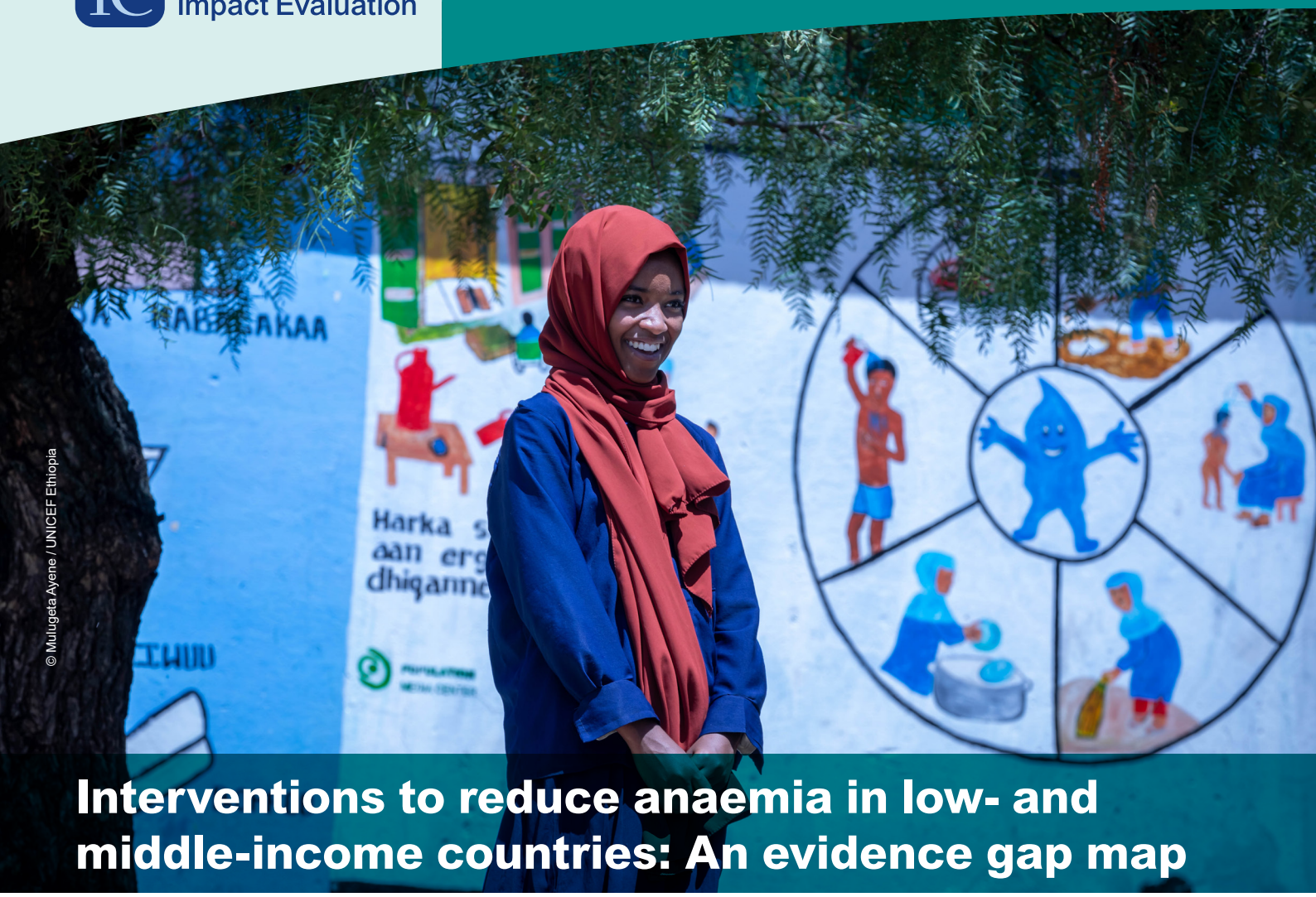
International Initiative for Impact Evaluation

Evidence gap map

Health



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Interventions to reduce anaemia in low- and middle-income countries: An evidence gap map

Anaemia affects about one quarter of the world's population. Defined by low red blood cell count or haemoglobin levels, anaemia causes adverse health outcomes, delayed cognitive and physical development, and reduced productivity. This loss of human potential can perpetuate a vicious cycle of poverty, especially in low- and middle-income countries (L&MICs).

Anaemia is challenging to address, in part because it has a complex set of causes. To facilitate access to evidence about interventions that focus on both nutritional and non-nutritional causes and risk factors of anaemia, International Initiative for Impact Evaluation (3ie) and Nutrition International (NI) developed this evidence gap map (EGM) with support from the Government of Canada. By organizing an extensive set of studies and highlighting evidence gaps, we aim to inform future research and programming across multiple fronts to reduce the global anaemia burden.

Our map takes a cross-sector approach. The interventions focus on **direct causes** of anaemia (including chronic and infectious diseases, gynaecological and obstetric conditions, and inadequate nutrient intake, absorption, and utilization); **intermediate risk factors** (including food insecurity, maternal and newborn care, family planning, knowledge, and services access); and **underlying risk factors** (such as education, poverty, cultural norms, and health policies). Primary outcomes focus on anaemia prevalence and haemoglobin levels. Other outcomes include nutrient absorption and intake, disease exposure and response, and gynaecological and obstetric conditions.

Highlights

- The EGM includes 2,268 studies of interventions to address anaemia.
- While over 80 percent of impact evaluations focused on direct causes of anemia, there is a significant knowledge gap. Far fewer studies (less than 1%) considered underlying risk factors such as poverty, which is a major contributor to diet and health. Addressing this gap is critical for effective anaemia reduction strategies, underscoring the need for further research and action.
- Evidence is clustered in Africa (30%) and South-East Asia (30%) but is absent in several countries with high anaemia prevalence.
- Systematic reviews suggest the potential to improve anaemia outcomes for children and pregnant women through interventions such as nutrient supplementation and fortification, and anti-malarial and deworming programs.

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Main findings

We included **2,196 impact evaluations (IEs), 57 systematic reviews (SRs)** that we rated as high- or medium-confidence, and 15 ongoing SRs. Reflective of trends in anaemia prevalence, most IEs took place in Africa and South-East Asia (for all IEs by country, see Figure 1).

Findings from IEs

Approximately 81 percent of IEs focused on interventions addressing the direct causes of anaemia, such as *supplementation with micronutrients* to address deficiencies that lead to anaemia *or programs to address malaria*. However, within the domain of direct causes, we found relatively fewer studies on *tuberculosis programs, routine immunization,* and *management of menses.*

Approximately 6.5 percent of IEs focused on intermediate risk factors of anaemia, such as interventions addressing *inadequate health/nutrition knowledge and awareness, access/use of health/nutrition services and interventions,* and *inadequate access to/use of WASH*. We found no IEs on treatment of severe acute malnutrition or interventions supporting the value chain and supply chain of anaemia products. We also found limited evidence for interventions on food insecurity or family planning support.

Far fewer IEs (less than 1%) focused on interventions to address underlying risk factors of anaemia, such as *low educational attainment, poverty, and unequal health policies.* Less than 1 percent of IEs analyzed aspects of women's empowerment.

Approximately 15 percent of the IEs evaluated multicomponent interventions that jointly addressed more than one cause or risk factor for anaemia.

Anaemia prevalence and haemoglobin levels were the most frequently evaluated outcomes across all three intervention domains.

Focus on other outcomes measuring inadequate nutrients (such as the status of copper, selenium, and riboflavin) and gynaecological/obstetric outcomes (such as frequency of delayed cord clamping) seems to be more limited.

Evidence is clustered in Africa (n = 661) and South-East Asia (n = 659). However, we identified a lower volume of evidence for some countries with high anaemia prevalence, including Mali, Zambia, and Togo. When considering high anaemia prevalence, particularly for children under five and women of reproductive age, we identified a very small number of studies in countries such as Yemen, Mali, and Benin.

Few IEs (about 6%) reported cost information, with even fewer undertaking a cost-benefit analysis. Although establishing efficacy or effectiveness is important, cost information can also inform decision-making, especially in resource-constrained contexts.

Findings from high- and medium-confidence SRs

Of the 57 SRs rated as high- or medium-confidence, **most focused on interventions to address direct causes of anaemia** (n = 53), such as *inadequate nutrient intake, absorption, and utilization* (n = 34) or *chronic disease/exposure and response to infectious diseases* (n = 18). Three SRs focused on *gynaecological and obstetric conditions*.

Five SRs focused on **intermediate risk factors** including *inadequate health/nutrition knowledge and awareness* (n = 2), *inadequate access to/use of WASH* (n = 3), and *access/use of health/nutrition services and interventions* (n = 1). No SRs focused on *food insecurity or inadequate family planning*.

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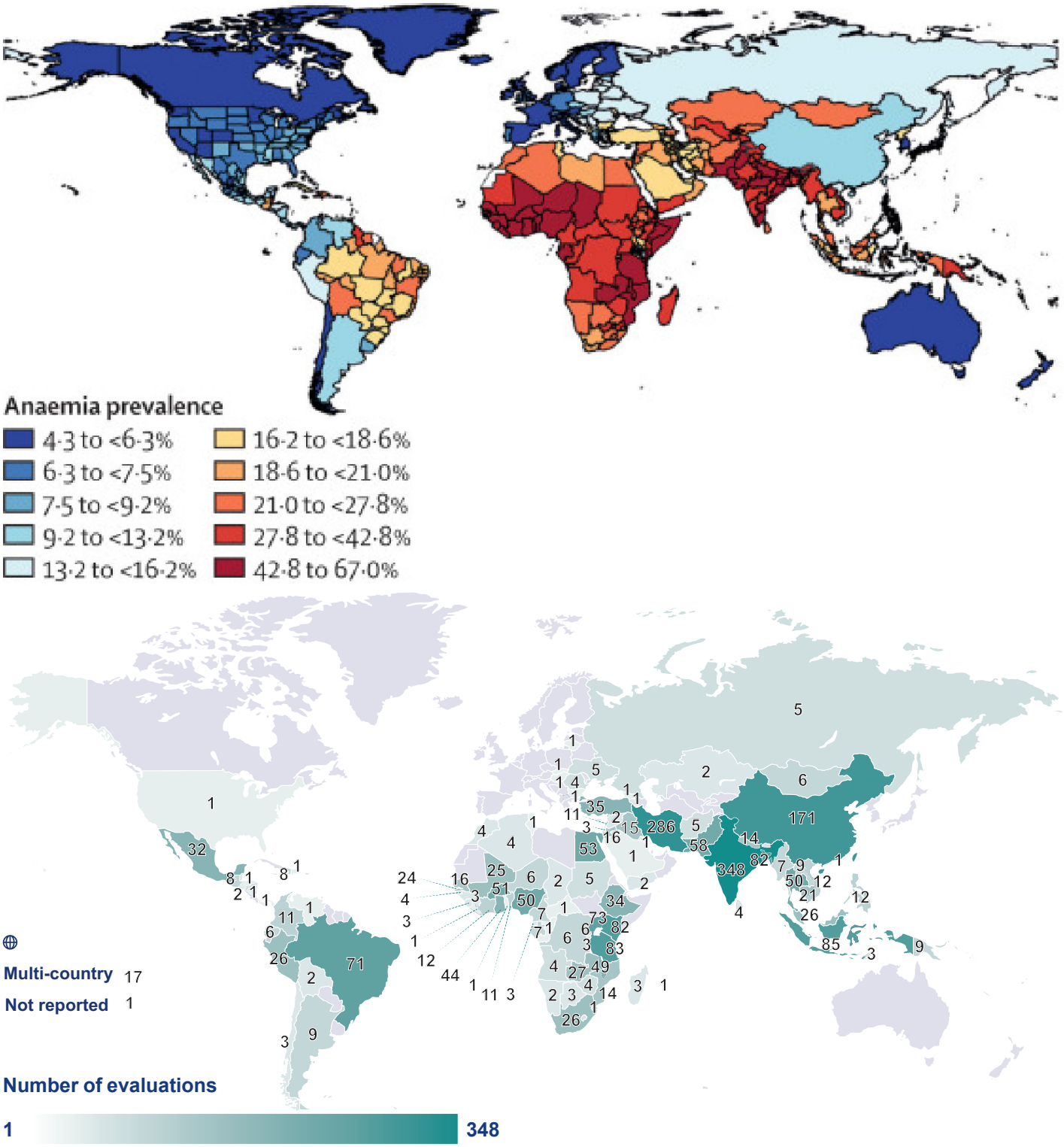
Figure 1: Comparison of anaemia prevalence to number of studies identified



Note: The map (from Gardner et al. 2023) represents anaemia prevalence by country. The map generated by the authors represents the number of IEs by country.

Main findings

Two SRs focused on **underlying risk factors,** both of which examined interventions to address *poverty*.

The SRs indicate the potential of interventions to address *direct causes of anaemia,* although in some cases the results were inconclusive or inconsistent:

- ***Iron fortification*** improved *haemoglobin* outcomes in children, and ***iron supplementation during pregnancy*** (sometimes combined with folic acid) reduced *anaemia prevalence and increased haemoglobin levels*. Iron *supplementation* and *fortification* interventions had inconsistent but often positive effects on *anaemia* outcomes across various populations.
- ***Multiple micronutrient-fortified foods* reduced *iron deficiency* for children,** though more research is needed to confirm their effects on *anaemia* outcomes.
- Many ***anti-malaria programs*** reduced anaemia, though variations in the populations and approaches of primary studies make it difficult to reach firm conclusions.
- The effectiveness of ***deworming interventions*** is less clear and may vary by population and frequency of helminths in the population.

Authors of high- and medium-confidence SRs suggest the following to improve the quality of primary research and better inform decision-making:

- Researchers should prioritize the **development of standardized definitions, quantification methods, and data collection tools, and make them publicly available** to improve the comparability and consistency of findings across studies.
- Future research can **target populations of specific age, sex, pregnancy status, and physiological conditions.** Other **focus areas may include under-researched populations such as migrants to urban slums,** where the situation may be more precarious than in rural settings.
- There is a need for more **high-quality evaluations of large-scale nutrition programs.**

Promising areas for future research

This EGM can be used to navigate the extensive evidence base on anaemia from the last decade, and we encourage funders, practitioners, and researchers to consider their own priorities and interests. We suggest focusing primary research on meaningfully filling the IE evidence gaps identified above. **Opportunities also exist to conduct or update SRs** in areas with robust IE evidence, including the following:

- Interventions that address direct causes of anaemia
  - *Biofortification, HIV programs,* and *anti-parasite programs* (other than malaria and helminths)
  - *Point-of-use fortification, targeted fortification,* and *dietary enhancement*
- Interventions that address intermediate risk factors
  - *Preventative care* such as annual checkups and adult immunization
  - *Resources for health facilities, anaemia education and habit support,* and *other nutrition education* activities

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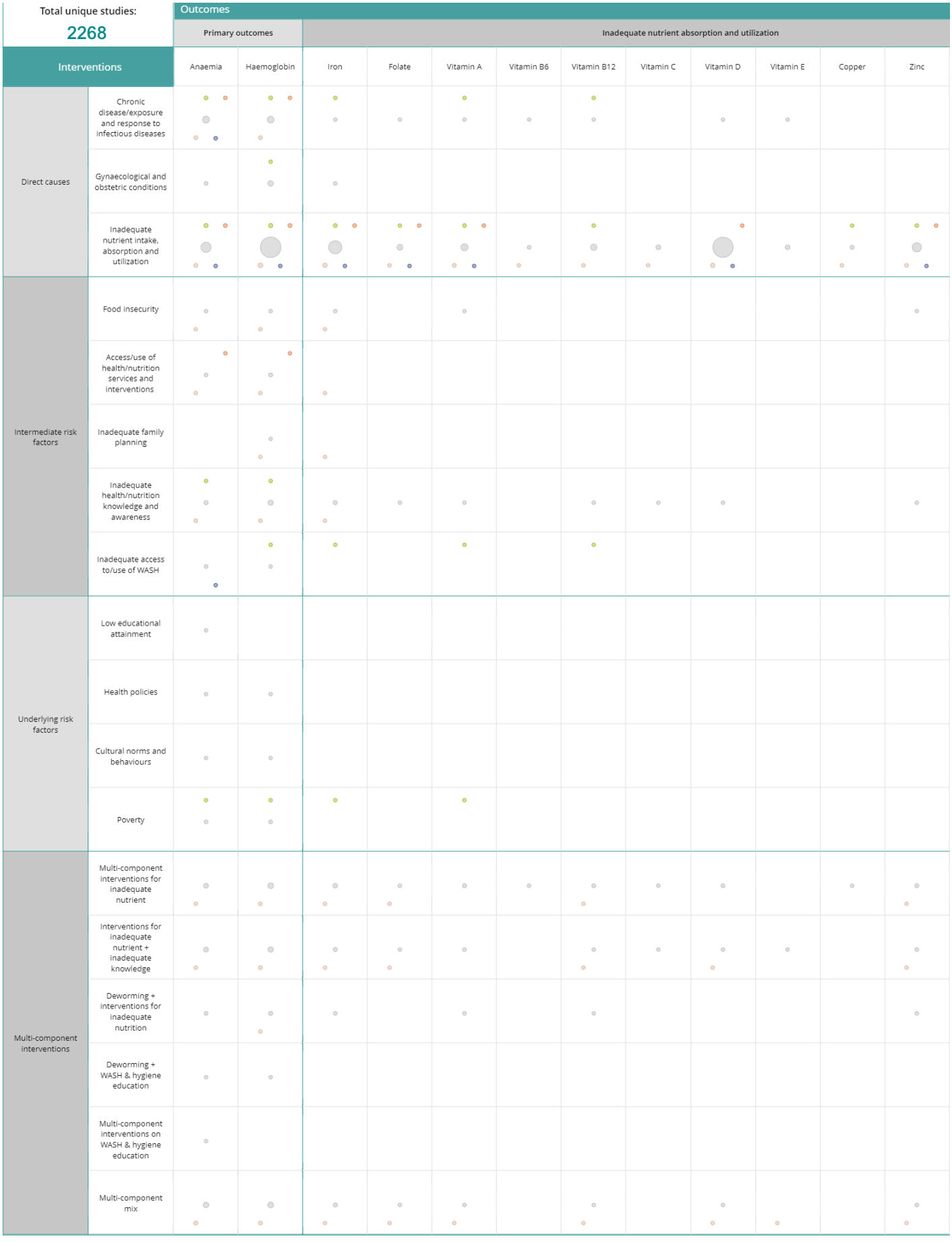
How to read an evidence gap map

3ie presents EGMs using an interactive online platform that allows users to explore the evidence base. Bubbles that appear at intersections of interventions and outcomes denote the existence of at least one study or review. The larger the bubble, the greater the volume of evidence in that cell. The color of each bubble represents the type of evidence and, for an SR, a confidence rating (as indicated in the legend). In the online version, hovering over a bubble displays a list of the evidence for that cell. The links for these studies lead to user-friendly summaries in 3ie's Development Evidence Portal. Users can filter the evidence by type, confidence rating (for SRs), region, country, study design, and population.

What is a 3ie evidence gap map?

3ie EGMs are collections of evidence from IEs, SRs, and in some cases, qualitative studies for a given sector or policy issue, organized according to the types of programs evaluated and the outcomes measured. They include an interactive online visualization of the evidence base, displayed in a framework of relevant interventions and outcomes. They highlight where there are sufficient IEs to support SRs and where more studies are needed. The maps help decision-makers target their resources to fill these important evidence gaps and avoid duplication. They also make existing research more accessible to facilitate evidence-informed decision-making.

Anaemia Evidence Gap Map



Note: This image shows only a part of the Anaemia Evidence Gap Map. For the full map, please visit the map online.

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About this brief

This brief is based on Interventions to reduce anaemia in low- and middle-income countries: An evidence gap map, a 3ie evidence gap map report by Ashiqun Nabi, Diana Belén Córdova-Aráuz, Ingunn Storhaug, Maria Daniela Anda Leon, Lina Khan, Charlotte Lane, Daniel López de Romaña, Alison Mildon, Mandana Arabi, and Shannon Shisler. The authors identify, map, and describe the evidence base regarding interventions that address anaemia's direct causes, intermediate and underlying risks factors, and impacts on health outcomes. The report describes 2,022 completed IEs, 174 ongoing IEs, 57 SRs rated as high- or medium-confidence, and 15 SR protocols mapped on a framework of 46 intervention categories and 21 outcomes, spanning 105 L&MICs. Any errors or omissions are also the sole responsibility of the authors. This brief was designed and produced by Akarsh Gupta, Mallika Rao, and Tanvi Lal.

3ie International Initiative for Impact Evaluation

NUTRITION INTERNATIONAL

The International Initiative for Impact Evaluation (3ie) develops evidence on how to effectively transform the lives of the poor in low- and middle-income countries. Established in 2008, we offer comprehensive support and a diversity of approaches to achieve development goals by producing, synthesizing and promoting the uptake of impact evaluation evidence. We work closely with governments, foundations, NGOs, development institutions and research organizations to address their decision-making needs. With offices in Washington DC, New Delhi and London and a global network of leading researchers, we offer deep expertise across our extensive menu of evaluation services.

Nutrition International is a leader in global nutrition excellence headquartered in Ottawa, Canada. For 30 years, we have focused on delivering low-cost, high-impact nutrition interventions to people in need, driven by our mission to achieve a world where everyone, everywhere, is free from malnutrition and able to reach their full potential. Working alongside governments as an expert ally, we strive to bring world class evidence, research, and innovation to address the most important issues facing successful roll out and scaling of proven nutrition interventions in LMICs.

For more information on 3ie's evidence gap maps, contact **info@3ieimpact.org** or visit our website.

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