete abstract or full text as reference incomplete

[Youssef 1993](#)

Methods	Unclear study design
Participants	60 mothers and their 60 first-born full-term healthy infants aged 0–12 months
Interventions	Growth monitoring and health education
Outcomes	Mothers' knowledge and practice scores; and weight, length, and midarm circumference at 6 and 12 months
Notes	Unable to obtain full text

Characteristics of ongoing studies [ordered by study ID]

Chek 2022

Study name	A nutrition programme using positive deviance approach to reduce undernutrition among urban poor children under-five in Malaysia: a cluster randomised controlled trial protocol
Methods	Mixed-methods study consisting of 2 phases: "Phase one will involve a focus group discussion with semi-structured interviews to explore maternal feeding practices and the types of food fed to the children"; "Phase two will involve a two-armed cluster randomised controlled trial to evaluate the effectiveness of a programme developed based on the positive deviance approach."
Participants	Urban poor children aged 3–5 years. Estimated 164 participants.
Interventions	The intervention will consist of educational lessons with peer-led cooking demonstrations, rehabilitation, and growth monitoring sessions for 3 months.
Outcomes	Data including height, weight, and dietary intake of children as well as the nutritional knowledge and food security status of mothers will be collected at baseline, immediately after the intervention, and 3 months after the intervention.
Starting date	30 December 2020
Contact information	Lok Poh Chek – lokpoh95@yahoo.com
Notes	Estimated completion date: December 2023

NCT04222998

Study name	Home-based growth charts in Indonesia
Methods	RCT
Participants	180 villages per arm; 1080 participants per arm Children aged 9–14 months
Interventions	Home-based growth monitoring chart containing promotional messages.
Outcomes	Primary outcomes: HAZ (time frame: 12 months); child stunting, defined as HAZ <-2 (time frame: 12 months) Secondary outcomes: WAZ (time frame: 12 months); early child development (time frame: 12 months)
Starting date	10 March 2022
Contact information	Peter C Rockers, ScD, MPH – prockers@bu.edu
Notes	

NCT05120427

Study name	The impact of growth charts and nutritional supplements on child growth in Zambia (ZamCharts)
Methods	Cluster-RCT to be conducted in 3 districts of Zambia
Participants	2291 participants. Children aged 6–12 months
Interventions	<p>Intervention arm 1: lipid-based nutrient supplements only</p> <ul style="list-style-type: none"> "Children in this arm will receive lipid-based nutrient supplements (LNS) for 12-18 months. LNS are 20 g/~110 calorie nutrient supplements that provide energy, protein, essential fatty acids and a wide range of micronutrients critical for children ages 6 to 24 months of age. They are designed to complement diets without displacing breastmilk and local dietary preferences and can be mixed into the child's meal or eaten directly from the sachet. The LNS used in this study will be Nutributer plus." <p>Intervention arm 2: growth charts only</p> <ul style="list-style-type: none"> "Children in this arm will receive a growth chart that can be installed at children's homes. Parents will be given the opportunity to measure their child whenever they want, and will also contain information on the most suitable local foods as well as the importance of diverse diets and frequent feeding. After the home installation of growth charts, caregivers will be given a short introduction on how to use them and on how to interpret the measurements by study staff." <p>Intervention arm 3: lipid-based nutrient supplements and growth charts</p> <p>Control: standard care</p>
Outcomes	Average HAZ at 12 months; proportion of children with HAZ < -2 at 2 years of age; Global Scales of Early Development (GSED) z-score at 2 years of age.
Starting date	November 15, 2021
Contact information	Principal Investigator: Günther Fink, Swiss TPH – guenther.fink@swisstph.ch
Notes	

HAZ: height-for-age z-score; RCT: randomised controlled trial; WAZ: weight-for-age z-score.

DATA AND ANALYSES
Comparison 1. Community-based growth monitoring and promotion (GMP) without supplementary feeding versus standard care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1.1 Proportion of children with normal nutrition status	1	665	Risk Ratio (IV, Fixed, 95% CI)	1.11 [0.95, 1.30]
1.2 Proportion of children who had eaten beta-carotene rich foods (paw-paw) the day before interview	1	442	Risk Ratio (M-H, Fixed, 95% CI)	1.53 [0.26, 9.05]
1.3 Proportion of children experiencing vomiting in the past 2 weeks	1	442	Risk Ratio (M-H, Fixed, 95% CI)	0.47 [0.18, 1.21]

Analysis 1.1. Comparison 1: Community-based growth monitoring and promotion (GMP) without supplementary feeding versus standard care, Outcome 1: Proportion of children with normal nutrition status

Study or Subgroup	GMP		Standard care		Weight	Risk Ratio	Risk Ratio
	Events	Total	Events	Total		IV, Fixed, 95% CI	IV, Fixed, 95% CI
Viraviadyha 1989	249	447	109	218	100.0%	1.11 [0.95, 1.30]	
Total (95% CI)		447		218	100.0%	1.11 [0.95, 1.30]	
Total events:	249		109				
Heterogeneity: Not applicable							
Test for overall effect: Z = 1.35 (P = 0.18)							
Test for subgroup differences: Not applicable							

Analysis 1.2. Comparison 1: Community-based growth monitoring and promotion (GMP) without supplementary feeding versus standard care, Outcome 2: Proportion of children who had eaten beta-carotene rich foods (paw-paw) the day before interview

Study or Subgroup	GMP		Standard care		Weight	Risk Ratio	Risk Ratio
	Events	Total	Events	Total		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI
Laurie 2008 (1)	3	219	2	223	100.0%	1.53 [0.26, 9.05]	
Total (95% CI)		219		223	100.0%	1.53 [0.26, 9.05]	
Total events:	3		2				
Heterogeneity: Not applicable							
Test for overall effect: Z = 0.47 (P = 0.64)							
Test for subgroup differences: Not applicable							

Footnotes

(1) Unit of analysis was participating households; average household size was eight people per household for both groups.

Analysis 1.3. Comparison 1: Community-based growth monitoring and promotion (GMP) without supplementary feeding versus standard care, Outcome 3: Proportion of children experiencing vomiting in the past 2 weeks

Study or Subgroup	GMP		Standard care		Weight	Risk Ratio	Risk Ratio
	Events	Total	Events	Total		M-H, Fixed, 95% CI	M-H, Fixed, 95% CI
Laurie 2008 (1)	6	219	13	223	100.0%	0.47 [0.18, 1.21]	
Total (95% CI)		219		223	100.0%	0.47 [0.18, 1.21]	
Total events:	6		13				
Heterogeneity: Not applicable							
Test for overall effect: Z = 1.56 (P = 0.12)							
Test for subgroup differences: Not applicable							

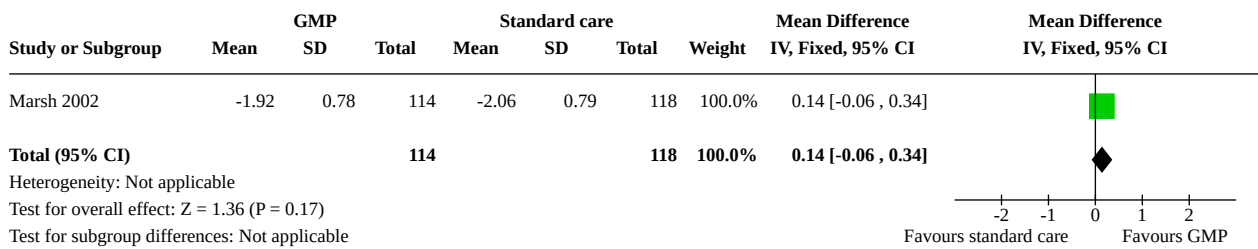
Footnotes

(1) Unit of analysis was participating households; average household size was eight people per household for both groups.

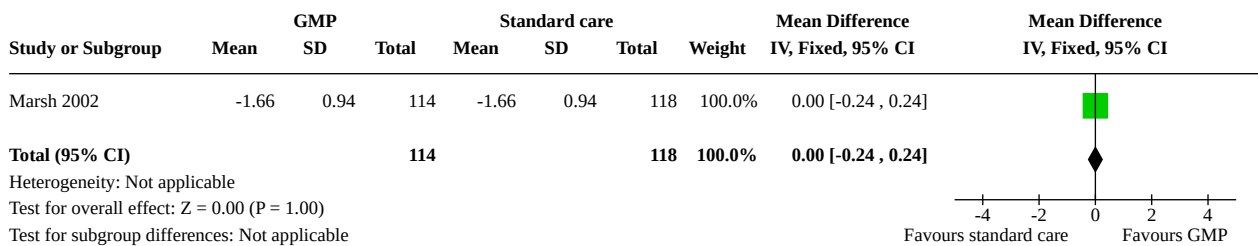
Comparison 2. Community-based growth monitoring and promotion (GMP) with supplementary feeding versus standard care

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
2.1 Mean weight-for-age z-score at 6 months	1	232	Mean Difference (IV, Fixed, 95% CI)	0.14 [-0.06, 0.34]
2.2 Mean height-for-age z-score at 6 months	1	232	Mean Difference (IV, Fixed, 95% CI)	0.00 [-0.24, 0.24]
2.3 Mean weight-for-height z-score at 6 months	1	232	Mean Difference (IV, Fixed, 95% CI)	0.14 [-0.03, 0.31]
2.4 Energy intake (kcal) at 12 months	1	227	Mean Difference (IV, Fixed, 95% CI)	108.50 [23.37, 193.63]

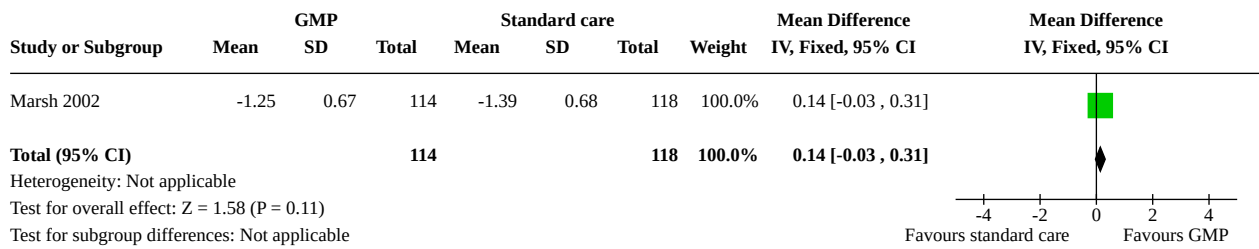
Analysis 2.1. Comparison 2: Community-based growth monitoring and promotion (GMP) with supplementary feeding versus standard care, Outcome 1: Mean weight-for-age z-score at 6 months



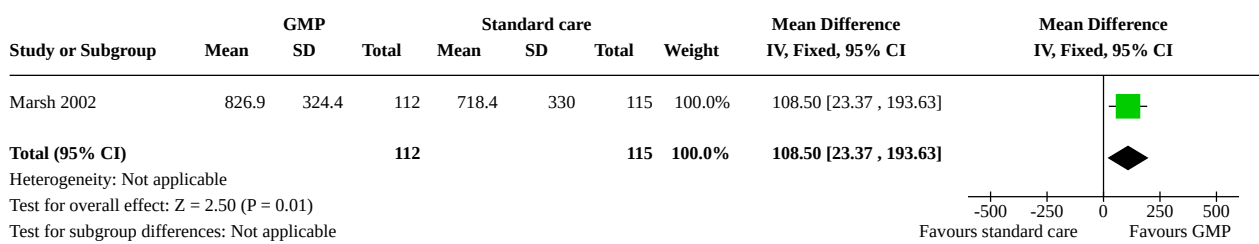
Analysis 2.2. Comparison 2: Community-based growth monitoring and promotion (GMP) with supplementary feeding versus standard care, Outcome 2: Mean height-for-age z-score at 6 months



Analysis 2.3. Comparison 2: Community-based growth monitoring and promotion (GMP) with supplementary feeding versus standard care, Outcome 3: Mean weight-for-height z-score at 6 months



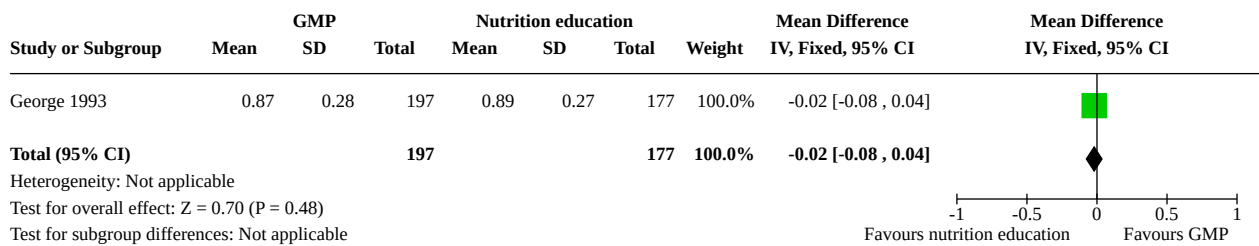
Analysis 2.4. Comparison 2: Community-based growth monitoring and promotion (GMP) with supplementary feeding versus standard care, Outcome 4: Energy intake (kcal) at 12 months



Comparison 3. Community-based GMP (no supplementary feeding) versus education

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
3.1 Mean length gain (cm per month) after 24 months	1	374	Mean Difference (IV, Fixed, 95% CI)	-0.02 [-0.08, 0.04]

Analysis 3.1. Comparison 3: Community-based GMP (no supplementary feeding) versus education, Outcome 1: Mean length gain (cm per month) after 24 months



ADDITIONAL TABLES
Table 1. Community-based growth monitoring and promotion (no supplementary feeding) versus standard care

Study	Time point	Outcome	Before (in- tervention)	Before (control)	After (inter- vention)	After (con- trol)	Relative effect	Number of partici- pants
Anthropometric measures								
Alderman 2009	≤ 24 months	Proportion of children with WAZ > -2 SDs below international norms	33.3%	28.6%	29%	27.6%	Not estimable ^a	220 clusters; 4296 observations in 2004, 6144 observations in 2006
Viraviadyha 1989	≤ 6 months	Proportion of children with normal nutrition status	197/447	102/218	249/447	109/218	RR 1.11 (95% CI 0.95 to 1.30) ^b	665 participants
		Proportion of children with 1st degree malnutrition	182/447	98/218	170/447	96/218	RR 0.86 (95% CI 0.71 to 1.05) ^b	665 participants
		Proportion of children with 2nd degree malnutrition	61/447	15/218	28/447	12/218	RR 1.14 (95% CI 0.59 to 2.19) ^b	665 participants
		Proportion of children with 3rd degree malnutrition	7/447	2/218	0/447	3/218	RR 0.07 (95% CI 0.00 to 1.35)	665 participants
Feeding practices								
Alderman 2009	≤ 24 months	Proportion of children who had liquids other than breast milk introduced early	77.5%	79.6%	49.7%	70.5%	Not estimable ^a	220 clusters; 4296 observations in 2004, 6144 observations in 2006
Laurie 2008	3 years	Proportion of households with children eating beta-carotene rich foods (paw-paw) the day before interview ^c	—	—	3/219	2/223	RR 1.53 (95% CI 0.26 to 9.05) ^b	442 households ^d
Health service usage								
Alderman 2009	≤ 24 months	Proportion of children who received vitamin A supplementation in previous 6 months	64.0%	57.9%	72.5%	62.9%	Not estimable ^a	220 clusters; 4296 observations in 2004, 6144 observations in 2006

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

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Table 1. Community-based growth monitoring and promotion (no supplementary feeding) versus standard care (Continued)

		Proportion of children who received deworming in previous 6 months	7.0%	7.6%	29.2%	14.6%	Not estimable ^a	220 clusters; 4296 observations in 2004, 6144 observations in 2006
Frequency and severity of illness								
Laurie 2008	3 years	Proportion of households with children experiencing vomiting in previous 2 weeks ^c	—	—	6/219	13/223	RR 0.47 (95% CI 0.18 to 1.21) ^b	442 households ^d
Mortality								
No data								

CI: confidence interval; RR: risk ratio; SD: standard deviation; WAZ: weight-for-age z-score.

^a Relative effect not estimable as no totals provided for the outcome.

^b Relative effects for non-randomized control trials are unadjusted for baseline differences.

^c Several food items/symptoms were presented for this outcome, and for ease of understanding we have extracted and presented just one, chosen based on the median effect.

^d Number of children per household not reported. The average household had eight people.

Table 2. Community-based growth monitoring and promotion (with supplementary feeding) versus standard care

Study	Time point	Outcome	Before (intervention)	Before (control)	After (intervention)	After (control)	Relative effect	Number of participants
Anthropometric measures								
Marsh 2002	≤ 6 months	WAZ	Mean -1.51 (SD 0.91)	Mean -1.68 (SD 0.87)	Mean -1.92 (SD 0.78)	Mean -2.06 (SD 0.79)	MD 0.14 (95% CI -0.06 to 0.34)	12 clusters; 232 participants
		HAZ	Mean -1.65 (SD 0.97)	Mean -1.67 (SD 1.05)	Mean -1.66 (SD 0.94)	Mean -1.66 (SD 0.94)	MD 0.00 (95% CI -0.24 to 0.24)	12 clusters; 232 participants
		WHZ	Mean -0.66 (SD 0.76)	Mean -0.90 (SD 0.84)	Mean -1.25 (SD 0.67)	Mean -1.39 (SD 0.68)	MD 0.14 (95% CI -0.03 to 0.31)	12 clusters; 232 participants
	≤ 12 months	WAZ	Mean -1.51 (SD 0.91)	Mean -1.68 (SD 0.87)	Mean -1.90	Mean -2.00	Not estimable ^a	232 participants

Table 2. Community-based growth monitoring and promotion (with supplementary feeding) versus standard care (Continued)

Fink 2017	≤ 12 months	HAZ	—	—	—	—	MD -0.152 (95% CI -0.341 to 0.036)	85 clusters; 337 participants
		INTER-NDA development score	—	—	—	—	MD -0.118 (95% CI -0.230 to -0.006)	85 clusters; 337 participants
		WAZ	—	—	—	—	MD -0.066 (95% CI -0.189 to 0.056)	85 clusters; 337 participants
Feeding practices								
Marsh 2002	≤ 6 months	Frequency of consuming positive deviant foods (times per day)	Mean 4.3 (SD 2.0)	Mean 4.2 (SD 1.8)	Mean 4.1 (SD 1.7)	Mean 3.6 (SD 1.1)	MD 0.50 (95% CI 0.14 to 0.86)	12 clusters; 238 participants
		Quantity of food consumed (g)	Mean 262.2 (SD 197.0)	Mean 243.5 (SD 168.4)	Mean 299.7 (SD 155.2)	Mean 254.5 (SD 134.0)	MD 45.20 (95% CI 8.36 to 82.04)	12 clusters; 238 participants
		Meal time frequency (meal per day)	Mean 4.6 (SD 1.8)	Mean 4.4 (SD 1.6)	Mean 4.6 (SD 1.3)	Mean 4.2 (SD 1.0)	MD 0.40 (95% CI 0.11 to 0.69)	12 clusters; 238 participants
		Energy intake (kcal)	Mean 629.2 (SD 386.9)	Mean 596.6 (SD 363.4)	Mean 662.7 (SD 301.0)	Mean 597.4 (SD 275.7)	MD 65.30 (95% CI -8.01 to 138.61)	12 clusters; 238 participants
		Proportion that met energy requirements	66.4%	62.2%	49%	35.1%	RR 1.38 (95% CI 1.02 to 1.87)	12 clusters; 238 participants
		Proportion breastfed previous day (%)	72.3%	65.5%	51.3%	47.8%	RR 1.07 (95% CI 0.83 to 1.38)	12 clusters; 238 participants
		Breastfeeding frequency (times per day)	Mean 7.0 (SD 2.9)	Mean 7.9 (SD 3.1)	Mean 9.3 (SD 3.3)	Mean 8.8 (SD 2.9)	MD 0.50 (95% CI -0.29 to 1.29)	12 clusters; 238 participants
	≤ 12 months	Frequency of consuming positive deviant foods (times per day)	Mean 4.3 (SD 2.0)	Mean 4.2 (SD 1.8)	Mean 3.8 (SD 1.6)	Mean 3.7 (SD 1.4)	MD 0.10 (95% CI -0.29 to 0.49)	12 clusters; 227 participants
	Quantity of food consumed (g)	Mean 262.2 (SD 197.0)	Mean 243.5 (SD 168.4)	Mean 409.8 (SD 197.4)	Mean 340.3 (SD 167.5)	MD 69.50 (95% CI 22.31 to 116.69)	12 clusters; 227 participants	
	Meal time frequency (per day)	Mean 4.6 (SD 1.8)	Mean 4.4 (SD 1.6)	Mean 4.9 (SD 1.5)	Mean 4.4 (SD 1.5)	MD 0.50 (95% CI 0.11 to 0.89)	12 clusters; 227 participants	

Table 2. Community-based growth monitoring and promotion (with supplementary feeding) versus standard care (Continued)

		Energy intake (kcal)	Mean 629.2 (SD 386.9)	Mean 596.6 (SD 363.4)	Mean 826.9 (SD 324.4)	Mean 718.4 (SD 330.0)	MD 108.50 (95% CI 24.29 to 192.71)	12 clusters; 227 participants
		Proportion that met energy requirements	66.4%	62.2%	31.3%	23.5%	RR 1.33 (95% CI 0.87 to 2.04)	12 clusters; 227 participants
		Proportion breastfed previous day	72.3%	65.5%	13.4%	13.9%	RR 0.57 (95% CI 0.32 to 1.01)	12 clusters; 227 participants
		Breastfeeding frequency (times per day)	Mean 7.0 (SD 2.9)	Mean 7.9 (SD 3.1)	Mean 6.0 (SD 3.0)	Mean 6.5 (SD 3.0)	MD -0.50 (95% CI -1.28 to 0.28)	12 clusters; 227 participants
Fink 2017	≤ 12 months	Proportion of families reporting child consumption of breast milk in past 7 days ^a	—	—	—	—	MD 0.042 (95% CI -0.037 to 0.121)	85 clusters; 337 participants

Health service usage

No data

Frequency and severity of illness

No data

Mortality

No data

CI: confidence interval; HAZ: height-for-age z-score; INTER-NDA: INTERGROWTH-21st Neurodevelopmental Assessment; MD: mean difference, RR: risk ratio; SD: standard deviation; WAZ: weight-for-age z-score; WHZ: weight-for-height z-score.

^a Relative effect not estimable as no totals provided for the outcome.

^b Several food items were presented for this outcome; for ease of understanding, we extracted and presented just one, chosen based on the median effect.

Table 3. Home-based growth monitoring and promotion (no supplementary feeding) versus standard care

Study	Time point	Outcome	Before (intervention)	Before (control)	After (intervention)	After (control)	Relative effect	Number of participants
Anthropometric measures								

Table 3. Home-based growth monitoring and promotion (no supplementary feeding) versus standard care (Continued)

Fink 2017	12 months	HAZ	—	—	—	—	MD 0.127 (95% CI -0.107 to 0.361)	85 clusters; 336 participants
		INTER-NDA development score	—	—	—	—	MD -0.017 (95% CI -0.133 to 0.098)	85 clusters; 336 participants
		WAZ	—	—	—	—	MD 0.183 (95% CI 0.037 to 0.328)	85 clusters; 336 participants
Feeding practices								
Fink 2017	12 months	Proportion of families reporting child consumption of breast milk in past 7 days ^a	—	—	—	—	MD 0.045 (95% CI -0.031 to 0.121)	85 clusters; 336 participants
Health service usage								
No data								
Frequency and severity of illness								
No data								
Mortality								
No data								

CI: confidence interval; HAZ: height-for-age z-score; INTER-NDA: INTERGROWTH-21st Neurodevelopmental Assessment; MD: mean difference; WAZ: weight-for-age z-score.

^aSeveral food items were presented for this outcome; for ease of understanding we extracted and presented just one, chosen based on the median effect.

Table 4. Community-based growth monitoring and promotion (no supplementary feeding) versus education

Study	Time point	Outcome	Before (intervention)	Before (control)	After (intervention)	After (control)	Relative effect	Number of participants
Anthropometric measures								
George 1993	After 24 months	WAZ	Mean -2.24	Mean -2.04	Mean -1.94	Mean -1.80	Not estimable ^a	12 clusters; 1093 participants

Table 4. Community-based growth monitoring and promotion (no supplementary feeding) versus education (Continued)

HAZ	Mean -1.91	Mean -1.51	Mean -1.58	Mean -1.28	Not estimable ^a	12 clusters; 1093 participants
Mean weight gain (g per month)	Mean 130	Mean 116	Mean 180	Mean 190	Not estimable ^a	12 clusters; 1093 participants
Mean length gain (cm per month)	Mean 0.87 (SEM 0.03)	Mean 0.83 (SEM 0.03)	Mean 0.87 (SEM 0.02)	Mean 0.89 (SEM 0.02)	MD -0.02 (95% CI -0.08 to 0.04)	374 participants
Feeding practices						
No data						
Health service usage						
No data						
Frequency and severity of illness						
No data						
Mortality						
No data						

CI: confidence interval; HAZ: height-for-age z-score; MD: mean difference; SEM: standard error of the mean; WAZ: weight-for-age z-score.

^a Relative effect not estimable as no totals provided for the outcome.

APPENDICES

Appendix 1. Search strategies

CENTRAL

ID Search

- #1 MeSH descriptor: [Infant] this term only
- #2 MeSH descriptor: [Child] this term only
- #3 (infant* or baby or babies or child* or boy* or girl* or preschool* or pre NEXT school*)
- #4 {or #1-#3}
- #5 MeSH descriptor: [Growth] this term only
- #6 MeSH descriptor: [Child Development] this term only
- #7 MeSH descriptor: [Anthropometry] this term only
- #8 MeSH descriptor: [Nutrition Surveys] this term only
- #9 (growth NEAR/3 (assess* or chart* or measur* or monitor*)
- #10 (anthropometric NEAR/3 (growth or indicator* or measure* or monitor* or surveillance))
- #11 (age* and ((weight or length or height) NEAR/1 (chart* or measur* or monitor* or surveillance)))
- #12 (z NEXT score*)
- #13 {or #5-#12}
- #14 [mh "Child health services"]
- #15 [mh ^"Health Education"] and [mh Parents]
- #16 [mh ^"Health Education"] and [mh Caregivers]
- #17 [mh "Health survey"]
- #18 [mh ^"Health promotion"] and [mh Parents]
- #19 [mh ^"Health promotion"] and [mh Caregivers]
- #20 [mh "Education, Nonprofessional"] and [mh Parents]
- #21 [mh "Education, Nonprofessional"] and [mh Caregivers]
- #22 MeSH descriptor: [Parents] explode all trees and with qualifier(s): [education - ED]
- #23 [mh Counseling] and [mh Parents]
- #24 [mh Counseling] and [mh Caregivers]
- #25 [mh "Nutrition assessment"]
- #26 [mh ^"Preventive Health Services"]
- #27 health services
- #28 ((mother* or father* or parent* or carer* or caregiver* or care NEXT giver*) NEAR/3 (advice or advised or counsel* or educat* or knowledge or learn*))
- #29 (health NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*))
- #30 (nutrition* NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*))
- #31 {or #14-#30}
- #32 #13 and #31
- #33 ("growth monitoring" near/10 promotion)
- #34 (integrated NEAR/2 nutrition)
- #35 (GMP NEAR/15 nutrition*)
- #36 {or #32-#35}
- #37 #4 and #36 in Trials

MEDLINE Ovid

Lines 54 to 56 are filters to identify studies relevant to LMIC, which were developed in 2020 by Cochrane Effective Practice and Organisation of Care (EPOC; [Cochrane EPOC 2020](#)).

- 1 exp infant/
- 2 exp child/
- 3 (infant\$ or baby or babies or child\$ or boy\$ or girl\$ or preschool\$ or pre-school\$).tw,kf.
- 4 or/1-3
- 5 growth/
- 6 Child development/
- 7 Anthropometry/
- 8 Nutrition Surveys/
- 9 (growth adj3 (assess\$ or chart\$ or measur\$ or monitor\$)).tw,kf.
- 10 (anthropometric adj3 (growth or indicator\$ or measure\$ or monitor\$ or surveillance)).tw,kf.
- 11 (age\$ and ((weight or length or height) adj1 (chart\$ or measur\$ or monitor\$ or surveillance))).tw,kf.
- 12 z score\$.tw,kf.

13 or/5-12
 14 Child Health Services/
 15 Health Education/ and Parents/
 16 Health Education/ and Caregivers/
 17 Health Survey/
 18 Health Promotion/ and Parents/
 19 Health Promotion/ and Caregivers/
 20 Education, Nonprofessional/ and Parents/
 21 Education, Nonprofessional/ and Caregivers/
 22 exp Parents/ed [Education]
 23 Counseling/ and Parents/
 24 Counseling/ and Caregivers/
 25 Nutrition assessment/
 26 Preventive Health Services/
 27 health services.tw,kf.
 28 ((mother\$ or father\$ or parent\$ or carer\$ or caregiver\$ or care-giver\$) adj3 (advice or advised or counsel\$ or educat\$ or knowledge or learn\$)).tw,kf.
 29 (health adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kf.
 30 (nutrition\$ adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kf.
 31 or/14-30
 32 13 and 31
 33 (growth monitoring and promotion).tw,kf.
 34 (integrated adj2 nutrition).tw,kf.
 35 (GMP adj15 nutrition\$).tw,kf.
 36 or/32-35
 37 4 and 36
 38 randomized controlled trial.pt.
 39 controlled clinical trial.pt.
 40 randomi#ed.ab.
 41 placebo\$.ab.
 42 drug therapy.fs.
 43 randomly.ab.
 44 trial.ab.
 45 groups.ab.
 46 cohort studies/ or follow-up studies/ or longitudinal studies/ or prospective studies/ or retrospective studies/
 47 (cohort\$ or longitudinal\$ or prospectiv\$ or retrospectiv\$ or (follow\$ adj1 up)).tw,kf.
 48 Controlled Before-After Studies/
 49 (controlled or control group or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or cba design\$ or cba stud\$ or comparative stud\$ or evaluation stud\$ or program\$ evaluation or program\$ effectiveness).tw,kf.
 50 or/38-49
 51 exp animals/ not humans.sh.
 52 50 not 51
 53 37 and 52
 54 (afghanistan or albania or algeria or american samoa or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or republic of belarus or belarus or byelarus or belorussia or byelorussian or belize or british honduras or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or burkina faso or burkina fasso or upper volta or burundi or urundi or cabo verde or cape verde or cambodia or kampuchea or khmer republic or cameroon or cameron or cameroun or central african republic or ubangi shari or chad or chile or china or colombia or comoros or comoro islands or iles comores or mayotte or democratic republic of the congo or democratic republic congo or congo or zaire or costa rica or "cote d'ivoire" or "cote d' ivoire" or cote divoire or cote d ivoire or ivory coast or croatia or cuba or cyprus or czech republic or czechoslovakia or djibouti or french somaliland or dominica or dominican republic or ecuador or egypt or united arab republic or el salvador or equatorial guinea or spanish guinea or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or gabonese republic or gambia or "georgia (republic)" or georgian or ghana or gold coast or gibraltar or greece or grenada or guam or guatemala or guinea or guinea bissau or guyana or british guiana or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or republic of korea or north korea or south korea or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or lao pdr or "lao people's democratic republic" or latvia or lebanon or lebanese republic or lesotho or basutoland or liberia or libya or libyan arab jamahiriya or lithuania or macau or macao or republic of north macedonia or macedonia or madagascar or malagasy republic or malawi or nyalaland or malaysia or malay federation or malaya federation or maldives or indian ocean islands or indian ocean or mali or malta or micronesia or federated states of micronesia or kiribati or marshall islands or nauru or northern mariana islands or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or morocco or ifni or mozambique or portuguese east africa or myanmar or burma or namibia or nepal or netherlands antilles or nicaragua

or niger or nigeria or oman or muscat or pakistan or panama or papua new guinea or new guinea or paraguay or peru or philippines or philippines or phillippines or poland or "polish people's republic" or portugal or portuguese republic or puerto rico or romania or russia or russian federation or ussr or soviet union or union of soviet socialist republics or rwanda or ruanda or samoan or pacific islands or polynesia or samoan islands or navigator island or navigator islands or "sao tome and principe" or saudi arabia or senegal or serbia or seychelles or sierra leone or slovakia or slovak republic or slovenia or melanesia or solomon island or solomon islands or norfolk island or norfolk islands or somalia or south africa or south sudan or sri lanka or ceylon or "saint kitts and nevis" or "st. kitts and nevis" or saint lucia or "st. lucia" or "saint vincent and the grenadines" or saint vincent or "st. vincent" or grenadines or sudan or suriname or surinam or dutch guiana or netherlands guiana or syria or syrian arab republic or tajikistan or tadjikistan or tadjhikistan or tadjhik or tanzania or tanganyika or thailand or siam or timor leste or east timor or togo or togolese republic or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or new hebrides or venezuela or vietnam or viet nam or middle east or west bank or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or northern rhodesia or global south or africa south of the sahara or sub-saharan africa or subsaharan africa or africa, central or central africa or africa, northern or north africa or northern africa or magreb or maghrib or sahara or africa, southern or southern africa or africa, eastern or east africa or eastern africa or africa, western or west africa or western africa or west indies or indian ocean islands or caribbean or central america or latin america or "south and central america" or south america or asia, central or central asia or asia, northern or north asia or northern asia or asia, southeastern or southeastern asia or south eastern asia or southeast asia or south east asia or asia, western or western asia or europe, eastern or east europe or eastern europe or developing country or developing countries or developing nation? or developing population? or developing world or less developed countr* or less developed nation? or less developed population? or less developed world or lesser developed countr* or lesser developed nation? or lesser developed population? or lesser developed world or under developed countr* or under developed nation? or under developed population? or under developed world or underdeveloped countr* or underdeveloped nation? or underdeveloped population? or underdeveloped world or middle income countr* or middle income nation? or middle income population? or low income countr* or low income nation? or low income population? or lower income countr* or lower income nation? or lower income population? or underserved countr* or underserved nation? or underserved population? or underserved world or under served countr* or under served nation? or under served population? or under served world or deprived countr* or deprived nation? or deprived population? or deprived world or poor countr* or poor nation? or poor population? or poor world or poorer countr* or poorer nation? or poorer population? or poorer world or developing econom* or less developed econom* or lesser developed econom* or under developed econom* or underdeveloped econom* or middle income econom* or low income econom* or lower income econom* or low gdp or low gnp or low gross domestic or low gross national or lower gdp or lower gnp or lower gross domestic or lower gross national or lmic or lmic's or third world or lami countr* or transitional countr* or emerging economies or emerging nation?).ti,ab,sh,kf.

55 (afghan or afghans or afghani or albanian? or algerian? or american samoan? or angolan? or antiguan? or barbudan? or argentine? or argentinian? or argentinean? or armenian? or aruban? or azerbaijani? or bahraini? or bangladeshi? or bangalees or bajan? or belarusian? or byelorussian? or belizean? or beninese? or bhutanese or bolivian? or bosnian? or botswana or batswana or brazilian? or brasilian? or bulgarian? or burkinabe or burkinese or burundian? or cape verdean? or cabo verdean? or cambodian? or khmer or cameroonian? or central african? or chadian? or chilean? or chinese or colombian? or comorian? or congolese or costa rican? or ivorian? or croatian? or cuban? or cyriot? or czech? or djiboutian? or dominican? or ecuadorian? or egyptian? or salvadoran? or equatorial guinean? or equatoguinean? or eritrean? or estonian? or swazi? or swati? or ethiopian? or fiji or gabonese or gabonaise or gambian? or georgian? or ghanaian? or gibraltarian? or greek? or grenadian? or guamanian? or guatemalan? or guinean? or bissau guinean? or guyanese or haitian? or honduran? or hungarian? or indian? or indonesian? or iranian? or iraqian? or iraqi? or manx or jamaican? or jordanian? or kazakhstan? or kenyan? or kirabati or kirabatian? or north korean? or korean? or kosovar? or kosovan? or kyrgyz* or lao or laotian? or latvian? or lebanese or lesothan? or lesothonian? or mosotho or basotho or liberian? or libyan? or lithuanian? or macanese or macedonian? or malagasy or madagascan? or malawian? or malaysian? or maldivian? or malian? or maltese or marshallese? or mauritanian? or mauritian? or mexican? or micronesian? or moldovan? or mongolian? or mongol or montenegrin? or moroccan? or mozambican? or burmese or myanmar or namibian? or nauruan? or nepali or nepalese or netherlands antillean? or nicaraguan? or nigerien? or nigerian? or northern mariana islander? or mariana? or omani? or pakistani? or palauan? or palestinian* or panamanian? or papua new guinean? or paraguayan? or peruvian? or philippine? or philipine? or philippine? or filipino? or filipina? or polish or pole or poles or portuguese or puerto rican? or romanian? or russian? or soviet people or soviet population or rwandan? or rwandese or ruandan? or ruandese or samoan? or sao tomean? or santomean? or saudi arabian? or saudi? or senegalese or serbian? or montenegrin? or seychellois or seychelloise? or sierra leonean? or slovak? or slovene? or solomon islander? or somali? or south african? or south sudanese or sri lankan? or ceylonese or kittitian? or nevisian? or saint lucian? or vintcentian? or sudanese or surinamese? or syrian? or tajik? or tajikistani? or tadjik? or tadjikistani? or tanzanian? or tanganyikan? or thai or timorese? or togolese or tongan? or trinidadian? or tobagonian? or tunisian? or turk? or turkish or turkmen? or tuvaluan? or ugandan? or ukrainian? or uruguayan? or uzbek? or vanuatu* or venezuelan? or vietnamese or yemeni? or yemenite? or yemenese or yugoslav? or yugoslavian? or zambian? or zimbabwean?).ti,ab,sh,kf.

56 or/54-55

57 53 and 56

MEDLINE In-Process and Other Non-Indexed Citations Ovid

1 (infant\$ or baby or babies or child\$ or boy\$ or girl\$ or preschool\$ or pre-school\$).tw,kf.

2 (growth or anthropomet\$ or nutrition).ti,kf.

3 (growth adj3 (assess\$ or chart\$ or measur\$ or monitor\$)).tw,kf.

4 (anthropometric adj3 (growth or indicator\$ or measure\$ or monitor\$ or surveillance)).tw,kf.

5 (age\$ and ((weight or length or height) adj1 (chart\$ or measur\$ or monitor\$ or surveillance))).tw,kf.

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

56

6 z score\$.tw,kf.
 7 or/2-6
 8 ((mother\$ or father\$ or parent\$ or carer\$ or caregiver\$ or care-giver\$) adj3 (advice or advised or counsel\$ or educat\$ or knowledge or learn\$)).tw,kf.
 9 (health adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kf.
 10 (nutrition\$ adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kf.
 11 or/8-10)
 12 7 and 11
 13 (growth monitoring and promotion).tw,kf.
 14 (integrated adj2 nutrition).tw,kf.
 15 (GMP adj15 nutrition\$).tw,kf.
 16 or/13-15
 17 12 or 16
 18 1 and 17
 19 (random\$ or control\$ or group\$ or cluster\$ or placebo\$ or trial\$ or assign\$ or allocat\$ or prospectiv\$ or meta-analysis or systematic review).tw,kf. (8621883)
 20 (cohort\$ or longitudinal\$ or prospectiv\$ or retrospectiv\$ or (follow\$ adj1 up)).tw,kf. (2854361)
 21 ((before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or cba design\$ or cba stud\$ or comparative stud \$ or evaluation stud\$ or program\$ evaluation or program\$ effectiveness).tw,kf.
 22 or/19-21
 23 (afghanistan or albania or algeria or american samoa or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or republic of belarus or belarus or byelarus or belorussia or byelorussian or belize or british honduras or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or burkina faso or burkina fasso or upper volta or burundi or urundi or cabo verde or cape verde or cambodia or kampuchea or khmer republic or cameroon or cameron or cameroun or central african republic or ubangi shari or chad or chile or china or colombia or comoros or comoro islands or iles comores or mayotte or democratic republic of the congo or democratic republic congo or congo or zaire or costa rica or "cote d'ivoire" or "cote d'ivoire" or cote divoire or cote d ivoire or ivory coast or croatia or cuba or cyprus or czech republic or czechoslovakia or djibouti or french somaliland or dominica or dominican republic or ecuador or egypt or united arab republic or el salvador or equatorial guinea or spanish guinea or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or gabonese republic or gambia or "georgia (republic)" or georgian or ghana or gold coast or gibraltar or greece or grenada or guam or guatemala or guinea or guinea bissau or guyana or british guiana or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or republic of korea or north korea or south korea or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or lao pdr or "lao people's democratic republic" or latvia or lebanon or lebanese republic or lesotho or basutoland or liberia or libya or libyan arab jamahiriya or lithuania or macau or macao or republic of north macedonia or macedonia or madagascar or malagasy republic or malawi or nyasaland or malaysia or malay federation or malaya federation or maldives or indian ocean islands or indian ocean or mali or malta or micronesia or federated states of micronesia or kiribati or marshall islands or nauru or northern mariana islands or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or morocco or ifni or mozambique or portuguese east africa or myanmar or burma or namibia or nepal or netherlands antilles or nicaragua or niger or nigeria or oman or muscat or pakistan or panama or papua new guinea or new guinea or paraguay or peru or philippines or philippines or philippines or poland or "polish people's republic" or portugal or portuguese republic or puerto rico or romania or russia or russian federation or ussr or soviet union or union of soviet socialist republics or rwanda or samoa or pacific islands or polynesia or samoan islands or navigator island or navigator islands or "sao tome and principe" or saudi arabia or senegal or serbia or seychelles or sierra leone or slovakia or slovak republic or slovenia or melanesia or solomon island or solomon islands or norfolk island or norfolk islands or somalia or south africa or south sudan or sri lanka or ceylon or "saint kitts and nevis" or "st. kitts and nevis" or saint lucia or "st. lucia" or "saint vincent and the grenadines" or saint vincent or "st. vincent" or grenadines or sudan or suriname or surinam or dutch guiana or netherlands guiana or syria or syrian arab republic or tajikistan or tadjikistan or tadhikistan or tadhik or tanzania or tanganyika or thailand or siam or timor leste or east timor or togo or togolese republic or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or new hebrides or venezuela or vietnam or viet nam or middle east or west bank or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or northern rhodesia or global south or africa south of the sahara or sub-saharan africa or subsaharan africa or africa, central or central africa or africa, northern or north africa or northern africa or magreb or maghrib or sahara or africa, southern or southern africa or africa, eastern or east africa or eastern africa or africa, western or west africa or western africa or west indies or indian ocean islands or caribbean or central america or latin america or "south and central america" or south america or asia, central or central asia or asia, northern or north asia or northern asia or asia, southeastern or southeastern asia or south eastern asia or southeast asia or south east asia or asia, western or western asia or europe, eastern or east europe or eastern europe or developing country or developing countries or developing nation? or developing population? or developing world or less developed countr* or less developed nation? or less developed population? or less developed world or lesser developed countr* or lesser developed nation? or lesser developed population? or lesser developed world or under developed countr* or under developed nation? or under developed population? or under developed world or underdeveloped countr* or underdeveloped nation? or underdeveloped population? or underdeveloped world or middle income countr* or middle income nation? or middle income population? or low income countr* or low income nation? or low income population? or lower income countr* or lower income nation? or lower income population? or underserved countr* or underserved nation? or underserved population? or underserved world or under

served countr* or under served nation? or under served population? or under served world or deprived countr* or deprived nation? or deprived population? or deprived world or poor countr* or poor nation? or poor population? or poor world or poorer countr* or poorer nation? or poorer population? or poorer world or developing econom* or less developed econom* or lesser developed econom* or under developed econom* or underdeveloped econom* or middle income econom* or low income econom* or lower income econom* or low gdp or low gnp or low gross domestic or low gross national or lower gdp or lower gnp or lower gross domestic or lower gross national or lmic or lmics or third world or lami countr* or transitional countr* or emerging economies or emerging nation?).tw,kf.

24 (afghan or afghans or afghani or albanian? or algerian? or american samoan? or angolan? or antiguan? or barbudan? or argentine? or argentinian? or argentinean? or armenian? or aruban? or azerbaijani? or bahraini? or bangladeshi? or bangalees or bajan? or belarusian? or byelorussian? or belizean? or beninese? or bhutanese or bolivian? or bosnian? or botswana or batswana or brazilian? or brasilian? or bulgarian? or burkinabe or burkinese or burundian? or cape verdean? or cabo verdean? or cambodian? or khmer or cameroonian? or central african? or chadian? or chilean? or chinese or colombian? or comorian? or congolese or costa rican? or ivorian? or croatian? or cuban? or cypriot? or czech? or djiboutian? or dominican? or ecuadorian? or egyptian? or salvadoran? or equatorial guinean? or equatoguinean? or eritrean? or estonian? or swazi? or swati? or ethiopian? or fijiian? or gabonese or gabonaise or gambian? or georgian? or ghanaian? or gibraltarian? or greek? or grenadian? or guamanian? or guatemalan? or guinean? or bissau guinean? or guyanese or haitian? or honduran? or hungarian? or indian? or indonesian? or iranian? or iraqian? or iraqi? or manx or jamaican? or jordanian? or kazakhstanian? or kenyan? or kirabati or kirabatian? or north korean? or korean? or kosovar? or kosovan? or kyrgyz* or lao or laotian? or latvian? or lebanese or lesothan? or lesothonian? or mosotho or basotho or liberian? or libyan? or lithuanian? or macanese or macedonian? or malagasy or madagascan? or malawian? or malaysian? or maldivian? or malian? or maltese or marshallse? or mauritanian? or mauritian? or mexican? or micronesian? or moldovan? or mongolian? or mongol or montenegrin? or moroccan? or mozambican? or burmese or myanmar or namibian? or nauruan? or nepali or nepalese or netherlands antillean? or nicaraguan? or nigerien? or nigerian? or northern mariana islander? or mariana? or omani? or pakistani? or palauan? or palestinian* or panamanian? or papua new guinean? or paraguayian? or peruvian? or philippine? or philippine? or philippine? or philippine? or filipino? or filipina? or polish or pole or poles or portuguese or puerto rican? or romanian? or russian? or soviet people or soviet population or rwandan? or rwandese or ruandan? or ruandese or samoan? or sao tomean? or santomean? or saudi arabian? or saudi? or senegalese or serbian? or montenegrin? or seychellois or seychelloise? or sierra leonean? or slovak? or slovene? or solomon islander? or somali? or south african? or south sudanese or sri lankan? or ceylonese or kittitian? or nevisian? or saint lucian? or vincentian? or sudanese or surinamese? or syrian? or tajik? or tajikistani? or tadjik? or tadjikistani? or tanzanian? or tanganyikan? or thai or timorese? or togolese or tongan? or trinidadian? or tobagonian? or tunisian? or turk? or turkish or turkmen? or tuvaluan? or ugandan? or ukrainian? or uruguayan? or uzbek? or vanuatu* or venezuelan? or vietnamese or yemeni? or yemenite? or yemenese or yugoslav? or yugoslavian? or zambian? or zimbabwean?).tw,kf.

25 or/23-24

26 18 and 22 and 25

27 limit 26 to ("in data review" or in process or "pubmed not medline")

MEDLINE EPub Ahead of Print Ovid

1 (infant\$ or baby or babies or child\$ or boy\$ or girl\$ or preschool\$ or pre-school\$).tw,kf.

2 (growth or anthropomet\$ or nutrition).ti,kf.

3 (growth adj3 (assess\$ or chart\$ or measur\$ or monitor\$)).tw,kf.

4 (anthropometric adj3 (growth or indicator\$ or measure\$ or monitor\$ or surveillance)).tw,kf.

5 (age\$ and ((weight or length or height) adj1 (chart\$ or measur\$ or monitor\$ or surveillance))).tw,kf.

6 z score\$.tw,kf.

7 or/2-6

8 ((mother\$ or father\$ or parent\$ or carer\$ or caregiver\$ or care-giver\$) adj3 (advice or advised or counsel\$ or educat\$ or knowledge or learn\$)).tw,kf.

9 (health adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kf.

10 (nutrition\$ adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kf.

11 or/8-10)

12 7 and 11

13 (growth monitoring and promotion).tw,kf.

14 (integrated adj2 nutrition).tw,kf.

15 (GMP adj15 nutrition\$).tw,kf.

16 or/13-15

17 12 or 16

18 1 and 17

19 (random\$ or control\$ or group\$ or cluster\$ or placebo\$ or trial\$ or assign\$ or allocat\$ or prospectiv\$ or meta-analysis or systematic review).tw,kf. (8621883)

20 (cohort\$ or longitudinal\$ or prospectiv\$ or retrospectiv\$ or (follow\$ adj1 up)).tw,kf. (2854361)

21 ((before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or cba design\$ or cba stud\$ or comparative stud\$ or evaluation stud\$ or program\$ evaluation or program\$ effectiveness).tw,kf.

22 or/19-21

23 (afghanistan or albania or algeria or american samoa or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or republic of belarus or belarus or byelarus or belorussia or

byelorussian or belize or british honduras or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or burkina faso or burkina fasso or upper volta or burundi or urundi or cabo verde or cape verde or cambodia or kampuchea or khmer republic or cameroon or cameron or cameroun or central african republic or ubangi shari or chad or chile or china or colombia or comoros or comoro islands or iles comores or mayotte or democratic republic of the congo or democratic republic congo or congo or zaire or costa rica or "cote d'ivoire" or "cote d'ivoire" or cote divoire or cote d ivoire or ivory coast or croatia or cuba or cyprus or czech republic or czechoslovakia or djibouti or french somaliland or dominica or dominican republic or ecuador or egypt or united arab republic or el salvador or equatorial guinea or spanish guinea or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or gabonese republic or gambia or "georgia (republic)" or georgian or ghana or gold coast or gibraltar or greece or grenada or guam or guatemala or guinea or guinea bissau or guyana or british guiana or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or republic of korea or north korea or south korea or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or lao pdr or "lao people's democratic republic" or latvia or lebanon or lebanese republic or lesotho or basutoland or liberia or libya or libyan arab jamahiriya or lithuania or macau or macao or republic of north macedonia or macedonia or madagascar or malagasy republic or malawi or nyalaland or malaysia or malay federation or malaya federation or maldives or indian ocean islands or indian ocean or mali or malta or micronesia or federated states of micronesia or kiribati or marshall islands or nauru or northern mariana islands or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or morocco or ifni or mozambique or portuguese east africa or myanmar or burma or namibia or nepal or netherlands antilles or nicaragua or niger or nigeria or oman or muscat or pakistan or panama or papua new guinea or new guinea or paraguay or peru or philippines or philipines or philippines or phillippines or poland or "polish people's republic" or portugal or portuguese republic or puerto rico or romania or russia or russian federation or ussr or soviet union or union of soviet socialist republics or rwanda or ruanda or samoa or pacific islands or polynesia or samoan islands or navigator island or navigator islands or "sao tome and principe" or saudi arabia or senegal or serbia or seychelles or sierra leone or slovakia or slovak republic or slovenia or melanesia or solomon island or solomon islands or norfolk island or norfolk islands or somalia or south africa or south sudan or sri lanka or ceylon or "saint kitts and nevis" or "st. kitts and nevis" or saint lucia or "st. lucia" or "saint vincent and the grenadines" or saint vincent or "st. vincent" or grenadines or sudan or suriname or surinam or dutch guiana or netherlands guiana or syria or syrian arab republic or tajikistan or tadjikistan or tadjhikistan or tadjhik or tanzania or tanganyika or thailand or siam or timor leste or east timor or togo or togolese republic or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or new hebrides or venezuela or vietnam or viet nam or middle east or west bank or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or northern rhodesia or global south or africa south of the sahara or sub-saharan africa or subsaharan africa or africa, central or central africa or africa, northern or north africa or northern africa or magreb or maghrib or sahara or africa, southern or southern africa or africa, eastern or east africa or eastern africa or africa, western or west africa or western africa or west indies or indian ocean islands or caribbean or central america or latin america or "south and central america" or south america or asia, central or central asia or asia, northern or north asia or northern asia or asia, southeastern or southeastern asia or south eastern asia or southeast asia or south east asia or asia, western or western asia or europe, eastern or east europe or eastern europe or developing country or developing countries or developing nation? or developing population? or developing world or less developed countr* or less developed nation? or less developed population? or less developed world or lesser developed countr* or lesser developed nation? or lesser developed population? or lesser developed world or under developed countr* or under developed nation? or under developed population? or under developed world or underdeveloped countr* or underdeveloped nation? or underdeveloped population? or underdeveloped world or middle income countr* or middle income nation? or middle income population? or low income countr* or low income nation? or low income population? or lower income countr* or lower income nation? or lower income population? or underserved countr* or underserved nation? or underserved population? or underserved world or under served countr* or under served nation? or under served population? or under served world or deprived countr* or deprived nation? or deprived population? or deprived world or poor countr* or poor nation? or poor population? or poor world or poorer countr* or poorer nation? or poorer population? or poorer world or developing econom* or less developed econom* or lesser developed econom* or under developed econom* or underdeveloped econom* or middle income econom* or low income econom* or lower income econom* or low gdp or low gnp or low gross domestic or low gross national or lower gdp or lower gnp or lower gross domestic or lower gross national or lmic or lmics or third world or lami countr* or transitional countr* or emerging economies or emerging nation?).tw,kf.

24 (afghan or afghans or afghani or albanian? or algerian? or american samoan? or angolan? or antiguan? or barbudan? or argentine? or argentinian? or argentinean? or armenian? or aruban? or azerbaijani? or bahraini? or bangladeshi? or bangalees or bajan? or belarusian? or byelorussian? or belizean? or beninese? or bhutanese or bolivian? or bosnian? or botswana or batswana or brazilian? or brasilian? or bulgarian? or burkinabe or burkinese or burundian? or cape verdean? or cabo verdean? or cambodian? or khmer or cameroonian? or central african? or chadian? or chilean? or chinese or colombian? or comorian? or congolese or costa rican? or ivorian? or croatian? or cuban? or cypriot? or czech? or djiboutian? or dominican? or ecuadorian? or egyptian? or salvadoran? or equatorial guinean? or equatoguinean? or eritrean? or estonian? or swazi? or swati? or ethiopian? or fijian or gabonese or gabonaise or gambian? or georgian? or ghanaian? or gibraltarian? or greek? or grenadian? or guamanian? or guatemalan? or guinean? or bissau guinean? or guyanese or haitian? or honduran? or hungarian? or indian? or indonesian? or iranian? or iraqian? or iraqi? or manx or jamaican? or jordanian? or kazakhstani? or kenyan? or kirabati or kirabatian? or north korean? or korean? or kosovar? or kosovan? or kyrgyz* or lao or laotian? or latvian? or lebanese or lesothan? or lesothonian? or mosotho or basotho or liberian? or libyan? or lithuanian? or macanese or macedonian? or malagasy or madagascan? or malawian? or malaysian? or maldivian? or malian? or maltese or marshallese? or mauritanian? or mauritian? or mexican? or micronesian? or moldovan? or mongolian? or mongol or montenegrin? or moroccan? or mozambican? or burmese or myanmar or namibian? or nauruan? or nepali or nepalese or netherlands antillean? or nicaraguan? or nigerien? or nigerian? or northern mariana islander? or mariana? or omani? or pakistani? or palauan? or palestinian* or panamanian? or papua new guinean? or paraguayian? or peruvian? or philippine? or philippine? or philippine? or philippine? or filipino? or filipina? or polish or pole or poles or portuguese or puerto rican? or romanian?

or russian? or soviet people or soviet population or rwandan? or rwandese or ruandan? or ruandese or samoan? or sao tomean? or santomean? or saudi arabian? or saudi? or senegalese or serbian? or montenegrin? or seychellois or seychelloise? or sierra leonean? or slovak? or slovene? or solomon islander? or somali? or south african? or south sudanese or sri lankan? or ceylonese or kittitian? or nevisian? or saint lucian? or vincentian? or sudanese or surinamese? or syrian? or tajik? or tajikistani? or tadjik? or tadjikistani? or tanzanian? or tanganyikan? or thai or timorese? or togolese or tongan? or trinidadian? or tobagonian? or tunisian? or turk? or turkish or turkmen? or tuvaluan? or ugandan? or ukrainian? or uruguayan? or uzbek? or vanuatu* or venezuelan? or vietnamese or yemeni? or yemenite? or yemenese or yugoslav? or yugoslavian? or zambian? or zimbabwean?).tw,kf.

25 or/23-24

26 18 and 22 and 25

27 limit 26 to publisher

Embase Ovid

1 exp *infant/

2 *child/ or preschool child/ or school child/ or toddler/

3 (infant\$ or baby or babies or child\$ or boy\$ or girl\$ or preschool\$ or pre-school\$).tw,kf.

4 or/1-3

5 growth/

6 child growth/

7 exp infant nutrition/ or child nutrition/

8 anthropometry/

9 (growth adj3 (assess\$ or chart\$ or measur\$ or monitor\$)).tw,kw.

10 (anthropometric adj3 (growth or indicator\$ or measure\$ or monitor\$ or surveillance)).tw,kw.

11 (age\$ and ((weight or length or height) adj1 (chart\$ or measur\$ or monitor\$ or surveillance))).tw,kw.

12 z score\$.tw,kw.

13 or/5-12

14 Child Health/

15 child health care/

16 health education/ and exp *parent/

17 health education/ and *caregiver/

18 health survey/

19 health promotion/ and exp *parent/

20 health promotion/ and *caregiver/

21 education/ and exp *parent/

22 education/ and *caregiver/

23 parenting education/

24 parent counseling/

25 counseling/ and *caregiver/

26 *nutritional assessment/

27 *preventive health service/

28 health services.tw,kw.

29 ((mother\$ or father\$ or parent\$ or carer\$ or caregiver\$ or care-giver\$) adj3 (advice or advised or counsel\$ or educat\$ or knowledge or learn\$)).tw,kw.

30 (health adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kw.

31 (nutrition\$ adj3 (advice or advised or counsel\$ or education\$ or knowledge or promot\$)).tw,kw.

32 or/14-31

33 13 and 32

34 (growth monitoring and promotion).tw,kw.

35 (integrated adj2 nutrition).tw,kw.

36 (GMP adj15 nutrition\$).tw,kw.

37 or/33-36

38 4 and 37

39 (afghanistan or albania or algeria or american samoa or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or republic of belarus or belarus or byelarus or belorussia or byelorussian or belize or british honduras or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or burkina faso or burkina fasso or upper volta or burundi or urundi or cabo verde or cape verde or cambodia or kampuchea or khmer republic or cameroon or cameron or cameroun or central african republic or ubangi shari or chad or chile or china or colombia or comoros or comoro islands or iles comores or mayotte or democratic republic of the congo or democratic republic congo or congo or zaire or costa rica or "cote d'ivoire" or "cote d'ivoire" or cote divoire or cote d ivoire or ivory coast or croatia or cuba or cyprus or czech republic or czechoslovakia or djibouti or french somaliland or dominica or dominican republic or ecuador or egypt or united arab republic or el salvador or equatorial guinea or spanish guinea or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or gabonese republic or gambia or "georgia (republic)" or georgian or ghana or gold coast or gibraltar or greece or

grenada or guam or guatemala or guinea or guinea bissau or guyana or british guiana or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or republic of korea or north korea or south korea or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or lao pdr or "lao people's democratic republic" or latvia or lebanon or lebanese republic or lesotho or basutoland or liberia or libya or libyan arab jamahiriya or lithuania or macau or macao or republic of north macedonia or macedonia or madagascar or malagasy republic or malawi or nyalaland or malaysia or malay federation or malaya federation or maldives or indian ocean islands or indian ocean or mali or malta or micronesia or federated states of micronesia or kiribati or marshall islands or nauru or northern mariana islands or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or "montenegro (republic)" or morocco or ifni or mozambique or portuguese east africa or myanmar or burma or namibia or nepal or netherlands antilles or nicaragua or niger or nigeria or oman or muscat or pakistan or panama or papua new guinea or new guinea or paraguay or peru or philippines or philippines or phillippines or phillippines or poland or "polish people's republic" or portugal or portuguese republic or puerto rico or romania or russia or russian federation or ussr or soviet union or union of soviet socialist republics or rwanda or ruanda or samoa or pacific islands or polynesia or samoan islands or navigator island or navigator islands or "sao tome and principe" or saudi arabia or senegal or serbia or seychelles or sierra leone or slovakia or slovak republic or slovenia or melanesia or solomon island or solomon islands or norfolk island or norfolk islands or somalia or south africa or south sudan or sri lanka or ceylon or "saint kitts and nevis" or "st. kitts and nevis" or saint lucia or "st. lucia" or "saint vincent and the grenadines" or saint vincent or "st. vincent" or grenadines or sudan or suriname or surinam or dutch guiana or netherlands guiana or syria or syrian arab republic or tajikistan or tadjikistan or tadjhikistan or tadjhik or tanzania or tanganyika or thailand or siam or timor leste or east timor or togo or togolese republic or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or "turkey (republic)" or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or new hebrides or venezuela or vietnam or viet nam or middle east or west bank or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or northern rhodesia or global south or africa south of the sahara or "sub saharan africa" or subsaharan africa or africa, central or central africa or africa, northern or north africa or northern africa or magreb or maghrib or sahara or africa, southern or southern africa or africa, eastern or east africa or eastern africa or africa, western or west africa or western africa or west indies or indian ocean islands or caribbean region or caribbean islands or caribbean or central america or latin america or "south and central america" or south america or asia, central or central asia or asia, northern or north asia or northern asia or asia, southeastern or southeastern asia or south eastern asia or southeast asia or south east asia or asia, western or western asia or europe, eastern or east europe or eastern europe or developing country or developing countries or developing nation? or developing population? or developing world or less developed countr* or less developed nation? or less developed population? or less developed world or lesser developed countr* or lesser developed nation? or lesser developed population? or lesser developed world or under developed countr* or under developed nation? or under developed population? or under developed world or underdeveloped countr* or underdeveloped nation? or underdeveloped population? or underdeveloped world or middle income countr* or middle income nation? or middle income population? or low income countr* or low income nation? or low income population? or lower income countr* or lower income nation? or lower income population? or underserved countr* or underserved nation? or underserved population? or underserved world or under served countr* or under served nation? or under served population? or under served world or deprived countr* or deprived nation? or deprived population? or deprived world or poor countr* or poor nation? or poor population? or poor world or poorer countr* or poorer nation? or poorer population? or poorer world or developing econom* or less developed econom* or lesser developed econom* or under developed econom* or underdeveloped econom* or middle income econom* or low income econom* or lower income econom* or low gdp or low gnp or low gross domestic or low gross national or lower gdp or lower gnp or lower gross domestic or lower gross national or lmic or lmic or third world or lami countr* or transitional countr* or emerging economies or emerging nation?).ti,ab,sh,kw.

40 38 and 39

41 exp controlled study/

42 cohort analysis/

43 follow up/

44 longitudinal study/

45 prospective study/

46 retrospective study/

47 epidemiology/

48 (controlled or control group or (before adj5 after) or (pre adj5 post) or ((pretest or pre test) and (posttest or post test)) or cba design\$ or cba stud\$ or comparative stud\$ or evaluation stud\$ or program\$ evaluation or program\$ effectiveness).tw,kw.

49 (cohort\$ or longitudinal\$ or prospectiv\$ or retrospectiv\$ or (follow\$ adj1 up)).tw,kw.

50 random\$.ti,ab.

51 placebo.ti,ab.

52 (compare or compared or comparison).ti.

53 ((evaluated or evaluate or evaluating or assessed or assess) and (compare or compared or comparing or comparison)).ab.

54 ((double or single or doubly or singly) adj (blind or blinded or blindly)).ti,ab.

55 parallel group\$1.ti,ab.

56 (crossover or cross over).ti,ab.

57 ((assign\$ or match or matched or allocation) adj5 (alternate or group\$1 or intervention\$1 or patient\$1 or subject\$1 or participant \$1)).ti,ab.

58 (assigned or allocated).ti,ab.

59 trial.ti.

60 or/41-59

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

61

61 (rat or rats or mouse or mice or swine or porcine or murine or sheep or lambs or pigs or piglets or rabbit or rabbits or cat or cats or dog or dogs or cattle or bovine or monkey or monkeys or trout or marmoset\$1).ti. and animal experiment/
 62 Animal experiment/ not (human experiment/ or human/
 63 or/61-62
 64 60 not 63
 65 40 and 64

CINAHL Plus EBSCOhost

S1 (MH "Growth+") OR (MH "Body Height")
 S2 (MH "Anthropometry")
 S3 (MH "Child Development")
 S4 TI(growth N3 (assess* or chart* or measur* or monitor*)) or AB(growth N3 (assess* or chart* or measur* or monitor*))
 S5 TI(anthropometric N3 (growth or indicator* or measure* or monitor* or surveillance)) OR AB(anthropometric N3 (growth or indicator* or measure* or monitor* or surveillance))
 S6 TI(age* and (weight or length or height) AND (chart* or measur* or monitor* or surveillance)) OR AB(age* and ((weight or length or height) N1 (chart* or measur* or monitor* or surveillance)))
 S7 TI("z score*") or AB("z score*")
 S8 S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7
 S9 (MH "Child Health Services")
 S10 (MH "Health Education") AND ((MH "Parents+") OR (MH "CAREGIVERS"))
 S11 (MH "Health Promotion+") AND ((MH "Parents+") OR (MH "CAREGIVERS"))
 S12 (MH "Education, Nonprofessional+") AND ((MH "Parents+") OR (MH "CAREGIVERS"))
 S13 (MH "Education") AND ((MH "Parents+") OR (MH "CAREGIVERS"))
 S14 (MH "Parents+/ED")
 S15 (MH "Counseling") AND ((MH "Parents+") OR (MH "CAREGIVERS"))
 S16 (MH "Nutritional Counseling") AND ((MH "Parents+") OR (MH "CAREGIVERS"))
 S17 TI("health services") or AB("health services")
 Search modes - Boolean/Phrase Interface - EBSCOhost Research Databases
 Search Screen - Advanced Search
 Database - CINAHL Plus 43,916
 S18 TI((mother* or father* or parent* or carer* or caregiver* or "care giver*") N3 (advice or advised or counsel* or educat* or knowledge or learn*)) OR AB((mother* or father* or parent* or carer* or caregiver* or "care giver*") N3 (advice or advised or counsel* or educat* or knowledge or learn*))
 S19 TI(health N3 (advice or advised or counsel* or education* or knowledge or promot*)) OR AB(health N3 (advice or advised or counsel* or education* or knowledge or promot*))
 S20 TI(nutrition* N3 (advice or advised or counsel* or education* or knowledge or promot*)) OR AB(nutrition* N3 (advice or advised or counsel* or education* or knowledge or promot*))
 S21 S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20
 S22 S8 AND S21
 S23 TI("growth monitoring" N10 promotion) OR AB("growth monitoring" N10 promotion)
 S24 TI(integrated N3 nutrition) OR AB(integrated N3 nutrition)
 Search modes - Boolean/Phrase Interface - EBSCOhost Research Databases
 Search Screen - Advanced Search
 Database - CINAHL Plus 206
 S25 TI(GMP N15 nutrition*) OR AB(GMP N15 nutrition*)
 S26 S22 OR S23 OR S24 OR S25
 S27 (MH "Child") OR (MH "Infant") OR (MH "Child, Preschool") OR (MH "Infant, Newborn+")
 S28 TI(infant* or baby or babies or child* or boy* or girl* or preschool* or pre-school*) OR AB(infant* or baby or babies or child* or boy* or girl* or preschool* or pre-school*)
 S29 S27 OR S28
 S30 S8 AND S26 AND S29
 S31 (afghanistan or albania or algeria or "american samoa" or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or "republic of belarus" or belarus or byelarus or belorussia or byelorussian or belize or "british honduras" or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or "burkina faso" or "burkina fasso" or "upper volta" or burundi or urundi or "cabo verde" or "cape verde" or cambodia or kampuchea or "khmer republic" or cameroon or cameron or cameroun or "central african republic" or "ubangi shari" or chad or chile or china or colombia or comoros or "comoro islands" or "iles comores" or mayotte or "democratic republic of the congo" or "democratic republic congo" or congo or zaire or "costa rica" or "cote d'ivoire" or "cote d'ivoire" or "cote divoire" or "cote d ivoire" or "ivory coast" or croatia or cuba or cyprus or "czech republic" or czechoslovakia or djibouti or "french somaliland" or dominica or "dominican republic" or ecuador or egypt or "united arab republic" or "el salvador" or "equatorial guinea" or "spanish guinea" or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or "gabonese republic" or gambia or "georgia

(republic) " or georgian or ghana or gold coast or gibraltar or greece or grenada or guam or guatemala or guinea or "guinea bissau" or guyana or "british guiana" or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or "republic of korea" or "north korea" or "south korea" or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or "lao pdr" or "lao people's democratic republic" or latvia or lebanon or "lebanese republic" or lesotho or basutoland or liberia or libya or "libyan arab jamahiriya" or lithuania or macau or macao or "republic of north macedonia" or macedonia or madagascar or "malagasy republic" or malawi or nyasaland or malaysia or "malay federation" or "malaya federation" or maldives or "indian ocean islands" or "indian ocean" or mali or malta or micronesia or "federated states of micronesia" or kiribati or "marshall islands" or nauru or "northern mariana islands" or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or morocco or ifni or mozambique or "portuguese east africa" or myanmar or burma or namibia or nepal or "netherlands antilles" or nicaragua or niger or nigeria or oman or muscat or pakistan or panama or "papua new guinea" or "new guinea" or paraguay or peru or philippines or philippines or philippines or philippines or poland or "polish people's republic" or portugal or "portuguese republic" or "puerto rico" or romania or russia or "russian federation" or ussr or soviet union or "union of soviet socialist republics" or rwanada or ruanda or samoa or "pacific islands" or polynesia or "samoan islands" or "navigator island" or "navigator islands" or "sao tome and principe" or "saudi arabia" or senegal or serbia or seychelles or "sierra leone" or slovakia or "slovak republic" or slovenia or melanesia or "solomon island" or "solomon islands" or "norfolk island" or "norfolk islands" or somalia or "south africa" or "south sudan" or "sri lanka" or ceylon or "saint kitts and nevis" or "st. kitts and nevis" or "saint lucia" or "st. lucia" or "saint vincent and the grenadines" or "saint vincent" or "st. vincent" or grenadines or sudan or suriname or surinam or "dutch guiana" or "netherlands guiana" or syria or "syrian arab republic" or tajikistan or tadjikistan or tadjhikistan or tadjhik or tanzania or tanganyika or thailand or siam or "timor leste" or "east timor" or togo or "togolese republic" or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or "new hebrides" or venezuela or vietnam or "viet nam" or "middle east" or "west bank" or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or "northern rhodesia" or "global south" or "africa south of the sahara" or "sub-saharan africa" or "subsaharan africa" or "africa, central" or "central africa" or "africa, northern" or "north africa" or "northern africa" or magreb or maghrib or sahara or "africa, southern" or "southern africa" or "africa, eastern" or "east africa" or "eastern africa" or "africa, western" or "west africa" or "western africa" or "west indies" or "indian ocean islands" or caribbean or "central america" or "latin america" or "south and central america" or "south america" or "asia, central" or "central asia" or "asia, northern" or "north asia" or "northern asia" or "asia, southeastern" or "southeastern asia" or "south eastern asia" or "southeast asia" or "south east asia" or "asia, western" or "western asia" or "europe, eastern" or "east europe" or "eastern europe" or "developing country" or "developing countries" or "developing nation*" or "developing population*" or "developing world" or "less developed countr*" or "less developed nation*" or "less developed population*" or "less developed world" or "lesser developed countr*" or "lesser developed nation*" or "lesser developed population*" or "lesser developed world" or "under developed countr*" or "under developed nation*" or "under developed population*" or "under developed world" or "underdeveloped countr*" or "underdeveloped nation*" or "underdeveloped population*" or "underdeveloped world" or "middle income countr*" or "middle income nation*" or "middle income population*" or "low income countr*" or "low income nation*" or "low income population*" or "lower income countr*" or "lower income nation*" or "lower income population*" or "underserved countr*" or "underserved nation*" or "underserved population*" or "underserved world" or "under served countr*" or "under served nation*" or "under served population*" or "under served world" or "deprived countr*" or "deprived nation*" or "deprived population*" or "deprived world" or "poor countr*" or "poor nation*" or "poor population*" or "poor world" or "poorer countr*" or "poorer nation*" or "poorer population*" or "poorer world" or "developing econom*" or "less developed econom*" or "lesser developed econom*" or "under developed econom*" or "underdeveloped econom*" or "middle income econom*" or "low income econom*" or "lower income econom*" or "low gdp" or "low gnp" or "low gross domestic" or "low gross national" or "lower gdp" or "lower gnp" or "lower gross domestic" or "lower gross national" or lmic or lmic or "third world" or "lami countr*" or "transitional countr*" or "emerging economies" or "emerging nation*")

S32 S30 AND S31

S33 (MH "Clinical Trials+")

S34 (MH "Controlled Before-After Studies") OR (MH "Pretest-Posttest Design+") OR (MH "Interrupted Time Series Analysis") OR (MH "Factorial Design") OR (MH "Prospective Studies+") or (MH "Retrospective Panel Studies")

S35 TI(cohort* or longitudinal* or prospectiv* or retrospectiv* or follow* N1 up)) OR AB(cohort* or longitudinal* or prospectiv* or retrospectiv* or follow* N1 up))

S36 TI(random* or control* or group* or cluster* or placebo* or trial* or assign* or allocat* or prospectiv* or "meta-analysis" or "systematic review") or AB(random* or control* or group* or cluster* or placebo* or trial* or assign* or allocat* or prospectiv* or "meta-analysis" or "systematic review")

S37 TI((before N5 after) or (pre N5 post) or ((pretest or "pre test") and (posttest or "post test")) or "cba design*" or "cba stud*" or "comparative stud*" or "evaluation stud*" or "program* evaluation" or "program* effectiveness") or AB((before N5 after) or (pre N5 post) or ((pretest or "pre test") and (posttest or "post test")) or "cba design*" or "cba stud*" or "comparative stud*" or "evaluation stud*" or "program* evaluation" or "program* effectiveness")

S38 S33 OR S34 OR S35 OR S36 OR S37

S39 S32 AND S38

Global Index Medicus

tw(((ti:(growth OR anthropomet* OR nutrition*) AND tw:(monitor* OR assess* OR measur* OR chart* OR surveillance))) AND (tw:(promot* OR educat* OR class* OR teach* OR counsel*))) AND (mj:("Child" OR "Child, Preschool" OR "Infant"))

Web of Science databases Clarivate

27 #22 AND #21

Indexes=CPCI-SSH Timespan=All years

26 #22 AND #21

Indexes=CPCI-S Timespan=All years

25 #22 AND #21

Indexes=SSCI Timespan=All years

24 #22 AND #21

Indexes=SCI-EXPANDED Timespan=All years

23 #22 AND #21

Indexes=SCI-EXPANDED, SSCI, CPCI-S, CPCI-SSH Timespan=All years

#22ts=afghanistan or albania or algeria or "american samoa" or angola or "antigua and barbuda" or antigua or barbuda or argentina or armenia or armenian or aruba or azerbaijan or bahrain or bangladesh or barbados or "republic of belarus" or belarus or byelarus or belorussia or byelorussian or belize or "british honduras" or benin or dahomey or bhutan or bolivia or "bosnia and herzegovina" or bosnia or herzegovina or botswana or bechuanaland or brazil or brasil or bulgaria or "burkina faso" or "burkina fasso" or "upper volta" or burundi or urundi or "cabo verde" or "cape verde" or cambodia or kampuchea or "khmer republic" or cameroon or cameron or cameroun or "central african republic" or "ubangi shari" or chad or chile or china or colombia or comoros or "comoro islands" or "iles comores" or mayotte or "democratic republic of the congo" or "democratic republic congo" or congo or zaire or "costa rica" or "cote d'ivoire" or "cote d'ivoire" or "cote divoire" or "cote d ivoire" or "ivory coast" or croatia or cuba or cyprus or "czech republic" or czechoslovakia or djibouti or "french somaliland" or dominica or "dominican republic" or ecuador or egypt or "united arab republic" or "el salvador" or "equatorial guinea" or "spanish guinea" or eritrea or estonia or eswatini or swaziland or ethiopia or fiji or gabon or "gabonese republic" or gambia or "georgia (republic)" or georgian or ghana or gold coast or gibraltar or greece or grenada or guam or guatemala or guinea or "guinea bissau" or guyana or "british guiana" or haiti or hispaniola or honduras or hungary or india or indonesia or timor or iran or iraq or isle of man or jamaica or jordan or kazakhstan or kazakh or kenya or "democratic people's republic of korea" or "republic of korea" or "north korea" or "south korea" or korea or kosovo or kyrgyzstan or kirghizia or kirgizstan or kyrgyz republic or kirghiz or laos or "lao pdr" or "lao people's democratic republic" or latvia or lebanon or "lebanese republic" or lesotho or basutoland or liberia or libya or "libyan arab jamahiriya" or lithuania or macau or macao or "republic of north macedonia" or macedonia or madagascar or "malagasy republic" or malawi or niasaland or malaysia or "malay federation" or "malaya federation" or maldives or "indian ocean islands" or "indian ocean" or mali or malta or micronesia or "federated states of micronesia" or kiribati or "marshall islands" or nauru or "northern mariana islands" or palau or tuvalu or mauritania or mauritius or mexico or moldova or moldovian or mongolia or montenegro or morocco or ifni or mozambique or "portuguese east africa" or myanmar or burma or namibia or nepal or "netherlands antilles" or nicaragua or niger or nigeria or oman or muscat or pakistan or panama or "papua new guinea" or "new guinea" or paraguay or peru or philippines or philippines or phillippines or philippines or poland or "polish people's republic" or portugal or "portuguese republic" or "puerto rico" or romania or russia or "russian federation" or ussr or soviet union or "union of soviet socialist republics" or rwanda or ruanda or samoa or "pacific islands" or polynesia or "samoan islands" or "navigator island" or "navigator islands" or "sao tome and principe" or "saudi arabia" or senegal or serbia or seychelles or "sierra leone" or slovakia or "slovak republic" or slovenia or melanesia or "solomon island" or "solomon islands" or "norfolk island" or "norfolk islands" or "somalia" or "south africa" or "south sudan" or "sri lanka" or "sri lanka" or "sri lanka" or "sri lanka" or "sri lanka" or "st. kitts and nevis" or "st. kitts and nevis" or "saint lucia" or "st. lucia" or "saint vincent and the grenadines" or "saint vincent" or "st. vincent" or grenadines or sudan or suriname or surinam or "dutch guiana" or "netherlands guiana" or syria or "syrian arab republic" or tajikistan or tadjikistan or tadjikistan or tadjik or tanzania or tanganyika or thailand or siam or "timor leste" or "east timor" or togo or "togolese republic" or tonga or "trinidad and tobago" or trinidad or tobago or tunisia or turkey or turkmenistan or turkmen or uganda or ukraine or uruguay or uzbekistan or uzbek or vanuatu or "new hebrides" or venezuela or vietnam or "viet nam" or "middle east" or "west bank" or gaza or palestine or yemen or yugoslavia or zambia or zimbabwe or "northern rhodesia" or "global south" or "africa south of the sahara" or "sub-saharan africa" or "subsaharan africa" or "africa, central" or "central africa" or "africa, northern" or "north africa" or "northern africa" or magreb or maghrib or sahara or "africa, southern" or "southern africa" or "africa, eastern" or "east africa" or "eastern africa" or "africa, western" or "west africa" or "western africa" or "west indies" or "indian ocean islands" or caribbean or "central america" or "latin america" or "south and central america" or "south america" or "asia, central" or "central asia" or "asia, northern" or "north asia" or "northern asia" or "asia, southeastern" or "southeastern asia" or "south eastern asia" or "southeast asia" or "south east asia" or "asia, western" or "western asia" or "europe, eastern" or "east europe" or "eastern europe" or "developing country" or "developing countries" or "developing nation*" or "developing population*" or "developing world" or "less developed countr*" or "less developed nation*" or "less developed population*" or "less developed world" or "lesser developed countr*" or "lesser developed nation*" or "lesser developed population*" or "lesser developed world" or "under developed countr*" or "under developed nation*" or "under developed population*" or "under developed world" or "underdeveloped countr*" or "underdeveloped nation*" or "underdeveloped population*" or "underdeveloped world" or "middle income countr*" or "middle income nation*" or "middle income population*" or "low income countr*" or "low income nation*" or "low income population*" or "lower income countr*" or "lower income 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"low gross national" or "lower gdp" or "lower gnp" or "lower gross domestic" or "lower gross national" or lmic or lmics or "third world" or "lami countr*" or "transitional countr*" or "emerging economies" or "emerging nation*")

21 #20 AND #16

20 #19 OR #18 OR #17

19 ti=((before NEAR/5 after) or (pre NEAR/5 post) or ((pretest or "pre test") and (posttest or "post test")) or "cba design*" or "cba stud*" or "comparative stud*" or "evaluation stud*" or "program* evaluation" or "program* effectiveness") or ab=((before NEAR/5 after) or (pre NEAR/5 post) or ((pretest or "pre test") and (posttest or "post test")) or "cba design*" or "cba stud*" or "comparative stud*" or "evaluation stud*" or "program* evaluation" or "program* effectiveness")

18 ti=(cohort* or longitudinal* or prospectiv* or retrospectiv* or (follow* NEAR/1 up)) or ab=(cohort* or longitudinal* or prospectiv* or retrospectiv* or (follow* NEAR/1 up))

17 ti=(random* or control* or group* or cluster* or placebo* or trial* or assign* or allocat* or prospectiv* or "meta-analysis" or "systematic review") or ab=(random* or control* or group* or cluster* or placebo* or trial* or assign* or allocat* or prospectiv* or "meta-analysis" or "systematic review")

16 #15 AND #14

15 ti=(infant* or baby or babies or child* or boy* or girl* or preschool* or pre-school*) or ab=(infant* or baby or babies or child* or boy* or girl* or preschool* or pre-school*)

14 #13 OR #12 OR #11 OR #10

13 ti=(GMP NEAR/15 nutrition*) or ab=(GMP NEAR/15 nutrition*)

12 ti=(integrated NEAR/2 nutrition) or ab=(integrated NEAR/2 nutrition)

11 ti=("growth monitoring" near/10 promotion) or ab=("growth monitoring" near/10 promotion)

10 #9 AND #5

9 #8 OR #7 OR #6

8 ti=(nutrition* NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*)) or ab=(nutrition* NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*))

7 ti=(health NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*)) or ab=(health NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*))

6 ti=((mother* or father* or parent* or carer* or caregiver* or "care-giver*") NEAR/3 (advice or advised or counsel* or educat* or knowledge or learn*)) or ab=((mother* or father* or parent* or carer* or caregiver* or "care-giver*") NEAR/3 (advice or advised or counsel* or educat* or knowledge or learn*))

5 #4 OR #3 OR #2 OR #1

4 ti=("z score*") or ab=("z score*")

3 ti=(age* and ((weight or length or height) NEAR/1 (chart* or measur* or monitor* or surveillance))) or ab=(age* and ((weight or length or height) NEAR/1 (chart* or measur* or monitor* or surveillance)))

2 ti=(anthropometric NEAR/3 (growth or indicator* or measure* or monitor* or surveillance)) or ab=(anthropometric NEAR/3 (growth or indicator* or measure* or monitor* or surveillance))

1 ti=(growth NEAR/3 (assess* or chart* or measur* or monitor*)) OR ab=(growth NEAR/3 (assess* or chart* or measur* or monitor*))

Cochrane Database of Systematic Reviews

#1 MeSH descriptor: [Infant] this term only

#2 MeSH descriptor: [Child] this term only

#3 (infant* or baby or babies or child* or boy* or girl* or preschool* or pre NEXT school*):ti,ab

#4 {or #1-#3}

#5 MeSH descriptor: [Growth] this term only

#6 MeSH descriptor: [Child Development] this term only

#7 MeSH descriptor: [Anthropometry] this term only

#8 MeSH descriptor: [Nutrition Surveys] this term only

#9 (growth NEAR/3 (assess* or chart* or measur* or monitor*)):ti,ab

#10 (anthropometric NEAR/3 (growth or indicator* or measure* or monitor* or surveillance)):ti,ab

#11 (age* and ((weight or length or height) NEAR/1 (chart* or measur* or monitor* or surveillance))):ti,ab

#12 (z NEXT score*):ti,ab

#13 {or #5-#12}

#14 [mh "Child health services"]

#15 [mh ^"Health Education"] and [mh Parents]

#16 [mh ^"Health Education"] and [mh Caregivers]

#17 [mh "Health survey"]

#18 [mh ^"Health promotion"] and [mh Parents]

#19 [mh ^"Health promotion"] and [mh Caregivers]

#20 [mh "Education, Nonprofessional"] and [mh Parents]

#21 [mh "Education, Nonprofessional"] and [mh Caregivers]

#22 MeSH descriptor: [Parents] explode all trees and with qualifier(s): [education - ED]

#23 [mh Counseling] and [mh Parents]

#24 [mh Counseling] and [mh Caregivers]
 #25 [mh "Nutrition assessment"]
 #26 [mh ^"Preventive Health Services"]
 #27 health services:ti,ab
 #28 ((mother* or father* or parent* or carer* or caregiver* or care NEXT giver*) NEAR/3 (advice or advised or counsel* or educat* or knowledge or learn*)):ti,ab
 #29 (health NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*)):ti,ab
 #30 (nutrition* NEAR/3 (advice or advised or counsel* or education* or knowledge or promot*)):ti,ab
 #31 {or #14-#30}
 #32 #13 and #31
 #33 ("growth monitoring" near/10 promotion):ti,ab
 #34 (integrated NEAR/2 nutrition):ti,ab
 #35 (GMP NEAR/15 nutrition*):ti,ab
 #36 {or #32-#35}
 #37 #4 and #36 in Cochrane Reviews, Cochrane Protocols

EPISTEMONIKOS

title:(growth OR anthropomet* OR nutrition*) AND title:(monitor* OR assess* OR measur* OR chart* OR surveillance) AND title:(promot* OR educat* OR class* OR teach* OR counsel*)

ProQuest Dissertations & Theses Global

TI(growth OR anthropomet* OR nutrition*) AND TI(INFANT* OR CHILD* OR PRESCHOOL* OR "PRE-SCHOOL*") AND (TI(monitor* OR assess* OR measur* OR chart* OR surveillance) OR AB(monitor* OR assess* OR measur* OR chart* OR surveillance)) AND (TI (promot* OR educat* OR class* OR teach* OR counsel*) OR AB(promot* OR educat* OR class* OR teach* OR counsel*)) AND TI(random* or control* or group* or cluster* or placebo* or trial* or assign* or allocat* or prospectiv* OR cohort* or longitudinal* or retrospectiv* or (follow* N/1 up) or ("pre" Near/3 post) or ((pretest or "pre test") and (posttest or "post test")) or "cba design*" or "cba stud*" or comparative or comparison or effectiveness or evaluation or experiment* or intervention or program*)

ClinicalTrials.gov

INTERVENTION| growth monitoring OR GMP | Child

WHO ICTRP

Basic search screen

growth AND monitoring OR growth AND measurement OR growth AND chart OR growth AND surveillance OR GMP OR integrated nutrition

WHO IRIS

Basic search screen

growth AND monitoring OR growth AND measurement OR growth AND chart OR growth AND surveillance OR GMP OR integrated nutrition

OpenGrey

Basic search screen

growth AND monitoring OR growth AND measurement OR growth AND chart OR growth AND surveillance OR GMP OR integrated nutrition

Appendix 2. Countries categorised as low- and middle-income by the World Bank

Correct to 2019 ([World Bank 2020](#)).

Afghanistan
 Albania
 Algeria
 American
 Angola
 Argentina
 Armenia
 Azerbaijan
 Bangladesh
 Belarus
 Belize
 Benin
 Bhutan
 Bolivia

Bosnia and Herzegovina
Botswana
Brazil
Bulgaria
Burkina Faso
Burundi
Cabo Verde
Cambodia
Cameroon
Central African Republic
Chad
China
Colombia
Comoros
Congo, Democratic Republic
Congo, Republic
Costa Rica
Côte d'Ivoire
Cuba
Djibouti
Dominica
Dominican Republic
Ecuador
Egypt, Arab Republic
El Salvador
Equatorial Guinea
Eritrea
Eswatini
Ethiopia
Fiji
Gabon
Gambia, The
Georgia
Ghana
Grenada
Guatemala
Guinea
Guinea-Bissau
Guyana
Haiti
Honduras
India
Indonesia
Iran, Islamic Republic
Iraq
Jamaica
Jordan
St Vincent and the Grenadines
Kazakhstan
Kenya
Kiribati
Korea, Democratic People's Republic
Kosovo
Kyrgyz
Lao People's Democratic Republic
Lebanon
Lesotho
Liberia
Sudan
Libya
Madagascar
Malawi
Malaysia
Maldives

Marshall Islands
Mauritania
Mexico
Micronesia, Federated States
Moldova
Mongolia
Montenegro
Morocco
Mozambique
Myanmar
Namibia
Nepal
Nicaragua
Niger
Nigeria
North Macedonia
Pakistan
Papua New Guinea
Paraguay
Peru
Philippines
Republic
Russian Federation
Rwanda
Samoa
Samoa
São Tomé and Príncipe
Senegal
Serbia
Sierra Leone
Solomon Islands
Somalia
South Africa
South Sudan
Sri Lanka
Saint Lucia
Suriname
Syrian Arab Republic
Tajikistan
Tanzania
Thailand
Timor-Leste
Togo
Tonga
Tunisia
Turkey
Turkmenistan
Tuvalu
Uganda
Ukraine
Uzbekistan
Vanuatu
Venezuela, Republic
Vietnam
West Bank and Gaza
Yemen, Republic
Zambia
Zimbabwe

HISTORY

Protocol first published: Issue 7, 2021

The impact of growth monitoring and promotion on health indicators in children under five years of age in low- and middle-income countries (Review)

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CONTRIBUTIONS OF AUTHORS

MT is the guarantor for the review; was involved in design and co-ordination of the review; and conducted the screening, data extraction, risk of bias assessments, analysis, interpretation of data, assessment of the certainty in the body of evidence, and write up of the review. JT conducted screening, data extraction, and risk of bias assessments, as well as providing feedback on review drafts. IA conducted screening and data extraction, as well as providing feedback on review drafts. QLi, QLo, and HN were involved in the conception and design of the review and provided guidance feedback on review drafts. QLi was also involved in the assessment of the certainty in the body of evidence.

DECLARATIONS OF INTEREST

MT: none known.

JT: non known.

IA: no relevant interests; works as a health professional at Alder Hey Hospital.

QLi: none known.

QLo: none known.

HN: no relevant interests; Consultant Paediatrician, Infectious Diseases and Respiratory, Alder Hey Children's Hospital, Liverpool, UK.

SOURCES OF SUPPORT

Internal sources

- Liverpool School of Tropical Medicine (LSTM), UK

LSTM provides financial support in the form of a salary for both MT and HN.

External sources

- Foreign, Commonwealth and Development Office (FCDO), UK

FCDO funds the Research, Evidence and Development Initiative (READ-It) project (project number 300342-104), which supports MT.

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

We did not search the World Health Organization (WHO) Global database on the Implementation of Nutrition Action (GINA) because we were unable to obtain the necessary membership. In any case, as we had performed a thorough search of several other databases of unpublished studies, including the WHO Institutional Repository for Information Sharing (IRIS) depository, we considered it unnecessary to search the GINA.

In the protocol, we planned to group the data first by comparator, then by outcomes, and finally by study design. We had assumed there would be one intervention and multiple potential comparators. However, after obtaining the included studies, we found significant variation in the implementation of interventions and in the content of promotion activities. For this reason, we grouped the studies according to the style of intervention, then by their comparator, producing two summary of findings tables. Within these groups, we described the data first by outcome and then by study design, in line with the protocol.

The protocol stated that we would assess risk of bias for all included studies. However, in line with current guidance for the Cochrane risk of bias tool RoB 2, we assessed risk of bias for outcomes (and studies) included in the summary of findings tables. We planned to independently assess the risk of bias of included cohort and controlled before-after studies using the ROBINS-I tool (Sterne 2016). However, these studies were not included in the summary of findings tables due to lack of outcome data.

We intended to calculate summary statistics of intervention effect estimates (e.g. median and interquartile range) and calculate a direction of effect by combining P values or performing vote counting, but we were unable to do so owing to insufficient data. We intended to use the intra-cluster correlation coefficients (ICCs) reported in the study to control for clustering when the study authors had not already done so. However, no studies reported ICCs. We contacted the study authors for further information, but received no response. In addition, no ICC estimates were available in similar studies, so we presented unadjusted results. It is good practice to conduct a sensitivity analysis of trials using imputed ICC estimates; however, as we produced a narrative synthesis, this was not possible.

Due to the nature of narrative synthesis, we were unable to perform any sensitivity analysis.

We intended to present any highly skewed continuous data in a table and consider the implications in the interpretation of results. However, we did not identify any.

We created summary of findings tables for the following outcomes at 12 months and 24 months after the intervention: weight-for-age z-score, height-for-age z-score, feeding practices, and health service usage, as most studies reported results for these endpoints.