

## Food Systems and Nutrition Evidence and Gap Map

### Update #6 (May 2023 – July 2023)

#### Highlights

- This update adds 140 new impact evaluations and six new systematic reviews for a total of 2,452 included studies.
- 48 new studies address previously identified gaps, but the overall gaps remain the same (Table 1).
- One high-confidence systematic review has been added and the rest low-confidence. Overall, during the update period few high- and medium-confidence reviews have been identified.
- We have added a new outcome category called Gender transformative outcomes. In total 19 studies in the map measure this outcome.
- We continue to see a shift towards more studies evaluating national and transnational programs, increasing from nine per cent in the original map to 17 per cent in the current update and 11 per cent overall.
- Overall, the intervention trends are similar to the original although we see a reduction in supplementation and fortification and an increase in agricultural education and training interventions.
- We continue to see more quasi-experimental methods, currently 50 per cent of studies in the update and 30 per cent overall in the E&GM.

**Table 1: Studies added to the E&GM (May-July 2023)**

Interventions	Studies and protocols added (studies previously included)
Total studies	146(2306)
Food supply	78(998)
Food environment	32(816)
Consumer behaviour	45(675)
Common multi-component	9(106)
<b>Previously identified gaps</b>	
<i>Illustrative list of interventions to priorities for evaluation</i>	
Government manipulations of price	0(25)
Advertising and labelling regulations	0(1)
On-farm, post-harvest processing	0(5)
Interventions to support food packaging	0(0)
Efforts to support women's empowerment	1(45)

Interventions	Studies and protocols added (studies previously included)
Gender transformative interventions	0(12)
Innovative store design	0(5)
Cold chain initiatives*	0(1)
Improved farm to market transport*	0(5)
Food safety regulations*	0(3)
<i>Illustrative list of outcomes to priorities for evaluation</i>	
Women's empowerment	7(81)
Gender transformative outcomes	0(19)
Economic, social, and political stability	0(4)
Food loss	0(2)
Environmental impacts of the food system	3(14)
Measures of diet insufficiency	0(29)
<i>Illustrative list of evidence synthesis priorities</i>	
Provision of free or reduced-cost farm inputs to crop production	0(13)
Educational approaches within the food value chain	0(8)
Agricultural insurance products	0(1)
Outcome related to other diet quality and adequacy measures	0(24)
<i>Illustrative list of methods and scale priorities</i>	
Cost evidence	4(184)
Mixed methods research	10(206)
High-confidence systematic reviews	1 (42)
National and trans-national evaluations	24(221)

\* These represent new priority areas identified through our mid-term report

## Background

Since May 2020, 3ie has been undertaking its ambitious, *living* Food Systems and Nutrition Evidence and Gap Map (E&GM) project with support from BMZ through GIZ's "Knowledge for Nutrition" programme. The E&GM presents all impact evaluations and systematic reviews of impact evaluations considering interventions in low- and middle-income countries (L&MICs) that function within food systems and measure outcomes related to food security and nutrition. Newly published studies are continuously monitored and periodically added to the E&GM. This ensures that the E&GM remains a useful and current tool as the evidence base rapidly expands. The map has the dual purpose of serving as a collection of the available evidence and a presentation of knowledge gaps. The E&GM acts as a global public good to inform the efficient allocation of resources. It makes existing evidence more easily available to decision-makers, funders, and researchers. With over 1,800 impact evaluations and 170 systematic reviews included, the original E&GM was 3ie's largest to

date. This report presents our analysis of the studies published from May 2023 to July 2023. We discuss additions and overall changes in the evidence base. Since the last update published in July 2023 the E&GM and related synthesis products were presented at the Agriculture, Nutrition & Health Academy (ANH) conference in Malawi. This included a side event at the conference discussing challenges faced by policymakers in finding the evidence they need and researchers in providing the evidence, along with findings from a suite of related evidence products; rapid evidence assessments of women's empowerment interventions and long-term effects of food systems interventions and a systematic review on fiscal policies within the food system.

### Map extension

The map will continue to be updated through March 2024. As a result of the reflections from the mid-term report, we are expanding the E&GM in two dimensions and adding a new filter. In the previous updates a year filter was added to the map, allowing users to search for evidence from specific years. The inclusion criteria for women's empowerment interventions were expanded to include any women's empowerment intervention, not only those that take place within the context of food systems. 'Gender transformative' interventions were added as a new intervention row in the map, including interventions aiming to influence structural and relational aspects of inequality.

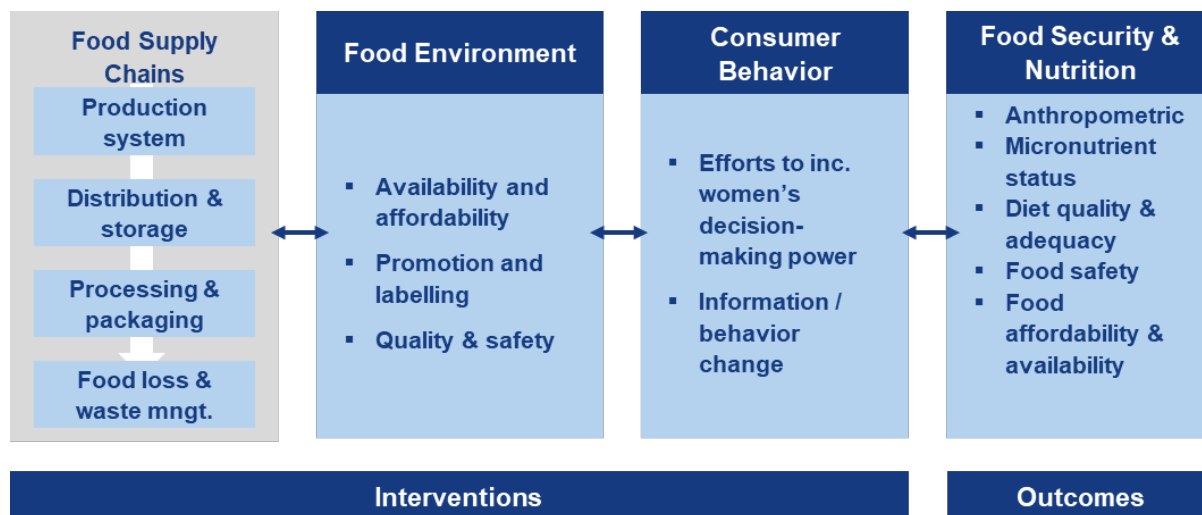
For this update, outcomes have been expanded to include gender transformative outcomes as a separate category. Although most gender transformative outcomes would have been included under our current definition of women's empowerment outcomes, studies that *only* considered gender norms regarding men would have been excluded. Therefore, to identify studies considering gender transformative outcomes, we have re-screened studies which were previously excluded on outcomes to check for gender transformative outcomes. We have also re-screen studies which are included as having women's empowerment outcomes to consider if these also should be coded as gender transformative outcomes.

In addition, in the next update planned for February 2024, we will also add a new set of interventions relating to social protection, cash transfers, social assistance, and social insurance programmes. These will be identified through a novel search and screening process.

### Framework

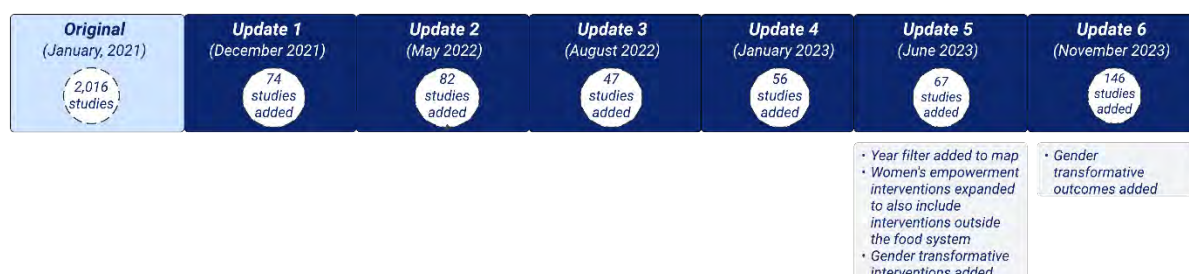
The E&GM uses an adapted version of the framework from the 'High-Level Panel of Experts on Food Security and Nutrition' (HLPE) from 2017 to conceptualise the food system, separating it into the three dimensions: (i) food supply chain, (ii) food environment, and (iii) consumer behaviour (Figure 1).

**Figure 1: Conceptual framework and theory of change for the Food Systems and Nutrition Evidence and Gap Map**



Source: 3ie (2020). Adapted from HLPE (2017).

**Figure 2: E&GM timeline**



## Methods

### Search

This update includes records identified in the most recent Development Evidence Portal (3ie's database of impact evaluations and systematic reviews across sectors in international development) and E&GM-specific searches from July 2023, covering the period since the previous searches. This update also includes a number of studies from previous Development Evidence Portal searches. The Development Evidence Portal's resource constraints often mean there is some delay between when these results are retrieved and when they are screened for EGM eligibility. Consequently, the studies added during each EGM update typically contain a mixture of the latest studies from EGM-specific searches and studies found in older searches for the Development Evidence Portal. For more details on search strategy see Appendix 2.

### Screening

The same process for screening was employed in this update as in the original E&GM. Records retrieved through the searches were uploaded into the EPPI-Reviewer 4 software (Thomas et al. 2020).

An automated process within the software was applied to remove duplicates. We applied a machine learning classifier, developed during the original E&GM, to these search results, and screened abstracts with a priority score of 20% or above. We also applied a second classifier developed with Development Evidence Portal screening data to the E&GM search results and screened those scoring 30% or above.

Single screening against inclusion/exclusion criteria was carried out for both title and abstract screening and full text screening, with a senior reviewer checking any marked as unsure.

### Data extraction, analysis, and presentation of results

Data extraction and analysis procedures were identical to those of the original E&GM. Results are presented graphically on the 3ie interactive [online platform](#). This report presents updated figures, illustrating the evolution of the evidence base.

## Results

Our search retrieved 76,104 records (Figure 2). We removed 38,117 duplicates. We also removed 32,183 which were identified as having low probability based on the classifier in EPPI-Reviewer 4. In total, 2,386 studies from the DEP search were added to a screening pipeline and will be screened at a later point. Therefore, 3,418 abstracts included in the E&GM specific search were screened. During title and abstract screening, 3,128 articles were excluded, leaving 290 to be screened at full text. Finally, 96 relevant articles were eligible for inclusion, 2 of which were linked to other articles and did not represent unique studies. Therefore, we added 94 unique studies from this search: 88 impact evaluations and six systematic reviews. Zero studies measuring gender transformative outcomes were identified when screening studies previously excluded on outcomes. In addition, 52 studies were also added from the Development Evidence Portal screening backlog. In total, 140 impact evaluations and six systematic reviews were added in this update. Of included studies, 34 reports were published before 2021 but added to the databases searched in a delayed manner. The remainder of the newly included studies were published in 2021, 2022 or 2023.

Over half of the new studies were added to the food supply chain domain of interventions (Figure 3, IE n=76, SR n=2), followed by consumer behaviour domain (IE n=41, SR n=4), and the food environment domain (IE n=29, SR n=3). Overall, in the E&GM the food supply chain is still the most common intervention domain (IE n = 1000, SR n = 76).

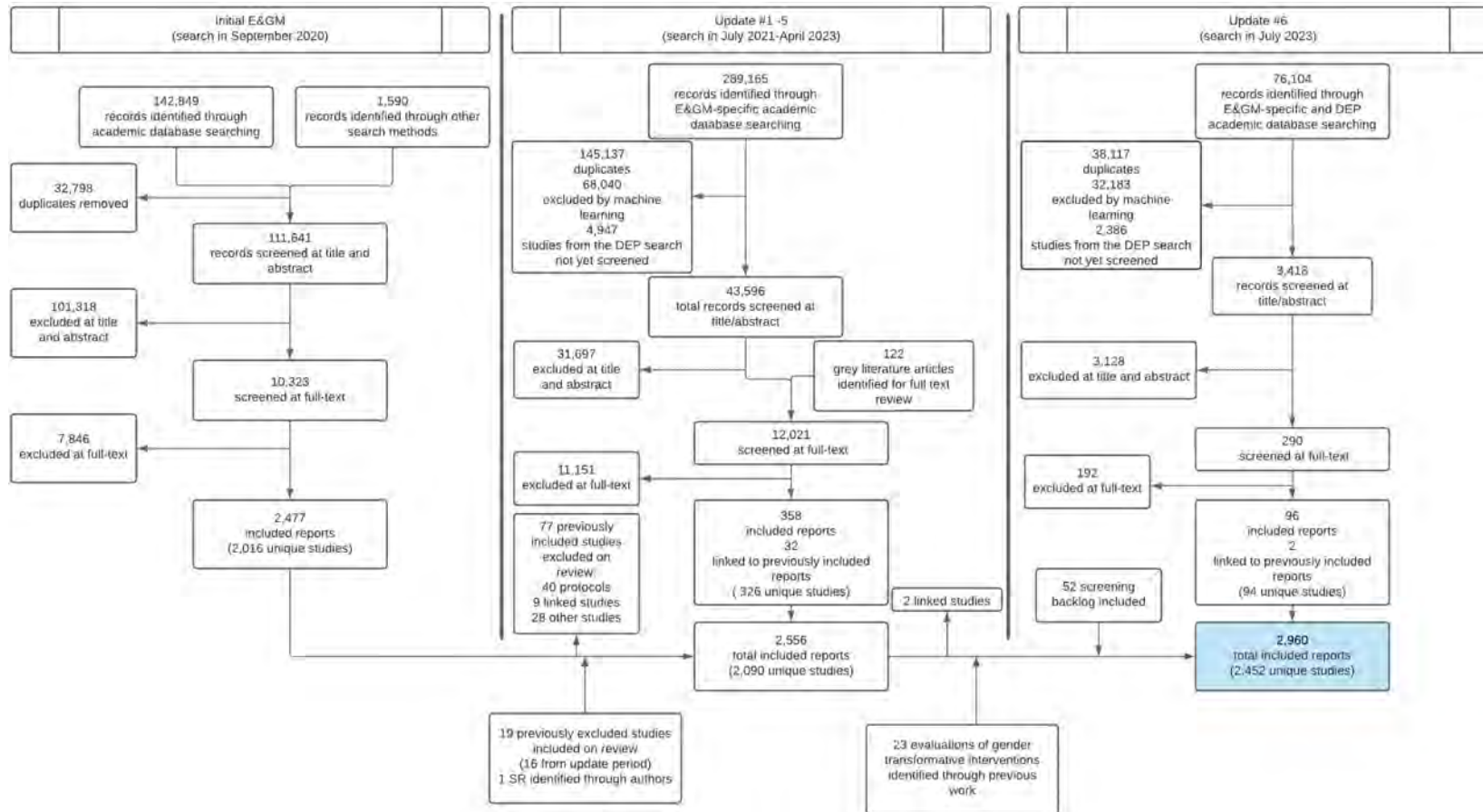
The newest studies focus on agricultural extension services (IE n=19, SR n=0), classes (IE n=17, SR n=2), and provision of supplements (IE n=15, SR n=2). The three most common

interventions overall are still the same as when the original E&GM was first published; provision of supplements in the food environment domain (IE n=406, SR n=75), fortification in the food supply chain (IE n=296, SR n=56) and classes in the consumer behaviour domain (IE n=300, SR n=31). The updates have shown a change in the intervention trends, where agricultural education interventions have become more commonly evaluated in recent years while there has been a reduction in evaluations focused on supplementation and fortification interventions.

In terms of the gaps identified in the original E&GM, this update has identified one study focusing on the intervention gaps (Table 1). This study evaluates a women's empowerment intervention. In total there are now 50 studies evaluating this type of intervention.

We have decided to reduce multi-component interventions to ones evaluated 10 or more times, as there were many categories with few studies. Six categories have been removed resulting in a total of five multi-component categories.

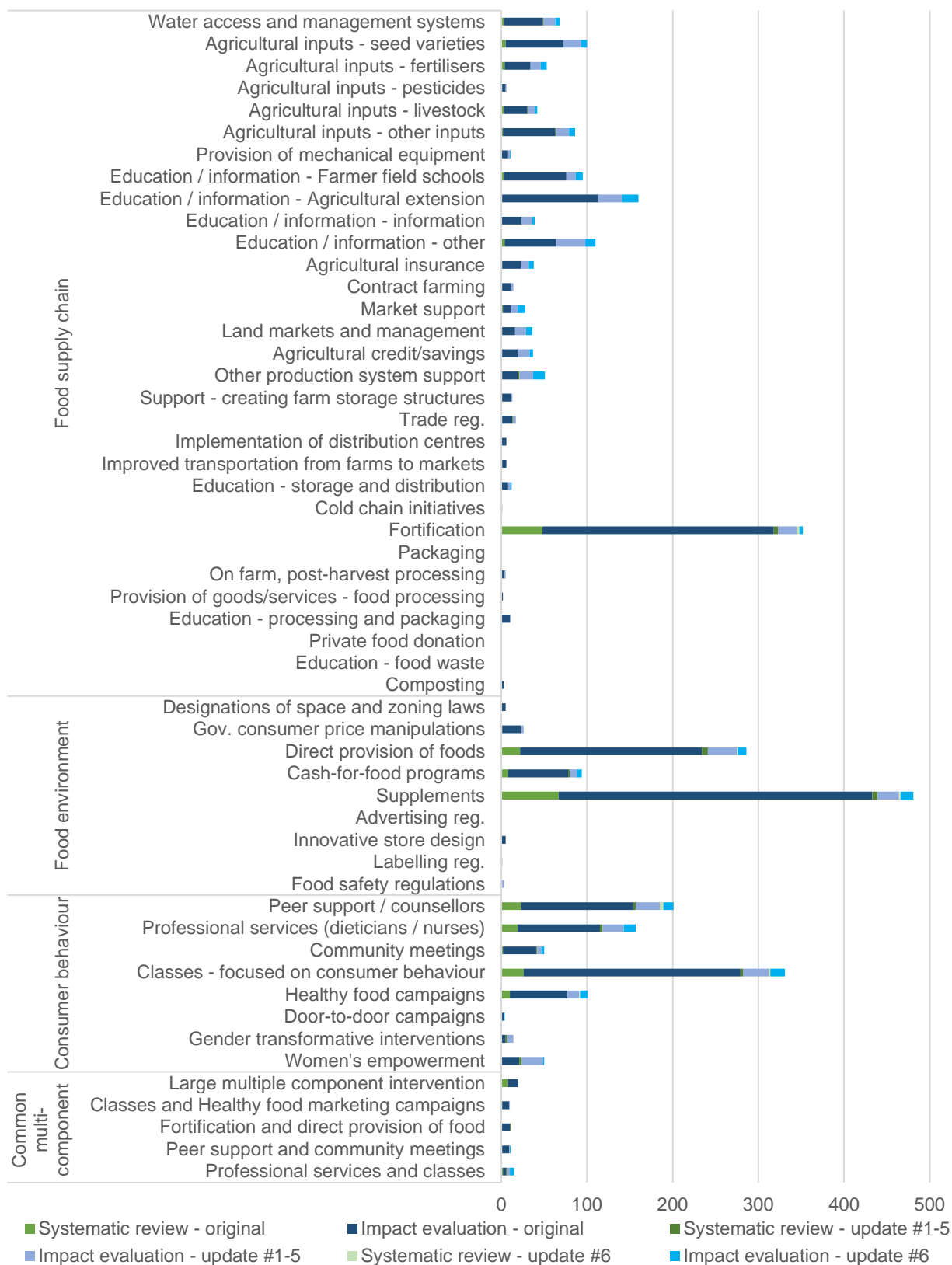
Figure 3: PRISMA flow diagram<sup>1</sup>



<sup>1</sup> The diagram follows the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines (Page et al. 2020).



Figure 4: Distribution of included studies by intervention domain and subdomain

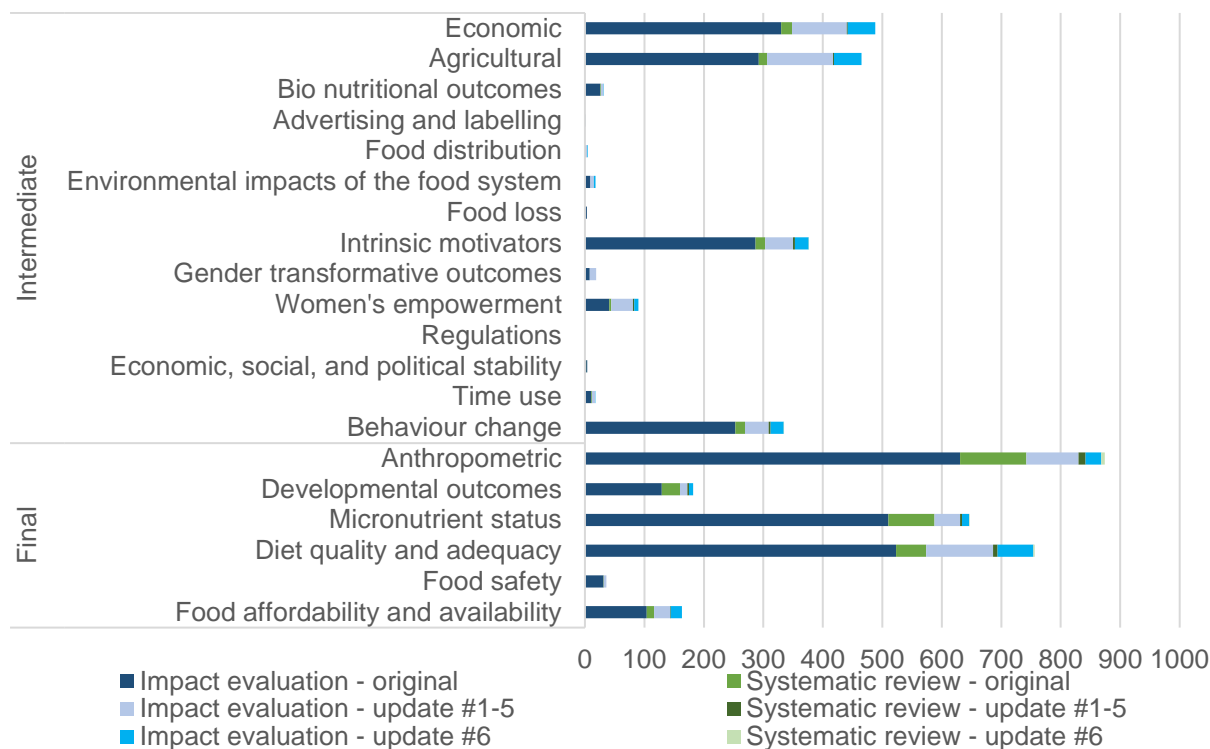




In terms of outcomes, most studies included in this update focus on diet quality and adequacy (IE n = 60, SR n=2), agricultural (IE n=45, SR n=0) and economic (IE n=46, SR n=0) outcomes. These are all in the top five most commonly evaluated outcomes overall for the E&GM. Anthropometric is the most common (IE n=747, SR n=130), followed by diet quality and adequacy (IE n = 695, SR n = 61), micronutrient status (IE n = 565, SR n =82), economic (IE n = 468, SR n = 20) and agricultural outcomes (IE n= 467, SR n= 16). Even though these are still the most common outcomes the updates have shown a reduction in the clustering on these outcomes, as noted in the mid-term report.

In total, 19 already included studies were found to measure the newly included gender transformative outcomes. In terms of gaps, we found three new studies evaluating environmental impacts of the food system outcomes, taking the total to 18 studies. Seven new studies evaluating women’s empowerment outcomes have been added, taking the total to 90 studies.

**Figure 5: Distribution of included studies by outcome domain**



The use of experimental methods has decreased considerably during the update period. There has been some variation between the updates in how large the decrease has been. The newest addition of studies show 50 per cent of the included studies use experimental methods compared to 73 per cent in the original map. When combining the updates and the original map we see that the overall proportion of experimental studies has slightly decreased to 70 per cent. The increased share of quasi-experimental studies among impact evaluations likely reflects the rise of such studies in the literature on agricultural interventions (Engelbert et al. 2023).

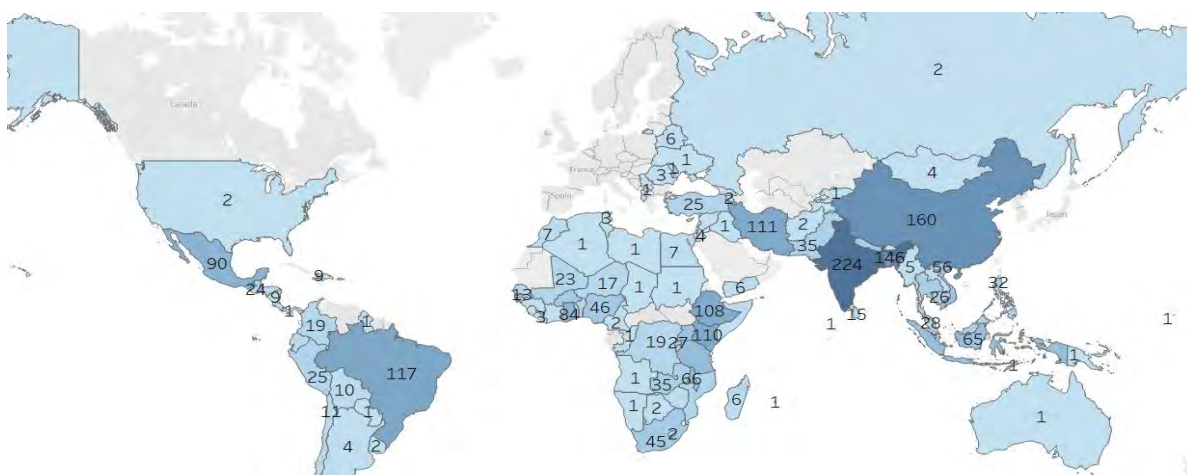
China (n = 20), India (n = 14) and Bangladesh (n = 11) were the countries with most impact evaluations added from this update. This aligns with the total included impact evaluations.

India (Figure 5; n = 224) has the highest number of evaluations followed by China (n = 160) and Bangladesh (n = 146).

Previous versions of the E&GM also identified a lack of evaluations of interventions at the national or trans-national levels (Table 1). National-scale interventions were implemented in 17 of the new impact evaluations (12%), while trans-national programmes were implemented in 7 impact evaluations (5%). This is higher than the overall E&GM (11%), demonstrating a positive change. Mixed methods and cost evidence are other gaps identified. These remain uncommon: only 4 (3%) of the new impact evaluations report cost evidence compared to 188 (8%) overall for the E&GM. While mixed methods were reported in 9 (6%) of the new impact evaluations and currently overall 216 (10%) studies report mixed methods.

Out of the six systematic reviews added, only one was high-confidence and the rest low-confidence. The overall map has 44 high- and medium-confidence reviews. Five of the newly added systematic reviews were published in 2023. None of the systematic reviews included any of the interventions or outcomes identified as gaps (Table 1).

**Figure 6: Distribution of all included impact evaluations by country (original and all updates)**



## Discussion

Through our first living E&GM we continue to provide researchers and decision-makers with the most up to date evidence on food systems and nutrition. We monitor whether gaps in the evidence base have been filled or the research focus is changing. New studies are made available through the interactive version of the E&GM. Overall, the E&GM is rapidly growing with a total of 2,452 studies now included. Despite the addition of studies across multiple updates evaluating areas considered as gaps, these additions are insufficient to provide robust evidence bases in these areas (Table 1). Decision makers can therefore continue investing in evaluation research in these areas. This update identified a study evaluating a women’s empowerment intervention, six studies evaluating women’s empowerment outcomes as well as three studies evaluating environmental outcomes.

Measurement of environmental outcomes has been very uncommon, with such outcomes appearing in only 17 studies across the original E&GM and its updates. The newly identified ones includes a study evaluating the effect of agricultural investment subsidies in Moldova (Mollers et al., 2022). The results demonstrated positive effects on a number of outcomes including decreased use of fertilisers, positive effect on erosion and environmental protection. Another study in Western Kenya evaluated the effect of farmer field schools on food security and environmental conservation outcomes (Kithi, Mugeru and Geza, 2021). The results showed that there was no significant effect on environmental conservation.

The systematic review rated as high-confidence evaluated the effectiveness of behaviour change interventions aiming to improve maternal and child nutrition in Sub-Saharan Africa (Watson et al., 2023). The review includes 79 articles. Many interventions were found to be effective, especially interventions with >2 behaviour change functions. The reviewers recommended incorporating multiple components when implementing nutrition interventions aiming to improve maternal and child outcomes, including combining a behaviour change component and components addressing food insecurity and/or nutritional deficiencies.

Only one systematic review identified in the update period from 2020-2023 has been rated as high-confidence and three as medium-confidence. In 2019, we found 10 high-confidence and 10 medium-confidence systematic reviews. Therefore, more systematic reviews in these areas could be carried out or previous ones updated to avoid gaps in synthesis of the latest evidence, as the systematic reviews are becoming outdated.

The studies we identified measuring gender transformative outcomes were all added before this update, six from the original E&GM and nine from updates 1-5. Most of the gender transformative outcomes measured were measures of change in gender attitudes and gender norms. For example, one study evaluated the Building Resilience of Vulnerable Communities in Burkina Faso (BRB) project, a multi-component intervention providing financial services, agricultural extension, and learning conversations on nutrition and gender (Crookston et al., 2021). The results showed improvement on a composite measure of empowerment, which included indicators related to intimate partner violence, control over use of income, and intra-household decision making.

Another example is an evaluation of apple production self-help groups for women in Southern Ethiopia (Alemu, Kempen and Ruben, 2018). The researchers looked at the difference in women's attitudes about their status but also men's attitudes concerning the status of women, such as opinions about women's involvement in politics, and women's rights to control resources. The evaluation showed positive effects on attitudes in targeted communities, while at the household level there was an increase in conflicts between spouses in relation to control of household resources.

The online map can be accessed [here](#). The original E&GM report is available [here](#). Notes from the [first](#), [second](#), [third](#), [fourth](#) and fifth updates are posted online.

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## Appendix A: Studies added to EGM May 2023 – July 2023

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### Appendix B: Search strategy

To populate this E&GM, we drew from three sets of searches. First, we re-ran the searches in the [original E&GM](#). The search strings used and the databases searched were identical to those in the original E&GM, with the exception of correcting a syntax error in the strings for one database (Scopus). Second, we also re-searched grey literature sources included in the original EGM. This was last completed in January 2022. Third, we screened items retrieved in the searches for 3ie's [Development Evidence Portal](#)—a database of impact evaluations and systematic reviews across sectors in international development—for relevance to this E&GM. Monthly “evidence surveillance” searches are used to populate the Development Evidence Portal. As there is considerable overlap in the inclusion criteria for the Portal and this E&GM, pooling these search strategies reduces overall workload and allows more articles to be screened.

#### Websites searched

##### ***Academic databases***

We conducted electronic searches of the following databases of published sources:

- MEDLINE
- EMBASE
- Cochrane Controlled Trials Register (CENTRAL)
- CINAHL
- CAB Global Health
- CAB Abstracts
- Agricola
- PsychINFO
- Africa-Wide Information
- Academic Search Complete
- Scopus
- Campbell Library

##### ***Grey literature sites searched***

To identify relevant grey literature, we searched the following databases (some of which contain a mixture of published and grey literature):

- Google Scholar
- EconLit
- ENN-Network
- IDEAS/RePEc
- Innovative Methods and Metrics for Agriculture and Nutrition Actions grantee database
- WHO Global Index Medicus
- Grey Literature Report
- Social Science Research Network (SSRN)
- Eldis

- Epistemonikos
- 3ie Development Evidence Portal
- Registry of International Development Impact Evaluations (RIDIE)
- Oxfam Policy & Practice

Below is a list of organisational websites we manually searched for additional related studies.

- [AgEcon Search \(University of Minnesota\)](#)
- [Innovations for Poverty Action](#)
- [Abdul Latif Jameel Poverty Action Lab](#)
- [Global Development Network](#)
- [World Bank Development Impact Evaluation \(DIME\) and Impact Evaluation Policy Papers](#)
- [Inter-American Development Bank](#)
- [Center for Global Development](#)
- [Center for Effective Global Action \(CEGA\)](#)
- [Department for International Development Research for Development \(R4D\)](#)
- [USAID](#)
- [International Food Policy Research Institute](#)
- [CIGAR](#)
- [Food and Agriculture Organization of the United Nations \(FAO\)](#)
- [High Level Panel of Experts on Food Security and Nutrition](#)
- [World Food Programme](#)
- [Action Against Hunger](#)
- [UNICEF](#)
- [United Nations Evaluation Group](#)
- [Asian Development Bank](#)
- [World Agroforestry Centre \(ICRAF\)](#)
- [International Livestock Research Institute \(ILRI\)](#)
- [Nutrition International](#)

### Search terms

Table B1 below presents the terms we used in the literature/ search to capture key concepts in the EGM framework. For each of the terms shown in the table, we used multiple variants to capture alternative spellings and word forms.

**Table B1: Search terms**

Concept	Terms
<b>Study type and geography</b>	
Impact evaluations	<ul style="list-style-type: none"> <li>• Random</li> <li>• Experiment</li> <li>• Propensity score matching</li> <li>• Difference-in-differences</li> <li>• Quasi-experiment</li> <li>• Counterfactual evaluation</li> <li>• Instrumental variables</li> <li>• Regression discontinuity</li> <li>• Time series regression</li> </ul>
Systematic reviews	<ul style="list-style-type: none"> <li>• Systematic review</li> <li>• Literature review</li> <li>• Meta-analysis</li> </ul>
Low- and	<ul style="list-style-type: none"> <li>• Developing</li> <li>• Deprived</li> </ul>



Concept	Terms
middle-income countries (LMICs)	<ul style="list-style-type: none"> <li>• Low/middle income</li> <li>• Underserved</li> <li>• Transitional/emerging economy</li> <li>• Global south</li> <li>• Poor</li> <li>• Low GDP</li> <li>• Terms associated with each LMIC (see full list below)</li> </ul>
<b>Interventions</b>	
Production systems	<ul style="list-style-type: none"> <li>• Food systems/production</li> <li>• Kitchen garden</li> <li>• Agriculture/aquaculture inputs</li> <li>• Livestock</li> <li>• Improved seeds/varieties/crops</li> <li>• Agriculture/crop subsidies</li> <li>• Price purchase guarantee</li> <li>• Crop/rain/weather/index insurance</li> <li>• Drought/pest resistant</li> <li>• GMOs</li> <li>• Fertiliser/pesticide/insecticide</li> <li>• Land management</li> <li>• Water meter</li> <li>• Rain-fed</li> <li>• Trench and hill method</li> <li>• Fixed distance planting</li> <li>• Row planting</li> <li>• Irrigation</li> <li>• Water break</li> <li>• Terracing</li> <li>• Contour bunding</li> <li>• Mechanisation</li> <li>• Intercropping</li> <li>• Companion plants/species</li> <li>• Integrated soil fertility management</li> <li>• Farmer training/field schools</li> <li>• Demonstration plots</li> <li>• Agricultural/rural extension</li> <li>• Farmers' organisations</li> <li>• Social protection</li> </ul>
Storage & distribution	<ul style="list-style-type: none"> <li>• Silo</li> <li>• Storage/storehouse</li> <li>• Shed</li> <li>• Warehouse</li> <li>• Collection/distribution centre</li> <li>• Cold chain</li> <li>• Refrigerated transport</li> </ul>
Processing & packaging	<ul style="list-style-type: none"> <li>• Fortification</li> <li>• (Non-)plastic packaging</li> <li>• Post-harvest cleaning/winning/canning/milling/threshing/hulling</li> <li>• Drying</li> <li>• Food donation/transfer</li> <li>• Food bank/pantry</li> <li>• Soup kitchen</li> </ul>
Food environment	<ul style="list-style-type: none"> <li>• Food environment</li> <li>• Zoning</li> <li>• Farmers market</li> <li>• Food desert</li> <li>• School meals/feeding/lunches</li> <li>• Cash transfers</li> <li>• Social assistance/safety net</li> <li>• Advertising bans/regulations</li> <li>• Store re-design</li> <li>• Front-of-package labelling</li> <li>• Food safety/quality</li> <li>• Food certification</li> </ul>
Consumer behaviour	<ul style="list-style-type: none"> <li>• Sugar-sweetened beverage tax</li> <li>• Consumer subsidies</li> <li>• Nudge campaigns</li> <li>• Social norms</li> <li>• Women's empowerment/decision-making</li> <li>• Information/education</li> </ul>

Concept	Terms
<b>Outcomes</b>	
Anthropometric	<ul style="list-style-type: none"> <li>• Height, Height-for-age (Z-score)</li> <li>• Weight, Weight-for-age (Z-score)</li> <li>• Weight-for-length (Z-score)</li> <li>• Short stature</li> <li>• Stunting</li> <li>• Elevated weight</li> <li>• Low (birth) weight</li> <li>• Small/large for gestational age</li> <li>• Body mass index</li> <li>• Head circumference</li> <li>• Adiposity</li> <li>• Lean body/muscle mass</li> <li>• Dual-energy X-ray</li> <li>• Absorptiometry</li> <li>• Electroimpedence</li> <li>• Whole body air displacement</li> <li>• Plethysmography</li> <li>• Skin fold</li> <li>• Arm fat</li> <li>• Hit-to-waist/shoulder ratio</li> </ul>
Micronutrients	<ul style="list-style-type: none"> <li>• Iron/fe</li> <li>• Vitamin A</li> <li>• B12</li> <li>• Cobalamin</li> <li>• Calcium/ca</li> <li>• Zinc/zn</li> <li>• Folate/folic acid</li> <li>• Haemoglobin</li> <li>• Anaemia</li> <li>• Ferritin</li> <li>• Transferrin</li> <li>• Urinary iodine concentration</li> <li>• Goitre</li> <li>• Serum thyroid stimulating hormone</li> <li>• Serum thyroglobulin</li> </ul>
Diet quality and adequacy	<ul style="list-style-type: none"> <li>• Food consumption/variety score</li> <li>• Dietary diversity</li> <li>• Dietary adequacy/sufficiency</li> <li>• Food groups consumed</li> <li>• Meal frequency</li> <li>• Minimal acceptable diet</li> <li>• Estimated average requirement</li> <li>• Reference daily intake</li> <li>• Recommended daily allowance</li> <li>• Fruit/vegetable consumption</li> <li>• Healthy eating index</li> <li>• Nutrient-rich food index</li> <li>• Mediterranean diet score</li> <li>• Nova food groups</li> <li>• Dietary pattern score</li> </ul>
Infant and young child feeding	<ul style="list-style-type: none"> <li>• Breastfeeding (exclusive, early, extended, initiation, frequency)</li> <li>• Mixed feeding</li> <li>• Introduction of complementary foods</li> <li>• Weaning</li> <li>• Infant and Young Child Feeding Index</li> </ul>
Food security	<ul style="list-style-type: none"> <li>• Food (in)security</li> <li>• Household food insecurity access scale</li> <li>• Poverty line/index</li> <li>• Income/wealth inequality</li> <li>• Market access</li> <li>• Food desert</li> <li>• Food basket</li> <li>• Consumer price index</li> <li>• Shannon measure/metric/score</li> <li>• Modified functional attribute diversity</li> <li>• Food stress</li> <li>• Hunger</li> <li>• Skipped/missed meals</li> <li>• Coping strategy index</li> <li>• Food affordability</li> </ul>

## Example full search strategy

Database: Ovid MEDLINE(R) and Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Daily and Versions(R) <1946 to April 06, 2020>

Search Strategy:

- 
- 1 (random\* or experiment\* or (match\* adj2 (propensity or coarsened or covariate)) or "propensity score" or ("difference in difference\*" or "difference-in-difference\*" or "differences in difference\*" or "differences-in-difference\*" or "double difference\*") or ("quasi-experimental" or "quasi experimental" or "quasi-experiment" or "quasi experiment") or ((estimator or counterfactual) and evaluation\*) or "instrumental variable\*" or (IV adj2 (estimation or approach)) or regression discontinuity or time series or segment\* regression).ti,ab,kw. (3158100)
  - 2 Randomized Controlled Trial/ or Random Allocation/ or Evaluation Studies/ or Propensity Score/ or Interrupted Time Series Analysis/ or Controlled Before-After Studies/ or Controlled Clinical Trial/ or Non-Randomized Controlled Trials as Topic/ (931395)
  - 3 1 or 2 (3600883)
  - 4 (review or meta-analysis).pt. (2687667)
  - 5 cochrane database of systematic reviews.jn. (14735)
  - 6 (systematic review or literature review).ti. (154171)
  - 7 4 or 5 or 6 (2731803)
  - 8 3 or 7 (6034861)
  - 9 developing countries.sh,kf. (85389)
  - 10 (Africa or Asia or Caribbean or West Indies or South America or Latin America or Central America).ti,ab,kw. (216058)
  - 11 Africa/ or Asia/ or Caribbean/ or West Indies/ or South America/ or Latin America/ or Central America/ (76022)
  - 12 (Afghanistan or Albania or Algeria or Angola or Argentina or Armenia or Armenian or Azerbaijan or Bangladesh or Benin or Byelarus or Byelorussian or Belarus or Belorussian or Belorussia or Belize or Bhutan or Bolivia or Bosnia or Herzegovina or Hercegovina or Botswana or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Upper Volta or Burundi or Urundi or Cambodia or Khmer Republic or Kampuchea or Cameroon or Cameroons or Cameron or Camerons or Cape Verde or Central African Republic or Chad or China or Colombia or Comoros or Comoro Islands or Comores or Mayotte or Congo or Zaire or Costa Rica or Cote d'Ivoire or Ivory Coast or Cuba or Djibouti or French Somaliland or Dominica or Dominican Republic or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Ethiopia or Fiji or Gabon or Gabonese Republic or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Grenada or Guatemala or Guinea or Guiana or Guyana or Haiti or Honduras or India or Maldives or Indonesia or Iran or Iraq or Jamaica or Jordan or Kazakhstan or Kazakh or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or

Kirghiz or Kirgizstan or Lao PDR or Laos or Lebanon or Lesotho or Basutoland or Liberia or Libya or Macedonia or Madagascar or Malagasy Republic or Malaysia or Malaya or Malay or Sabah or Sarawak or Malawi or Mali or Marshall Islands or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Middle East or Moldova or Moldavia or Moldovan or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Netherlands Antilles or Nicaragua or Niger or Nigeria or Muscat or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Papua New Guinea or Romania or Rumania or Roumania or Rwanda or Ruanda or Saint Lucia or St Lucia or Saint Vincent or St Vincent or Grenadines or Samoa or Samoan Islands or Navigator Island or Navigator Islands or Sao Tome or Senegal or Serbia or Montenegro or Seychelles or Sierra Leone or Sri Lanka or Solomon Islands or Somalia or Sudan or Suriname or Surinam or Swaziland or South Africa or Syria or Tajikistan or Tadzshikistan or Tadjikistan or Tadjhik or Tanzania or Thailand or Togo or Togolese Republic or Tonga or Tunisia or Turkey or Turkmenistan or Turkmen or Uganda or Ukraine or Uzbekistan or Uzbek or Vanuatu or New Hebrides or Venezuela or Vietnam or Viet Nam or West Bank or Yemen or Zambia or Zimbabwe).ti,ab,kw,sh. (1423829)

13 ((developing or less\* developed or under developed or underdeveloped or middle income or low\* income or underserved or under served or deprived or poor\*) adj (countr\* or nation? or population? or world or state\*)).ti,ab,kw. (98986)

14 ((developing or less\* developed or under developed or underdeveloped or middle income or low\* income) adj (economy or economies)).ti,ab,kw. (535)

15 (low\* adj (gdp or gnp or gross domestic or gross national)).ti,ab,kw. (243)

16 (low adj3 middle adj3 countr\*).ti,ab,kw. (15731)

17 (lmic or Imics or third world or lami countr\*).ti,ab,kw. (7551)

18 (transitional countr\* or emerging econom\* or global south).ti,ab,kw. (1010)

19 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 (1594007)

20 8 and 19 (255764)

21 exp Agriculture/ or Food Assistance/ or exp Food Packaging/ or Food Preservation/ or Food Storage/ or Food-Processing Industry/ or exp Meat-Packing Industry/ or exp Food Quality/ or exp Nutrition Policy/ or exp Nutrition Therapy/ (311574)

22 (((agricultur\* or aquacultur\*) adj3 input\*) or (improv\* adj3 (seed\* or variet\* crop\*)) or (genetic\* adj3 modif\* adj3 (food\* or organism\*)) or GMO or fertili\* or pesticid\* or insecticid\* or compost\* or manure\* or mulch\* or ((drought\* or pest\* or insect\*) adj3 (toleran\* or resist\*)) or (rotat\* adj3 crop\*) or (land adj3 manage\*) or "fixed distance planting" or (plant\* adj3 row?) or ((farm\* or crop or agricultur\* or aquacultur\*) adj6 subsid\*) or (price\* adj6 purchas\* adj6 guarantee\*) or ((crop\* or rain\* or weather or index) adj6 insurance) or (irrigat\* adj6 (project\* or program\* or access\* or improv\*)) or "water meter\*" or (rain\* adj3 (fed or feed\*)) or (trench\* adj3 hill\*) or hilling or "water break" or terrac\* or ((farm\* or agricultur\* or aquacultur\*) adj3 (mechani#e\* or mechani#ation\*)) or intercrop\* or (companion adj3 (plant\* or variet\* or species))).ti,ab,kw. (274307)

23 (((grain\* or crop\* or agricultur\* or aquacultur\* or farm\* or produce) adj6 (silo\* or stor\* or shed\*

or warehous\*) or ((agricultur\* or aquacultur\* or farm\*) adj3 (collection or distribution) adj3 (centre\* or center\*)) or ((farm\* or produce or food\* or agricultur\* or aquacultur\*) adj6 ("cold chain\*" or ((refrigerat\* or cold) adj3 (truck\* or transport\* or transit))))).ti,ab,kw. (4047)

24 (((food\* or crop\* or staple\*) adj3 (fortif\* or biofortif\*)) or ((recycl\* or compost\* or biodegrad\* or plastic\*) adj3 (pack\* or sache\*)) or (post-harvest adj6 (clean\* or winnow\* or cann\* or mill\* or thresh\* or hull\*)) or ((food\* or crop\* or grain\*) adj3 dry\*) or ((food\* or grocer\* or soup) adj6 (donat\* or pantr\* or bank\* or kitchen or transfer\*)) or (food\* adj6 near\* adj6 spoil\*).ti,ab,kw. (9156)

25 ("food environment\*" or (zoning and (food\* adj3 (security or access\*))) or "farmers market" or "food desert" or (school adj6 (meal\* or feed\* or food\* or lunch\*)) or (food\* adj6 (cash or "social assistance" or "social safety net")) or (food\* adj6 ((advertis\* or label\* or market\*) adj3 (ban\* or restrict\* or regulat\* or polic\* or law\*))) or ((supermarket or ((food\* or grocer\* or convenience or corner) adj (store\* or market\*))) adj6 (design\* or redesign\* or re-design\* or layout\*)) or (front adj3 pack\* adj3 label\*) or (food\* adj3 (safe\* or quality) adj3 (regulat\* or restrict\* or polic\* or law\* or inspect\*)) or (food\* adj3 certif\*).ti,ab,kw. (8820)

26 (((sugar\* or SSB) adj3 tax\*) or ((food\* or consumer\*) adj6 subsid\*) or nudg\* or ((food\* or eat\* or feed\* or meal\* or diet\*) adj6 (deci\* or ((cultur\* or social) adj3 (norm\* or preferen\*))) or (wom#n adj6 (food\* or eat\* or feed\* or meal\* or diet\*) adj6 (empower\* or deci\*)) or ((food\* or eat\* or feed\* or meal\* or diet\*) adj3 (inform\* or educat\* or promot\* or campaign\* or media or initiative\*))).ti,ab,kw. (33515)

27 or/21-26 (608240)

28 Breast Feeding/ or Child Nutritional Physiological Phenomena/ or Adolescent Nutritional Physiological Phenomena/ or Infant Nutritional Physiological Phenomena/ or Weaning/ or Energy Intake/ or Diet, Healthy/ or Eating/ or Elder Nutritional Physiological Phenomena/ or Food Preferences/ or exp Maternal Nutritional Physiological Phenomena/ or exp Nutritional Requirements/ or Nutritional Status/ or exp Nutritive Value/ or exp Nutrition Disorders/ or Nutrition Assessment/ or exp Food Supply/ (548239)

29 (height? or length? or length-for-age or LAZ or "short stature" or stunt\* or weight? or weight-for-age or WAZ or "elevated weight" or underweight or "low weight" or "body mass index\*" or "weight-for-length" or WLZ or BMI or BMIz or wasted or wasting or obes\* or overweight or "mid-upper arm circumference" or MUAC or "low birth weight" or LBW or ((small or large) adj3 "gestational age\*") or "head circumference\*" or adiposity or (lean adj3 ("muscle mass" or "body mass")) or DEXA or "dual-energy x-ray" or absorptiometry or electroimpedence or "whole body air displacement" or plethysmography or "skin fold\*" or "arm fat" or ((hip-to-waist or hip-to-shoulder) adj ratio\*).ti,ab,kw. (1939806)

30 (((iron or fe or iodine or "vitamin a" or b12 or cobalamin or calcium or ca or zinc or zn or folate or "folic acid") adj3 deficien\*) or h?emoglobin or an?emia or ferritin or transferrin or "urinary iodine concentration\*" or goitre\* or goiter\* or "serum thyroid stimulating hormone" or TSH or (serum adj (thyroglobulin or tg))).ti,ab,kw. (388485)

31 ((food adj (consumption or variety) adj score\*) or (diet\* adj6 divers\*) or DDS or "food groups consumed" or ((meal or "food consumption") adj frequency) or "minimal acceptable diet\*" or "estimated average requirement" or "reference daily intake" or RDI or "recommended daily allowance" or RDA or (diet\* adj6 (adequa\* or sufficien\*)) or ((fruit\* or vegetable\*) adj6 consum\*) or "healthy eating index" or HEI or "nutrient rich food index" or "Mediterranean diet score" or "nova

food groups" or "dietary pattern score\*" or (probability adj3 adequa\*).ti,ab,kw. (38256)

32 ((breastfeed\* adj3 (exclusive\* or early or extend\* or initiat\* or frequen\*)) or "mixed feeding" or weaning or ((food\* or feed\*) adj6 complement\* adj6 introduc\*) or (index adj3 feed\* adj3 (infant or child)) or IYCF).ti,ab,kw. (38042)

33 ((food adj (security or insecurity)) or "household food insecurity access scale" or HFIAS or "poverty index" or "poverty line" or ((income or wealth) adj3 (inequality or relative)) or (access\* adj3 market\*) or "food desert\*" or (food\* adj3 basket\*) or (index adj3 "food consumer price\*") or FCPI or (Shannon adj (measure or metric or score)) or (modified adj3 functional adj3 attribute adj3 diversity) or (stress\* adj3 food) or hunger or hungry or ((meal\* or food\* or feed\*) adj3 (skip\* or miss\*)) or "coping strategy index" or (food\* adj6 afford\*).ti,ab,kw. (25766)

34 or/28-33 (2604578)

35 exp Animals/ (23074750)

36 Humans/ (18388397)

37 35 not (35 and 36) (4686353)

38 34 not 37 (2088346)

39 20 and 27 and 38 (4339)

### About this note


This note presents information and results from the sixth update to the Food Systems and Nutrition Evidence & Gap Map. We discuss the distribution of the evidence base and the current state of the evidence.

This brief was authored by Ingunn Storhaug, Charlotte Lane, Diana Cordova-Arauz, and Mark Engelbert. They are solely responsible for all content, errors, and omissions. It was designed and produced by Akarsh Gupta and Tanvi Lal.

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For more information on 3ie's Note, contact [info@3ieimpact.org](mailto:info@3ieimpact.org) or visit our website.


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