

Qualitative systematic reviews of complementary feeding recommendations' impact on preferences, equity and rights, resource implications, acceptability, and feasibility.

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LIST OF ABBREVIATIONS

BCC	Behavior Change Communication
BFCI	Baby Friendly Community Initiative
CF	Complementary Feeding
DD	Dietary diversity
DDS	Dietary Diversity Score
FMNP	Fortified Micronutrient Products
IYCF	Infant and Young Child Feeding
MAD	Minimum Acceptable Diet
MC	Milk Consumption
MDD	Minimum Dietary Diversity
MMF	Minimum Meal frequency
RF	Responsive Feeding
SBCC	Social and Behaviour Change Communication
UFB	Unhealthy Foods and Beverages
WHO	World Health Organization

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CONFLICT OF INTEREST

The authors are faculty (RAA, NAFA) of the Department of Biochemistry and Biotechnology, College of Science, KNUST, and Ph.D. candidates (LNEA, OAB, MWK). The authors have no conflict of interest to declare concerning this review.

ABSTRACT

With the need to understand the impact of WHO Complementary Feeding (CF) recommendations for infants and children 6-23 months, this qualitative systematic review sought to answer five questions regarding CF recommendations on the consumption of Unhealthy Foods and Beverages (UFB), Responsive Feeding (RF), Milk Consumption (MC), Fortified Micro-Nutrient Products (FMNP), and Dietary Diversity (DD) among children 6-23 months, namely:

1. Do caregivers of children 6-23 months have particular values and preferences impacted by these recommendations?
2. What are the resource implications and considerations for these guidelines?
3. What are the barriers and enablers to the acceptability of these guidelines?
4. How do equity/right to food and the environment influence adherence to these guidelines?
5. How feasible are these recommendations?

Two additional questions answered for UFB, one for FMNP, and three for DD, respectively, were:

1. How often are unhealthy foods and beverages used as treats to show love or have fun?
2. Do children have innate taste preferences for salty or sweet foods and beverages?
3. What are the cost implications of the use of FMNP compared to unfortified 'natural' foods?
4. How has dietary diversity been defined in both counselling interventions and population-based indicators?
5. What evidence exists that more diverse diets lead to improved health outcomes?
6. What is the relative cost of different elements of a diverse complementary feeding diet, particularly fruits and vegetables and animal-source foods?

Using keywords, we searched for relevant studies with predefined criteria published from 2000 to March 2021 from the following databases: PubMed, AgeCon, Mintel, New York Library, Agricola, ClinicalTrials.gov, Cochrane, WHO Global Library, Business Source Premier, ScienceDirect, Google Scholar, Research4life - Hinari, and PH partners. We also searched grey literature sources and references of identified studies. Studies on any of the five recommendations should assess any of the impacts to be selected for review.

The review found limited studies with low confidence answering the barriers and enablers to acceptability and preference of UFB guidelines. We found no papers answering feasibility, resource implications, whether 6-23 months old children have innate taste preferences for UFB, use of UFB as treats to show love or fun, and equity/right to food impact of UFB guidelines. For RF, the review found papers that answered with moderate confidence acceptability barriers and enablers, papers with low confidence answering preference, feasibility, and resource implications, and no study on equity and right to food impact. For MC recommendations, limited studies with low confidence were found on barriers and enablers, but no studies answered preference, resource implications, and feasibility of MC recommendations. Our review findings on barriers and enablers of acceptability of FMNP were of moderate confidence, while limited studies with low confidence on cost-benefit, feasibility, and resource implications were found. Review findings on barriers and enablers for acceptability, and health impacts were strong and of high confidence for DD, but limited studies on resource implications were found, while no studies answered feasibility, preference, and equity/right impact on DD guidelines.

Overall, we found the barriers and enablers to the acceptability of WHO's Dietary Diversity recommendations to be over-researched. On the other hand, the acceptability of the other recommendations is seldom assessed. However, for all the five CF recommendations reviewed, more studies should be commissioned to assess how preference and values, feasibility, resource implications, and equity/right to food impact the recommendations. Studies are also needed to assess innate taste preferences for UFB and the use of UFB as treats to show love or fun among children 6-23 months of age.

1. INTRODUCTION

1.1 Rationale

Adequate complementary feeding is essential to ensure optimum growth of the child from six months onwards. The complementary feeding period is critical in every child's life as it is a growth spurt period. It is the period in which most stunting cases occur for most countries (1, 2). Dietary recommendations among children and complementary feeding practices are intended to promote healthy dietary practices linked to optimal health and wellbeing throughout the life cycle (3). Appropriate complementary feeding practices are required to provide the nutrient deficits of breastmilk among children six months and older for whom breastmilk alone is inadequate. As with other dietary guidelines, the World Health Organization Complementary feeding recommendations are geared towards halting and reducing the rate of nutrition-related morbidities resulting from inadequate or excess dietary intakes (4). Non-adherence to these feeding recommendations is linked to poor growth outcomes and development among children, stunting, underweight, obesity, and poor cognition and mortality (5-7). Currently, 45% of child mortality is related to malnutrition (WHO, 2020). Several epidemiological studies have assessed the impact of complementary feeding recommendations on several growth indicators, cognition, and health outcomes. They have mostly found that adhering to the recommendations is beneficial for the growth and development of children (8-10). For instance, in a systematic review, Panjwani and Heidkamp (11) synthesized evidence to indicate that complementary feeding-related interventions that revolve around WHO's recommendations ranging from education to supplementation significantly impact linear and ponderal growth. Dietary and consumption patterns during childhood strongly associate with health profile and morbidity across all ages (12).

Complementary feeding recommendations are established on global evidence generated from primary and secondary data. Several nutrition programmes targeted at children measure the level of achievement against the specific indicators within the recommendations. These indicators include timeliness, safety, adequacy, and proper feeding. They also serve as guidelines against which global nutritional targets are measured and how countries monitor their nutrition achievements, progress, and gaps, and how donor agencies assess the success of their funded programs.

The current young child and complementary feeding recommendations were published by the World Health Organization and have been used for more than a decade (13). Children's food environment, dietary patterns, morbidity and mortality indicators, and societal dynamics have evolved over the years. This necessitates the review and update of current feeding recommendations among children (14).

Updating recommendations requires synthesizing existing research evidence concerning the impact of existing recommendations on growth outcomes, morbidity and mortality indicators, and other aspects of human life such as values and preferences, equity and rights, resource and cost implications, acceptability, and feasibility. These additional indicators impact long-term adherence to the recommendations, human dignity, and overall quality of life. In South Asia, a region with one of the highest prevalence of child malnutrition, barriers to adherence to the current recommendations relating to the unavailability of affordable foods to meet specific indicators have been cited (15). Thus, synthesizing evidence around these factors can aid stakeholders in revising the current complementary feeding recommendations such that they could easily be adhered to by the majority of the global population. This systematic review sought to evaluate the values and preferences, equity and rights, resource implications, acceptability, and feasibility of infants and young children complementary feeding recommendations' covering unhealthy foods and beverages, responsive feeding, milk consumption, fortified micronutrient products, and dietary diversity.

1.2 Review objectives

The qualitative systematic review answers five questions regarding complementary feeding recommendations for the 1. consumption of unhealthy foods and beverages, 2. responsive feeding, 3. milk consumption, 4. fortified micronutrient products, and 5. dietary diversity among children 6-23 months.

The five review questions are as follows:

1. Do caregivers of children 6-23 months have particular values and preferences impacted by recommendations on unhealthy foods and beverages, responsive feeding, dietary diversity, milk consumption, and fortified micronutrient products?
2. What are the resource implications and considerations for guidelines on unhealthy foods and beverages, responsive feeding, dietary diversity, milk consumption, and fortified micronutrient products?
3. What is the acceptability level for guidelines on unhealthy foods and beverages, responsive feeding, dietary diversity, milk consumption, and fortified micronutrient products?
4. What are the impacts of the recommendations on unhealthy foods and beverages, responsive feeding, dietary diversity, milk consumption, and fortified micronutrient products on equity/right to food and the environment?
5. How feasible are recommendations on unhealthy foods and beverages, responsive-feeding, dietary diversity, milk consumption, and fortified micronutrient products?

In addition to the five questions, the review on unhealthy foods and beverages has two additional questions, which are:

6. How often are unhealthy foods and beverages used as treats to show love or have fun?
7. Do children have innate taste preferences for salty or sweet foods and beverages?

In addition to the five key questions, the review on the consumption of micronutrient nutrient products has one extra question, which is:

8. What are the cost implications of the use of these products compared to unfortified 'natural' foods?

In addition to the five key questions, the review on DD has three extra questions, which are:

9. How has dietary diversity been defined in both counselling interventions and population-based indicators?
10. What evidence exists that more diverse diets lead to improved health outcomes?
11. What is the relative cost of different elements of a diverse complementary feeding diet, particularly fruits and vegetables and animal-source foods?

2.0 Methods

2.1 Protocol registration

The title for this review and the review protocol are recorded in the Campbell Library as Project 27.

2.2 Eligibility criteria

For this review, the exposures were WHO recommendations on five areas: unhealthy foods and beverages, responsive feeding, milk consumption, fortified micronutrient products, and dietary diversity. The impacts were any of the five aspects: preference and values, resource implications, barriers or opportunities for acceptability, equity or right to food, and feasibility. We searched for studies for each exposure separately, meaning we did five searches. However, selected studies must have assessed any of the impacts of the exposure. We did not limit the study selection by study design but did not include reviews and reports. The studies were limited to those conducted among children 6-23 months, as that is the age range that these recommendations apply. We also limited the search to studies reported in the English language. Extra impact questions that pertained to unhealthy foods and beverages, fortified micronutrient products, and dietary diversity were searched for those exposures only.

2.3 Information sources

2.3.1 Electronic searches

The following electronic databases with date limitations in parentheses were searched to identify relevant studies:

1. PubMed (2000 – March 2021)
2. AgeCon (2000-March, 2021)
3. Mintel
4. New York Library
5. Agricola (2000 – Mar 2021)
6. ClinicalTrials.gov (2000 – Mar 2021)
7. Cochrane (2000 – Mar 2021)
8. WHO Global Library (2000 – Mar 2021)
9. Business Source Premier (2000 – Mar 2021)
10. ScienceDirect (2000- Mar 2021)
11. Google Scholar (2000-Mar, 2021)
12. Research4life -Hinari (2000-Mar, 2021)
13. PH partners (2000-Mar, 2021)

2.3.2 Other sources

In addition to the databases, we searched references of selected papers. We also requested for colleagues to lead us to any articles which may have been missed in the database and reference list searches.

2.4 Search strategy

We used a combination of keywords and subject headings to identify studies for the review. We searched the impact questions (five questions, three additional for DD, and one additional milk consumption) using different keywords and combined them using the OR term. We then restricted the output by date, age group, and non-reviews. We did the keyword search for the exposures using terms that were relevant for each exposure. As an example, we used responsive feeding keywords, like stop feeding, put a child to sleep, “punishing” children, “forced” feeding, feed favourite food, feed patiently, and feed slowly. We then combined each exposure search output with the impact search output using the AND term. We restricted the studies to those published from 2000 till the date each search was conducted. This was to allow papers that go back enough to find relevant papers published before WHO’s recommendations on appropriate complementary feeding and forward enough to identify more current studies. Appendix 1 provides the search terms, keywords, and search process.

2.5 Study selection

The search results from the databases for each exposure were exported to MS Excel and combined. The resultant number of papers was sorted alphabetically to identify and remove the duplicates. The five Excel sheets based on the five exposure outputs were reviewed to remove irrelevant titles and abstracts. One reviewer then reviewed the full text for studies that were found possible for inclusion for each exposure. The reasons for full-text exclusions were noted in a column created at the end of each Excel sheet. Each reviewer had her own Excel workbook to keep the review process blinded. A second reviewer reviewed all the full text studies on milk consumption and unhealthy foods and beverages. This was done because the first reviewer found very few studies in these two categories. For the other three exposures, a second reviewer only randomly selected some of the full-text papers that were rejected and reviewed them to ensure their rejection was correct. The review group also discussed papers that a reviewer brought up that were not clear for inclusion for the group to decide.

2.6 Data collection process

One reviewer extracted data into standardized tables. Another reviewer reviewed the tables. The tables were provided to collect data on each impact separately for each exposure. The data extracted include general study characteristics (design, location/setting, recruitment strategy), participant characteristics (sample size, age, inclusion/exclusion criteria), and findings regarding the particular impact for each exposure. Since the review team was together for data extraction, discussions were held where issues around which impact question findings fitted came up. Since the impact questions were all qualitative and sometimes not clear cut, these discussions enabled agreements by the group and ensured that included papers were well placed. The GRADE CERQual approach was used to assess the risk for each study.

2.7 Quality assessment of review studies

The GRADE CERQual approach was used to assess the quality of the included studies. The aim was to transparently assess and describe how much confidence to place in the findings from the studies selected for each impact question for the five recommendations. To do this, we assessed each article by four CERQual qualities; methodological limitations, the relevance of the data, coherence, and adequacy of data.

Methodological limitations were assessed using 6 of the ten questions that form the Critical Appraisal Skills Programme (CASP) used to assess qualitative research. The reviewers agreed that papers that met more than four of the six questions criteria be rated no to very low/minor methodological limitations, those that met 3-4 rated low methodological concerns, those that met two be rated moderate, while those that met no to one criterion were rated as having serious methodological concerns. We assessed coherence by determining the fit between data from the primary studies and the review findings. We assessed the level of oversimplification of data or overstressing the explanation or implication from the primary data to meet the review questions. Relevance, by the CERQual, criteria was assessed by examining the extent to which the body of data from the primary studies supporting the review findings/questions applied to the context: perspective and population, review themes, and setting. We assessed adequacy by determining the degree of richness and quantity of data supporting the review findings from the primary studies. Each study was assessed and rated as very minor, minor, moderate, or serious methodological, relevance, coherence, and adequacy concerns.

The overall confidence in the evidence for each impact question on the five complementary feeding recommendations was defined as the extent to which our review finding for each impact question on each recommendation (exposure) is a reasonable representation of the question asked. We graded the level of confidence as high, moderate, low, or very low by bringing together the assessment of all the studies answering each impact question on the five CF reviews. The definitions for the confidence levels according to the CERQual are shown in Table 1.

Table 1: CERQual definition for quality assessment of papers.

Level	Definition
High confidence	The review finding is likely a reasonable representation of the phenomenon of interest.
Moderate confidence	The review finding is likely a reasonable representation of the phenomenon of interest.
Low confidence	It is possible that the review finding is a reasonable representation of the phenomenon of interest.
Very low confidence	It is not clear whether the review finding is a reasonable representation of the phenomenon of interest.

PART 1-RESEARCH QUESTION 1: IMPACT OF UNHEALTHY FOODS AND BEVERAGES RECOMMENDATIONS

3.0 Results

3.1 Study selection

We identified a total of 8029 studies using the keyword search terms in the databases. Five additional papers were obtained from the WHO systematic review committee. Of these, 718 were removed because they were duplicates, while 7142 were deleted because titles were not appropriate. Of the 174 appropriately-titled papers for which abstracts were reviewed, a hundred and thirty-seven (137) were rejected because the samples used were outside the age range of interest. The full texts of the remaining 37 papers were reviewed. Thirty-three (33) of these were rejected because they were either outside the age range of interest, did not report on unhealthy foods and/or their impact on any of the outcomes, or reported on the exposures but not concerning unhealthy foods. Finally, five (1 study identified from another review category) full-text articles that met the inclusion criteria on acceptability and barriers and impact on preferences in relation to unhealthy foods were reported. **Figure 1** shows the Prisma flow diagram of the screening, eligibility evaluation, and study selection process. **Appendix 7.1** shows the full description of full-texts that were reviewed for this category.

3.2 Study characteristics

Four of the five studies reported on acceptability and barriers, while 3 of the 5 papers reported on preference. None of the studies reported on feasibility, resource implications, or impact on the right to food. One of the studies was conducted in the United States of America, and one each was conducted in South Africa, Brazil, and Nepal. One of the studies was a multi-country study conducted in Cambodia, Nepal, Senegal, and Tanzania. All five studies collected primary data, and the sample sizes of the studies ranged between 62 and 14326 children. One of the studies sampled conveniently; two used random sampling, and another used multistage random sampling. All the studies were cross-sectional and specified the inclusion and exclusion criteria for the study.

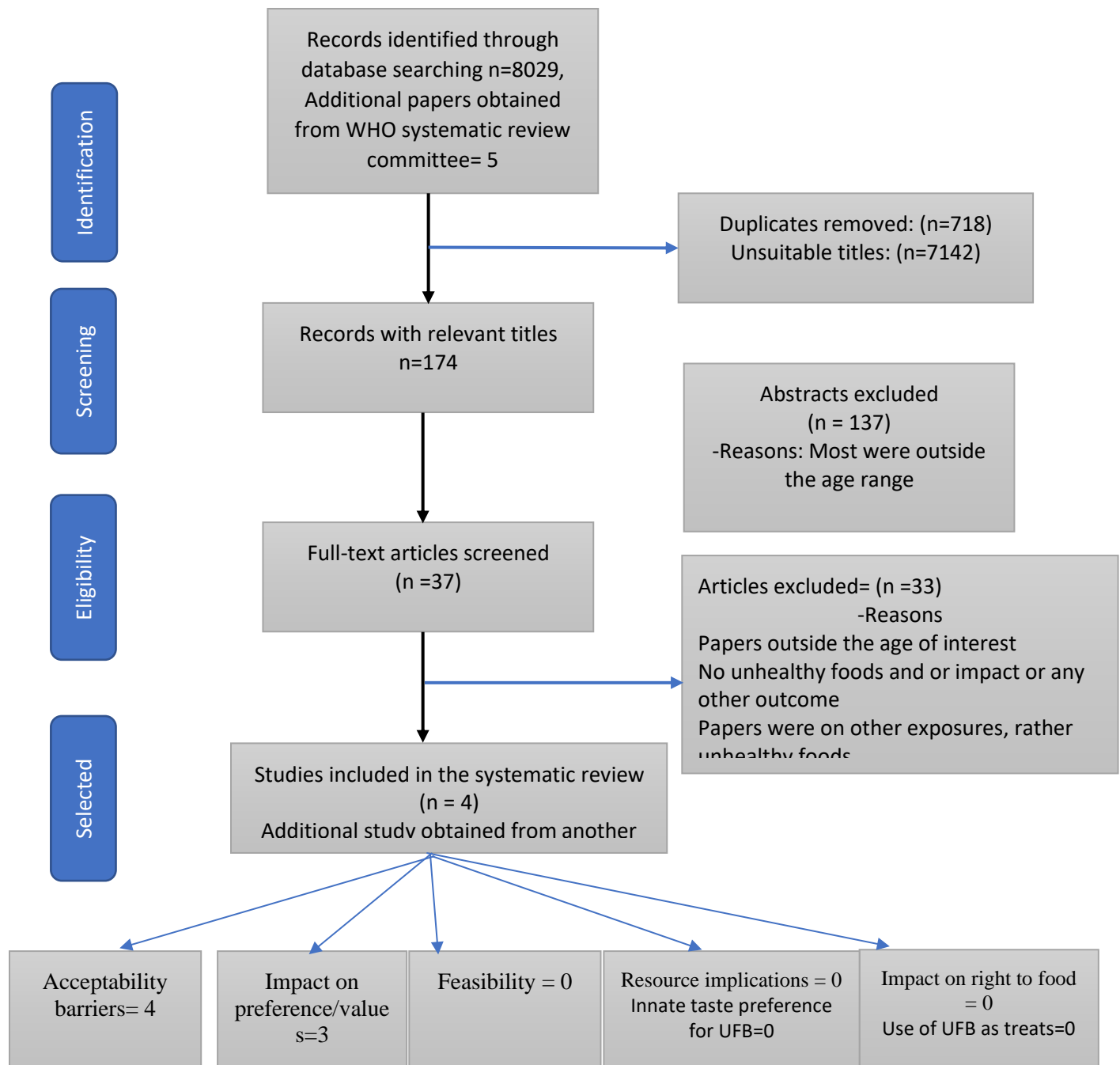


Figure 1 Study selection process for unhealthy foods and beverages

3.3 Results synthesis

Appendix 2 presents the SOFT for unhealthy foods and beverages studies reviewed.

3.3.2 Acceptability of Unhealthy foods

The prevalence of consumption of unhealthy foods, beverages, and snacks ranged between 9.6% to as high as 71.5% (1-3). In a study conducted among American children, Cartagena, McGrath, & Linares (2018) specifically reported that by ten months of age, about 50 % of the children had been introduced to sugar-sweetened beverages, high fat, and sugar snacks. The factors associated with the acceptability and use of unhealthy foods included maternal level of education and knowledge, maternal work status, wealth status, affordability, parity, and television exposure during feeding (1-4). All the papers reporting on maternal education and wealth status indicated that low maternal education and low socioeconomic status were positively associated with consuming unhealthy foods. Still, Among American children, mealtime television exposure positively correlated with the consumption of fruit drinks ($r= 0.550$, $p<0.001$), sugar beverages, and snacks ($r=0.480$, $p<0.005$) (Cartagena, McGrath, & Linares, 2018). An inverse relationship was generally observed between maternal education and consumption of unhealthy foods, although the effect sizes were generally not strong or were null. For instance, Passanha, Benício & Venâncio, (2021) reported that among Brazillian children, low maternal education was associated with increased odds of consumption of ultra-processed foods. Additionally, in a multi-country study in Cambodia, Nepal, Senegal, and Cambodia, it was observed that the daily expenditure on ultra-processed foods was small, between 0.003 and 0.09 dollars. However, mothers mentioned the affordability of ultra-processed foods as one of the reasons for feeding them to their children (4).

3.3.3 Values and Preferences

Among mothers from Tanzania, Cambodia, Nepal, and Senegal, a sizable number fed ultra-processed food to their children because of the high preference of children to these foods and was mentioned as the primary reason for feeding unhealthy foods to children. The percentage of mothers reporting preference of children as reasons for feeding unhealthy foods ranged from 45.8% to 88.3% across the four countries. Preference for unhealthy foods was also mentioned as a reason why caregivers in a South African study gave unhealthy foods to their infants (5). Many of these caregivers giving their babies 'junk' foods, including crisps, sweets and lollipops, biscuits and juice, and other sugar-sweetened fizzy drinks as a snack, believed that all children liked and needed small amounts of these foods. Mothers also reported that children demanded and cried for unhealthy foods and their products (3). In Nepal, poorer mothers were more likely to choose unhealthy foods for their children (4).

3.4 Quality of reviewed studies on unhealthy foods and beverages recommendations

Table 2 presents the GRADE CERQual findings for the unhealthy foods and beverages studies reviewed.

3.4.1 Quality of acceptability of unhealthy foods and beverages reviewed papers

The four studies that assessed the acceptability of unhealthy foods and beverages recommendations had minor methodological concerns as most of them met the CASP criteria. The studies had very minor coherence limitations as all four studies reported data that directly answered the review questions on barriers

to the acceptability of unhealthy foods and beverages recommendations. Likewise, the studies were all relevant to the context, population, and phenomenon of interest. The studies were graded to have minor adequacy concerns because 3 of the four studies had rich large data, and one was a multinational study. Overall, the four studies answering acceptability of unhealthy foods and beverages recommendations were graded low confidence based on the CERQual criteria. The grading was based on the fact that these studies did not span the different regions and did not provide a good global picture on this question of the acceptability of unhealthy foods and beverages recommendations.

3.4.2 Quality of papers on preference and values of unhealthy foods and beverages recommendations

Two of the three studies answering the question of preference and values of unhealthy food and beverages recommendations had minor methodological concerns based on CASP criteria. All three studies had primary data directly related to the preference for unhealthy foods and beverages among 6–23-month-old and very minor coherence concerns. In terms of adequacy, two studies had very rich data, of which one is multinational, while 1 study was a small qualitative study. However, for relevance, all three studies were relevant to the context, population, and phenomenon of interest. Overall, the studies were rated low confidence for answering preference and values for unhealthy foods recommendations because they were few, did not span the different regions, and did not provide a good global picture on this question.

3.4.3 Quality of resource implications of unhealthy foods and beverages reviews papers

This could not be assessed as there were no studies answering the question.

3.4.4 Quality of feasibility of unhealthy foods and beverages reviewed papers

This could not be assessed as there were no studies answering the question.

3.4.5 Quality of right to food/equity/environmental impact of unhealthy foods and beverages reviewed papers

This could not be assessed as there were no studies answering the question.

3.4.6 Quality of studies on how often unhealthy foods and beverages used as treats to show love or have fun

This could not be assessed as there were no studies answering the question.

3.4.7 Quality of studies on whether children have innate taste preferences for salty or sweet foods and beverages

This could not be assessed as there were no studies answering the question.

Table 2: Quality assessment of unhealthy foods and beverages studies reviewed using GRADE CERQual

Summary of review finding	Studies contributing to the review finding	Methodological limitations	Coherence	Adequacy	Relevance	<i>CERQual assessment of confidence in the evidence</i>	Explanation of CERQual assessment
Acceptability of unhealthy foods and beverages recommendations	1,2,3,4	Minor methodological concerns. Four papers, three no or very minor methodological limitations, and two moderate methodological limitations based on CASP criteria.	No or very minor coherence limitations. All four studies reported data that directly answer the review questions on barriers to the acceptability of unhealthy foods and beverages recommendations.	Minor adequacy concerns. Three of the four studies scored low to minor adequacy as they have rich large data. One of these 4 was a multinational study. One study was a small purposeful sample study and rated moderate adequacy concerns.	No to very low minor relevance concerns. All three studies are relevant to their context, population, and phenomenon of interest. One study had minor relevance concerns by the small size that do not provide enough perspective and context.	Low confidence	Four studies were only answering the acceptability of unhealthy food recommendations. Studies do not span the different regions and do not provide a good global picture on this question.
Preference and values papers	3,4,5	Minor methodological concerns Two studies rated no to very minor and 1 with moderate methodological concerns based on CASP criteria.	No to very minor coherence concerns. All 3 studies have primary data directly related to the preference for unhealthy foods and beverages among 6–23-month-olds.	Minor adequacy concerns. 2 studies have very rich data, of which 1 is multinational. 1 study is a small qualitative study.	Not to very minor relevance concerns. All 3 studies are relevant to their context, population, and phenomenon of interest.	Low confidence	3 studies only answering preference and values for unhealthy foods. Studies do not span the different regions and do not provide a good global picture on this question.
Resource							

implications	No study						
Feasibility	No study						
Equity/right to food, environment	No study						
Innate preference for UFB	No study						
Use of UFB as treats or for fun	No study						

PART 2: RESEARCH QUESTION 2: IMPACT OF RESPONSIVE FEEDING RECOMMENDATIONS

4.0 Results

4.1 Study selection

We identified 3801 titles using the keyword search terms in the databases. Six hundred and sixty-eight duplicates and 2898 unsuitable titles were removed. The abstracts for the resultant 235 titles were reviewed. Of these, 183 were removed, mainly because they talked about IYCF practices generally but did not mention RF, leaving 52 abstracts that were deemed suitable for full-text reviews. Of the 52 whose full texts were reviewed, 37 were rejected. Of the rejected, 3 were duplicates, 10 were on RF but did not assess the impact of RF on any of the questions being answered. Ten other papers were rejected because they assessed the impact questions but did not assess their association or impact on RF practices. Eleven full-text articles which assessed neither RF nor the impact questions were also rejected. Another 5 studies rejected were student theses or registered trials. Finally, 12 full-text articles met the criteria for inclusion on the impact of RF on acceptability, preference and values, resource implications, and feasibility. **Figure 2** shows the Prisma flow diagram of the screening, eligibility evaluation, and study selection process. **Appendix 7.2** shows the full description of full texts that were reviewed and excluded from the final set.

4.2 Study characteristics

Twelve (12) studies were reviewed but these reported 15 impacts, 6 were on acceptability, 4 on preference and values, 3 resource implications, and 2 on feasibility. No study addressed the question of impact on the right to food or the environment. Five of the 12 were conducted in Africa, of which 2 were in South Africa, and 1 each in Malawi, Namibia and Kenya. Four of the 12 studies were conducted in Asia, of which 3 were in India and 1 in Bangladesh. A study was conducted in Europe and the USA. Sample sizes for the studies varied greatly, ranging from 13 to 857 participants. Six of the 12 studies did not report any exclusion criteria, while the rest had clear inclusion and exclusion criteria. Seven of the 12 studies used randomization for recruitment of participants, 4 used purposive sampling, 1 used convenience sampling, while 1 did not report on the sampling process.

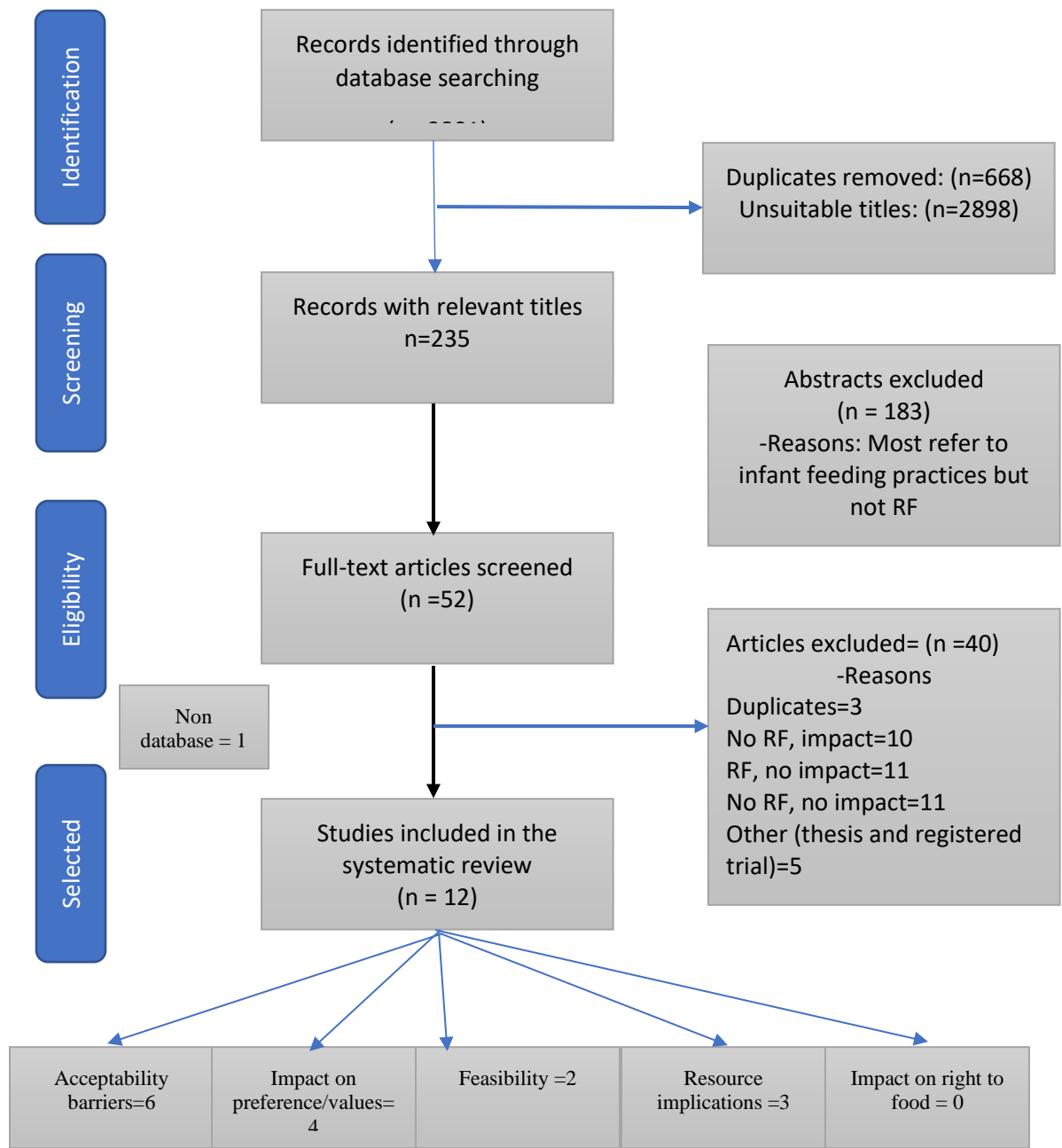


Figure 2: Study selection Prisma for RF

4.3 Results synthesis

Appendix 3 presents the SOFT for RF studies reviewed.

4.3.1 Acceptability of RF recommendations

On the acceptability of RF recommendations, mothers in India reported three barriers, namely: lack of knowledge and experience on RF practice, receiving conflicting and misleading information from multiple sources, including family, neighbours, and friends, and a sense of low self-efficacy because of limited support from family members (6). Among parents from Spain asked if the child should eat all her food, some neither agreed nor disagreed, while those who accept the RF recommendations of psychosocial care said they must apply pressure or else their children would not eat enough (7). The latter assertion was also reported among South African mothers, who also mentioned the need for pressure or else children would not eat well (8). These mothers believe that what babies eat is important for their health and that an unwillingness to eat is a sign of ill health. Hence, they will force-feed their babies if they refuse to eat. The fourth study assessing barriers to parents and caregivers' involvement in IYC feeding reported cultural beliefs that child feeding is a feminine task, and heavy workload for women, limited knowledge, family members influence as barriers and enablers to RF recommendations practices.

Thus, of the six RF acceptability studies, limited knowledge was reported three times. Cultural beliefs that pressure caregivers to force-feed children to eat enough and family influence or lack of support to enable RF were mentioned twice. Financial pressure and a heavy workload were barriers to acceptability mentioned once.

4.3.2 Impact of RF recommendations on preference and values

Four studies assessed the impact of preference and values on RF practices. A study in India reported that fathers preferred being uninvolved in a child's eating (12). This was shown by most fathers (36%) practicing low responsiveness in their children's eating. In that same study, about 29.5% of the fathers practiced or preferred the opposite style, using an authoritative style of feeding (i.e., high responsiveness, high demand) their children. Among Ethiopians assessed on RF, over three quarters (75.7%) of caregivers used a responsive feeding style to feed their children, 12.8% used a controlling style of feeding, and 11.5% used a "laissez-faire" style of feeding. Caregivers who were not the biological mothers highly practiced laissez-faire feeding, while rural caregivers were more responsive. Moreover, caregivers who frequently breastfed (more than eight times) were more likely to practice both laissez-faire (RRR = 1.88; 95% CI = 1.03-3.41) and controlling (RRR = 1.7; 95%CI = 1.02-2.85) feeding styles as compared to responsive feeding (13). In Bangladesh, responsive feeding lessons seemed to improve RF practices/preference, leading to more child self-feeding, increased mothers' verbal responsiveness, and children's refusal to eat. A study in India reported high acceptability and preference to verbally encourage children to eat (95%), but also interacting socially (93%) and giving full attention to the child (96%) during feeding. It seems the practices of forced, responsive, or laissez-faire feeding were driven by the presence or absence of societal preference. In this study, responsive feeding was socially accepted and preferred, yet, some caregivers preferred a "laissez-faire" feeding style, while just a few participants practiced completely opposite RF (15). From these four studies, it could be said that preferences and values affected RF practices, and the extent of RF practices was affected by society's preferences and values.

4.3.3 Resource implications RF recommendations

Among the three studies which assessed the resource implications for RF recommendations, three studies reported on the capacity of health workers to provide the needed information on RF recommendations. These three studies mentioned the lack of, or poor access to information from health workers (10), inadequate nurses' knowledge on RF (11), and limited support from nurses to learn the appropriate IYCF practices (8). Among Ghanaian health workers whose knowledge of RF was assessed, 39% said to give children attention (39%), 56% mentioned playing with the child, and only 2% mentioned using encouraging words (11). In Namibia, mothers whose experiences regarding child feeding practices were assessed mentioned they were not given any health education by the health workers related to child feeding practices. This lack of information led to non-responsive feeding practices (10). In South Africa, mothers reported having received limited support and teaching from nurses on IYCF (8). Therefore, these three studies point to the capacity-building resource implications required to enable healthcare to provide the right information and counseling to caregivers. The fourth study in this category, which took place in the USA, reported that refusal or acceptance by children to eat pressured caregivers force-fed children as caregivers are not sure of how much is enough for their children (16). This points again to capacity-building implications for meeting RF recommendations.

4.3.4 Feasibility of RF recommendations

Two studies assessed the feasibility of RF recommendations (16,17). In Kenya, an assessment of RF behaviour revealed that parents who have other children are unlikely to spend a lot of time on one child who refuses to eat, as they need to give attention to other children too. This means that the feasibility of RF recommendations may be affected by the number of children caregivers have.

4.4 Quality of reviewed studies on RF recommendations

Table 3 presents the GRADE CERQual findings for the reviewed studies on RF.

4.4.1 Quality of acceptability of RF reviewed papers

Six studies that assessed barriers and enablers to RF guidelines acceptability were rated very minor methodological limitations as most met the CASP criteria used. They also had no to very minor relevance and coherence concerns as the data were directly related to the question on acceptability and relevance for the context. With three studies having very minor, 1 having minor and 2 studies having moderate adequacy concerns, the studies in this category had moderate adequacy concerns. Altogether, the studies were rated moderate confidence because of the low or very minor methodological, coherence, and relevance limitations and moderate adequacy concerns.

4.4.2 Quality of papers on preference and values of RF recommendations

Four studies assessing the preference and values impact on RF recommendations had no or very minor methodological and adequacy limitations. They had minor relevance concerns as all three studies were predominantly relevant to the perspective, population, and study theme, but moderate coherence concerns because of the significant implication of the data and stretching of the explanation. Altogether, the findings on the impact of RF recommendations on preference and values were of low confidence because just three studies limited by scope and regional representation answered this review question.

4.4.3 Quality of resource implications of RF reviewed papers

The three studies answering the resource implications of RF guidelines had moderate coherence and adequacy concerns but very minor methodological and relevance concerns. For these reasons, the review findings on this theme were rated low confidence.

4.4.4 Quality of feasibility of RF review

Regarding the feasibility of RF guidelines, three studies answering this question had minor relevance, coherence, and methodological concerns. For adequacy, the studies were overall rated serious adequacy concerns as one had very minor, one had serious, and one had moderate adequacy issues judging by the richness and quantity of data answering this question. Therefore, the studies were rated low confidence on feasibility.

4.4.5 Quality of right to food/equity/environmental impact of RF reviewed papers

This could not be answered as no study answering this question was found.

Table 3: Quality assessment of RF studies reviewed using GRADE CERQual

Summary of review finding	Studies contributing to the review finding	Methodological limitations	Coherence	Adequacy	Relevance	<i>CERQual assessment of confidence in the evidence</i>	Explanation of CERQual assessment
Acceptability of RF	6,7,8,9,10,11	Very minor methodological limitations. (5 studies with very minor limitations, 1 study with moderate methodological limitation)	No or very minor coherence limitations	Moderate adequacy limitations (3 with no or minor, 1 minor and 2 moderate adequacy concerns)	No or very minor concerns on relevance	Moderate confidence	6 studies and most have no or very minor methodological concerns. Studies were rated low or very minor coherence and relevance limitations and moderate adequacy concerns
Preference and values papers	12,13,14,15	No or very minor methodological limitation.	Moderate coherence concerns (significant implying from the data, and stretching the explanation)	No or very minor adequacy concerns	Minor relevance concerns. All three studies rated minor relevance concerns	Low confidence	Four studies but methodological limitations, relevance and adequacy are fine, except coherence concerns that are rated moderate due to overstretching of explanation
Resource implications	8,10,11	No or very minor methodological limitation.	Moderate coherence concerns (1 study rated no or very minor, 1 study rated moderate)	Moderate adequacy concerns (1 study rated no or very minor, 1 study rated moderate)	No or very minor relevance concerns	Low confidence	Just three studies on the theme, coherence and adequacy are of moderate concerns, due to stretching of explanation and lack of rich data on the theme.
Feasibility	16,17	Minor methodological limitations (1 study rate moderate, 2 rated no or minor)	Minor coherence concerns (1 rated no or very minor, 1 rated minor and 1 rated moderate)	Serious adequacy concerns (1 rated very minor, 1 rated serious, 1 rated moderate)	Minor relevance concerns (1 rated no or very minor, 1 rated minor and 1 rated moderate)	Low confidence	Two studies on the theme, yet 1 has serious adequacy limitations
Equity and right to food	No study						

PART 3: RESEARCH QUESTION 3: IMPACT OF MILK CONSUMPTION RECOMMENDATIONS

5.0 Results

5.1 Study selection

Four thousand, four hundred and eighty-nine (4489) papers were identified through online database search using the keyword search terms. Two hundred and eighty-five (285) titles were removed due to being duplicates while 3732 were removed because their titles were inappropriate. Four hundred and seventy-two (472) papers with appropriate titles were retrieved, and their abstracts read. Three hundred and eighty-four (384) of them were rejected because the sample age ranges were outside the age of interest. The full-texts of 88 papers were read, out of which 85 were rejected because they did not report on milk consumption or did not report on the outcomes of interest. Finally, three (3) full texts that met the inclusion criteria on the acceptability/barriers of milk consumption were included. **Figure 3** shows the Prisma flow diagram of the screening, eligibility evaluation, and study selection process. **Appendix 7.3** shows the full description of full texts that were reviewed and excluded from the final set.

5.2 Study characteristics

All the three studies that qualified reported on barriers to milk consumption among children 6-23 months (18-20). No study assessed the preferences and values, feasibility, resource implications, and impact on the right to food. One of the studies was conducted in Bangladesh, one in Nepal, and one in Ethiopia. The sample sizes of the three studies were 80 (20), 1497 (19), and 11796 (18). The study with a sample size of 11796 reported on other children outside the range of interest but reported results separately for the 6-23 months age group. Two studies reported the exclusion criterion which was children outside the age range of 6-23 months while one did not report any exclusion criteria. One of the studies was a cross-sectional experimental design, another involved secondary analysis of a demographic health survey, while the third study was an explorative qualitative study. One of the studies used purposive sampling, and the other two did not specify the sampling strategy used.

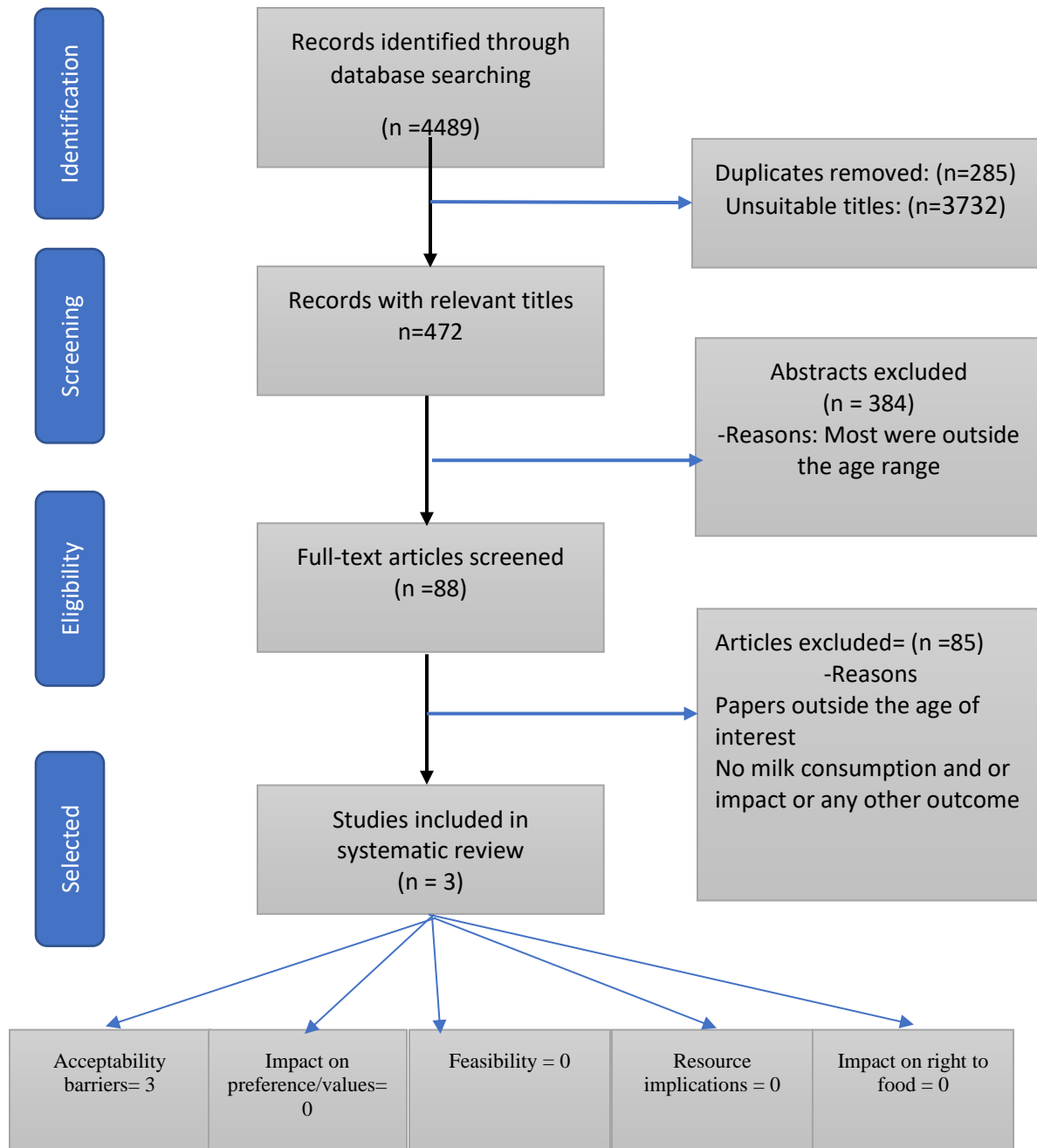


Figure 3 Study selection process PRISMA for milk consumption review

5.3 Results synthesis

Appendix 4 presents the SOFT for milk consumption studies reviewed.

5.3.1 Acceptability and Barriers

The factors reported as barriers and enablers to the consumption of milk were household livestock and dairy production, age of the child, gender, mother's education, the wealth quintile, ecological region, and ethnic background (18-20). Children aged 6–11 months had higher odds of not consuming milk compared to those

aged 18–23 months (AOR = 1.79; 95% CI 1.28, 2.49), while children in the lower wealth quintiles had higher odds of not consuming milk compared to those in the wealthiest quintile (AOR = 2.47; 95% CI 1.27, 4.81) (19). In a qualitative study to explore the barriers to animal source food consumption, including the consumption of milk, Haileselassie et al., (2020) reported that households preferred to sell milk produced for money to purchase other foods for the household rather than feed the milk to the children. Some households also extracted the butter from the milk for sale and fed the children with skimmed rather than whole milk. The scarcity of milk in the local market was also mentioned as a barrier to its consumption (20).

5.4 Quality of reviewed studies on milk consumption

Table 4 presents the GRADE CERQual findings for the milk consumption studies reviewed.

5.4.1 Quality of acceptability of milk consumption reviewed papers

The three studies assessing the acceptability of milk consumption recommendations were of very minor methodological limitations as all met more than 4 CASP criteria used for grading. The studies were rated minor coherence concerns. This is because 2 papers had very minor coherence concerns, while 1 paper had moderate coherence concerns because milk consumption was implied from dairy consumption. All three papers had primary data applicable to the context, perspective, populations, the research question, and setting, making them relevant, while all three papers have rich primary adequate data supporting the review findings. Overall, the studies were rated low confidence because although methodological, adequacy and relevance are adequate, and coherence concerns are minor, just three studies that took place in Nepal, Ethiopia, and Bangladesh provide answers to the question of the acceptability of milk consumption guidelines.

5.4.2 Quality of papers on preference and values of milk consumption recommendations

This could not be assessed as there were no studies answering the question.

5.4.3 Quality of resource implications of milk consumption reviews papers

This could not be assessed as there were no studies answering the question.

5.4.4 Quality of feasibility of milk consumption recommendations reviewed papers

This could not be assessed as there were no studies answering the question.

5.4.5 Quality of right to food/equity/environmental impact of milk consumption reviewed papers

This could not be assessed as there were no studies answering the question.

Table 4: Quality assessment of milk consumption studies reviewed using GRADE CERQual

Summary of review finding	Studies contributing to the review finding	Methodological limitations	Coherence	Adequacy	Relevance	<i>CERQual assessment of confidence in the evidence</i>	Explanation of CERQual assessment
Acceptability of MC	18,19, 20	Not to very minor methodological limitations (3 studies with no or minor methodological limitations, meeting more than 4 CASP criteria used for grading.	Minor coherence concerns (2 papers have no to low minor coherence concerns, 1 paper has moderate, as milk consumption is being implied from dairy consumption	Not to very minor adequacy concerns (all three papers have rich primary data which support the review finding.	Not to minor relevance concerns (all three papers have primary data applicable to the context, perspective, populations, the research question and setting.	Low confidence	Although methodological, adequacy, and relevance are adequate, and coherence concerns are minor, just a few studies in Nepal, Ethiopia, and Bangladesh
Preference and values papers	No study						
Resource implications	No study						
Feasibility	No study						
Equity and right to food	No study						

PART 4: RESEARCH QUESTION 4: IMPACT OF FORTIFIED MICRONUTRIENTS PRODUCTS RECOMMENDATIONS

6.0 Results

6.1 Study selection

We identified 2299 papers through database searching for initial screening, from which 487 were removed as duplicates, additional 1526 were removed as unsuitable titles. The remaining 286 abstracts were screened for the second time, and 223 abstracts were excluded due to the following reasons; duplicates, no fortified micronutrient product mentioned, relevant questions not addressing the outcome of interest, and full text not accessible. A total of 63 full-text articles were referred to, and 31 articles were excluded due to articles outside the age/outcome of interest and duplicates. One paper was recommended from the reviewer to be added. Thus, the final relevant articles reviewed were thirty-three. **Figure 4** shows the Prisma flow diagram of the screening, eligibility evaluation, and study selection process. **Appendix 7.4** shows the full description of full-text articles that were reviewed. (See Figure 1 for full texts that were included and excluded).

6.2 Study characteristics

Of the 33 articles reviewed, 24 articles focused on acceptability, two (2) articles on feasibility, four (4) articles on value and preferences, two (2) articles focused on resource implications and one (1) study on cost benefit analysis. No study addressed health equities. The studies were mainly conducted in sub-Saharan African and Asian countries. Eighteen (19) of the 33 studies were carried out in Africa. Three were in Ghana, two each in Malawi, Uganda, Ethiopia, Kenya, and Burkina Faso, 1 each in Mali, Madagascar, Nigeria, Mozambique, and Tanzania and one in Ghana and Malawi. Of the studies in Africa, five were conducted in West Africa; Burkina Faso, Mali, Ghana, Nigeria, 5 in Eastern Africa; Kenya, Uganda, Tanzania, Ethiopia, Mozambique, 1 in Southern Africa; Malawi, and none for Northern and Central Africa. Twelve (12) studies were conducted in Asia, of which 5 were in Bangladesh, 2 in Nepal, 1 each in Vietnam, India, China, Philippines, and Cambodia. Of the studies in Asia, four were conducted in Southern Asia; India, Bangladesh, Nepal, and Pakistan, 3 in Southeastern Asia; Cambodia, Philippines, and Vietnam, and 1 in Eastern Asia. Two multi-countries studies were conducted, of which 1 in Africa countries only; Mozambique and Malawi, and 1 in combined Africa and Asia countries; Ghana, Ethiopia, Pakistan, and India. Of the 19 different countries, seven were classified as low-income countries; Malawi, Burkina Faso, Madagascar, Uganda, Mali, Mozambique, and Ethiopia, 11 were from lower-middle-income countries; Ghana, Kenya, Tanzania, Nigeria, Pakistan, India, Philippines, Bangladesh, Nepal, Cambodia, Vietnam, and 1, China, being an upper-income country. Eighteen of the studies did not report on any exclusion criteria, while 14 studies showed the inclusion and exclusion criteria. All the studies reported on any of the recruitment strategies, of which 14 studies used randomization, 4 used purposive sampling, 3 each used multistage cluster sampling and two stages cluster sampling, 2 used stratified multistage sampling, 1 each used one-stage cluster sampling, convenient, blocked randomization, population proportional to size, stratified sampling.

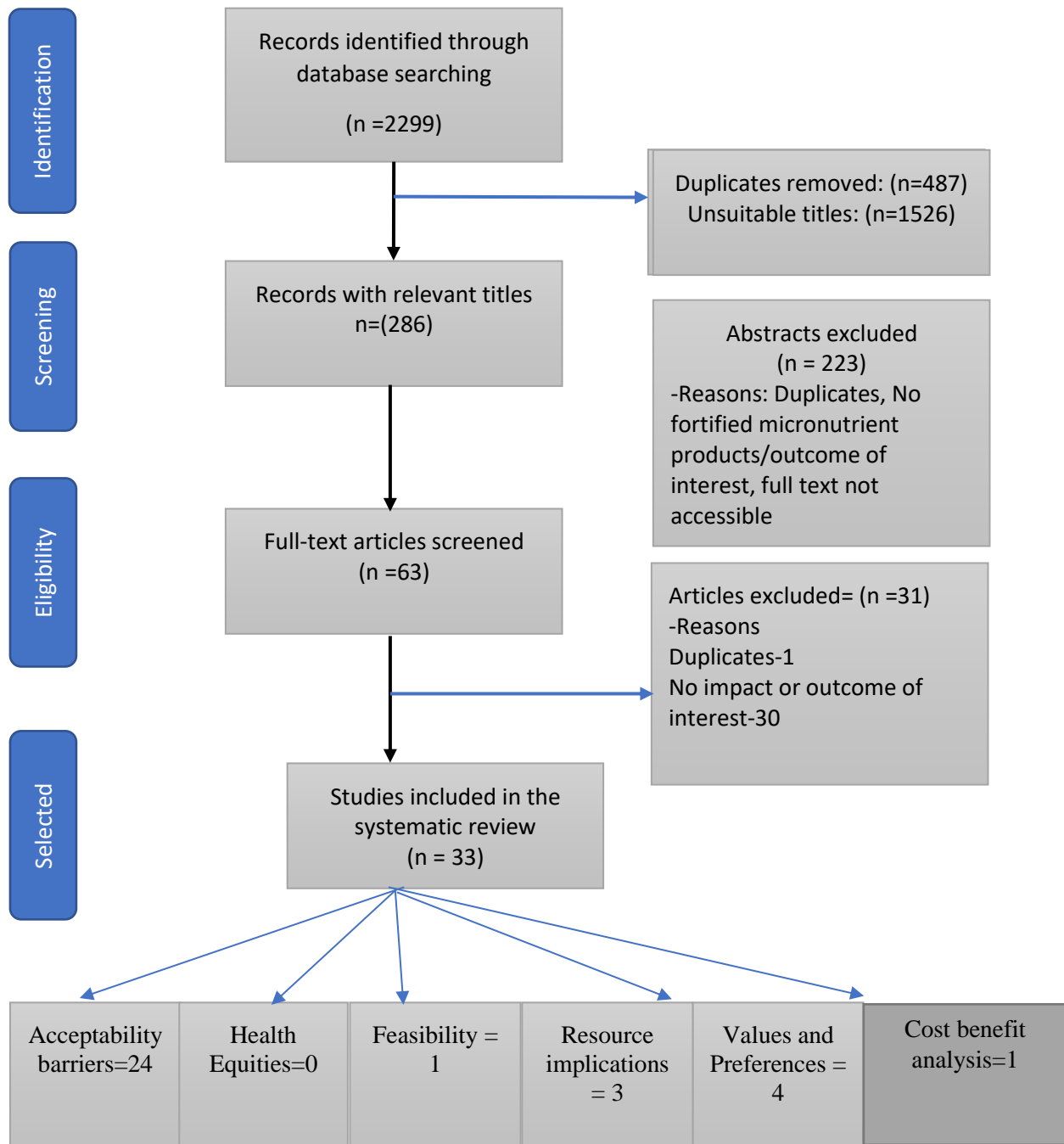


Figure 4: Study selection process PRISMA for fortified micronutrient products review

6.3 Results synthesis

Appendix 5 presents the SOFT for FMNP studies reviewed.

6.3.1 Acceptability of Fortified Micronutrients Product

The overall findings of the 24 articles on acceptability showed that children aged 6-23 months old tolerated any of the fortified micronutrients given, and this was reported in 18 studies. Despite the acceptability of FMNP, some reported barriers to acceptability were that FMNP made the children sick (28), household food insecurity (44), husbands' disapproval of the product (33), unavailability (29, 30, 40), incorrect preparation of the MNP, and perceived lack of added benefit (29). Other barriers reported were lack of knowledge and experience with FMNP, cost (30), perceived side-effects after consumption (33), changes in organoleptic of food mixed with MNP (36), infrequent supply of FMNP, and child rejection of food mixed with FMNP (37).

Also, many enablers of FMNP acceptability were reported. Notable among the enablers are health benefits, if it increases appetite (22, 31, 34, 36), involvement of health workers and local community leaders (33, 40), easy storage of the product (23,26), a decentralized and integrated delivery approach, and verbal encouragement by mothers (26), and taste of the product (40). The rest of the enablers include caregivers CF knowledge (28), maternal literacy, attendance at a community health worker-infant young child feeding (CHW-IYCF) meeting, exposure to information on IYCF-MNP, and her ability to explain MNP benefits (44).

6.3.2 Cost-benefit of FMNP compared

Concerning cost-analysis of FMNP, only one study (45) reported that home fortification with micronutrient powder was highly cost-effective. They estimated a total start-up cost of 35.46 million BDT (456 thousand USD) and an implementation cost of 1111.63 million BDT (14.12 million USD). They indicated that high production could affect the pricing of the FMNP, and reduce its utilization.

6.3.3 Feasibility of Fortified Micronutrient Product Recommendations

Two studies reported on the feasibility of fortified micronutrient powder (48,49). In Nguyen et al. (2016) study, coverage of the MNP project was effective as the child consumed 3 or more sachets/week in their trial study. They reported an overall effective coverage of 11.5% among all caregivers, higher than the 8% projection among caregivers who visited health centers in the previous month. The finding suggested that the locally produced micronutrient powder was readily accessible by the caregivers. Promoting FMNP was feasible, especially when the products are accessed through the public health system and integrated into other health interventions such as counseling. Adams et al. (2017) also explored factors that affect willingness of caregivers to pay (WTP) for Small Quantity -Lipid Nutrient Supplement (SQ-LNS) and therefore how feasible it will be for caregivers to buy SQ-LNS for their children. They found WTP for SQ-LNS for the infant, both for a day's supply and in the long term, was lower among mothers compared to heads of household (fathers). The association with household food insecurity was negative and significant. Finally, WTP was, on average, approximately \$0.09 higher ($p = .004$) for male children than for female children, and WTP in the long term was approximately higher ($p = .01$) for male children than for female children.

They found that the association between months from the birth of an infant and WTP was negative and significant ($p < .001$). If the infant was reported to be generally ill at least once during the reference period before WTP data collection, WTP for a day's supply of SQ-LNS was, on average, approximately higher.

6.3.4 Values and Preference of Fortified Micronutrient Product

Four studies reported on the value and preferences of FMNP by mothers/caregivers and their children. On the whole, the four studies reported that children preferred fortified micronutrient products given to them by their mothers. The children preferred the taste of the FMNP while, for the mothers, the preference of FMNP depended on the taste, aroma (49, 51), colour, content of FMNP, and easy preparation of the FMNP (50). Any changes in taste, colour, or smell resulted in dislike of the FMNP and discontinued its use (52). The findings imply that carers have particular values and preferences for FMNP, and if these values are not present in the FMNP, they are likely not to give to their children. For instance, Flax et al. (49) study revealed that the children in lipid-based nutrient supplement groups liked the sweetness of the LNS, unlike the corn-soy blend.

6.3.5 Resource Implications of Fortified Micronutrient Product Recommendation

Three studies reported on resource implications of fortified micronutrient product recommendations. The findings of the three studies revealed that resources influenced the utilization of fortified micronutrient products. The promotion of FMNP by health workers or household neighbours (46), capacity-building on nutrition-sensitive interventions such as nutrition BCC, and cash transfer to caregivers/mothers (47) contributed to the utilization of fortified micronutrient products. The findings implied that health workers' capacity should be strengthened on FMNP promotion where this is an intervention. The findings also support the need to make FMNP affordable/cheap for mothers to purchase without putting additional financial constraints on household food acquisition.

6.4 Quality of reviewed studies on fortified micronutrient products recommendations

6.4.1 Quality of acceptability of fortified micronutrient products reviewed papers

The twenty-three studies that assessed the acceptability of fortified/specialized micronutrient products recommendations had minor methodological concerns as most met the CASP criteria. The studies had very moderate coherence limitations as some of the findings in the primary studies were overstretched to answer the review question on acceptability. The studies had minor relevance concerns because all the studies answered the review questions in context, population and phenomenon. The studies were graded to have moderate concerns in terms of adequacy because 18 studies had limited, insufficient data supporting the review question. Overall, the twenty-three studies answering acceptability of fortified micronutrient product recommendations were graded moderate confidence based on limited data.

6.4.2 Quality of cost-benefit of fortified micronutrient products reviewed paper

The one study that reported on cost-benefit had very minor methodological concerns as it passed the CASP criteria of assessment. It also had very minor coherence and relevance concerns because the primary data aligned with the review findings, and the study population and phenomenon of interest supported the review findings. However, the study had a serious adequacy concern because it is just one study answering the question and did not provide a global perspective on the theme.

6.4.3 Quality of papers on preference and values of fortified micronutrient products recommendations

All four studies answering preference and values impact on the uptake of FMNP recommendations had minor methodological concerns after assessing the CASP criteria. Three of the studies had a moderate fit with the findings reported in the review and thus were graded as having moderate coherence concerns. The reported review findings were slightly stretched to answer the impact question on preference and values. The studies have moderate adequacy due to the limited number of studies which also lacked rich primary findings. In addition, they did not cover many countries or regions of the world, making it inadequate to provide a global perspective. For relevance, all four studies were relevant to the context, population, and phenomenon of interest.

Overall, the studies were rated low confidence for answering preference and values for fortified micronutrient products. The studies were few, did not span the different regions, and did not provide a good global picture on this review question.

6.4.4 Quality of resource implications of fortified micronutrient product reviews papers

Three studies reported on the resource implications on uptake of fortified micronutrient recommendations. All the studies had minor methodological concerns as they passed the CASP criteria for assessment. The fit between the reported findings in the primary studies and the review findings was the same. The phenomenon of interest was not overstretched or oversimplified to answer the review question. For adequacy, the studies were very few and so were limited in fully answering the review question. They failed in providing rich data and findings to support the review question. The studies' relevance was also rated as having minor concerns because the two studies answered the phenomenon of interest directly, although conducted in the same country. Overall, the studies were rated low confidence for answering resource implications for fortified micronutrient products, as the studies were few, did not span the different regions, and did not provide a good global picture on this review question.

6.4.5 Quality of feasibility of fortified micronutrient products reviewed papers

The two studies that reported on feasibility had minor methodological concerns as both passed the CASP criteria of assessment. They were rated as having minor concerns with coherence because the reported finding answered the review question on feasibility of adhering to the WHO recommendations on fortified micronutrient products. Moderate adequacy and relevance concerns were recorded for these studies because findings were from two African countries and one Asian country which did not present a broader global perspective. However the combined sample size was large and so present moderate relevance in answering the review question. Due to these reasons, they were rated as moderate confidence.

6.4.6 Quality of right to food/equity/environmental impact of fortified micronutrient product reviewed papers

This could not be assessed as there were no studies answering the question.

Quality assessment of FMNP reviewed studies

Table 5 presents the GRADE CERQual findings for the studies on fortified micronutrient products.

Table 5: Quality assessment of FMNP studies reviewed using GRADE CERQual

Summary of review finding	Studies contributing to the review finding	Methodological limitations	Coherence	Adequacy	Relevance	<i>CERQual assessment of confidence in the evidence</i>	Explanation of CERQual assessment
Acceptability of FMNP	21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44	Minor methodological limitations (3 studies with serious, 2 studies with moderate, 4 studies with minor, 14 studies with very minor) (inappropriate research design, no eligibility, no justification of selected sites, no rigorous statistical analysis/less in-depth information on data analysis)	Moderate concern about coherence (6 studies with serious, 7 studies with moderate, 1 study with minor concerns about fits between the data from primary studies and review findings), 10 studies with no/very minor concerns	Moderate concerns with adequacy(24 studies in total, with 17 studies with limited, scanty data supporting review questions, e.g. 17 studies reported on only acceptability result, without stating barriers, cost, enablers contributing the acceptability of FMNP.	Minor concern with relevance (24 studies with 11 studies with concern on phenomenon of interest and from two continents; Asia and Africa)	Moderate confidence	Nine studies with methodological limitations, moderate concern about coherence, limited data from two continents (Asia and Africa)

Cost-benefit analysis	45	No or very minor methodological limitation	No or very minor concern about coherence	Serious concern on adequacy (only one study supporting review question)	No or very minor concern about relevance (population or phenomenon of interest supported review finding)	Low confidence	Limited data from only one country to support review finding
Resource implications	46, 47	Minor methodological limitation (one studies with no or very minor methodological limitation, one study with serious methodological limitation; inappropriate sampling method, insufficient details on ethical issues, inappropriate research design, poor in-depth report on statistical analysis)	No or very minor concern about coherence(the two studies had primary data fitting the review finding)	Minor concern about adequacy (one study with no or very minor concern, one study with moderate concern (limited data on review findings and question)	Serious concern about relevance (all two studies from same country)	Low confidence	Two studies with very minor or serious methodological limitations, data from only one country from LIC, minor concern about adequacy (limited data on review question) and no or very minor concern about coherence
Feasibility	48,49	Minor methodological limitation (weak data analysis, and no report on eligibility of participant, no reflexivity)	Minor concern about coherence (primary study data partially fit the review finding)	Moderate concern about adequacy (2 studies in total with limited, few data)	Moderate concern about relevance (two studies:one multi-country studies and one from country in Asia)	Moderate confidence	Two studies with minor methodological limitations, minor concerns about coherence, minor relevance concerns and moderate adequacy concerns. The studies cut across two African countries

							with a large sample size and one Asian country.
Preference and values papers	50, 51,52,53	No or very minor methodological limitations	Moderate concern with coherence (some moderate concern about fit between data from primary studies and review findings in 3 studies)	Moderate concern about adequacy (three studies with limited, scanty data supporting review questions)	Minor concern about relevance (2 studies with partial relevance on the phenomenon of interest and from 3 countries)	Low confidence	Three studies with concern about coherence, three studies with limited, scanty data supporting review questions, two studies with partial relevance on the phenomenon of interest and from 3 countries
Equity/right to food, environment	No study						

PART 5: RESEARCH QUESTION 5: IMPACT OF DIETARY DIVERSITY RECOMMENDATIONS

7.0 Results

7.1 Study selection

We found 2399 articles that mentioned dietary diversity or other phrases or word variations of dietary diversity such as dietary quality, dietary diversity scores, quality of food, diverse diets diversification, food consumption score in their titles for initial screening. Of the 2399 titles, 334 abstracts were screened. One hundred and forty-nine (149) for full papers were screened and 97 included in the final review. **Figure 5** shows the Prisma flow diagram of the screening, eligibility evaluation, and study selection process. **Appendix 7.5** shows the full description of full-texts that were reviewed and excluded from the final set.

7.2 Study characteristics

Out of the 97 articles reviewed, 80 were on acceptability (including barriers, enablers, cost, lack of skills, and perception) of the WHO guidelines or recommendations for dietary diversity, 9 on the impact of adhering to the dietary diversity guidelines on health, 3 on the definition of dietary diversity and 5 on resource implications in employing the WHO recommended guidelines for dietary diversity. There were no articles that explored values and preferences, feasibility and equity. Fifty-nine of the 97 studies were conducted in LMICs in Africa. Specifically, thirty-three studies were done in Ethiopia, six in Ghana, one in Somalia, two in Zambia, three in Malawi, three in Tanzania, six in Kenya and five multi-country studies. For the five multi-country studies, one study was conducted in Rwanda and Burundi, one in Kenya, Uganda and Tanzania, one in Ghana, Liberia, Nigeria, and Sierra Leone, one in Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, Niger, and Senegal.

We found 35 studies conducted in Asia. Six of these were done in Indonesia, 1 in the Philippines, 1 in Southeast Asia, 3 in Pakistan, 1 in Sri Lanka, 2 in Iran, 4 in Nepal, 6 in India, 2 in China, 5 in Bangladesh, 1 in Cambodia, 1 in Iraq, and one each in Mongolia and Vietnam. One study was conducted in South America, specifically in the Bolivian Andes, and 2 in North America, Haiti.

Thirty-seven of the 97 studies did not report any exclusion criteria, while the rest had clear inclusion and exclusion criteria. Seventeen of the 97 studies used the multistage sampling method to recruit the study participants. Eleven studies used the two-stage sampling method, 18 studies used simple randomization for recruitment of participants, 5 purposive samplings, 3 used convenience sampling, 18 used systematic random sampling method, 1 used probability proportional to size sampling, 3 were randomized control trials, 1 observational study, 13 cross-sectional studies, one complete enumeration, and 3 secondary analysis. At the same time, 3 did not report on the sampling process.

Eighty of the 97 studies reviewed were on the “acceptability of dietary diversity recommendations”, 9 were “impact or effect on health” studies, 5 were on “resource implications for dietary diversity recommendations”, 3 were on “a definition of dietary diversity” and no studies on the “feasibility of dietary diversity recommendations”, “equity issues” and “values and preferences” impacted on WHO recommendations for dietary diversity.

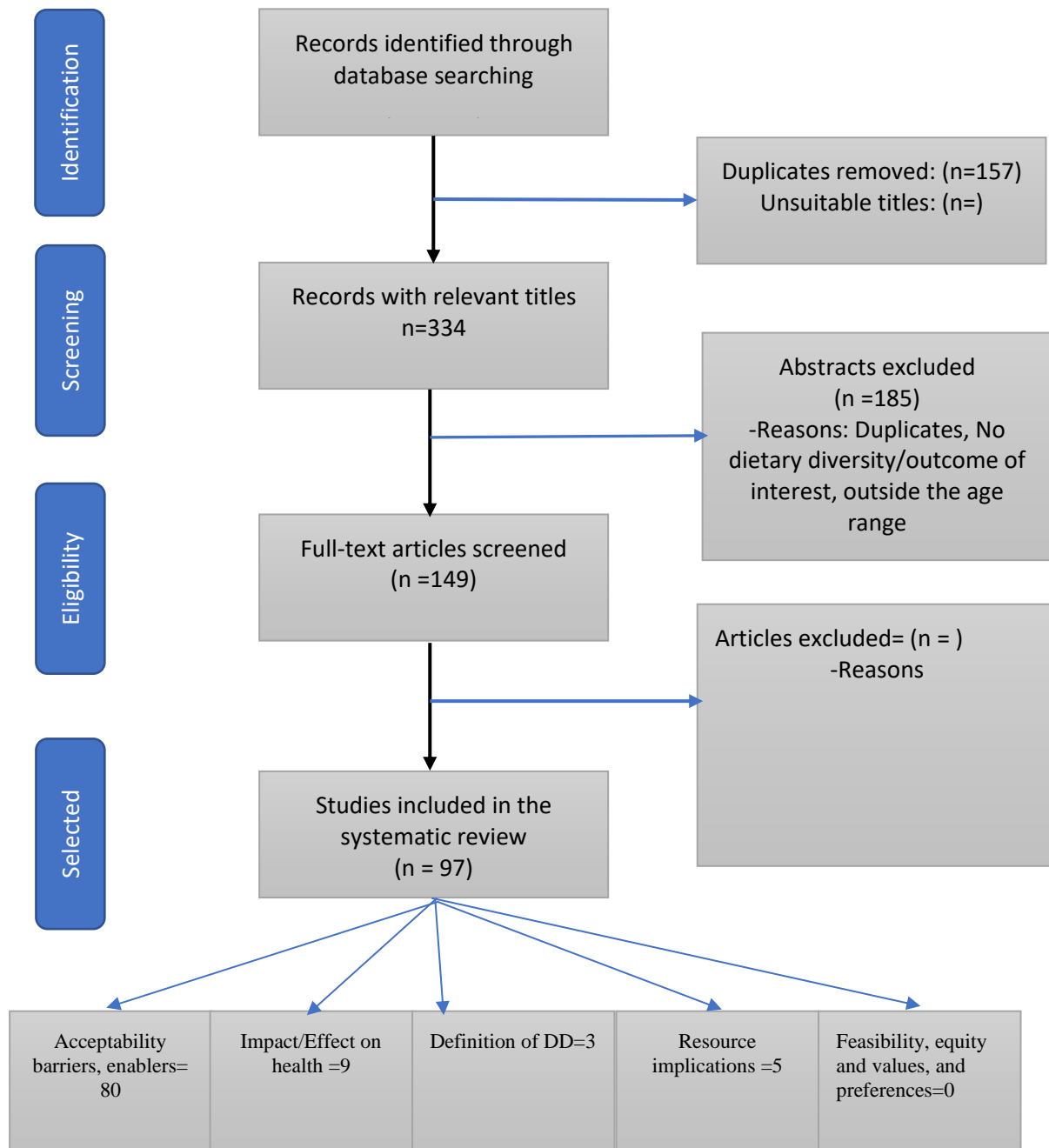


Figure 5: Study selection process PRISMA for dietary diversity review

7.3 Results synthesis

Table 5 presents the SOFT for unhealthy foods and beverages studies reviewed.

7.3.1 Acceptability DD recommendations

The 80 papers that reported acceptability explored some factors such as barriers and enablers that deterred or helped participants who were primarily mothers to accept the WHO recommendations on dietary diversity. Some of the reported barriers were 1) Lower educational level of mothers, 2) poor socio-economic household, 3) poor access to maternal information on either newspaper/magazine or television, 4) Maternal knowledge about IYCF, 5) geographical locations of participants (poorer suburbs or rural settings), 6) low maternal age (15-19), 7) mother's work status, 8) fertility desire, 9) intimate partner violence 10) Number of children, 11) limited diversity of agricultural production. We found these reported barriers in about 80%-90% of the 80 studies on acceptability.

A lower level of education of mothers and sometimes fathers was associated with low adherence to recommendations on dietary diversity. In addition, poor socio-economic household status, poor access to maternal information from either newspaper/magazine or television resulted in low acceptance/adherence to dietary diversity (53, 56, 58, 61, 62, 63, 64, 70). Similarly, enablers for following the WHO recommendations on dietary diversity were high maternal and paternal education, high socio-economic status, i.e., wealthy families or households, high media exposure, high maternal age (35-49), good knowledge on IYCF and diverse diets, geographical location (urban/rich regions or suburbs)

Many of the studies found that children whose mothers were older, aged 35 or above at pregnancy, were more likely to be fed with diverse foods and met the minimum dietary diversity specified by the WHO guidelines (79).

Children from the Midwestern region (rural region) were less likely to be provided with the diverse food than children from the Eastern region (urban region) (79, 82, 84, 86). From the barriers and enablers studies, the age of children was found to be associated with consumption of diverse diets or meeting the minimum dietary diversity score. Older (17-23 months) children had higher odds of meeting the minimum dietary diversity recommendations compared to younger ones (6-11 months) (61, 59, 57; 54, 63).

Some beliefs were also found to influence the uptake/acceptability of the WHO recommendations. Three out of five behavioural beliefs were found to be significantly correlated with the intention to accept dietary diversity guidelines. (118). Further analysis revealed three of six normative beliefs and three of seven control beliefs were also significantly correlated with intention to accept guidelines. The cost of diverse food largely influenced the uptake of guidelines and recommendations. A combination of whole grain flour and Irish potatoes, pulses and seeds, dried sardines and other animal source foods, and vitamin A-rich fruits and vegetables meeting the RDIs for 20 selected nutrients were varied but had high cost for children aged between 6–23 months. Further analysis showed that the alternative optimal formulation for improving dietary adequacy of limiting nutrients were of relatively higher price (87). Other studies reported on lack of skill's impact on acceptability. They concluded that children whose mothers were part of the Growth, Monitoring, and Promotion (GMP) programme had higher odds of offering a diversified diet to their children than those whose mothers did not attend the GMP programme (69). One study by Na et al., 2017, in Nepal reported briefly on mothers' perception of guidelines' acceptability. They concluded that mothers who perceived that their child's birth weight was smaller than average had reduced odds (OR= 0.8, p=0.04, 95%CI= 0.6-1.0) of offering adequate MDD to said child than those who perceived the birth weight as normal.

7.3.2 Resource implication for DD recommendations

The five studies on resource implications and considerations for guidelines on dietary diversity assessed the effects of building the capacity of mothers and providing knowledge on diverse diets and IYCF practices through various interventions, and comparing the outcomes with control groups. The intervention used to build the capacity of mothers included 1) BFCI, which comprised a) home visitations to offer personalized counselling and support on infant feeding; b) establishment of mother support groups; c) provision of infant feeding education materials and d) income-generating activities. Children in the intervention group attained the minimum dietary diversity compared to the control group.

The odds of attaining minimum dietary diversity were five times greater in the intervention groups than the control groups when mother's age, education level, marital status, religion, and main source of income were taken into account (140). Hitachi et al., 2020, (137), reported after a nutritional education interventional study with mothers/caregivers that the results indicated a significant positive impact of nutritional education with the help of CHWs and SNUs on household caregivers' attitudes toward recommended feeding and practices of dietary diversity. Similar results were reported by Gelli et al., 2018, (138), from their study in Malawi after intervening with activities such as BCC and training mothers and caregivers on the nutritional needs of infants and young children, year-round meal planning and preparation, food storage, hygiene, waste disposal, and monitoring of meal provision. The intervention improved mean dietary diversity in children, driven by the higher likelihood of consuming fruits and fish (138). In their study, Kuchenbecker et al., 2017, (139) also provided nutritional education to mothers and caregivers. They observed increased consumption of diverse diets and improvement in dietary diversity scores following the recommendations provided by the educators. Laterra et al., 2014, (136) came to a similar conclusion after mothers/caregivers received postnatal care and received IYCF messages. These studies resonate with the positive implications of capacity building and education for mothers and caregivers in their uptake of the WHO guidelines on dietary diversity.

7.3.3 Definition of Dietary Diversity studies

The three studies reported on the definition of dietary diversity were all adaptations or variations from the definition encapsulated in the WHO guidelines and recommendations. Patel et al., 2012, (151), defined dietary diversity as the proportion of children 6–23 months of age who received four or more food groups. Minimum Dietary Diversity (MDD) was also defined as breastfed children between 6–23 months of age who had received food from 4 or more food groups from a total of 10 food groups (152). Minimum dietary diversity was also defined by Liao et al., 2020 as the proportion of children 6–23 months of age who received food from four or more food groups. Dietary diversity was defined as optimal if children (aged 6–23 months) received foods from at least four of the following seven food groups (1) Grains, roots, and tubers, (2) Legumes and nuts, (3) Dairy products, (4) Flesh foods, (5) Eggs, (6) Vitamin-A rich fruits and vegetables, (7) Other fruits and vegetables (89)

7.3.4 Impact of dietary diversity on health studies

Out of the nine studies reporting the impact of the dietary diversity guidelines on health, 6 reported effects on stunting, 2 on underweight, and 1 on anaemia. Children who consumed inadequate diverse diets had higher odds of being stunted than those who consumed adequate dietary diversity. Similar conclusions were drawn by Reinbott et al., 2016 (149); Komaruddin et al., 2019 (142); Paramashanti et al., 2017 (143); Mallard et al., 2016 (144); Kuche et al., 2019 (145) and Chipanha, 2020, (148) in studies in different regions and countries. Saakaa and Galaa, 2017, (146) also explored the effect of diverse diets on anaemia

and concluded that a less diverse diet was associated with anaemia and stunting. Conclusions drawn from the two studies that assessed the impact of diverse diets on underweight in children 6-23 months were that, for weight-for-age, children fed 2-3 diverse diets daily were less underweight than those not fed 2-3 diverse diets. Children not consuming diverse diets were 1.246 increased odds of underweight compared to those who follow the dietary diversity recommendations (147, 148)

7.4 Quality of reviewed studies on dietary diversity recommendations

Table 6 presents the GRADE CERQual findings for the dietary diversity studies reviewed.

7.4.1 Quality of acceptability of dietary diversity reviewed papers

The eighty studies that assessed the acceptability of dietary diversity recommendations had no/minor or moderate methodological concerns as most of them met the CASP criteria. Only seven of the studies on acceptability had moderate methodological concerns. These were typically due to non-rigorous data analysis, lack of ethical clearance, and inappropriate sampling procedures. Seventy-three studies had no or minor methodological limitations. The studies had minor coherence limitations as all 80 studies reported data that directly answered the review questions on barriers to the acceptability of dietary diversity recommendations.

Likewise, the studies were all relevant to the context, population and answered the review's phenomenon of interest. The reported review findings do not differ significantly from the reports in the primary studies. The primary studies' findings were neither overstretched nor oversimplified to answer the review questions. In terms of adequacy, the studies were graded to have minor adequacy concerns because 80 studies present rich data that span many cities/countries, contexts, and a very large consolidated sample size. The studies were rated to have no "relevance" concerns as all 80 studies reported either barriers or enablers to acceptability. In addition, 1 study explored beliefs and enablers, 1 study explored the cost of diverse diets, lack of skill to acceptability, and 1 study explored perceptions of mothers/caregivers. These were all relevant in the context of the review questions.

Overall, the 80 studies answering acceptability of dietary diversity recommendations were graded high confidence based on the CERQual criteria. The grading was based on the fact that these studies span the different regions and provided a good global picture on the acceptability of dietary diversity recommendations.

7.4.2 Quality of papers on preferences and values of dietary diversity recommendations

This could not be assessed as there were no studies answering the question.

7.4.3 Quality of resource implications of dietary diversity reviews papers

The six studies that assessed resource implications of dietary diversity recommendations had no methodological concerns because they met the CASP criteria. The studies had minor coherence limitations as all six studies reported data that directly answered the review questions. The reported review findings do not differ significantly from the reports in the primary studies. The primary studies' findings were neither overstretched nor oversimplified to answer the review questions. Likewise, the studies were all relevant to the context, population and answered the review's phenomenon of interest. All six studies explored the

effect of building the capacity of caregivers and mothers, equipping mothers with knowledge and other resources to increase the uptake of the dietary diversity recommendations. These were all relevant in the context of the review questions. In terms of adequacy, the studies were graded to have moderate adequacy concerns because though the six studies answered the review questions, only those studies investigated the implications of resources on the impact of the WHO recommendations on dietary diversity.

Overall, the six studies answering resource implications of dietary diversity recommendations were graded low confidence based on the CERQual criteria. The grading was based on the fact that these studies did not span different countries/ regions. The consolidated sample size was not large enough to adequately present a good global perspective.

7.4.4 Quality of feasibility of dietary diversity reviewed papers

This could not be assessed as there were no studies answering the question.

7.4.5 Quality of right to food/equity/environmental impact of dietary diversity reviewed papers

This could not be assessed as there were no studies answering the question.

7.4.6 Quality of health impact of dietary diversity reviewed papers

The 10 studies that assessed the impact of dietary diversity recommendations on health had no methodological concerns because all of them met the CASP criteria. The studies had very minor coherence limitations as all 10 studies reported data that directly answered the review questions on health impacts. Likewise, the studies were all relevant to the context, population and answered the review's phenomenon of interest. The reported review findings were neither overstretched nor oversimplified to answer the review questions and it did not differ from the findings reported in the primary studies. In terms of adequacy, the studies were graded to have moderate adequacy concerns because only 10 studies answered the review questions on the impact on health. Overall, the 10 studies answering resource implications of dietary diversity recommendations were graded high confidence based on the CERQual criteria. The grading was based on the fact that the studies presented a "fair" global perspective.

7.4.7 Quality of definition of dietary diversity reviewed papers

The 16 studies on the definition of dietary diversity had no methodological concerns because all of them met the CASP criteria. The studies had very minor coherence limitations as all 16 studies reported data that directly answered the review questions on the definition, which were according to the WHO's definition or a variation of it. Likewise, the studies were all relevant to the context, population and answered the review's phenomenon of interest. The reported review findings were neither overstretched nor oversimplified to answer the review questions, and it did not differ from the findings reported in the primary studies. In terms of adequacy, the studies were graded to have minor adequacy concerns because 16 studies provided a rich perspective of the definition of dietary diversity.

Overall, the 16 studies answering the definition of dietary diversity were graded high confidence based on the CERQual criteria. The grading was based on the fact the studies presented a rich global perspective.

Table 6: Quality assessment of DD studies reviewed using GRADE CERQual

Summary of review finding	Studies contributing to the review finding	Methodological limitations	Coherence	Adequacy	Relevance	CERQual assessment of confidence in the evidence	Explanation of CERQual assessment
Acceptability of DD	54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133	No/Minor concerns on methodological limitations (Only 7 studies had moderate methodological limitations). These were typically non-rigorous data analysis, lack of ethical clearance, and inappropriate sampling procedure. 73 studies had no or minor methodological limitations)	No/ Minor coherence concerns	No or very minor adequacy concerns	No relevance concerns. All 83 studies reported on either barriers to acceptability or enablers to the acceptability of the WHO recommendations on DD or both. In addition, 1 study explored beliefs and enablers, 1 study explored cost of diverse diets, lack of skill to acceptability, and 1 study explored perceptions of mothers/caregivers	High Confidence	Very few studies (7) had moderate methodological limitations; there were no or minor coherence, adequacy and relevance concerns. The studies on acceptability adequately answered the setting and review questions on barriers, enablers, cost, lack of skill, perception, and beliefs. The studies cut across 3 major regions of the world i.e. Africa, Asia, and America but mostly LMICs. The data are represented with very large sample sizes.
Preferences and values papers	No study						
Resource implications	92, 134,135,136,137	No concerns on methodological limitations	No/Minor coherence concerns (All 6 papers were rated no or	Moderate adequacy concerns	No or very minor concerns on relevance. All the studies explored the effect of resources on taking up	Low Confidence	All the studies answered the review questions and had moderate adequacy concerns due to the

			very minor)		the recommendations on DD		limited number (6) of studies.
Feasibility	No study						
Impact on equity and right to food	No study						
Impact/Effect on health	80, 138,139,140,141,142,143,144, 145, 146	No/Minor concerns on methodological limitations (1 study had an inappropriate sampling strategy and lacked rigorous analysis)	No/ Minor coherence concerns (All ten papers were rated no or very minor concerns)	Moderate adequacy concerns	No or very minor concerns on relevance. All the studies reported on the health impacts of diverse diets in children 6-23 months	High Confidence	Only 1 study had methodological limitations, which was mainly lack of rigorous analysis according to the CASP criteria. All the studies answered the review questions and had moderate adequacy concerns due to the limited number (10) of studies.
Definition of DD	89, 90, 91,95, 96, 97, 99,100, 104, 105, 106, 114,115, 147, 148,149	No/Minor concerns on methodological limitations (1 study had an inappropriate sampling strategy)	No/Minor coherence concerns (All 16 papers were rated no or very minor)	Minor adequacy concerns	No concerns on relevance. All study defined DD adequately	High Confidence	All the studies answered the review questions and had moderate adequacy concerns due to the limited number (16) of studies.

8.0 General discussion

This systematic review aimed to explore the impact of infant and young child feeding recommendations regarding Unhealth foods and beverages, Responsive Feeding, Milk Consumption, Fortified Micronutrient Products, and Dietary Diversity, on acceptability, preferences and values, feasibility, and resource implications, impacts, and right to foods. Other questions the review sought to answer were the definition for dietary diversity across studies, the existing evidence that more diverse diets led to improved health outcomes, the extent to which unhealthy foods were used for fun and or reward, whether children have innate taste preferences for unhealthy foods and beverages, the cost implications of FMNP, and the relative cost of different elements of a diverse complementary feeding diet, particularly fruits and vegetables and animal-source foods.

In this review, the acceptability of UFB guidelines was associated with maternal level of education and knowledge, maternal work status, wealth status, affordability, and television exposure during feeding. Consumption of UFB was driven by preference. Lack of knowledge and cultural beliefs were barriers to the acceptability of RF guidelines, preference affected RF practice, and adequate health worker capacity was a reported needed resource to enable RF practice by caregivers. Reported barriers and enablers of MC recommendations were household livestock and dairy production, age of the child, gender, mother's education, wealth quintile, ecological region, and ethnic background. However, children feeling sick, husbands' disapproval, unavailability, incorrect preparation, perceived lack of added benefit, lack of knowledge, and perceived side-effects were barriers to FMNP acceptability. On the other hand, FMNP acceptability enablers were health benefits, appetite, health worker involvement, decentralized and integrated delivery approach, and knowledge. Finally, mothers' educational level, household socioeconomic status, access to maternal information, maternal age, number of children, among others, affected DD acceptability and improving caregiver confidence and support on infant feeding, mother support groups, provision of infant feeding education materials, and income-generating activities improved DD practice. Impact on health studies reported that DD improved stunting, underweight, and anaemia status.

The review findings further show that children have a high preference for sugar-containing foods, which results in high intakes of unhealthy foods and low adherence to the consumption of some fortified micronutrient products. Also, early introduction to sugar-containing foods increases the sugar taste threshold among children and predisposes them to unhealthy dietary patterns later.

Appropriate infant and young child feeding practices have implications throughout all the different stages of the life cycle. From the findings, policies and interventions on food subsidy for mothers with infants 6-23 months, free food distribution and provision of seedling and animals for farming at the household level, and creating awareness through media like radio and television advertisement improved adherence to CF recommendations and infant growth outcomes. Maternal education by health workers and media houses must equip mothers with knowledge on the need to restrict sugary and other unhealthy foods among infants. The review findings reveal the need to improve maternal knowledge, socioeconomic status, and overall women's empowerment. Low maternal education, knowledge, and low socioeconomic status were associated with poor outcomes for almost all of the outcomes across all exposures. There is research evidence to show that women's well-being positively impacts household well-being and child development (16,17). Policies and interventions aimed at improving the living standards of women can increase adherence to infant and young child feeding practices by directly impacting the outcomes explored in this review. Unplanned pregnancies and low birth spacing result in poor child care practices, sub-optimal child feeding practices, and poor child survival (18,19). Promotion of family planning, education, and initiatives to increase compliance with feeding recommendations are urgently needed. At the household level, improving overall food security and health status through the provision of grants, foods and encouraging subsistence farming can enhance adherence to feeding recommendations.

Additionally, building capacity in health care to equip health professionals with knowledge and skills on infant and young child feeding practices directly impacts mothers' knowledge and infant and young feeding. In this review, we observed that implementing interventions through the public health system and health centres are associated with increased adherence to recommendations on child feeding, further deepening the need to strengthen health systems to make them effective toward supporting recommendations.

The location of the studies in this review is worth mentioning. Across the world, Asia and Africa remain the continents with the highest levels of all forms of child malnutrition (Organization, 2019). Most of the studies included in this review were conducted in Africa and Asia, with only a few developed countries and continents. It is assuring that much of the evidence from this review comes from parts of Asia and Africa, where childhood malnutrition is pervasive. This means that the focus of research has been on the areas where the problems are more pronounced. However, evidence is also needed in other parts of the world to enable countries with a high burden of malnutrition and high prevalence of non-adherence to infant feeding recommendations to learn lessons to improve their respective countries and context. Such complete data are also needed to understand the infant and young children's feeding situation comprehensively. The bias of the available evidence in terms of scope limits the generalization of the findings.

The quality of the evidence in this review call for caution in implementing the interventions mentioned above. Except for the studies on barriers and enablers of acceptability, the quality of evidence synthesized using the GRADE CERQual classification for the different outcomes across all exposures was predominantly of low confidence. For unhealthy foods, all the evidence available across all the outcomes was of low confidence. The evidence on acceptability barriers and preferences was of moderate confidence for responsive feeding, while that on feasibility and resource implications was low. The evidence on acceptability barriers was low confidence for milk consumption, while we found no study for the other impact questions. For fortified micronutrient products, the evidence synthesized under acceptability and barriers was of moderate confidence, while the other outcomes, including feasibility, values/preferences, and resource implications, were low. For dietary diversity, the evidence on acceptability barriers and enablers, definition of dietary diversity, and impact on health were of high confidence, while that on resource implications were of low confidence. The generally low level of quality of most of the evidence synthesized implies that we should interpret the review findings cautiously. It also means that the evidence is not enough to understand the guidelines' impact and revise them.

Finally, the review could not answer at all the following questions: preference and values, feasibility, and impact on equity and right to food of dietary diversity recommendations; equity and right to food impact on FMNP recommendations; preference and value, resource implications, feasibility and equity and right to food of milk consumption recommendations, equity and right to food impact on responsive feeding; and resource implications, feasibility, right to food, use of unhealthy foods and beverages as treats to show love or fun, and whether children 6-23 months old have an innate taste for salty or sweet foods and beverages. This calls for the need to commission studies to answer these questions. Also, studies on the impact of CF guidelines in developed countries are needed.

8.1 Summary of evidence

This qualitative systematic review assessed how the values and preferences, equity and rights to food, resource implications, acceptability, and feasibility impact five WHO's CF guidelines for infants and young children aged 6-23 months.

For unhealthy foods and beverages, acceptability was associated with maternal level of education and knowledge, maternal work status, wealth status, affordability, parity, and television exposure during feeding. Consumption was driven by preference. Overall, we found limited data with low confidence on acceptability and preference and no data on the feasibility, resource implications, and equity/right to food.

For RF, lack of knowledge and cultural beliefs were the most reported barriers to acceptability. Preference affected practice, and health worker capacity was the main resource implication reported. Overall, our findings showed moderate confidence in barriers and enablers of RF acceptability, low confidence in preference, feasibility, resource implications, and no study on equity and right to food.

On milk consumption, household livestock and dairy production, age of the child, gender, mother's education, the wealth quintile, ecological region, and ethnic background were reported barriers and enablers for acceptability with overall low confidence. We found no study on preference, feasibility, resource implications, and right to food impacts of milk consumption.

Moderate confidence on barriers and enablers of acceptability of FMNP were observed. Barriers included children feeling sick, husbands' disapproval, unavailability, incorrect preparation, no added benefit, lack of knowledge, experience, cost, and perceived side-effects. The enablers were health benefits, appetite, health worker involvement, decentralized and integrated delivery approach, and knowledge. We found limited data with low confidence on cost-benefit, feasibility, and resource implications for FMNP consumption.

For DD, high confidence data reported acceptability barriers and enablers such as mothers' educational level, household socio-economic status, access to maternal information, maternal age, number of children, work status, knowledge about IYCF, and diversity of agricultural production. The resource implications for DD were of low confidence but reported BFCI such as home visitations to offer personalized counselling and support on infant feeding, mother support groups, provision of infant feeding education materials, and income-generating activities. Findings on the impact of DD on health were of high confidence, showing that DD improved stunting, underweight, and anaemia status.

Overall, we found the barriers and enablers for the acceptability of WHO's DD recommendations to be over-researched. We did not find the same for the other four recommendations. Also, more evidence is needed on the impact of preference and values, feasibility, and resource implications for all five CF recommendations. Equity/right to food impact on these recommendations is completely unstudied.

8.2 Review Limitations

Apart from the acceptability of dietary diversity guidelines, evidence generated from reviews was mostly of low confidence or non-existent to answer the feasibility, acceptability, resource implications, and preferences or values for the WHO CF recommendations. Clearly, studies are needed to address the impact of WHO's CF guidelines. Additionally, most of the reviewed evidence were from developing countries in Asia and Africa, limiting the generalization of the findings to developed countries and calling for studies in other contexts.

8.3 Conclusions

Our qualitative systematic reviews of the impact of CF recommendations only confidently answered the question of barriers and enablers to the acceptability of dietary diversity recommendations. Acceptability barriers and enablers for RF and FMNP recommendations were of moderate confidence, while the same

for unhealthy foods and beverages, milk consumption guidelines were of low confidence. No studies were identified to answer preference and values, feasibility, and equity and right to food impact of DD recommendations; equity and right to food impact of FMNP, DD, RF and MC recommendations; preference and value, resource implications, feasibility of impact of MC recommendations; and resource implications, feasibility, use of UFB as treats to show love or fun, and whether children 6-23 months old have innate taste for salty or sweet foods and beverages. Studies should be commissioned to answer these questions.

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TABLE: APPENDIX 1 SEARCH TERMS ON PUBMED FOR RESPONSIVE FEEDING

1. FMNP	(((((fortified micronutrient products) OR (specialized food products)) OR (fortified complementary foods)) OR (micronutrient powders)) OR (small quantity lipid based nutrient supplements)
2. DD	(((((dietary diversity) OR (dietary quality)) OR (dietary diversity score)) OR (quality of food)) OR (diverse diets)) OR (diversification)) OR (food consumption score)
3. Unhealthy foods and snack	((((((((unhealthy foods) OR (beverages)) OR (ultra-processed foods)) OR (foods high in sugar)) OR (fat)) OR (salt)) OR (non-alcoholic sweeteners)) OR (non-alcoholic drinks)) OR (snacks)
4. Milk consumption	(((((milk consumption) OR (infant toddler formulas)) OR (fortified milk)) OR (low-fat milk)) OR (plant-based milk)
5. RF	((((((((responsive feeding) OR (feed slowly)) OR (feed patiently)) OR (feed favorite food)) OR (force feeding)) OR (punishing children)) OR (putting child to sleep)) OR (stopping feeding)
6. RF with limits	((((((((responsive feeding) OR (feed slowly)) OR (feed patiently)) OR (feed favorite food)) OR (force feeding)) OR (punishing children)) OR (putting child to sleep)) OR (stopping feeding) AND ((booksdocs[Filter] OR casereports[Filter] OR classicalarticle[Filter] OR clinicalstudy[Filter] OR clinicaltrial[Filter] OR comparativestudy[Filter] OR randomizedcontrolledtrial[Filter]) AND (humans[Filter]) AND (2000/1/1:2021/3/1[pdat]) AND (allinfant[Filter])))

12. RESULTS 11 AND 7	<p>(((((((unhealthy foods) OR (beverages)) OR (ultra-processed foods)) OR (foods high in sugar)) OR (fat)) OR (salt)) OR (non-alocoholic sweeteners)) OR (non-alcoholic drinks)) OR (snacks) AND ((booksdocs[Filter] OR casereports[Filter] OR classicalarticle[Filter] OR clinicalstudy[Filter] OR clinicaltrial[Filter] OR randomizedcontrolledtrial[Filter]) AND (humans[Filter]) AND (2000/1/1:2021/3/1[pdat]) AND (allinfant[Filter]))) AND (((((((((((((((((((((((((((((((((((((((values) OR (preferences)) OR (perceived importance)) OR (food interventions)) OR (food values)) OR (societal food values)) OR (resource implications)) OR (economic constraints)) OR (resource evaluation)) OR (cost)) OR (health rights)) OR (health equities)) OR (environment impact)) OR (right to food)) OR (food rights)) OR (barriers)) OR (feasibility)) OR (acceptability)) OR (innate taste)) OR (reward)) OR (fun)) OR (stress)) OR (treat)) OR (love)) OR (reward)) OR (emotion)) OR (inherent)) OR (born with)) OR (genetic)) OR (cost benefit analysis)) OR (economic implications)) OR (cost implications)) OR (definition of dietary diversity)) OR (description of dietary diversity)) OR (explanation of dietary diversity)) OR (health outcomes)) OR (impact on health)) OR (effect on health)) OR (benefit of dietary diversity)) OR (comparing cost of complementary feeding)) OR (cost of diverse complementary foods)) OR (cost of quality complementary food) AND (2000/1/1:2021/3/1[pdat]))</p>
13. FMNP keywords with restrictions	<p>(((((((fortified micronutrient products) OR (specialized food products)) OR (fortified complementary foods)) OR (micronutrient powders)) OR (small quantity lipid based nutrient supplements) AND ((booksdocs[Filter] OR casereports[Filter] OR classicalarticle[Filter] OR clinicalstudy[Filter] OR clinicaltrial[Filter] OR comparativestudy[Filter] OR randomizedcontrolledtrial[Filter])</p>

TABLE: APPENDIX 2 SOFT FOR UNHEALTHY FOODS AND BEVERAGES

	Author, year, location	Recruitment strategy	Sample size	Duration of study	Results
IMPACT ASSESSED: Acceptability Barriers and Enablers					
1.	Cartagena, D., McGrath, J. M., & Linares, A. M. (2018). USA	Cross-sectional study Convenience sampling	62	Not specified	The mean age of infants is 8.2 months. At 10 months of age about 50% of children had been introduced to sugar sweetened beverages including soda and desserts high in sugar and fat. Meal time television exposure associated with high consumption of age inappropriate foods such as fruit drink Fruit drink ($r = 0.55, p < 0.001$), sugar sweetened beverages and snacks ($r = 0.48, p < 0.005$) among 7- 9 months old infants
2.	Passanha, Benício & Venâncio (2021). Brazil	Cross-sectional study, Random sampling	14326	Not specified	The prevalence of the consumption of UPF was 71.5%. cookies, packaged snacks were among the UPF frequently consumed. Low maternal education was associated with increased consumption of UPF 1.25(1.17-1.33 $P < 0.001$). Infant born to multiparous mothers had higher consumption of UPF 1.05 (1.02-1.08). Maternal work status was not associated with UPF consumption.
3	Pries et al., 2019 Nepal	Cross sectional study Multi-stage cluster sampling	745	February to April 2017	Averagely, USFB contributed 24.5% TEI-NBF across all children, and 5.2%, 21.5%, and 46.9% TEI-NBF among the lowest, moderate, and highest tertiles of USFB consumption. Enabler and barriers <ol style="list-style-type: none"> 1. Both low and moderate USFB consumers were more likely to be from an upper caste/ethnicity as compared with high USFB consumers 2. Consumption of UFSF among children is higher in Buddhist than Hindu caregivers. 3. More children from lowest wealth quintile were high consumers 4. Less children whose caregivers had university education were high consumers
4.	Pries et al., 2017 Phnom Penh, Cambodia; Kathmandu Valley, Nepal; Dakar, Senegal; and Dar es Salaam, Tanzania	Cross-sectional, Random sampling proportional size	897	Not specified	Acceptability Infant formula was consumed by one fifth (20.2%) of children in Dakar and one third (29.3%) in Phnom Penh. Tea and/or coffee were also commonly consumed by children in Dar es Salaam and Kathmandu Valley

Commercial fruit drinks were consumed by one fifth of Dakar (21.6%) and Dar es Salaam (19.7%) children, chocolate-based or malt-based drinks were consumed by 16.2% of Kathmandu Valley and 11.7% of Phnom Penh children, and soft drinks were consumed by 9.6% and 11.6% of children 12–23 months of age in Dakar and Phnom Penh, respectively.

Consumption of commercially produced snack foods— including cakes or doughnuts, candies or chocolates, chips or crisps, and cookies or biscuits—was highly prevalent.

Among 12–23-month-olds, snack foods were the second most commonly consumed food group in Dakar, and third most common in Kathmandu Valley and Phnom Penh.

Primary reason reported among mothers was because the child liked the snack food.

Over one third of mothers in Kathmandu Valley reported feeding commercially produced cookies (40.4%), candies (33.8%), or cakes (34.4%)

Reasons for acceptability

1. Consumption of unhealthy beverages products increased with age across all sites.
2. Convenient food options, and one fifth (21.5%) of Phnom Penh mothers reported feeding cookies because they believed they were healthy for their child.
3. Few mothers reported the affordability of these products as the main reason for their use
4. Daily expenditure on commercially produced snack foods was minimal —\$0.003–0.18 in Dakar, \$0.02–0.09 in Dar es Salaam, \$0.05–0.09 in Kathmandu Valley, and \$0.08–0.32 in Phnom Penh.
5. Valley, maternal educational attainment was negatively associated with commercial snack food consumption among children
6. In Dakar and Kathmandu, the odds of commercially produced snack food consumption were lower if their mother had attended university and had no formal education.
7. A negative association between wealth status and snack consumption was found in Phnom Penh

PREFERENCES AND VALUES

3	Pries et al., 2017 Phnom Penh, Cambodia; Kathmandu Valley, Nepal; Dakar, Senegal; and Dar es Salaam, Tanzania	Cross-sectional, Random sampling proportional size	897	Not specified	Child preference was also noted by the sizable proportion of mothers in Dakar, Dar es Salaam, and Phnom Penh who reported feeding commercially produced snack foods because their child demanded or cried for the products.
4.	Alissa M. Pries, Nisha Sharma, Atul Upadhyay, Andrea M. Rehman, Suzanne Filteau, Elaine L. Ferguson, 2019 Kathmadu Valleu, Nepal	Multi-stage sampling	745	N/A	Poorer caregivers choose unhealthy foods more. Female children had %TEI-NBF from unhealthy. More educated and upper caste/class caregivers are less likely to feed their children unhealthy foods.
5.	Wrottesley et al. (2020) South Africa	Random sampling	19	Not reported	Many feeding their children unhealthy foods and snacks, including crisps, sweets and lollipops, biscuits and juice, and other sugar-sweetened fizzy drinks believed that all children liked and needed small amounts of these foods.

TABLE: APPENDIX 3 SUMMARY OF FINDINGS TABLE FOR RESPONSIVE FEEDING

	Author, year and country	Recruitment strategy	Sample size	Duration of study	Results
Acceptability					
6.	Arhavale et al., (2020) India	Purposive sampling	27	November 2019- January 2020	<p>BARRIERS Lack of knowledge and experience IYCF recommendations Mothers reported receiving conflicting information from multiple sources: family, neighbours, etc. Limited social support from family members and low self-efficacy</p> <p>ENABLERS Professional nutrition guidance Personal self-efficacy and empowerment Family support</p>
7.	Klerk et al. (2021) Spain	Random sampling	630	Autumn 2014	<p>Acceptability of RF recommendations or that it has any impact: The parents neither agreed nor disagreed</p> <p>Parents accept RF recommendations but feel they must apply pressure for else the children won't eat.</p>
8.	Wrottesley et al. (2020) South Africa	Random sampling	19	Not reported	<p>Mothers' believe that what babies eat is important for their health and that an unwillingness to eat is a sign of ill health. As such, mothers often force-fed their babies.</p> <p>Mothers are pressured to force feed, else children will not eat</p>
9.	Kumwenda (2016) Malawi	Stratified random sampling Purposive sampling	382	January – February 2016	<p>Cultural beliefs that child feeding is feminine and heavy workload for mothers at home Financial constraint. Family members influence Limited knowledge on IYCF.</p>

10	Mulenga, Amukugo and Shilunga (2018) Namibia	purposive sampling	15	Not reported	Lack and poor access to adequate information related to infant nutrition and feeding practices
11	Davis et al. (2017) Ghana	Purposive sampling	41	June 2015	Cultural beliefs Poverty Poor knowledge wrong attitude
Preference and values					
12	Inbaraj et al., (2020) India	Convenient sampling	210	September 2016 - March 2018.	Majority of the fathers (36%) practiced an uninvolved style of feeding (that is; low responsiveness, low demandingness) their children. About 29.5% of the fathers used an authoritative style of feeding (ie: high responsiveness, high demandingness) their children.
13	Wondafrash, Amsalu and Woldie (2012) Ethiopia	Multistage stratified sampling and simple random sampling	764	January 2009	The majority (75.7%) of caregivers used a responsive feeding style to feed their children, 12.8% used a controlling style of feeding and 11.5% used a "laissez-faire" style of feeding. Caregivers other than the biological mother highly practiced a laissez-faire feeding style, while rural caregivers were more responsive. Caregivers who frequently breastfed more than eight times were more likely to practice both laissez-faire (RRR = 1.88; 95% CI = 1.03-3.41) and controlling (RRR = 1.7; 95%CI = 1.02-2.85) feeding styles as compared to responsive feeding.
14	Aboud, Shafique and Akhter (2009) Bangladesh	Random sampling	203	April and December 2007	Responsive feeding lessons led to: More child self-feeding. increased mothers' verbal responsiveness (d = 0.36) than control children. lowered child refusals to eat Non responsiveness declined

15	Boucheron et al. (2020) India	Cluster sampling and random sampling	857		High acceptability and preference for verbally encouraged the child to eat (95%), interacting socially (93%) and giving full attention to the child (96%) Responsive feeding is socially accepted and preferred Some carers prefer during feeding. "laissez-faire" feeding style; Harshness (2%) and force-feeding behaviours (2%) less preferred
Resource Implications					
10	Mulenga, Amukugo and Shilunga (2018) Namibia	purposive sampling	15	Not reported	1. Lack of information from health workers relating to child feeding practices. 2. Access to information: participants not given any health education by the health workers related to child feeding practices.
11	Davis et al. (2017) Ghana	Purposive sampling	14	June 2015	1. Nurses knowledge on RF adequate: reported knowledge on responsive feeding were; give child attention (39%), play with child (56%), and encouraging words to child (2%)
8	Wrottesley et al. (2020) South Africa	Random sampling	19	Not reported	Support and capacity implications: 5. The mothers showed limited support from nurses in teaching them Infant's feeding style.
Feasibility					
16	Tovar et al. (2016) USA	Not reported	48	Not reported	Refusal or acceptance of children to eat drives leads to responses which could be coercive controlling, a mixture of force and/or praise Mothers may not practice RF because they are not sure how much is enough for the children

17	Mwase et al. (2016) Kenya	Purposive sampling	33	June - July 2014	If parents have other children, they will not spend a lot of time on one child who refuses to do it. Feasibility issues become important with mothers who have many children to feed.
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APPENDIX 4 SUMMARY OF FINDINGS TABLE FOR MILK CONSUMPTION

Acceptability/Barriers				
Author, year and country	Study design	Sample size	Study duration	Findings
18. Choudhurya and Headey, 2018 Bangladesh	Repeated cross-sectional experimental design. Recruitment strategy not specified	11796 households	3 years	Household diary production is positively associated with child's milk consumption.
19. Baek and Chitekwe, 2019 Nepal	Secondary analysis of the national demographic and health survey data	1497 children; Boys- 809 Girls- 688	Not specified	Age of the child, gender, mother's education, the wealth quintile, ecological region, and caste/ethnic groups significantly associated with milk consumption. The odds of not consuming dairy products was higher among children aged 6–11 months as compared to those aged 18–23 months (adjusted OR = 1.79; 95% CI 1.28, 2.49). Children in the fourth quintile (adjusted OR = 1.76; 95% CI 1.01, 3.07), middle quintile (adjusted OR = 2.43; 95% CI 1.40, 4.21), second quintile (adjusted OR = 3.16; 95% CI 1.70, 5.88), and poorest quintile (adjusted OR = 2.47; 95% CI 1.27, 4.81) had higher odds of not consuming dairy products compared to those in the richest quintile.

20. Haileselassie et al., (2020). Ethiopia	Exploratory qualitative study, purposive sampling	80	Three months	Thus, milk was not available all year round at home or in the nearby local market.
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TABLE: APPENDIX 5 SUMMARY OF FINDINGS TABLE FOR FMNP

Acceptability barriers and enablers				
21. Borg et al. (2018) Cambodia	Random sampling	92 caregiver-child pairs	2 weeks June-July 2015	<p>The unadjusted odds of children consuming more than 50% of borbor fortified with MNP were higher than the odds of them consuming more than 50% of RUSF snack, RUSF with borbor or CSB++ (OR = 6.79; 95% CI = 2.80-16.47; p < 0.001; OR = 3.91; 95% CI = 1.71-8.96; p = 0.001; OR = 3.59; 95% CI = 1.58-8.16; p = 0.002, respectively). Added benefit of the FMNP such improvement of child's appetite, weight gain, quality of sensory analysis influenced acceptance</p> <p>The results for the adjusted model were very similar, with the odds of children consuming more than 50% of borbor fortified with MNP being higher than the odds of them consuming more than 50% of any of the other foods.</p>
22. Young et al. (2017). India	Random sampling	Baseline (N = 100),	2.5 months	<p>The majority of mothers reported that their children consumed the iron product in the past month and expressed interest in continuing to use the product in the future (91-100%). Enablers were regular visits of ASHA to households, health benefits and increased appetite: increased energy (82-88%) and weight gain.</p>
23. Phuka et al. (2011) Malawi	Phase 1- Purposeful sampling Phase 2- Random	Phase 1=18. Phase 2:48	April-May 2009.	<p>The three new lipid-based nutrient supplements were largely accepted by the caregivers and their children.</p> <p>The acceptability test scores were; 88% for LNS-10gM, 90% for LNS-20gM, 87% for LNS-20gNoM, and 86% for Nutributter. Likewise, that reported for Nutributter was 5.</p> <p>The caregivers also gave a high liking score for all test foods themselves.</p> <p>At the end of the intervention, the whole ration had been finished in all but one household. In an interview concerning the latter supplementation week, caregivers reported that few infants had difficulties in eating LNS, and that they usually finished the whole LNS ration offered to them. The focus group participants found LNS very acceptable also from the point of preparing the meal.</p>
24. Hess et al. (2011). Burkina Faso	Random sampling	108	2 weeks	<p>The LNS products were well appreciated by the mothers and children during the sensory trials and the 2-week home feeding trial.</p> <p>The focus group discussions confirmed that LNS (locally called 'fanga deguè') was well accepted. Several mothers reported that LNS increased their child's appetite and many reported that their child 'had more energy' and 'was more joyous' than prior to the 2-week feeding trial. Although the majority of mothers experienced LNS as beneficial for their children, a few mothers did associate LNS with diarrhoea and a lack of appetite.</p>

25. Goyena et al. (2019). Philippines	Random sampling intervention	144	February to September 2017	<p>The overall compliance to MNP consumption was 74.7% which was lower than the set accepted rate of 80%. On average, each mother reported her child disliking MNP 2 to 3 times due to its after-taste and rusty smell.</p> <p>During the follow-up visits, mothers reported that their children dislike the taste of MNP. Most mothers/caregivers (n 1/4 10) who withdrew from the study justified their decision based on their children's dislike of the supplement. They grew worried since their children were no longer eating any food, even those without MNP. The children seemed to have associated the taste of MNP with all other food, causing the mothers to fear health consequences for their child if they insist on feeding food mixed with MNP.</p>
26. Roschnik et al. (2019). Mali	Random sampling	A total of 1,072 children and their caregivers were surveyed in 2014, and 1,148 caregivers were surveyed in 2016.	2014-2016	<p>Almost all mothers interviewed had found it easy to give the MNP to their child. Enablers were: perceived positive changes in the children following MNP use, the selection of a food vehicle that was already commonly given to children (morning porridge or bouillie) and the community driven, decentralized and integrated delivery approach, verbal encouragement by mothers, easy to use, health benefit; healthy growth, weight gain. Negative effects mentioned were few and included diarrhoea; the child became ill, constipated, or got nausea/vomiting; and the child's stools became black. Over 94% of the parents reported that their child liked the food with the MNP added, and 98% of parents said they would like to give their child MNP again.</p>
27. Angdembe et al. (2015) Bangladesh	one stage cluster sampling technique	78	Nov-12	<p>Among children aged 6-23 months, the mean acceptance rate was 72%, and was influenced by color, flavor, texture, smell of MMNP. None of the mothers reported any barriers to using MMNP.</p>
28. Adejugbabe et al. (2019) Nigeria	multistage sampling method	218	August, 2018	<p>One hundred and thirty-five (61.9%) of the respondents reported using MNP as food fortification for their index child. Among those 83 (38.1%) that reported not to be using MNP, 38 (45.8%) reported that MNP makes their child be sick followed by it makes them spend more money on feeding [19 (22.9%)]. Enablement of FMNP acceptability was: knowledge of complementary feeding influenced respondent's compliance with the use of MNP. More respondents with good knowledge of complementary feeding (87.5%) use MNP compared to those with bad knowledge (58.8%) (p= 0.006).</p>
29. Leyvraz et al. (2018). Kenya	Stratified sampling method	618	Not reported	<p>Effective coverage (ie, the child had been given the MNP at least 3 times in the previous 7 days) was 5.8%. Only 11.7% of the caregivers of children who had ever been given MNP reported that they liked MNP as it improved the appetite of their child, while 6.6% reported MNP was good for the health of their child. The main potential barriers to optimal coverage that were identified included perception that the MNP does not bring any added benefits (19.4%), incorrect preparation of the MNP (10.4%), and unavailability (3.1%).</p>

30. Jefferds et al. (2010). Kenya	Purposeful sampling	102	4 weeks	Almost all the participants' immediate reactions to Sprinkles were positive and accepted it because of the taste of sprinkles. Potential barriers identified were lack of knowledge of and experience with Sprinkles, availability of Sprinkles, and cost.
31. Adu-Afarwuah et al. (2008). Ghana	community-based randomized trial	Intervention sample size for the various MNP: SP= 105. NT=105 NB=103. Non-intervention group= 96	February 2004 to June 2005	Nearly all mothers liked giving the supplements to their children and believed that consumption of the supplements benefited their children's health; and 89-99% said that they would be willing to pay greater or equal to \$0.36 for a week's supply. Health benefit of MNP was an enabler. Cost was not a barrier to acceptability
32. Timalsina et al. (2020). Nepal	Random sampling	200	February-March, 2020	About two in three mothers (66.45%) did not accept the organoleptic properties of MNP. For 4 in 5 mothers (82.58%), there was regular availability of MNP, but 1 in 5 mothers (17.42%) there was no regular availability of MNP. A higher adherence with MNP was observed among mothers having one child less than five years of age as compared to mothers who did not have any child of 23-59 months of age, though the statistical significance was borderline (COR=0.5, 95% CI: 0.25-1.00).
33. D'Agostino et al. (2019) Uganda	two-stage cluster-sampling strategy	1,060	February 2016 to November 2016	Social discouragement (husband disapproval) and advocacy facilitated use. Forgetting to give MNP was a barrier. Counselling, receipt of communication materials, perceived positive effects, MNP knowledge, and child liking MNP were enablers of MNP acceptability
34. Kyei-Arthur et al. (2020) Ghana	Qualitative cross-sectional study with purposive sampling	142	November to December 2019	In general, caregivers reported that they accept the MNP for their children because they believe this supplement has health benefits including: weight gain; lower frequency of illnesses (e.g. diarrhea); increased appetite (in a positive sense), strength and energy; more regular bowel movements; and being able to walk independently relatively early compared with other siblings. Barrier for acceptance: Perceived side-effects of MNP consumption.
35. Kejo et al. (2018) Tanzania	Random sampling	310	Not reported	There is a significant ($P < 0.01$) association of willing to pay for MNPs and mothers' age. Cost of MNP was not a barrier to MNP acceptability.

36. Ford et al. (2019) Uganda	multistage cluster sampling design,	683 children	June–July 2016	<p>The percentage of caregivers reporting they perceived MNP was easy or very easy to obtain was significantly higher among children with high coverage (89.3%, 95% CI [85.8, 92.8] vs. 82.5%, 95% CI [78.4, 86.6]) and recent intake (89.5%, 95% CI [86.3, 92.7] vs. 80.9%, 95% CI [76.5, 85.4]) relative to those with low coverage and no recent intake, respectively. Enablement of MNP acceptance was; added health benefits including decreased sickness and improved growth, knowing how to get information about how to resolve side effects.</p> <p>Barrier: changes in organoleptic of food mixed with MNP reduced acceptance</p>
37. Tumilowicz et al. (2019). Ethiopia	Multistage cluster sampling design with proportion to size	1916	May 2016 and until May 2017,	<p>The most frequently cited reasons for not having recently fed Desta were the caregiver finished the supply and did not obtain additional supply (36.1%), perceived child rejection of food mixed with Desta (22.9%) and perceived negative side effects as a result of feeding Desta (9.1%)</p>
38. Weber et al. (2016). Ethiopia, Ghana, Pakistan, India	Random sampling	200 identified MAM for enrollment, 195 completed acceptability study	December 2014 to May 2015,	<p>Local RUTF was accepted among infants. In Ethiopia, Ghana and India, the local RUTF was tolerated well without increased reports of rash, diarrhoea or vomiting. In Pakistan, local RUTF was consumed in similar quantities, but mothers perceived that children did not enjoy it as much as standard RUTF. Consumption of either local or standard RUTFs ranged from 82% to 93%. children consumed each RUTF for a week; for therapy, they would be offered the RUTF for 6weeks on average. Overall, the results demonstrate the acceptance of alternative RUTFs.</p>
39. Luel-Brockdorf et al. (2015). Burkina Faso	Blocked randomization and convenience sampling	180	January–February 2013	<p>Majority of caretakers estimated to have half or less of the ration served left following the observed test meal in all groups. The results suggest that both LNS and CSB products with different quantities of milk and qualities of soy are equally well accepted among healthy children in rural Burkina Faso. However, after the take home ration, 58% of participants receiving CSB reported having left-overs at the end of the day compared to 37% (n = 33) of the participants receiving LNS (p = 0.004), suggesting that CSB was not as readily consumed as LNS. Also, all supplemented foods received good ratings in terms of the perceived appreciation by the children and on organoleptic properties and there was no significant difference between the foods.</p>

40. Wu et al. (2017). China	Two-stage cluster sampling	Baseline, N= 1804, Mini 1, N= 494, Midterm follow-up, N= 2187, Mini 2, N= 504, Endline, N= 2186	August 2012 - August 2014	<p>High adherence/acceptability to YYB increased from 49.4% in the first follow-up survey to 81.4% in the last follow-up survey (P < 0.0001). More than 80% of children ever took YYB.</p> <p>Barrier was unplanned YYB stock out decreased adherence in follow-up. Self-reported acceptability increased from 43.2% to 71.8%, partly due to improving the taste of YYB, which was the main reason that children liked taking YYB.</p> <p>Caregivers mainly knew about YYB through their village doctors.</p> <p>Repeated training sessions with village doctors to educate mothers on YYB, improved taste of YYB were enablers.</p>
41. Adu-Afarwuah et al. (2011) Ghana	random sampling	46	Jun-09	The infants/mothers accepted the LNS, as mothers rated likeness to 81%, and this was influenced by sensory quality of LNS. The 95% CI of the mean proportion of the koko + LNS-20gM mixture consumed by infants was 65.4%–87.0%. The 95% CI of the mean proportion of the koko+Nutributter mixture consumed by infants was 60.4%–81.9%. This means that infants accepted the food supplements given. Except for three mothers who said their infants had diarrhoea because of the supplement, most mothers did not think their infants had any problems after consuming the supplement.
42. Ahmed et al. (2017). Bangladesh	simple random sampling	90	Not reported	The two RUCFs were well accepted. Health benefits, sensory taste, aroma, flavour influenced acceptability.
43. Kodish et al. (2016). Malawi and Mozambique	two-tiered sampling strategy	Multiple methods, including in-depth interviews (n = 38), direct meal observations (n = 80), full-day child observations (n = 38) and spot checks of SQ-LNS supply (n = 23), were conducted with households (n = 35 in Malawi; n = 24 in Mozambique)	February to May 2013 in Ntchisi District, Malawi and from May to August 2013 in seven districts of Cabo Delgado Province, Mozambique.	Seasonal influences on household food security affected utilization of LNS as mothers shared during the rainy season.

44. Locks et al. (2017). Madagascar	Stratified multistage sampling /probability proportional to size	The baseline and endline surveys included 372 and 475 children	October-November 2012 and after implementation in April 2014	The study found that 48.7% had consumed the MNP. The following were enablers to consumption of MNP: mothers attending community health worker-infant young child feeding (CHW-IYCF) meeting, and mothers regular exposure to radio messages on IYCF-MNP, mothers confidence in her ability to explain MNP benefits, identification of her CHW as the primarily source to obtain MNP, and her perception that other mothers in the community .
Cost implications				
45. Ahmed et al. (2021). Bangladesh		144	May to July 2016	The cost of producing home fortified micronutrient products is high. The home fortification programme had an estimated total start-up cost of 35.46 million BDT (456 thousand USD) and implementation cost of 1111.63 million BDT (14.12 million USD). The highest cost for implementation was associated with the activities related to home visits (708.40 million BDT or 9.00 million USD). Social mobilisation, monthly meetings, special refresher training and upazila office maintenance cost were estimated to be 283.06 million BDT or 3.59 million USD. The head office-level cost in the implementation period was estimated to be 120.16 million BDT or 1.52 million USD. Considering per capita gross domestic product (1516.5 USD) as the cost-effectiveness threshold, the home fortification programme was highly cost-effective.
Resource implications				
46. Sarma et al. (2016). Bangladesh	purposively	33	March to June 2014	The use of health workers to promote FMNP called Pushikona in the community motivated the caregivers to feed Pushtikona to their children.
47. Hoddinott et al. (2018)	Random sampling	North RCT: Baseline=2498 Endline=2408 South RCT: Baseline=2494 Endline =2434	March 2012 and May 2014	Resources contributing to multiple micronutrient powder (MMP) acceptance was cash transfer and nutrition behaviour change communication (BCC) provided to caregivers. Mothers in the cash transfer and nutrition behaviour change communication group were more likely to give MMP to their children in the preceding week compared to those in other groups (cash + food ration, food ration + BCC, control group). Also, a transfer accompanied by nutrition BCC increased the mothers awareness of MMP.
Feasibility				

48 .Nguyen et al. (2016) Vietnam	A stratified multistage cluster and simple sampling	1,082	June 2014 - December 2014	The overall effective coverage (consumption of 3 schets/week) of the MNP project was 11.5% among the caregivers (and 27.3% among the ones who had visited the health center in the 30 days prior to the survey), which was higher than the initial projection of 8 percent effective coverage .The MNP coverage survey during the pilot implementation showed MNP project was very feasible and that caregivers (30.1%) had ever heard about MNP (Bibomix), 22.6% of them had ever given the product to their child, 21.7% of them had given some of it to their child (at least one sachet per week), and 11.5% used the product effectively.
49. Adams et al, 2017, Ghana and Malawi	Randomized sampling	1320-Ghana 1391-Malawi	2009-2012	In the child period in Ghana, WTP for SQ-LNS for the infant, both for a day's supply and in the long term, was lower among mothers compared to heads of household (Table 4). The association with household food insecurity was negative and significant. Finally, WTP was, on average, approximately \$0.09 higher (p = .004) for male children than for female children, and WTP in the long term was approximately \$0.05 higher (p = .01) for male children than for female children. None of the child morbidity variables were systematically associated with WTP in Ghana nor were the measures of child nutritional status (length-for-age z- score (LAZ) and weight-for-length z-score (WLZ)). In Malawi, the association between months from the birth of the infant and WTP was negative and significant (p < .001). There was a positive and significant (p = .01) association between WTP for a day's supply of SQ-LNS for the child and the asset index and a negative association (p = .01) between household food insecurity and WTP. If the infant was reported to be generally ill at least once during the ref- erence period before WTP data collection, WTP for a day's supply of SQ-LNS was, on average, approximately \$0.06 higher (p = .01), while infant with diarrhoea was associated with a \$0.05 lower (p = .04) WTP
Values and preferences				
50. Flax et al. (2009). Malawi	Random sampling	522	Study 1 (March–July 2005); Study 2 (January–May 2007); and Study 3 (November 2007–April 2008)	When mothers mentioned that the child liked the product. Mothers in the CSB group who disliked something about the supplement raised issues such as CSB does not have enough sugar or it is difficult to cook, whereas mothers in the LNS group most often said that LNS contained too sweetness of the food (CSB 32%, LNS 34%), that the supplement improved the child's health or growth (CSB 17%, LNS 19%), or that the child liked eating the supplement much sugar or they disliked the taste of the cooking oil in it. A small proportion of mothers in each group (12%) named something they disliked about the supplements. They most frequently said there were problems with the contents or preparation of supplements.

51. Ashorn et al. (2015). Malawi	Random sampling intervention	1920	November 2009 and May 2011	The mothers revealed children preferred the LNS. Mothers preferred LNS because they did not have to cook porridge and the child could eat the LNS straight from the cup. Mothers also emphasized the perceived positive effects of LNSs on child health and development: they felt the LNSs made the children “grow fat” and strong and stay healthy and happy.
52. Gunaratna et al. (2015) Ethiopia	Random sampling	61 mother-child pairs	Not reported	Linear regression of mothers’ and children’s overall scores on mothers’ scores for specific sensory characteristics indicate that mothers’ overall scores were positively related to acceptability of aroma and taste (both $P < 0.01$), and children’s overall scores were additionally related to their mother’s score on appearance ($P < 0.01$). Although mothers scored both varieties similarly overall, when asked which variety they preferred, they were more than twice as likely to prefer the QPM variety (69% vs. 31%) compared to conventional maize variety.
53. Locks et al. (2019) Ethiopia	Population proportional to size sampling	2,578 mother-child pairs	January-February 2016	Among mothers who tried giving their child MNP, approximately half thought the child liked food with MNP, whereas half reported that their child was disturbed by a change of colour, taste, or smell of food.

Table: Appendix 6 Summary of findings table for DD

	Acceptability				
	Author /Country	Recruitment strategy	Sample size	Duration of study	Results
54	Sekartaji et al, (2021). Indonesia	A multistage (two stage) probability sampling	4861	2017	Lower educational level of mothers, poor socio-economic household, poor access to maternal information on either newspaper/magazine or television resulted in poorer dietary diversity. Mothers who had tertiary education (university) were 5.16 times more likely (AOR = 5.2; 95% CI = 2.1-12.9) to offer a diversified diet to their children compared to mothers who did not attend school. Mothers who had access to maternal information on mass media (reading newspapers or magazines (AOR = 1.3; 95% CI = 1.1-1.6) and watching television (AOR = 1.6; 95% CI = 1.1-2.3), and those from the richest wealth quintile (AOR = 1.9; 95% CI = 1.3-2.8) had increased odds of offering a diversified diet to their children aged 6-23 months in Indonesia.
55	Yesuf et al. (2021). Ethiopia	Two-stage-cluster sampling and simple random sampling	511	May 10 - 30, 2018	The odds of MDD among children aged 6-11 months was reduced by 45% (AOR = 0.6, 95%CI= 0.3, 0.9) compared to 18-23 months old children. The odds of minimum dietary diversity practice among women who have good knowledge towards dietary diversity was increased by 2.8 folds compared to those who had low knowledge about DD (AOR= 0.4, 95% CI= 0.2-0.6). Housewife women had higher odds (AOR = 2.4, 95%=1.-2 5.0) of providing minimum diversified food to their children compared to women who were self-employed. The odds of practicing minimum dietary diversity among Children whose fathers were government-employed had reduced odds (AOR = 0.5, 95% CI= 0.24-1.0) of being offered a diversified diet compared to children of self-employed fathers.
56	Sirait and Achadi (2020). Indonesia	Not reported	2769	Not reported	Children aged 18-23 months had 5.7 times higher odds of meeting the MDD compared to children aged 6-11 months and 1.3 times higher than children aged 12-17 months. 2. Children of wealthier household (3rd quintile and above) (OR= 1.5, p<0.001, 95%CI= 1.2-1.8), those delivered by trained health personnel (OR= 1.7, p=0.007, 95%CI= 1.2-2.4), children of higher mothers' education (OR= 1.3, p=0.007, 95%CI= 1.1-1.6), working mothers (OR= 1.2, p=0.019, 95%CI= 1.0-1.4), fathers' involved in child care (OR= 1.3, p=0.024, 95%CI= 1.0-1.6), and children whose parents reside in urban areas (OR= 1.3, p=0.006, 95%CI= 1.1-1.5) had an increased odds of achieving MDD.

57	Feleke and Mulaw (2020). Ethiopia	Multi-stage with stratified sampling	662	August 15 - Sep-15	Finding showed that maternal primary (Adjusted OR= 1.9; 95% CI: 1.2-3.2) and secondary education (AOR= 2.1, 95% CI= 1.1-3.8), media exposure (AOR= 2.2; 95% CI= 1.5-3.3), delivery at health facility, older children; 9-11months (AOR= 2.7; 95% CI: 1.4-5.5) and 12-23 months (AOR=2.5; 95% CI= 1.5-4.1) and GMP service utilization (AOR= 4.1; 95% CI: 2.5-6.6) were associated with MAD of children.
58	Aemro et al. (2013). Ethiopia	Stratified, two stage cluster sampling	2836	December 2010 - June 2011	Children aged 12–17 (OR = 0.3, 95% CI= 0.2- 0.5) and 18–23 months (OR = 0.2, 95% CI= 0.1- 0.3) were less likely to have inadequate dietary diversity compared to children aged 6–11 months old. Children of women with primary (OR = 0.3, 95% CI= 0.2- 0.4) and secondary education (OR= 0.3, 95%CI= 0.2-0.6) had reduced odds of having inadequate dietary diversity compared to those of parents with no formal education. Also, children from the richest households had 70% lower odds (OR = 0.3, 95% CI= 0.1- 0.5) to have inadequate dietary diversity compared with children from the poorest household.
59	Asfew (2017). Ethiopia	Multistage and simple random sampling	682	March 1- March 30, 2017	Children whose father had secondary education were over six times higher odds (AOR= 6.2, p<0.05, 95%CI= 1.2-25.2) of being offered adequate dietary diversity compared to those of fathers with college education. Mothers who perceived smaller baby size were more likely (AOR= 1.9, p<0.001, 95%CI= 1.3-2.9) to offer an adequate diversified diet to their children compared to those who perceived larger body size. Mothers who had information on breastfeeding were more likely (AOR= 3.6, p<0.01, 95%CI= 1.2-11.2) to provide a diversified diet compared to their counterpart. Mothers with 3-4 children had higher odds (AOR= 2.0, p<0.05, 95%CI= 1.2-3.5) of providing an adequate diversified diet to their children than those with ≥ 5 children.
60	Haruna Ghana (2018).	Purposive and simple random sampling	280	Not reported	Children aged 12-17 months had higher odds (AOR=2.7, 95% CI= 1.5-4.9, P=0.001) of meeting the MDD compared to 6-11 months children. Children whose mothers were employed had four times higher odds (AOR= 4.0, 95%CI= 1.7-9.6, P=0.002) of meeting MDD compared to those whose mothers were unemployed.
61	Kumar et al. (2015). Zambia	Not reported	3,040	Not reported	There was weak positive correlation between, number of field crops cultivated (r= 0.1, p= 0.008), number of agricultural activities (r= 0.1, p= 0.012), number of food groups produced (r= 0.1, p= 0.009), log of agricultural production (r = 0.016, p = 0.004), and log of agricultural income (r= 0.014, p = 0.003) and minimum dietary diversity.

62	Nkoka et al., (2018). Malawi	Multistage cluster sampling	4732	Not reported	<p>The 12–17 months (aOR= 1.9, 95%CI= 1.5-2.4) and 18–23 months old (aOR=2.3, 95%CI= 1.8- 2.9) had higher odds of receiving adequate MDD compared with the 6–11 months old children. A higher odds of receiving adequate MDD were observed among children whose mothers had primary education (aOR=1.6, 95%CI= 1.2 -2.3), secondary and post-secondary education (aOR=1.7, 95%CI= 1.1 -2.5) and were in non-agricultural employment (aOR= 1.8, 95%CI= 1.4-2.3) compared with children whose mothers had no formal education and were unemployed. A higher odds of achieving adequate MDD were found among children whose mothers were 25–34 years (aOR=1.5 , 95%CI=1.2-1.2) and 35–49 years of age (aOR=1.6, 95%CI= 1.1-2.3) compared with children whose mothers were younger than 25 years old. Compared with children whose mothers were not exposed to mass media, children whose mothers were exposed to mass media had an increased odds (aOR=1.4, 95%CI= 1.1-1.6) of receiving adequate MDD. Children who came from the wealthiest households (aOR=1.4, 95%CI= 1.1-1.7) and lived in the central region (aOR= 1.6, 95%CI= 1.1- 2.3) were more likely to receive adequate MDD compared with their respective counterparts.</p> <p>Children whose mothers' parity was 3 (aOR=0.7, 95%CI= 0.5-0.9) and ≥ 4 (aOR= 0.5, 95%CI= 0.4- 0.8) had reduced odds of achieving adequate MDD compared with children whose mother had only one child.</p>
63	Iqbal et al., (2017). Pakistan	Multistage cluster sampling and random sampling	1102	October, 2012 and March 2013	<p>The study revealed that children aged 12-17 months ($\beta = 0.56$, $p < 0.001$), children who were still breastfeeding ($\beta = -0.89$, $p < 0.001$), mothers' education up to primary level ($\beta = -0.68$, $p < 0.001$) and mothers who received information/services from LHWs on maternal and child health ($\beta = 0.57$, $p = 0.002$) were found to be statistically significant predictors of children's dietary diversity.</p>

64	Senarath et al. (2012). Sri Lanka	Stratified two-stage cluster sampling and systematic sampling	2106	Not reported	<p>The 12-17 months (AOR= 1.4, p=0.023, 95%CI= 1.1-1.8) and 6-11 months old (AOR= 4.7, p<0.001, 95%CI= 3.5-6.3) children and children with acute respiratory infection in the past two weeks (AOR= 2.1, p=0.007, 95%CI= 1.2-3.5) had higher odds of not meeting the MDD. Children of mothers with primary or no education (AOR= 1.5, p=0.009, 95%CI= 1.1-2.0) and secondary education(AOR= 2.0, p<0.001, 95%CI= 1.4-2.8), and children from the poorest(AOR= 2.1, p=0.001, 95%CI= 1.3-3.2), poorer household (AOR= 1.9, p=0.010, 95%CI= 1.2-3.0) were more likely to receive inadequate MDD compared to those whose mother had tertiary education.</p> <p>Children whose mothers had fewer postnatal visits; 1 time (AOR= 1.4, p=0.013, 95%CI= 1.1-1.9) and none (AOR= 1.6, p=0.007, 95%CI= 1.1-2.2) were more likely to receive inadequate MDD compared to those who attended ≥ 3.</p> <p>Children of working mothers had reduced odds (AOR= 0.7, p=0.040, 95%CI= 0.5-1.0) of providing inadequate MDD to their children compared to those of non-working mothers.</p> <p>Children of mothers with height of 150-155cm (AOR= 1.5, p=0.006, 95%CI= 1.1-1.9) were more likely to receive inadequate MDD compared with those whose mother's height is >155cm.</p>
65	Joshi et al. (2012). Nepal	Multi-stage sampling and systematic sampling with probability proportional to size.	1428	Not reported	<p>Children of mothers with no education (AOR= 1.9, p=0.001, 95%CI= 1.3-2.9), and working mothers (AOR= 1.5, p=0.014, 95%CI= 1.1-2.0) in past 12 months had higher odds of not meeting the MDD compared to those of mothers with secondary and higher education and non-working mothers.</p> <p>Children from the poorest (AOR= 2.9, p=0.001, 95%CI= 1.5-5.5), poorer (AOR= 2.9, p=0.001, 95%CI= 1.6-5.4), middle (AOR= 2.6, p=0.001, 95%CI= 1.5-4.7) and richer (AOR= 2.2, p=0.005, 95%CI= 1.3-3.8) households had higher odds of not meeting the MDD compared to those from the richest household.</p> <p>Children whose mothers had fewer antenatal visits; 1-3 times (AOR= 1.4, p=0.041, 95%CI= 1.0-1.9) and none (AOR= 1.7, p=0.0012, 95%CI= 1.1-2.5) were more likely to receive inadequate MDD compared to those who attended ≥ 4</p>

66	Bilal et al. (2016). Ethiopia	Systematic random sampling	850	2011	<p>In both rural (OR= 3.4, p<0.001, 95%CI: 2.2–5.4) and urban (OR= 2.6, p<0.001, 95%CI: 1.6–4.2) districts, children whose fathers had knowledge of the important things to keep the child healthy had higher odds of meeting DD.</p> <p>In both rural (OR= 5.3, p<0.001, 95% CI: 3.3–8.4) and urban (OR=8.4, p<0.001, 95%CI: 5.3–13.2) districts, the children whose fathers had a good knowledge of important food groups had higher odds of meeting DD.</p> <p>Fathers' knowledge of child care activities was significantly associated with minimum dietary diversity with OR of 4.6 (95%CI: 2.86–7.48, p<0.001) and 2.9 (95% CI: 1.94–4.29, p<0.001) in the urban and rural districts, respectively.</p> <p>Children whose fathers had a good practice of routine child care activities met the dietary diversity, with a reported OR of 2.3 (95%CI:1.5–3.6, p<0.05) and 1.7 (95% CI:1.1–2.8, p<0.05) in the urban and rural districts, respectively</p> <p>The fathers' provision of necessary things for child care was associated with meeting dietary diversity with OR of 3.4 (95% CI: 2.1–5.4, p<0.001) in urban district and 1.7 (95% CI: 1.1–2.8) in rural district. In urban districts, children whose fathers had a meaningful participation in child feeding activities had higher odds (OR= 3.4, p<0.05, 95% CI: 2.1–5.5) of meeting the DD, but this was not significant for the rural district.</p>
67	Issaka et al. (2015). Benin, Burkina Faso, Cote d'Ivoire, Guinea, Mali, Niger, Senegal,	Multi-stage cluster sampling	22,376	Not reported	<p>This finding showed that older children (12-23 months) were more likely to meet the minimum dietary diversity compared with their younger counterparts in all the seven francophone countries.</p> <p>Children in Benin (≥ 4 times; OR= 0.6, p=0.001, 95%CI= 0.4-0.8, 1-3 times; OR= 0.5, p<0.001, 95%CI= 0.4-0.7) whose mothers did make any antenatal clinic visits had reduced odds of not achieving the MDD.</p> <p>Children in Cote d'Ivoire, Niger and Senegal whose mothers had no schooling at all had a significantly higher risk of not meeting the MDD compared with those whose mothers attained secondary education or higher.</p> <p>The risk of not achieving the MDD was significantly higher among children born to illiterate mothers in Guinea. The odds of not meeting the MDD was significantly higher among children in Benin and Burkina Faso whose mothers did not have access to television or radio compared with those who had access to television and radio.</p>

68	Issaka et al. (2015). Ghana, Liberia, Nigeria and Sierra Leone	Multi-stage cluster sampling	12623	Not reported	<p>Children in the youngest age bracket (6–11 months) were more likely to have inadequate dietary diversity in all the four countries. Children from poor households were found to be significantly associated with inadequate dietary diversity in Ghana and Nigeria. In Nigeria and Sierra Leone, poor dietary diversity was found to be significantly associated with children whose mothers had no education, whilst, in contrast, children whose fathers had only primary education in Liberia posed risk to meeting the MDD. In Sierra Leone, father’s education was found to be significant when it replaced mother’s education in the final model (OR = 0.6; 95% CI: 0.5-0.9) for secondary education or higher). Other factors found to be significantly associated with inadequate dietary diversity were: children whose mothers perceived them to be small in size at birth and those who were delivered at home (Ghana), children who had acute respiratory infection in the previous 2 weeks and whose fathers worked in a non-agricultural industry (Liberia), rural children who did not contract diarrhea in the past 2 weeks and whose mothers had limited or no access to the newspaper/magazine (Nigeria) and children who did not contract fever in the past 2 weeks, whose mothers were non-Muslim, unemployed and had limited or no access to the radio(Sierra Leone).</p>
69	Na et al. (2018). Nepal	Multi- cluster and systematic sampling	1885	Not reported	<p>Children aged 12-17 months (OR= 3.6, p<0.001, 95%CI= 3.0-4.5), and 18-23 months (OR= 4.4, p<0.001, 95%CI= 3.6-5.5) had higher odds of meeting MDD compared with those aged 6-11 months old. Children of younger mothers had reduced odds (OR= 0.7, p=0.05, 95%CI= 0.6-1.0) of providing adequate DD to children compared to those aged 25-34 years. Children of mothers with fewer ANC visits; 1-3 times (OR= 0.8, p=0.01, 95%CI= 0.6-0.9), and none (OR= 0.6, p=0.001, 95%CI= 0.4-0.8) had reduced odds of providing adequate DD to child compared with those whose mother had ≥4 visits. Children of mothers with secondary or higher education had higher odds (OR= 2.4, p<0.001, 95%CI= 0.9-3.0) of providing adequate DD to children compared with those whose mother had no education.</p> <p>Perception Mothers who perceived birth weight of child to be smaller than average had reduced odds (OR= 0.8, p=0.04, 95%CI= 0.6-1.0) of offering adequate MDD to child compared to those who perceived average birth weight of child.</p>

70	Gezahegn and Tegegne Ethiopia (2020).	systematic random sampling	503	April to May 2018	Children of mothers who attended GMP programme (adjusted OR= 1.5, p<0.05, 95%CI= 1.0-2.2) and postnatal clinic check-up (adjusted OR= 1.9, p<0.001, 95%CI= 1.3-2.8) had higher odds of offering diversified diet to their children compared to those whose mothers did not attend GMP and PNC check-up.
71	Duan et al. (2018). China	Multi-stage stratified cluster random sampling	14,458	2013	<p>Children living in urban-metropolis (AOR= 2.5, p<0.001, 95%CI=1.4-4.5), small cities (AOR= 2.3, p<0.001, 95%CI= 1.3-4.1), rural-general areas (AOR= 1.1, p<0.001, 95%CI= 0.6-1.9), had higher odds of consuming diverse diet compared with those living in poor rural areas.</p> <p>Children whose mothers were younger than 24 years old had 27% less odds (AOR= 0.73, p=0.001, 95%CI= 0.6-0.9) of consuming a diverse diet compared to those children whose mothers were older than 30 years old.</p> <p>Children of migrant mothers had higher odds (AOR= 1.6, p<0.001, 95%CI= 1.3-2.1) of consuming a diversified diet compared with those children of mothers living at home.</p> <p>Children had 39% less odds ((AOR= 0.6, p<0.001, 95%CI= 0.5-0.7) of consuming a diverse diet for maternal education up to Junior high school or below compared to those of maternal education up to secondary or higher.</p> <p>Children from households with higher income (10,000–19,999 Chinese Yuan (CNY) and $\geq 20,000$ CNY) had 1.65 and 1.63 times odds of consuming a diverse diet than those from households with annual income less than 10,000 CNY per capita (p=0.010).</p>
72	Anane et al. (2021). Ghana	Multi-stage Cluster sampling	887	Not reported	<p>Children from the wealthiest households had higher odds (AOR=2.5, 95%CI= 1.1–5.9) of consuming adequate dietary diversity, compared to children from the poorest households.</p> <p>Children who had mothers with tertiary education had higher odds (AOR= 2.2, 95% CI= 0.8–5.9) of consuming adequate dietary diversity compared with children whose mothers had no education.</p> <p>Children from regions, particularly Greater Accra, Western, Bono-Ahafo, and Central region, had higher odds of consuming an adequate dietary diversity than their counterparts from the Volta, Eastern, and Ashanti regions.</p>

73	Abera et al. (2019). Ethiopia	Convenient sampling	1525	2015	<p>Children from the wealthiest (OR = 2.6, p<0.001, 95%CI= 1.5–4.3) and wealthy households (OR = 3.1, p<0.001, 95%CI= 1.9–5.0) had higher odds of consuming an adequate diverse diet compared to children from poorest households.</p> <p>Children living in highlanders compared to lowlanders showed a 0.23 (OR = 0.23, p<0.001, 95%CI=0.1–0.6) times reduced odds of consuming a high vs the combined medium and low dietary diversity.</p> <p>The odds of the combined high and moderate dietary diversity vs low dietary diversity was 1.2 (OR = 1.17, p<0.001, 95%CI= 0.7–1.8) times higher for highlanders as compared to lowlanders.</p>
74	Ogbo et al., (2018). Tanzania	Stratified two-stage cluster	7705	Not reported	<p>Children whose mothers were working had higher odds (AOR= 1.2, p=0.029, 95%CI= 1.0-1.5) of consuming an adequate diverse diet compared to those children whose mothers were unemployed.</p> <p>Children who had mothers with primary education (AOR= 1.3, p= 0.007, 95% CI= 1.1–1.5) and secondary or higher education (AOR= 1.6, p=0.002, 95% CI= 1.2–2.1) had increased odds of consuming adequate diverse diet compared with children whose mothers had no education.</p> <p>Children who had fathers with secondary or higher education (AOR=1.4, p= 0.029, 95%CI= 1.0–1.8) had increased odds of consuming an adequate diverse diet compared with children whose mothers had no education.</p> <p>Children from the richest (AOR=3.2, p< 0.001, 95%CI= 2.5–4.1) and middle-rich households (AOR=1.4, p<0.001, 95%CI= 1.2–1.6) had higher odds of being offered adequate MDD compared to children from the poorest households.</p> <p>Children born in a health facility had higher odds (AOR=1.7, p<0.001, 95%CI= 1.3–2.3) of being offered adequate MDD compared to children born at home.</p>

75	Dhami et al., (2019). India	A two-stage cluster sampling	69,464	Not reported	<p>In the Northern, Western, Central and North Eastern regions of India, children whose mothers came from the richest households had higher odds of achieving MDD compared with those from the regions from the poorest households.</p> <p>Children of mothers from the Northern and Central regions who had secondary and higher education were more likely to achieve the MDD compared with children of mothers with no education.</p> <p>Mothers from the Northern and Central regions who were aged 35–49 years had higher odds of having children who met MDD compared with their counterparts.</p> <p>Mothers from the Southern region who had power over earnings and household purchases were more likely to have children who achieved MDD compared with their counterparts in other regions.</p> <p>Mothers who had ≥ 4 ANC attendances in the Eastern region were more likely to have children who met the MDD compared with those who had no ANC attendance.</p>
76	Kumera et al. (2018). Ethiopia	Systematic random sampling	967	March-April 2016	<p>Mothers with unsatisfactory exposure to media (AOR = 5.2, $p= 0.001$, 95%CI= 3.3-8.3) and low household monthly income (AOR = 2.2, $p=0.001$, 95%CI= 1.4-3.5) were more like to have children who did not meet DD compared to their counterparts.</p> <p>As compared to economic related reasons, mothers/caregivers who do not feed diet of animal origin to their children due to fasting status were 1.5 times (AOR=1.5, $p=0.002$, 95%CI=1.1 – 2.5) less likely to provide the minimum dietary diversity.</p>
77	Tegegne et al. (2017). Ethiopia	Multi-stage sampling, purposive and systematic sampling	801	January-June 2016	<p>Minimum dietary diversity practice of mothers was 48% times less likely (AOR = 0.52, $p<0.05$, 95%CI: 0.28–0.94) among illiterate mothers compared to mothers with formal education .</p> <p>A child's history of illness in the week preceding the interview decreased the practice of minimum dietary diversity scores by 56% times [AOR =0.44, $p<0.05$, 95%CI: 0.26–0.73]</p> <p>Children whose mothers were counselled on IYCF practice during PNC visits had higher odds (AOR =2.6, $p<0.05$, 95%CI: 1.6–4.5) of meeting MDD compared with those who did not receive counselling on IYCF.</p>

78	Temesgen et al. (2018). Ethiopia	Random sampling	740	February 16 to March 10, 2016	Factors such as mother's access to media sources at household (Adjusted Odds Ratio (AOR) = 2.8, 95%CI=1.7-4.7), availability of cow milk in the household (AOR = 2.4, 95%CI= 1.3-4.4), women's involvement in decision-making at household level (AOR = 2.1, 95%CI= 1.0-4.2), health facility delivery (AOR = 2.4, 95%CI=1.2-4.7), receiving assisted delivery service (AOR = 2.4, 95%CI=1.1-4.9), receiving postnatal care (AOR = 2.1, 95%CI= 1.2-3.6), residence distance far from the health center (AOR = 3.1, 95%CI=1.7-5.8) and providing meal frequency ≥ 4 (AOR = 3.3, 95%CI= 1.5-7.2) were associated with children receiving the minimum dietary diversity.
79	Ariff et al., (2020). Pakistan	Convenient sampling	250	October 2014 to November 2017	Children aged 9 months (OR=18.9, $p < 0.001$, 95%CI= 6.6-54.2), 12 months (OR= 40.3, $p < 0.001$, 95%CI=14.1-114.6), 18 months (OR= 90.0, $p < 0.001$, 95%CI= 30.8-262.8) and 24 months (OR= 82.1, $p < 0.001$, 95%CI= 27.2-247.8) had higher odds of consuming diversified diet compared to 6 months old children. Children whose mothers practice breastfeeding had higher odds (OR= 3.9, $p < 0.001$, 95%CI= 2.7-5.7) of consuming a diversified diet compared with those whose mothers did not practice breastfeeding. Children whose mothers had more than 14 years of education had increased odds (OR= 1.5, $p < 0.001$, 95%CI= 1.1-1.9) of consuming a diversified diet compared with those whose mothers had ≤ 14 years of education.
80	Khanal et al., (2013). Nepal	Secondary data analysis	698 children	Not reported	It was found that children whose mothers were older, aged 35 or above at pregnancy, were more likely [aOR 2.546; 95% CI (1.042-6.223)] to be fed with diversity foods and hence, meet the minimum dietary diversity than those children whose mothers were 15-19 years at pregnancy. Children whose mothers were well educated and had a secondary level education [aOR 2.634; 95% CI (1.606-4.318)] or higher education [aOR 3.246; 95% CI (1.423-7.403)] were more likely to meet the minimum dietary diversity compared to children whose mothers did not have any formal education, indicating an increase in the odds of providing a diversity of foods with an increase in education level. Similarly, compared to no education, as the education level of the fathers increased, the children were more likely to get the recommended diversity of food - primary education [aOR 2.613; 95% CI (1.216-5.616)], secondary [aOR 4.278; 95% CI (2.035-8.992)] or higher [aOR 4.648; 95% CI (1.866-11.578)]. Children from the Mid-western region were less likely [aOR 0.451; 95% CI (0.258- 0.787)] to

					be provided with the diversity food than children from the Eastern region; however, no differences were found between the Eastern and other regions.
81	Saaka et.al., (2015). Ghana	Two stage cluster sampling	2,026 mother/child pairs	Not clearly reported	<p>Chronic malnutrition (stunting) was less prevalent in Christian homes.</p> <p>Health impact The prevalence of stunting was significantly higher among male and older children. Surprisingly, none of the (WHO) recommended complementary feeding indicators (Minimum meal frequency, minimum dietary diversity, and minimum acceptable diet) was associated with stunted growth among children aged 6–23 months. Multiple logistic regression analysis revealed that children's age, ANC attendance, gender of child, and timely introduction of first complementary food were significantly related to stunting. Compared to children who were introduced to complementary either late or early, children who started complementary at six months of age were 25 % protected from chronic malnutrition (AOR = 0.75, CI = 0.50 - 0.95, P = 0.02). Compared to children aged 6–8 months, children aged 12– 23 months were 2.9 times more likely [AOR 2.98; 95 % CI (1.91 - 4.64)] of becoming stunted. It was found that children whose mothers attended antenatal care (ANC) at least 4 times were 34 % protected [AOR 0.66; 95 % CI (0.50 - 0.88)] against stunted growth compared to children born to mothers who attended ANC less than 4 times. Male children were 1.5 times more likely [AOR 1.50; 95 % CI (1.18 - 1.90)] of being stunted compared to female children.</p>

82	Hoddinott et al., (2017). Bangladesh	Cluster randomized control trial	900	Not clearly reported	<p>Having a neighbouring mother participate in a nutrition BCC intervention increased non-participant mothers' IYCN knowledge by 0.17 SD (translating to 0.3 more correct answers). They were 14.1 percentage points more likely to feed their 6-24m children legumes and nuts; 11.6 percentage points more likely to feed these children vitamin A rich fruits and vegetables; and 10.0 percentage points more likely to feed these children eggs.</p> <p>Children of non-participant mothers who had a neighbouring mother participate in a nutrition BCC intervention were 13.8 percentage points more likely to meet (WHO) guidelines for minimum diet diversity, 11.9 percentage points more likely to meet WHO guidelines for minimum acceptable diet, and 10.3 percentage points more likely to meet WHO guidelines for minimum meal frequency for children who continue to be breastfed after age 6m.</p> <p>Children aged 0-6m of non-participant mothers who are neighbours of mothers receiving BCC were 7.1 percentage points less likely to have ever consumed water-based liquids.</p>
83	Tassew et al., (2019). Ethiopia	Two stage cluster sampling design	2919	Not clearly reported	<p>At individual level: child age, father's education, mother's occupation, time to get drinking water, media exposure; and at the community level: region of residence were independent predictors of feeding the child MAD. The odds of feeding the child MAD were nearly 4 times (AOR = 3.7; 95%CI 1.9, 7.3) higher among children in age between 18-23 months than children at age 6-8 months. The odds of feeding the child with a minimum acceptable diet were 70% (AOR = 1.7; 95%CI 1.2, 2.5) higher among employed mothers compared with unemployed mothers.</p> <p>Mothers who have media exposure had nearly 2 times (AOR = 1.95; 95%CI 1.3, 2.9) higher odds of feeding a MAD for their children than mothers with no media access. The odds of feeding MAD to a child were twice (AOR = 2.0; 95%CI 1.3, 3.1) higher among mothers who travel less than 30 minutes to fetch drinking water. Father's education was significantly positively associated with feeding minimum acceptable diet to the child. Fathers who educated secondary or higher had 2.4 times (AOR = 2.4; 95%CI 1.4, 4.0) higher odds to feed their children MAD. The region was a significant predictor of feeding the child MAD. Mothers from the agrarian region had 5 times (AOR = 5.1; 95% CI 2.0, 13.1) and city dwellers had nearly 5 times (AOR = 5.4; 95%CI 1.9, 14.8) higher odds to feed their children MAD respectively compared with mothers from pastoralist.</p>

84	Tsedal et al., (2020). Ethiopia	Cross-sectional analysis	3105	Not reported	<p>In the multivariable analysis, level of education, mothers' work status, fertility desire, and intimate partner violence had a statistically significant association with a minimum acceptable diet.</p> <p>The odds of getting a minimum acceptable diet among children of mothers who had a secondary education was higher than those who did not have formal education (AOR: 4.01; 95% CI: 1.04, 15.45). As compared to children of mothers who did not work for the last 12 months prior to the survey, children of mothers who were working during the survey had higher odds of getting a minimum acceptable diet (AOR: 2.26; 95% CI: 1.01, 5.11). Children of mothers who didn't decide their fertility desire had higher odds of getting a minimum acceptable diet as compared to those who were children of mothers who decided not to have more children (AOR: 4.72; 95% CI: 1.37, 16.28). Finally, children of mothers who had intimate partner violence had 65% lesser odds of getting a minimum acceptable diet as compared to those who were children of women who did not have an intimate partner violence (AOR: 0.35; 95% CI: 0.16, 0.77)</p>
85	Abebe et al., (2019). Ethiopia	Cross section	3433	Feb-June, 2016	<p>Age of the children, maternal education, maternal ANC and PNC follow up, household food security status and method of child feeding were associated with DDS.</p> <p>The odds of receiving an adequately diversified diet among younger children (6-11months) were 41% (AOR = 0.59; 95%CI: 0.41, 0.85) lesser compared to the older children (48-59months). Mothers who had secondary and above educational status were 6 times (AOR = 6.51; 95%CI: 4.95, 8.56) more likely to provide an adequately diversified diet to their children compared to mothers who had no education. Similarly, mothers who attended primary school were about 2 times (AOR= 2.11; 95%CI: 1.76, 2.53) more likely to practice adequate diversified diet than those who had no formal education. The likelihood of a diversified diet was higher among children whose mothers had ANC (AOR = 1.90; 95%CI: 1.60, 2.26) and PNC follow ups (AOR=1.31; 95%CI: 1.00, 1.72).</p> <p>Finally, those children from food insecure household were 24% less likely to received adequately diversified diet compared to children from food secured household (AOR = 0.76; 95%CI: 0.63, 0.92)</p>
86	Rana et al., (2019). Bangladesh	Cross sectional study	106	Mid 2017	<p>Overall, an overwhelming proportion of respondents from both groups (doers and non-doers) identified economic factors (e.g. household income and food price) as the main facilitator for achieving MDD. As most households were primarily reliant on markets for access to food, distance to the market was also a big predictor. The barrier analysis additionally identified existing misconceptions around consuming a diversified diet (e.g., certain foods can cause indigestion/breathing problems) and a lack of full understanding of the benefits, as well as</p>

					perceived difficulty of remembering to include foods from different food groups, as other important determinants of MDD. Approval and support of husbands and mothers-in-law were found necessary for practicing the behaviours. However, no social, cultural or religious restrictions or taboos against consumption of a diversified diet by women or children were identified.
87	Seymour et al., (2019). Bangladesh	Data from the 2011-2012 Bangladesh Integrated Household Survey (BIHS).	694	Not reported	Without controlling for women's empowerment, our analysis points to the existence of a strong association between income poverty and household dietary diversity, but provides weak evidence of a relationship between time poverty and household dietary diversity or of a multiplicative effect between the two on household dietary diversity. On average, income poor households consume 1.5 fewer food groups compared to non-poor households. The relationship between time poverty and household dietary diversity is tenuous. Depending on whether time poverty is defined as spending less than 50% or 70% of median discretionary time, time poor households consume 0.2 or 0.1 fewer food groups, respectively, compared to non-poor households, though only the former is statistically significant.
88	Raymond et al. (2017). Tanzania	Random sampling	400	September - December 2015.	<p>The study found that a combination of whole grains flour and Irish potatoes (33 g), pulses and seeds (47 g), dried sardines and other animal source foods (5.6 g) and vitamin A rich fruits and vegetables (228 g) meeting the RDIs for 20 selected nutrients cost 1122 Tanzanian shillings per day (TZS/day) (approximately 0.6 USD/day), which doubles the cost of the observed average food cost per day for a child aged between 6–8 months.</p> <p>The cost of a combination of whole grains flour (61 g), pulses and seeds (41 g), dried sardines and other animal source foods (36 g) and vitamin A rich fruits and vegetables (224 g) which met the RDIs for 20 selected nutrients was 1335 TZS/day (approximately 0.7 USD/day), which is nearly doubles the observed cost of food bought per day for a child aged 9–11 months old.</p> <p>The cost of combination of whole grains flour (85 g), pulses and seeds (44 g), dried sardines and other animal source foods (59 g) and vitamin A rich fruits and vegetables (348 g) which met the daily reference intake for all selected nutrients was 2650 TZS/day (approximately 1.3 USD/day), which is a double amount of the observed food purchase cost for a child aged between 12 and 23 months.</p>

					The study showed that the alternatives optimal formulation for improving dietary adequacy of limiting nutrients are available but at a relatively higher cost than observed cost across all age groups.
89	Wu et al. (2013). China	Random and convenience sampling	98	July - December 2011	The children had poor consumption of diverse food groups. 2. Children were not given meat, beans, liver and vegetables because mothers perceived that their children did not have teeth to chew and cannot digest these foods.
90	Tefera et al., (2020). Ethiopia	Cross sectional Simple random sampling	517	March 28 to April 30 2017	<p>Definition of DD</p> <p>Dietary diversity was defined as optimal if children (aged 6–23 months) received foods from at least four of seven food groups (1) Grains, roots, and tubers, (2) Legumes and nuts, (3) Dairy products, (4) Flesh foods, (5) Eggs, (6) Vitamin-A rich fruits and vegetables, (7) Other fruits and vegetables, within the preceding 24 h of interview.</p> <p>Barriers and enablers</p> <p>Mothers’ education, media exposure, fathers’ occupational status and knowledge of mothers on food diversification were the only variables which have shown statistically significant and independent association with minimum dietary diversity practices. Children aged 12-23 months were more likely to be fed minimum dietary diversity compared with children who were aged 6-11 months (AOR=2.99, 95% CI, 1.65:5.42). This study also indicated children of mothers having secondary and above education level were more likely to be fed diversified food. It showed that the odds of feeding their baby minimum dietary diversity among mothers whose education level was secondary or above were nearly 3 times higher than those mothers who have no formal education (AOR=3.21, 95% CI, 1.05:9.85). Mothers who were exposed to media frequently had higher odds of feeding their children a diversified diet than those mothers who had not attended to the media (AOR=3.99, 95 % CI, 1.97:7.77).</p> <p>The study showed that mothers 15-24 years of age were more likely to feed their child diversified food than older mothers. Children whose mothers aged 30 or above years were 56% less likely to meet minimum dietary diversity score than children whose mothers were aged 15-24 years (AOR=0.44, 95% CI, 0.22:0.87). Mothers who have knowledge about food diversification showed significant association to their habit of dietary diversity feeding practice. Children whose mothers were knowledgeable about food diversification had 8.5 times higher odds of</p>

					<p>minimum dietary diversity practice as compared to children whose mothers haven't specific knowledge on food diversification (AOR=8.5, 95% CI, 4.95:14.58) . Children whose fathers were daily laborers showed low practice of minimum dietary diversity as compared to children whose fathers were merchants. Children whose father's occupation was merchants were 2 times more likely to get a diversified diet than children whose fathers were daily laborers (AOR=2.27, 95% CI, 1.19:4.33).</p>
91	Guja and Melaku (2017). Ethiopia	Cross-sectional study Cluster sampling	791	One month	<p>Definition of DD Minimum dietary diversity of children: proportion of children 6–23 months of age who receive foods from ≥ 4 food groups during the previous day considered as adequate and < 4 food groups are considered as inadequate (low) from the seven food groups the previous day and night.</p> <p>Barriers Mothers having no formal education (AOR= 1.8; 95% CI: 1.08-3.05, mothers who did not own milking cow (AOR= 1.7; 95% CI: 1.10-2.56), children with low diversity diversity (AOR= 8.23; 95% CI: 5.17-13.08) and mothers with low dietary diversity (AOR= 0.46; 95% CI: 0.29-0.74) were found to be factors associated with mother-child dietary diversity concordance.</p>
92	Di Marcantonio, et al., (2020). Somalia	Cross-sectional, multi-stage cluster sampling	3188	Two months	<p>Household Dietary Diversity Score and the Food Consumption Score were significantly associated with CDDS, with HDDS showing a stronger association. Children living in households with access to latrines or flush toilets were found to be 2 times more likely to reach MDDC.</p> <p>Household key decision-maker, women's physiological status, the duration of the house settlement, the frequency of milk feeding to a child in the previous 24 hours, and child's measles vaccination associated with child's dietary diversity.</p> <p>Women as key decision maker positively associated with child's dietary diversity. Children in households where there are pregnant or lactating women were more likely to have an adequate diet. For these children, the odds of a more adequate diet were about 1.8 and 2.2 times higher than for those living in households without a lactating or pregnant women.</p> <p>Family size, child age and sex, reason for displacement, food aid received, source of drinking water, household women's age or education, vitamin A supplementation, child breastfeeding, and mother or child registration at feeding centers were not statistically significant.</p>

93	Ocampo-Guirindola et al., (2016). Philippines	Cross-sectional, stratified sampling	4276	Not specified	<p>Definition of DD Minimum Dietary Diversity indicates the proportion of children who receive food from at least four of the seven food groups.</p> <p>Barriers and enablers Children fed on complementary food that are mainly milk-based have three times greater odds of meeting the MDD than children fed on breastfeeding with complementary food. Based on maternal characteristics, mothers having only one or 2-3 children increased the child's odds of meeting the MDD by 1.93 and 1.85 times, respectively. Similarly, mothers working locally or away from home increased the likelihood of children meeting the MDD by 1.4 times over those with mothers working at home. Results also show that incorrect knowledge of mothers on the duration of exclusive breastfeeding and right time for introducing complementary food are predictors for failing to meet the MDD. Taking into consideration household characteristics, living in urban areas increased the child's odds of meeting the MDD. Conversely, a household size of nine and above and food insecurity reduced the likelihood of children meeting the MDD.</p>
94	Na et al., (2015). Benin, Burkina Faso, Ethiopia, Mali, Niger, Nigeria, Rwanda, Sierra Leone, Uganda and Zimbabwe.	Secondary analysis of sociodemographic health survey data	15, 153	Not specified	<p>Definition of DD Minimum dietary diversity was defined as children 6–23 months of age who received foods from at least four out of seven food groups during the past day.</p> <p>Barriers and enablers The mean dietary diversity score ranged from 1.4 in Burkina Faso to 2.7 in Benin and Rwanda. Less than 35 %, children 6–23 months of age met the criterion of minimum dietary diversity. Women with higher economic empowerment were more likely to feed their children with the minimum required dietary diversity (aOR=1.05–1.43) as compared with women with lower economic empowerment in all countries except Benin (aOR=0.92; 95 % CI 0.74, 1.16), Ethiopia (aOR=0.75; 95 % CI 0.41, 1.37) and Zimbabwe (aOR=0.77; 95 % CI 0.41, 1.47). However, the association was significant only in Nigeria (aOR=1.40; 95 % CI 1.15, 1.70). In two countries, Benin (aOR =0.76; 95 % CI 0.61, 0.95) and Nigeria (aOR=0.80; 95 % CI 0.66, 0.98), there were significant negative associations between the socio-familial dimension and the likelihood of meeting the minimum dietary diversity.</p>

95	Nyakundi, Kenya (2020).	Purposive sampling and systematic random sampling . Cross-sectional	201	Not specified	<p>Definition of DD A off of at least 4 out of the 7 food groups was used to determine the minimum dietary diversity.</p> <p>Barriers and enablers The attainment of the minimum dietary diversity among the children was found to be significantly associated with several socio-demographic and socio-economic characteristics, including Maternal age ($\chi^2 = 12.30$, P value= 0.032), Mother's level of education ($\chi^2 = 14.01$, P value= 0.007), Main source of income ($\chi^2 = 10.27$, P value= 0.016), Average monthly income ($\chi^2 = 18.46$, P value= 0.001), Husband occupation ($\chi^2 = 14.13$, P value= 0.007), HH Size ($\chi^2 = 22.96$, P value= 0.006) and No. of children in HH ($\chi^2 = 25.64$, P value= 0.001). In contrary, Maternal occupation ($\chi^2 = 8.83$, P value= 0.07), Marital status ($\chi^2 = 5.42$, P value= 0.247) and number of under five years children in the household ($\chi^2 = 4.14$, P value= 0.246) were not associated with meeting the minimum dietary diversity.</p>
96	Ng et al., Indonesia (2012).	Systematic random sampling / Secondary analysis of socio-demographic health data	4604	Not specified	<p>Definition of DD Minimum dietary diversity was defined as the percentage of children 6–23 months of age who received foods from four or more food groups.</p> <p>Barriers and enablers As expected, mother's education had a positive impact on dietary diversity. Women from wealthier households or urban areas reported significantly higher dietary diversity than those from poorer households or rural areas. Increasing child's age also had a positive association with dietary diversity. Infants whose mothers read newspapers/magazines and watched television every day were significantly less likely to be fed with four or more food groups. As compared with the Sumatra region, only Kalimantan was significantly more likely to meet minimum dietary diversity criterion.</p>
97	Wondu, Garoma and Yang, Ethiopia (2017).	Cross-sectional study	595	4 months	Children who were from older mothers were more likely to meet MDD adequacy. Mothers in the age of 25–49 years were shown 52-65% lower risks (OR=0.35; 95% CI 0.15, 0.84) of not meeting the MDD for their children compared to early age once. Children from household's head who had a tertiary level of education were found to have protective factors towards practices of inappropriate MDD (OR=0.45; 95% CI 0.21, 0.95).

98	Issaka et al., (2015). Ghana	Random sampling	822	3 months	<p>Definition of DD Minimum dietary diversity', defined as the proportion of children 6–23 months of age who receive foods from four or more food groups.</p> <p>Household poverty, children whose mothers perceived their size to be smaller than average and children who were delivered at home were significantly less likely to meet the minimum dietary diversity requirement; and children whose mothers did not have any postnatal check-ups were significantly less likely to meet the requirement for minimum acceptable diet. Complementary feeding was significantly lower in infants from illiterate mothers (adjusted OR=3.55; 95 % CI 1.05, 12.02). Children of mothers from Ashanti and Central regions were almost three times more likely not to meet the minimum dietary diversity criterion (AOR=3.52; 95 % CI 1.74, 7.10 for Ashanti and AOR=3.45; 95 % CI 1.65, 7.19 for Central) than those of mothers from the Upper East region (AOR=1.27; 95 % CI 0.54, 2.96). Children aged 6–11 months were four times more likely not to meet the minimum dietary diversity criterion (AOR=4.29; 95 % CI 2.68, 6.84) than children aged 12–17 months (AOR= 1.07; 95 % CI 0.70, 1.66). Also, children who were born at home were 87 % more likely not to meet the minimum dietary diversity criterion (AOR=1.87; 95 % CI 1.24, 2.81) compared with those who were born at a health facility.</p>
99	AL-waly and Al-Hafidh, (2019). Iraq	Random sampling/ Cross-sectional	420	3 months	<p>Definition of DD Minimum dietary diversity: proportion of children 6–23 months of age who received foods from four or more food groups out of the seven food groups.</p> <p>Barriers and enablers Children of mother aged < 18 years were more likely to meet minimum dietary diversity (P =0.027, AOR = 0.13; 95% CI: 0.02 – 0.79). Higher risks for not meeting minimum meal diversity were significantly found among children belong to families having monthly income per capita < 50,000 ID (P = 0.002, AOR = 3.27; 95% CI: 1.56–6.88) and 50,000 - 100,000 ID (P = 0.010, AOR = 2.35; 95% CI: 1.23–4.51) compared to families with more income.</p>
100	Waswa et al., (2021). Kenya	Cluster sampling with probability proportional to size. Longitudinal study	596	3 months	<p>Results showed that education of women (years) had a positive effect child's dietary diversity CDDS (OR= 1.01 95% CI 1.00, 1.02, P = 0.005). On the other hand, household food insecurity had a negative influence on both CDDS (OR = 0.94 95% CI 0.92, 0.96, P < 0.001). Increasing age (in months) among children had a positive effect on CDDS (OR = 1.02 95% CI 1.01, 1.02, P < 0.001).</p>

101	Kamran et al., (2017). Iran	Cross-sectional	576	Not specified	Children with birth order third and above had significantly higher odds of having adequate MDD (Adjusted odds ratio [AOR] 3.7; 95% CI- 2.3 - 5.9) as compared to the children with birth order one. Children born to mothers belonging to academic literacy had significantly higher odds of having adequate MDD (AOR 4.3; 95% CI- 2.7 - 6.9) as compared to low literacy. Also, children born to mothers' adequate health literacy had significantly higher odds of having adequate MDD (AOR 6.5; 95% CI- 4.0 - 10.7) as compared to low health literacy. Same result was seen about male child compared to female child
102	Korir, (2013). Kenya	Cluster sampling / Cross-sectional study	322	Not specified	Definition of DD To determine minimum dietary diversity, a cut-off of at least 4 out of the above listed 7 groups was selected because it is associated with better quality diets for both breastfed and non-breastfed children. Enablers Mothers who knew the importance of a diverse diet were likely (chi-square test; p=0.001) to feed their children on a diverse diet.
103	Ali et al., (2021). Pakistan	Stratified sampling / Secondary analysis of socio-demographic health data.	2688	Not specified	Definition of DD Minimum dietary diversity is based on the WHO recommendation of consuming at least four food groups out of seven. Barriers and enablers Children aged 6–11 months have two-fold, three-fold and ~4-fold higher odds of meeting minimum dietary diversity in urban areas [2.3 (1.59–3.33)], overall sample [2.96 (2.28–3.83)], and rural areas [3.97 (2.71–5.81)], respectively, as compared to the children aged 18–23 months. Children in households headed by male members are more likely to consume a diversified diet. In rural regressions, households using unimproved water source (reference: piped water) [0.53 (0.32–0.90)] and with household size between 6–9 members (reference: 1–5 members) [0.65 (0.43–0.97)] have lower odds of diet diversity compliance. Among community characteristics, a higher proportion of at least four prenatal visits at the community level is associated with higher odds of dietary diversity compliance in all three regressions, whereas postnatal were only significant in urban regression [1.99 (1.09–3.62)].

104	Fentaw Mulaw et al, (2020). Ethiopia	Simple random sampling proportional size/ Cross-sectional study	345	One month, two weeks	<p>Definition of DD Minimum dietary diversity is defined as when a child gets at least 4 from the 7 WHO recommended food groups, regardless of the portion size and meal frequency.</p> <p>Barriers and enablers Child dietary diversity score had no significant association with place of delivery, birth order, maternal residence, child immunization status, and food taboo. Children whose mothers attended formal education were 3.042 times (AOR = 3.042 (1.312–7.052)) more likely to meet the minimum optimal dietary diversity score than children whose mothers not attended secondary and above educational status. Children whose mothers were underweight and/or overweight were 51.2% (AOR = 0.488, 95% CI, (0.259–0.918)) and 68.10% (AOR = 0.319, 95% CI, (0.119–0.855)) less likely to meet the optimum minimum dietary diversity score than children whose mothers were with normal BMI, respectively.</p>
105	Nyakundi, et al, (2019). Kenya	Systematic random sampling / Cross-sectional study	201	Not specified	The attainment of the minimum dietary diversity among the children was found to be significantly associated with several demographic and socioeconomic characteristics, including Maternal age ($\chi^2 = 12.30$, P value= 0.032), Mother's level of education ($\chi^2 = 14.01$, P value= 0.007), Main source of income ($\chi^2 = 10.27$, P value= 0.016), Average monthly income ($\chi^2 = 18.46$, P value= 0.001), Husband occupation ($\chi^2 = 14.13$, P value= 0.007), HH Size ($\chi^2 = 22.96$, P value= 0.006) and No. of children in HH ($\chi^2 = 25.64$, P value= 0.001). In contrary, Maternal occupation ($\chi^2 = 8.83$, P value= 0.07), Marital status ($\chi^2 = 5.42$, P value= 0.247) and number of under five years children in the household ($\chi^2 = 4.14$, P value= 0.246) were not associated with meeting the minimum dietary diversity
106	Janmohamed, et al, (2020). Mongolia	Random cluster sampling using probability proportional to size/ Secondary analysis of nutrition data	938	3 months	Children in wealthier households were also more likely to receive MDD, as compared with children in the poorest households. Child age (OR, 95% CI: 1.09 [1.06, 1.12; p < .001]) and maternal MDD (OR, 95% CI: 2.36 [1.67, 3.34]; p < .001) were also significant predictors of children's MDD in the adjusted model
107	Nguyen et al, (2016). Vietnam	Systematic sampling/ Cross-sectional study	1875	Not specified	Children of ethnic minority mothers had fewer dietary diversity.

108	Gebremedhin et al. (2017). Ethiopia	Multistage. Sampling using probability proportion to size, and systematic random sampling	2080	Oct-14	<p>Maternal knowledge about IYCF was positively associated with a child consuming a diversified diet (adjusted IRR= 1.02, 95% CI, 1.02–1.03). Households with moderate and severe food insecurity had a 9% (95% CI, 3.8–13.9%) and a 24.9% (95% CI, 14.6–44%) reduced odds of offering diversified food to their children than food-secure households.</p> <p>Husbands' direct involvement in IYCF practice increased the DD by 13.7% (95% CI, 7.4–20.4). Participants who discussed child feeding with health extension workers (HEWs), participated in cooking demonstrations, and heard radio spots about IYCF in the preceding 3 months had 11.7% (95% CI= 3.4–20.7%), 18.9% (95% CI= 0.3–40.9%), and 11.4% (95% CI, 4.8–18.4) higher odds of offering a diversified food to their children.</p> <p>Participants with ownership of a home garden and number of chickens owned showed a significant positive association with dietary diversity (IRR= 1.1; 95% CI=1.0–1.2 and IRR= 1.01; 95% CI= 1.0–1.02, respectively).</p>
109	Tuji, and Wake, (2021). Ethiopia	Simple random sampling of Kebeles and total recruitment of the population/ Cross-sectional	782	One month	<p>Mothers' who have attended secondary and above education [AOR=2.52, 95%CI (1.65, 8.34)], mothers' who have attended primary education [AOR=1.53, 95%CI (1.26, 4.21)], fathers who have attended secondary and above education [AOR=2.39, 95% CI (1.22, 3.75)], family size from 1-3 children [AOR=3.07, 95% CI: (1.42, 6.64)], 4-6 number of children [AOR=2.93, 95%CI (1.5, 5.46)], mothers' belonged to richest [AOR=2.67, 95%CI (1.74, 3.79)] and richer wealth quintiles [AOR=1.87, 95%CI (1.33, 3.47)] was positively associated with MDD</p>
110	Roba et al. (2016). Ethiopia	Random sampling / Cross-sectional	216	2 months	<p>Significantly association was found between infant dietary diversity and women dietary diversity score and child age. As dietary diversity of women increased by one unit, the dietary diversity of the child also increased ($\beta=0.2$ P=0.042). Similarly, as the age of the child increased by one month, the dietary diversity score of the children increased by 0.84 units ($\beta=0.84$, P<0.001).</p>
111	Kabir et al., (2012). Bangladesh	Systematic sampling / Secondary analysis of socio-demographic health survey	1728	Not specified	<p>Children of mothers with no formal education were twice as likely not to meet the minimum dietary diversity criteria (AOR for primary education = 1.41; 95% CI: 1.03–1.94) than mothers with secondary or higher level of education (AOR = 1.69; 95% CI: 1.14–2.54)., Infants born in the divisions of Sylhet (AOR = 4.00; 95% CI: 2.01–7.99), Chittagong (AOR = 2.25; 95%, 95% CI: 2.01–7.99), Chittagong (AOR = 2.25; 95% CI: 1.48–3.43) or Barisal (AOR = 1.98; 95% CI: 1.19–3.26) all had higher risks of not meeting the minimum dietary diversity criteria compared to infants born in Rajshahi division. Infants from the poorer and poorest households had higher risks of not meeting dietary diversity (AOR = 2.16; 95% CI: 1.23–3.77 and AOR = 2.63; 95% CI: 1.39–4.94,</p>

					respectively) compared to the infants from the wealthiest households (Table 6). When we replaced mother's education by father's education in the final model, fathers with primary education and no education had higher risks of not meeting dietary diversity (AOR = 1.81; 95% CI: 1.28–2.55 and AOR = 2.54; 95% CI: 1.84–3.51 respectively).
112	Heidkamp et al, (2015). Haiti	Two-stage cluster sampling/ Cross-sectional secondary analysis of socio-demographic health data	1701	Not specified	<p>Definition of DD Minimum dietary diversity was defined as the proportion of breastfed and non-breastfed children aged 6–23 months who received foods from four or more out of seven food groups in the previous 24 h.</p> <p>Barriers and enablers Children in the youngest age group (6–8 months) were less likely to achieve MDD compared with children aged 18–23 months (OR 0.38; P = 0.007), which is consistent with 6–8 months being a transitional feeding time. Odds of achieving MDD increased with higher wealth quintiles. Children with overweight mothers were more likely to achieve MDD compared with children of normal weight mothers (OR 2.08; P = 0.012). Unexpectedly, children of underweight mothers were also more likely to achieve MDD than normal weight mothers, but the OR was not statistically significant (OR 1.49; P = 0.24)</p>
113	Ahmad et al., (2017). India	Systematic random sampling / Cross-sectional	326	One month	The proportion of children 6–23 months of age who receive foods from four or more food groups. Children residing in rural area had significantly lower odds of having adequate MDD (adjusted odds ratio [AOR] = 0.61; 95% CI = 0.38, 0.98) as compared to urban area. Children with birth order third and above had significantly lower odds of having adequate MDD (AOR = 0.54; 95% CI = 0.31, 0.97) as compared to the children with birth order one. Children born to mothers belonging to high SLI had significantly higher odds of having adequate MDD (AOR = 3.27; 95% CI = 1.26, 8.52) as compared to low SLI.
114	Sema et al., (2021). Eastern Ethiopia	Simple Random sampling method	438	February, 2019	<p>The result of the multivariate logistic analysis revealed that mothers' educational status, age of a child, birth interval, child's sex, place of delivery, and the mother involved in decision making, antenatal, and postnatal care utilization were significantly associated with minimum dietary diversity. Accordingly, mothers who had formal education were 2 times [AOR 2.20; 95% CI: 1.08, 4.52] more likely to practice minimum dietary diversity practices compared to their counterparts.</p> <p>Children aged between 9 to 11 months were nearly 3 times [AOR=2.84; 95% CI: 1.39, 5.83] more likely to practice MDD as compared to those ages 6 to 8 months. Moreover, mothers who had birth interval 2 and above years for the index child were 3 times [AOR = 3.29; 95% CI (1.37, 7.92)] more likely to practice MDD compared to those who have less</p>

					<p>than 2years of birth interval. Furthermore, mothers who had postnatal and antenatal care follow up were nearly 6 and 2 times [AOR=6.4; 95% CI: 2.78, 14.94] and [AOR=2.19; 95% CI: 1.20, 3.99] more likely to practice minimum dietary diversity to their children compared to their counterparts, respectively.</p> <p>Also, mothers who had a male child were nearly 3 times [AOR=2.85; 95% CI: 1.64, 4.94] more likely to practice minimum dietary diversity as compared to those of females, and mother involved in decision making were 2.5 times [AOR = 2.5; 95% CI: 1.19.5.29] more likely to practice minimum dietary diversity. Mothers who gave birth in a health facility for the index child were 2.66 times [AOR = 2.66; 95% CI: 1.35, 5.25] more practice minimum dietary practice compared to those who gave birth at home,</p>
115	Dafursa and Gebremedhin, (2019). Aleta Wondo District, Southern Ethiopia	systematic sampling technique	509	February, 2016	<p>As the maternal knowledge of IYCF increased by one unit, DDS increased by 0.21 units ($p < 0.004$). Unit increment in the husband's involvement in the IYCF score was linked with 0.32 units increment in DDS ($p < 0.016$). A one-unit shift in the ordinal category of household food insecurity was associated with 0.13 units decline in DDS ($p < 0.001$).</p> <p>In the distal multivariable model, 8 variables showed significant associations with DDS. Unit change in the household wealth index was associated with 0.54 ($p < 0.041$) rise in DDS. Among children having literate fathers, the DDS was increased by 0.48 ($p < 0.002$) units. Ownership of a backyard garden ($\beta < 0.38$, $p < 0.01$), mothers' participation in cooking demonstrations ($\beta < 0.19$, $p < 0.036$), receiving IYCF information from the mass media and during ANC and PNC were associated with improved DDS. A significant positive association was also observed between child age and DDS.</p>
116	Mulaw et al., (2020). Northeast Ethiopia	simple random sampling method	347	February 15 to March 30, 2017	<p>Child dietary diversity score had no significant association with place of delivery, birth order, maternal residence, child immunization status, and food taboo. Children whose mothers attended formal education were 3.042 times (AOR=3.042 (1.312–7.052)) more likely to meet the minimum optimal dietary diversity score than children whose mothers did not attend secondary and above educational status. Children whose mothers were underweight and/or overweight were 51.2% (AOR = 0.488, 95% CI, (0.259–0.918)) and 68.10% (AOR=0.319, 95% CI, (0.119–0.855)) less likely to meet the optimum minimum dietary diversity score than children whose mothers were with normal BMI, respectively</p>

117	Agize et al., (2017). Oromia, Ethiopia	systematic random sampling	730	September 2014 to October 2014	<p>Those mothers who belong to the age group of 25–34 years were 1.82 times more likely to practice good dietary diversity for their 6–23-month-old children as compared with those who belong to the age group of 15–24 years (AOR = 1.82, 95% CI = (1.05, 3.17)). Mothers who were married and living with their husbands were 88% times less likely to practice good dietary diversity as compared with single mothers (AOR = 0.22, 95% CI = (0.08, 0.59)). And those mothers who were divorced were 91% times less likely to practice good dietary diversity compared to single mothers (AOR = 0.09, 95% CI= (0.02, 0.53)). Mothers' dietary diversity practice was also affected by seasonal availability of food groups to diversify meal for their 6–23-month-old children. Mothers who can have access to all food groups in winter were 1.78 times more likely to practice good dietary diversity as compared with those mothers who can have access to all food groups in summer (AOR = 1.78, 95% CI = (1.01, 3.15)). Mothers who received health information from health posts and health development army (HDA) were 52% times less likely to practice good dietary diversity for their children as compared with those mothers who received health information from health posts only (AOR = 0.48, 95% CI = (0.29, 0.79)). Accordingly, mothers who were not knowledgeable on dietary diversity were 70% times less likely to practice good dietary diversity for 6–23-month-old children as compared with their counterparts (AOR = 0.30, 95% CI = (0.18, 0.48))</p>
118	Bedada Damtie et al., (2020). Bale Zone, Ethiopia	systematic sampling technique	517	March 28 to April 30, 2017.	<p>The analysis indicated that children aged 12–23 months were more likely to have minimum dietary diversity compared with children aged 6–11 months (AOR=2.99, 95% CI, 1.65: 5.42). This study also indicated that children of mothers having secondary and above education level were more likely to be fed diversified food. It was shown that, among mothers whose education level was secondary or above, the odds of feeding their children minimum diversified diet were nearly three times higher than those mothers who have no formal education (AOR=3.21, 95% CI, 1.05 :9.85). Mothers who were exposed to the media frequently had higher odds of feeding their children diversified diet than those mothers who had not attended to the media (AOR=3.99, 95% CI, 1.97:7.77). The study showed that mothers aged 15–24 years were more likely to feed their child diversified food than older mothers. Children whose mothers aged 30 or above years were 56% less likely to meet the minimum dietary diversity score compared with children whose mothers aged 15–24 years (AOR=0.44, 95% CI, 0.22: 0.87). Mothers who have knowledge about food diversification showed significant association with their habit of dietary diversity feeding practice.</p>

					Children whose mothers were knowledgeable about food diversification had 8.5 times higher odds of minimum dietary diversity practice compared with children whose mothers do not have specific knowledge on food diversification (AOR=8.5, 95% CI, 4.95 :14.58). Children whose fathers were daily laborers showed a low practice of minimum dietary diversity compared with children whose fathers were merchants. Children whose fathers' were merchants were two times more likely to get a diversified diet than children whose fathers were daily laborers.
119	Karimi-Shahanjarini et al., (2017). Iran	Random sampling	290	June to August 2015	For the behavioural beliefs, bivariate correlations showed that three of five beliefs were significantly correlated with the intention ($r = 0.24-0.25$). Furthermore, bivariate correlations revealed three of six normative beliefs ($r = 0.15-0.28$), and three of seven control beliefs ($r = 0.12-0.26$) as significantly correlated with intention. Multiple regression analysis indicated one behavioural belief (improve my child's health) ($\hat{\alpha} = 0.13$), one normative belief (health-care professionals) ($\hat{\alpha} = 0.15$), and one control belief (daily pressures) ($\hat{\alpha} = 0.19$) as significant predictor of intention
120	Ali et al., (2019). Bangladesh	multistage cluster sampling technique	6468	July to October 2014	Children of mothers with primary or higher education had a 15% higher DDS when compared to children of mothers with no education. Similarly, on average children of mothers who were skilled workers had 47% higher DDS than children whose mothers were homemakers. Household's economic status showed strong positive association with DDS among the children. Children from households spending BDT 5000/ 60USD or more on food monthly, had 26% higher DDS when compared to their counterparts. DDS also showed a dose response relationship with household wealth. The children from the highest wealth quintile had 54% higher DDS than the children from the lowest wealth quintile. Children from the food secure households had 21% higher DDS when compared with children from food insecure households. In addition to DDS scores, the socio-economic determinants of nutritional statuses were examined. Results from the multivariable analysis showed that the adjusted odds of being stunted or underweight decreased as maternal education and household wealth increased

121	Dangura and Gebremedhin, (2017). Southern Ethiopia	systematic random sampling procedure.	417	Not reported	According to the final multivariate regression models, in children having literate fathers, the DD was increased by 0.26 as compared to their counterparts (p=0.026). Whereas, children from households that grow fruits and vegetables and own livestock, the DDS was increased by 0.32 (p = 0.032) and 0.51 (p = 0.001) as compared to their counterparts and, respectively. As the age of the child increases by a month, the DD also increased by 0.04 (p=0.001). Children born from mothers that received IYCF messages during PNC, the DDS was increased by 0.21 (p = 0.037). Unit increase in maternal knowledge on IYCF was associated with 0.41 rise in DDS (p=0.001). Other factors that were positively associated with the out- come variable were mothers participated in food demonstration, exposure to IYCF information on the mass media and husband involvement in IYCF.
122	Gewa and Leslie, (2015). Kenya, Uganda, Tanzania	Random systematic	10000, 10086 and 10300 households were drawn for surveys in Kenya, Uganda and Tanzania respectively	2008-2011	Being an older child (9-11, 12-17 & 18-24 months) was associated with significantly higher odds of achieving adequate DDS compared to those within the 6-8-month age-group across all three countries: 125%-299% higher for the 9-11-month age-group, 164%-174% higher for the 12-17-month age-group, and 219%-300% higher for the 18-24-month age-group. In Uganda, children who were breast-feeding at the time of the survey were associated with 63% reduction in odds of achieving adequate DDS compared to those who were not breast-feeding. Mothers' working status was shown to be a significant factor only in Kenya, where children whose mothers were working at the time of survey were associated with 47% increase in odds of achieving adequate DDS compared to those with non-working mothers. Children living in households within higher wealth index quintiles were associated with significantly higher odds of achieving adequate DDS compared to those living in households within the first wealth index quintile. However, the relationship was not uniform across all countries. In Kenya, significance was shown among households in the second, fourth and fifth wealth index quintiles. In Uganda, the relationship was noted among households in the fifth quintile. In Tanzania, the relationship was noted among households in third, fourth and fifth quintiles. In Kenya, children whose mothers had made at least four PNCs were associated with 105% increase in odds of achieving adequate DDS compared to children whose mothers did not. In Tanzania, children who had received vitamin A supplements were associated with 43% increase in odds of achieving DDS compared to those had not. In Tanzania, children whose mothers utilized modern contraceptive methods were associated with 40% increase in odds of

					<p>achieving adequate DDS compared to children whose mothers did not. Children who had consumed at least the defined minimum number of meals per day were associated with 153%, 213% and 51% increase in odds of achieving adequate DDS in Kenya, Uganda and Tanzania respectively.</p> <p>In a combined analysis that included all three countries, being an older child, mother's post-primary education, higher household wealth, at least four prenatal care visits, use of modern contraceptives, and daily consumptions at or above the minimum meal frequency adequate meal frequencies were each associated with significantly higher odds of achieving adequate DDS among young children in the East African region.</p>
123	Demilew et al., (2017). Bahir Dar City, Ethiopia	Simple random sampling technique	412	June 1-30, 2016	<p>The bivariate logistic regression analysis showed that place of delivery (hospital vs health center), age of the mother, maternal education, attending postnatal care, possession of radio and maternal occupation were statistically associated with complementary feeding practice (. In the multivariable logistic regression analysis, place of delivery, educational status of the mother, having postnatal care and possession of radio were independent predictors for complementary feeding practice. Mothers who have postnatal care follow up were four times more likely to have appropriate complementary feeding practice than those who did not attend postnatal care (Adjusted Odds Ratio [AOR] 4.1; 95% Confidence Interval [CI] 1.1, 7.3). Mothers who attend above primary education were three times more likely to have appropriate complementary feeding practice than their counterparts (AOR 3.0; 95% CI 1.2, 8.6). Mothers who have a radio were 3.2 times more likely to have appropriate complementary feeding practice than mothers who have no radio (AOR 3.2; 95% CI 1.1, 8.8). Mothers who delivered at hospital were 2.4 times more likely to have appropriate complementary feeding practice than mothers who gave birth at health centers (AOR 2.4; 95% CI 1.1, 7.3)</p>

124	Mekonnen et al, (2017). Wolaita Sodo town, Southern Ethiopia	Systematic sampling method	623	March 02-20, 2015.	<p>Among the variables reached to the final model, household head, occupation and child age were statistically, associated with minimum dietary diversity. Children from households headed by housewives were 2.3 times more likely to be fed four and above food items or groups per day as compared to children from households headed by private workers [adjusted odds ratio (AOR) = 2.3; 95% CI (1.01-5.4)]. In addition, the odds of meeting minimum dietary diversity among children from families headed by government workers were almost four times higher than the odds of minimum dietary diversity among children from families headed by private workers [AOR = 3.7; 95% CI (2.3-5.9)]. The odds of minimum dietary diversity in children 6-8 months of age were nearly five times higher than the odds' of minimum dietary diversity among older children [AOR = 5.2; 95% CI (2.9-9.1)].</p> <p>Likewise, among the variables reached the final step, household head occupation, maternal/caregiver educational level, child sex and age were identified as predictors of minimum meal frequency. The chance of children came from households lead by government workers, who met the requirement of minimum meal frequency, were reduced by 40% [AOR = 0.6; 95% CI (0.4-0.9)]. The probability of meeting the requirement of minimum meal frequency was reduced by 50% if the child fed by illiterate mothers/caregivers as compared to mothers or caregivers who attain grade 10 and above [AOR = 0.5; 95% CI (0.2-0.9)]. Girls were nearly two times more likely to be fed frequently as compared to boys [AOR = 1.5; 95% CI (1.02-2.1)]</p>
125	Jones et al, 2012. Bolivian Andes	Purposive sampling	Household survey-Baseline-331, follow-up : 390	June 2009 and February 2010	<p>The two most commonly reported categories of barriers are linked to agriculture. Families with a limited diversity of agricultural production reported being frequently unable to improve weaning foods by diversifying potato-based dishes with ingredients such as cereal grains, legumes, fruits, vegetables and animal-source foods. Rearing several young children simultaneously was also frequently reported as a barrier to improving feeding practices and mothers often expressed that they had little control over the size of their families.</p>

126	Custodio et al., 2019. Rwanda and Burundi	Random sampling	957 and 1049 children aged 6–23 months from rural Burundi and rural Rwanda, respectively.	Fieldwork in Rwanda was conducted from September 26, 2010 to March 10, 2011, and in Burundi from August 29, 2010 to January 30, 2011 in Burundi.	Among the individual and household level factors, the odds of meeting the MDD-C criterion were significantly higher among older children, by more than two folds for children older than one year old as compared to infants. Also in both countries, children living in households with higher living standards index were more likely to meet the MDD-C criterion. In Burundi, the higher level of education of the mother’s husband/partners was also associated with higher MDD. On the other hand, in Rwanda, higher ages of the head of the household and of the mother at the first birth were positively associated with meeting MDD-C. The mothers’ educational level and the educational index were positively associated with MDD-C in both countries, but only in the bivariable model, and lost significance when the living standards index was introduced.
127	Beyene et al., (2015). Northwest Ethiopia	Simple random sampling technique	920	March 1–30, 2014	<p>The educational status of a mother, age of a child, birth order of index child, area of residence, home gardening and satisfactory media exposure of a mother were significantly associated with providing the minimum dietary diversity after controlling for other predictors in the model.</p> <p>The study found that children born from mothers who were well educated and had a secondary level education [AOR 2.52; 95 % CI (1.28, 4.93)] or higher education [AOR 4.23; 95 % CI (1.92, 9.33)] had greater odds of feeding diversified foods. A recent study done on comparison of five Asian countries on infant feeding reports that mother’s education is a significant determinant of appropriate diversified infant feeding [18, 19]. This could be educated mothers are more likely to have information (media exposure), understand the education message, more likely to be engaged in the paid work and might have received lessons on child feeding in the curricula at school. Another most important factor significantly associated with minimum dietary diversity was age of a child. Children aged 12–17 and 18–23 months had about two times higher odds [(AOR 2.05; 95 % CI (1.17–3.58) and (AOR 2.89; 95 % CI (1.69, 4.93))] of having minimum dietary diversity compared to children aged 6–11 months. This study is in line with studies conducted in Ethiopia, Indonesia, Nepal, and Sri Lanka [9, 12, 15, 19]. This indicated the relationship between different food groups by age group which implies that food groups decrease as the child age decreases</p>

128	Solomon et al, (2017). Addis Ababa, Ethiopia	systematic random sampling method	352	26th February to 28th April, 2016	<p>According to the multivariable analysis mother's education, household income and knowledge on dietary diversity and child feeding were significantly associated with minimum dietary diversity feeding practices. However, mother's age and occupation, and father's education and occupation didn't show any significant association in the multivariable analysis. Moreover, obstetrics and health service characteristics of mothers didn't show any statistical association at both levels; the binary and multivariable logistic regression model.</p> <p>The odds of feeding minimum dietary diversity to child's age 6–23 months was significantly associated and higher among mothers who had attained secondary, and college and above level of education, with an adjusted odds ratio of 4.62 (95% CI: 2.31–9.25) and 4.49 (95% CI: 1.50–13.42) respectively as compared to those who had no formal education. Mother's good knowledge on dietary diversity and child feeding was significantly associated with the feeding of the minimum dietary diversity, with an adjusted odds ratio of 1.98 (95% CI: 1.11–3.53) to their child. Furthermore, children of mother's who had a household monthly income of greater than 3000 Ethiopian Birr were more likely to feed the minimum dietary diversity as compared to those from a family of a monthly income \leq1500 Ethiopian Birr.</p>
129	Gautam et al., 2016. Nepal	systematic random sampling	180	August to September 2011	<p>Mothers who attained high school or higher education were more likely [aOR: 3.02; 95 % CI (1.318–6.98)] to provide minimum acceptable diets to their children in the last 24 h than their counterparts with lower level of education. Mothers who took their children for growth monitoring were more likely [aOR 2.15; 95 % CI (1.02– 4.54)] to provide recommended minimum acceptable diet in the past 24 h.</p>
130	Eshete et al., (2018). Ethiopia	Two stage cluster sampling	2972	Not reported	<p>Those children whose mothers read to news- paper or magazine at least once in a week had 81% less chance to be inadequate for MDD. Furthermore, statistically significant result has shown that the odds of being inadequate to minimum dietary diversity among children whose mothers read to newspaper or magazine less than once in a week was 56% less likely (AOR = 0.44; 95% CI 0.23, 0.83) than those children's mother who do not read at all. Likewise, the odds of being inadequate to MDD among children who had mothers that listen to radio at least once in a week was 57% less likely than (AOR = 0.43; 95% CI 0.30, 0.62) those children who had mothers that did not listen at all. Those fathers who had attained primary education had 41% less likely (AOR=0.59; 95% CI 0.37, 0.94) odds of having children who are inadequate to minimum dietary diversity than fathers who did not go to formal education. The odds of having inadequate minimum dietary diversity among children living in richest household was 60% (AOR=0.40; 95%</p>

					CI 0.21, 0.76) less likely than children who were living in poorest household.
131	Bimpong et al., (2020). Ghana	Purposive sampling	200	Not reported	Significant determinants of adequate diet were mothers/care givers having high knowledge in child feeding recommendations; and the father of the child reportedly earning adequate income for the upkeep of the family.
132	Berhane et al., 2020. Addis Ababa, Ethiopia	Multi-stage sampling/ systematic random sampling method	6253	Not reported	<p>More children from the highest wealth households received an adequate diet diversity compared to children in the lowest (70% vs. 49%). The difference in the prevalence of adequate diet diversity was more than 30% between the food secure (68%) as compared to the severely food insecure (33%), and among children who had college-educated mothers (75%) as compared to those who had never attended school (42%). However, there was no difference by sex.</p> <p>When evaluating the independent associations, all three socio-economic resources showed significant variations in diet diversity. Compared to children in the highest wealth tertile, children in the lowest wealth tertile had lower odds of having a diverse diet (AOR: 0.60, 95% CI: 0.51-0.71). Adequate diet diversity was attributed to maternal education and household food security. Children with mothers who never attended school and those from food-insecure households had lower odds of having adequate diet diversity. No significant association was observed between the diet diversity of the different sexes (boys vs. girls).</p>
133	Harvey et al., 2018. South East Asia	Simple Random sampling method	8364	Not reported	Pooling all data from Cambodia, Myanmar and Indonesia to quantify the difference between countries in the likelihood of children meeting MDD, with Cambodia as reference category, the odds of meeting MDD was 68% lower (AOR=0.32; 95% CI 0.27, 0.38) in Myanmar and 22% higher in Indonesia (AOR=1.22; 95% CI 1.08, 1.38). In this pooled analysis, children from the richest households (AOR = 2.78; 95 % CI 2.36, 2.92) and those living in urban areas (AOR = 1.83; 95 % CI 1.64, 2.04) were more likely to meet the MDD. High labour force participation was associated with a 25% increased odds of meeting MDD (AOR = 1.25; 95 % CI 1.10, 1.42).
	Resource implications				

134	Laterra et al., 2014. Haiti	Convenience sampling	310	13 June and 14 July 2013	Meeting MDD was not statistically significantly associated with parity, receipt of maternal postnatal care, rural place of residence, location of most recent birth, receipt of IYCF counselling following the most recent birth, or school level attended (Table 5). To account for a possible interaction between child age and dietary diversity, a stratified analysis was performed. When stratified by age, the association between receipt of postnatal care and achievement of MDD became statistically significant among children >12-24 months old (OR = 6.73 (95% CI: 1.09-4.55))
135	Hitachi et al., (2020). Kenya	Purposive sampling	662	February, 2018- June 2019	From pre- to post-intervention, the means of DDS increased similarly in both groups, 1.97 ± 0.45 in the control and 1.94 ± 0.53 in the intervention group ($p < 0.01$). Likewise, the means of the attitude score by group were significantly improved (control improved: 0.46 ± 0.15 ; $p < 0.01$; intervention improved: 0.49 ± 0.41 ; $p < 0.01$). Concerning child nutritional statuses, the means of HAZ, WAZ, and WHZ for each group had no evident changes between pre- and post-intervention. The results indicate a significant positive impact of nutritional education with the help of CHWs and SNU's (i.e., Nyumba Kumi) on household caregivers' attitudes toward recommended feeding and practices of dietary diversity
136	Gelli et al., (2018). Malawi	Random sampling	Baseline: 1199 Endline: 1122	December, 2015-December, 2016	The intervention improved the dietary intake of foods consumed at home, measured over a 24-h recall period, by pre-schoolers for energy, protein, and all micronutrients studied (zinc, iron, and vitamins A, C, B-6, and B-12). The intervention also improved mean dietary diversity in pre-schoolers, driven by the higher likelihood of intake of fruits and fish in the past 24 h. Findings showed that mean DDS was 0.31 points greater in the intervention group ($P < 0.05$; mean DDS = 3.24 in the intervention group compared with 2.93 in the control group; data not reported). This difference was driven by the higher likelihood of the consumption of nuts, pulses, fruits, and vegetables. Moreover, the intervention group had a higher percentage of younger siblings who had achieved MDD in the past 24 h (39% in the intervention group compared with 28% in the control group; mean \pm SE difference: 0.11 ± 0.05 ; $P < 0.05$). Positive effects on HAZ (DID: 0.44; SE: 0.16; $P < 0.05$) with a concurrent reduction in the prevalence of stunting [DID: -17 percentage points (pp); SE: 6 pp; $P < 0.05$] were found in the younger siblings ($n = 304$)

137	Kuchenbecker et al., (2017). Malawi	Two-stage probability sampling strategy	Baseline: 413-control, 419-intervention area Endline: 466-control, 493-intervention	Aug/Sep,2011- Aug/Sep,2014	The improvements in mean CDD in the intervention area at endline are further reflected in higher percentages of children reaching the WHO indicator MDD (BL = 61.9%, EL = 71.1%). Accordingly, within the control area, lower percentages of MDD (BL = 59.9%, EL = 55.5%) were achieved.
138	Maingi et al., (2018). Kenya	Randomized control	294 mother-infant pairs	20months	Seventy seven percent of children in the intervention group (77%) had attained the minimum dietary diversity compared to 58% in the control group (p = 0.001). In general, more children from the intervention group than controls consumed food from at least four food groups. Overall, 67 and 23% of the children in the study consumed Vitamin A rich and Iron-rich foods respectively. The odds of attaining minimum dietary diversity were five times greater in the intervention group compared to the control group (OR: 4.95; 95% CI 2.44–10.03), when mother's age, education level, marital status, religion and main source of income were controlled for (p = < 0.001)
Impact/Effect on health					
139	Nai and Renyoet , (2020). Yogyakarta, Indonesia	Analytic observational study with cross-sectional design	135	March 2018 to October 2018.	This present study found that minimum dietary diversity was associated with stunting. Children who consumed inadequate dietary diversity (consumed ,4 food groups) had 3.03 times higher odds of being stunted (95% CI (1.42–6.47)) than those who consumed adequate dietary diversity (consumed \$4 food groups). This study also found that minimum meal frequency was not associated with stunting. The result of bivariate analysis indicated that not diverse diet was significantly associated with a higher likelihood of stunting in children aged 6–23 months (RP: 2.87; 95%CI: 1.23–6.68). Children who consumed not diverse diet were 2.87 more likely to be stunted than those who consumed a diverse diet.
140	Komaruddin et al., (2019). East Jakarta	Cross-sectional study using a consecutive sampling scheme	120	February to March 2018	Multivariate analysis showed that stunting was strongly related with individual dietary diversity in young children. Subjects who had poor dietary diversity or consumption of food groups less than four were associated with 6.76 times higher chance of becoming stunted (95%CI: 6.77-41.51) than children who had good dietary diversity.

141	Paramashanti et al, (2017). Yogyakarta, Indonesia	Cross-sectional design using probability proportional to size sampling	185	February to March 2016	Bivariate analysis results showed that there were several variables that had a significant association with stunting, such as poor dietary diversity (OR=5,22; 95%CI: 3,09-8,83), low birth weight (OR=2,90; 95%CI: 1,96-4,30), and appropriate time of complementary feeding (OR=0,46; 95%CI: 1,96-4,30). Multivariate analysis showed that stunting was strongly related with individual dietary diversity in young children. Subjects who had poor dietary diversity or consumption of food groups less than four were associated with 16,76 times higher chance of becoming stunting (95%CI: 6,77-41,51) than children who had good dietary diversity.
142	Mallard, et al, (2016) . Lusaka, Zambia	randomized controlled fortification trial (longitudinal)	811	October 2005 and July 2009	In multiple linear regression models adjusted for baseline LAZ or WLZ and other a priori confounders, all of the measures of mean micronutrient adequacy at 6 mo were positively associated with LAZ and WLZ at 18 mo of age (all at 6 mo on WLZ at 18 mo non-statistically significant (all P \$ 0.11), likely because of the inclusion of energy intake. In final models additionally adjusted for dietary diversity, the association between MMDA Ca Fe Zn at 6 mo and LAZ at 18 mo remained statistically significant (P = 0.028), whereas all other associations between micronutrient adequacy and LAZ became nonsignificant (both P \$ 0.19) (Table 6). In all 3 of these fully adjusted models, dietary diversity at 6 mo was positively associated with LAZ at 18 mo (all P # 0.014 for linear trend).
143	Kuche et al, (2020). Ethiopia	Systematic random sampling	1,848 children and their respective caregivers	May-July 2016	Child dietary diversity was positively associated with LAZ: children who consumed the highest number of food groups (between 4 and 7) had 0.42 higher mean LAZ (95% CI [0.08, 0.77]; P = .006) compared with those children who consumed no complementary foods
144	Saakaa and Galaa, (2017). Ghana	random systematic method	2388	Not reported	In bivariate analyses, stunting and minimum dietary diversity were associated with anaemia but they did not remain in a regression model.
145	Chandrasekhar et al. (2017). India	Not reported	1953	February - May 2012	Children's diet diversity score was significantly associated with weight-for-age (B= 0.8, p=0.001, 95%CI= 0.9-1.1) (underweight) and weight-for-height (B= 0.9, p0.036, 95%CI= 0.8-1.0) (wasted) of child.

146	Chipahna, (2020). Tanzania	Simple Random sampling method	395	Not reported	Dietary diversity was significantly associated with food fed child for past 24 hours (p=0.0150) on nutritional status in terms of height for age were stunted, food fed child for past 24 hours (p=0.0012) on nutritional status in terms of weight for age were underweight. With respect to dietary diversity majority 123 (67.2%) were 2-3 meal per day while 125 (59.8%) were 2-3 meal per day not diversity diet. In case of weight for age 51 (27.4%) of child fed 2-3 Diversity diet were underweight and 2-3 not diversity diet 49(23.5%) were under. Findings show that for a child who were not dietary diversity is more than 2.158 times to have stunting compared to those who were dietary Diversity [OR=2.158, P-value=0.010, Lower=0.695 and Upper=3.494]. And lastly for the child who were not dietary diversity is more than 1.246times to be underweight compared to those who were dietary diversity [OR=1.246, P-value=0.024, Lower=1.096 and Upper=1.404].
147	Reinbott et al., (2016). Cambodia	two-stage probability sampling strategy	1664	2012-2014	Households had a more diverse diet at impact in both groups in comparison with baseline. Both groups had a mean household food insecurity access scale score of 6 (min, max: 0–19). In a partial correlation model, HAZ scores were weakly but not significantly correlated with CDDS when including covariates: R 0.05, P = 0.06.
Definition of dietary diversity					
148	Shubha et al., (2016). India	Complete enumeration/ Cross-sectional	350	6 months	Minimum dietary diversity was defined as the proportion of children 6–23 months of age who receive foods from four or more food groups. Working mothers were more likely to provide adequate dietary diversity compared to non-working mothers
149	Patel et al., (2012). India	Simple random sampling/ Cross-sectional	15028	Not specified	Minimum dietary diversity was defined as the proportion of children 6–23 months of age who received foods from four or more food groups. No maternal education, lower maternal Body Mass Index (BMI) (<18.5 kg/m), lower wealth index, less frequent (<7) antenatal clinic visits, lack of post-natal visits and poor exposure to media were associated with not meeting dietary diversity.
150	Shaw et al., (2020). India	Cross-sectional study	277	Not specified	Minimum Dietary Diversity (MDD) was defined as breast fed children 6–23 months of age who had received foods from 4 or more food groups from a total of 10 food groups. We found no association between the educational status of mothers. There was no association between the type of family and feeding practices of the subjects. The

					first-time mothers in the study were feeding children better than women with more children
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APPENDIX 7 LIST OF SELECTED FULL TEXT STUDIES FOR REVIEW

Selected unhealthy foods and beverages full texts for review

1. Cartagena, D., McGrath, J.M. and Linares, A.M., 2018. Associations between introduction of age-inappropriate foods and early eating environments in low-socioeconomic Hispanic infants. *Journal of Pediatric Health Care*, 32(2), pp.e27-e36.
2. Passanha, A., Benício, M.H.D.A. and Venâncio, S.I., 2021. Determinants of fruits, vegetables, and ultra-processed foods consumption among infants. *Ciência & Saúde Coletiva*, 26, pp.209-220.
3. Pries AM, Sharma N, Upadhyay A, Rehman AM, Filteau S, Ferguson EL. Energy intake from unhealthy snack food/beverage among 12-23-month-old children in urban Nepal. *Matern Child Nutr*. 2019 Jun;15 Suppl 4(Suppl 4):e12775. doi: 10.1111/mcn.12775. PMID: 31225707; PMCID: PMC6617731.
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5. Wrottesley, S.V., Prioreschi, A., Slemming, W., Cohen, E., Dennis, C.L. and Norris, S.A., 2020. Maternal perspectives on infant feeding practices in Soweto, South Africa. *Public Health Nutrition*, pp.1-13.

Selected RF full texts for review

6. Athavale, P., Hoeft, K., Dalal, R.M., Bondre, A.P., Mukherjee, P. and Sokal-Gutierrez, K., 2020. A qualitative assessment of barriers and facilitators to implementing recommended infant nutrition practices in Mumbai, India. *Journal of Health, Population and Nutrition*, 39(1), pp.1-12.
7. Klerks, M., Roman, S., Bernal, M.J., Haro-Vicente, J.F. and Sanchez-Siles, L.M., 2021. Complementary Feeding Practices and Parental Pressure to Eat among Spanish Infants and Toddlers: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*, 18(4), p.1982.
8. Wrottesley, S.V., Prioreschi, A., Slemming, W., Cohen, E., Dennis, C.L. and Norris, S.A., 2020. Maternal perspectives on infant feeding practices in Soweto, South Africa. *Public Health Nutrition*, pp.1-13.
9. Kumwenda, W., 2017. *Parental and caregivers' nutrition knowledge, attitudes, perceptions and practices on infant and young child feeding (aged zero to 24 months) in Mzimba-north district, Malawi* (Doctoral dissertation, University of Pretoria).
10. Inbaraj, L.R., Khaja, S., George, C.E. and Norman, G., 2020. Paternal involvement in feeding and its association with nutritional status of children in an urban slum in a low-resource setting: A cross-sectional study. *Nutrition*, 74, p.110735.
11. Wondafrash, M., Amsalu, T. and Woldie, M., 2012. Feeding styles of caregivers of children 6-23 months of age in Derashe special district, Southern Ethiopia. *BMC Public Health*, 12(1), pp.1-8.
12. Aboud, F.E., Shafique, S. and Akhter, S., 2009. A responsive feeding intervention increases children's self-feeding and maternal responsiveness but not weight gain. *The Journal of nutrition*, 139(9), pp.1738-1743.
13. Boucheron, P., Bhopal, S., Verma, D., Roy, R., Kumar, D., Divan, G. and Kirkwood, B., 2020. Observed feeding behaviours and effects on child weight and length at 12 months of age: Findings from the SPRING cluster-randomized controlled trial in rural India. *PLoS one*, 15(8), p.e0237226.
14. Amukugo, H.J. and Shilunga, A.P., 2018. The experiences of mothers and caregivers on feeding practices of children under the age of five years with undernutrition in Oshikoto region, Namibia.
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17. Mwase, I., Mutoro, A., Owino, V., Garcia, A.L. and Wright, C.M., 2016. Poor infant feeding practices and high prevalence of malnutrition in urban slum child care centres in Nairobi: a pilot study. *Journal of tropical pediatrics*, 62(1), pp.46-54.

Selected milk consumption full text for review

18. Choudhury, S. and Headey, D.D., 2018. Household dairy production and child growth: Evidence from Bangladesh. *Economics & Human Biology*, 30, pp.150-161.

19. Haileselassie, M., Redae, G., Berhe, G., Henry, C.J., Nickerson, M.T., Tyler, B. and Mulugeta, A., 2020. Correction: Why are animal source foods rarely consumed by 6-23 months old children in rural communities of Northern Ethiopia? A qualitative study. *Plos one*, 15(3), p.e0230527.
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