Food Fortification protects billions—but could triple its impact

New analysis provides first-ever global estimates of how fortified foods improve nutrition and the untapped potential to dramatically expand benefits at a minimal cost

Summary

- Micronutrient deficiencies—a lack of essential vitamins and minerals—have serious health and economic consequences. Affecting one in two preschool-aged children and two in three women of reproductive age globally, they increase susceptibility to infectious diseases, impair child growth and development, and undermine educational attainment and work productivity, limiting human potential worldwide.
- Food fortification is the process of adding key nutrients like iron, zinc, and Vitamin A to staple foods and condiments such as wheat and maize flour, rice, oils, and salt during production.
- New analysis in *The Lancet Global Health* estimates that existing food fortification programs **prevent 7.0 billion nutrient gaps[1] annually**, particularly for iodine and iron.
- **Fortification has enormous untapped potential**: current programs have poor compliance, and standards are not always aligned with global guidance. Improving compliance could prevent an additional 6.1 billion nutrient gaps, while aligning standards in addition to improving compliance could prevent 17.7 billion nutrient gaps relative to the status quo.
- **Fortification is highly cost-effective**, costing just $0.18 USD per person, per year. Aligning standards, improving compliance, and expanding programs would raise this cost to USD 1.15 per person per year—still a bargain, given the immense public health and economic dividends. On average, fortification returns USD 27 in health and productivity benefits for every USD 1 invested.

Recommended actions

- Ensure that food producers comply with existing food fortification standards, including through capacity building, addressing technical barriers, providing incentives, enforcing regulations, and effective monitoring.
- Align national fortification standards with World Health Organisation (WHO) guidelines to safely maximize effectiveness.
- Expand programs to reach high-need regions, prioritizing countries with widely consumed, centrally processed staple foods to ensure cost-efficient delivery at scale.

1 When we count up all the ways people may not be getting enough essential nutrients (like iron, zinc, vitamin A, etc.), fortification programs currently prevent about 7 billion of these nutrient gaps each year.

Food fortification currently prevents 7.0 billion nutrient gaps

Micronutrient deficiencies are a significant challenge to public health worldwide. Though often undetected, they contribute to poor growth, blindness, cognitive impairment, reduced work productivity, and increased risk of death from infectious diseases. Large-scale food fortification works to address this, and is one of the most powerful, scalable, and cost-effective nutrition solutions to tackle malnutrition. Because fortification happens at the point of processing and targets staple foods that are already regularly consumed by large shares of the population, it requires little to no behavior change by consumers. Over 150 countries require fortification of at least one staple food.

Fortification has been recognized as a safe and effective intervention for over 100 years—but its full impact and potential have not been explored until recently.

The new analysis, published in March 2026 in *The Lancet Global Health*, uses **modelling to estimate the prevalence of inadequacies for 13 micronutrients across 185 countries**. The authors consider six scenarios, allowing them to see both the effects of current programs (the status quo), as well as what would happen if programs were improved in terms of compliance (i.e. alignment with current national standards), strengthened national standards, and/or improved coverage or availability across the entire population.

The analysis is based on the number of existing 'nutrient gaps' under each scenario—meaning the number of people inadequate in each one of the 13 nutrients summed together, where one person can contribute multiple nutrient gaps (e.g., if one person is consuming inadequate amounts of both iron and iodine, they would represent two inadequate intakes; if they were also consuming inadequate zinc, they would represent three).

The results of the study show that current fortification programs annually prevent 6.9 billion nutrient gaps.

Iodine fortification programs are shown to be especially effective, eliminating 3.3 billion nutrient gaps across 139 countries and reducing the global population with inadequate iodine intake from an estimate of 3.8 billion to 473 million people. Iron fortification programs are also shown to be highly effective, preventing inadequate iron intakes for 1.4 billion people.

The study also estimates the cost of this impact at an average of just USD 0.18 per person per year across all staple food and micronutrient combinations. Salt and oil fortification (with iodine and vitamin A, respectively) are particularly cost-effective, costing just 1 or 2 cents a year, per person.

Strengthening fortification programs could more than double the existing impact

Despite the success described above, significant gaps remain, with an estimated 38.6 billion nutrient gaps worldwide. The lowest hanging fruit is poor compliance: even where fortification is mandated, companies lack the willingness or capacity to fortify foods to established standards, and governments lack the political will or capacity to monitor and enforce these standards. Closing these gaps to improve compliance with current programs to 90% could prevent an additional 6.1 billion inadequate intakes. By far, the largest gains would come through vitamin A fortification, where 90% compliance could prevent an additional 1.1 billion inadequate intakes.

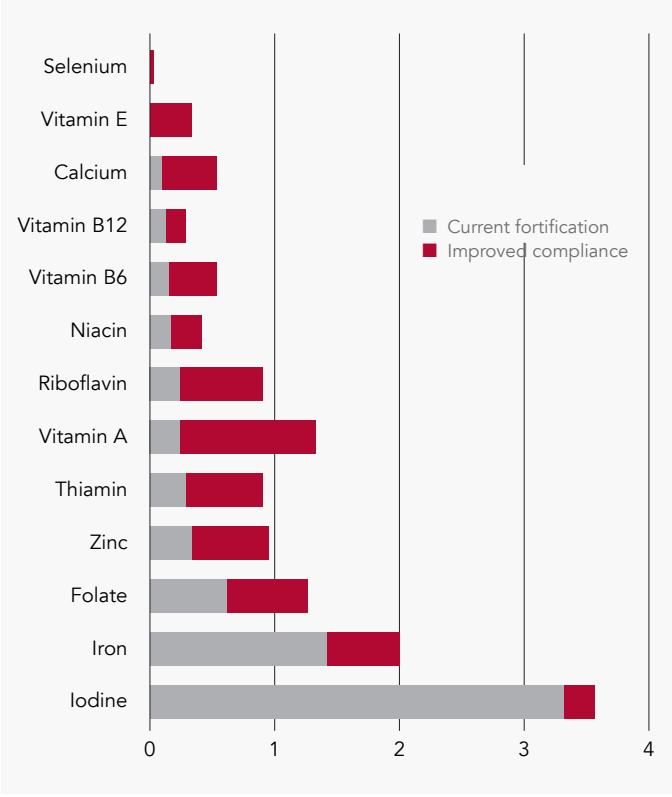

FIGURE 1: Billions of people with inadequate intakes prevented.

Still, even with improved compliance, an estimated 32.5 billion nutrient gaps would remain under current fortification programs. The authors thus explored what would happen if, in addition to improving compliance, standards were aligned with international fortification guidelines established by the WHO. Achieving this could prevent an additional 10.3 billion nutrient gaps relative to the status quo or an additional 4.2 billion gaps relative to 90% compliance with current fortification standards. Adding new programs in countries where there is an identified need and appropriate food to fortify (e.g., a country with widespread iron deficiency where wheat flour is widely consumed) would bring the largest gains, preventing an estimated additional 17.7 billion nutrient gaps relative to the status quo and an additional 7.5 billion gaps relative to 90% compliance with standards aligned with WHO guidance.

Large-Scale Food Fortification

PREVENTS

7.0 billion

nutrient gaps annually.

COULD PREVENT

24.7 billion

(at just $1.15 per person per year) with better compliance, aligned standards, and expanded programs.

Costs increase with each scenario: from the estimated status quo cost of USD 0.18 per person per year:

- Achieving 90% compliance with existing standards would increase costs to 0.43 USD per person annually
- Additionally aligning existing fortification standards with WHO guidance while sustaining 90% compliance would increase costs to 0.82 USD per person
- Expanding programs to include additional fortified staple foods, combined with 90% compliance and strong standards, would increase costs to USD 1.15 per person, per year.

Because the burden of micronutrient malnutrition falls disproportionately on low and middle-income countries and because fortification programs in these countries tend to have significant room for advancement, gains from the improvements described above accrue most significantly in Africa and South, Central, and Southeast Asia, **strengthening the case for large-scale food fortification investments in these regions**.

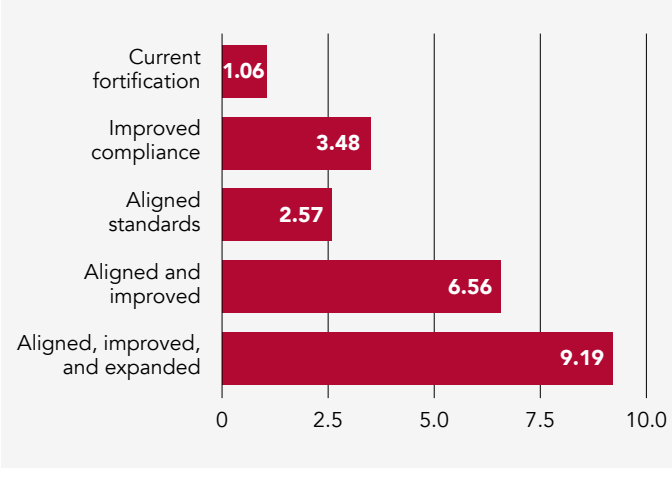

FIGURE 2: Fortification costs across scenarios.

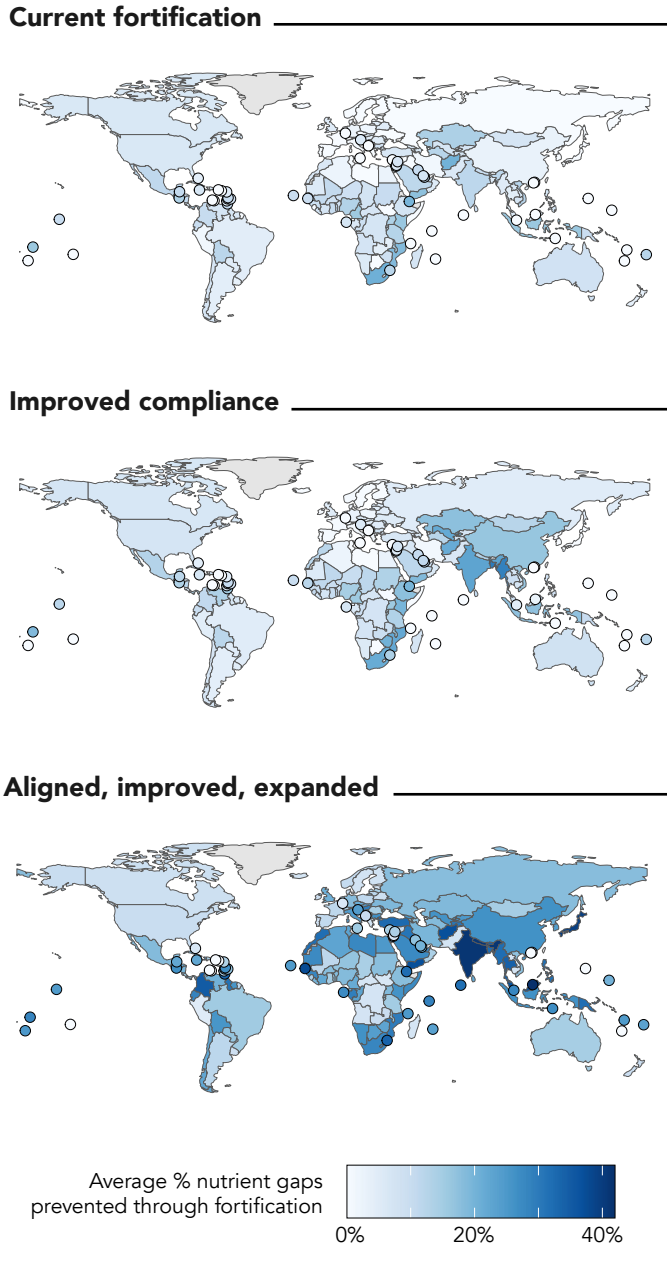

FIGURE 3: Global distribution of impact.

A call to action

Unlocking the full potential of food fortification will require simultaneous action on three fronts:

Ensure industry compliance with existing standards.

- Leverage public-private partnerships for capacity building and addressing technical barriers, such as inconsistent premix supply chains and inadequate equipment.
- Establish or strengthen quality control and monitoring systems throughout the fortification supply chain, covering both imported and domestic products.
- Incentivize companies to comply—and where they do not, use penalties and other forms of enforcement.

Align national fortification standards with global guidelines of the World Health Organization.

For example, many countries currently fortify wheat flour with iron at levels below WHO recommendations, limiting impact. National fortification standards should be set based on population micronutrient needs and baseline dietary intakes, and monitoring systems should be in place to balance benefits and risks of excess intake (particularly for iodine, zinc, selenium, and iron).

Expand programs to reach more high-need regions with suitable fortified food vehicles.

For example, expanding rice fortification in South Asia—where the majority of the population consumes rice daily—could address folate inadequacies affecting hundreds of millions of people. New programs should use widely consumed, centrally processed staple foods to ensure cost-efficient delivery.

Complementary pathways to end global malnutrition

Improving intake of essential nutrients is the ultimate solution to micronutrient deficiencies.

Even with improved compliance and strengthened standards, the authors estimate that 20.9 billion nutrient gaps would persist—underscoring the importance of healthy diets from a diverse range of nutrient-dense foods and the targeted use of supplements where medically necessary to sustainably eliminate micronutrient deficiencies for all.

About the research

Methods

We estimated the prevalence of nutrient gaps for 13 micronutrients across 185 countries by integrating global modelled dietary intake data with fortification program parameters. We modelled six scenarios: (1) no fortification, (2) current fortification, (3) improved compliance, (4) aligned standards, (5) aligned standards with improved compliance, and (6) aligned standards with improved compliance and expanded coverage. Implementation costs were calculated as the sum of premix, industry-related, and government costs across five fortified foods: wheat flour, maize flour, oil, rice, and salt.

The Swiss Development Cooperation and the Gates Foundation provided funding for this research.

Read the full paper: Friesen and Free et al. 2026. Impact of large-scale food fortification programs on micronutrient inadequacies and their implementation costs: a modelling analysis. *Lancet Global Health*, DOI: https://doi.org/10.1016/S2214-109X(26)00023-9

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