



2022 Annual Report

CELEBRATING 20 YEARS OF BUILDING A SMARTER,
STRONGER, AND HEALTHIER WORLD



Food Fortification Initiative
Enhancing Grains for Healthier Lives



Photo: Making fortified baladi bread in Egypt. (FAO/Jordi Vaque)
Cover photo: UNICEF

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ABOUT US

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The Food Fortification Initiative (FFI) champions effective grain fortification so people have the nutrition they need to be smarter, stronger, and healthier.

FFI provides unique expertise to help country leaders plan, implement, and monitor fortification of industrially milled cereal grains. Established in 2002, we are a public, private, and civic partnership based at Emory University.

What is fortification?

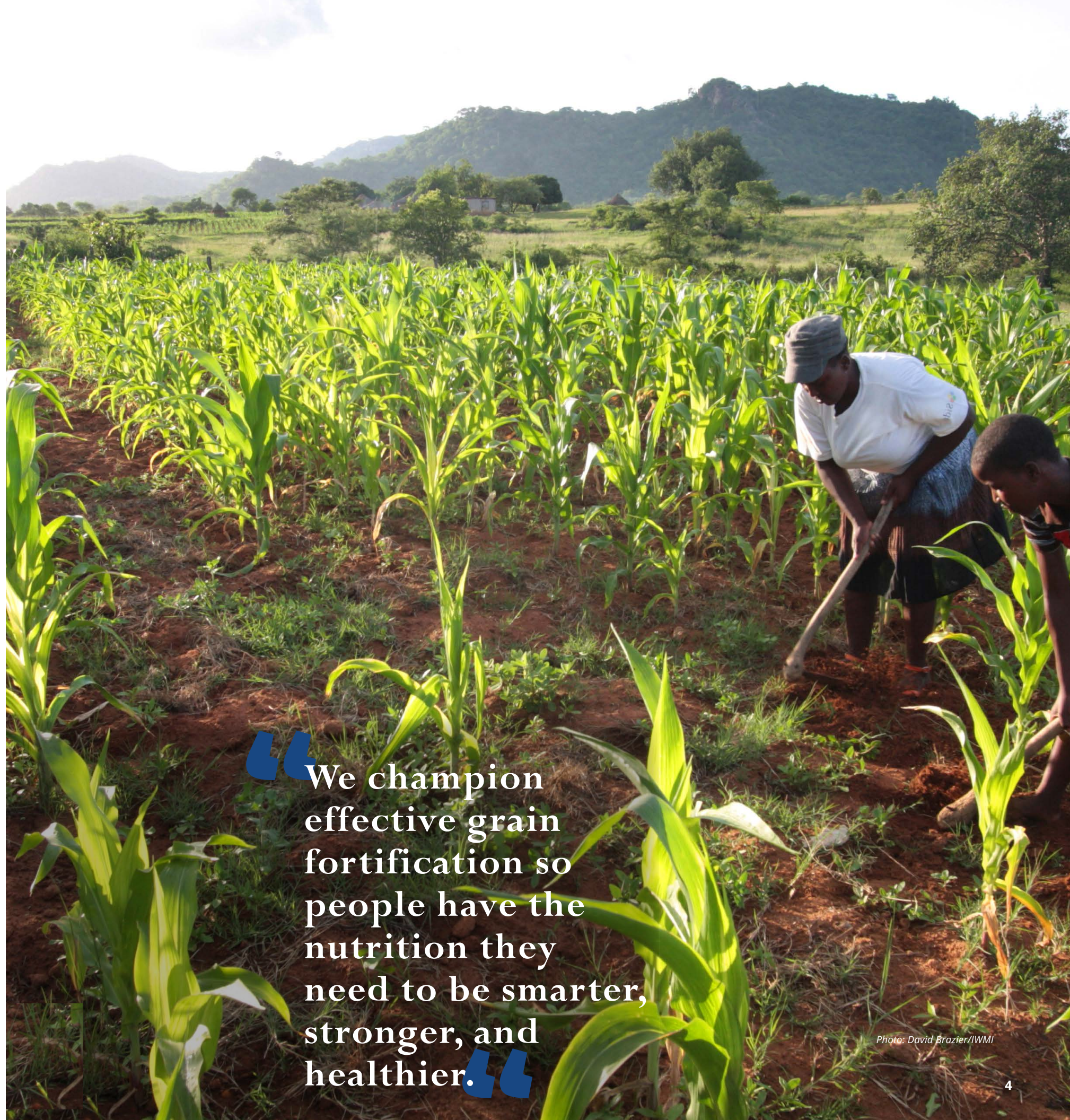
Food fortification—sometimes referred to as food enrichment—is when food producers add essential vitamins and minerals missing in a population’s diet to food that people eat every day.

Humans need vitamins and minerals, called micronutrients, in small amounts to function optimally. The consequences of

micronutrient deficiencies can be extensive, including devastating birth defects for babies, maternal death, impaired brain development in young children, and reduced work capacity among adults.

Large-scale food fortification is a proven, cost-effective way to prevent micronutrient deficiencies, save lives, and build a better future.

Visit our website FFInetwork.org



“We champion effective grain fortification so people have the nutrition they need to be smarter, stronger, and healthier.”

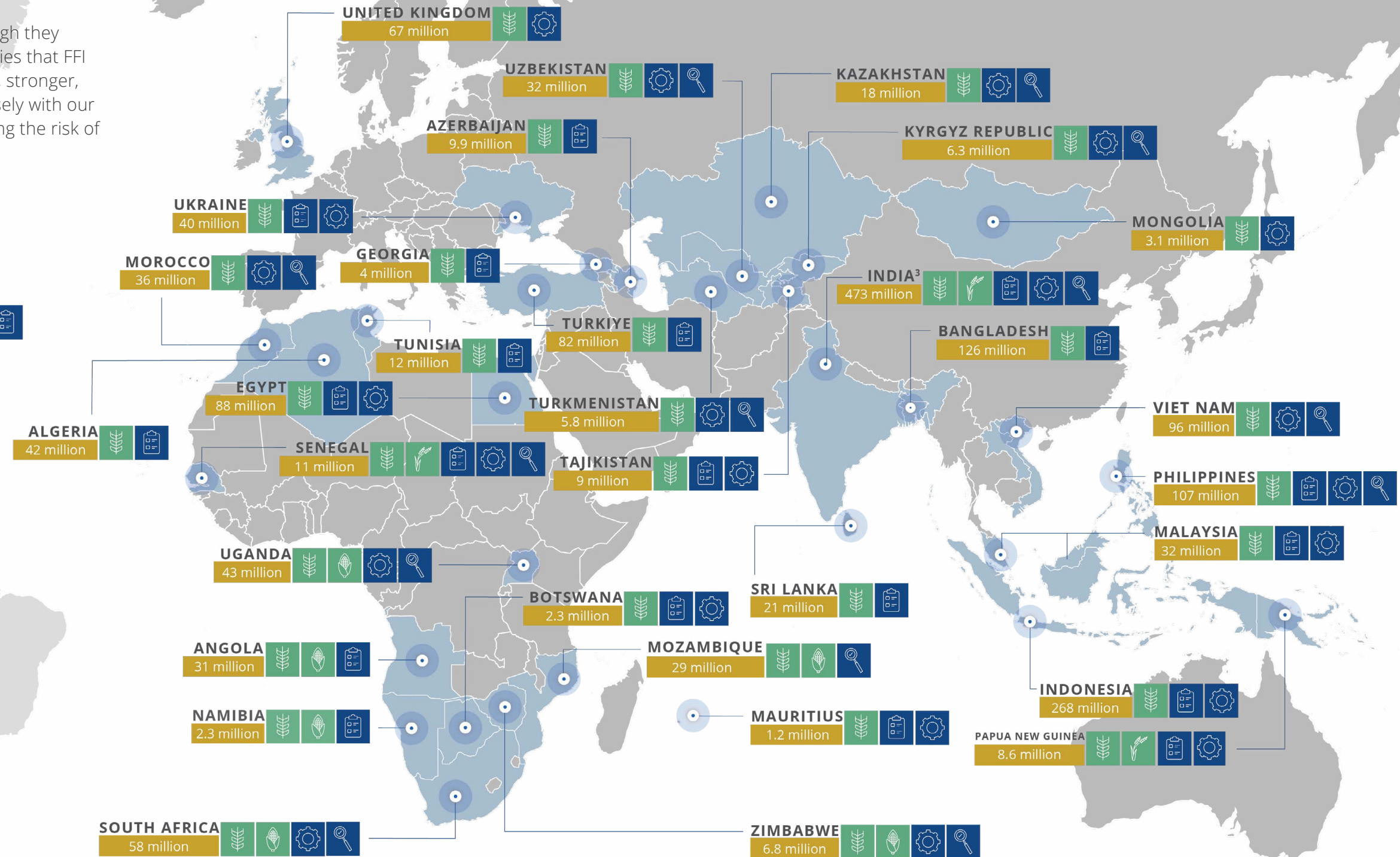
Photo: David Brazier/IWMI

FFI Around the World

In 2022, FFI provided technical assistance for grain fortification in 33 countries across five regions: Africa, the Americas, Asia-Pacific, Europe, and India.

This report highlights a snapshot of FFI's work globally. Though they may not be included in the report, many of the other countries that FFI supported in 2022 made strides towards building a smarter, stronger, and healthier future through grain fortification. Working closely with our partners, we contributed to or began contributing to reducing the risk of micronutrient deficiencies for nearly 1.4 billion people.¹

Where We Work: 2022



¹ Total estimate only includes countries that FFI supported in 2022. Potential reach is calculated by multiplying total population by the coverage rate of the industrially milled grain. Coverage rate is the percentage of population that consumes an industrially milled grain multiplied by the percentage of grain available in the country that is processed in industrial mills. For example, if 90% of grain is milled in industrial mills, we would multiply the consumption rate by .90.

² FFI worked in the following Indian states: Haryana, Gujarat, Madhya Pradesh, Maharashtra, and Rajasthan.

HOW TO READ THE MAP

Potential Reach in millions of people	COUNTRY million	Industrially Milled Grain	FFI in Action
		WHEAT	PLAN
		MAIZE	IMPLEMENT
		RICE	MONITOR

GLOBAL

Celebrating 20 Years of FFI

Since its inception in 2002, FFI has partnered with more than 30 countries across the globe to build cereal grain fortification programs.

In that time, FFI's work has made a positive impact on millions of lives by addressing the pressing burden of micronutrient deficiencies and their life-altering consequences, such as [birth defects of the brain and spine](#). By engaging with public, private, and civic partners, FFI has helped countries around the world establish sustainable fortification programs that will improve lives for years to come.

To celebrate its twentieth birthday, in October 2022, FFI honored [20 Fortification Champions](#), individuals from various sectors and parts of the world that have been game-changing advocates for food fortification. The 2022 FFI Fortification Champions represent the partnerships and tireless efforts that have helped approximately 55 countries adopt mandatory cereal grain fortification legislation between 2002 and 2022.

20 years of milestones

In the past twenty years, FFI and the fortification community have marked several notable milestones as global efforts to prevent micronutrient deficiencies through fortification have grown.

2002: At the Policy Planning Forum meeting in Mauritius, FFI is founded to coordinate global flour fortification efforts.

2006: The World Health Organization (WHO) and Food and Agriculture Organization of the United Nations (FAO) issue the [first guidelines](#) on food fortification that are written from a nutrition and public health perspective. The guidelines provide practical instruction on the implementation, monitoring, and evaluation of sustainable fortification programs.

2009: WHO releases the first guidelines for wheat and maize flour fortification with nutrient levels and fortification compounds, particularly for iron, folic acid, zinc, and vitamins B12 and A.

2014: FFI includes the fortification of industrially milled rice in its scope of work and changes its name from Flour Fortification Initiative to Food Fortification Initiative.

2016: WHO releases updated [maize flour fortification guidelines](#).

2017: The [Global Fortification Data Exchange \(GFDx\)](#) is built to empower governments, donors, implementing agencies, and other members of the global health community to reach populations affected by micronutrient deficiencies with data driven policy and programs. FFI contributes data and expertise to the GFDx.

2018: WHO releases [updated rice fortification guidelines](#).

2022: WHO releases [updated wheat flour fortification guidelines](#) that provide locally adaptable, clear, evidence-informed global recommendations grounded in gender, equity, and human rights approaches.

FFI fortification champions

Nominated by their peers, the 2022 FFI Fortification Champions were selected based on their dedicated efforts to advance food fortification and save lives. FFI sat down with each champion to learn about their experiences supporting or implementing fortification programs, the challenges and triumphs of their work, and the role of fortification in their respective regions or countries.

The conversations reflected the dynamic nature of advocacy work as it pertains to health and nutrition. Dr. Nelly Zavaleta, 2022 FFI Fortification Champion and Senior Investigator at Instituto de Investigación Nutricional in Peru, highlights that "working in nutrition gives you the opportunity

“Empowering communities and individuals is a key component of food fortification as a public health strategy. It is important to address any perceived barriers to the fortification program and discuss it with local opinion leaders.”

- Juan Pablo Peña-Rosas, Head of Global Initiatives, Department of Nutrition and Food Safety, World Health Organization

to be a servant for your country, and to make a contribution for the development of society. If you have a dream and you want to make a difference, nutrition gives you this opportunity.”



Photo: UNICEF

FFI Fortification Champions are influential players in the realm of food fortification, providing real-life lessons learned from working on or supporting national fortification programs. Councilor Lyall Thurston of Bay of Plenty, New Zealand, a 2022 FFI Fortification Champion, has a son who was born with spina bifida. This ultimately led him to be involved in advocating for [mandatory wheat flour fortification in New Zealand](#). “The New Zealand campaign was a long, protracted, collective effort which drew on support, relentless encouragement, and endless optimism from some of the greatest child health advocates, communicators, researchers, and members of medical and disability organizations worldwide.”

Twenty years of FFI represents two decades of robust collaborative work. And yet there is still much for FFI and its partners to do to help countries build self-sustaining fortification programs that address the nutritional needs of their people. Fortification Champion Dr. Rajesh Mehta, summarized the future of fortification: “We have to convince people that food fortification is a good public health strategy for which we should continue to be tenacious in our advocacy, and we should also be prepared to sustain support for countries to build and implement good quality food fortification programs and address the implementation challenges.” Integrity and sustainability are two of the core characteristics that drive FFI and FFI’s Champions. Collaboration is crucial for sustained, large-scale impact.

Celebrating accomplishments, committing to the future

In the last 20 years, FFI has grown from an idea to a key player in the global effort

“To continue strengthening fortification efforts there needs to be a meeting of minds, including academic, policymakers, and food manufacturers.”

- Sir Nicholas Wald, Professor of Preventative Medicine, University College London, and Founding Director, The Wolfson Institute of Preventive Medicine

to fortify the world against micronutrient deficiencies. In that time, building strong partnerships with government officials, food producers, civic sector organizers, researchers, neurosurgeons, staff of non-governmental organizations, and others passionate about creating fortification programs to prevent micronutrient deficiencies has been a core part of FFI’s strategy. Even during FFI’s most formative stages, champions across many sectors and disciplines played an integral part in building a healthier future through food fortification.

The progress of the work sustained by FFI and its global partners has had a direct impact on the number of countries with mandatory cereal grain fortification legislation. As of July 2022, [92 countries have legislation to mandate fortification](#) of at least one industrially milled cereal grain. When FFI was founded in 2002, only [38 countries mandated fortification of wheat flour, maize flour, or rice](#).

FFI Joins USAID AFFORD Program

In 2022, FFI was one of four main partners invited to take part in a new USAID initiative: [Advancing Food Fortification Opportunities to Reinforce Diets \(AFFORD\)](#).

Funded by USAID as part of Feed the Future, the US Government’s global hunger and food security initiative, USAID AFFORD represents a holistic approach to large-scale food fortification (LSFF) that puts businesses at the core of the solution while strategically engaging with public, private, and civil society sectors.

TechnoServe is leading program implementation in conjunction with FFI, Nutrition International, and ISF Advisors. FFI’s role will be to improve the design and effectiveness of LSFF programs and create tools that help ensure accountability across all sectors. FFI will also convene stakeholders across the globe to share ideas as part of a whole-society approach. Lastly, FFI staff member Becky Tsang will serve as the program’s Knowledge Management and Communications Manager.

The USAID AFFORD program’s four main goals are to: 1. strengthen the LSFF enabling environment through the public sector, 2. expand and sustain LSFF interventions through

private sector engagement, 3. strengthen the effectiveness of LSFF interventions and increase public and private sector accountability through civil society engagement, and 4. mobilize global commitment, leadership, and investment in support of LSFF. The five-year program (2022-2027), made possible by the generous support



Photo: Omega Foods – Zambia. (Bobby Neptune/TechnoServe)



Photo: Legacy Manufacturers – Zambia. (Jason J. Mulikita/TechnoServe)

of the American People and in partnership with TechnoServe, will strengthen connections and capacity across food systems, influencing relevant global initiatives, and contributing to population-, market-, and government-level fortification objectives to reduce micronutrient deficiencies.

Under the program, TechnoServe, FFI, Nutrition International and ISF Advisors will be generating national country assessments to identify food fortification opportunities and recommendations, as well as tools built from these assessments. Interested USAID missions then have an opportunity to contribute funds (through a “buy-in” or “associate” award) to implement the recommendations from USAID AFFORD. USAID AFFORD has completed its first six-month initiation phase, with assessments underway in Senegal. Future assessment countries will be shortlisted from a list of Feed the Future priority countries and in consultation with USAID and its country missions. Those interested in their country participating should

reach out to their local USAID mission office or the [Bureau for Resilience and Food Security in Washington, DC](#).

USAID AFFORD will build government capacity to prioritize LSFF by making regulator processes more efficient and effective. Using a whole-of-business approach, the program will optimize the desire, capacity, and effectiveness of industry to deliver and sustain adequately fortified staple foods. Consistent dissemination of timely, relevant data will inform and build trust with key stakeholders, amplify leadership, and encourage innovation towards fortification as a common goal.

Through these activities, USAID AFFORD seeks to capacitate, motivate, and hold every actor accountable for sustaining and prioritizing LSFF. LSFF will enrich the diets of the economically and nutritionally vulnerable, particularly women, with the goal of ultimately reducing chronic micronutrient malnutrition by 20 percent by 2025.

WHA Resolution on Food Fortification

FFI and partners are supporting a proposed World Health Organization (WHO) World Health Assembly resolution introduced by the Government of Colombia that calls on all Member States to institute and strengthen large-scale food fortification (LSFF) programs

in line with WHO recommendations. This is an important public health nutrition advocacy opportunity to address and prevent deficiencies of micronutrients like folate, iron, zinc, vitamin A, and iodine globally.

At the 152nd session of the WHO Executive Board, the [draft resolution](#) was accepted after extensive negotiations by sponsoring Member States, led by the Government of Colombia. This means that the draft resolution will be put on the agenda of the 76th World Health Assembly (WHA), where if approved, the proposed resolution will be adopted, paving the way for significant progress in advancing large-scale food fortification with micronutrients globally.

To build momentum and support for the resolution in 2022, researchers from Emory University’s Center for Spina Bifida Prevention (CSBP) in collaboration with FFI, neurosurgeons from the G4 Alliance, and the Global Alliance for Prevention of Spina Bifida caused by folate inadequacy (GAPSBiF), published an [article in *The Lancet Global Health*](#) that urges WHO Member States to take immediate action and pass a resolution in support of universal folic acid fortification of common staple foods.

In May 2022, FFI presented at a [side event](#) at the 75th WHA that helped generate momentum for the future WHA resolution on fortification. The event was hosted by the G4 Alliance, International Federation for Spina Bifida and Hydrocephalus, and GAPSBiF, which includes FFI. Among other presenters at the side event, FFI’s Research Director, Helena Pachón, provided an [overview of evidence](#) that food fortification with folic acid is safe, effective, and cost-effective.

The proposed resolution comes just after the 30-year anniversary of the [British Medical Research Council’s landmark trial](#) provided some of the most unequivocal evidence that maternal intake of folic acid (vitamin B9) starting before pregnancy prevents most cases of infant spina bifida and anencephaly—two major neural tube defects that are severe, disabling, and often fatal. Since then, research has continuously proved the safety, affordability, and effectiveness of food fortification. However, only about [69 countries](#) have chosen to make the fortification of wheat flour, maize flour, or rice with folic acid mandatory. The hesitancy by policy makers to act has resulted in more than 4 million preventable cases of spina bifida and anencephaly globally in the past 30 years.

INDIA



INDIA

473 million
potential reach

The preliminary results of the Haryana Demonstration Project are in—and they are a clear indication that fortification can lead to a healthier future in India.

In 2021, FFI and partners including the Chandigarh Postgraduate Institute for Medical Education and Research (PGIMER) and United States Centers for Disease Control and Prevention (CDC), followed up with women who had participated in a pilot fortification program in Haryana, India, to assess the impact of the program on their health. Since March of 2018, the women had received atta, a type of wholemeal wheat flour used to make traditional foods like roti, fortified with iron, folic acid, and vitamin B12 through the Public Distribution System (PDS).

Preliminary results indicate a positive impact on biomarker measures of micronutrient status with substantial increases in biomarker concentrations (red blood cell folate, serum folate, vitamin B12, hemoglobin, and ferritin) among women of reproductive age after the implementation of the atta fortification program in two blocks of Ambala District, Haryana.

Not only do these positive results suggest that

the fortified atta is being consumed and that the added nutrients are at an optimum level, they demonstrate that targeted fortification of atta through an Indian social protection program like PDS has a radical health benefit for all, women and their future children in particular. Fortification of grains does not just promote individual health; it has a ripple effect that can reduce malnutrition for entire communities.

Haryana is a populous state (approximately 28 million) with one of the highest percentages of anemic children in India. Haryana also has some of the highest rates of anemia among women in India and a high prevalence of neural tube defects (NTDs)—40 per 10,000 births—despite a relatively strong per capita income. The state's position in India's food pipeline also makes it an ideal location for a fortification program: Haryana is the source of much of India's food and is a main contributor of cereals and pulses.



Photo: Staff from FFI and partner organizations meet with the Honorable Deputy Chief Minister of Haryana to share the preliminary results of the Haryana Demonstration Project in July 2022. (FFI)

Preliminary results indicate a positive impact on women's health after the implementation of the atta fortification program.

The Haryana Demonstration Project was first conceived in 2014 when various stakeholders gathered to discuss strategies to initiate food fortification in India; however, the decision to address micronutrient deficiencies was not formalized until the 2015 Global Summit on Food Fortification in Arusha, Tanzania. Rather than starting from scratch, the Haryana Demonstration Project was designed to take advantage of existing governmental nutritional interventions, including PDS, a program that provides grains and other staple foods at a highly subsidized rate to those in need; 'Pradhan Mantri Poshan Shakti Nirman' (PM Poshan), a program that provides prepared meals for

children at school; and the Integrated Child Development Scheme (ICDS), which distributes meals to children aged six months to five years and pregnant and lactating mothers. Providing fortified foods through these social protection programs ensures that people most vulnerable to micronutrient deficiencies—women, children, and those for whom a diverse, nutritious diet is not always economically feasible—have access to the nutrients they need.

As a result of FFI and partners' efforts, 17,500 metric tons of fortified atta are distributed through PDS per month, reaching 3.3 million people in five districts of Haryana. Most PDS

“ These positive results suggest that the fortification of wheat flour through an Indian social protection program like PDS has a radical health benefit for all, women and their future children in particular. ”



Photo: Fortified atta. (Becky Tsang)

beneficiaries receive five kilograms of fortified atta a month; however, the lowest income beneficiaries receive 35 kilograms a month irrespective of the number of family members. All districts in Haryana receive fortified atta under PM Poshan and ICDS: 1.4 million people benefit from each program, respectively. ICDS distributes 2,000 metric tons of fortified flour and PM Poshan distributes 3,550 metric tons of fortified flour to beneficiaries per month.

Over the course of the program, FFI has worked with five main partners: the Government of Haryana, PGIMER, CDC, World Health Organization (WHO), and Indian nonprofit Survival for Women and Children Foundation (SWACH). FFI's main role has been to analyze the atta supply chain and opportunity for fortification, conduct milling industry assessments, and provide technical support.

The Haryana Demonstration Project was conducted in three phases, with the goal of assessing the feasibility, sustainability, and health impact of fortifying atta using existing government systems.

The project began in 2017, when a baseline survey of consumption and micronutrient status was conducted in two blocks of Ambala District, Haryana State. Face-to-face interviews were conducted for demographic, household, health, and biomarker information using multistage cluster sampling. Before PDS recipients began receiving fortified atta, blood samples were collected for chemical analysis from nearly 900 non-pregnant, non-lactating women of reproductive age. It was determined that many women had red blood cell (RBC) folate insufficiency. RBC folate insufficiency in women can lead to their babies being born with life-altering and life-threatening NTDs. More

than 96% of the women had insufficient levels of at least one micronutrient. This first phase also focused on advocacy. Teams met with beneficiaries to explain the benefits of fortified atta as well as its shelf life, which is shorter than the whole, unmilled grains they received through PDS before the project.

During phase two, which began in March 2018, the government started to distribute atta fortified with iron, folic acid, and vitamin B12 to PDS beneficiaries in the Ambala District project area. Samples of the fortified atta were evaluated, and it was determined that the levels of iron and folic acid very precisely approximated 2016 nutrition standards in India, which are in line with 2009 WHO recommendations. According to an assessment conducted by PGIMER, nearly all PDS beneficiaries of the project received and consumed fortified atta. In June 2018, distribution of fortified atta expanded to ICDS in those same two blocks of Ambala.

During phase three, which began in 2021, PGIMER and partners including CDC and FFI assessed the impact of atta fortification in Ambala. They found that there was a significant nutritional benefit to the women who had received and consumed fortified atta.

The project in Haryana is a clear demonstration that fortification reduces micronutrient deficiencies and promotes health. FFI and its partners hope to tailor the model developed in Haryana to other Indian states and transform millions more lives. When scaled up and integrated into state systems, fortification can continue to build a healthier future in India for years to come.

AFRICA

EGYPT

90 million
potential reach

After the success of FFI and partners' April 2021 workshop for millers, FFI collaborated with the Ministry of Supply and Internal Trade (MOSIT) to host a follow-up workshop for millers on 27 February 2022.

The workshop was held with the following FFI partners: the Global Alliance for Improved Nutrition (GAIN), the International Federation for Spina Bifida and Hydrocephalus (IF), and UNICEF. The workshop reached millers and stakeholders from across the country to share key advocacy messages on the importance of wheat flour fortification, and to continue building the country's momentum towards launching a national wheat flour fortification program.

The workshop brought together more than 100 stakeholders from private, public, and civic sectors including the Egypt National Food Safety Authority, National Nutrition Institute, Food Holding Company, and Ministry of Health. Other organizations present included the World Health Organization (WHO) and USAID as well as members from Harvard University, ambassadors, the American Chamber of Commerce, and others. The forum was a unique opportunity for all the stakeholders engaged in fortification to meet, exchange progress, flag areas that need to be addressed, and recommend next steps for a national launch of flour fortification in Egypt. The workshop was also an opportunity to bring in new players to the fortification arena.

The workshop's format actively engaged

participants and created a dynamic day full of interest, participation, and energy. The workshop engaged the participants through training modules, presentations by experts, quizzes, and effective moderation that highlighted the significance of fortification to Egyptians and for Egypt meeting goals outlined in its Vision 2030 and 100 Million Healthy Lives Initiative.

This workshop was yet another demonstration of FFI's role as a programmatic catalyst, bringing key partners together and reaching out to new ones to further advocate for fortification by presenting evidence of its impact. Participants left the workshop with clarity regarding the significance of their work, both within and beyond the mill, and developed a better understanding of their work's role in meeting the goal of creating a stronger and healthier future for Egypt.

FFI is exploring and expanding partnerships with a number of new private, public, and civic organizations that expressed interest in the fortification program at the workshop. Many of these organizations are interested in learning more about the program and the various ways their organization can support it.

As the momentum for Egypt's flour fortification

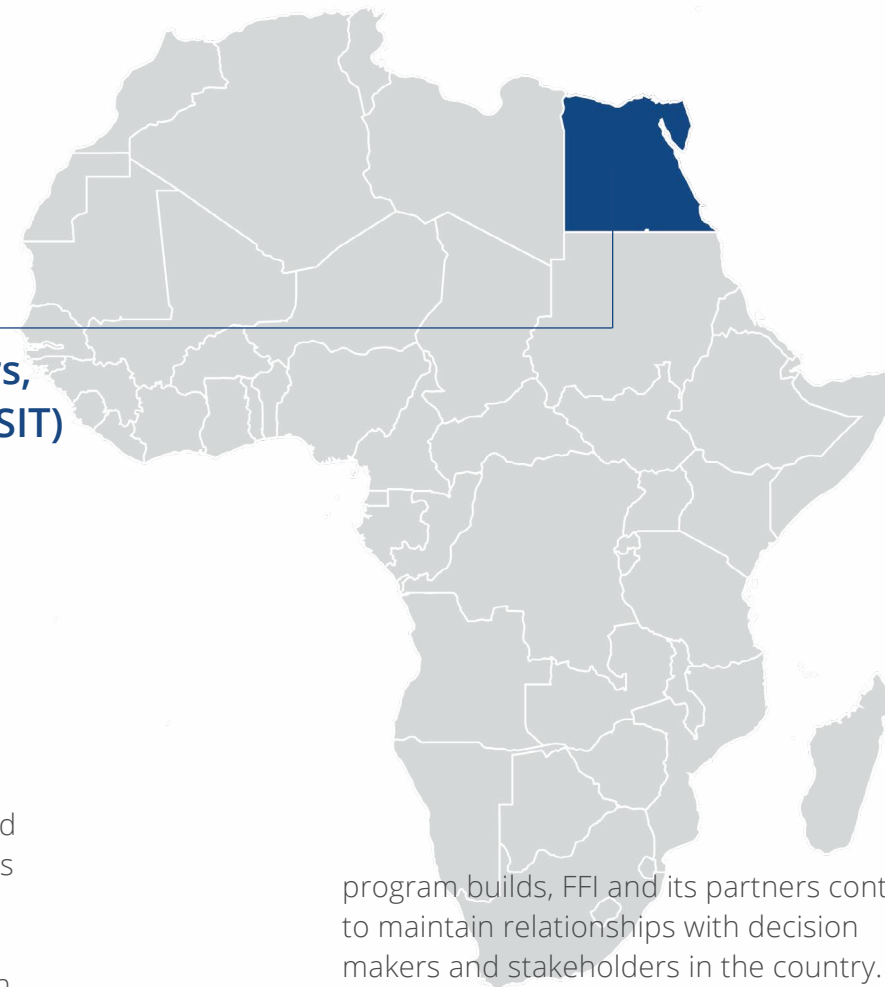


Photo: Nada Elhussiny, FFI Egypt and North Africa Technical Advisor, presents. (FFI/4PR)

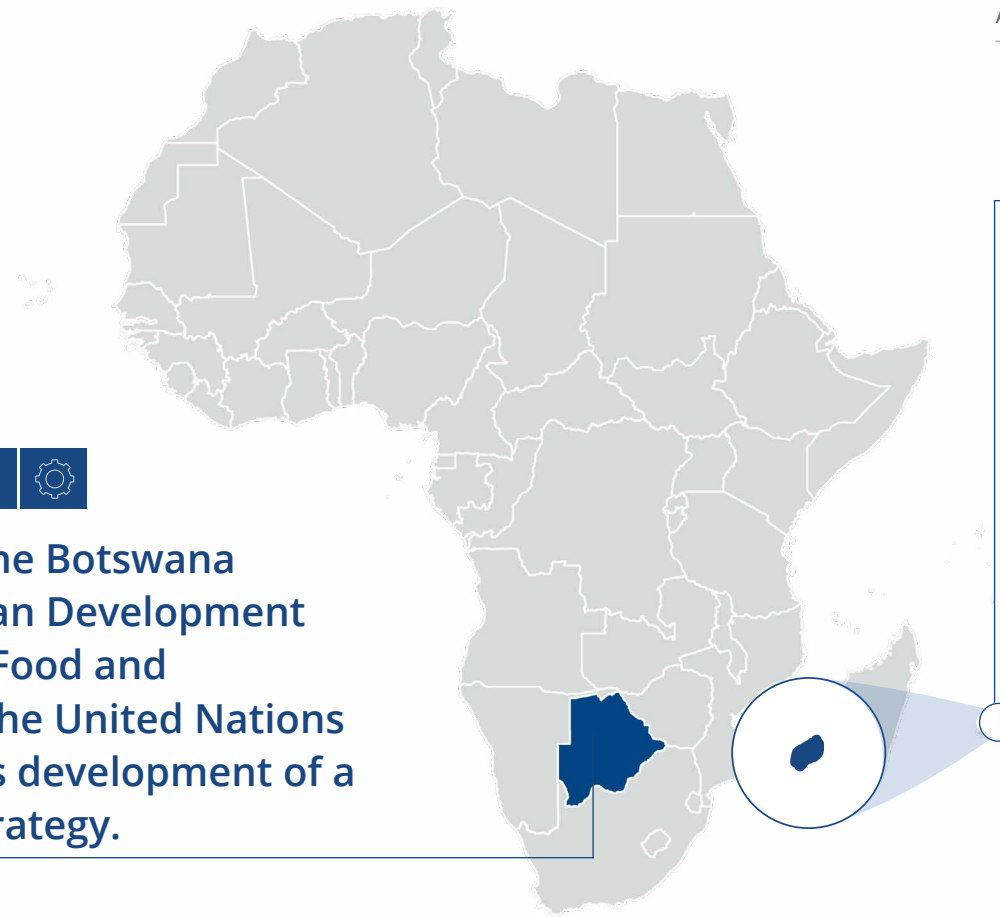


Photo: Workshop attendees. (FFI/4PR)

program builds, FFI and its partners continue to maintain relationships with decision makers and stakeholders in the country. Through partnerships and on-call technical assistance, FFI is supporting Egypt to create a solid foundation for its flour fortification program and strengthen nutrition.



Photo: Workshop attendees. (FFI/4PR)

**BOTSWANA**2.3 million
potential reach

In 2022, FFI partnered with the Botswana Government, Southern African Development Community (SADC), and the Food and Agriculture Organization of the United Nations (FAO) to facilitate Botswana's development of a national food fortification strategy.

FFI and partners sought to create a strategy that considered existing interventions and capabilities of national institutions while also exploring innovative, cross-cutting solutions. [The project](#), funded by FAO, also sought to help Botswana develop wheat flour fortification standards that are in line with existing SADC regional standards and serve the needs and context of Botswana.

FFI's efforts to help Botswana create a national fortification standard faced a challenge common to the world of nutrition: lack of data. The most recent micronutrient survey in Botswana was conducted in 1994, and without recent data, the government of Botswana was unsure of wheat flour fortification's relevance. FFI began liaising with government stakeholders and SADC in 2019 to support the country's micronutrient deficiency data needs in order to make a strong case for the implementation of mandatory fortification in the country. Through FAO and SADC's support, FFI completed a [landscape analysis](#) of the wheat flour milling

industry in Botswana. The results of this analysis have motivated Botswana to further pursue a fortification program and, with the government's input, FFI drafted a national food fortification strategy that is currently under government review. FFI's next steps will be the pursuit of partners that can carry out a national micronutrient survey and gathering data for a cost-benefit analysis of wheat flour fortification and support implementation of the national program.

No two countries are alike, and Botswana has individualized dietary, nutritional, and industry requirements that will shape its fortification strategy. Once the information provided by a cost-benefit analysis and a supply chain analysis is obtained, Botswana will be able to finalize a wheat flour fortification program that can be implemented and monitored according to best practices and improve the health of Botswanans for generations to come.

MAURITIUS1.2 million
potential reach

Mauritius first began planning its wheat flour fortification program in 2018 and has since made tremendous progress.

FFI, the Southern African Development Community (SADC), and the Food and Agriculture Organization of the United Nations (FAO) have been important resources for Mauritius in the development of its fortification program. [A recent FAO grant, which concluded in December 2022](#), supported FFI and SADC to provide Mauritius with technical assistance to develop mandatory fortification regulations and national fortification standards that follow regional minimum standards set by SADC. Beyond the FAO grant, FFI will provide technical assistance to Mauritius as it implements the fortification program.

In 2022, Mauritius progressed rapidly through grant activities and the drafting of a 2023-2028 fortification strategy. Finalized regulations and standards will soon be gazetted, and implementation of wheat flour fortification is expected to begin in 2023: a singular achievement.

Mauritius is an ideal candidate for wheat flour fortification: the average person in Mauritius consumes a large amount of wheat flour—220 grams per day—and there is only one company that mills wheat flour on the island nation, making fortification relatively easy to implement and monitor. Furthermore, there is a tremendous opportunity to prevent life-threatening health consequences of micronutrient deficiencies like neural tube defects and anemia through food fortification. Fortifying wheat flour with folic acid, iron, and other micronutrients would reduce the number of babies born with a neural tube defect

and lower rates of anemia among women of reproductive age.

FFI first provided technical assistance to the Government of Mauritius in 2020 through the drafting of a [costed implementation plan](#) for fortification, which was presented to and accepted by the government. Several subsequent national-level meetings helped operationalize the action plan among the various stakeholders. With FAO and SADC support in 2021 and 2022, FFI completed a [landscape analysis](#) and a [cost-benefit analysis](#) of fortifying wheat flour. FFI worked closely with the Government of Mauritius and SADC to develop mandatory wheat flour fortification legislation and standards that meet the needs of Mauritius and SADC regional standards. FFI expects the new regulation to pass quickly and that the country's newly minted fortification standards will be published in 2023. Lastly, the Mauritius fortification strategy includes plans for implementing, financing, monitoring, and evaluating the fortification of wheat flour.

Despite the end of FAO's grant, FFI will continue to support Mauritius in the implementation of the fortification strategy, standards, and regulation. FFI's next steps include supporting partners in Mauritius to establish a quality premix supply, to build capacity of the industry and markets to monitor fortification standards compliance, and to advocate for fortification to the public. In the coming years, FFI and SADC expect fortification to become built into consumer expectations and for the people of Mauritius to reap the benefits of a healthier, more nutritious life.

ASIA-PACIFIC

MALAYSIA

32 million
potential reach

The Malaysia Ministry of Health (MOH) demonstrated renewed dedication in 2022 to scale up and strengthen wheat flour fortification.

Previously, mandatory fortification of flour with iron and folic acid only applied to government subsidized 1 kg packages of flour. There were also voluntary regulations in place that allowed millers to add thiamin, niacin, and riboflavin. In 2023, the MOH will release regulations mandating that wheat flour sold in bags 25 kilograms and under be fortified with iron and folic acid. Millers can choose to also fortify with thiamin, niacin, and riboflavin per the previous voluntary regulations. The new regulation will come into effect in 2025, after a two-year grace period.

Making fortification mandatory is one step toward ensuring that millers comply with fortification guidelines and that consumers are able to access flour fortified with micronutrients. Expanding fortification to flour sold in larger packages means that fortified flour will be used by businesses making and selling wheat-flour foods – increasing the number of people who have access to fortified flour and the life-saving micronutrients they contain. About half

of the wheat flour in Malaysia is distributed in 25-kilogram bags or under; FFI estimates that the new regulation will lead to at least 15 million more Malaysians being reached by fortified flour.

Commenting on the proposed regulation, Malaysia Health Minister Khairy Jamaluddin said it “will ensure that the level of iron and folic acid in wheat flour is in line with the World Health Organization (WHO).” By including iron and folic acid at WHO-recommended levels, fortification is more likely to have a positive impact on health, particularly for women and their unborn children. These efforts on the part of Malaysia’s government are evidence of a growing recognition of the power of fortification to transform the country’s health. It is also a recognition of FFI and its partners’ persistence in providing advocacy and technical support, which began in 2006.

In August 2022, FFI virtually attended an MOH-hosted meeting. This meeting was held to increase awareness among the wheat flour

industry (millers as well as food processors using flour) so that they could begin preparing for scaling up fortification following the new regulation. FFI and UNICEF Headquarters staff collaborated to present on the global status of wheat flour fortification, its costs, and its best practices. FFI and UNICEF also answered millers’ questions, including how to verify whether flour is fortified. The new regulation was accepted and no millers expressed opposition to mandatory fortification at the meeting.

A shortcoming of the new regulation is that it does not apply to flour sold in bulk (bulk trucks and containers) and purchased by large-scale food processors such as noodle and biscuit manufacturers. Large bulk shipments make up nearly 50% of the flour consumed in the country.

Malaysia is one of the only countries in the world that uses food packaging size to define its parameters for food fortification. FFI and UNICEF both recommend, depending on the results of a planned public health evaluation of fortification’s impact on the population, that the MOH consider expanding mandatory fortification to all flour consumed in the country, regardless of packaging size, for maximum health benefits.

Before 2022, FFI and partners’ efforts to help Malaysia scale up fortification had stalled despite years of advocacy and technical assistance. The Malaysian government’s renewed focus on fortification is an example of the country’s commitment to improving nutrition and how persistent advocacy by FFI and its partners can build future programs.



Photo: (Dennis Sylvester Hurd)



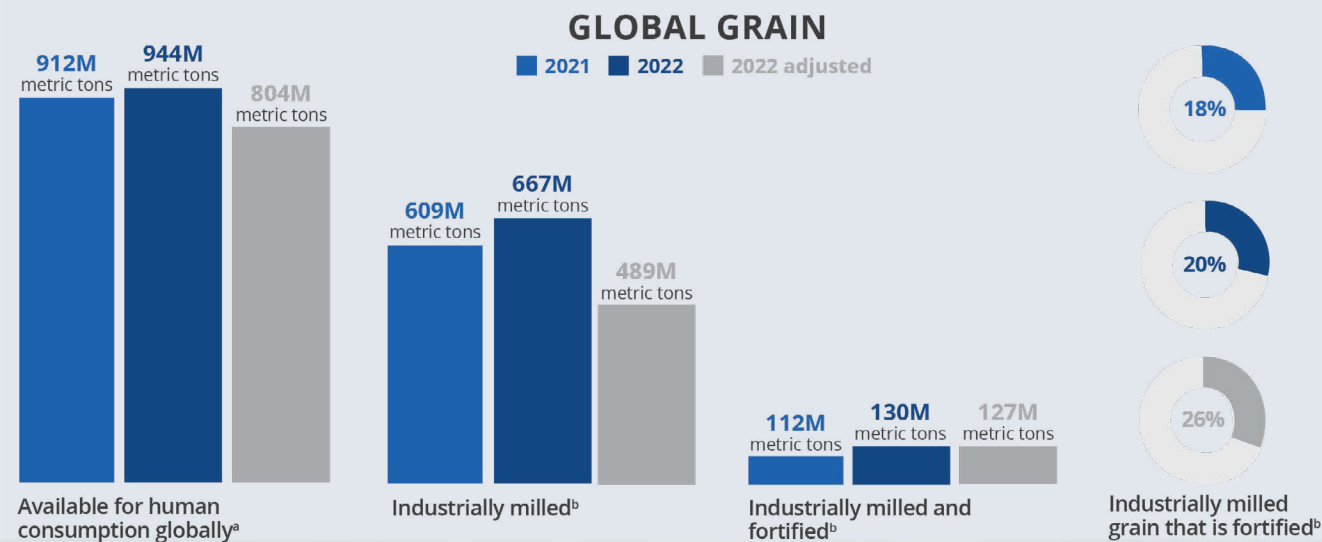
Photo: Wheat flour sold in a market in Malaysia. (NSTP/Aizzuddin Saad)



In a world still reeling from the effects of the COVID-19 pandemic, the overall amount of fortified grains available nevertheless rose in 2022.

Scaling up of fortification programs in highly populous countries like Mexico and India created noticeable impacts on the total amount of fortified maize flour (Mexico) and rice (India via state-wide social safety net programs). Global wheat flour production

and the percentage that is fortified also increased slightly, indicating a need for sustained and accelerated action in the implementation, monitoring, and scale-up of wheat flour fortification programs.



^a FAO data with additional, openly available data sources. 2021 estimates: 2019 FAOSTAT, New Food Balances, Food (element 5142) 2019 Data: <http://www.fao.org/faostat/en/#data/FBS> 2022 estimates: 2020 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2020 Data: <https://www.fao.org/faostat/en/#data/SCL>

^b FFI calculations.

Photo: Xaume Olleros/RTI

How we calculate global estimates

Measuring global progress in grain fortification through an annual survey.

Update on methodology

In 2022, FFI began transitioning to a new methodology for determining its annual estimates of global grain fortification progress. In this report, results produced using both new (referred to in this report as “adjusted”) and old methodologies are presented. Please note that some of the differences between previous and current numbers may be due to these methodological changes.

As a part of the new methodology, we apply specific criteria to data from each country that focuses our calculations on the grain(s) that would be good candidates and excludes the grain(s) that would not be good candidates for large-scale fortification. This primarily means emphasizing grains that are widely consumed and mostly industrially processed. Consequently, the results presented in future annual reports may have a slightly different composition than in previous years. The new methods are described in “How we calculate global estimates – opportunity adjustment”.

Flour and rice available

We measure global progress in grain fortification using multiple data sources. We begin with data from the Food and Agriculture

Organization (FAO) of the United Nations that describes how much flour or milled rice is available in the food supply for each country.

For countries with FAO data, we use the Supply Utilization Account (SUA) food supply quantity (tons) element to determine the amount of wheat flour, maize flour, and milled rice available. In previous years, the Food Balance Sheets (FBS) and extraction rates were used to calculate the amount of flour available. For some countries, moving from SUA to FBS figures causes significant changes, likely due to SUA's focus on milled grains and products made with flour used specifically for human consumption versus FBS's more general inclusion of grains and their uses.

If a country or territory does not have FAO data available, we use publicly available data and, as needed, extraction rates to convert grain numbers to flour available. If country-specific extraction rates are available, those are applied. Otherwise, the default extraction rate for wheat in its conversion from grain to flour is 75%. The default extraction rate for maize varies by region, with 67.5% used for Africa, 72.5% for the Americas, and 70% elsewhere. We collect data on milled, hulled, and broken rice in our estimates. As a result, it is not necessary to apply a default extraction rate to rice.



Industrially milled & percentage fortified

We then determine the amount of flour or milled rice that is industrially produced. For countries in FFI's [Europe region](#), we assume that 100% of the wheat flour, maize flour, and rice are industrially milled. Countries in FFI's [Americas region](#) are assumed to industrially process 100% of their wheat flour.

We also ask national partners in governments, milling associations, nongovernmental organizations, private sector, and UN agencies around the world to estimate how much of each grain is industrially processed and fortified in their country. We then compile the country figures into global estimates.

Opportunity adjustment

Based on these findings and calculations, FFI determines if countries could be considered

a good opportunity for large-scale grain fortification. For each grain, the grams available per person per day are examined. If a country has more than 25 grams of wheat flour or more than 37.5 grams of maize flour or rice available per person per day, it may be a good opportunity. Popularity of grain is another consideration. For example, even though the average Jordanian eats more than 37.5 grams of rice per day, they eat more than 176 grams of wheat flour per day. Therefore, fortification of rice may not be considered a priority in Jordan. Additionally, FFI is primarily concerned with large-scale fortification, meaning a grain must be primarily produced at industrial mills for it to be considered a good opportunity for fortifying. These factors and others such as urbanicity are used to determine which grain(s) may be a good opportunity for fortification in each country.



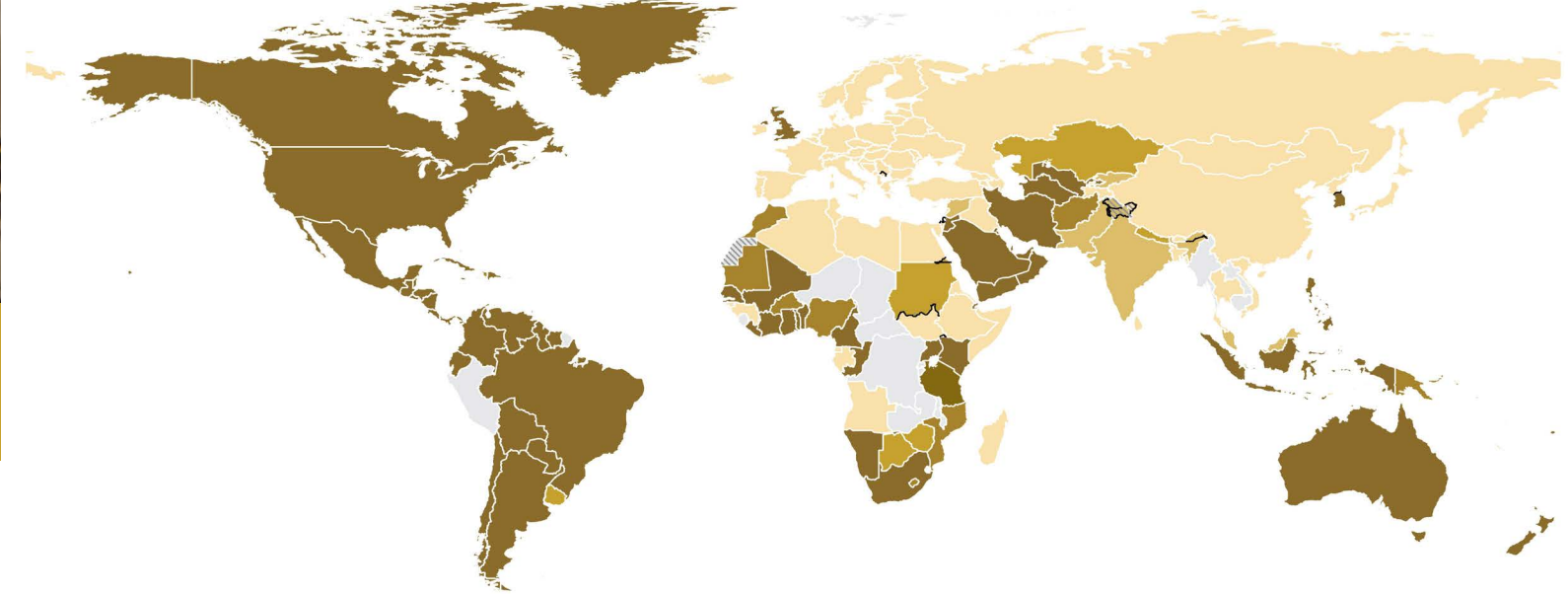
Photo: Heifer International



Photo: RTI

 **Wheat**

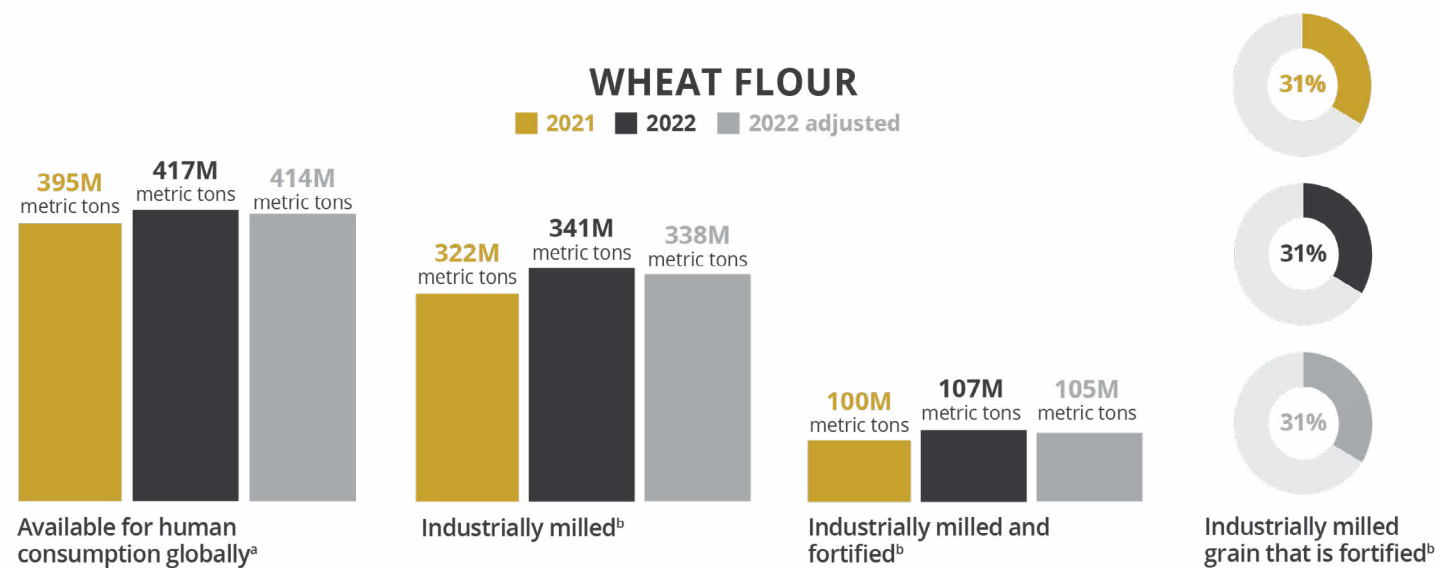
Percentage of industrially milled wheat that is fortified, adjusted for opportunity - 2022








FII's calculations showed relatively small increases from 2021 to 2022 in the amount of wheat flour available (up 1.7%), industrially milled wheat flour available (3%), and fortified wheat flour in the market (6%) (based on unadjusted estimates). While the magnitude of the year over year difference may be impacted by changes in how we calculate our flour figures from FAO data, the continuing upward trend of fortified wheat flour is encouraging.

in light of continued production and linkage disruptions due to COVID-19 and the war in Ukraine. Supply chain lapses due to these global issues have halted fortification of wheat flour in Iraq. Similarly, fortification of wheat flour in Egypt continues to be stalled despite strong advocacy and support from the government and development partners. Increases in the amount of fortified wheat flour across the globe, despite such complications, display the determination of countries and systems to provide fortified foods to their citizens.

This positive trend is particularly impressive



LEGEND

-  75-100%
-  50-74%
-  25-49%
-  1-24%
-  0-<1%

 Not an opportunity for wheat flour fortification

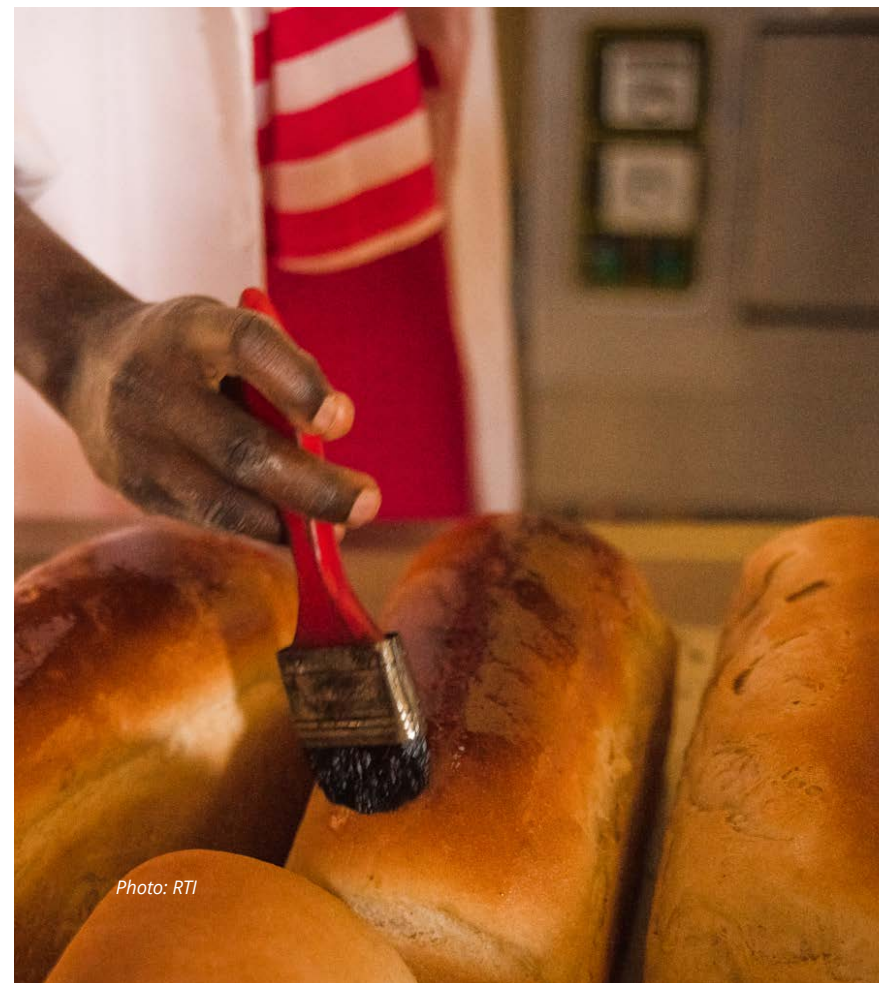


Photo: RTI

^a FAO data with additional, openly available data sources. 2021 estimates: 2019 FAOSTAT, New Food Balances, Food (element 5142) 2019 Data: <http://www.fao.org/faostat/en/#data/FBS> 2022 estimates: 2020 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2020 Data: <https://www.fao.org/faostat/en/#data/SCL>

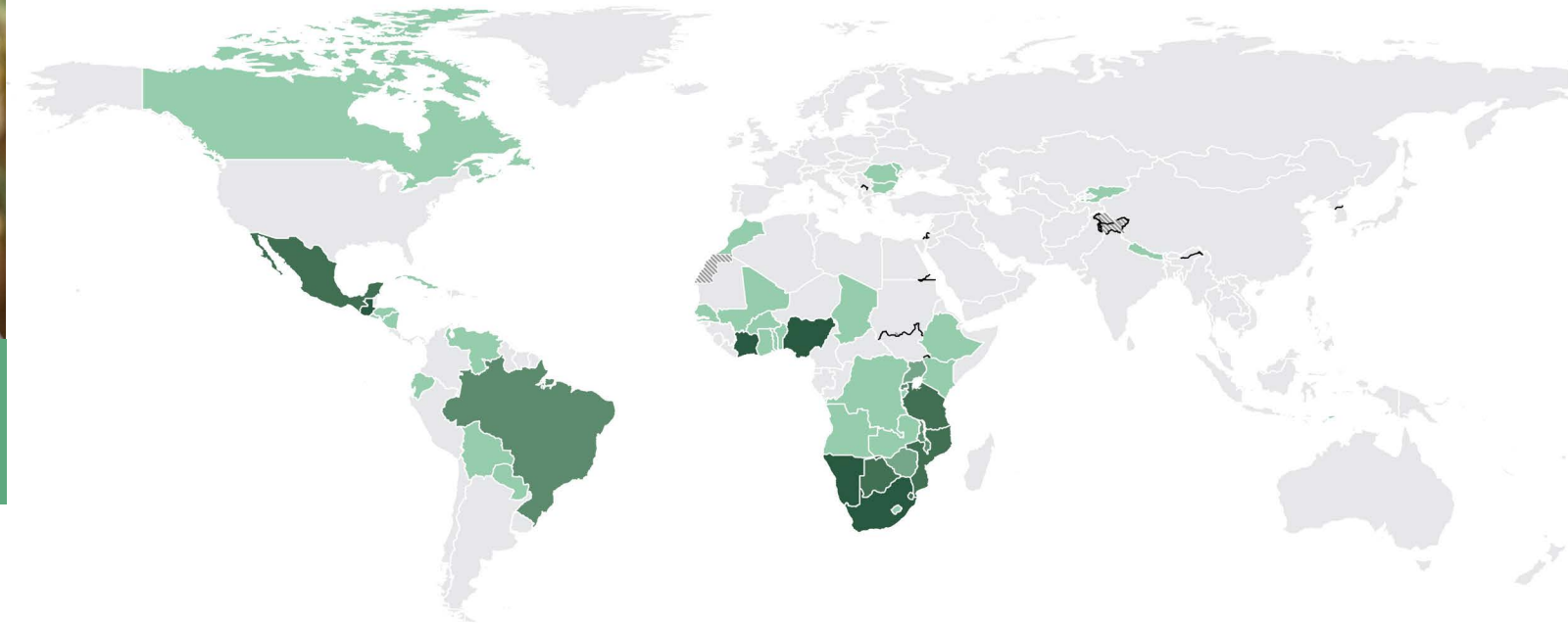
^b FFI calculations.



Photo: Xaume Olleros/RTI

 **Maize**

Percentage of industrially milled maize that is fortified, adjusted for opportunity - 2022

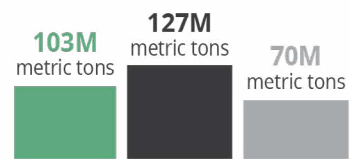


Worldwide, maize flour is significantly less available than wheat flour or rice. However, there are many specific populations and countries that consume a substantial amount of maize flour. Importantly, many countries that have a large amount of maize flour available for human consumption process much of the flour in small, non-industrial mills, making it a difficult grain to fortify on a large scale.

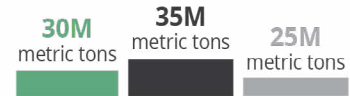
Nevertheless, maize flour fortification and industrial processing expanded in 2022. Significantly, Mexico now fortifies 65% of its industrially milled maize flour, contributing to a 4% overall rise in the amount of fortified maize flour around the globe (based on unadjusted estimates).

MAIZE FLOUR

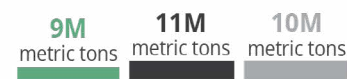
■ 2021 ■ 2022 ■ 2022 adjusted



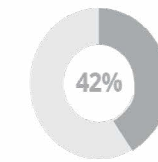
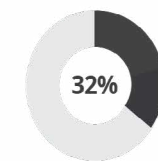
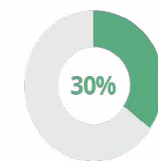
Available for human consumption globally^a



Industrially milled^b



Industrially milled and fortified^b



Industrially milled grain that is fortified^b

LEGEND

- 75-100%
- 50-74%
- 25-49%
- 1-24%
- 0-<1%

Not an opportunity for maize flour fortification



Photo: Xaume Olleros/RTI

^a FAO data with additional, openly available data sources. 2021 estimates: 2019 FAOSTAT, New Food Balances, Food (element 5142) 2019 Data: <http://www.fao.org/faostat/en/#data/FBS> 2022 estimates: 2020 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2020 Data: <https://www.fao.org/faostat/en/#data/SCL>

^b FFI calculations.



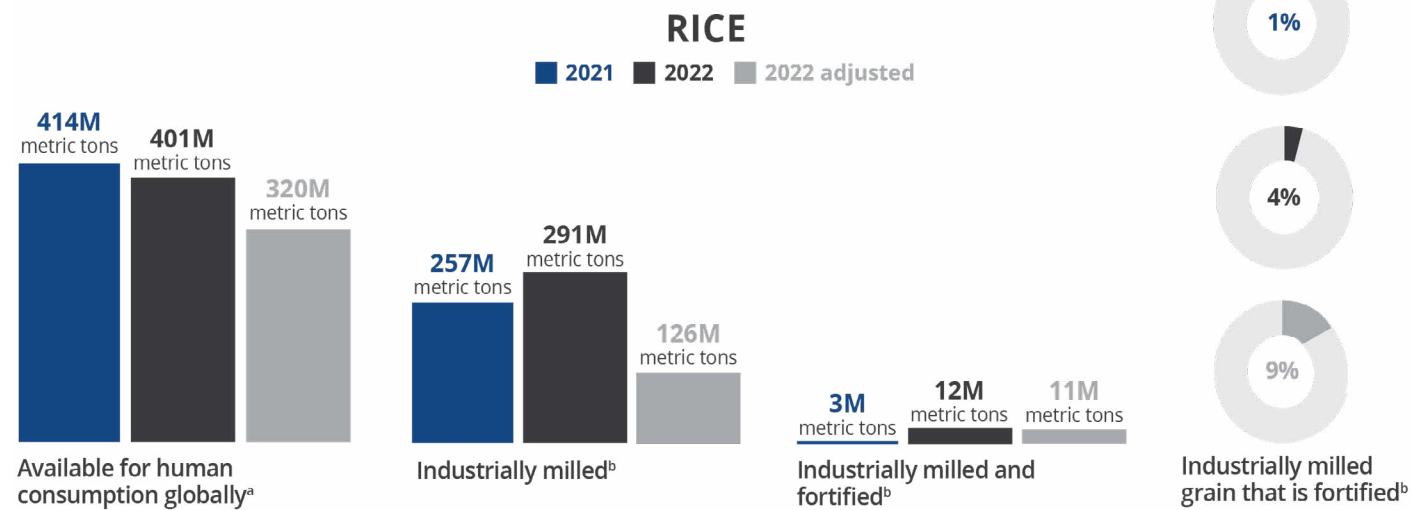
Photo: Tran Thi Hoa / World Bank



Rice

Although, through the unadjusted estimates, we found an overall decrease (~3.2%) in rice available for human consumption globally, the amount and proportion of industrially processed rice and fortified rice increased. In 2022 approximately 4.1% of industrially milled rice was fortified, up from around 1.2% in 2021. India is the most significant contributor to this increase. Multiple Indian states are expanding their distribution of fortified rice via social support systems, meaning that those most vulnerable to micronutrient deficiencies are now

receiving fortified rice. The amount of fortified rice distributed in India increased each month in 2022, suggesting the amount of industrially processed rice that is fortified will increase in 2023. Despite these positive steps, we estimate that less than 10% of the rice that FFI considers a good opportunity for fortification is being fortified. This gap between opportunity and reality represents hundreds of millions of people who consume rice daily and would benefit from the scaling up of rice fortification.

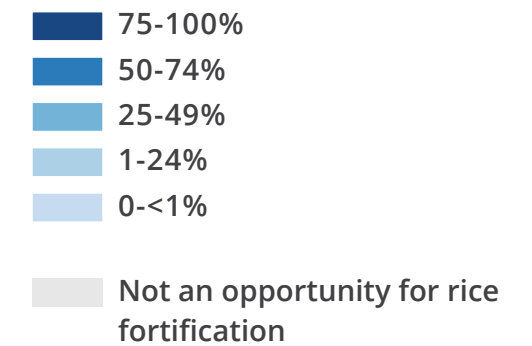


Percentage of industrially milled rice that is fortified, adjusted for opportunity - 2022



Photo: Xaume Olleros/RTI

LEGEND



^a FAO data with additional, openly available data sources. 2021 estimates: 2019 FAOSTAT, New Food Balances, Food (element 5142) 2019 Data: <http://www.fao.org/faostat/en/#data/FBS> 2022 estimates: 2020 FAOSTAT, Supply Utilization Accounts, Food (element 5141) 2020 Data: <https://www.fao.org/faostat/en/#data/SCL>

^b FFI calculations.



Legislation Update

Mandatory Cereal Grain Fortification Legislation, 2022

LEGEND

- Wheat flour alone - 67 countries
- Rice alone - 1 country (Papua New Guinea)
- Wheat flour and maize flour - 17 countries
- Wheat flour and rice - 5 countries (Nicaragua, Panama, Peru, Philippines, Solomon Islands)
- Wheat flour, maize flour, and rice - 2 countries (Costa Rica and the United States)
- No mandatory fortification legislation or data not available

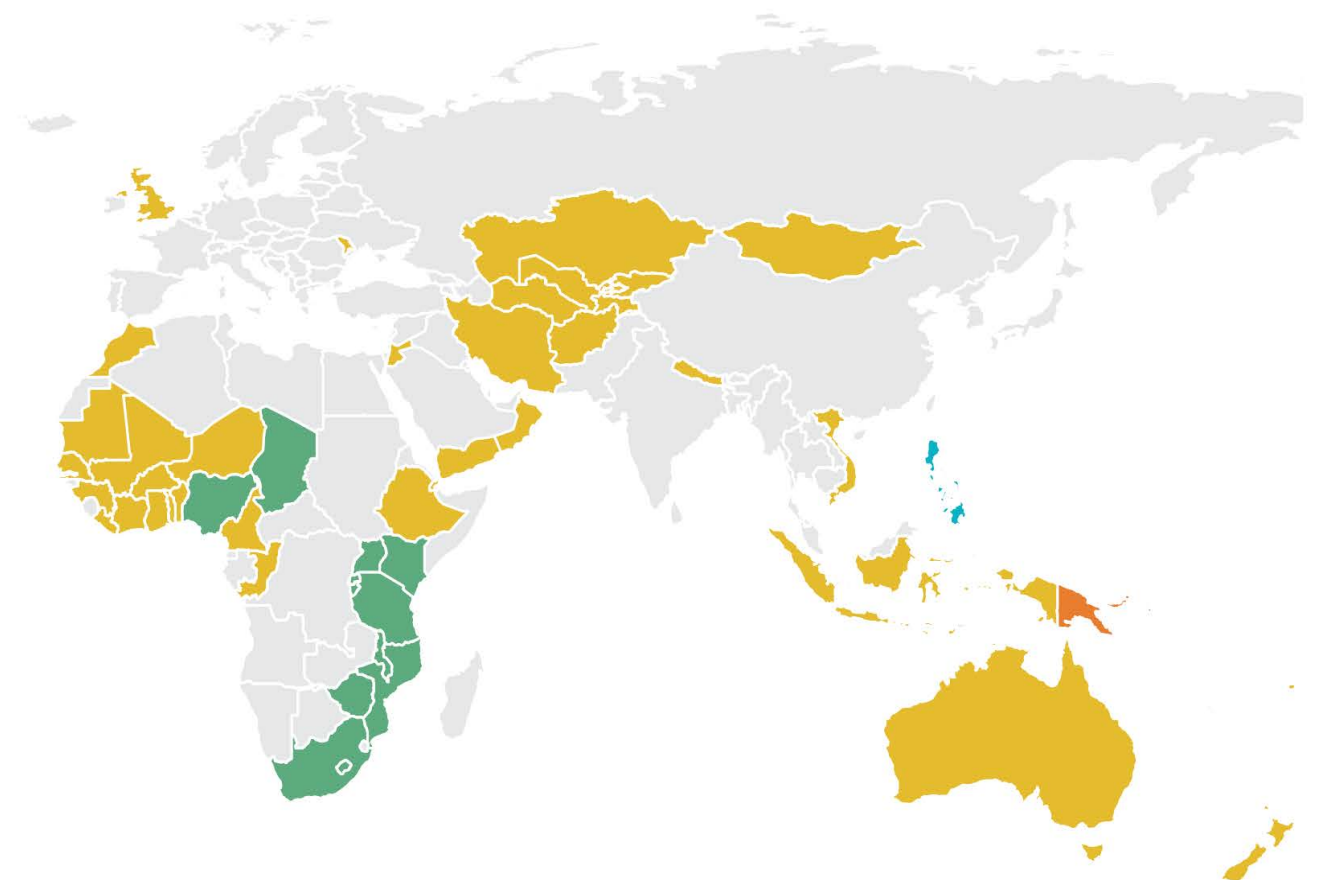
Legislation has effect of mandating grain fortification with at least iron or folic acid.

Legislation status from the Food Fortification Initiative (www.FFInetwork.org) July 2022.

In 2022, mandatory legislation was created in Ethiopia to fortify wheat flour and edible oil. The standard for fortified wheat flour includes vitamins B1, B2, B3, B6, B9 (folic acid), and B12 and zinc. Wheat flour fortified with these micronutrients will reach approximately 40 million people.

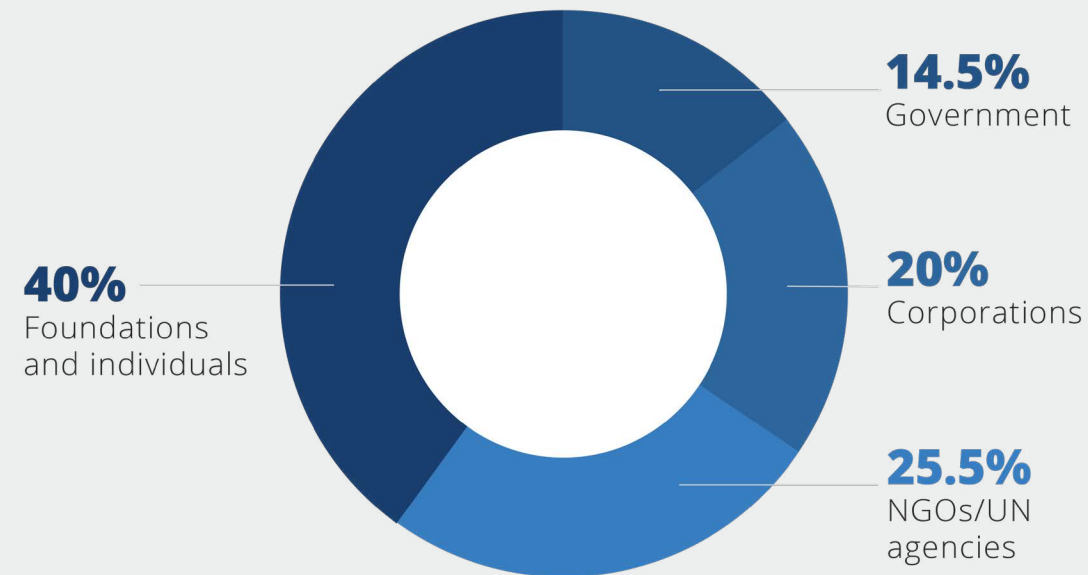
Globally, 92 countries have legislation to mandate fortification of at least one industrially milled cereal grain. Of these, 91 countries mandate fortification of wheat flour alone or in combination with other grains. One country—Papua New Guinea—has a mandate only for rice fortification.

When FFI was founded in 2002, only [38 countries](#) mandated fortification of wheat flour, maize flour, or rice.



Gift Profile

We are grateful to the individuals and donors who support our work. Contributions for 2022 were US \$1.2 million.



How to contribute

Your gift will make a difference by reducing the debilitating effects of anemia, preventing thousands of serious birth defects a year, and strengthening immune systems to prevent premature death in children and adults alike. Join us and [donate to FFI](#).



Executive Management Team

An Executive Management Team (EMT) representing global leaders in the public, private, and civic sectors provides FFI's strategic direction.

Jane E. Friedrich, EMT Chair
Leader, Global Core Research and Development
Cargill, Inc.

Manpreet Chadha
Senior Technical Adviser, Fortification
Nutrition International

Markus Lotsch
President, Health and Wellness
Archer-Daniels-Midland Company

Melinda Farris
Executive Vice President
International Association of
Operative Millers

Penjani Mkambula
Lead, Food Fortification
Global Alliance for Improved Nutrition

Reynaldo Martorell
Woodruff Professor of International Nutrition; Senior Advisor, Global Health Institute
Emory University

Sylvia Roozen
Secretary General
International Federation for Spina Bifida and Hydrocephalus (IF)

Vilma Tyler
Senior Advisor, Nutrition - School Age Children, Adolescents, and Women
United Nations Children's Fund (UNICEF)

Staff Updates

In addition to the eight EMT members, leaders from the CDC and WHO are EMT observers, including:

Jenny Williams

Team Lead, Neural Tube Defects Surveillance and Prevention Team, Division of Reproductive Health - National Center on Birth Defects and Developmental Disabilities Centers for Disease Control and Prevention

Ruth Petersen

Director, Division of Nutrition, Physical Activity, and Obesity - National Center for Chronic Disease Prevention and Health Promotion Centers for Disease Control and Prevention

Luz María De-Regil

Unit Head, Multisectoral Action in Food Systems World Health Organization



Photo: Rahim Mirza/Asian Development Bank

FFI welcomed two new members to the team in 2022: Molly Hogsett and Jalisa Starling.

Molly Hogsett, FFI Program Coordinator

Molly joined FFI in October 2022. As Program Coordinator, Molly provides operational support to local and international projects and oversees FFI's annual operating budget. She also handles the logistics of EMT semi-annual meetings and the FFI Global Secretariat office in collaboration with core team members and strategic partners to ensure programmatic success. Molly is a recent graduate of the Rollins School of Public Health, where she earned her Master of Public Health (MPH). In addition to several years of experience in data management and program evaluation, both domestic and international, Molly has held several leadership and administrative roles with global non-profits. She is currently based in Atlanta, Georgia, USA.



Jalisa Starling, FFI Research Associate - Americas

Jalisa is a first-year participant of the two-year Public Health Associate Program (PHAP) through the US Centers for Disease Control and Prevention (CDC). Through PHAP, Jalisa supports FFI efforts to make the fortification of corn masa flour common practice in the United States. Before FFI, Jalisa held several administrative and clinical roles. She is currently based in Atlanta, Georgia, USA.





Photo: Abbas Farzami/Rumi Consultancy/WorldBank

FFI's Unique Contributions

to Global Grain Fortification



Expertise

FFI's in-house leadership and technical expertise enable us to apply a data-driven approach to program planning, implementation, and monitoring.



Rigor

FFI operates through a unique model, bringing together voices from the public, private, and civic sectors through our Executive Management Team and our technical assistance to make sustainable change.

FFI conducts supply chain analyses for any given grain to discover and act on opportunities to advance fortification.

FFI documents and publishes up to 196 countries' annual potential and progress toward successful cereal grain fortification.



Focus

FFI is the only global group that focuses exclusively on large-scale fortification of the three most consumed grains: wheat flour, maize flour, and rice.

Inspired by the Good to Great model by Jim Collins

How We Work

FFI's strategic approach to scaling grain fortification, which is based on two decades of experience conducting research and providing on-the-ground assistance, offers a replicable method to building and strengthening fortification programs.

FFI chooses countries, regions, states, and

provinces through rigorous research. We take a holistic, objective approach with the goal to help eliminate micronutrient deficiencies in every country in the world where industrially milled cereal grain is commonly consumed. FFI does not have a predetermined set of countries it will support; instead, it relies on data to identify where the needs and opportunities are greatest.



Photo: Neil Palmer/CIAT

Before FFI begins working in a country, we use data to determine two essential requirements: demonstrated need for fortification and the potential to make a positive impact on health through fortified food. Our data comes from several sources and through varied methods that include consumption and milling analyses, nutrition needs assessments, market analyses, political readiness assessments, systematic reviews, and partner interviews. Once an opportunity for fortification is determined, FFI uses a four-stage phased approach to help countries plan, implement, and monitor a fortification program that can generate and sustain large-scale impact.

Plan

PHASE 1: EXPLORE AND ENGAGE

- Engage private sector
- Engage birth defects groups, neurosurgeons, and consumer associations
- Identify key challenges and opportunities
- Identify fortification champion(s) within government
- Determine what it will take to move forward

MILESTONE

Once the government expresses permission and willingness to move forward, FFI will move to the next phase of planning: map the context.

PHASE 2: MAP THE CONTEXT

- Conduct a thorough supply chain analysis
- Assess industry structure including readiness and reach of mills
- Assess monitoring structure and needs
- Map the legislative process
- Assess budgetary needs (initial investment by sector and annual recurring costs) to ensure commitment and sustainability
- If necessary, conduct a cost-benefit analysis making the case for fortification's impact on national health and economic indicators

MILESTONE

At this stage, FFI gives a formal presentation to government stakeholders to recommend effective staples and market channels based on diagnostic results. Once the government expresses permission and support of the plan, FFI will move to the next phase: implement - design and develop.

Implement

PHASE 3: DESIGN AND DEVELOP

- Draft recommended standards
- Identify miller, regulatory inspector, and laboratory training needs
- Support premix procurement process
- Engage the legislative process
- Develop a communication and education strategy
- Integrate realistic fortification monitoring into existing framework

MILESTONE

Clear budget and implementation plan.

- Train millers on quality assurance/quality control practices
- Train regulatory monitoring inspectors and lab staff; map agency responsibilities
- Facilitate the passage of legislation
- Develop a National Guideline for Fortification document and national logo, as necessary

MILESTONE

Fortification program is implemented and ready to scale.

Monitor

PHASE 4: MONITOR FOR COMPLIANCE AND IMPACT

- Support collection of monitoring data
- Ensure monitoring data is shared with relevant stakeholders
- Augment government monitoring partnerships with civic entities
- Ensure action is taken to improve program performance based upon monitoring data

MILESTONE

Ensure program reaches intended population

- When applicable, partner with stakeholders to measure impact

Why Fortify?

Nutrition can be a matter of life and death. More than two billion people globally suffer from vitamin and mineral deficiencies.¹

One in two preschool-aged children and two in three women of reproductive age worldwide suffer from at least one vitamin or mineral deficiency, increasing their vulnerability to infectious disease and compromising child growth and development.¹ Fortifying grains to prevent these micronutrient deficiencies can strengthen the health of individuals, populations, and countries' economies.

Micronutrient deficiencies affect an estimated:¹

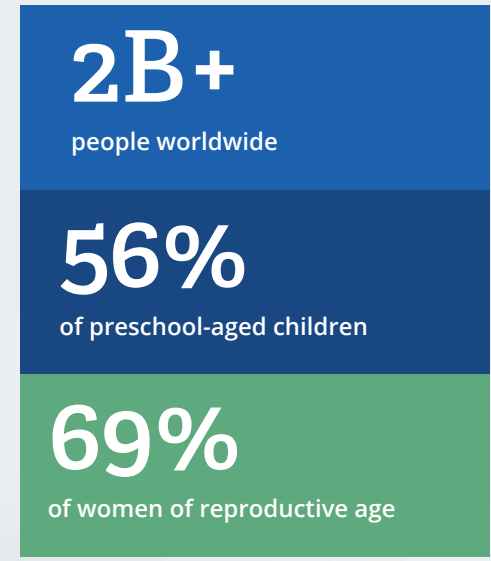


Photo: Yvonne Oleros/RTI

Anemia is often caused by deficiencies of micronutrients including iron and zinc. Children, pregnant women, and women of reproductive age (15-49 years) who are unable to include enough micronutrients in their diet are at risk for anemia. Pregnant women with severe anemia are twice as likely to die during or shortly after pregnancy than non-anemic women.² Globally, nearly 250 million women of reproductive age are affected by iron deficiency anemia; if they stood head to toe, they could reach the moon and circle it.³

Iron deficiency in childhood stunts cognitive development, which hinders academic performance and future earnings potential as adults.⁴

Zinc deficiency adversely affects children and adults by weakening immune systems, increasing rates of childhood diarrhea and pneumonia, and contributing to increased rates of childhood stunting. Globally, zinc deficiency contributes to 116,000 child deaths per year—a number that would be much higher if researchers were

able to count the number of deaths caused by preterm births in zinc-depleted mothers.⁵

Anencephaly and spina bifida are birth defects of the brain and spine that can be prevented by consuming enough folic acid, also known as vitamin B9. About 75% of children born with brain and spinal birth defects die before their fifth birthday.⁶ Though spina bifida has varying degrees of severity, it often leads to life-long disability and enormous costs for healthcare systems. Anencephaly is always fatal.

Vitamin B12 benefits children, adults, and the elderly by maintaining functions of the brain and nervous system.⁷ Consuming adequate amounts of vitamin B12 can reduce the risk of developing chronic diseases including heart disease, stroke, dementia, Alzheimer's disease, and Parkinson's disease.⁷

Fortification with micronutrients including iron, zinc, folic acid, and other B vitamins benefits individuals at every point in life—from conception to aging.



Photo: Thomas Cristofolletti/Ruom for RTI

A call to action

Research published using FFI data credited fortification with preventing 61,677 brain and spine birth defects globally in

2020 for an average of 169 healthier babies a day.⁸ Yet according to estimates, an additional 78% of birth defects of the brain and spine⁸ and 34% of anemia⁹ could still be prevented globally through adequate intake of folic acid

and iron, respectively. That's why FFI's mission to build high-impact, self-sustaining fortification programs is so important. **By improving nutrition, we can create a smarter, stronger, and healthier world.**



Photo: World Bank/Sarah Farhat

“We can create a smarter, stronger, healthier world.”



Photo: Yamanaka Tamaki

- 1 Stevens, G. A., et al. [Micronutrient deficiencies among preschool-aged children and women of reproductive age worldwide: a pooled analysis of individual-level data from population-representative surveys](#). The Lancet Global Health. 2022.
- 2 Daru, J., et al. [Risk of maternal mortality in women with severe anemia during pregnancy and postpartum: a multilevel analysis](#). The Lancet Global Health. 2018.
- 3 World Health Organization. [The global prevalence of anemia in 2011](#). 2015.
- 4 Horton, S. and J. Ross. [The economics of iron deficiency](#). Food Policy. 2003.
- 5 Black, R., et al. [Maternal and child undernutrition and overweight in low-income and middle-income countries](#). The Lancet. 2013.
- 6 Blencowe, H., et al. [Estimates of global and regional prevalence of neural tube defects for 2015: a systematic analysis](#). Annals of the New York Academy of Sciences. 2018.
- 7 Beckett, E., et al. [Reduced plasma homocysteine levels in elderly Australians following mandatory folic acid fortification: a comparison of two cross-sectional cohorts](#). Journal of Nutrition and Intermediary Metabolism. 2017.
- 8 Kancharla, V., et al. [A global update on the status of prevention of folic acid preventable spina bifida and anencephaly in year 2020: 30th anniversary of gaining knowledge about folic acid's prevention potential for neural tube defects](#). Birth Defects Research. 2022.
- 9 Keats, E., et al. [Improved micronutrient status and health outcomes in low- and middle-income countries following large-scale fortification: evidence from a systematic review and meta-analysis](#). American Journal of Clinical Nutrition. 2019.

Suggested citation: Food Fortification Initiative. 2022 Annual Report. FFI: Atlanta, USA, 2023. Accessed at <https://www.ffinetwork.org/annual-reports>

ENSURING EVERY POUND OF INDUSTRIALLY PROCESSED GRAIN IS FORTIFIED WITH NUTRIENTS IS A GOAL WITHIN OUR SHORT-TERM REACH. IT IS ONLY POSSIBLE WITH COLLECTIVE ACTION.



Food Fortification Initiative
Enhancing Grains for Healthier Lives

Photo: Asian Development Bank