



# Mixed-Methods Systematic Review of Behavioral Interventions in Low- and Middle-Income Countries to Increase Family Support for Maternal, Infant, and Young Child Nutrition during the First 1000 Days

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## ABSTRACT

Fathers, grandmothers, and other family members' influence on maternal, infant, and young child nutrition (MIYCN) is widely recognized, yet synthesis of the effectiveness of engaging them to improve nutrition practices during the first 1000 d is lacking. We examined the impact of behavioral interventions to engage family members in MIYCN in low- and middle-income countries through a mixed-methods systematic review. We screened 5733 abstracts and included 35 peer-reviewed articles on 25 studies (16 with quantitative and 13 with qualitative data). Most quantitative studies focused on early breastfeeding, primarily engaging fathers or, less often, grandmothers. Most found positive impacts on exclusive breastfeeding rates and family members' knowledge and support. The few quantitative studies on complementary feeding, maternal nutrition, and multiple outcomes also suggested benefits. Qualitative themes included improved nutrition behaviors, enhanced relationships, and challenges due to social norms. Interventions engaging family members can increase awareness and build support for MIYCN, but more rigorous study designs are needed. This systematic review is registered at PROSPERO as CRD42018090273, [https://www.crd.york.ac.uk/prospero/display\\_record.php?RecordID=90273](https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=90273). *Curr Dev Nutr* 2020;4:nzaa085.

**Keywords:** breastfeeding, complementary feeding, maternal nutrition, fathers, grandmothers, gender roles, social support, behavior change

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Supplemental Tables 1–3 are available from the "Supplementary data" link in the online posting of the article and from the same link in the online table of contents at <https://academic.oup.com/cdn/>.

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Abbreviations used: EBF, exclusive breastfeeding; JBI, Joanna Briggs Institute; LMIC, low- and middle-income country; MIYCN, maternal, infant, and young child nutrition; PMTCT, prevention of mother-to-child transmission; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; RCT, randomized controlled trial.

## Introduction

Adequate nutrition during pregnancy through the first 2 y of life, or the first 1000 d, is critical for children's short- and long-term health, growth, and development and for the health and well-being of women. Effective nutrition-specific interventions to improve health and development include promotion of micronutrient supplementation and appropriate weight gain during pregnancy, early initiation of breastfeeding, exclusive breastfeeding (EBF) for 6 mo, and adequate, appropriate, safe, and responsive complementary feeding (1, 2). Maternal, infant, and young child nutrition (MIYCN) practices are impacted by individual, interpersonal, community, and environmental factors (3). Most nutrition interventions require caregiver action at the household level, often sustained behavioral change, and are dependent upon material and psychosocial resources (4, 5). In contexts where women's lives are characterized by heavy workloads, constrained autonomy, and limited access to resources, household-level support for recommended nutrition prac-

tices may be essential. Fathers, grandmothers, and other family members are highly influential (6) and can either promote or deter the adoption of recommended practices (7–9).

In recognition of family members' influence, there have been calls to engage them in nutrition interventions rather than focus interventions only on mothers (10–16). Engaging family members in MIYCN is also included in broader global frameworks for nurturing care and nutrition (17, 18). Further, social support has been associated with optimal MIYCN practices in low- and middle-income country (LMIC) settings (6, 19–21). However, there is limited evidence in the peer-reviewed literature of the impact of interventions engaging family members to support MIYCN practices in LMICs. Such evidence is needed to guide program decisions on the value of investments to broaden interventions in ways that will reach additional family members.

Previous systematic reviews have examined the effectiveness of engaging either fathers or grandmothers to improve specific nutrition be-

haviors, but have not considered family support for nutrition throughout the first 1000 d. Reviews on engaging fathers have typically focused on early and exclusive breastfeeding (22–26) or included breastfeeding outcomes in reviews related to reproductive, maternal, and child health (27–30) or the prevention of mother-to-child transmission (PMTCT) of HIV (31–33). Reviews have also looked at engaging grandmothers in MIYCN broadly (6), breastfeeding (34), and infant feeding and development (35). In general, these reviews suggest that engaging fathers and grandmothers can improve breastfeeding and other nutrition practices. However, the findings are mixed and each review focused on a subset of possible family influencers and specific nutrition behaviors.

We lack a summary of the effectiveness of a broader range of interventions that engage family members in supporting MIYCN throughout the first 1000 d. While most reviews have examined interventions to support mothers during the EBF period, mothers also need support during pregnancy and after the EBF period, especially in settings where limited resources constrain maternal nutrition and complementary feeding practices. In addition, there is considerable heterogeneity in family and household structures and relationships and it may not be appropriate to limit intervention efforts to only fathers or grandmothers. Concerns about unintended consequences of engaging family members, particularly male partners, have also been raised and warrant further examination (26).

We conducted a mixed-methods systematic review of behavioral interventions that engage any family member to support nutrition, with the aim of informing the design and implementation of MIYCN programs in LMICs. Mixed-methods reviews include quantitative, qualitative, and mixed-methods studies (36); allow a broad examination of available evidence (37–39); can examine the effect and appropriateness of interventions; and identify research gaps (36). The aims of this mixed-methods systematic review were as follows:

- Describe quantitative results of studies comparing MIYCN interventions with and without family member engagement, including impacts on knowledge, attitudes, and practices related to nutrition or family support for nutrition, and
- Summarize qualitative themes describing the experiences of mothers and family members who participated in interventions to increase family support for MIYCN.

## Methods

### Protocol and registration

This mixed-methods systematic literature review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (40) for study selection, data collection, data analysis, and result reporting, and was registered with PROSPERO ID# CRD42018090273. We used a segregated approach such that quantitative and qualitative data were analyzed independently following the Joanna Briggs Institute's (JBI's) methodology (41).

### Inclusion and exclusion criteria

Studies were evaluated for eligibility based on inclusion and exclusion criteria structured according to the PICO-S (Population, Intervention, Comparison, Outcomes, Study design) format.

#### Population.

Participants were pregnant and lactating women, mothers with children <2 y of age, and/or their family members in LMICs. Studies were included in this review if conducted in a country that met the World Bank 2017 definition of either a low- or middle-income economy (<https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups>).

#### Intervention.

Studies were included if they contained a behavioral intervention that sought to engage fathers, grandmothers, or other family members to support MIYCN. The term “grandmothers” includes female elder relatives deemed influential in maternal and child health in different cultures (6). MIYCN behaviors included maternal nutrition (dietary intake or micronutrient supplementation during pregnancy or lactation) or infant and young child feeding (breastfeeding, complementary feeding, or micronutrient supplementation). Complementary feeding is a complex set of behaviors including the timely introduction of foods at 6 mo in addition to breast milk; adequate amount, frequency, diversity, and consistency of foods to meet age-specific nutrient needs; the safe and hygienic preparation of foods; and responsive feeding (42). Interventions addressing  $\geq 1$  aspects of complementary feeding were included.

#### Comparison.

Quantitative studies were included if they provided direct comparisons of intervention arms that did and did not engage family members to support improved MIYCN. All qualitative studies that evaluated an intervention to engage family members were included.

#### Outcomes.

Outcomes evaluating knowledge, attitudes, support, or practices related to maternal nutrition or feeding of infants and young children 0–24 mo of age were included, as were growth outcomes. In order to conduct as comprehensive a review as possible, studies were included if they reported  $\geq 1$  of these outcomes. Many studies reported a variety of outcomes and all relevant nutrition and support outcomes were extracted.

#### Study designs.

Quantitative studies that were randomized controlled trials (RCTs) or quasi-experimental studies with arms that compared engaging family members with not engaging them were included. Studies that compared intervention arms engaging family members to standard of care that focused only on mothers were deemed as fitting inclusion criteria when the experimental intervention added family engagement without substantially changing the standard-of-care activities for mothers. Qualitative studies were included if they reported on participants' experience with an intervention to increase family engagement in MIYCN.

No date limits were placed on the search. Studies were excluded if they did not meet the inclusion criteria, were not peer reviewed, fo-

cused on populations affected by severe illness or disability, or if the full-text article could not be accessed in English. Protocol and review articles were excluded; however, the references were reviewed as part of the search strategy.

### Literature search strategy

Five databases were searched: PubMed, Scopus, Web of Science, Global Health, and CINAHL on 16 March, 2020. The search strategy in **Box 1** was used for Scopus and adapted as necessary to correspond to database formatting for searches performed in the other databases. We also conducted citation chaining, manually screening reference lists of relevant systematic reviews and all articles included in the review.

### Study selection

The review process was managed in Covidence Online Software (<https://www.covidence.org>). The first 200 abstracts in the search results were independently screened by 4 authors (KLD, EG, SLM, JKM), who then discussed each abstract in relation to inclusion criteria to reach unanimous agreement and ensure a consistent approach to study selection decisions. The remaining abstracts were reviewed independently by 2 review authors (EG, JKM). All conflicts were resolved through discussion with KLD and SLM to reach consensus on inclusion. The selected full-text articles were each independently assessed on inclusion and exclusion criteria by 2 reviewers (EG, JKM), with discussions with KLD and SLM to resolve any disagreements.

### Data extraction

All authors participated in data extraction and at least 2 review authors independently extracted information from each quantitative, qualitative, and mixed-methods paper that met inclusion criteria, including details on study objective, population, intervention, outcomes or key themes, results, and conclusions. The data-extraction process was managed in a Qualtrics database to facilitate independent and consistent reporting across reviewers. Data from multiple papers describing the same study were grouped to avoid reporting results more than once. Completed data-extraction forms were reviewed by a third study team member to ensure consistency, accuracy, and completeness. Included studies were sorted into the following categories based on the nutrition focus and, in some cases, family member targeted: 1) multiple nutrition outcomes across the first 1000 d, 2) maternal nutrition, 3) breastfeeding interventions involving fathers or 4) grandmothers or 5) fathers and/or grandmothers or other family members, and 6) complementary feeding.

### Quality assessment and risk of bias

We assessed the quality of quantitative studies by adapting the JBI critical appraisal checklist for RCTs and the JBI checklist for quasi-experimental studies as appropriate (43). Nonrelevant domains on the checklist were not included. For example, it was not possible for participants to be blinded to the arm to which they were assigned, and breastfeeding could not be measured before the intervention as the interventions often began in pregnancy. The RCT assessment included the following domains: randomization, allocation to treatment groups, blinding of assessors, baseline differences, unit of analysis, outcome measurement, and use of appropriate statistical analysis (including whether or not adjustments had been made for potential confounders). The

## BOX 1

### Scopus search strategy

TITLE-ABS-KEY (Breastfe\* OR "complementary feeding" OR "breast feed" OR "breast feeding" OR "breast fed" OR wean\* OR "complementary food" OR "complementary foods" OR "infant feeding" OR "infant and young child feeding" OR "maternal nutrition" OR "nutrition during pregnancy" OR "nutrition in pregnancy" OR "child feeding" OR "child nutrition" OR "infant nutrition" OR "micronutrient supplement" OR "micronutrient supplements" OR "micronutrient supplementation" OR "nutrient supplement" OR "nutrient supplements" OR "nutrient supplementation")  
 AND TITLE-ABS-KEY ("Family member" OR "family members" OR familial OR grandmother\* OR father\* OR parental OR "family support" OR spouse\* OR parent\* OR "social support" OR "male involvement" OR husband\* OR partner OR grandparent\* OR gender OR elder\* OR grandfather\* OR "older women" OR relatives)  
 AND TITLE-ABS-KEY (program\* OR intervention\* OR project\* OR "health education" OR "nutrition education" OR engage\* OR "behavior change" OR "behaviour change" OR "behavioral change" OR "behavioural change" OR implement\* OR counsel\*)  
 AND TITLE-ABS-KEY ("Developing country" OR "Developing countries" OR "low-income countries" OR "low-income country" OR "middle-income country" OR "middle-income countries" OR "low- and middle-income country" OR "low- and middle-income countries" OR afghan\* OR Albania\* OR Algeria\* OR "American Samoa\*" OR angola\* OR Armenia\* OR Azerbaijan\* OR bangladesh OR belarus OR byelarus OR belorussia OR belize\* OR benin\* OR Bhutan\* OR Bolivia\* OR bosnia\* OR Botswan\* OR brazil\* OR Bulgaria\* OR burm\* OR "Burkina Faso" OR Burundi\* OR "Cabo Verde\*" OR "Cape verde\*" OR Cambodia\* OR Cameroon\* OR "Central African Republic" OR chad\* OR china OR Chinese OR Colombia\* OR comoros OR comores OR comoro OR congo OR "Costa Rica\*" OR "Côte d'Ivoire" OR "Ivory Coast" OR cuba\* OR Djibouti\* OR dominica\* OR "Dominican Republic" OR ecuador OR Egypt\* OR "El Salvador\*" OR Eritrea\* OR Ethiopia\* OR fiji OR gabon\* OR gambia\* OR gaza OR Georgia\* OR Ghana\* OR grenada\* OR grenadines OR Guatemala\* OR guinea\* OR guyana OR haiti OR herzegovina OR herzegovina OR hondura\* OR india\* OR Indonesia\* OR iran\* OR Iraq\* OR Jamaica\* OR Jordan\* OR Kazakhstan\* OR Kenya\* OR Kiribati\* OR korea\* OR kosov\* OR kyrgyz OR kirghizia OR kirghiz OR kirgizstan OR kyrgyzstan OR "Lao PDR" OR laos OR lebanon OR lesotho OR Liberia\* OR Libya\* OR Macedonia\* OR madagascar OR Malawi\* OR malay OR malaya OR Malaysia\* OR maldives OR mali OR "Marshall Islands" OR Mauritania\* OR mauritius OR mexic\* OR Micronesia\* OR moldova\* OR Mongolia\* OR montenegr\* OR morocc\* OR mozambique OR myanmar OR Namibia\* OR nepal OR nicaragua OR niger\* OR Nigeria\* OR Pakistan\* OR palau OR panama\* OR "Papua New Guinea" OR paraguay OR peru\* OR philippines OR philippines OR philipines OR philippines OR principe OR romania OR Rwanda\* OR ruanda OR samoa\* OR "Sao Tome" OR Senegal\* OR Serbia\* OR "Sierra Leone" OR "Solomon Islands" OR somalia OR "South Africa\*" OR "South Sudan\*" OR "Sri Lanka\*" OR "St Lucia" OR "St Vincent" OR sudan\* OR surinam OR suriname OR swaziland OR Syria\* OR "Syrian Arab Republic" OR tajikistan OR tadjikistan OR tadjikistan OR tadjik OR Tanzania\* OR thai\* OR timor OR togo OR tonga OR tunisia OR turkey OR Turkmen\* OR tuvalu OR Uganda\* OR ukraine\* OR uzbek OR uzbekistan OR vanuatu OR Vietnam\* OR West Bank OR yemen OR Zambia\* OR Zimbabwe)

quasi-experimental studies checklist included clear cause and effect, comparison groups, follow-up, outcome measurement, and in a similar manner to the RCT studies, the use of appropriate statistical analysis (including adjustment for potential confounders) (**Supplemental Tables 1–3**).

Each study was assessed independently by 2 researchers (DA, DF) and any discrepancies were resolved through discussions with a third researcher (SLM). We assigned 1 point for each criterion in the checklist to determine a quality score. We did not exclude any studies based on the results of the scoring; however, 1 study was excluded because the outcome measure was unclear.

We assessed the quality of all included qualitative studies using an adapted version of the Critical Appraisal Skills Program (CASP) Qualitative Checklist (44), adding 2 items from the JBI qualitative appraisal checklist (45). The checklist assessed study design, participant recruitment and data collection, ethics, the role of the researcher, data analysis, and the presentation of the results (Supplemental Tables 1–3). Similar to the quantitative appraisal, each study was assessed independently by at least 2 researchers (JKM, DF), with another researcher (SLM) deciding any discrepancies.

### Synthesis of results

Results of data extraction were output into a spreadsheet and summarized in tables and narrative form. Quantitative studies were summarized in terms of the focus and type of intervention, family members included, and quantitative and qualitative outcomes reported. Intervention arms were categorized by family member and labeled as follows: intervention arms that reached mothers and other family members, either together or separately, are referred to as mother–father interventions or mother–grandmother interventions. Some studies included arms that we refer to as fathers-only or grandmothers-only interventions because the activities were delivered primarily to this family member rather than including mothers. Comparison arms were usually mother-only interventions or standard or care that was essentially a mother-only arm, as explained above in the inclusion criteria.

Due to the varied nature of included qualitative studies, we conducted a narrative synthesis of all included studies, identifying key themes across studies (45). Themes were identified through qualitative content analysis using Atlas.ti (version 8.4; Scientific Software Development GmbH). Using an inductive approach, documents were coded for key themes relevant to the aims of this review. Codes were then grouped into 2 categories: experiences with intervention and recommendations for programs.

## Results

The PRISMA diagram (**Figure 1**) details the flow of papers identified in the search, and the steps in screening and review that led to final selection and inclusion. Data extraction was completed on 35 papers from 25 studies. Characteristics of these quantitative ( $n = 12$ ), qualitative ( $n = 9$ ), and mixed-methods studies ( $n = 4$ ) are summarized in **Table 1**, including country, study design, population, intervention characteristics (activities, dose, duration), and key intervention topics.

### Quality assessment

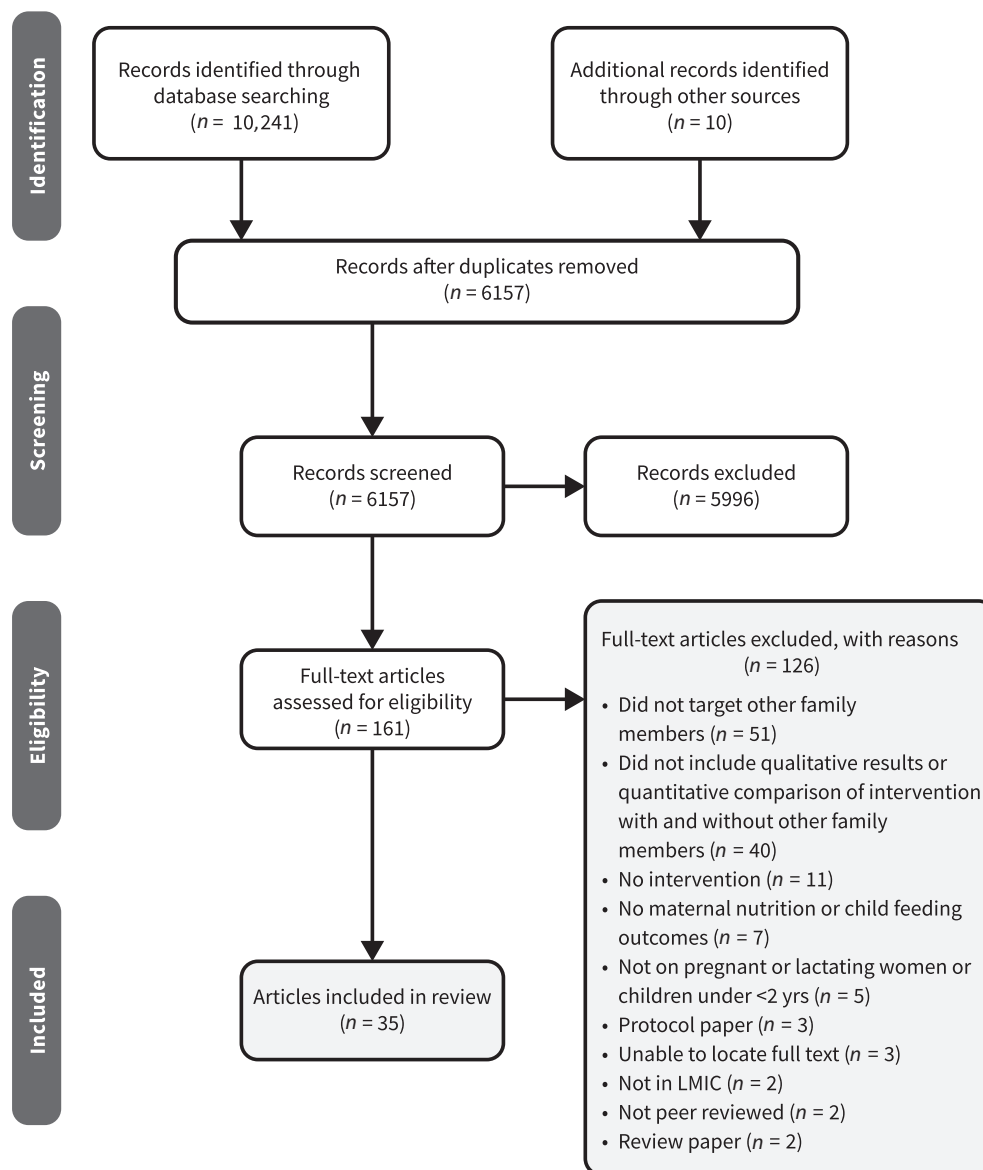
Quality assessments of randomized, quasi-experimental, and qualitative designs are shown in Supplemental Tables 1–3, respectively. Among the 5 randomized studies, 4 reported that treatment groups were treated identically other than the intervention of interest, 4 analyzed participants in the groups to which they were randomized, 4 used reliable measures, 4 measured outcomes in the same way for treatment groups, and 3 used appropriate statistical analysis. Of the 12 quasi-experimental designs, 6 reported that participants in the intervention and comparison groups were similar, 8 reported that participants received similar treatment/care other than the intervention of interest, all 12 studies measured outcomes in the same way regardless of treatment group, 9 used reliable measures, and 8 used appropriate statistical analysis. Among the 15 qualitative studies, all clearly stated the research objectives; all used an appropriate research design, recruitment strategy, and data collection methods; 9 reported sufficiently rigorous analysis; 9 adequately represented participants' voices; and all clearly stated their findings. Only 2 adequately considered the relationship between the researcher and participants.

### Quantitative results

The search identified 16 studies designed to compare quantitative outcomes of intervention arms that did and did not involve other family members: 13 focused on breastfeeding (9 engaged fathers, 2 engaged grandmothers, and 2 included fathers, grandmothers, and/or other family members); 1 study addressed complementary feeding; 1 focused on maternal nutrition (antenatal micronutrient supplementation), and 1 included multiple nutrition outcomes throughout the first 1000 d. Results are described within each category, below, and summarized in **Table 2**. Due to the breadth of this review, the outcomes reported across studies varied widely. Nutrition outcomes, including nutrition knowledge and attitudes of mothers, nutrition practices, and any indicators of nutritional status are presented in the third column of **Table 2**. The fourth column summarizes psychosocial and support outcomes, including support family members reported providing or mothers perceived receiving, awareness of need for supportive roles, and bonding. The knowledge and attitudes of other family members were included in this column because the usual rationale authors cited for targeting these was as a step toward improving support and countering potential negative influences of misinformed family members.

#### *Multiple nutrition outcomes across the first 1000 d.*

One study addressed multiple nutrition outcomes, comparing an intervention to engage grandmothers with a mothers-only nutrition education program. In Senegal, Aubel et al. (46) evaluated participatory communication and empowerment education to encourage grandmothers to support recommended MIYCN practices including increased food intake during pregnancy, early initiation of breastfeeding, EBF, and enriched porridge for complementary feeding. The grandmother strategy was incorporated into an ongoing community-based nutrition program. Aubel et al. (46) compared 1) grandmothers' advice before and after the strategy was introduced in intervention villages and 2) mothers' practices after the strategy was implemented in intervention villages. Grandmothers' advice about MIYCN improved across all vari-



**FIGURE 1** PRISMA flow diagram of systematic search, screening, and selection of qualitative and quantitative papers on family engagement in maternal, infant, and child nutrition interventions. LMIC, low- and middle-income country; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

ables, and mothers in the intervention villages reported higher rates of recommended MIYCN practices; however, no statistical analysis was reported.

#### **Maternal nutrition.**

One study compared an intervention to engage fathers in maternal nutrition with a mothers-only intervention. Nguyen et al. (47) conducted a cluster-randomized nonblinded impact evaluation study of a nutrition-focused maternal, neonatal, and child health program engaging fathers to support women to adopt optimal nutrition practices in Bangladesh. The intervention included interpersonal counseling, husband forums, community mobilization, free micronutrient supplements, and weight-

gain monitoring targeted to expectant mothers and fathers. Adjusting for socioeconomic variables (household socioeconomic status and husbands' and wives' education), which were different at endline, the authors observed that mothers in the intervention arm consumed more micronutrient supplements (iron-folic acid and calcium) and more food groups compared with mothers in the comparison group. Path analysis showed that fathers' behavioral determinants (i.e., maternal nutrition knowledge, self-efficacy, and perceived social norms) were associated with increased support, and each 1-point increase in fathers' support (on a scale of 1–10) was associated with increasing maternal consumption by 3.6 iron-folic acid tablets, 3.8 calcium tablets, and 0.04 food groups (47).

**TABLE 1** Description of quantitative and qualitative studies identified in review<sup>1</sup>

First author, year, country (ref)	Study population, n			Intervention characteristics			
	Methods/study design	Women	Fathers/partners	Grandmothers	Other family or whole family	Description: activities, dose, duration, implementation length	Key topics
Interventions for multiple nutrition outcomes across the first 1000 d Aubel, 2004; Senegal (46)	Quasi-experimental: 2 arms Qualitative: FGDs	first 1000 d 200 (WRA) Not specified	n/a n/a	134 pre-test; 150 post-test n/a	n/a n/a	Grandmothers/elders received 4 nutrition education sessions with songs, stories, discussions; follow-up to reinforce nutrition topics by community leaders, CHWs, and grandmother leaders; in both intervention and control villages, WRA participated in nutrition education activities addressing the same nutritional practices as covered in grandmother sessions. Implemented over 9 mo. Families reached separately.	Nutritional practices related to pregnancy (e.g., decreased work and improved diet) and infant feeding (e.g., BF and CF)
Bezner Kerr, 2019; Malawi (48)	Qualitative: in-depth interviews, FGDs	n/a n/a	n/a n/a	n/a n/a	90 29	Households received training on agro-ecological principles and were asked to select any intervention to test; participated in participatory agriculture monthly discussions and community-based dialogue. Implemented over a 4-y period. Families reached together.	Farming practices, food security, and dietary diversity social inequalities (gender and health status)
DeLorme, 2018; Kenya <sup>2</sup> (49)	Qualitative: FGDs	28 total: mothers and grandmothers	7	n/a	n/a	Social network groups participated in 6 curriculum sessions over 12 wk. Each session was 2–3 h facilitated by CHWs trained the week before leading the session; aimed to engage social support networks, including fathers, grandparents, and other community members, and strengthen relationships with CHWs. Families reached together.	Knowledge of IYCF practices, social support (CF, dietary diversity), family planning, safe pregnancy, BF support, food security, barriers to food access

(Continued)

TABLE 1 (Continued)

First author, year; country (ref)	Study population, n				Intervention characteristics	
	Women	Fathers/partners	Grandmothers	Other or whole family	Description: activities, dose, duration, implementation length	Key topics
Flax, 2019; Malawi (50)	9	7	n/a	n/a	Feasibility and acceptability study: Community-based intervention for HIV-positive women incorporated into Village Savings and Loans Association meetings; 15 sessions total (7 BF and 8 CF) held during regular weekly Village Savings and Loans Assoc meetings; fathers invited to 4 out of the 15; sessions are 20–25 min. Implemented 6 mo (June–December 2015). Couples reached together at the sessions the fathers attended.	Nutritional practices related to infant feeding (early initiation of BF, EBF, breastfeeding on demand, continued BF until 2 y, frequency and quantity of food 6–11 mo, 12 and beyond) food hygiene and feeding during illness, preparing nutritious food
Kim, 2018; Bangladesh <sup>2</sup> (51)	90	80	81	n/a	Intensive areas received community mobilization, intensive interpersonal communication and mass media, while the less-intensive areas received standard nutrition counseling, less intensive mass media and nonintensive community mobilization; mass media was 7 television spots with 3 focused on CF. Implemented from 2011 to 2015. Families reached together.	IYCF, CF
Satzinger, 2009; Malawi <sup>2</sup> (52)	42	31	Unclear	n/a	Participants attended monthly intergenerational agriculture and nutrition discussion groups. Implemented for 1 y. Families reached both together and separately.	IYCF, sharing household resources

(Continued)

TABLE 1 (Continued)

First author, year, country (ref)	Methods/study design	Study population, n			Intervention characteristics		
		Women	Fathers/partners	Grandmothers or whole family	Description: activities, dose, duration, implementation length	Key topics	
Maternal nutrition interventions Martin, 2017, 2018; Kenya <sup>2</sup> (53, 54)	Qualitative: in-depth interviews	32	13	7	Pregnant women counseled during antenatal care to identify and ask for adherence support from an "adherence partner" and received poster to encourage other family members to provide support. Implemented for 9 mo. Couples reached separately (women reached directly, adherence partners reached through women).	Micronutrient supplement adherence, family support	
Nguyen, 2018; Bangladesh (47)	Path analysis of cluster-randomized impact evaluation; cross-sectional household survey at baseline and endline; 2 arms	2000	1307	n/a	Mothers and fathers participated in nutrition-focused MNCH program (interpersonal counseling, husband forums, community mobilization, free micronutrient supplements, weight-gain monitoring). Implemented as part of Alive and Thrive Study. Couples reached together (counseling and community events) and separately (husband forum).	Diet quality and quantity, taking IFA and calcium supplements, optimal weight-gain patterns, rest, engaging fathers and other family members to ensure availability and support women consuming enough varied foods and supplements	
Breastfeeding interventions involving fathers Bich, 2014, 2016, 2017; Vietnam (55–57)	Quasi-experimental: 2 arms	469	239	n/a	Fathers received monthly group counseling (one 30–45-min session/mo), home visits/individual counseling (1 antenatal home visit; 3 postnatal home visits at 1 wk, 6 wk, and 3.5 mo), mass media communication (2/wk), and fathers role enforcement community mobilization events. Fathers reached separately. Implemented 1 y.	BF initiation, EBF, maternal nutrition, father's support	

(Continued)



TABLE 1 (Continued)

First author, year, country (ref)	Study population, n			Intervention characteristics		
	Methods/study design	Women	Fathers/partners	Grandmothers or whole family	Description: activities, dose, duration, implementation length	Key topics
Bich, 2019; Rempel, 2020; Vietnam (58, 59)	Quasi-experimental: 2 arms	761	396	n/a	Fathers received monthly group counseling (one 30–45 min session/mo), home visits/individual counseling (1 antenatal home visit; 3 postnatal home visits at 1 wk, 6wk, and 3.5 mo), 5–10 min radio message played weekly, monthly fathers clubs facilitated by peer fathers, and Fathers' Contest to demonstrate fathers' learning to community. Fathers reached separately. Implemented 1 y, 4 mo.	BF initiation, EBF, maternal nutrition, fathers support
Jones, 2018; South Africa (60)	Cluster-randomized trial: 2 arms	1368 (836 assessed for EBF)	Not specified	n/a	Mothers in intervention received 3 antenatal weekly 2-h group sessions, 1 individual or couples counseling, 2 postnatal individual or couples counseling, PMTCT education; control received standard PMTCT plus child health education (collapsed). Phase 1: PMTCT (both I and C) mother only; phase 2: fathers included (couple counseling, men's groups). Implemented for 3 y. Couples reached together and separately.	HIV transmission, testing, stigma, disclosure; intimate communication; intimate partner violence reduction; family planning; EBF with additional foods at 6 mo and until 12 mo
Matare, 2019; Tanzania (61)	Qualitative: in-depth interviews, FGDs	36	30	n/a	Mothers and fathers received individual counseling on improving EBF practice: 2 initial consecutive visits and 1 follow-up visit after 2 wk. Couples reached separately; participated for 16 d.	Feedback on existing feeding practices, BF practices, anticipated barriers and facilitators, social support
Özlüses, 2014; Turkey (62)	Quasi-experimental: 3 arms	117	Not specified	n/a	Mothers and fathers received individual counseling (20 min for both); distinct educational materials were provided for mothers and fathers. Couples reached separately. Implemented for 6 mo.	BF techniques, EBF education

(Continued)

TABLE 1 (Continued)

First author, year; country (ref)	Study population, n			Intervention characteristics			
	Methods/study design	Women	Fathers/partners	Grandmothers	Other family or whole family	Description: activities, dose, duration, implementation length	Key topics
Raeisi, 2014; Iran (63)	Quasi-experimental: 2 arms	100	100	n/a	n/a	Fathers attended a training course held 3 times from the 30th week of gestation to the end of pregnancy where they were provided educational package on promoting fathers' participation. Couples participated from 30 wk gestation to end of pregnancy. Implemented for 8.5 mo.	Father's support, BF
Sahip, 2007; Turkey (64)	Quasi-experimental; 2 arms; Qualitative: FGD	n/a	160	n/a	n/a	Couples reached separately. Fathers participated in 6 group sessions (3–4 h) for expectant fathers conducted at worksites. Fathers reached separately.	Health/nutrition during pregnancy, ANC, support of women, infant feeding practices, BF, check-ups, communication techniques, adjustment to fatherhood
Su, 2016; China (65)	Quasi-experimental: 2 arms	72	36	n/a	n/a	In intervention, couples participated in antenatal BF counseling (60–90 min); for control, only mothers participated in the counseling. Couples reached together or separately.	BF benefits, techniques, timing, problem-solving; For fathers: supportive involvement in decision-making, emotional and practical support for BF
Susin, 1999, 2008; Brazil (66, 67)	Quasi-experimental: 3 arms	547	547	n/a	n/a	Group counseling postnatal—a video discussing basic topics of BF, pamphlet, and open discussion after viewing video. Couples reached together.	EBF, BF (the WHO recommendations, prevention and management of common BF problems, and the importance of paternal participation)
Turan, 2001; Turkey (68)	Clinic-based RCT: 3 arms Qualitative: open-ended questionnaire	279	253	n/a	n/a	Couples received four 90-min group education sessions, a booklet, and telephone counseling service. Couples reached together.	Health during pregnancy, safe birth, infant care and feeding, women's health, father perceptions of support, maternal health and infant care, adjustment to fatherhood

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TABLE 1 (Continued)

First author, year; country (ref)	Study population, n				Intervention characteristics		
	Methods/study design	Women	Fathers/partners	Grandmothers	Other or whole family	Description: activities, dose, duration, implementation length	Key topics
Breastfeeding interventions involving grandmothers Bootsri, 2017; Thailand (69)	Quasi-experimental: 2 arms	84	n/a	84	n/a	Grandmothers received training in hospital at baseline (6 h, 2-d course), postnatal (1 h) and at 2 mo and 4 mo (1 h) while mothers received routine program. In control, both mothers and grandmothers received routine program in antenatal and postnatal clinic. Implemented for 10 mo. Families reached together (control group) and separately (intervention group).	General BF and benefits
DeOliveira, 2012, 2014; Nunes, 2011; Bica, 2014; Brazil (70–73)	RCT: 4 arms	323	n/a	169	n/a	Mothers and grandmothers received counseling sessions while in the hospital and at 7, 15, 30, 60, and 120 d. Families reached together. Implemented for 19 mo.	EBF/BF importance, duration, and technique; early introduction of food and liquids; CF
Breastfeeding interventions involving fathers, grandmothers, and/or other family members Anderson, 2013; South Africa <sup>a</sup> (74)	Qualitative: in-depth interviews	12	3	2	9 buddies	Mothers and buddies attended routine antenatal and postnatal clinic visits and PMTCT counseling sessions. Mothers and buddies reached together. Implemented over 6 mo.	PMTCT, EBF, formula feeding
Ke, 2018; China (75)	Quasi-experimental: 2 arms	59	Not specified	Not specified	n/a	Mothers in intervention group received 2 antenatal BF education lectures, 3 home visits in first month postnatally when father or grandmother present, and 8 calls or text messages with video/audio interactions every 2 wk from 2 to 6 mo postnatal by trained researcher; they also could discuss BF-related issues at any time via text and had access to internet and public information platforms; Mothers in the control received in-hospital care and 1 follow-up 14 d postnatal by community nurse. Families reached together.	Detailed BF messages and support at key time points

(Continued)

TABLE 1 (Continued)

First author, year; country (ref)	Study population, n			Intervention characteristics			
	Methods/study design	Women	Fathers/partners	Grandmothers	Other or whole family	Description: activities, dose, duration, implementation length	Key topics
Namale-Matovu, 2018; Uganda (76)	RCT: 3 arms	218	Not specified	Not specified	Not specified	Mothers received training and information sessions delivered at 2, 6, 10, and 14 wk, and 6 mo postnatal; sessions ranged from 30 to 45 min across intervention arms; Arm A: SOC; Arm B: peer mothers supported mothers at hospital and family members supported mother at home; Arm C: SOC enhanced with nutrition education about BF and nutritious foods. Implemented for 1 y. Families reached together.	EBF, BF; maternal nutrition; safe preparation of locally available nutritious foods
Complementary feeding interventions Dinga, 2018; Kenya (77)	FGD	8	8	n/a	n/a	Mother and father participated in 4-h group nutrition education session by trained nutritionist and received pamphlet summarizing key messages. Couples reached together.	Benefits of BF; varieties of food for children; provision of required foods; how to prepare foods; responsive feeding; father participation
Mukuria, 2016; Thuita, 2015; Martin, 2015; Kenya (19, 78, 79)	Quasi-experimental: 3 arms Qualitative: in-depth interviews	217 n/a	138 7	154 10	n/a n/a	Peer educators facilitated discussion groups 2/mo for 6 mo; 8 father discussion groups, 10 grandmother discussion groups. Families reached separately.	Maternal nutrition and rest, EBF, CF, child health, HIV and IYCF, family communication, gender roles

<sup>1</sup>ANC, antenatal care; BF, breastfeeding; C, control; CF, complementary feeding; CHW, community health worker (used to denote village health worker, community resource person, community health volunteer); EBF, exclusive breastfeeding; FGD, focus group discussion; I, intervention; IFA, iron folic acid (supplements); IYCF, infant and young child feeding; MNCH, maternal newborn and child health; n/a, not applicable; PMTCT, prevention of mother-to-child transmission; RCT, randomized controlled trial; ref, reference; SOC, standard of care; WRA, women of reproductive age.

<sup>2</sup>Study includes additional papers with quantitative results that did not meet the criteria for quantitative studies in this review.

**TABLE 2** Summary of quantitative study results of including family members in interventions (includes 16 studies from Table 1 with quantitative results assessing impact of family member involvement as compared with mothers-only intervention or standard-of-care nutrition services)<sup>1</sup>

First author, year, country; (ref)	Design: intervention (I) and control (C) arms; follow-up length; critical appraisal score	Nutrition outcomes: maternal knowledge, attitudes, nutrition practices, growth outcomes	Psychosocial and support outcomes: other family members' knowledge, attitudes, supportive practices, relationship characteristics
Interventions for multiple nutrition outcomes across the first 1000 d Aubel, 2004; Senegal (46)	QE: C: MOI (n = 100); I: MGI (n = 100) [4/8] Follow-up: 1 y Critical appraisal [4/8]	Pregnant women decrease workload: MOI: 34%, MGI: 91% Pregnant women increase food intake: MOI: 35%, MGI: 90%; BF initiation w/in 1 h: MOI: 57%, MGI: 98% EBF for 5 mo: MOI: 35%, MGI: 93% First complementary foods at 5/6 mo: MOI: 35%, MGI: 93%	Grandmothers provide special foods for pregnant women: MOI: 33%; MGI: 88%
Maternal nutrition interventions Nguyen, 2018; Bangladesh (47)	RCT: C: usual MNCH services (BRAC program) (n = 1000 women baseline, n = 1000 women endline); n = 767 baseline n = 685 endline); I: nutrition-focused MNCH that included fathers (n = 1000 women baseline, n = 1000 women endline); n = 747 fathers baseline, n = 622 endline) Follow-up: 1 y (cross-sectional) Critical appraisal [7/11]	Significant differences due to overall intensive intervention: Consumption of IFA: DID (I vs. C): 46 tablets; Calcium supplements: DID (I vs. C): 50 tablets; Food groups consumed by pregnant women: DID: 1.6 food groups Proportion of differences at endline in intakes of IFA and calcium supplements and dietary diversity explained through improved fathers' behavioral determinants (see psychosocial outcomes); Path analysis: indirect differences, obtained by adding the products of the regression coefficients for each path, suggest that for IFA consumption, 48% of the total program difference was explained by improved fathers' behavioral determinants and supportive activities. These indirect differences were 44% for calcium and 22% for dietary diversity.	Father's awareness on maternal nutrition: DID (I vs. C) = 2.74 (P < 0.001), awareness significantly associated with father support: 0.24 (P < 0.001); NS association with no. Ca, IFA, or no. food groups consumed; Father's knowledge of recommended practices: DID (I vs. C): 1.31 (P < 0.001); significantly associated with greater husband support: 0.21 (P < 0.001); significant association with no. Ca tablets consumed: 4.63 (P < 0.001); significantly associated with no. IFA tablets consumed: 4.68 (P < 0.001); significantly associated with no. food groups consumed: 0.17 (P < 0.001); Father's self-efficacy for support of wife and perception of social norms (reported by fathers): DID (I vs. C) = 1.08 (P < 0.001), significantly associated with greater husband's support: 0.79 (P < 0.001); significantly associated with no. Ca tablets consumed: 5.32 (P < 0.01); significantly associated with no. of IFA tablets consumed: 4.78 (P < 0.01); NS associated with no. of food groups consumed Father's support (reported from others): DID (I vs. C) = 1.86 (95% CI: 1.53, 2.19); significantly associated with husband's awareness, knowledge, and self-efficacy/perception of social norms (see above); significantly associated with no. of IFA tablets consumed = 3.59 (P < 0.001); significantly associated with no. of Ca tablets consumed = 3.75 (P < 0.001); significantly associated with no. of food groups consumed = 0.04 (P < 0.05)

(Continued)

TABLE 2 (Continued)

First author, year, country; (ref)	Design: intervention (I) and control (C) arms; follow-up length; critical appraisal score	Nutrition outcomes: maternal knowledge, attitudes, nutrition practices, growth outcomes	Psychosocial and support outcomes: other family members' knowledge, attitudes, supportive practices, relationship characteristics
Breastfeeding interventions involving fathers Bich, 2014, 2016, 2017; Vietnam (55-57)	QE: C: no intervention (n = 230); I: FOI mass media communication/fathers counseling (n = 239) Follow-up: 6 mo postnatal Critical appraisal [6/8]	Initiation of BF w/in 1 h: AOR = 7.64 (95% CI: 4.81-12.12) No prelacteal feeding: OR = 4.43 (95% CI: 2.88, 6.82) EBF rates at 4 mo: 24-h/1-wk recall methods: NS; since-birth recall method: I: 20.6% C: 11.3% (P < 0.01). EBF rates at 6 mo: 24-h recall method: I: 18%; C: 3.9% (P < 0.001); 1-wk recall method: I: 6.6%; C: 1.9% (P < 0.001); since-birth recall method: I: 6.7%; C: 0.9% (P < 0.001)	Father knowledge score (reported by fathers): C: 19.5; FOI: 25.8 (P < 0.001) Father attitudes score (reported by fathers): General attitude: C: 35.8; FOI: 38.7 (P < 0.001); attitude towards early initiation of breastfeeding: C: 18.2; I: 19.9 (P < 0.001); attitude towards exclusive breastfeeding (6 mo): C: 5.1; FOI: 6.4 (P < 0.001); attitude towards supporting mothers to breastfeed: C: 12.5; FOI: 12.4 (NS, P > 0.05) Father support practices in postnatal period (reported by fathers): Told mother to breastfeed regularly: AOR: 1.88 (95% CI: 1.00, 3.53; P < 0.05); told mother to breastfeed correctly: AOR: 2.48 (95% CI: 1.61, 3.83, P < 0.001); took care of mother's health: AOR: 1.91 (95% CI: 1.26, 2.90, P < 0.01); helped mother breastfeed: AOR: 2.70 (95% CI: 1.65, 4.41, P < 0.001); bought mother favorable food or fruits: AOR: 2.06 (95% CI: 1.21, 3.48, P < 0.01); did not buy/ask others to buy formula: AOR: 1.96 (95% CI: 1.30, 2.95, P < 0.001); told household of BF benefits: AOR: 2.39 (95% CI: 1.52, 3.79, P < 0.001) Father's support scores at 1 mo: Reported by fathers: Savvy: C: 2.61 (SD .62); FOI: 2.80 (SD .57) (P < 0.001); Helping: C: 2.89 (SD .51); FOI: 3.13 (SD .50) (P < 0.001); Presence: C: 2.23 (SD .84); FOI: 2.45 (SD .88) (P < 0.001); Responsiveness: C: 2.63 (SD .55); FOI: 2.92 (SD .54) (P < 0.001) Reported by mothers: Savvy: C: 2.75 (SD .65); FOI: 2.78 (SD .65) (NS); Helping: C: 2.94 (SD .59); FOI: 3.09 (SD .55) (P < 0.001); Presence: C: 2.24 (SD .81); FOI: 2.16 (SD .94) (NS); Responsiveness: C: 2.80 (SD .57); FOI: 2.90 (SD .54) (P < 0.01) Father's support scores at 4 mo: Reported by fathers: Savvy: C: 2.61 (SD .61); FOI: 2.82 (SD .53) (P < 0.001); Helping: C: 2.90 (SD .57); FOI: 2.98 (SD .51) (P < 0.05); Presence: C: 2.27 (SD .81); FOI: 2.51 (SD .72) (P < 0.001); Responsiveness: C: 2.76 (SD .53); FOI: 2.92 (SD .44) (P < 0.001) Reported by mothers: Savvy: C: 2.64 (SD .65); FOI: 2.68 (SD .66) (NS); Helping: C: 2.74 (SD .70); FOI: 2.84 (SD .61) (P < 0.05); Presence: C: 2.26 (SD .85); FOI: 2.18 (SD .88) (NS); Responsiveness: C: 2.76 (SD .61); FOI: 2.87 (SD .54) (P < 0.01)
Bich, 2019, Rempel, 2020; Vietnam (58, 59)	QE: C: no intervention (n = 368) I: FOI (n = 403) Follow-up: 9 mo postnatal Critical appraisal [6/8]	Initiation BF w/in 1 h: AOR: 1.69 (95% CI: 1.19, 2.41) EBF rates at 1 mo (since birth recall): AOR: 10.15 (95% CI: 6.06, 17.02) EBF rates at 4 mo (since birth recall): AOR: 7.46 (95% CI: 3.95, 14.11) EBF rates at 6 mo (since birth recall): Crude OR: 16.78 (95% CI: 0.96, 294.8) EBF rates at 6 mo (last-week recall): Crude OR: 35.47 (95% CI: 2.1, 594.9) EBF for 1 mo or longer: C: 6% FOI: 35% (P < 0.001) Fathers' claimed support behaviors were associated with longer EBF (Savvy, B = 0.168, t = 3.01, P = 0.003; 95% CI: 0.06, 0.28; Helping, B = 0.140, t = 2.36, P = 0.022; 95% CI: 0.02, 0.26; Presence, B = 0.084, t = 2.06, P = 0.040; 95% CI: 0.00, 0.17; Responsiveness, B = 0.159, t = 2.54, P = 0.011; 95% CI: 0.04, 0.28) Mothers' reports of father support all associated with longer EBF (Savvy, B = 0.166, t = 3.42, P = 0.001, 95% CI: 0.07, 0.26; Helping, B = 0.174, t = 3.44, P = 0.001; 95% CI: 0.08, 0.27; Presence, B = 0.118, t = 3.19, P = 0.013; 95% CI: 0.05, 0.19; Responsiveness, B = 0.251, t = 4.44, P < 0.001; 95% CI: 0.14, 0.36) Mother's experience of greater responsiveness uniquely predicted longer EBF duration (B = 0.217, t = 2.27, P = 0.023; 95% CI: 0.030, 0.40)	Father's support scores at 1 mo: Reported by fathers: Savvy: C: 2.61 (SD .62); FOI: 2.80 (SD .57) (P < 0.001); Helping: C: 2.89 (SD .51); FOI: 3.13 (SD .50) (P < 0.001); Presence: C: 2.23 (SD .84); FOI: 2.45 (SD .88) (P < 0.001); Responsiveness: C: 2.63 (SD .55); FOI: 2.92 (SD .54) (P < 0.001) Reported by mothers: Savvy: C: 2.75 (SD .65); FOI: 2.78 (SD .65) (NS); Helping: C: 2.94 (SD .59); FOI: 3.09 (SD .55) (P < 0.001); Presence: C: 2.24 (SD .81); FOI: 2.16 (SD .94) (NS); Responsiveness: C: 2.80 (SD .57); FOI: 2.90 (SD .54) (P < 0.01) Father's support scores at 4 mo: Reported by fathers: Savvy: C: 2.61 (SD .61); FOI: 2.82 (SD .53) (P < 0.001); Helping: C: 2.90 (SD .57); FOI: 2.98 (SD .51) (P < 0.05); Presence: C: 2.27 (SD .81); FOI: 2.51 (SD .72) (P < 0.001); Responsiveness: C: 2.76 (SD .53); FOI: 2.92 (SD .44) (P < 0.001) Reported by mothers: Savvy: C: 2.64 (SD .65); FOI: 2.68 (SD .66) (NS); Helping: C: 2.74 (SD .70); FOI: 2.84 (SD .61) (P < 0.05); Presence: C: 2.26 (SD .85); FOI: 2.18 (SD .88) (NS); Responsiveness: C: 2.76 (SD .61); FOI: 2.87 (SD .54) (P < 0.01)

(Continued)

TABLE 2 (Continued)

First author, year, country; (ref)	Design: intervention (I) and control (C) arms; follow-up length; critical appraisal score	Nutrition outcomes: maternal knowledge, attitudes, nutrition practices, growth outcomes	Psychosocial and support outcomes: other family members' knowledge, attitudes, supportive practices, relationship characteristics
Jones, 2018; South Africa (60)	RCT: C: MOI (n = 683) I: MFI (n = 685) Follow-up: 6 wk postnatal Critical appraisal [6/11]	EBF at 6 wk: Phase including male partners did not predict EBF in multivariate regression model: AOR: 0.924 (95% CI: 0.683, 1.248); Only depression predicted EBF. EBF at 1 and 2 wk: NS EBF at 1 mo: C: 33.3%; MOI: 82.1%; MFI: 87.2% (MFI, MOI > C; P < 0.001) EBF at 2 mo: C: 30.8%; MOI: 69.2%; MFI: 76.9% (MFI, MOI > C; P < 0.001) EBF at 4 mo: C: 25.6%; MOI: 51.3%; MFI: 69.2% (MFI, MOI > C; P = 0.001) EBF at 6 mo: C: 12.8%; MOI: 33.3%; MFI: 56.4% (MFI > MOI > C; P < 0.001) Mother's birth weight, weight at 3 mo, weight at 6 mo, rate of weight gain at 3 mo and 6 mo: NS differences: C and FOI	Male involvement index: Higher scores reported by women in phase that included men, 7.48/11 (SD 3.29) vs. 7.10 (SD 3.07), P = 0.026.  Paternal Infant Attachment Scale (PIAS) points: C: 73.3; MOI: 82.3; MFI: 89.5 (P < 0.001)
Özlüses, 2014; Turkey (62)	QE: C: no intervention (n = 39); I1: MOI (n = 39); I2: MFI (n = 39) Follow-up: 6 mo postnatal Critical appraisal [8/8]	Mother's awareness of best breastfeeding practices: C: 95.71 (SD 4.1); FOI: 103 (SD 8.8) (P < 0.0001) BF at 6 mo: C: 76%; FOI: 94% (P < 0.01) BF initiation w/in 1 h (reported by father): OR: 2.4 (95% CI: 1.2, 4.6) EBF at 3 mo (reported by father): OR: 3.4 (95% CI: 1.7, 6.8) BF at 9 mo: OR: 2.64 (95% CI: 1.36, 5.09) Baby fed supplements before 6 mo (reported by fathers): 0.19 (95% CI: 0.09, 0.37)	Father's participation, encouragement, and support: FOI "11 times more" than C Father's participation in mother's constant breastfeeding: FOI: 94%; C: 60%
Raeisi, 2014; Iran (63)	QE: C: no intervention (n = 50), FOI: fathers attending training course (n = 50) Follow-up: 6 mo postnatal Critical appraisal [5/8]	Mother's awareness of best breastfeeding practices: C: 95.71 (SD 4.1); FOI: 103 (SD 8.8) (P < 0.0001) BF at 6 mo: C: 76%; FOI: 94% (P < 0.01) BF initiation w/in 1 h (reported by father): OR: 2.4 (95% CI: 1.2, 4.6) EBF at 3 mo (reported by father): OR: 3.4 (95% CI: 1.7, 6.8) BF at 9 mo: OR: 2.64 (95% CI: 1.36, 5.09) Baby fed supplements before 6 mo (reported by fathers): 0.19 (95% CI: 0.09, 0.37)	Father's participation, encouragement, and support: FOI "11 times more" than C Father's participation in mother's constant breastfeeding: FOI: 94%; C: 60%
Sahip, 2007; Turkey (64)	QE: C: no intervention (n = 80) Follow-up: 9 mo postnatal Critical appraisal [7/8]	Mother's awareness of best breastfeeding practices: C: 95.71 (SD 4.1); FOI: 103 (SD 8.8) (P < 0.0001) BF at 6 mo: C: 76%; FOI: 94% (P < 0.01) BF initiation w/in 1 h (reported by father): OR: 2.4 (95% CI: 1.2, 4.6) EBF at 3 mo (reported by father): OR: 3.4 (95% CI: 1.7, 6.8) BF at 9 mo: OR: 2.64 (95% CI: 1.36, 5.09) Baby fed supplements before 6 mo (reported by fathers): 0.19 (95% CI: 0.09, 0.37)	Father's report of: -Accompanying wives >50% of ANC visits: OR: 3.0 (95% CI: 1.3, 6.8) -Supporting good pregnancy nutrition: OR: 9.0 (95% CI: 2.0, 40.8) -Making preparations for birth: OR: 22.8 (95% CI: 10.6, 55.6) -Joint (mother/father) decision making on infant feeding: At 3 mo: OR: 22.8 (95% CI: 6.4, 75.9); at 9 mo: OR: 26.33 (95% CI: 3.44, 201.76) -Changing nappies: At 3 mo: OR: 5.98 (95% CI: 2.92, 12.26); at 9 mo: OR: 4.53 (95% CI: 2.26, 9.06) -Dressing baby: At 9 mo: OR: 11.67 (95% CI: 5.23, 26.03) Fathers' supportive area scores (3 mo) (father report): Housework: C: 7.60; FOI: 10.90 (P = 0.000); baby care: C: 9.61; FOI: 10.68 (P = 0.000); Female support: C: 9.28; FOI: 10.75 (P = 0.097); Male self-support: C: 3.75; FOI: 3.82 (NS) Fathers' supportive area scores (9 mo) (father report): Housework: C: 7.62; FOI: 9.61 (P = 0.013); Baby care: C: 8.88; FOI: 11.45 (P = 0.000); Female support: C: 9.31; FOI: 10.69 (P = 0.097); Male self-support: C: 4.70; FOI: 3.82 (P = 0.068)

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TABLE 2 (Continued)

First author, year, country; (ref)	Design: intervention (I) and control (C) arms; follow-up length; critical appraisal score	Nutrition outcomes: maternal knowledge, attitudes, nutrition practices, growth outcomes	Psychosocial and support outcomes: other family members' knowledge, attitudes, supportive practices, relationship characteristics
Su, 2016; China (65)	QE: C: MOI (n = 36); I: MFI (n = 36) Follow-up: 6 mo postnatal Critical appraisal [6/8]	BF initiation: NS EBF at 1 mo: NS; 4 mo: MOI: 26.4%; MFI: 51.4% (P < 0.05); 6 mo: MOI: 17.6%; MFI: 40% (P < 0.05) CF at 1, 4, 6 mo: NS Formula feeding: 1 mo: MOI: 23.5%; MFI: 5.6% (P < 0.05); 4 mo: NS; 6 mo: MOI: 44.1%; MFI: 20% (P < 0.05) Mother's BF knowledge change: MOI: 14.81; MFI: 18.75 (P < 0.01) Mother's BF attitude (IIFAS) change: MOI: 5.17; MFI: 7.50 (P < 0.01) Cessation of BF (6 mo): MOI: HR: 0.64 (95% CI: 0.47–0.86); MFI: HR: 0.86 (95% CI: 0.65, 1.14) (NS) Cessation of EBF (6 mo): MOI: HR: 0.86 (95% CI: 0.70, 1.05) (NS); MFI: HR: 0.80 (95% CI: 0.65, 0.98) Mother BF knowledge score post-study: C: 14.9; MOI: 17.0; MFI: 16.9 [MOI and MFI > C (P = 0.00)] Mother BF knowledge % increase: C: 5.2%; MOI: 15.6%; MFI: 27.9% [MOI and MFI > C (P < 0.0001)] EBF: NS	Father's change in BF attitude (IIFAS score); pre-study: 59.14; post-study: 66.50 (P = 0.000) Father's change in BF knowledge (BKS score): pre-study: 61.73; post-study: 87.51 (P = 0.000)
Susin, 1999, 2008; Brazil (66, 67)	QE: C: no intervention (n = 201); I1: MOI (n = 192); I2: MFI (n = 193) Follow-up: 6 mo postnatal Critical appraisal [4/8]	Cessation of BF (6 mo): MOI: HR: 0.64 (95% CI: 0.47–0.86); MFI: HR: 0.86 (95% CI: 0.65, 1.14) (NS) Cessation of EBF (6 mo): MOI: HR: 0.86 (95% CI: 0.70, 1.05) (NS); MFI: HR: 0.80 (95% CI: 0.65, 0.98) Mother BF knowledge score post-study: C: 14.9; MOI: 17.0; MFI: 16.9 [MOI and MFI > C (P = 0.00)] Mother BF knowledge % increase: C: 5.2%; MOI: 15.6%; MFI: 27.9% [MOI and MFI > C (P < 0.0001)] EBF: NS	Father BF knowledge score: C: 12.3; MOI: 12.4; MFI: 15.2 [MFI > C and MOI (P = 0.00)] Father BF knowledge % increase: C: 19.4%; MOI: 20.6%; MFI: 58.3% [MFI > C and MOI (P < 0.0001)]
Turan, 2001; Turkey (68)	RCT: C: no intervention (n = 112) I1: MOI (n = 112) I1: MFI (n = 110) Follow-up: 4 mo postnatal Critical appraisal [6/11]	EBF: NS	Father BF knowledge: NS
Breastfeeding interventions involving grandmothers Bootsri, 2017; Thailand (69)	QE: C: no intervention (n = 42) I: GOI (n = 42) Follow-up: 6 mo postnatal Critical appraisal [8/8]	EBF at 6 mo: C: 4.8%; GOI: 28.6% (P = 0.003) EBF duration (d) (median): C: 0; GOI: 90 (P < 0.001) Mother BF knowledge score (baseline): NS; 2 mo: C: 12.76; GOI: 17.86 (P < 0.001); 6 mo: C: 12.83; GOI: 18.62 (P < 0.001) Mother BF attitude score (baseline): NS; 2 mo: C: 52.93; GOI: 58.62 (P < 0.001); 6 mo: C: 53.12; GOI: 59.52 (P < 0.001) Risk of weaning in first 12 mo: Non-co-residence: HR: 0.51 (95% CI: 0.30, 0.85); co-residence: NS (but lower in intervention group) Duration EBF (d) (median): Non-co-residence: MOI: 103 (95% CI: 82.4, 123.5); C1: 36 (95% CI: 21.5, 50.5); co-residence: MGI: 89 (95% CI: 56.8, 121.2); C2: 43 (95% CI: 29.5, 56.1)	Grandmother BF knowledge score (baseline): NS; 2 mo: C: 12.62; GOI: 16.33 (P < 0.001); 6 mo: C: 13.10; GOI: 18.05 (P < 0.001) Grandmother BF attitude score (baseline): NS; 2 mo: C: 51.21; GI: 58.88 (P < 0.001); 6 mo: C: 51.69; GOI: 58.62 (P < 0.001) Perceived social support of grandmothers (measured from mothers): C: 55.36; GOI: 43.74 (P < 0.001)
DeOliveira, 2012, 2014; Nunes, 2011; Bica, 2014; Brazil (70–73)	RCT: C1: no intervention [non-co-residence] (n = 79) C2: no intervention [co-residence with grandmother] (n = 81) I1: MOI (n = 72) I2: MGI (n = 88) Follow-up: 6 mo postnatal Critical appraisal [9/11]	EBF at 6 mo: C: 4.8%; GOI: 28.6% (P = 0.003) EBF duration (d) (median): C: 0; GOI: 90 (P < 0.001) Mother BF knowledge score (baseline): NS; 2 mo: C: 12.76; GOI: 17.86 (P < 0.001); 6 mo: C: 12.83; GOI: 18.62 (P < 0.001) Mother BF attitude score (baseline): NS; 2 mo: C: 52.93; GOI: 58.62 (P < 0.001); 6 mo: C: 53.12; GOI: 59.52 (P < 0.001) Risk of weaning in first 12 mo: Non-co-residence: HR: 0.51 (95% CI: 0.30, 0.85); co-residence: NS (but lower in intervention group) Duration EBF (d) (median): Non-co-residence: MOI: 103 (95% CI: 82.4, 123.5); C1: 36 (95% CI: 21.5, 50.5); co-residence: MGI: 89 (95% CI: 56.8, 121.2); C2: 43 (95% CI: 29.5, 56.1)	Grandmother BF knowledge score (baseline): NS; 2 mo: C: 12.62; GOI: 16.33 (P < 0.001); 6 mo: C: 13.10; GOI: 18.05 (P < 0.001) Grandmother BF attitude score (baseline): NS; 2 mo: C: 51.21; GI: 58.88 (P < 0.001); 6 mo: C: 51.69; GOI: 58.62 (P < 0.001) Perceived social support of grandmothers (measured from mothers): C: 55.36; GOI: 43.74 (P < 0.001)

(Continued)



TABLE 2 (Continued)

First author, year, country: (ref)	Design: intervention (I) and control (C) arms; follow-up length; critical appraisal score	Nutrition outcomes: maternal knowledge, attitudes, nutrition practices, growth outcomes	Psychosocial and support outcomes: other family members' knowledge, attitudes, supportive practices, relationship characteristics
Breastfeeding interventions involving fathers, grandmothers, and/or other family members Ke, 2018; China (75)	QE: C: in hospital care and 14-d postnatal follow-up; I: MFGI Follow-up: 6 mo postnatal Critical appraisal [7/8]	Abandonment of EBF in first 6 mo: Non-co-residence: HR: 0.52 (95% CI: 0.36, 0.76); co-residence: HR: 0.64 (95% CI: 0.46, 0.90) BF rates (12 mo): Non-co-residence: C1: 38%; MOI: 62% (P = 0.014); co-residence: NS Day of initiating water/tea (median): Non-co-residence: MOI: 122 (95% CI: 107.6, 136.3); C1: 78 (95% CI: 50.2, 105.8) (difference: 44 d); co-residence: MGI: 130 (95% CI: 113.4, 146.6); C2: 63 (95% CI: 47.2, 78.7) (difference: 67 d)	Father's knowledge: significantly higher in MFGI vs. C at each time point (P < 0.05) Grandmother's knowledge: significantly higher in MFGI vs. C at each time point (P < 0.05) except for 7 d postnatal (P > 0.05) Family support (reported by all participants): significantly higher means of perceived family support at 1 mo, 4 mo, and 6 mo in MFGI vs. C (P < 0.05)
Namale-Matovu, 2018; Uganda (76)	RCT: Arm A: SOC (n = 73); Arm B: enhanced family support (n = 72); Arm C: enhanced nutrition education (n = 73) Follow-up: 9 mo postnatal Critical appraisal [9/11]	EBF (first 6 mo): Compared with the control group, intervention group was more likely to exclusively breastfeed in first 6 mo: OR: 0.44 (95% CI: 0.20, 0.98) Mother's knowledge: Significantly higher in MFGI vs. C at each time point (P < 0.05) Mother's attitude (IFAS) (all time points): NS (P > 0.05)	Father's knowledge: significantly higher in MFGI vs. C at each time point (P < 0.05) Grandmother's knowledge: significantly higher in MFGI vs. C at each time point (P < 0.05) except for 7 d postnatal (P > 0.05) Family support (reported by all participants): significantly higher means of perceived family support at 1 mo, 4 mo, and 6 mo in MFGI vs. C (P < 0.05)
Complementary feeding interventions Mukuria, 2016; Kenya (19)	QE: C: no intervention (mothers: n = 76; grandmothers: n = 73; fathers: n = 63) I: MGI (mothers: n = 71; grandmother: n = 81); I2: MFI (mothers: n = 70; fathers: n = 75) Follow-up: 6 mo postnatal Critical appraisal [6/8]	EBF rates: not significantly different across arm at 6 or 9 mo: 6 mo (A, 85%; B, 84%; C, 87%; P = 0.47) and 9 mo (A, 17%; B, 18%; C, 16%; P = 0.97) follow-ups Consistency of food: MFI vs. C: OR: 2.4; P = 0.06; MGI vs. C: OR: 9.8; P = 0.001 Animal-source foods: MFI vs. C: OR: 6.1; P = 0.005; MGI vs. C: OR: 4.1; P = 0.03 Minimum meal frequency, diet diversity, and minimum acceptable diet: NS Interactions: Grandmother x social support on dietary diversity (OR: 1.19; 95% CI: 1.01, 1.40; P = 0.04) Father x support on minimum meal frequency (OR: 0.85; 95% CI: 0.73, 1.00; P = 0.045) Grandmother x support on minimum meal frequency (OR: 0.82; 95% CI: 0.70, 0.97; P = 0.02) No interaction effect on minimum acceptable diet	5+ support actions received from father or grandmothers (reported by mother): MFI vs. C: OR: 13.6; P = 0.002; MGI area vs. C: OR: 18.4; P = 0.01 Father-reported social support of mother: 5+ social support actions: MFI vs. C: OR: 46.0; P = 0.001; 5+ physical support actions: MFI vs. C: OR: 35.9; P = 0.001; 3+ material support actions: MFI vs. C: OR: 13.7; P = 0.001 Grandmother-reported social support of mother: any social support provided: OR: 2.9; P = 0.36; 5+ social support actions: OR: 1.9; P = 0.27

<sup>1</sup>ANC, antenatal care; AOR, adjusted OR; BF, breastfeeding; BKS, Breastfeeding Knowledge Scale; BRAC, an international development organization based in Bangladesh; C, control; CF, complementary feeding; CHW, community health worker (used to denote village health worker, community resource person, community health volunteer); DID, difference in difference; EBF, exclusive breastfeeding; FGD, focus group discussion; FOI, fathers-only intervention; GOI, grandmothers-only intervention; I, intervention; IFA, iron folic acid (supplements); IFAS, Iowa Infant Feeding Attitude Scale; MFGI, mother/fathers/grandmothers intervention; MFI, mothers/fathers intervention; MGI, mothers/grandmothers intervention; MNCH, maternal newborn and child health; MOI, mothers-only intervention; PMTCT, prevention of mother-to-child transmission; QE, quasi-experimental; RCT, randomized controlled trial; ref, reference; SOC, standard of care; w/in, within.

### Breastfeeding.

*Breastfeeding interventions involving fathers.* The 9 studies that quantitatively assessed interventions engaging fathers to support breastfeeding are described in Tables 1 and 2 (alphabetically by author name) and are summarized briefly below, starting with the 3 community-based and then the 6 health facility-based interventions.

Two related quasi-experimental studies were conducted of multi-channel community-based interventions for fathers in Vietnam. The first was implemented in 2010–2011 (55–57) and then adapted and tested in a second study in 2014–2015, in different districts in Vietnam (58, 59). These studies assessed similar father-focused interventions that included monthly group counseling for fathers, home visits, mass media communication, and community mobilization, in comparison to communities where mothers received standard of care. The first study found substantially increased odds of initiating breastfeeding within 1 h of birth and lower odds of prelacteal feeds (57). Odds of early initiation were also significantly higher in the second study (58). These studies reported higher rates of EBF at most time points measured; however, in the first study, Bich et al. (57) found no significant difference at 4 mo (based on 1-wk recall), despite higher EBF rates in the intervention group at 6 mo. In the follow-up study, odds of EBF were 7 to 16 times higher at 1, 4, and 6 mo. However, rates for EBF at 6 mo were very low in both intervention and comparison communities, such that a significantly higher OR reflected a rate that was only ~5% higher in the intervention group. Rates of EBF for  $\geq 1$  mo were 35% in the father-only intervention, compared with 6% in standard-of-care comparison communities.

Most knowledge, attitudes, and practices reported by fathers were significantly higher in the intervention group compared with the standard-of-care comparison group in the first study in Vietnam, with Bich et al. (57) reporting higher adjusted ORs for father-reported practices to support breastfeeding. In the second study, Rempel et al. (59) found that father-reported support practices were higher in the father-only intervention compared with the comparison group at 1 and 4 mo, and mothers' reports confirmed these increases for 2 of the 4 practices assessed. Importantly, all support variables in this study, whether reported by fathers or mothers, were significantly associated with longer EBF (59). Both studies adjusted for demographic characteristics and, in the second study, also for birth weight and type of delivery.

In the third community-based study, Sahip and Turan (64) evaluated an educational intervention in Turkey that consisted of 6 group-counseling sessions for expectant fathers conducted at worksites by male physicians, with "trained father" certificates for participants (64). They reported significantly higher rates of early initiation of breastfeeding in the intervention families, as compared with families who received standard of care. Odds of EBF at 3 mo were 3 times higher and odds of any breastfeeding at 9 mo were more than double in the intervention group compared with the comparison group. Fathers who participated in the worksite intervention reported more participation in decision making and multiple practices related to infant care, housework, and female support at 3 and 9 mo after birth. This study did not report adjustment for covariates in models but used stratified sampling to select the comparison group and found no demographic differences between groups.

The other 6 studies were facility-based interventions that included expectant fathers in antenatal and/or perinatal counseling on breast-

feeding. Counseling sessions were delivered to individuals, couples, or groups; men and women were reached together or separately; and some interventions included combinations of these approaches (Table 1).

Three interventions provided single educational sessions. In a facility-based study in Turkey, expectant mothers and fathers were reached separately with individual counseling and distinct educational materials (62). Özlüses and Çelebioglu (62) reported that EBF rates did not differ at 1 or 2 wk but were significantly higher at 1, 2, and 4 mo in both intervention arms (mother-only or mother-father) as compared with the control (no intervention). Little detail was provided on statistical analysis. While EBF rates were higher in the mother-father intervention arm than in the mother-only arm at multiple time points by ~10–15%, statistical significance between the 2 intervention groups was not clearly stated by authors. However, they reported that differences between all groups were significant at 6 mo when over half of the mother-father intervention group reported EBF, as compared with one-third of those in the mother-only arm and ~13% of the controls. Fathers scored higher on a Paternal Infant Attachment Scale in both mother-only and mother-father intervention groups relative to the control, but the authors did not state whether there were significant differences between the 2 intervention groups (62).

A quasi-experimental study assessed an intervention in China in which expectant couples attended a single small group-counseling session, as compared with counseling provided only to mothers (65). The intervention for fathers was based on a "father support" model promoting fathers' involvement in feeding decisions and emotional and instrumental support for breastfeeding. Su and Ouyang (65) found no significant differences in initiation of breastfeeding or in EBF rate at 1 mo, but infants in the fathers' intervention group were more likely to be EBF at 4 and 6 mo than in the mother-only intervention group. The authors also assessed formula feeding, finding lower rates in the mother-father intervention than in mother-only intervention at 1 and 6 mo (but not 4 mo), and no differences in rates of complementary feeding at these time points. Su and Ouyang (65) also reported significant pre-post improvements in Chinese fathers' knowledge and attitudes about breastfeeding, although difference in difference analysis was not reported. No adjustment for covariance was reported.

A study in Brazil assessed the impact of group counseling provided in maternity wards to couples, as compared with mothers-only and no-intervention control groups. Participants attended a single session that included a video, pamphlet, and discussion, with information for fathers on the importance of paternal participation (66, 67). Susin and Giugliani (67) reported that the intervention including fathers significantly decreased the risk of discontinuing EBF by 4 mo, relative to the mother-only and control arms, in models adjusted for baseline demographics that differed between groups. However, EBF rates were low and differences between groups were in the range of 5–10%. The mother-only intervention was protective against cessation of any breastfeeding at 6 mo, whereas inclusion of fathers had a negative effect on any breastfeeding at 6 mo among the subgroup of fathers with <8 y of education. Mothers' breastfeeding knowledge increased in both mother-only and mother-father arms compared with the control, and fathers' knowledge increased significantly more in the mother-father intervention compared with the mother-only or control. The quality appraisal rating for this study was relatively poor and the authors note that the intervention may not have been culturally appropriate.

The other 3 facility-based interventions offered 3 to 6 contacts. Jones et al. (60) reported on a PMTCT intervention in South Africa that provided multiple antenatal group sessions and postnatal individual or couples counseling focused on HIV transmission and testing, as well as relationship and communication issues. Some education was also provided on infant nutrition, but this was not a key focus. There were no significant differences in EBF rate at 6 wk (the only nutrition outcome assessed), but mothers reported higher male involvement in the intervention group that included counseling and education for male partners (60).

In a quasi-experimental study in Iran conducted by Raeisi et al. (63), a father-only intervention consisting of 3 antenatal training sessions promoting fathers' participation and support was compared with standard-of-care antenatal counseling for expectant mothers. Distinct educational materials on breastfeeding were provided to men and women. The rate of continued breastfeeding was higher in the intervention group at 9 mo, the only breastfeeding practice assessed. There were no significant differences in mothers' knowledge or infant weight gain. Fathers in the father-focused intervention group reported more participation and support, but statistical significance was not reported. Interpretation is limited by poor quality and reporting of statistical analysis and results.

Based on formative research findings, Turan et al. (68) designed a facility-based intervention focused on pregnancy, delivery, and infant feeding that included 4 antenatal group educational sessions for men and women together, plus a booklet and availability of telephone counseling. This was a controlled trial, randomly assigning participants to women-only or couples' groups. The paper reported no statistical analysis but stated that EBF was not significantly "more common" in the couples' intervention group. The authors noted that men's participation was very low (26% reported attending  $\geq 1$  session and only 5% attended all sessions) and even women's attendance was reduced in the couples' group. Based on these disappointing results, the researchers describe efforts to develop a community-based intervention but do not report outcomes.

In summary, results tended to be positive but often modest in magnitude and varied across studies and outcomes. Four studies reported impacts on early initiation of breastfeeding, but most did not assess this outcome. The most frequent nutrition outcome assessed was rate of EBF, most often at 6 mo, although many also compared rates at earlier time points. The majority of studies found statistically significant impacts on EBF rates at  $\geq 1$  time points, although not all. Among studies that found statistically significant impacts on EBF rate at 6 mo, the magnitude of differences ranged from  $\sim 5\%$  to  $\sim 30\%$  higher rates in the father-inclusive intervention groups compared with the mother-only group (57, 58, 62, 64–67). The statistical significance of the smaller differences in rates may reflect low prevalence of EBF until 6 mo in some contexts. Overall, results indicated significant impacts on fathers' knowledge and attitudes, and the majority of the subset of studies that assessed supportive practices also found positive results of including fathers in interventions, usually based on fathers' report of practices. One study assessed breastfeeding support practices by both mother and father report, finding confirmation on some practices, and presented analysis demonstrating associations of improved breastfeeding practices and with greater support (59).

*Breastfeeding interventions involving grandmothers.* Two studies directly compared interventions to engage grandmothers to improve breastfeeding practices. They both focused on adolescent mothers and combined hospital-based counseling and home visits. In Thailand, Bootsri and Taneepanichskul (69) used a clinic-based "Experiential Learning with Empowerment Strategies and Social Support Program" to involve grandmothers to support EBF among adolescent mothers. The intervention included training for grandmothers before birth, in the maternity ward with the mother, and at home at 2 and 4 mo postpartum. In Brazil, researchers (70–73) assessed a facility- and home-based intervention that included maternal grandmothers to promote EBF among adolescent mothers. Maternal grandmothers and adolescent mothers who cohabitated received joint counseling sessions, 1 in the hospital before discharge and 5 at home.

Both studies reported positive impacts of the grandmother intervention on breastfeeding outcomes. In their difference-in-difference analysis, Bootsri and Taneepanichskul (69) found significantly higher rates of EBF in the intervention group at 6 mo and the median EBF duration was much longer. In addition, participants in the intervention group reported significantly higher breastfeeding knowledge and attitudes, and more perceived social support (69). DeOliveira et al. (71) found that adolescent mothers who lived with maternal grandmothers and received the intervention reported significantly longer durations of EBF compared with adolescent mothers living with maternal grandmothers who did not receive the intervention. However, the intervention was most effective among adolescents who did not live with a maternal grandmother and received the intervention alone. Both studies reported adjusting their models but did not state which covariates were included.

*Breastfeeding interventions involving fathers, grandmothers, and/or other family members.* Two studies compared interventions to engage fathers and grandmothers or other family members (i.e., whoever was with or was chosen by mothers) to improve breastfeeding practices to a mothers-only intervention or standard of care. In China, Ke et al. (75) used a quasi-experimental design to evaluate a family-centered education program to promote EBF that included fathers and grandmothers. Participants in the intervention arm received 2 antenatal facility-based breastfeeding education lectures, 3 home visits during the first month postpartum when fathers and grandmothers were home, and mothers received 8 telephone calls or text messages every 2 wk from 2 to 6 mo. In adjusted models, the results show that the odds of EBF in the first 6 mo were significantly higher in the family-centered intervention arm than in the comparison. There were also significant differences in improvements in mothers' knowledge, fathers' knowledge, and perceived family support, but not in grandmothers' knowledge.

In Uganda, Namale-Matovu et al. (76) conducted a 3-arm randomized study involving HIV-positive pregnant women on antiretroviral therapy, providing education on EBF, maternal nutrition, and safe preparation of locally available nutritious foods. They compared an intervention arm including family members and peer mothers, another intervention arm with additional nutrition training and support, and a control arm with standard PMTCT services. EBF rates were not significantly different in the 2 intervention arms compared with the control arm. Models were adjusted for covariates, but no process indicators were presented.

### **Complementary feeding.**

One study to improve complementary feeding practices compared an intervention to engage fathers and grandmothers with a mothers-only comparison group. A quasi-experimental study by Mukuria and colleagues (19, 78, 79) in Kenya used separate peer-led dialogue-based groups of fathers and grandmothers to provide health and nutrition information on EBF, complementary feeding, maternal nutrition, HIV, family communication, and gender roles. They found significant positive impacts in both father and grandmother arms on practices such as the consistency of complementary food and provision of animal-sourced foods. However, there were no significant differences between intervention and comparison arms on other complementary feeding practices, such as number of meals, diet diversity, and minimum acceptable diet. At endline, mothers in the father and grandmother intervention groups had significantly higher odds than the comparison group mothers of reporting receiving  $\geq 5$  of 12 possible supportive actions related to complementary feeding. Mothers reported increases in support of 25.8 percentage points in the father intervention area and 32.7 percentage points in the grandmother intervention area. The authors also examined the interaction of intervention (i.e., father, grandmother) and social support on complementary feeding indicators and found mixed results (Table 2). Authors mentioned adjusting results for covariates but did not specify the covariates included in the models.

### **Qualitative themes.**

For the qualitative synthesis, all but 1 of the 13 studies included were conducted in sub-Saharan Africa. The interventions engaged fathers, grandmothers, and other family members and addressed maternal nutrition, breastfeeding, and complementary feeding through community- and facility-based activities. The studies used varied data collection methods, including focus group discussions, in-depth interviews, observations, and focused-ethnographic methods. Several themes emerged from this analysis, which were grouped into 2 categories: 1) changes mothers and family members attributed to participation in the intervention and 2) programmatic implications for engaging family members in MIYCN (Table 3).

Mothers, fathers, grandmothers, and other family members typically reported positive experiences, improved nutrition behaviors, and enhanced relationships. Family members described changes in nutrition knowledge and practices (48–50, 52, 68, 78, 79) and appreciated learning about MIYCN recommendations (46, 49, 50). All studies found that family members reported providing emotional, informational, or instrumental support, and several reported mothers appreciated the increased support (46, 49, 53, 54, 61). Several studies reported that mothers, fathers, and grandmothers attributed improved communication and family relationships to their participation in the intervention (46, 48, 52–54, 68, 77–79), as well as improved social norms (46, 48, 49, 52–54, 68, 77).

Through the qualitative synthesis, we identified considerations for future interventions to engage family members. Findings from almost all of the qualitative studies, which used a variety of delivery approaches, suggest that interventions to engage family members were acceptable and feasible (46, 48–53, 64, 68, 74, 77–79), particularly when designing interventions that build on existing norms and family members' roles (46, 48–53, 64, 68, 74, 77–79) or use principles of participatory facilitation (46, 48–53, 64, 68, 74, 77–79). However, some challenges around

engaging fathers were identified, such as when fathers did not participate in activities (50, 64), received negative comments from others in the community about behaviors inconsistent with traditional gender norms (64), and experienced financial constraints limiting their ability to buy recommended foods (49, 51). While most qualitative studies reviewed reported positive changes in relationships, 2 qualitative studies (53, 64) described 1 or 2 participants who reported that fathers became overbearing and pressured mothers to practice recommended behaviors. Very few studies discussed issues related to the sustainability of interventions to engage family members, but those that did acknowledged it could be difficult without continued financial, logistical, and supervisory support (49–51, 79).

## **Discussion**

This mixed-methods systematic review aimed to describe the quantitative results of studies comparing MIYCN interventions with and without family member engagement and to summarize qualitative themes relevant to understanding the experiences of women and their family members who participated in such interventions. Included quantitative studies used a variety of research methods and interventions involving family members in support of breastfeeding and, in a few studies, complementary feeding, maternal nutrition, or promoting improved behaviors related to multiple nutrition outcomes. The majority of studies reported positive impacts on at least some outcomes, including family members' knowledge, attitudes, and nutrition practices and reports of increased support provided to mothers, although the magnitude and consistency of results varied across studies. Differing outcomes and assessment methods constrained comparison of results. The qualitative synthesis found that mothers and family members attributed improved knowledge and practices to the interventions and mothers generally appreciated increased family support for MIYCN.

The number of studies initially identified by the search demonstrated a growing trend toward behavioral interventions engaging family members to support MIYCN during the first 1000 d. However, relatively few studies had research designs that compared interventions differing only in the inclusion of family members. Research designs that permit these comparisons are needed to draw causal inferences and estimate the magnitude of impact of including family members, and to identify which intervention approaches are most likely to be effective if scaled up. Qualitative studies that capture women's and family members' perceptions of support needed or provided, and their responses to intervention approaches, can help fill this gap and provide insights on how to design interventions to effectively engage family members.

### **Quantitative evidence**

As reported in previous systematic reviews of engaging fathers in breastfeeding in LMICs (22, 25), we found that most studies that assessed breastfeeding practices, such as early initiation and EBF rates, reported improvements, although impacts were not found at all time points or for all practices. There was some evidence that minimal educational interventions with fathers can impact EBF rates, warranting further study in other contexts. The small number of studies of interventions with grandmothers found significant impacts on EBF rates. This is consistent

**TABLE 3** Synthesis of qualitative study themes

Theme	Study findings
Changes reported that were attributed to the intervention Changes in maternal nutrition and infant feeding knowledge, attitudes, and practices	<ul style="list-style-type: none"> <li>● Family members reported improvements in nutrition-specific knowledge and practices (49, 50, 52, 68, 78, 79)</li> <li>● Fathers reported feeding their children (79)</li> <li>● Family members also reported changes in nutrition-sensitive practices</li> <li>● Some fathers reported growing more nutritious foods for their families (48, 49, 52), helping feed children</li> <li>● Fathers and grandmothers reported improved water, sanitation, and hygiene (WASH) behaviors (78, 79)</li> <li>● Fathers and grandmothers were open to and appreciated learning new maternal and child nutrition content (46, 49, 50)</li> <li>● Fathers and grandmothers were glad to be viewed by others in their community as influential and enjoyed the increased respect (46, 61, 79)</li> </ul>
Family members enjoyed learning nutrition information and gaining additional respect	<p>Family members reported supporting mothers to practice recommended practices (68), some noted increased support in general, others are categorized below:</p>
Increased support from family members	<p>Instrumental support:</p> <ul style="list-style-type: none"> <li>● Fathers procured food (50, 51, 53, 77, 78)</li> <li>● Grandmothers provided healthy foods (46, 53, 79)</li> <li>● Fathers (61, 78), grandmothers (46), and other family members (46), helped with chores</li> <li>● Grandmothers (78) and fathers (49) provided child care</li> </ul> <p>Emotional support:</p> <ul style="list-style-type: none"> <li>● Fathers provided emotional support for breastfeeding (61, 64, 68) and complementary feeding (77)</li> <li>● Family members provided emotional support for supplement adherence (54) and also helped women feel more confident about their infant feeding decisions (49, 64, 74)</li> </ul> <p>Informational support:</p> <ul style="list-style-type: none"> <li>● Fathers (64, 77) and other family members (74) shared information and reminded mothers about infant feeding recommendations</li> <li>● Family members reminded mothers to take micronutrient supplements (54, 79) and encouraged maternal nutrition (64)</li> </ul> <p>Most women confirmed family members' reports of increased support (49, 53, 68), but some did not (61).</p> <ul style="list-style-type: none"> <li>● Mothers appreciated the increased support they received from family members related to infant feeding (49, 61), child care (49), and maternal nutrition (53, 54)</li> <li>● Mothers also reported a new appreciation for grandmothers' roles in the family (46)</li> <li>● Mothers, fathers, and grandmothers reported improved communication, joint decision making, and strengthened family relationships (46, 51, 68, 74, 78–82)</li> <li>● Grandmothers reported improved social relationships with other grandmothers in their community (46)</li> <li>● Family members supported mothers to resist pressure for suboptimal practices from other family members (64, 74)</li> <li>● The combined effects of the direct intervention impact on targeted family members and indirect impact on other family and community members contributed to evidence of positive changes in community nutrition norms (46, 49, 52)</li> </ul>
Mothers appreciated the support	
Improved relationships and communication	
Changes in the household/community norms	

(Continued)

TABLE 3 (Continued)

Theme	Study findings
Programmatic considerations	
Design interventions that build on existing norms and roles	<ul style="list-style-type: none"> <li>• Interventions and activities were consistent with family members' roles and built on existing norms and knowledge (46, 48, 52, 53, 78)</li> </ul>
Inclusion of family members in nutrition programming is feasible and acceptable	<ul style="list-style-type: none"> <li>• Multiple delivery approaches were feasible and acceptable to engage family members: facility-based interventions (53, 54, 68, 74), household visits (61) and community groups (46, 48–50, 52, 68, 78, 79), mass media (51), workplace programs (64)</li> </ul>
Delivery and facilitation techniques may be important	<ul style="list-style-type: none"> <li>• Family members reported valuing facilitation techniques that encouraged open dialogue and respect (48, 52, 78, 79)</li> </ul>
Challenges specific to engaging fathers	<ul style="list-style-type: none"> <li>• Some fathers viewed nutrition/health programs as “women’s business” or felt uncomfortable attending groups that were mostly women, limiting participation (50, 64)</li> <li>• Some fathers reported being ridiculed by other men in the community (61, 64), although it did not prevent their participation</li> </ul>
Inclusion of fathers not always positive	<ul style="list-style-type: none"> <li>• A few mothers reported that fathers used new information to dominate decision-making and pressure women to adopt behaviors and focus on infant health sometimes at the expense of women’s own health (53, 64)</li> </ul>
Challenges to sustainability	<ul style="list-style-type: none"> <li>• Sustaining participation in community groups can be a challenge after a study ends (49, 79); incorporating income-generating activities was recommended (79)</li> </ul>

with findings from other reviews suggesting that grandmothers can be engaged to improve infant feeding practices (6, 34).

Most studies reported positive impacts on breastfeeding and other nutrition knowledge and relevant attitudes of fathers, grandmothers, and other family members—necessary but not sufficient steps toward increased family support. Impacts on psychosocial and support variables tended to be positive when assessed by surveying or interviewing the family member but more variable results were found when assessed in terms of mothers' perceptions of support actually received. A contribution of this review is our effort to summarize evidence on a wide range of such outcomes, which represent intermediate steps in the process of changing behaviors. While increased knowledge does not necessarily translate into improved practices, there was substantial evidence that, at a minimum, engaging family members leads to greater awareness of recommended practices, and often to supportive attitudes and behaviors that could plausibly increase support for mothers' efforts to adopt improved practices.

The plausibility of reported impacts of interventions in quasi-experimental studies is strengthened by analysis showing that maternal reports of support received were associated with longer EBF (59) or improved complementary feeding (19). Similarly, Nguyen et al. (47) demonstrated plausibility of impacts on maternal intake of micronutrient supplements through path analysis examining links from program exposure to men's knowledge, attitudes, and self-efficacy, to support behaviors, to outcome. While many studies evaluated both practice outcomes and support or knowledge outcomes, very few carried out analyses assessing these interrelationships. Measurement of potential mediators is important for future studies that seek to examine how engaging family members influences MIYCN practices. Reviews of breastfeeding self-efficacy scales (80) and breastfeeding knowledge, attitudes, and social support scales have identified potential measures (83), and examples of context-specific EBF measures have been developed for use in LMIC settings (84, 85).

Studies with comparative designs permitting assessment of the impact of engaging fathers or grandmothers to support maternal nutrition, complementary feeding, or multiple nutrition outcomes all found positive impacts on relevant practices, as well as on knowledge or awareness. Engagement of fathers and grandmothers improved some but not all measures of complementary feeding in Kenya (19), fathers' support for and practices related to maternal diet and micronutrient supplementation in Bangladesh (47), and a community-based participatory intervention with Senegalese grandmothers improved advice and reported practices related to maternal diet and several aspects of infant and child feeding (46). Despite these positive results, the number of studies examining maternal nutrition, complementary feeding, or multiple nutrition outcomes was quite limited, and more comparative studies are needed to confirm these findings.

While a few studies reported limited participation among fathers (50, 68), a lack of data on the extent to which fathers, grandmothers, or other family members were actually reached and chose to participate in an intervention precludes assessment of how coverage of the intervention may have influenced impact. Similarly, fidelity and quality of implementation were not reported in most studies, so implementation, and how it affected the outcomes, could not be assessed. Few studies assessed family members' views on participating, the perceived benefits of doing so, or the acceptability of delivery approaches and comprehen-

sion of behavior-change messages. Future intervention research could benefit from collecting and reporting process data.

Variation in evaluation designs and outcome measures limits comparison of effectiveness across studies, which would inform decisions on scaling up the most promising approaches. Intervention designs ranged from relatively simple short-term hospital-based antenatal breastfeeding counseling to multichannel approaches tailored to specific family members. Given how costly and time-consuming it is to implement complex interventions, particularly at a meaningful scale, adding multiple research arms beyond a nonintervention or standard-of-care comparison group is challenging. But stronger causal research designs are needed to guide decisions about the value of additional investment in family engagement. The most cost-effective strategy may be to engage families early and devise interventions that build social norms related to gender and family roles that enable and sustain supportive practices that enhance multiple MIYCN outcomes across multiple life stages.

### Qualitative evidence

In the qualitative synthesis, most mothers and family members attributed improvements in nutrition-specific and nutrition-sensitive knowledge and practices to the interventions. Fathers and grandmothers reported providing informational, emotional, and instrumental support for MIYCN, which mothers generally confirmed. For example, a study in Kenya found that grandmothers' roles related to caregiving and providing complementary foods could be built upon to ensure that child feeding practices were consistent with recommendations. Similarly, encouraging fathers to purchase or provide funds for nutrient-rich foods for complementary feeding was consistent with their role as a "provider" (19).

Several of the reviewed qualitative studies that engaged fathers, grandmothers, or other family members reported additional benefits of improvements in interpersonal relationships, communications, and decision making. Improved relationships have far-reaching benefits for women, children, and families (46, 86). A few of the studies in this review included gender transformative intervention components or content that addressed inequitable gender norms and promoted women's empowerment (19, 48, 52). However, a small number of women from 2 studies also reported that fathers' involvement in MIYCN was controlling or negative rather than supportive, as has occasionally been reported elsewhere (87). While this experience was uncommon, it is important to consider potential unintended negative consequences of bringing powerful family members into the arena of MIYCN (26). If not carefully designed, implemented, and monitored, interventions could lead to increased dominance of men in areas where women traditionally have influence and decision-making power. Turan et al. (68) attempted to monitor this and did not find ill effects. Most intervention studies did not acknowledge this possibility, leaving risk of inadequate attention to prevent such problems. Future research should specifically ask women about any negative aspects of engaging family members, report these findings, and consider women's perspectives in intervention design. Further, if relationship quality and dynamics are not assessed, it is also difficult to document positive changes in gender relationships (28). While most mothers and family members were happy about increased engagement, traditional gender norms could still be difficult to overcome when designing interventions.

Asking mothers and family members where, how, and when they want to be involved is critical to designing interventions (68, 86). Two studies reported that ensuring participation among fathers was a challenge (50, 68). In a study that sought to involve men in infant feeding in Malawi, men's participation was limited because they did not feel comfortable participating in groups that were predominantly women (50). While those who did attend were positive about the intervention, this clearly limited impact. Low participation among fathers was also a challenge in a study in Turkey (68). Others have identified that efforts to engage men can be limited if facility-based services are not "male friendly" (88), and alternative strategies will be needed to engage men in community- and facility-based programs.

### Quality appraisal

We did not exclude studies based on critical appraisal ratings of quality (Supplemental Tables 1–3) because we sought to comprehensively examine relevant interventions across the first 1000 d. Limiting inclusion based on strict quality guidelines has restricted the scope of previous reviews, given that well-designed studies tend to focus on narrow interventions of short duration or target only 1 type of family member (22, 24, 25). When quality limited our ability to assess and integrate findings, we reported shortcomings in study design and analysis that should influence interpretation of findings.

Although there were notable exceptions, weak research designs and implementation reduced the strength of the overall evidence. Studies comparing similar interventions with and without other family members often lacked randomization or used sequential rather than concurrent intervention and comparison groups, and not all analyses accounted for self-selection, incomplete follow-up, or potential confounders. The analysis reported in quasi-experimental studies often did not include fully adjusted models, which may overstate the impact of engaging family members. Most studies did not address the risk of social desirability bias when presenting their results. Few studies demonstrated plausibility of impact by analyzing process variables such as "dose" or level of participation, fidelity and quality of intervention delivery, or the relationship of intermediate outcomes such as knowledge and attitudes to behavioral outcomes. The studies were not designed or adequately powered to investigate subgroup differences (e.g., rural-urban areas, sociodemographic factors). Investigating variable impact should be considered in future research and limits the external validity of some studies reviewed here.

### Recommendations for future research to strengthen the evidence base

This review highlights the need for more rigorous designs with comparable interventions and careful assessment of quantitative outcomes through pretested methods that minimize social desirability and recall biases. It is important to collect data from all family members involved in the intervention (e.g., mothers, fathers, grandmothers), triangulate responses from mothers and other sources, and understand the perspectives and practices of other family members.

Future research should explore interventions to achieve psychosocial and behavioral outcomes (e.g., infant bonding, family relationships) that are meaningful for other family members and could sustain their motivation to provide support. Implementation research methods and measurement of intermediate outcomes such as social support would

also strengthen the evidence by providing information on how change happens, among whom, and why or why not. Several studies measured social support specific to the nutrition behaviors promoted through their interventions [i.e., breastfeeding (56, 64, 68, 75, 81, 82), complementary feeding (19), and maternal nutrition (47)].

Conducting qualitative research as part of future intervention studies will be useful for examining the acceptability of engaging family members. With a few exceptions (19, 46, 68), most quantitative studies did not examine how family members felt about being included or how mothers feel about family members' participation. However, several qualitative studies (Table 3) explored participants' experiences with interventions both from mothers and family members' perspectives, which can help inform intervention design.

None of the studies included cost-effectiveness and cost-benefit analyses. Such data could gauge not only if it is beneficial to target other family members but how the magnitude of the marginal impact compares to the investment or the impact of other aspects of an intervention.

This review identified several gaps in the literature. Most of the interventions in the review were nutrition specific and delivered through the health sector. Exceptions include 2 studies from Malawi, which described interventions to engage family members through multisectoral nutrition activities. One described a participatory, integrated agriculture and nutrition project that included gender dynamics (48, 52) and another describes integrating nutrition content into Village Savings and Loan Associations (50). As governments, donors, and nongovernmental organizations prioritize multisectoral nutrition activities, future research should examine the impact of engaging family members in multisectoral nutrition programs. Studies from Alive & Thrive were the only ones to examine the impact of implementing nutrition programs at scale (51, 47). While social norms (89), such as gender roles and the influence of elders, may be important barriers or facilitators for improving MIYCN practices (18), few studies implemented norms-shifting approaches. Another gap identified in this review is the lack of research about the comparative advantage of engaging different types and combinations of family members. Some studies encouraged women to select the family member to engage (53, 54, 74), since women are best positioned to know who is likely to provide support.

Overall, our review generally found positive outcomes across multiple approaches, countries, nutrition topics, and types of participants. This, combined with theoretical and empirical evidence of the influence of family members, suggests developing strategies to increase family support for improved nutrition practices has the potential to improve some MIYCN outcomes and improve relationships. It is important to consider the context when designing future research studies, ideally conducting formative research on relevant social norms and sources of social support (90, 91). While the influence of fathers, grandmothers, and other family members on MIYCN practices appears to be universal, household structures and family and gender dynamics vary considerably within households and communities.

### Strengths and limitations of this review

A strength of this review is the breadth of the search in terms of designs, quality, participants, and nutrition as well as support outcomes, allowing a holistic examination of the benefits of engaging family members throughout the first 1000 d. The studies summarized

here demonstrate the wide range of direct approaches for engaging other family members and the potential benefits of doing so. However, the quality of evidence varies widely and inclusion of studies with multiple outcomes and research designs made it difficult to summarize results succinctly and draw conclusions across contexts and approaches.

Despite the shortcomings of many studies, this review also found examples of strong designs and quantitative strategies for measuring support, valuable insights from qualitative investigations, and innovative intervention approaches. Engaging family members in interventions adds complexity and creates challenges for evaluation of effectiveness, so it is understandable that some research does not succeed in providing definitive evidence on effectiveness with and without this engagement. However, the influence of fathers and grandmothers is not in doubt (6, 7, 92, 93). Rather, there is a lack of research evidence on how best to garner their support and assess the impacts on nutrition practices. This review highlights the need for strong interventions and appropriate research designs to learn from those efforts and guide program decisions, and provides a summary of innovations and progress made toward this goal.

### Conclusions

This mixed-methods review of research on behavioral interventions that engage fathers, grandmothers, and other family members to support MIYCN found quantitative and qualitative evidence of positive impacts on nutrition practices, as well as on family members' knowledge and awareness of recommended practices and provision of support to mothers. Variable outcome measures limit synthesis across studies and lack of rigorous designs often constrained interpretation of causal relationships. However, the plausibility of an important role of family support in enhancing mothers' capacity to adopt recommended practices was strengthened by qualitative evidence and by the few studies analyzing relationships between support variables and nutrition practices (19, 47, 59).

The weight of evidence favors inclusion of family members in interventions, with attention to building family support in ways that fit each cultural context. More rigorously designed and implemented research would strengthen interpretation and inform development of effective, sustainable interventions. A notable gap was a lack of research on interventions focused on maternal nutrition and complementary feeding, both key periods in the first 1000 d. There is a need to move beyond early breastfeeding behaviors to promote family support for other nutrition practices, as well to include nutrition-sensitive interventions, gender-transformative approaches, and measurement of process indicators to assess implementation and explore impact pathways. The feasibility and sustainability of such interventions will be strengthened by upstream structural changes to improve the status of women and their access to education, resources, and economic opportunity, and by shifting social norms towards greater equity in gender and family dynamics.

Engagement of family members is a growing trend in nutrition interventions, but there is more to be learned about intervention design and implementation to effectively reach family members, challenge harmful norms or restrictions, and promote supportive behaviors that contribute to better nutrition for women and children.



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