

Beyond coverage: A literature review of existing information
on parameters for delivery effectiveness of health and
nutrition services in low- and middle-income countries

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Ifanadiana District, Madagascar
Consultant : Alina Michalska

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Abbreviations

BCG	Bacille Calmette-Guérin
BMGF	Bill and Melinda Gates Foundation
CDC	Centers for Disease Control and Prevention
CHD	Child Health Days
CHE	Child Health Events
CMAM	Community-based management of acute malnutrition
DAC	Development Assistance Committee
DTP	Diphtheria, tetanus, pertussis
ENN	Emergency Nutrition Network
EPOC	Effective Practice and Organisation of Care
GHO	Global Health Observatory
IA2030	Immunization Agenda 2030
IGME	Inter-Agency Group for Child Mortality Estimation
LMIC	Low- and middle-income country
MDG	Millennium Development Goals
MNCH	Maternal, newborn, and child health
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
PHC	Primary health care
PHCPI	Primary Health Care Performance Initiative
REACH	Regular Events to Advance Child Health
SDG	Sustainable Development Goals
UN	United Nations
UNICEF	United Nations Children's Fund
VAS	Vitamin A supplementation
WBG	World Bank Group
WHA	World Health Assembly
WHO	World Health Organization

1 Introduction

1.1 Background

The global community has set a deadline of reaching the Sustainable Development Goals (SDGs) related to nutrition and health by 2030. These goals include specific targets to end all forms of malnutrition (Target 2.2), and to end preventable deaths of newborns and children under 5 years of age and to achieve universal health coverage including access to vaccines for all (Targets 3.2 and 3.8) (1,2). Under-five mortality remains off-track particularly in sub-Saharan Africa, and efforts must be intensified and accelerated in order to meet the under-five mortality target of 25 or fewer deaths per 1,000 live births (3). According to 2020 estimates developed by the UN Inter-Agency Group for Child Mortality Estimation (UN IGME), infectious diseases such as pneumonia, diarrhoea, and malaria remain a leading cause of death among children under five years of age. Additionally, children suffering from severe malnutrition are at a higher risk of death from these illnesses, with malnutrition contributing to 45% of deaths among children under five (3,4). Despite significant progress that has been made towards reducing child morbidity and mortality since the pre-Millennium Development Goal (MDG) era (5), millions of children will remain at risk if progress towards achieving the SDGs is not accelerated.

Preventive public health and nutrition programs are a key component of a successful health system and to support progress towards the SDGs. Evidence that community-based interventions—such as immunization, micronutrient supplementation and malaria mass drug administration—improve maternal, neonatal and child health and nutrition has increased steadily during recent decades (6). It is clear these interventions contribute significantly to reductions in morbidity and mortality. Moreover, by supporting improved access to preventive and promotive services, including early diagnosis and treatment, community-based interventions can reduce total health care costs (for example, by reducing avoidable more costly inpatient hospitalizations) and increase efficiency (for example, by reducing disparities) (7,8).

1.2 Rationale

A variety of community-based delivery strategies are used to deliver preventive and promotive services and reach those most in need. These include routine and outreach service/intervention delivery, Child Health Events/Regular Events to Advance Child Health (CHE/REACH), and mass campaigns. However, despite the successes of these strategies, there remains a gap in our understanding of whether some delivery strategies of community-based interventions are more effective than others and under what conditions.

Perhaps more important is a gap in our understanding of what constitutes an effective delivery strategy. At the centre of this gap is an assumption that the effectiveness of program delivery can be measured comprehensively and exhaustively in terms of coverage. Treatment coverage – referring to the proportion of the targeted population that is reached with preventive health services – is the main indicators used to measure health impact of community-based programmes (9). This literature review concerns itself with exploring

whether effective service delivery goes beyond coverage? And, if so, what are the additional parameters of effectiveness that should be integrated into measuring health and nutrition programme service delivery?

Although effectiveness of service delivery is regularly equated with coverage, an encompassing definition may include additional attributes. For example, prioritized uptake among those who need interventions the most such as children that have never received the intervention or service, without excluding any at-risk community or population; continued delivery over time, including during acute emergencies; enhanced quality in delivery; and an improved value proposition for health services that enables caregivers to take away improved knowledge, awareness, and intention to change behaviours, and seek out other health and nutrition interventions.

The effectiveness of various community health and nutrition interventions has been well documented and is not under question in this study. Instead, this literature review aimed to explore current use of various parameters for the assessment of the *effectiveness of service delivery* of community nutrition and health interventions. In other words, we are looking beyond coverage to explore potential limitations in our understanding of what makes for effective delivery of health and nutrition services in low- and middle-income countries (LMICs).

2 Methodology

2.1 Search topic definition

The literature review aimed to answer the following question:

What information exists on parameters for effectiveness of community nutrition and health intervention delivery in low- and middle-income countries?

2.2 Search strategy

Once the search question was defined, the search strategy was developed and structured around three overlapping concepts (Figure 1). The three search concepts are: 1) effectiveness of service delivery; 2) child health and nutrition interventions; and 3) location (LMICs).

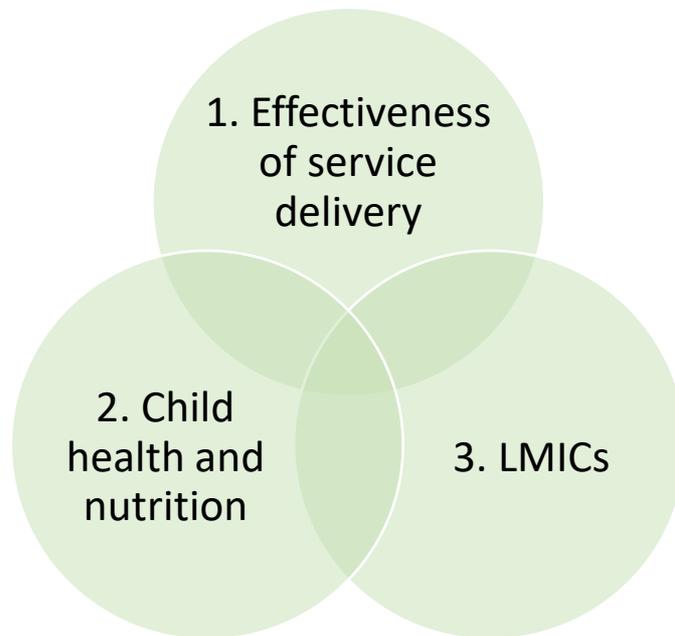


Figure 1: Concepts for literature review search terms.

These concepts were identified and aligned with the search question to help investigate the understanding of measurement of effective service delivery for children in low-and middle-income countries. Concept 1 (effectiveness) focussed the search on service delivery effectiveness. Concept 2 (child health and nutrition interventions) focussed the search on child health and nutrition programmes. Concept 3 (LMICs) focussed the search on the location of programme delivery. The concepts provided an overarching framework for the search strategy from which the detailed search terms were derived. Through brainstorming and search testing, relevant search terms for each concept were then identified and used in the review.

The choice of search terms in a literature review is critical, knowing that language and trends used in describing health and nutrition interventions can change over time and by geographic location and setting. Since coverage is currently the main parameter for measuring delivery effectiveness of health and nutrition interventions, coverage was included as a search term in the literature review for this first concept of effectiveness. This term was used as a proxy to identify relevant studies (i.e., studies that included measures of effectiveness of service delivery). The term effectiveness itself was not included in the final search strategy; when effectiveness was included as a search term, the resulting studies focussed more on effectiveness of interventions rather than effectiveness of service delivery. Service delivery, however, was included as a search term related to the concept of effectiveness.

For the second concept, the search terms for child health and nutrition were kept deliberately broad in order to not exclude any potential parameters of service delivery effectiveness identified by the first concept (effectiveness). However, in order to ensure a programmatic focus, four interventions (described in study selection) were also searched specifically. Finally, to help identify studies relevant to LMICs, the search terms for location of programme delivery included specific country names, as well as generic LMIC search terms developed by the Cochrane Effective Practice and Organisation of Care (EPOC) in

collaboration with the World Health Organization (WHO) Library and the Campbell Collaboration.¹ Countries included in the search were based on the 2021 World Bank Country Classification of LMIC economies.²

2.2.1 Search terms

Synonyms within a concept were included as “OR” terms, and each concept was linked with the other with an “AND” operator.

The following search terms were used in the review: "service delivery" OR coverage AND "child nutrition" OR "child health" OR malaria OR malnutrition OR undernutrition OR vaccin* OR immunisation OR immunization OR “vitamin A supplementation” AND LMIC³.

2.3 Study selection

The studies and articles that were included in this review were limited to specific inclusion and exclusion criteria (Table 1). The review was limited to peer-reviewed publications as well as grey literature published during the 20-year period from January 1, 2000 to January 31, 2021. The date range for the review was chosen to be sufficiently wide to capture the

¹EPOC LMIC filters 2020 <https://epoc.cochrane.org/lmic-filters>

² World Bank Country and Lending Group

<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>

³ "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 nations" OR "developing population" OR "developing populations" OR "developing world" OR "less developed country" OR "less developed countries" OR "less developed nation" OR "less developed nations" OR "less developed world" OR "lesser developed countries" OR "lesser developed nations" OR "under developed country" OR "under developed countries" OR "under developed nations" OR "under developed world" OR "underdeveloped country" OR "underdeveloped countries" OR "underdeveloped nation" OR "underdeveloped nations" OR "underdeveloped population" OR "underdeveloped populations" OR "underdeveloped world" OR "middle income country" OR "middle income countries" OR "middle income nation" OR "middle income nations" OR "middle income population" OR "middle income populations" OR "low income country" OR "low income countries" OR "low income nation" OR "low income nations" OR "low income population" OR "low income populations" OR "lower income country" OR "lower income countries" OR "lower income nations" OR "lower income population" OR "lower income populations" OR "underserved countries" OR "underserved nations" OR "underserved population" OR "underserved populations" OR "under served population" OR "under served populations" OR "deprived countries" OR "deprived population" OR "deprived populations" OR "poor country" OR "poor countries" OR "poor nation" OR "poor nations" OR "poor population" OR "poor populations" OR "poor world" OR "poorer countries" OR "poorer nations" OR "poorer population" OR "poorer populations" OR "developing economy" OR "developing economies" OR "less developed economy" OR "less developed economies" OR "underdeveloped economies" OR "middle income economy" OR "middle income economies" OR "low income economy" OR "low income economies" OR "lower income economies" OR "low gdp" OR "low gnp" OR "low gross domestic" OR "low gross national" OR "lower gdp" OR "lower gross domestic" OR lmic OR lmic OR "third world" OR "lami country" OR "lami countries" OR "transitional country" OR "transitional countries" OR "emerging economies" OR "emerging nation" OR "emerging nations"

evolution of use of various parameters for service delivery effectiveness. The start date coincides with the pre-MDG era, when the Lancet series on child survival and other key reviews noted the “critical need for strengthened health systems to achieve child health gains” and also identified the need to increase the evidence on measures of effectiveness for child nutrition and health service delivery (10,11).

The following databases were selected for the literature review, based on the nature of the search question: PubMed/MEDLINE; EMBASE; and Global Health. The database search was complemented by grey literature including reports from United Nations (UN), Non-Governmental Organisations (NGOs), and donor websites and technical information platforms such as the Emergency Nutrition Network (ENN). Reference lists of selected articles were also screened for potentially relevant publications for inclusion. No language inclusion or exclusion criteria were used, though it was expected that the majority of studies and articles would be in English or French.

Only studies with programme delivery in LMICs were included in this literature review, representing the target area for the majority of community child health and nutrition interventions related to the SDGs. Strategies and resources that are used towards these interventions are very different in high-income countries. Studies were also limited to primary care (community- or facility-based), and those with a main focus on tertiary care (hospitals) were excluded from the review.

Table 1: Inclusion criteria for eligibility

Criteria	Included	Excluded
Date	January 1, 2000 – January 31, 2021	Prior to January 2000
Language	All	None (majority in English and French)
Source	Journal articles and grey literature (e.g., reports, ENN).	
Availability	Full text available	Full text not available
Geographic location	LMIC	Not LMIC
Health care setting	Primary health care (community- or facility-based)	Tertiary care (hospital) as the major focus of the study or report
Intervention	Vitamin A supplementation, vaccination (BCG, hepatitis B, polio, DTP-containing vaccine, haemophilus influenzae type b, pneumococcal, rotavirus, measles, and rubella), severe malnutrition, malaria	Articles and reports that do not reference at least one of the four target interventions

2.3.1 Interventions

Several interventions were considered for inclusion in the review. After careful consideration, eligible studies were limited to one of four preventive nutrition or health service delivery interventions: vitamin A supplementation (VAS), vaccinations, as well as severe malnutrition and malaria programmes. They were chosen based on their inclusion in globally accepted frameworks and targets, on their impact on mortality in children under five, and because of their method of service delivery. The four interventions are part of the

2013 Lancet Maternal and Child Nutrition framework for actions to achieve optimum child nutrition and development (4) and their inclusion as WHO and global health priorities in World Health Assembly (WHA) targets and the SDGs.⁴ These four preventive interventions also address the leading causes of mortality in children under five years of age (3,4), and are often delivered together. For example, many countries use CHEs as a delivery system and package VAS with other preventive health services such as immunisations, bed net distribution, growth monitoring and screening for severe malnutrition (12). Prevention, early detection, and treatment for common childhood diseases are critical to saving many young lives. Preventive interventions such as vaccines, micronutrient supplementation, vector control, and screening for severe malnutrition are generally highly cost-effective and deliver extensive benefits to society in terms of averted mortality and morbidity (13,14). It has also been well documented that scale up of various programmes such as the ones included in the review over the past two decades have led to increased coverage and decrease in child mortality and morbidity globally (15–17).

The four preventive health and nutrition interventions included in the review are outlined below.

Malaria

Malaria is a preventable life-threatening disease that disproportionately affects children under 5; in 2019, they accounted for 67% (274,000) of all malaria deaths globally (14). Furthermore, almost half of the world's population is at risk of malaria, with 94% of malaria cases and deaths occurring in sub-Saharan Africa. The first pillar of the 2016-2030 Global technical strategy for malaria, adopted by the WHA in 2015, focusses on ensuring universal access to malaria prevention, diagnosis, and treatment (28). Several different malaria interventions exist that are delivered through various delivery channels. Vector control is the primary method of preventing and reducing malaria transmission (14), and delivery methods include routine service delivery as well as campaign delivery integrated with other interventions such as vaccinations (29).

Severe malnutrition⁵

Malnutrition – in the form of wasting, stunting, and micronutrient deficiencies – causes 45% of all child deaths, and childhood overweight is linked to obesity, diabetes, and non-communicable diseases during adulthood (4). According to the most recent global estimates⁶, wasting affects 47 million children under 5 (24), and 4.7% of children are affected by both wasting and stunting, a condition that puts them at a 4.8-fold increased risk of death (25). The pandemic is wrecking havoc on nutrition in LMICs in the form of reduced quality of diets and interruptions to nutrition services (26) and malnutrition can also exacerbate the already deleterious effects of COVID-19 through reduced immune function, increased risk of severe illness and death, and lowered efficacy of vaccines (27).

⁴ VAS: Lancet 2013 action: micronutrient supplementation, SDG 2030: Target 3.2; vaccinations: Lancet 2013 action: disease prevention and management, SDG 2030: Target 3.8; severe malnutrition: Lancet 2013 action: nutrition-specific interventions, treatment of SAM, WHA 2025: Target 6, SDG 2030: Target 2.2; malaria: Lancet 2013 action: disease prevention and management, SDG 2030: Target 3.3

⁵ In the context of this review, “severe malnutrition” refers to any form of malnutrition associated with high risk of severe adverse outcomes (67), with a focus on wasting.

⁶ Joint Child Malnutrition Estimates, 2020.

The 2013 Maternal and Child Nutrition Lancet series outlined a framework for optimum foetal and child growth and development through nutrition specific and nutrition sensitive interventions and programmes (4). Preventive efforts – which include community-based screening for severe malnutrition, micronutrient supplementation, and disease prevention and management – should focus on the first 1,000 days; this time period is also essential for prevention of overweight (4).

Vitamin A supplementation

Vitamin A supplementation is one example of a highly impactful preventive health and nutrition service. VAS is one of the world’s largest public health programs that reaches approximately 250 million children every year in countries that are at increased risk of vitamin A deficiency, and supplementing children aged 6 to 59 months with a high dose of vitamin A is a highly effective public health intervention in deficient populations that saves millions of lives. Because supplementation does not address underlying causes of deficiency, it must be repeated every four to six months – or until dietary intake of vitamin A is sufficient. However, despite the benefits of VAS, data for 2018 suggest fewer than two-thirds of children in at-risk countries receive the recommended doses of vitamin A (18). Most doses of the supplement are delivered through campaigns; these can take various forms, including as CHEs, whose popularity has increased dramatically since 1999, or co-delivery with oral polio vaccines in house-to-house campaigns (12). However, as countries phase out polio campaigns and move towards strengthening routine health services as part of their commitment to the SDGs (15,19), policy and program focus is beginning to shift away from campaigns. It is more critical than ever to strengthen the myriad and shifting VAS service delivery mechanisms.

Vaccinations

Vaccinations are a key component of primary health care and one of the most successful and cost-effective preventive health interventions globally (20). Extremely effective in reducing morbidity and mortality associated with various infectious diseases (21), childhood vaccinations prevent an estimated 2 to 3 million deaths each year (22). The WHO has compiled information on recommended routine immunizations for children, including age at first dose and immunization schedule. However, despite massive efforts, the proportion of the world’s children who receive recommended vaccines has remained unchanged over the past few years (22). With nearly 20 million children unvaccinated every year, a new global immunization strategy⁷ has recently been endorsed by the World Health Assembly to address vaccination challenges for “everyone, everywhere” (23). This new Immunization Agenda 2030 to increase equitable access to vaccines, co-led by WHO and United Nations Children’s Fund (UNICEF), is set to become operational through regional and national strategies in 2021.

The vaccinations selected for this review were limited to the nine WHO-recommended routine vaccinations for children under 5 years of age⁸: Bacille Calmette-Guérin (BCG);

⁷ Immunization Agenda 2030: A Global Strategy to Leave No One Behind (IA2030). The IA2030 Core Team is co-led by WHO and UNICEF, with representation from the Wellcome Trust, Bill and Melinda Gates Foundation (BMGF), Gavi, US Centers for Disease Control and Prevention (CDC), and civil society.

⁸ https://www.who.int/immunization/policy/Immunization_routine_table2.pdf, updated September 2020.

hepatitis B; polio; diphtheria; tetanus, pertussis (DTP)-containing vaccine; haemophilus influenzae type b; pneumococcal; rotavirus; measles; and rubella.

2.4 Screening and data extraction

After removal of duplicates, a screening of all titles and abstracts of eligible studies was undertaken to determine their relevance and inclusion in the review. Data extracted from eligible studies included type of intervention as well as parameters to measure the effectiveness of strategies for service delivery.

Various constraints have been identified concerning why those most in need are not being reached (9,15). In order to better understand how a program is performing, how that service is being delivered must also be measured and understood (30). This means thinking beyond using the proportion of children reached – or coverage – as the only parameter for success and exploring other parameters that contribute to effective service delivery, or that are outcomes of effective service delivery.

Several frameworks and PHC indicators were explored when selecting potential parameters for the review. In 2015, an initiative of the WHO, the World Bank Group (WBG), and the Bill and Melinda Gates Foundation (BMGF) was launched to catalyse improvements in primary health care (PHC) in LMICs. The resulting Primary Health Care Performance Initiative (PHCPI) conceptual framework describes how to build and measure strong PHC systems, with service delivery at its core (31). The PHCPI centres around key parameters for PHC service delivery, which include access and availability, as well as outcomes of effective service coverage such as equity, efficiency (cost-effectiveness), responsiveness, and resilience. This framework also references previous models such as Tanahashi’s model of health system coverage – that includes measures of acceptability, accessibility, and availability, as well as effective coverage⁹ (30) – and Starfield’s key characteristics of high performing PHC systems (7,32) – that include accessibility, equity, sustainability, and quality. The WHO Global Health Observatory (GHO) was also reviewed, including the WHO compendium of indicator definitions for health and nutrition services (33) that includes not only coverage but also indicators for access and equity.

Following compilation and sorting from various sources mentioned above, the following ten parameters of service delivery effectiveness were selected for screening and data extraction in this study: *acceptability, accessibility, availability, awareness, cost-effectiveness, equity, quality, resilience, responsiveness, and sustainability*. These parameters were identified based on the aforementioned frameworks, primary health care and coverage models, and the GHO compendium of indicators. They are by no means exhaustive, but represent a preliminary selection of parameters to explore in this review. The parameters and their definitions are show in Table 2 below.

Table 2: Parameters of health and nutrition service delivery effectiveness

⁹ Effective coverage is a concept that has gained momentum in recent years and includes a parameter of quality of care. However, as effective coverage is still an emerging topic, and a standardised definition has not been adopted, it was not included in this review (65).

Parameter	Definition
Acceptability	When community members are willing to use services being delivered and find them acceptable in terms of costs, waiting times, beliefs etc.
Accessibility	The absence of physical, logistic, social, cultural, or financial barriers that can prevent community participation in service delivery.
Availability	Necessary human resources and commodities are supplied in sufficient quantities.
Awareness	Community knowledge of the intervention being delivered, and/or that the delivery is taking place and when it is taking place, and/or knowledge of the purpose of the intervention(s) being delivered.
Cost-effectiveness	Various definitions are used for cost-effectiveness but normally refer to the number of deaths averted per monetary amount invested or cost per life-year saved for a set of interventions (i.e., outcomes – e.g., coverage – divided by cost of delivery). Also referred to as efficiency.
Inequity	The situation where a segment of the population, usually defined in terms of income quintiles or some other type of socio-economic status, and grouped geographically, experience diminished health and nutrition outcomes and/or impaired or restricted access to health and nutrition services.
Quality	Services and interventions are provided safely, timely, and in a way that is people centred.
Resilience	A delivery program's ability to continue core functions or return to normal operations over an acceptable period following a shock or disruption (such as COVID-19 or other national emergencies). Also referred to as robustness.
Responsiveness	The ability of a system to be sensitive and able to pivot in response to shocks. Sometimes referred to as "humanitarian adaptiveness".
Sustainability	A delivery program's ability to maintain operations without interruption over an extended period of time.

These parameters were purposefully not included as search terms. Instead, eligible studies that referred to coverage or service delivery were screened to explore whether parameters other than coverage are used to measure effectiveness of delivery of child health and nutrition programmes. In order to capture all potential references to potential parameters for effectiveness of service delivery, synonyms were also included in the search terms for data extraction: *disparities*, *inequalities*, and *wealth* for equity, *robustness* for resilience, *long term* for sustainability, as well as any root terms and variations in spelling. The full text of all articles referring to at least three of the four selected interventions were read as part of a secondary screening.

An overview of the ranking of each parameter based on title and abstract screening is presented in the results, along with narrative that is based on full text reading of articles and supplemented by grey literature and other relevant publications.

All citations were managed using Mendeley Reference Manager (Version 1.19.4).

3 Results

3.1 Search results

A total of 13,427 records were identified through database searches and grey literature. Of these, 589 were eligible to be included in the review for data extraction (Figure 2).

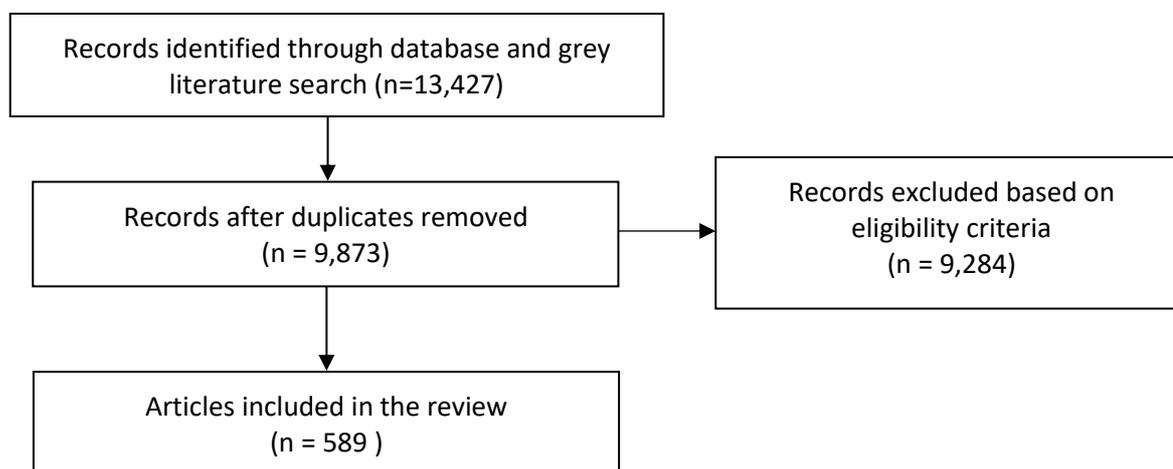


Figure 2: Flowchart of articles included in literature review.

Of the 589 eligible records, 88 (15%) referred to vitamin A supplementation, 277 (47%) referred to child vaccination, 107 (18%) referred to severe malnutrition, and 185 (31%) referred to malaria. Several articles mentioned more than one intervention; 60 mentioned at least two of four interventions and seven articles referred to three interventions. Overall, 14% (80) of articles had a global perspective and 7% (41) were regional in their scope (two or more countries), while the majority (79%, 468) were single country studies. While all LMIC regions were represented in this review, over half (52%, 307) of eligible articles focussed on sub-Saharan Africa. Just under one fifth of studies (19%, 112) were located in South Asia. A full breakdown by region is presented in Table 2.

Table 3: Source of eligible articles, by region¹⁰

Region	Eligible articles	
	n	%
Global	80	14
East Asia and Pacific	50	8%
Eastern Europe and Central Asia	2	0%
Latin America and Caribbean	28	5%
Middle East and North Africa	10	2%
South Asia	112	19%
Sub-Saharan Africa	36	6%
Eastern and Southern Africa	158	27%
West and Central Africa	113	19%
Total	589	100%

¹⁰ Breakdown by UNICEF regional classifications <https://data.unicef.org/regionalclassifications/>

3.2 Parameters of health and nutrition service delivery effectiveness

Ten pre-defined parameters of delivery effectiveness were searched among the 589 eligible articles in this literature review. Of the pre-defined parameters, accessibility, equity, cost-effectiveness, quality, and sustainability were most commonly referenced both overall and by intervention, in descending order. Accessibility was identified most frequently overall among 25% of articles, followed by equity (23%), cost-effectiveness (22%), quality (19%), sustainability (16%), awareness (9%), acceptability (6%), availability (5%), resilience (0%), and responsiveness (0%) (Figure 3 and Table 3).

Coverage was identified in 567 (96%) articles overall while only 21 (4%) of articles included “service delivery” exclusively and did not reference coverage (not shown). To test the assumption that coverage is used as the primary parameter for effectiveness in child health and nutrition programmes, a parallel search was conducted which explicitly specified the four selected intervention along with the LMIC search terms but removed “coverage” and “service delivery” from the search. The result of this search showed the same proportion of coverage (96%) as well as similar proportions of the four interventions.

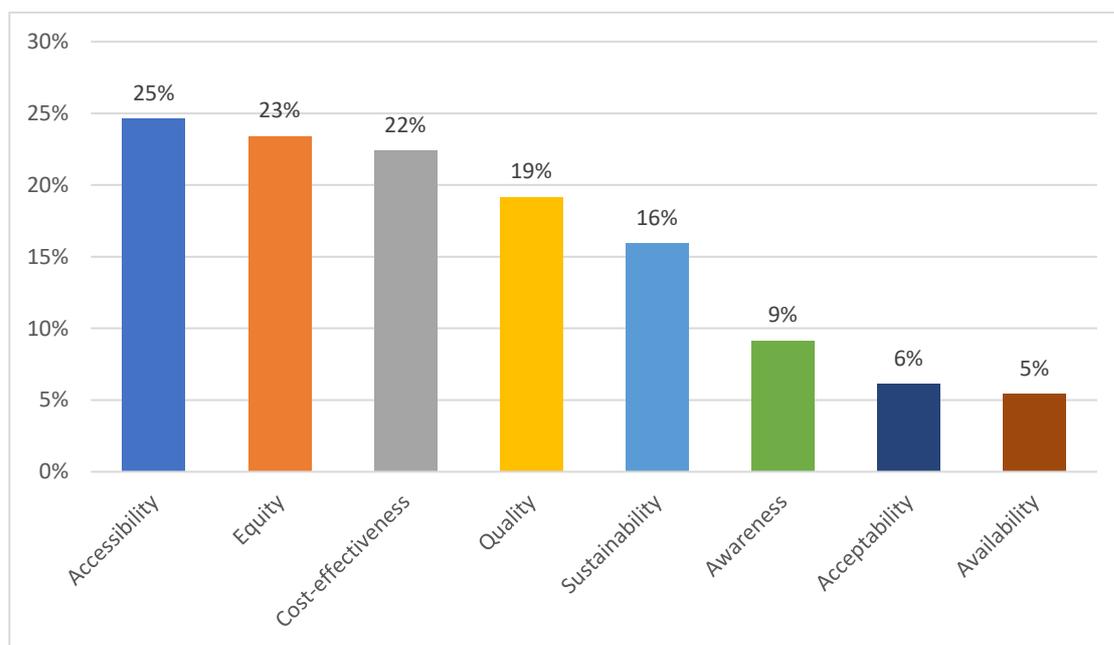


Figure 3: Overall distribution of parameters of effectiveness among eligible articles (n=589)

3.3 Interventions

The ranking or popularity of parameters of effectiveness differed by intervention; however, accessibility, equity, cost-effectiveness, quality, and sustainability were all ranked in the top five for all four interventions. Equally, the lowest ranking parameters across all four interventions were resilience and responsiveness, of which the latter was not identified in any articles included in the review. Popularity of the remaining three parameters (awareness, acceptability, and availability) was slightly different for each intervention but they were all ranked between sixth and eighth of the ten parameters (Table 3 and Figures 4-7).

Table 4: Distribution of parameters of service delivery effectiveness among eligible articles.

Parameter	Total results (n=589)		Malaria (n=185)		Severe malnutrition (n=106)		Vaccination (n=277)		Vitamin A supplementation (n=88)	
	n	%	n	%	n	%	n	%	n	%
Accessibility	145	25%	56	30%	27	25%	57	21%	21	24%
Equity	138	23%	51	28%	24	23%	61	22%	20	23%
Cost-effectiveness	132	22%	42	23%	33	31%	45	16%	31	35%
Quality	113	19%	40	22%	27	25%	42	15%	18	20%
Sustainability	94	16%	33	18%	17	16%	38	14%	21	24%
Awareness	54	9%	7	4%	8	8%	38	14%	8	9%
Acceptability	36	6%	10	5%	9	8%	16	6%	1	1%
Availability	32	5%	15	8%	10	9%	8	3%	4	5%
Resilience	2	0%	0	0%	1	1%	1	0%	1	1%
Responsiveness	0	0%	0	0%	0	0%	0	0%	0	0%

3.3.1 Malaria

The ranking of the top five parameters for malaria mirrors the overall ranking for all interventions combined. Accessibility (30%) and equity (28%) were the top two parameters for malaria. These were followed by cost-effectiveness (23%), quality (22%), and sustainability (18%). The bottom ranking parameters are all found in fewer than 10% of articles referring to malaria interventions, with availability ranked sixth (8%).

3.3.2 Severe malnutrition

Cost-effectiveness was ranked first among severe malnutrition interventions, followed by accessibility and quality. Almost one third of articles referring to severe malnutrition (31%) mentioned cost-effectiveness and one quarter (25%) mentioned both accessibility and quality. Equity was also important among severe malnutrition interventions (23%, ranked fourth). Sustainability was ranked fifth (16%), and the remaining parameters were identified in fewer than 10% of articles (availability 9%, awareness and acceptability 8% each, and one article for resilience).

3.3.3 Vaccination

Equity was ranked as the top parameters among vaccination articles (22%) followed closely by accessibility (21%). The next four parameters were almost equally ranked: cost-effectiveness (16%), quality (15%), sustainability (14%) and awareness (14%). The bottom four parameters for vaccinations (acceptability, availability, resilience, and responsiveness) were identified in fewer than 10% of vaccination articles.

3.3.4 Vitamin A Supplementation

As with severe malnutrition, cost-effectiveness was the top ranked parameter for VAS (35%). This was followed by accessibility and sustainability (24% each), equity (23%), and quality (20%). The bottom five parameters for VAS were identified in fewer than 10% of articles.

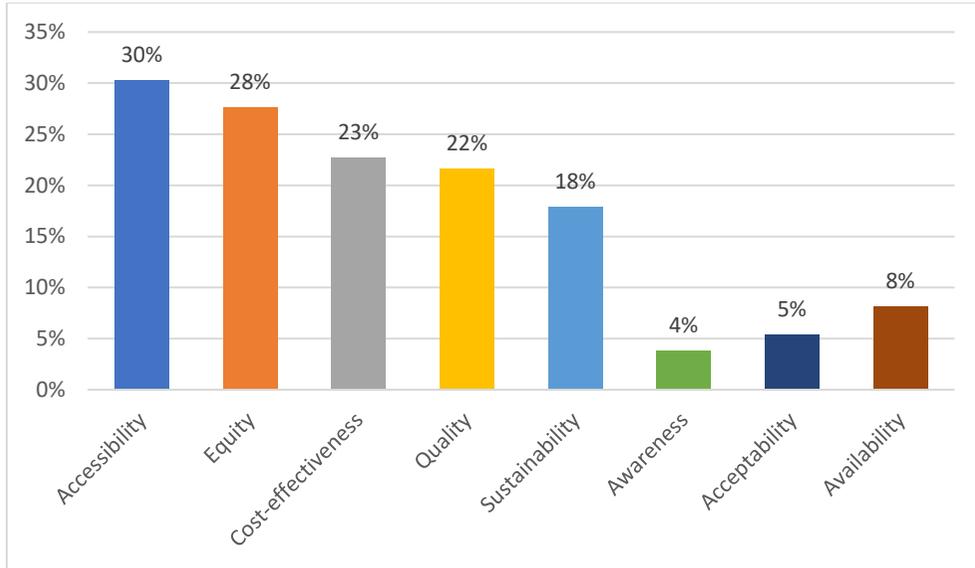


Figure 4: Distribution of parameters of effectiveness among malaria interventions (n=185).

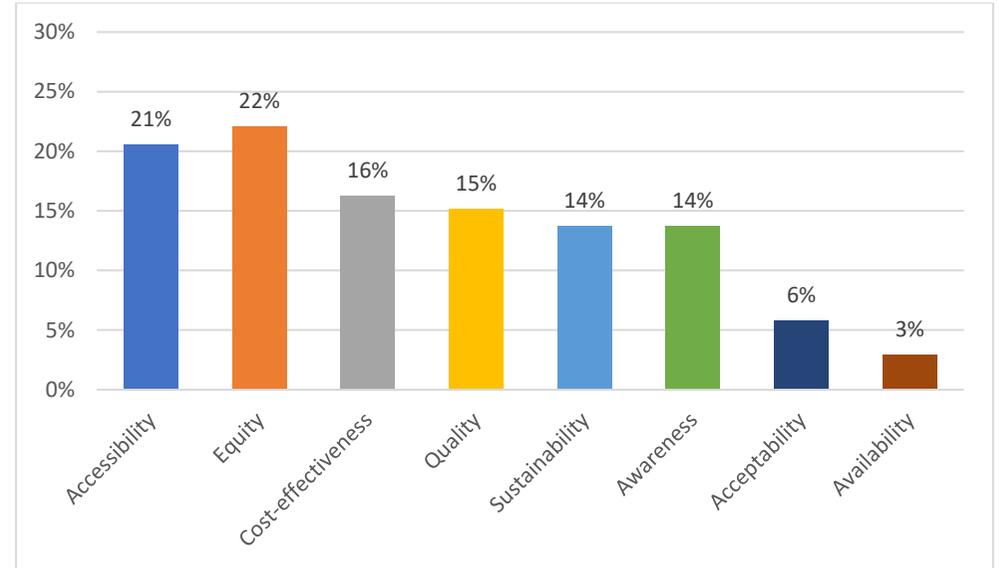


Figure 6: Distribution of parameters of effectiveness among vaccination interventions (n=277).

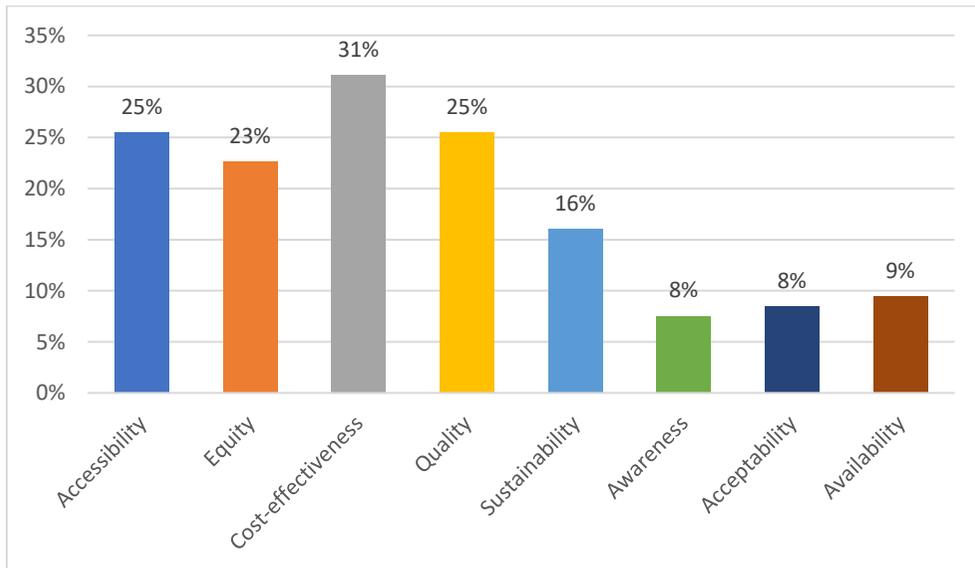


Figure 5: Distribution of parameters of effectiveness among severe malnutrition interventions (n=107).

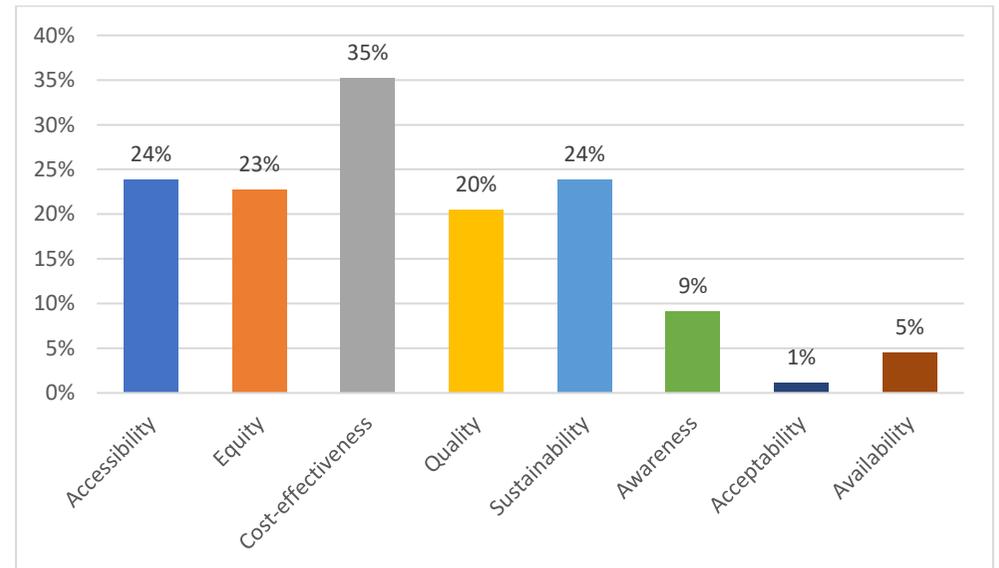


Figure 7: Distribution of parameters of effectiveness among vitamin A supplementation interventions (n=88).

3.4 Parameters

3.4.1 Accessibility

Ranking

Accessibility was identified as the top ranked parameter of service delivery effectiveness among all articles screened for this review. Overall, one quarter, or 145 of 589 articles (25%) referred to accessibility. Accessibility was ranked in the top two parameters for all four interventions, and ranked as the top parameter for malaria. This parameter was identified in 30% of eligible articles referring to malaria, in 25% of articles referring to severe malnutrition, in 24% referring to VAS, and 21% referring to vaccinations.

Description of parameter in reviewed articles

Accessibility is included as a target for the SDG (access to quality essential health care services) (19), and among studies screened in this review it is a common thread that impact of interventions can be improved by improving access, as well as coverage and cost-effectiveness (34). Access in reviewed articles was mainly referred to as lack physical and logistic barriers that can prevent community participation in service delivery, for example time to reach a community health centre to receive preventive services. In addition to these barriers to access, review articles also identified social, cultural, and financial barriers such that must be addressed in order to allow children to access preventive interventions with ease (34). Trained human resources at community level and moreover perception of health provider skills and quality of interaction between health care provider and client were also identified as important factors for to access to care (35–37).

Preventive child health and nutrition interventions in LMICs are mainly delivered through either outreach activities or at health-care facilities (38). Programme delivery plays a key role to promote community participation. Providing access to services close to target populations can help overcome this barrier, including outreach and preventive interventions such as community-based management of acute malnutrition (CMAM) with the purpose of achieving “the greatest possible coverage and make services accessible for the highest possible proportion of a population in need” (34). Child Health Events have increased in popularity over the past twenty years, and are also seen as an effective method for reaching high - and equitable - coverage of child health and nutrition interventions CHEs now commonly include diverse packages of interventions, including delivery of vitamin A supplementation, immunisations, insecticide-treated nets, as well as screening and referral services for acute malnutrition (12,39). These campaigns and health-day style events represent one-off or cyclical events; however, the trend towards routinisation of services may decrease access to services, which may in turn reduce coverage. If distances are long or transport is not available or affordable, families may be less likely to travel for preventive interventions (19,40). A reduction or elimination of fees has been shown to improve access as well as equity, with the greatest impact on children from the poorest households as measured by wealth quintile (36).

3.4.2 Equity

Ranking

Equity was identified in 138 of 589 studies (23%) and was ranked second overall among parameters for effective programme delivery. Within each of the four interventions, equity was the top parameter for vaccinations (22%), second for malaria (28%), and ranked fourth for both VAS and severe malnutrition (23% each).

Description of parameter in reviewed articles

Inequity in the review studies mainly refers to a disadvantaged segment of the population, was usually defined in terms of gender, education, and/or income or wealth quintiles or some other type of socio-economic status, and grouped geographically (e.g., rural versus urban), experiencing diminished health and/or nutrition outcomes or impaired access to health and nutrition services (41). Equity, or inequities of coverage, are determined by various factors: geographic, economic, and sociocultural. An equity-focused approach can result in higher coverage among most deprived populations who are often those most in need (38,39). Studies included in this review suggest that an equity-focussed approach to service delivery results in a reduction in existing disparities in access, especially between most and least deprived groups and geographic areas, and could result in lower child mortality, improved health outcomes, and higher cost-effectiveness compared with “mainstream approaches” (38). “Myriad and complex” links between gender and health service delivery were also identified in the review (46). For example, while one review of VAS in sub-Saharan Africa showed gender-equitable VAS coverage, it identified that gender equity extends to issues related to timing, location, staff, safety, access, and consent for service delivery.

Monitoring equity and ensuring access through community-based approaches have also been seen to increase coverage and utilisation of health and nutrition services (42) and programmes should be collecting information regarding whether and to what extent health and nutrition interventions are reaching the same children (43). Geographic areas are easiest to monitor, however national success does not always translate equitably at lower administrative levels – specifically regularly unreached children, mostly in disperse, rural communities (44). These inequities in accessing hard-to-reach areas have very serious implications for preventive health and nutrition services including vaccinations (45).

3.4.3 Cost-effectiveness

Ranking

Cost-effectiveness ranked third overall among effectiveness parameter search (identified in 132 or 22% of studies). Among individual interventions, this parameter was ranked first overall for both VAS (35%) and severe malnutrition (31%) and third for both malaria (23%) and vaccinations (16%).

Description of parameter in reviewed articles

Various definitions were used for cost-effectiveness, but they primarily referred to the number of deaths averted per amount invested (38) or cost per life-year saved for a set of

interventions, with a bench mark of less than three-time per person income (39). Most eligible articles mentioned or referred to cost-effectiveness as a desirable attribute for interventions, while fewer than one third (27%) specifically studied cost-effectiveness or undertook cost-benefit analyses.

Some studies noted that advances in technology and an increase in community-based programming have generated innovative strategies with the potential to reach the underserved in a cost-effective manner (36,38). This shift from centralised, inpatient care towards community-based models “allows more affected children to be reached and is cost effective” (39). There is no longer this trade-off between equity and cost-effectiveness when referring to child health and nutrition (and child survival overall) and there is evidence to suggest that an equitable approach to service delivery will be more effective, meaning that coverage will increase, be more equitable, and at the same time more cost-effective (38).

3.4.4 Quality

Ranking

Quality was ranked fourth overall, mentioned in almost one fifth (113, or 19%) of articles included in the review. This parameter was also ranked fourth among articles referring to severe malnutrition (25%), malaria (22%) and vaccination (15%), and ranked fifth for VAS (20%).

Description of parameter in reviewed articles

Several aspects of quality were mentioned in the reviewed articles. These included service delivery - for example, reduction of service quality based on number of co-delivered interventions (12), adjusting delivery by increasing the number of community health workers to improve the quality of the service they provide (47), or quality of interaction between health care provider and user (48). However, overarchingly, no specific or standardised definition of quality was noted. Review of intervention performance was often undertaken using data quality of information systems (49) but not quality of services or service delivery.

3.4.5 Sustainability

Ranking

Sustainability was ranked fifth overall, mentioned among 94 (16%) of eligible studies. It was tied for second among articles referring to VAS (24%), on par with accessibility, and fifth for malaria (18%), severe malnutrition (16%), and vaccinations (14%).

Description of parameter in reviewed articles

One challenge of this parameter is that sustainability is an integrated and interconnected concept, and as such definitions and subsequent measurement depend on perspective (43). The scope of sustainability can refer to financial, economic, social, environmental or institutional capacity that support long term benefits (children surviving – and thriving). The Organisation for Economic Co-operation and Development (OECD) definition of effectiveness also refers to achieving objectives in a “sustainable fashion” – or “the extent

to which the net benefits of the intervention continue, or are likely to continue”. Sustainability in this regard refers to whether supply or benefits from service delivery of interventions can and will continue over time without interruption.

Most studies in this review referred to “sustained approaches” or “sustained progress” or “long-term outcomes”. CMAM programmes place a system design and delivery focus on understanding and acceptance in order to have a sustainable and effective programme (34). Sustainability is a concern for many service delivery platforms, and lack of sustainability may not only affect intervention capacity based on unstable commitments and resources, but it can also specifically increase inequities by concentrating services in smaller or easier to reach populations (12,44).

3.4.6 Awareness

Ranking

Overall, awareness ranked sixth among the then search parameters and was identified in 9% (54) of eligible studies. Awareness was ranked fifth (tied with sustainability) among vaccination studies (14%), and on par with cost-effectiveness, quality, and sustainability. However, this parameter was identified in fewer than 10% of the remaining interventions: sixth among VAS (9%), seventh among severe malnutrition (8%, tied with acceptability), and ranked eighth malaria (4%).

Description of parameter in reviewed articles

Awareness in reviewed studies most often referred to community awareness of distribution campaigns such as CHEs that are often accompanied by targeted communication campaigns with awareness raising prior to event days (19) or through use of social marketing for bed net distribution (36). Awareness raising intersects with equity and gender, and some articles identified by the review emphasized who messages are targeting, how messages are delivered, how messages are framed and who will ultimately use and benefit from health and nutrition services (46).

3.4.7 Acceptability

Ranking

Acceptability was identified among 36 (6%) of eligible studies and ranked seventh overall of ten parameters. This parameter was also ranked seventh for severe malnutrition (8%, tied with awareness), vaccinations (6%) and malaria (5%), and eighth among VAS (1%).

Description of parameter in reviewed articles

Acceptability was not a common parameter among the reviewed articles. In the few that did refer to acceptability, it was presented as an important factor in service delivery – for example, acceptability of community-directed interventions (50,51). However, overall, inadequate information on acceptability was available. Only three reviewed articles focussed on acceptability of specific interventions and few included any specific measures of the parameter.

3.4.8 Availability

Ranking

Availability was ranked eighth overall and mentioned in 32 (5%) of studies included in the review. This parameter was ranked higher (sixth) for both severe malnutrition (9%) and malaria (8%), and lower for the remaining interventions – seventh for VAS (5%) and eighth for vaccinations (3%).

Description of parameter in reviewed articles

Availability of commodities or availability of human resources are critical to effective service delivery. In financially restricted economies, programmatic choices can be based on availability of resources (supply) instead of based on need (demand), reflecting mainstream or equity-focussed approaches to service delivery, respectively (38). Availability in the eligible review articles referred to a range of factors: availability of infrastructure, evidence (data and monitoring documents), healthcare services and service delivery, health care workers, and resources such as vaccinations and bed nets (52,53).

3.4.9 Resilience

Ranking

Resilience was ranked ninth overall. This parameter was only mentioned in two articles: one that referred to vaccinations and one that referred to severe malnutrition and VAS. No studies with malaria referred to resilience.

Description of parameter in reviewed articles

The resilience of a system refers to its ability to absorb disturbance, to adapt, and to respond with the provision of needed services (54). Resilience is not an action but rather a dynamic objective (55) and can be thought of in terms of adaptive resilience (to acute shocks), or planned resilience (to chronic stress) (56). In the face of crises, health and nutrition service delivery must be resilient, meaning able to absorb shocks and not lose any previously made gains. In other words, these services must be able to maintain core functions – continue these critical interventions – when a crisis hits (i.e., business continuity). The OECD definition of sustainability refers to resilience; the terms are linked. Sustainability of service delivery according to the OECD refers to the “continuation of benefits from an intervention after major assistance has been completed”. This also includes analysis of resilience of the delivery system to withstand any shocks (43).

The mention of resilience in identified articles referred to either enhancing resilience of a population in response to receiving service delivery (57) or to actual delivery of services (polio vaccination) (58). Upon further snowballing, it was noted that resilience could refer to lack of capacity building and resilience of routine services to respond to increased demand of health-seeking behaviour (59). Many studies mostly use general, sweeping terms when referring to resilience such as “robust and sustainable systems” (42) or a “robust maternal, newborn, and child health (MNCH) program” (53) or “resilience of health workers” in conflict areas (60). Overall, there is little uptake on studying service delivery resilience, and how it can best be built and measured. However, studies on health system resilience have

begun to increase since the 2014 Ebola epidemic in West Africa (61). In the case of Ebola-affected countries, efforts have been directed not only to restore how the system functioned before the crisis but to transform and fundamentally improve the health system (54).

3.4.10 Responsiveness

Ranking

Responsiveness was not identified in any of the eligible articles.

Description of parameter in reviewed articles

The responsiveness of a delivery system – sometimes referred to as “humanitarian adaptiveness” (62) – refers to the ability of a system to be sensitive and able to pivot in response to shocks. This means changing humanitarian approaches and interventions in response to change, rather than continuing with a plan that no longer fits the problem it is trying to address. It is a concept that occurs often in practice but is not well documented, which is reflected in this review.

Responsiveness can refer to changing timing or frequency of data collection and reporting, or to larger systems changes such as linkages of interventions or the way interventions are delivered. Changes can be triggered by various factors. These include changes in the humanitarian situation (needs, location, context), changes in the system or organisation, at the beginning or end of a crisis, changes in understanding of quality of a response (programmatic or user feedback), or a change in paradigm of a response such as during new or unexpected crises (e.g., COVID-19). Adapting and responding to complex or changing circumstances is important for effectiveness (43). Hence, the main question when speaking about responsiveness is, *can a health and nutrition service delivery system change when needed?* More specifically, looking operationally – changing where and how, programmatically – changing what and who, and strategically – changing roles and functions.

4 Discussion

Effectiveness has been defined by the OECD Development Assistance Committee (DAC) as “the extent to which the intervention achieved, or is expected to achieve, its objectives, and its results, including any differential results across group” (43). This definition includes reference to equity (“differential results across groups”), however it focusses specifically on effectiveness of interventions themselves. To date, no conceptual framework on the effectiveness of service delivery of preventive interventions for child health and nutrition has been adopted, though some work has been done towards proposing a basis for this type of approach (63).

Coverage remains the primary parameter of service delivery effectiveness among child health and nutrition programmes in LMICs. However, this literature review highlights other parameters that help support the effectiveness of service delivery of four key preventive health and nutrition interventions. The top three parameters of effectiveness of service

delivery for preventive child health and nutrition programmes that have gained popularity since the pre-MDG era are: *accessibility*, *equity*, and *cost-effectiveness*. It is not surprising that accessibility and equity are ranked first and second overall; access is included as a target for health in the SDGs, and improving access is often linked with improving equity. The increase in performance-based financing for health and nutrition services in LMICs (64) and general constraints on health and nutrition budgets help support the high ranking of cost-effectiveness in this review.

The mid-ranked parameters in this review were *quality* and *sustainability*. It has been posited that coverage of interventions potentially overestimates the benefits of health and nutrition services (65) and that a dimension of quality should be added to the measurement of intervention coverage. Finally, donors are increasingly concerned about the sustainability of health and nutrition services (66). However, defining and measuring both quality and sustainability of health and nutrition service delivery remains a challenge, as it does for some of the lower ranking parameters.

The lowest ranking parameters were *awareness*, *acceptability*, *availability*, *resilience*, and *responsiveness*, with the exception of awareness among vaccination articles which was on par with the mid-ranking parameters. Awareness, acceptability, and availability are not new concepts or parameters; they are part of well-established frameworks of coverage and characteristics of primary health care, although they are not reflected with importance in the reviewed community-based interventions. The bottom two parameters – resilience and responsiveness – have only recently been included in narratives on health service delivery; this may help explain their low ranking in this review including the complete absence of responsiveness.

It is evident that coverage is not the only parameter that is being used to examine effectiveness of health and nutrition service delivery. Parameters such as accessibility, equity, cost-effectiveness, quality, and sustainability are interconnected and are also being used to quantify and describe what does it really mean to have effective health and nutrition service delivery for children in LMICs. However, this review has not provided strong enough evidence to determine whether the parameters included in this review should be considered as stand-alone or whether they are supporting actors to coverage – or even whether they are outcomes of effective service delivery.

Limitations

Several limitations have been identified in this study which could affect the strength of the results. The search terms that were used in this review may have unintentionally excluded relevant results. To mitigate this risk, a wide net was cast such that all four interventions were searched directly along with the umbrella terms *child health* and *child nutrition*. Impact was also excluded as a search term, since it refers to higher-order effects and broader changes, compared to effectiveness, which is more along the results chain and concerned with interventions at a lower level (43). This decision may have excluded studies utilising the terms *impact* and *effectiveness* interchangeably.

The final selection of the four interventions that were included in the review may have biased the results. Vaccinations were over-represented compared with the other three

interventions, but it is unclear whether this reflects the fact that there is more funding, and hence subsequent research and documentation on service delivery for that particular intervention compared with the others, or whether there are other reasons why fewer results were attributed to VAS, severe malnutrition, and malaria. It is also possible that more research has been published on the topic of service delivery effectiveness in LMICs using other interventions or even among other sectors not included in this review. It is also possible that the low ranking of certain parameters is an artefact of bias in selection of search databases, that studies that include emerging parameters are not yet reflected in the literature, that these types of studies are not published externally or readily searchable, or that search terms do not reflect the correct vernacular.

Finally, and importantly, the studies included in this review most often focussed on effectiveness of interventions, with only minor consideration given to parameters for measuring effectiveness of service delivery; this distinction was not made when screening titles and abstracts for data extraction and ranking parameters.

5 Conclusions

OECD DAC criteria emphasize the importance of understanding the context of evaluations. Not all services and contexts are created equal, and context should dictate how parameters of effectiveness of service delivery are used. Developing a framework for effectiveness of service delivery would provide a critical and standardised point of reference to improve context-specific child health and nutrition interventions, with the ultimate goal of increasing their impact among vulnerable children.

The current literature, however, is insufficiently developed to make strong conclusions on which additional parameters, other than coverage (and perhaps equity), could be used to describe effectiveness of health and nutrition service delivery strategies. More research is also needed to understand the linkages between this literature review and the operational reality in LMICs. A large gap remains in our understanding of how to make better use of these potential parameters of service delivery effectiveness – whether to improve upon existing monitoring of programme delivery effectiveness, or perhaps also to gain a better understanding of how decision makers use and perceive of delivery effectiveness.

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