

2-26-2021

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Citation of this paper:

Ezezika, Obidimma; Gong, Jenny; Abdirahman, Hajara; and Sellen, Daniel, "Barriers and Facilitators to the Implementation of Large-Scale Nutrition Interventions in Africa: A Scoping Review" (2021). *Health Studies Publications*. 136.

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Barriers and Facilitators to the Implementation of Large-Scale Nutrition Interventions in Africa: A Scoping Review

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Received: 4 September 2020 / Accepted: 3 February 2021 / Published online: 26 February 2021
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Abstract

The effective implementation of large-scale nutrition interventions in Africa is an ongoing challenge. This scoping review identifies and explores the barriers and facilitators to the implementation of large-scale nutrition interventions in the African region. We searched PubMed, EMBASE, Scopus, ERIC, and Web of Science using search terms focused specifically on barriers and facilitators to the implementation of nutrition interventions in Africa. To supplement the database search, reference lists in publications included for full-text review were also examined to identify eligible articles for inclusion. Eligible studies underwent quality assessment, and a directed content analysis approach to data extraction was conducted and aligned to the Consolidated Framework for Implementation Research (CFIR) to facilitate narrative synthesis. The search identified 1452 citations and following removal of duplicates and our inclusion/exclusion criteria, 34 papers were eligible for inclusion. More than half of included studies ($n = 19$) reflect research conducted in East Africa. Overarching thematic areas spanning the barriers and facilitators that were identified included policy and legislation; leadership management; resources mobilization; and cultural context and adaptability. Key activities that facilitate the development of successful implementation include (1) more supportive policy and legislation to improve government competency, (2) effective leadership, strategic partnership, and coordination across multiple sectors, (3) more effective resource mobilization, and (4) adequate adaptation of the intervention so that it is culturally relevant, tailored to local needs and aligned to research data. The barriers and facilitators identified under the CFIR domains can be used to build knowledge on how to adapt large-scale nutrition interventions to national and local settings.

Registration Open Science Framework (<https://osf.io/6m8fy>).

Keywords Nutrition · Implementation · Scale · Technology · Africa · CFIR

Background

Large-scale health interventions aim to improve health outcomes for the general public and encompass a wide range of therapeutic procedures, drugs, and interventions geared

towards improving clinical evaluation and treatment (Landefeld et al. 2008; Crump 2008). Many large-scale health interventions within the scope of global health fall under broad umbrellas such as HIV/AIDS, malaria, TB, and maternal or newborn health (Mangham and Hanson 2010). Current

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interest in the implementation and scaling up of health interventions can be traced back to the HIV AIDS pandemic, where the “scale-up” of antiretroviral treatments proved to be effective in reducing HIV incidence (Mangham and Hanson 2010). Glasgow et al. (2012) provided a succinct and fitting definition for the term implementation in relation to health interventions, characterizing it as “the use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings.” On the other hand, the World Health Organization simply defines scale-up as “increasing the coverage of an intervention” (WHO Scaling Up Health Services 2008). Research examining the scale-up and implementation of nutritional interventions in particular has gained more traction over the past decade, as malnutrition remains a pervasive public health issue, contributing to more than half of total child mortality cases in developing nations (Heikens et al. 2008). In addition, there remains a lack of comprehensive understanding of implementation factors related to large-scale nutrition interventions within the African context, where at regional level, progress on reducing undernutrition remains stagnant in contrast to most other global regions. This review aims to explore such factors in more depth.

The term malnutrition itself encompasses conditions such as undernutrition, overnutrition, and also hunger (Githanga et al. 2019). Malnutrition, especially in children and in utero, can have severe and long-term effects, translating into cognitive and productivity challenges later in life, thus, perpetuating this recursive cycle of hunger and poverty (Githanga et al. 2019). Malnutrition is a complex issue that affects not only individual wellbeing, but also heavily impacts families, communities, and countries overall (Visser et al. 2018). Despite the establishment of millennium development goals aimed to reduce hunger by half by the year 2015, malnutrition has been progressively worsening within Africa (Bain et al. 2013). According to Bain et al. (2013), the increase in malnutrition and undernutrition within African countries can be attributed to economic and environmental factors such as poverty, policy, corruption, illiteracy and climate change (Bain et al. 2013). Although inadequate food intake is the proximate cause of individual malnutrition, the issue can be examined through a socio-ecological framework, where inadequate individual food intake is linked to broader issues such as inadequate maternal and childcare, lack of health services, poverty, and unhealthy environments (Visser et al. 2018).

Many interventions have been developed to combat malnutrition within Africa, from food fortification, supplementary feeding, to agricultural and education-based programs (Moench-Pfanner et al. 2012). For example, many micronutrient fortification interventions have been created, from powders to crushable tablets (Lartey 2008). Previous research demonstrated the effectiveness of nutrition-specific

interventions that target proximate causes of malnutrition, such as large-scale fortification and micronutrient supplementation programs, which are especially important in areas disproportionately affected by undernutrition and malnutrition (Bain et al. 2013; Rosenberg et al. 2018). Recent initiatives such as Scaling Up Nutrition (SUN) and Feed the Future have directed more attention to the issues surrounding malnutrition within Africa (Moench-Pfanner et al. 2012). Implementing nutritional programs in Africa remains especially challenging due to poor infrastructure, conflict, and limited resources Fanzo (2012).

Despite the abundance of evidence indicating the importance of investing in nutrition programs, government and stakeholder actions still fall short (Moench-Pfanner et al. 2012). As stated by Heiken et al. (2008), we must move beyond generating data and focus more on operational research aimed to scale-up existing interventions. A “know-do gap” was identified by researchers in global health research, wherein exists a distinct gap between research and interventions being implemented to address an identified issue (Pablos-Mendez and Shademani 2006). According to Yamey (2012), many complex health issues within low- and middle-income countries could be reduced by scaling up evidence-based tools and programs. As sustainability of health interventions is an ongoing issue in Africa, understanding factors that promote and inhibit the sustainability of various interventions is necessary for successful program design and implementation (Oldewage-Theron et al. 2018). The Consolidated Framework for Implementation Research (CFIR) is a conceptual framework that was developed to guide the systematic assessment of implementation contexts and factors which influence effective intervention implementation (Damschroder et al. 2009). Incorporating CFIR during the analysis and synthesis phase of this review is beneficial, as integrating a conceptual framework increases both the generalizability and interpretability of study results. Moreover, this framework was constructed to be flexible in its application, where researchers can tailor the framework to fit the intervention and context being studied (Keith et al. 2017).

To our knowledge, no formal review has been conducted examining factors related to the implementation of large-scale nutrition interventions in Africa. The goal of this review is to identify key barriers and facilitators for the effective implementation and scale up of large-scale nutrition interventions in Africa. Previous studies broadly defined nutrition interventions as any invention that aims to improve the nutrition diagnosis of a specific population and can include strategies such as supplementation or fortification, cash transfers or incentives, and behavior change interventions (Barker et al. 2018). Previous researchers have also investigated the topic of scaling up nutrition interventions in countries outside of Africa. For example, Cordon and colleagues investigated interventions addressing the issue

of stunting in Guatemala. They concluded a need for multi-leveled interventions that address both proximate and distal factors underlying child malnutrition, and also advocated for more comprehensive implementation science studies examining scale-up efforts (Cordon et al. 2019). Similarly, Roos et al. (2018) examined population-based nutrition interventions in South East Asia. Researchers cited lack of routine data collection and monitoring as a major barrier to program scale up in countries such as Cambodia, Indonesia, and Vietnam (Roos et al. 2018). Moreover, Kim et al. (2017) reported intersectoral coordination as a major facilitator in scaling up nutrition interventions in India, where governments, policy makers, and stakeholders have a shared understanding of overall program goals and priority actions (Kim et al. 2017).

Better understanding the limitations and facilitators encountered in specific nutrition studies can assist researchers, stakeholders, and policy makers in successfully implementing future nutrition programs. This review examines and integrates lessons learned from pre-existing formative research and pilot studies to identify priority areas to guide the scale-up of future nutrition interventions within Africa.

Methods

Eligibility

A scoping review methodology was used to address study aims because it provides a broad overview of the topic and allows for synthesizing findings across a range of study designs (Arksey and O'Malley 2005). For this review, only primary research articles focused on implementation or scale-up of large-scale nutrition interventions carried out in Africa were included. This study aimed to focus only on countries in Africa as nutrition is an especially pertinent problem in this region, where factors such as poverty, lack of infrastructure, and political instability continue to exacerbate both undernutrition and malnutrition in this region (Bain et al. 2013; Visser et al. 2018).

The review included all primary research studies which met the eligibility criteria. This included (i) qualitative studies which used appropriate methods of data collection and data analysis (such as case studies, phenomenology, grounded theory, ethnography, and action research studies); (ii) quantitative studies (such as cross-sectional studies, case-control studies, cohort studies, quasi-experimental studies, and randomized controlled trials); and (iii) mixed-methods studies which combined qualitative and quantitative methods of data collection and analysis. Research conducted outside of Africa and articles that do not directly evaluate the barriers and facilitators affecting the implementation of nutrition interventions were excluded. Moreover,

non-research articles, editorials, commentary, opinion pieces, or articles without a direct focus on implementation or scaling up the intervention were also not eligible for inclusion. Although no timeline was specified, gray literature was excluded in order to maintain a feasible scope for the review.

Search Strategy

Preliminary searches were conducted in PubMed in order to identify search terms and establish a comprehensive search string, with the support from a health sciences librarian. Thus, the following search strategy was generated: ('implementation science' OR 'enabling environment' OR 'scale-up') AND ('nutrition' OR 'diet' OR 'supplementation') AND (combining all 54 countries in Africa by the Boolean operator 'OR'). To supplement the database search, reference lists in publications included for full-text review were also referenced to identify eligible articles for inclusion. The final search was carried out in 5 databases including PubMed, EMBASE, Scopus, ERIC, and Web of Science. Only articles published after 2005 were included. As the search strategy was constructed without the use of controlled vocabulary such as MESH terms, this is a limitation which likely resulted in the undercounting of potentially eligible articles.

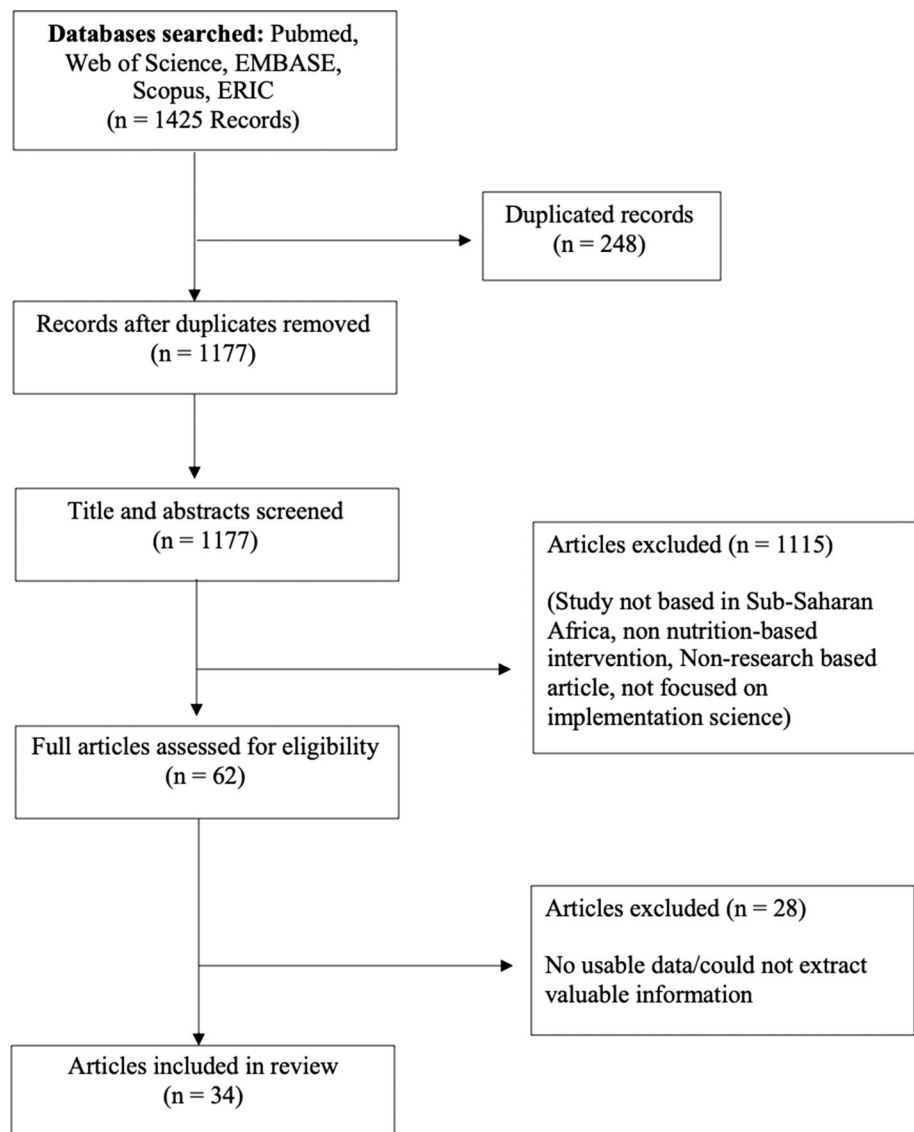
Screening Strategy

Investigators screened the titles and abstracts of studies identified from each database using the inclusion and exclusion criteria. Full texts were retrieved for all studies that passed the title and abstract screening but required more information than was provided in the abstract to inform a decision. The flow of information through different phases of the scoping review, as well as the number of records and the reasons for inclusion and exclusion is documented in the PRISMA flowchart in Fig. 1. In total, 62 articles were included in full-text review and 28 articles were excluded as barriers and facilitators related to implementation could not be extracted for these studies. Thus, 34 final articles were included in this review.

Quality Assessment

Quality assessment of articles were conducted by two authors independently, using the Mixed-Methods Appraisal Tool (MMAT). The overall goal of MMAT is to appraise the quality of primary research studies. All 34 studies included scored full points on the MMAT and were deemed high-quality articles (received a full score

Fig. 1 PRISMA flowchart



of 4). To generate the quality assessment result for each study, two authors independently completed the MMAT appraisal tool, and any inconsistencies were resolved by a third author when required. Overall, there was almost perfect agreement between researchers, with an inter-rater agreement of 97%.

Data Extraction and CFIR Application

Data were extracted using a table developed by the research team, which detailed various study characteristics including (1) authors; (2) publication year; (3) journal; (4) type of nutrition intervention; (5) study design; (6) study setting; (7) details regarding the intervention; (8) primary outcomes; and (9) barriers and/or facilitators to implementing the intervention [Refer to the Table within Supplementary File 1]. Two authors were blinded and independently extracted

relevant data from each article to ensure rigor. In addition, the authors coded each facilitator and barrier according to the CFIR, which is a conceptual framework created to guide the systematic assessment of factors that influence the implementation and effectiveness of interventions (Damschroder et al. 2009). The CFIR codebook describes 5 broad domains and 39 constructs in much detail.

Both authors collaborated to produce one consolidated document containing all relevant codes by resolving any disagreements between their original data extraction documents. A third author was brought into resolve any conflicts between documents. The two authors aligned roughly 70% in relation to extraction of barriers and facilitators from each article, and 75% in relation to the coding of each point according to CFIR. The reported frequency of the barriers and facilitators, and their alignment to the CFIR constructs is shown in Supplementary File 2. Finally, all

barriers and facilitators were grouped together inductively to facilitate the creation of broad themes.

Results

Study Characteristics

All included articles in this scoping review were published after 2010, with the majority after 2013 ($n = 31$, 91%). In terms of geography, this review encompassed studies examining 16 different African countries, with more studies examining interventions within countries such as Ethiopia ($n = 9$, 26%), Malawi ($n = 5$, 15%), Uganda ($n = 5$, 15%), Kenya ($n = 4$, 12%), Zambia ($n = 3$, 8%), Burkina Faso ($n = 3$, 8%), and South Africa ($n = 3$, 8%). Fewer studies examined interventions in Ghana ($n = 2$, 6%), Nigeria ($n = 1$, 3%), Congo ($n = 1$, 3%), Madagascar ($n = 1$, 3%), Liberia ($n = 1$, 3%), Rwanda ($n = 1$, 3%), Tanzania ($n = 1$, 3%), Senegal ($n = 1$, 3%), and Sierra Leone ($n = 1$, 3%). East Africa was most represented ($n = 19$) within this review, followed by West Africa ($n = 8$), Southern Africa ($n = 2$), and Central Africa ($n = 1$). Four studies also examined multiple countries. The majority of studies utilized a qualitative study design ($n = 31$, 91%), with only 2 mixed-methods articles (6%), and only 1 quantitative study (3%). Most articles collected qualitative interview data from stakeholders and/or reviewed available documents, but notably 3 (8%) articles explicitly conducted a process evaluation either in isolation or combined with a qualitative study. A wide range of nutrition intervention types were also examined, with micronutrient powders and community fortification programs being the most represented ($n = 6$, 18%). In addition, infant and young child feeding (IYCF) programs ($n = 3$, 8%) and mobile health interventions ($n = 3$, 8%) were also commonly examined [Refer to Supplementary File 1].

After reviewing the consolidated document containing all relevant barriers and enablers extracted from included articles, researchers noted four themes which naturally emerged from the data: policy and legislation, leadership management, resources mobilization, and cultural context and adaptability. To provide the reader with a sense of the diverse contexts across studies, Supplementary File 2 provides sample quotes from articles representative of the meta-themes associated with CFIR domains and constructs [Supplementary File 2]. Although the CFIR was useful in orienting researchers to implementation factors and provided increased rigor for data extraction, grouping of barriers and facilitators into broader themes assisted researchers in imposing logic and creating sense from a previously overwhelming list of constructs. In addition, as only 16 out of 39 (41%) of CFIR constructs were able

to be coded, the grouping of relevant themes can assist in further understanding which factors and constructs are relevant in the African context. Below, we present the four major themes with the relevant CFIR domains and constructs addressed within each theme.

Theme 1: Policy and Legislation

This theme can be described as the government's capacity to create supportive policy environments. Having supportive policies and legislations for implementation encourages collaborations between stakeholders and also increases both scalability and sustainability of interventions. The CFIR constructs External Policy and Incentives (Outer Settings) and Champions (Process) are included in this thematic area.

External Policy and Incentives (Outer Settings) Five studies cited that gaps in policy making and regulations undermined the implementation of nutrition interventions (Anjorin et al. 2019; Hodge et al. 2015; Mildon et al. 2015; Doudou et al. 2018; Harris et al. 2017). Despite some success in mainstreaming nutrition as a core policy concern (for example, through the World Bank's Scaling Up Nutrition initiative and the UN's ongoing Food Systems Dialogues), malnutrition remains rarely seen as a pressing issue for policy makers; instead, governments are often more interested in solving "visible" issues with tangible solutions, such as fixing infrastructure or building new schools. (Hodge et al. 2015). Lack of legislation mandating nutrition fortification and diffused political attention also decreased motivation of individuals involved with fortification projects (Mildon et al. 2015). Thus, policy gaps were shown to hamper the scalability and sustainability of specific interventions (Doudou et al. 2018). Bureaucracy also hindered the ability for interventions to gain funding, which ultimately delayed the implementation process (Pomeroy-Stevens et al. 2016). Eight studies highlighted how supportive policies facilitated the implementation process (Anjorin et al. 2019; Carroll et al. 2019; Kennedy et al. 2016; Mildon et al. 2015; Legesse et al. 2014; Sanghvi et al. 2013; Harris et al. 2017; Laar et al. 2017; Gillespie et al. 2015). For example, supportive policies improved service delivery (Sanghvi et al. 2013), strengthened stakeholder commitment (Harris et al. 2017), fostered collaborations between organizations, enhanced partnerships, and encouraged the translation of nutrition recommendations into concrete actions (Carroll et al. 2019).

Champions (Process) Six articles cited lack of champions as a barrier to the implementation of nutrition interventions (Pomeroy-Stevens et al. 2016; Kennedy et al. 2015; Sanghvi et al. 2013; Kavle et al. 2019a; Carroll et al. 2019; de Villiers et al. 2015). Specifically, lack of advocates for the intervention (Pomeroy-Stevens et al. 2016; Kennedy et al.

2015; Sanghvi et al. 2013) and low community support for large-scale nutrition projects (Carroll et al. 2019; de Villiers et al. 2015) created barriers for the implementation process. On the other hand, seven studies cited that developing informal alliances can enable implementation (Schneider et al. 2019; Eby et al. 2019; Kavle et al. 2019a; Carroll et al. 2019; Tanumihardjo et al. 2017; Blauvelt et al. 2018; Nankunda et al. 2010). Examples of such informal alliances include involving experts like dieticians, (Schneider et al. 2019) or engaging with community leaders that can increase the acceptability of an intervention (Carroll et al. 2019).

Theme 2: Leadership Management

This theme is defined as the ability to foster strong leadership, strategic partnerships, and coordination across multiple sectors. In addition, this theme includes the capacity to engage informal and formal external partners to assist in the implementation process, and the capacity to conduct program monitoring or evaluation. The following CFIR constructs are included in this theme: Cosmopolitan (Outer setting), Leadership engagement (Inner setting), External Change Agents (Process), Executing (Process), and Reflecting and Evaluating (Process).

Cosmopolitan (Outer Setting) Two studies cited inadequate stakeholder engagement as a barrier for the implementation of large-scale nutrition interventions (Anjorin et al. 2019; Blauvelt et al. 2018), where issues such as competing agendas (Blauvelt et al. 2018) and lack of stakeholder attention to malnutrition (Harris et al. 2017) often impede implementation efforts. Poor communication among stakeholders (Anjorin et al. 2019), ineffective coordination, and unsupportive leadership (Kennedy et al. 2016) were all factors shown to interfere with effective stakeholder engagement. Furthermore, the idea of multisectoral coordination often involves collaboration between different government ministries and organizations. Inefficient multisectoral coordination was then mentioned in three studies as an obstruction to implementing nutrition interventions (Kennedy et al. 2016; Pomeroy-Stevens et al. 2016; Carroll et al. 2019), where the absence of effective multisectoral strategies prevented sectors from taking responsibility for nutrition planning (Kennedy et al. 2015). The lack of a feasible implementation plan contributes to disorganization across all sectors (Kennedy et al. 2016) and the absence of program monitoring (Hodge et al. 2015). On the other hand, intersectoral coordination across units, departments, ministries enabled better project outcomes (Kennedy et al. 2016), as such collaboration increased delivery, integration, and monitoring of the intervention (Carroll et al. 2019; Pomeroy-Stevens et al. 2016).

Leadership Engagement (Inner Setting) Government support was found to be valuable to implementation by providing policy, guidelines, material resources, and technical expertise to nutrition projects (Schneider et al. 2019). Moreover, support from government agencies facilitated meaningful engagement with a range of stakeholders, champions, and community leaders (Sanghvi et al. 2013; Blauvelt et al. 2018). According to Anjorin et al. (2019) and Weber et al. (2019), government involvement also legitimized and ensured the sustainability of interventions.

External Change Agents (Process) Five studies cited external support as a key facilitator to implementing large-scale nutrition interventions (Kavle et al. 2019a; Carroll et al. 2019; Pomeroy-Stevens et al. 2016; Kennedy et al. 2016; Anjorin et al. 2019). External support from key government and non-government affiliated partners (Kavle et al. 2019a) served as a catalyst to advance the national nutrition policy environment (Harris et al. 2017) due to the engagement of multisectoral committee experts within the fields of program implementation and evaluation (Carroll et al. 2019). Large government-sponsored workshops were also important in raising political awareness about the dangers of malnutrition (Kennedy et al. 2016). Lastly, involvement of donors and UN groups added to multisectoral coordination efforts and facilitated program implementation (Pomeroy-Stevens et al. 2016).

Executing (Process) Uneven implementation of the intervention was mentioned by three studies (Kennedy et al. 2015; Hodge et al. 2015; Gillespie et al. 2015). This is described as the difference in intervention awareness among various sectors (Kennedy et al. 2015) and the systemic capacity gaps related to program implementation (Hodge et al. 2015). Additionally, language barriers between implementors and program users were cited in two studies as a barrier to implementation (Carroll et al. 2019; Kavle et al. 2019a). Certain words and phrases can be lost in translation, hindering users' understanding of the nutrition programming, which significantly reduces intervention accessibility (Kavle et al. 2019b). However, linguistic sensitivity was also cited as an enabler, where Carroll et al. (2019) stressed the importance of developing communication materials in various local languages in order to maximize program implementation.

Reflecting and Evaluating (Process) Evaluation challenges were cited in six studies as an implementation barrier (Gillespie et al. 2015; Nielsen et al. 2018; Legesse et al. 2014; Carroll et al. 2019; Pomeroy-Stevens et al. 2016; Hodge et al. 2015). Specifically, the lack of established mon-

itoring or evaluation systems and absence of accountability for program targets were often cited as key issues (Hodge et al. 2015; Gillespie et al. 2015). In addition, logistical and methodological issues related to lack of data availability and accessibility were also explicitly stated (Carroll et al. 2019). Inability to pilot data reporting systems (Carroll et al. 2019), lack of follow-up (Nielsen et al. 2018), and lack of nutrition indicators (Hodge et al. 2015) were also outlined.

Routine program monitoring was cited in six studies as an enabler for implementation (Schneider et al. 2019; Pomeroy-Stevens et al. 2016; Sanghvi et al. 2013; Eby et al. 2019; Menon et al. 2013; Baker et al. 2013; Guyon et al. 2016). To illustrate, program monitoring was achieved through annual review meetings, which provided an excellent platform to raise and address any outstanding program challenges (Eby et al. 2019). Schneider et al. (2019) cited that accurate and timely reporting of data allows for effective program monitoring and evaluation. According to Baker et al. (2013), ongoing dissemination and monitoring of nutrition policies and national strategies across sectors encourage their implementation. Starting evaluation processes early in the project cycle and collaborating with implementation teams were also found to be beneficial (Menon et al. 2013, 2016).

Theme 3: Resources Mobilization

This theme is defined as the ability to adequately leverage and use funds, human resources (staff training and support), goods (raw materials and stock), and services. The following CFIR constructs are included in this theme: Cost (Intervention Characteristic), Available Resources (Inner Settings), and Organizational Incentives and Rewards (Inner Settings).

Cost (Intervention Characteristics) Five articles cited inadequate intervention funding as a major constraint to intervention implementation (Harris et al. 2017; Mildon et al. 2015; Anjorin et al. 2019; Pomeroy-Stevens et al. 2016; Kennedy et al. 2015). Insufficient financial resources (Harris et al. 2017) resulted in an over-reliance on the community's ability to fund and manage nutrition activities themselves (Mildon et al. 2015), especially in relation to micronutrient interventions which relied heavily on funding from donor agencies. Three articles cited that adequate program funding facilitated implementation of nutrition interventions (Anjorin et al. 2019; Hodge et al. 2015; Legesse et al. 2014). Sufficient funding and budgeting, made possible through both governments and donors, are crucial in coordinating large-scale nutrition interventions that require action from multiple sectors (Hodge et al. 2015). Funding is important for every step of project scale-up, from initial start-up, implementing policy, engaging staff, program surveillance, as well as leveraging other resources (Anjorin et al. 2019; Legesse et al. 2014).

Available Resources (Inner Settings) Inadequate human resources and training of personnel were cited in thirteen studies as a barrier to implementation. There were gaps in the provision of nutrition services due to lack of resources, materials, and a solid understanding of key nutrition counseling messages (Kavle et al. 2019a; Aryeetey et al. 2015; Pankomera and van Greunen 2018). High rates of staff turnover (Sako et al. 2018) and low-quality training (Baker et al. 2013) prevented health providers from being adequately equipped to carry out program goals. Further, insufficient stock of micronutrient powders and other materials hindered scale-up of the intervention (Carroll et al. 2019; Eby et al. 2019). For example, poor storage facilities led to product expiring or spoiling (Carroll et al. 2019). Unrealistic timeframe (Kennedy et al. 2015) can also be a barrier, as organizing nutrition programs can be time consuming, and a short timeframe might cut a program off before results can be achieved (Sako et al. 2018). However, adequate staff training and support were highlighted as a facilitator to implementation in five studies (Schneider et al. 2019; Eby et al. 2019; Kavle et al. 2019a; Carroll et al. 2019; Sanghvi et al. 2013). To illustrate, successful examples include cascaded training, refresher courses, targeted mentoring of individual facilities or subdistricts, and training modules modified after each implementation phase (Eby et al. 2019; Sanghvi et al. 2013).

In three studies, insufficient health personnel or human resources were cited as a major barrier to implementing large-scale nutrition interventions (Eby et al. 2019; Pomeroy-Stevens et al. 2016; Noordam et al. 2015). Specifically, Eby et al. (2019) reported insufficient workforce for managing inventory, while Noordam et al. (2015) advocated that more qualified health workers are needed to perform program monitoring and data entry.

Organizational Incentives and Rewards (Inner Setting) Lack of program incentives was cited in four studies as a major barrier to implementation (Hodge et al. 2015; Sako et al. 2018; Sanghvi et al. 2013; Kennedy et al. 2015), where the lack of incentives often translated to lack of stakeholder motivation to carry out the project. For example, many volunteers involved with nutrition programming reported dropping out due to the lack of financial incentives (Sanghvi et al. 2013). Informants also reported that incentives are required for different ministries and organizations to engage in multisectoral work (Hodge et al. 2015).

Theme 4: Cultural Context & Adaptability

This theme is defined as the connection between research and programming, and the ability to ensure that interventions are supported by data, and is culturally tailored to local needs. The following CFIR constructs are included in this

theme: Evidence Strength and Quality (Intervention Characteristics), Complexity (Intervention Characteristics), Access to Knowledge and Information (Inner Setting), Adaptability (Intervention Source), Knowledge and Beliefs about the Intervention (Characteristics of Individuals), and Self-efficacy (Characteristics of Individuals).

Evidence Strength and Quality (Intervention Characteristics) Lack of stakeholder understanding about intervention was cited by two articles as a barrier (Gillespie et al. 2015; Hodge et al. 2015). Gillespie et al. (2015) stated how lack of data prevented decision makers from selecting appropriate policy options, meanwhile Hodge et al. (2015) mentioned that lack of stakeholder understanding of the importance of nutrition actually decreased program productivity. Knowledge of nutrition interventions was found to be low due to lack of access, affordability, cultural practices, and understanding of their importance (Carroll et al. 2019). Little knowledge of nutrition-related ailments (Carroll et al. 2019), difficulty understanding recommendations, and lack of time were also commonly cited barriers (Nielsen et al. 2018). In addition, differing knowledge among stakeholders (Gillespie et al. 2015) leads to gaps in nutrition knowledge and skills of staff at all levels, from field workers to policy makers (Hodge et al. 2015). In contrast, interventions supported by data enabled more efficient implementation, where access to routine data provided timely information and insights regarding project progression (Guyon et al. 2016). Other facilitators that increased capacity building for interventions involved basic training, continued follow-up through observation visits, supportive supervision, incentives or rewards, refresher training for personnel, user-friendly job aids, and regular monitoring or feedback (Baker et al. 2013; Pankomera and van Greunen 2018).

Complexity (Intervention Characteristics) Community social support was cited as a major facilitator for improved implementation of nutrient interventions (Sanghvi et al. 2013; Pridmore et al. 2015). This support often originated from community-based groups such as faith-based organizations, women's groups, or other kinship networks (Sanghvi et al. 2013).

Access to Knowledge and Information (Inner Setting) Insufficient implementor knowledge was highlighted as a barrier in seven studies (Eby et al. 2019; Anjorin et al. 2019; Carroll et al. 2019; Kennedy et al. 2015; Hodge et al. 2015; Gillespie et al. 2015; Garcia-Casal et al. 2016). To illustrate, many implementors lacked knowledge related to appropriate storage practices and inventory management for food-based interventions (Eby et al. 2019). In addition, several studies lacked adequate data associated with intervention coverage and monitoring (Anjorin et al. 2019). Further, insufficient knowledge undermines policy decisions and hinders the creation of

appropriate action plans (Gillespie et al. 2015). However, an adequate knowledge base was shown to encourage implementation efforts (Carroll et al. 2019; Schneider et al. 2019; Hodge et al. 2015; Guyon et al. 2016; Nankunda et al. 2010; Tanumihardjo et al. 2017). To illustrate, adequate knowledge enables “systems thinking” required in collaborative service delivery (Schneider et al. 2019). Additionally, timely information and insights reduces stagnation in project implementation (Guyon et al. 2016; McLean et al. 2019).

Adaptability (Intervention Characteristics) Tailoring nutrition interventions to the needs of local communities is crucial to ensuring intervention scale-up, as cited by 5 articles (Schneider et al. 2019; Carroll et al. 2019; Kennedy et al. 2016; Clark and Hobbs 2018; Hodges et al. 2015). To note, researchers concluded that it is important to reference local data (Schneider et al. 2019), develop country-specific packaging and messaging (Carroll et al. 2019; Clark and Hobbs 2018), and recognize that malnutrition is a complex issue in need of tailored solutions and interventions (Kennedy et al. 2016). It is important for stakeholders to develop innovations that respect local cultural practices, in order to ensure community-wide acceptance of the intervention (Laar et al. 2017). Adhering to community values during product design is also crucial, as Carroll et al. (2019) cited that program acceptance is highly dependent on individual word of mouth, where these individuals' perceptions and endorsements were essential in ensuring program sustainability.

Knowledge and Beliefs About the Intervention (Characteristics of Individuals) Two specific articles cited lack of trust from beneficiaries as barriers to the implementation of nutrition interventions (Nielsen et al. 2018; Clark and Hobbs 2018), for example, community members often doubted product quality and the safety of complementary food ingredients. In addition, researchers cited that facilitating trust between community volunteers and beneficiaries is important for ensuring program sustainability (Nielsen et al. 2018). Similarly, articles outlined that lack of cultural understanding also prevented beneficiaries from accepting and accessing innovations (Legesse et al. 2014; Nankunda et al. 2010). For example, a project aimed to promote breastfeeding experienced various socio-cultural challenges during implementation, as community members considered breastmilk as “dirty” and unsuitable for feeding newborns (Nankunda et al. 2010).

Self-efficacy (Characteristics of Individuals) Two articles cited participant empowerment as a facilitator to implementing of nutrition interventions (Hodges et al. 2015; Nielsen et al. 2018). Such empowerment was achieved either through addressing gender inequality and women's role as caregivers (Hodges et al. 2015), or through increased income for members in the community (Nielsen et al. 2018).

Discussion

This review identified multiple barriers and facilitators to implementing large-scale nutrition interventions in Africa across 34 articles published between 2010 and 2019. The overarching themes identified within this review related to all five domains of the CFIR and included policy and legislation, leadership management, resources mobilization, and cultural context and adaptability.

With respect to the policy and legislation theme, this review revealed how supportive political environments and nutrition-specific guidelines ease the implementation process by removing logistical barriers and increasing the motivation or commitment of personnel. This idea was echoed by a recent study conducted by Namirembe et al. (2020), where researchers stated that individual nutrition programs are more sustainable and cost effective when they are supported by structures and policies that fit with program goals. Interventions do not exist in a vacuum; thus, factors such as political commitment to carrying out nutrition-relevant policies are part of the requirement for achieving desirable nutrition outcomes (Namirembe et al. 2020). For example, South Africa's integrated nutrition strategy, later known as the Integrated Nutrition Program (INP), aimed to incorporate nutritional promotion at various policy levels (Labadarios et al. 2005). This strategy included action items such as breastfeeding policies and guidelines for health workers, development of food fortification legislation, and guidelines for nutritional interventions at health facilities in order to address child malnutrition (Labadarios et al. 2005). By setting these targets and objectives, INP developed an enabling environment for the implementation of related interventions and also created a necessary framework for monitoring or assessing nutrition programs (Labadarios et al. 2005). Overall, when designing nutrition interventions, practitioners should be familiar with national, district level, and local policies or legislations of the intended geographical area in order to ensure that program goals fit within existing policy structures.

The theme of leadership management encompasses the ability to foster and coordinate strategic partnerships across multiple sectors. Within this thematic area, the importance of program monitoring and evaluation was frequently mentioned as a critical enabler to implementation. Similarly, researchers Nordhagen et al. (2019) demonstrated that partnerships between various organizations across multiple sectors pose both benefits and challenges. For example, multisectoral partnerships between governments and other organizations allow for program implementors to leverage unique knowledge and strengths of each sector to create wide-reaching interventions (Lencucha et al. 2018). While partnerships can be sources of

expertise and knowledge, collaborations between different sectors and organizations also might require additional time and resources (Nordhagen et al. 2019). Further, McDermott et al. (2015) suggest that program monitoring is crucial to the implementation of nutrition programs, where documenting challenges and successes along the way can help evaluators make informed decisions about whether and how programs should be improved. Therefore, it is important for implementors to be mindful that collaborating with stakeholders such as governments or NGOs might assist with procuring project funding and leveraging knowledge from different domains. However, factors such as competing agendas and ineffective communication can impede multisectoral coordination, thus, highlighting the need to outline responsibilities of individual stakeholders and establish regular check-ins in order to ensure successful multisectoral collaborations.

In addition, factors such as sufficient program funding, program resources, and adequate staff training are key determinants of successful program implementation. A study examining IYCF programs in Sri Lanka, India, Nepal, Bangladesh, and Pakistan confirmed this result, stating that lack of financial support and manpower were the two main barriers to accomplishing nutrition goals (Uddin et al. 2017). For interventions such as complementary feeding and counseling programs that require the involvement of community health workers or volunteers, adequate training is crucial to enhance the communication and performance of personnel. Zaman et al. (2008) examined a complementary feeding program in Pakistan and concluded that effective training of health workers combined with providing monthly refresher courses increased the skills of health workers and also improved feeding practices of counseled mothers. The importance of refresher courses also was suggested by Ara et al. (2019), where incorporating one-day refresher courses after intensive training enabled workers to deliver health messages clearly and concisely to beneficiaries. Thus, incorporating intensive training combined with refresher courses would be especially beneficial for programs that require the assistance of volunteers or community-based personnel. Implementors also should aim to provide tangible incentives for health workers and volunteers, in order to increase individual motivation. Program monitoring and evaluation mechanisms also should be in place before initial program implementation, where such monitoring tools should be piloted by health workers to ensure that such devices are easy to use and will not delay program progress.

Finally, it is important to ensure that a program or intervention is well supported by data and is culturally adapted to fit local contexts, as a lack of cultural understanding often prevented beneficiaries from accepting and accessing innovations. An article written by Lizarondo et al. (2019) noted that cultural- and context-specific factors such as language,

resources, and local traditions often impede implementation of health-related programs in African countries specifically. Cultural barriers also were demonstrated by studies examining nutrition interventions outside of the African context. Dijkhuizen et al. (2019) cited traditional cultural beliefs, including food taboos as “counterproductive” in the adoption of micronutrient programs in low- and middle-income countries within Southeast Asia. Similarly, implementors experienced difficulty administering a nutrition education program aimed towards Bangladeshi beneficiaries due to cultural barriers (Grace 2011). Program messages contradicted cultural understandings, where beneficiaries believed that raw foods, root vegetables, and baked or grilled foods were indigestible (Grace 2011). To foster cultural acceptability of interventions, it is important to form informal alliances and engage with champions such as religious leaders, church groups, or other kinship networks. Co-creation

of interventions with enlightened community members or including community participation in the product development phase can also alleviate cultural barriers and build trust with beneficiaries.

Implications for Implementation Practitioners

The view of the landscape revealed in this analysis advances knowledge about how nutrition programs are implemented in Africa in ways that can immediately inform ongoing program delivery and design of future frameworks and plans.

First, we note that both facilitators and barriers are revealed as significant influences for most of the domains examined (Table 1). This means that no simple, “blanket” approach to implementation aimed at either removing

Table 1 Frequency table of cited consolidated framework for implementation research (CFIR) constructs

CFIR domains ($n = 5$) and constructs ($n = 39$)	Facilitator n (%) of studies	Barrier n (%) of studies
I. Intervention characteristics		
No facilitators or barriers were noted for these constructs related to Intervention Source, Relative Advantage, Trialability, Design Quality, and Packaging		
Evidence strength and quality	None identified	2 (5.9%)
Adaptability	6 (17.6%)	None identified
Complexity	None identified	2 (5.9%)
Cost	3 (8.8%)	5 (14.7%)
II. Outer setting		
No facilitators or barriers were noted for these constructs related to Patient Needs and Resources, Peer Pressure		
Cosmopolitanism	3 (8.8%)	3 (8.8%)
External policy and incentives	8 (23.5%)	7 (20.6%)
III. Inner setting		
No facilitators or barriers were noted for these constructs related to Structural Characteristics, Network and Communications, Culture, Tension for Change, ^a Compatibility, ^a Relative Priority, ^a Goals and Feedback, ^a Learning Climate ^a		
Organizational incentives and rewards	None identified	4 (11.8%)
Leadership engagement—readiness for implementation	5 (14.7%)	None identified
Available resources—readiness for implementation	5 (14.7%)	13 (38.24%)
Access to knowledge and information—readiness for implementation	6 (17.6%)	8 (23.5%)
IV. Characteristics of individuals		
No facilitators or barriers were noted for these constructs related to Individual Stage of Change, Individual Identification with Organization, Other Personal Attributes		
Knowledge and beliefs about the intervention	None identified	8 (23.5%)
Self-efficacy	2 (5.9%)	None identified
V. Process		
No facilitators or barriers were noted for these constructs related to Planning, Opinion Leaders, ^b Formally Appointed Internal Implementation Leaders ^b		
Champions—engaging	7 (20.6%)	6 (17.6%)
External change agents—engaging	4 (11.8%)	None identified
Executing	1 (2.94%)	5 (14.7%)
Reflecting and evaluating	6 (17.6%)	6 (17.6%)

^aSub-constructs of Implementation Climate

^bSub-constructs of Engaging

barriers or strengthening facilitators is recommended. Rather, a mix of efforts should be aimed on both sides of each specifically identified key driver to shift all or selected outcomes in the desired directions. The mix of strategies chosen must depend on local assets, opportunities, and resources that exist or could be mobilized at baseline; with time additional assets, opportunities, and resources may be leveraged or become newly available. At some “bottle necks,” the balance of innovation and resource investment might best be shifted towards removing barriers; at others, facilitation may be primary, and at yet others—a mix; and everything may change over time. Prior to the development phase of an intervention, practitioners should ensure sufficient epidemiological data and background knowledge on the target population and geographical area. Accurate epidemiological data can assist implementors to ensure sufficient coverage within areas of high demand and prevent overstocking within low-demand areas. For food-based interventions, knowledge about appropriate storage practices and inventory management is also crucial to prevent product spoiling or expiring.

Second, the picture emerging from this analysis does not support claims that any major gains are to be made by completely re-designing ongoing or new nutrition projects with some “game-changing” shift in major focus, pathways, or outcomes. Rather, it highlights that an abundance of options for improvement may be available, both through “course correction” of ongoing program delivery and rebalancing of priorities in planned programs or extensions and later phases. Indeed, at least in theory from these findings, it is possible that in any given specific programmatic context, a well-targeted, small series of process and delivery changes could presage cumulatively large and positive changes in particular performance indicators and selected outcomes.

Since adequate preparation is paramount for effective decision making towards substantive change, we suggest that implementation practitioners should consider ways to use the present framework to conduct a self-assessment of their approaches. Various stakeholders may advocate for action on particular barriers or facilitators, data may be available only for some and not others. Additionally, many options may remain hidden or latent that is yet to be highlighted for consideration or unlocked by some prior shift in process and results. It would, therefore, be beneficial for implementation practitioners to consider more variables when designing and or evaluating interventions. Thus, incorporating an implementation framework similar to the CFIR during the planning and execution process can effectively support the implementation process. Our results give support to retaining “holistic” approaches that consider all options, prioritizing some based on some transparent and agreed rubric, and always remaining flexible to adapt, and open to modifying any specific program mix.

Strengths and Limitations

This study presents several limitations that should be taken into consideration when interpreting the results. As with any review, it was limited by the search terms used, the number of databases searched, the journals included, and the time of papers published. For the database search, only text-word search was conducted. Thus, articles that did not use the particular words listed in our search string were missed, making the search less comprehensive. Second, since we limited the inclusion criteria to primary research articles, valuable information from secondary sources might have been overlooked. In addition, we extracted only results-oriented data from each eligible article; thus, other significant results might have been overlooked. During the full-text screening process, many articles were excluded that they did not describe any results-based barriers or facilitators to the implementation or scale-up process. Scoping reviews are often limited by the breadth of articles published; publication bias might limit results as studies with negative results are less likely to be published.

Also, a potential limitation was our selection of a determinant framework (CFIR) as they have been criticized for their inadequacy in addressing how change takes place (Nilsen 2015). However, the framework still served as a valuable tool for organizing and contextually understanding data (Weir et al. 2019). The CFIR assisted in triangulating information and also allowed us to conceptualize the barriers and facilitators in a more organized manner and resulted in the identification of 16 out of 39 CFIR constructs. Although only 41% of CFIR constructs were accounted for within this review, this might reflect the relatively nascent approach of incorporating implementation factors within study designs and is not attributed to any deficiency within the CFIR framework. In a study conducted by Warren et al. (2017), researchers utilized the CFIR framework to explore maternity care projects in Kenya. Similar to this current study, Warren and colleagues reported that only a few of the CFIR constructs were contextually relevant, and that many did not apply to their study (Warren et al. 2017). Despite this, researchers still concluded that CFIR served as an important “framing tool” within their research (Warren et al. 2017). Similarly, Huang et al. (2017) utilized the CFIR to examine a mental health intervention within Uganda. Researchers utilized only two of the five CFIR domains to contextualize predictors of implementation outcomes but noted that it was a valuable guiding tool for evaluation studies. There have also been scenarios where findings overlapped in terms of the coded constructs, which is a limitation suggested by Safaeinili et al. (2020) in their qualitative study. Finally, the use of the CFIR allowed the findings to be placed in

the context of the wider implementation research literature (Means et al. 2020; Kirk et al. 2015).

Conclusion

The results from this scoping study can inform the planning and design of new or ongoing evaluations, and the development of implementation strategies specifically aimed at overcoming common barriers and exploiting known facilitators. Key areas to address include (1) more supportive policy and legislation to improve government competency, (2) stronger leadership, strategic partnerships, and coordination across multiple sectors, (3) more effective resource mobilization, and (4) adapting interventions based on relevant data to ensure cultural acceptability and tailoring programs to local needs. The barriers and facilitators identified under the CIFR domains can be used to build knowledge on how to adapt large-scale nutrition interventions to national and local settings. Our findings highlight the need to evaluate factors that both prevent and also assist the implementation of large-scale nutrition interventions in Africa, in order to inform successful program development and implementation.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s43477-021-00007-2>.

Acknowledgements We would like to thank Kathryn Barrett, liaison librarian at the Department of Health and Society, for her guidance and support throughout the research process.

Author Contributions Study conception and design: OE. Analysis and interpretation of data: JG, HA, and OE. Draft of the manuscript: JG, HA, and OE. Critical revision of the manuscript for important intellectual content: JG, OE, and DS. All authors read and approved the final manuscript.

Funding No funding was received for this research project.

Compliance with Ethical Standards

Competing interests The authors declare that they have no competing interests.

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