



Fortifying our Future

A SNAPSHOT REPORT ON
FOOD FORTIFICATION

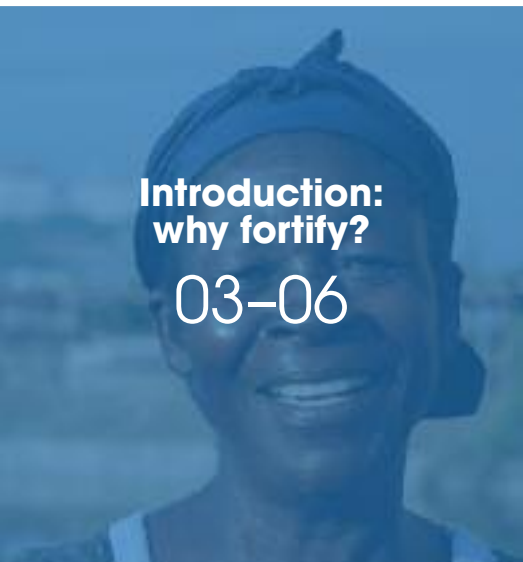
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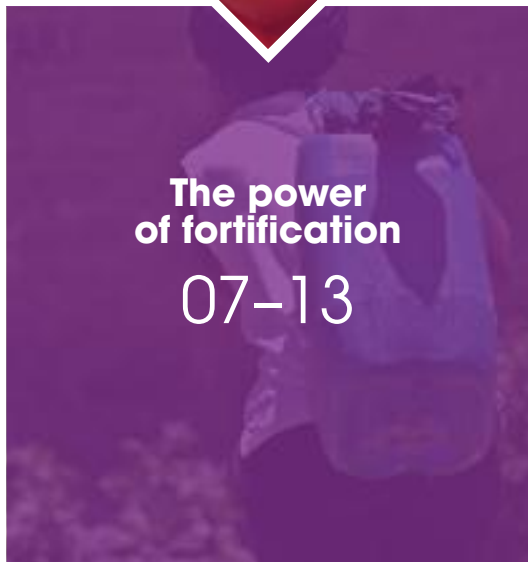
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Foreword

This snapshot report sets our perspective on food fortification and highlights the work of our partners in order to effectively employ food fortification as part of a new global food security system. In it we showcase efforts to drastically improve the nutritional quality of the diets of vulnerable and food insecure people across the globe.

Over 2 billion people lack the essential vitamins and nutrients needed to grow and live healthy lives. Without essential micronutrients, such as vitamins A, D, iron, zinc, folic acid and iodine, among many others that we need to thrive, health consequences can range from serious physical disabilities to life-threatening disorders. For example, when a woman is iodine deficient during pregnancy, her baby's cognitive development is impaired, leading to irreversible effects. Similarly, anemia – often due to iron deficiency – affects nearly one-third of the world's population and contributes to 20 percent of all maternal deaths.¹

Nothing illustrates or makes the case better than fortification of the simplest of foods: salt. By adding iodine to salt – first done by Switzerland and the United States in the 1920s and now practiced worldwide in approximately 140 countries – it has been possible to virtually eradicate goitre and the worst effects of intellectual impairment caused by iodine deficiency.

Over 2 billion
people lack the essential vitamins
and nutrients needed to grow and
live healthy lives.

Over the past seven years, GAIN and UNICEF, along with the Micronutrient Initiative, the Iodine Global Network, governments and salt companies around the world, have worked together to expand better iodine nutrition for hundreds of millions of people who were previously unprotected. We are close to finishing the job of eliminating iodine deficiency at a global scale. We have also made great progress with adding nutrients to other foods and must now extend the reach and benefits of fortification, using foods such as flour, edible oils, rice and even condiments.

WHAT PROVIDES THE BASIS FOR THIS SNAPSHOT REPORT?

Over the past decade, GAIN has delivered an ambitious program to improve nutritional status for some of the poorest consumers in the world by fortifying everyday staple foods and condiments such as flour, salt and oil with vitamins and minerals that help prevent common diseases and contribute to normal, healthy development. With funding from the Bill & Melinda Gates Foundation and donors such as USAID and the Netherlands, today our programmes reach almost a billion people in 40 countries, mainly in Africa and Asia. These interventions, which follow World Health Organization's guidelines and have been long established in developed countries, have been delivered under the guidance of national governments in partnership with more than a 1,000 small, medium and large private companies, as well as our partners such as UNICEF, the World Food Program, Helen Keller International, the Food Fortification Initiative, the Iodine Global Network, the Micronutrient Initiative, PATH, and Project Healthy Children and many others.

¹ WHO. (2015) Micronutrient deficiency, iron deficiency, 2015. Available from: <http://www.who.int/nutrition/topics/ida/en/>. (Accessed: July 30 2015).

Together, this represents surely the biggest example of multi-stakeholder partnership at scale in the food and nutrition security arena, and perhaps offers a model for the partnership vision advocated under the Sustainable Development Goals (SDGs).

Let's be clear, food fortification alone will not end malnutrition. We need to address such critical issues as food prices, dietary practices, agricultural productivity, and water and sanitation. Interventions for exclusive breastfeeding and complementary foods are the foundation for improving child nutrition.

But food fortification can be a strong pillar of the new food security system: it is a proven intervention, low cost and is relatively easy to implement, because it uses existing food value chains and requires little change in consumption habits. It can target endemic diseases and contribute to improving education and productivity. It is capable of reaching rural areas and the burgeoning urban poor, and the emerging evidence shows that – given the right set of circumstances – it can improve the nutritional intake of the most vulnerable and poor women, infants and children.

This report sets out some of our successes and learnings from a decade-long investment, as well our partners' successes, and our aspirations for the sector as a whole. It aims to cement the case that food fortification is a vital part of the public health toolkit to achieving food and nutrition security. To make this case, we explore lessons learned on how to build public private partnerships and the enabling environment; improve monitoring and enforcement issues related to harmonising standards across borders; and lay out issues which may influence fortification programs in the future.

Food fortification programs only work through partnerships, globally and nationally. GAIN, together with the Government of Tanzania, the African Union, Bill & Melinda Gates Foundation, the Scaling Up Nutrition Movement, UNICEF, WFP, USAID and leading global agencies and experts, are working with national partners to map a future for the next generation of food fortification programs. This report is intended to contribute to that discussion, with the aim of elevating the role of fortification in food security, and within the SDGs.

By scaling up and improving fortification programs, we can reach more people. This will achieve greater impact among at-risk populations in low- and middle-income countries. We owe it to the world's children to invest in their healthy futures today. We invite you to join the discussion and hope you will become advocates to scale up food fortification to end hidden hunger.

Marc Van Ameringen
Executive Director, GAIN



Introduction: why fortify?

Malnutrition is one of the biggest development challenges facing the world. Eight hundred and five million people still go hungry every day.² Over 2 billion people lack the essential vitamins and nutrients needed to grow and live healthy lives, primarily due to diets consisting of starchy staples that provide calories but not nourishment.³ At the same time, about 1.4 billion people worldwide are overweight or obese.⁴ The double burden of malnutrition is prevalent with 3.5 billion people – or one in every two people on the planet – being malnourished in some form.

² Food and Agriculture Organization of the United Nations. (2014) The State of Food and Agriculture 2014: Innovation in Family Farming Rome: FAO.

³ Micronutrient Initiative. (2009) Investing in the Future: A United Call to Action on Vitamin and Mineral Deficiencies. Ottawa: Micronutrient Initiative.

⁴ WHO. (2015) Obesity and Overweight Factsheet No. 311. Available from: <http://www.who.int/mediacentre/factsheets/fs311/en/>. (Accessed: 20 August 2015).



Micronutrients	Function
Iron	<ul style="list-style-type: none"> Major role in delivering oxygen to tissues Contributes to the regulation of the immune function Iron Deficiency Anaemia (IDA) can cause extreme fatigue and depression IDA impacts cognitive development and productivity IDA can lead to maternal haemorrhage and is associated with 20% of all maternal deaths
Zinc	<ul style="list-style-type: none"> Zinc deficiency is characterised by impaired immunity leading to increased infections, dermatitis and diarrhoea
Iodine	<ul style="list-style-type: none"> Needed for the formation of thyroid hormone Iodine deficiency disorders cause goitre (enlargement of the thyroid gland in the neck), growth retardation and mental retardation or cretinism
Vitamin A	<ul style="list-style-type: none"> Needed for vision Vitamin A deficiency is the single most preventable cause of blindness Vitamin A deficiency increases the susceptibility to infection and impairs immune responses
Folic Acid	<ul style="list-style-type: none"> Folic acid is required for appropriate development of the brain and spinal cord of babies Pregnant women with a low folic acid status are at increased risk of having a baby with a neural tube defect Neural tube defects are a group of conditions in which the spinal cord does not close properly leading to learning disabilities, paralysis, and babies being born with little to no brain
Vitamin D	<ul style="list-style-type: none"> Required for adequate bone health Modulates the immune system and its response Vitamin D deficiency causes rickets in children

Geissler, C. and Power, H. (2011) Human Nutrition. Churchill Livingstone; 12 edition, London.

Micronutrient malnutrition traps communities and whole societies in a vicious cycle of poverty. Children are unable to learn and reach their full potential, adults are less productive, and household poverty is exacerbated. Often significant proportions of a population are affected by micronutrient deficiencies which go largely unnoticed. These deficiencies are referred to as “hidden hunger” because even mild to moderate deficiencies, undetectable by physical signs or symptoms, can lead to mental impairment, poor health, and low productivity.⁵

Although hidden hunger rarely shows visible signs, its consequences are long lasting and devastating – poor physical and mental health, increased child and maternal mortality, and reduced cognitive development. For example, the absence of sufficient folic acid in the first weeks of pregnancy increases the risk of neural tube defects that results in severe nervous system malformations. Deficiency of iodine is the world’s most prevalent cause of preventable brain damage. Night blindness is caused by vitamin A deficiency which affects millions of pregnant women and children.⁶ And iron deficiency leads to greater risk of death for anaemic women during childbirth and impairs physical and cognitive development in their babies.

Considerable investment is being made to improve nutrition outcomes around the world, but these efforts take time. Nutrient rich foods are not as accessible as they need to be and many people cannot afford a diverse healthy diet that includes fresh fruits, vegetables, and animal source foods. Improving nutrition involves not only ensuring that diverse micronutrient rich foods are available, but changing consumer awareness and behaviour so that people understand the benefits a diverse diet provides and know how to achieve a nutrient-rich diet. This requires a shift in national food systems. This is not an easy change to make and will require significant investment now and in decades to come.

The good news is that, for large segments of the population, there are proven solutions which can be delivered through existing technology and within the limitations of the current food system.

Countries have been fortifying foods to combat micronutrient deficiencies for over 90 years.

WHAT IS FOOD FORTIFICATION?

Food fortification involves adding small amounts of micronutrients to foods, with minimal effects on taste and cooking properties. Staple foods and condiments, such as salt and flour, are typically used in fortification because they are consumed by a large majority of the population, including vulnerable groups most at-risk of inadequate dietary intake of micronutrients. Food fortification uses simple technology while food is being processed. At the processing plant, a micronutrient mixture called “premix” is blended into the product being fortified. At a flour mill, for example – a mix of iron, folic acid, and other micronutrients is added to the flour before it’s packaged and distributed. Vitamins A and D, on the other hand, are fat-soluble so they can easily be mixed in with edible oils.

FOOD FORTIFICATION: A GLOBAL INTERVENTION

Fortification is a proven solution. Countries in North America and Europe have been adding micronutrients to foods since the 1920s. This has led to the virtual eradication of goitre, rickets, beriberi, and pellagra in these regions.⁷ We are now seeing food fortification efforts achieving real scale in low- and middle-income countries. Over 140 countries are implementing salt iodisation programs, 83 countries have mandated cereal grain fortification and dozens more are fortifying edible oils, sauces, and condiments.⁸ Many of these programs are in low- and middle-income countries, representing a tremendous success in scaling up a proven, highly cost effective, and sustainable nutrition intervention.

Food fortification can help hundreds of millions of people have access to essential nutrients early on in their lives so they can reach their full potential. For example, by improving a child’s nutrition it will allow them to do better in school, grow into more productive adults, contributing more to society and improving economic benefit.

COSTA RICA REDUCES ANAEMIA THROUGH FORTIFICATION

Costa Rica has a long history of food fortification, starting in 1958 with adding iron to their wheat flour. The country fortifies a range of other foods, including iodising salt since 1972, and later, expanding to include milk, maize flour, rice, and sugar. An evaluation of the impact of iron fortification revealed a significant decrease nationally in the prevalence of anaemia in children and women. Anaemia was reduced from 19 to 4 percent in children and from 18 to 10 percent in women. In children, iron deficiency was also reduced from 27 to 7 percent.⁹ As one of the earliest low- and middle-income countries to implement fortification efforts, the results Costa Rica has achieved suggest significant potential for impact when programs are designed, implemented, and monitored adequately.

⁵ von Grebmer, K., A., Saltzman, E., Birol, D., Wiesmann, N., Prasai, S., Yin, Y., Yohannes, P., Menon, J., Thompson, A. and Sonntag (2014) Global Hunger Index: The Challenge of Hidden Hunger. Bonn, Washington, D.C., and Dublin: Welthungerhilfe, International Food Policy Research Institute, and Concern Worldwide.

⁶ WHO. (2009) Global prevalence of vitamin A deficiency in populations at risk 1995–2005. WHO Global Database on Vitamin A Deficiency. Geneva, World Health Organization. Available from: http://apps.who.int/iris/bitstream/10665/44110/1/9789241598019_eng.pdf. Accessed 27 August 2015.

⁷ Berner, L.A., Clydesdale F.M. and Douglass J.S. (2001) Fortification contributed greatly to vitamin and mineral intakes in the United States, 1989–1991. *J Nutr.* 131. p. 2177–83.

Bishai, D. and Ritu N. (2002) The History of Food Fortification in the United States: Its Relevance for Current Fortification Efforts in Developing Countries, *Economic Development and Cultural Change*. The University of Chicago Press. 51(1/October), p. 37–53.

⁸ Food Fortification Initiative. *Global Progress*, 2015. Available from: http://www.ffinetwork.org/global_progress/. (Accessed: July 30 2015).

⁹ Martorell, R., Ascencio, M. Tacsan, L., Alfaro, T., Young, M.F., Addo, O.Y., Dary, O., and Flores-Ayala, R. (2014) Effectiveness evaluation of the food fortification program of Costa Rica: impact on anaemia prevalence and hemoglobin concentrations in women and children. *Am J Clin Nutr.* 2015 Jan; 101(1):210–7.

FORTIFICATION IS A HIGHLY COST EFFECTIVE INVESTMENT

In addition to being a simple process that uses existing technology and processes, fortification is extremely good value with its benefits far outweighing costs. A 2008 meeting of some of the world's most notable economists, known as the Copenhagen Consensus, declared adding micronutrients to staple foods as one of the most cost-effective ways to help address the global malnutrition crisis.¹⁰ Additionally, fortification provides significant returns for a low cost. Iodising salt can cost as little as US\$0.05 to US\$0.10 cents per person per year, but provides a return on investment of more than US\$26 in increased productivity and health care savings.¹¹ In Chile, researchers compared the annual cost of the rehabilitation and treatment for children with spina bifida with the cost of adding folic acid to flour and found that for every US\$1 invested in folic acid fortification of flour, US\$12 was saved in medical treatment and care.¹² Similarly, in Jordan, iron fortification costs approximately US\$0.04 per capita annually while treating anaemia costs \$7.00 per capita each year.¹³

The double burden of malnutrition is prevalent with 3.5 billion people – or one in every two people on the planet – being malnourished in some form.

IMPROVING NUTRIENT INTAKE THROUGHOUT THE ENTIRE POPULATION

The idea behind fortification isn't to "cure" micronutrient deficiencies. Rather it's to prevent deficiencies and move people and whole populations towards consuming recommended amounts of fortified foods. Using data on food and nutrient intake, fortification programs estimate the level of micronutrient addition required to achieve a given nutritional goal, ensuring that the levels are set to be both effective and safe for everyone who potentially consumes these foods.

¹⁰ Horton, S., Mannar, V. and Wesley, A. (2008) Best Practice Paper: New Advice from CC08. Micronutrient Fortification (Iron and Salt Iodization). Copenhagen Consensus Center. Available from: http://www.copenhagenconsensus.com/sites/default/files/bpp_fortification.pdf (Accessed: 20 August 2015)

¹¹ Ibid.

¹² Llanos, A., Hertrampf, E., Cortes, F., Pardo, A., Grosse, S.D., and Uauy, R. (2007). Cost-effectiveness of a folic acid fortification program in Chile. *Health Policy*, Oct;83(2-3):295-303.

¹³ WHO. (2013) Global nutrition policy review: what does it take to scale up nutrition action? Available from: http://apps.who.int/iris/bitstream/10665/84408/1/9789241505529_eng.pdf. (Accessed: 20 August 2015).



The power of fortification

Since 2008, GAIN has been partnering with UNICEF to improve iodine nutrition through Universal Salt Iodisation in 14 high-burden countries. We are now in an unprecedented position on the verge of eliminating iodine deficiency at a population level, in a sustainable way. According to the WHO, eliminating iodine deficiency would rank alongside some of the world's biggest public health achievements, like eradicating smallpox.¹⁴ However, achieving this goal around the world, especially among the most deprived countries and populations, requires further work. Iodine deficiency remains the leading cause of preventable mental disabilities globally, potentially causing a 10 point reduction in IQ.¹⁵ Goitre has been largely addressed globally but still persists in some countries in Africa and Asia. The tremendous success of salt iodisation is indicative of the significant potential food fortification holds for addressing micronutrient deficiencies but the world must continue to strengthen and expand its efforts to tackle these issues.



UNIVERSAL SALT IODISATION

Iodised salt is a strong example of the power of fortification. Even though Switzerland and the United States began adding iodine to salt as early as the 1920s, by 1990 less than one fifth of households globally had access to iodised salt. As a result, iodine deficiency disorders were a common public health problem in many parts of the world, affecting more than 2 billion people. Widespread international support for the elimination of iodine deficiency dates from the World Summit for Children in 1990, a landmark gathering of heads of state and government, driven by UNICEF. The Summit adopted a plan of action in which world leaders agreed to a goal of eliminating iodine deficiency. This commitment led to the development of the Network for Sustained Elimination of Iodine Deficiency, a global partnership that included United Nations and donor agencies, scientists, non-governmental organisations, and the salt industry.

In 1994, World Health Organization (WHO) and UNICEF recommended universal salt iodisation as a safe, cost-effective and sustainable strategy to ensure sufficient intake of iodine by all individuals, and called on all countries to ensure access to iodised salt, regardless of whether they had a documented iodine deficiency disorder. In 2002, the pledge for progress towards the elimination of sustained iodine deficiency was renewed at the United Nations General Assembly Special Session on Children.

Based on these international commitments, global efforts started to increase access to iodised salt. After a slow start, salt iodisation programs gained strength in the mid-1990s and the proportion of people consuming iodised salt increased from less than 20 percent in the early 1990s to about 70 percent in 2000. With increased attention towards ensuring that salt contains adequate levels of iodine, 75 percent of the global population now has access to adequately iodised salt. In line with the dramatic increase in access to adequately iodised salt, the number of countries with iodine deficiency has decreased from more than 100 to only 25. Since putting salt iodisation on the global development agenda in 1990, UNICEF has supported more than 100 countries in the elimination of iodine deficiency disorders.

(submitted by UNICEF)

We are now in an unprecedented position on the verge of eliminating iodine deficiency at a population level, in a sustainable way.

¹⁴ Schultink, W. and Ameringen, M.V. Can salt help us win the battle against malnutrition? London: The Guardian. Available from: <http://www.theguardian.com/global-development-professionals-network/gain-partner-zone/2015/apr/30/can-salt-help-us-win-the-battle-against-malnutrition>. (Accessed: 27 August 2015).

¹⁵ Qian, M., Wang, D., Watkins, W.E., et al. (2005) The effects of iodine on intelligence in children: a meta-analysis of studies conducted in China. *Asia Pac J Clin Nutr.* 14, p. 32-42.

¹⁶ Ethiopian Public Health Institute. (2009/10) Nutrition Baseline Survey Report for the National Nutrition Program of Ethiopia. Available from: <http://www.ephi.gov.et/images/nutrition/nutrition%20baseline%20survey%20report.pdf>. (Accessed: 20 August 2015).

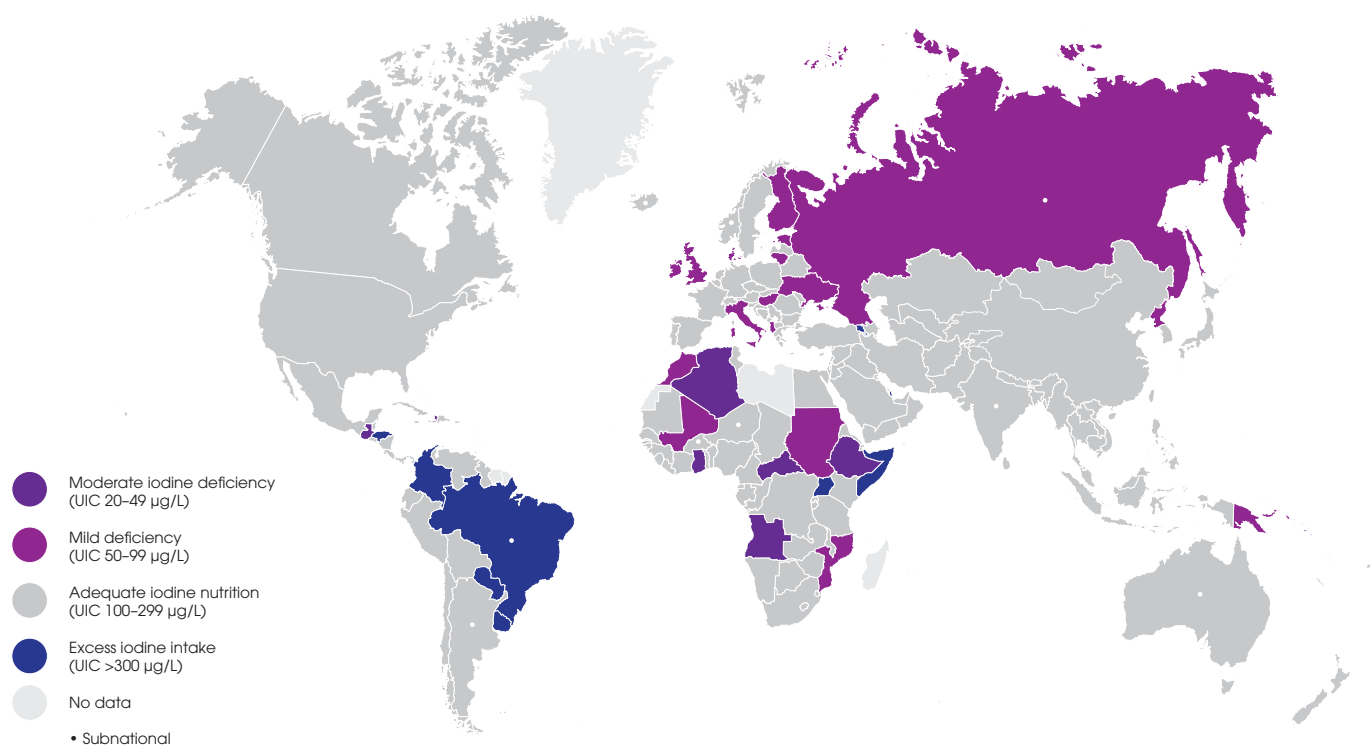


REDUCING IODINE DEFICIENCY IN ETHIOPIA

As a result of the political tensions and border closures from the Eritrean-Ethiopian War, household coverage of iodised salt plummeted from 80 percent to as low as 5 percent in 2008.¹⁶ In 2005, the Ethiopian government estimated that over 83 percent of school children had mild to severe iodine deficiency, with 40 percent of children and 36 percent of mothers having goitre.

In 2008, a partnership between the Ethiopian government, GAIN, UNICEF, Micronutrient Initiative, and the country's salt producers, began working to increase the availability and access to adequately iodised salt. The combination of advocacy and technical support from development partners with a motivated Ethiopian Prime Minister and other high level officials, resulted in the passing of new legislation on the mandatory iodisation of salt in March 2011. However, at that time, Ethiopia's salt iodisation capacity was only able to meet 15 percent of the national requirement. The development partners worked with government and industry to develop a strategy to scale up iodisation. Training was provided to salt producers on iodisation processes, machine maintenance, and Quality Assurance and Quality Control. A revolving fund and distribution system for potassium iodate was established. Salt iodisation across the country started to rapidly increase and as of 2014, 95 percent of households had access to salt with some iodine. However, approximately 43 percent of Ethiopia's salt is adequately iodised (ie, to the level specified in the standard) currently, indicating that further progress is still needed to improve the quality of iodised salt.

GLOBAL STATUS OF FORTIFICATION BY VEHICLE NATIONAL IODINE STATUS



Universal salt iodisation (USI) programs in over 140 countries have improved global iodine nutrition. Through continued scale-up of USI and targeted interventions, there is an opportunity to virtually eliminate iodine deficiency disorders. Iodine Global Network (2014). Status by Region, 2014. Available from: <http://ign.org/p142001046.html> (Accessed 25 August 2015).

Iron and folic acid are two critical micronutrients that can be added to staple foods, particularly wheat flour, maize flour, and rice, to reduce anaemia, birth defects and other adverse outcomes. Through tremendous efforts in recent decades, 82 countries now have legislation in place that requires processors to add critical nutrients to wheat flour, maize products, or rice.¹⁷ As a result, if this legislation is followed, iron, folic acid, and other critical micronutrients could be included in 30 percent of the world's industrially-milled wheat flour, 48 percent of industrially-milled maize flour, and 1 percent of industrially-milled rice.¹⁸

¹⁷ Food Fortification Initiative (2015) Global Progress, 2015. Available from: http://www.ffinetwork.org/global_progress/. (Accessed July 30 2015).

¹⁸ Ibid.

¹⁹ For more information, please visit: http://www.path.org/projects/ultra_rice.php

Fortifying rice could potentially reach billions of people in the Asia-Pacific region, Africa, and Latin America

FOLIC ACID FORTIFICATION

South Africa's folic acid fortification reduced neural tube defect births by **30.5%** between **2003** and **2005** (Sayed et al, 2008).

Oman's folic acid fortification reduced prevalence of spina bifida from **3 per 1,000** in **1996** to **0.3 per 1,000** births in 2006 (Alasfoor et al, 2010).

Researchers have estimated that **folic acid fortification** programs **prevented 25% of spina bifida globally** in 2012.

(Youngblood et al, 2013).

OVERCOMING THE CHALLENGES OF RICE FORTIFICATION

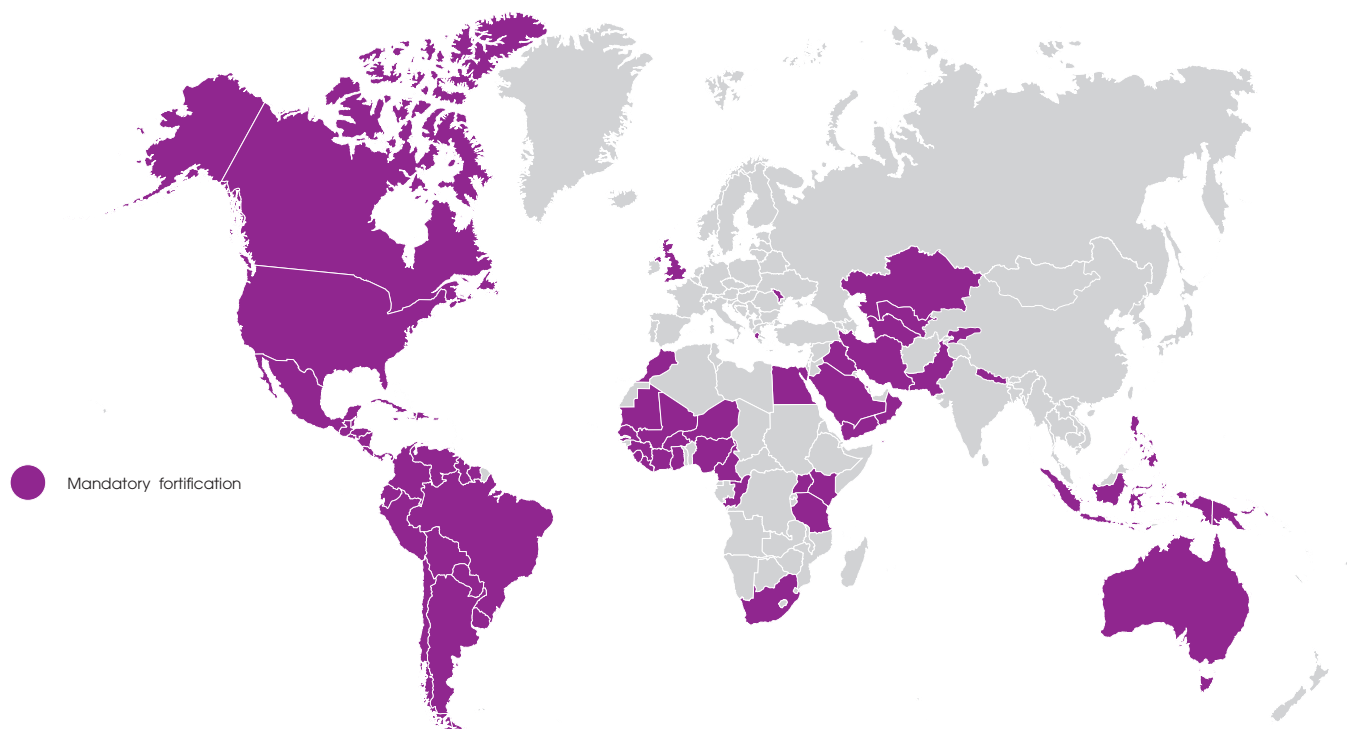
Rice is the staple food for more than half of the world's population, including many of those living in poverty. Especially in Asia, many people rely on rice for most of their daily calories, but rice does not provide them with all the vitamins and minerals needed to live healthy, productive lives. Fortifying rice with iron, zinc, vitamin A, and B vitamins could greatly improve human health, potentially reaching billions of people in the Asia-Pacific region, Africa, and Latin America. However, fortifying rice is more challenging than other staple foods, in part because rice is usually soaked and rinsed prior to cooking, risking considerable loss of nutrients.

To address these issues, NGOs and private companies have developed technologies for adding micronutrients to rice flour to create fortified kernels. These kernels are made to resemble milled rice and are blended in very small proportions with milled rice grains. When cooked, fortified rice has the same taste, colour, and texture as non-fortified rice. PATH, a leading global health non-profit organisation, pioneered this technology in the late 1990s.

In 2010, PATH partnered with GAIN to explore ways to scale up rice fortification through commercial channels. With its high levels of rice consumption, sophisticated rice industry, and strong retail channels, Brazil provided the perfect testing ground for developing such a model. Despite the country's significant economic growth and declining poverty rates, micronutrient deficiencies remain a serious problem, especially among women and children. Working with local rice milling companies, a market-based approach was used to enable the fortified rice supply chain in the country. By April 2015, over 2.7 million consumers in Brazil had benefitted from fortified rice through a combination of market channels and school feeding programs.¹⁹

(submitted by PATH)

GLOBAL STATUS OF FORTIFICATION BY VEHICLE GRAIN FORTIFICATION



Fortifying flour with critical micronutrients such as iron and folic acid is now mandatory in 82 countries and 1 province*. It is estimated that, as a result of both mandatory and voluntary efforts, 31% of the World's industrially milled flour is now fortified with at least some iron or folic acid. *Punjab province, Pakistan. Food Fortification Initiative (2015). Global Progress. Available from: http://www.ffinetwork.org/global_progress/index.php. (Accessed 24 August 2015).

By increasing vitamin A in children's diets, countries around the world should prevent about a third of all under-five deaths.²⁰ As a result of advocacy efforts, 20 countries now have legislation in place mandating vitamin A fortification in vegetable oil. While some regions, such as the Economic Community of West African States (ECOWAS), have agreed to enact mandatory legislation for oil fortification, there is much more to do to ensure edible oils are fortified with vitamin A, where relevant. For example, imports from Indonesia and Malaysia represent a significant opportunity for vitamin A fortification given their status as two of the largest producers and exporters of vegetable oil. Large-scale vitamin A fortification in these two countries could potentially reach millions of people globally, given the extent of their exported oil.²¹

²⁰ Golden Rice Humanitarian Board. Vitamin A Deficiency-Related Disorders (VADD). Available from: http://www.goldenrice.org/Content3-Why/why1_vad.php (Accessed: July 30 2015).

²¹ Lailou, A., Panagides, D., Garrett, G.S. and Moench-Pfanner, R. (2013) Vitamin A-fortified vegetable oil exported from Malaysia and Indonesia can significantly contribute to vitamin A intake worldwide. *Food Nutr Bull.* 34. (June/2 Suppl), p. S72-80.

²² Sandjaja, Jus'at, I., Jahari, A.B., Ifrad, Htet, M.K., Tilden, R.L., Soekarjo, D., Utomo, B., Moench-Pfanner, R., Soekirman, and Korenromp, E.L. (2015) Vitamin A-fortified cooking oil reduces vitamin A deficiency in infants, young children and women: results from a program evaluation in Indonesia. *Public Health Nutrition.* Jan 16:1-12.

²³ Soekirman, Soekarjo D, Martianto D, Lailou, A. and Moench-Pfanner R. (2012). Fortification of Indonesian unbranded vegetable oil: public-private initiative, from pilot to large scale. *Food and nutrition bulletin* 33 (4 Suppl): S301-9.

OIL FORTIFICATION HAS SIGNIFICANT POTENTIAL TO IMPROVE VITAMIN A INTAKE IN INDONESIA

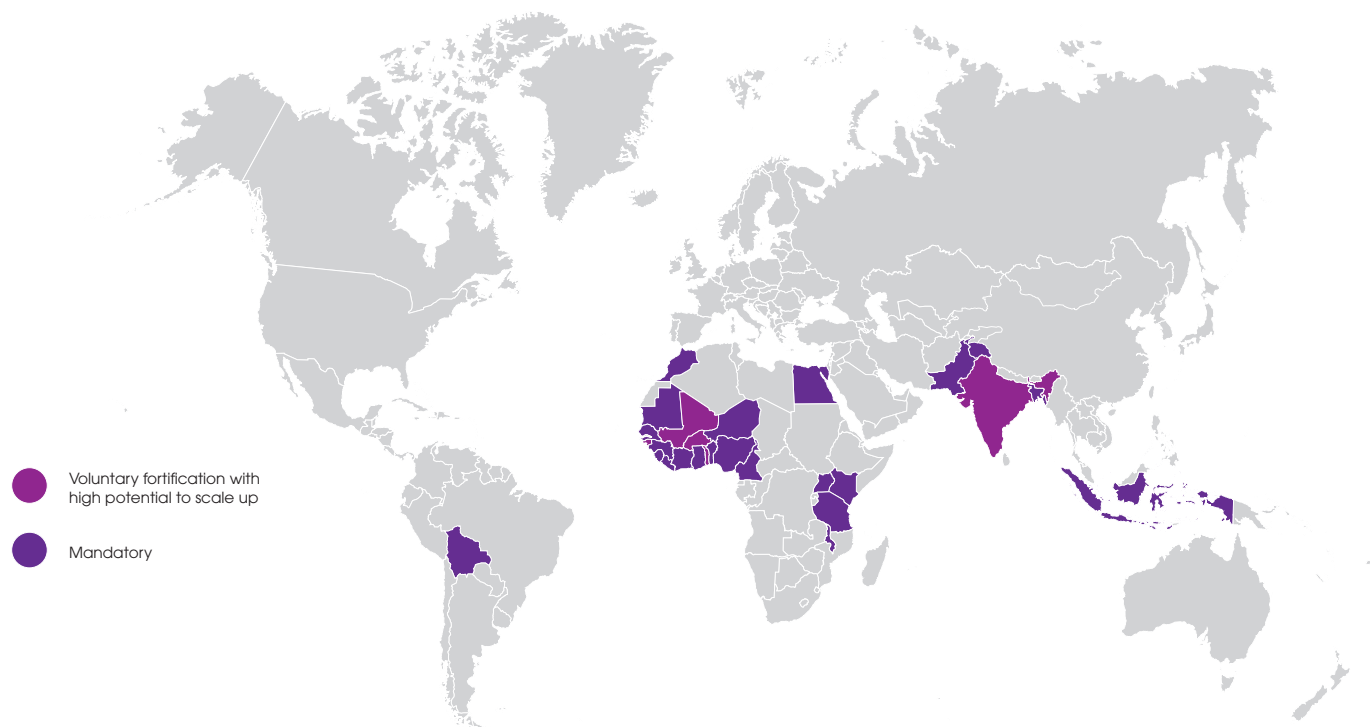
In Indonesia, vitamin A deficiency affects nearly half of pregnant women and preschool age children. An effectiveness study by the National Institute for Health Research and Development (NIHRD), Indonesian Ministry of Health demonstrated significant potential for increasing vitamin A uptake through fortified cooking oil, spurring the formation of a coalition of government officials, the oil industry association, leading nutritionists, and non-governmental organisations to pursue large scale fortification in the country with a grant from GAIN in 2010.

From 2011 to 2012, a study was conducted in two districts in West Java to assess the effects of large-scale fortification on the vitamin A status of women and children. The results showed that fortified oil helped bring vitamin A intake closer to recommended nutrient intakes, contributing on average 26 percent of daily need for children aged 12 to 23 months, 38 to 40 percent among older children, and 29 to 35 percent for women. The vitamin A status of all beneficiaries improved from 2011 to 2012, as did the vitamin A content of breast milk of lactating mothers. Deficiency dropped significantly during this time, falling from 6.5 to 18 percent to 0.6 to 6 percent.²²

Based on these results, Indonesia's Ministry of Industry mandated oil fortification with vitamin A in 2014, with implementation planned to start in 2016. However, there are still challenges ahead to ensure compliance and meet packaging requirements. The country's leading role as a cooking oil supplier globally provides significant opportunity for their producers to expand their market and become leaders in exporting fortified oil, potentially reducing vitamin A deficiencies in many countries.²³



GLOBAL STATUS OF FORTIFICATION BY VEHICLE OIL FORTIFICATION



Approximately 20 countries require fortification of edible oils. Imports from Malaysia and Indonesia represent major opportunity. Isabelle, M., Chan, P., Wijaya, S.Y. (2011). Report on Regulatory Status of Micronutrient Fortification in Southeast Asia. International Life Sciences Institute. Available at http://www.ilsa.org/SEA_Region/Publications/ILSI%20SEA%20Region%20Report%20-%20Micronutrient%20Fortification%20Regulations.pdf. Accessed 25 August 2015.; Sablah M., Grant F., Fielder J. (2013). Food Fortification in Africa: Progress to Date and Priorities Moving Forward. Sight and Life, Vol. 27 (3), p. 18-24. Available from: http://www.sightandlife.org/fileadmin/data/Magazine/2013/27_3_2013/food_fortification_in_africa.pdf. (Accessed 27 August 2015).

MEASURING THE EFFECTIVENESS OF FORTIFICATION PROGRAMS

Although the efficacy of food fortification is well proven, evidence of the effectiveness of fortification programs has been difficult to demonstrate. Many evaluations are done before implementation issues have been resolved, and it's difficult to attribute changes in status to fortification in populations where foods are available and purchased in the market.

GAIN and partners developed a Fortification Assessment Coverage Toolkit (FACT) that provides an alternative method to assess the effective coverage and estimate the potential impact of fortification programs. It was developed to help stakeholders achieve greater program understanding by rapidly assessing who consumes fortified foods and how much. The tool also helps identify program barriers, allowing for the development of evidence-based improvement strategies. The tool can be used in a nationally representative survey, or focus on specific groups at risk of low micronutrient intake, such as specific geographical or socio-economic groups. While evaluations are still needed to assess impact on micronutrient status and functional outcomes, this tool allows program implementers to estimate the contribution of fortified foods to the diet and the extent to which these benefits are reaching diverse segments of the population.

The Senegalese government has been fortifying wheat flour with iron, folic acid and vegetable oil with vitamin A since 2009 to address key micronutrient deficiencies in the population. To assess the contribution of this program, the Cellule de Lutte contre la Malnutrition used GAIN's FACT tool to determine who in the country consumes fortified foods, how much, and the extent to which the foods were fortified according to the national standards. The survey found that 96 percent of the flour samples collected contained added iron and 97 percent of the oil samples contained vitamin A, demonstrating the significant progress that Senegal made in a relatively short period of time. With 85 percent of women consuming flour with added iron and 73 percent using cooking oil fortified with vitamin A at least once a week, fortification was successfully increasing nutrient intake. Overall, the assessment suggested that fortification in Senegal reaches women of reproductive age living in rural areas and those classified as living in poverty, thus those most likely to suffer from deficiencies.

Key factors for impact through fortification

Although adding nutrients to food is a relatively simple process, there are technical, social, and economic challenges associated with implementing successful fortification programs in low- and middle-income countries. Several decades of fortification efforts in low- and middle-income countries have provided key lessons for scaling up to achieve maximum impact.



THE IMPORTANCE OF CROSS-SECTOR PARTNERSHIPS

To overcome these challenges and achieve impact, cross-sector partnerships that are able to successfully mobilise the international community, while simultaneously driving progress at a national level, are essential. A strong national fortification alliance can: provide strategic direction around a common agenda; set up shared measurement and learning systems; support the activities of the different partners; and facilitate communication.²⁴ Providing leadership while building ownership among the different partners involved, national alliances use each partner's strengths and assets while accomplishing shared goals.

Every day,
60 million women
are at risk of having a baby born
with spina bifida.

²⁴ Patscheke, S., Barmettler, A., Herman, L., Overdyke, S. and Pfitzer, M. (2014) Shaping Global Partnerships for a Post-2015 World. Stanford Social Innovation Review (Feb/12).

²⁵ For more information, please visit: <http://sophiesvoicefoundation.org/>

²⁶ Zimmerman, S., Baldwin, R., Codling, K., Hindle, P., Montgomery, S., Pachón, H. and Maberly, G. (2014) Mandatory policy: Most successful way to maximize fortification's effect on vitamin and mineral deficiency. Indian Journal of Community Health. 26 (Supp 02), p. 369-374

ENHANCING THE ENABLING ENVIRONMENT

Advocacy efforts to raise awareness of the effects of micronutrient deficiencies and the benefits of fortification programs are essential to generate the political will to make long-term commitments to effective fortification efforts. Successful fortification programs require both strong government leadership and a motivated private sector. The private sector is usually willing to engage in fortification as long as there is a level playing field. Consumer demand for nutritious products is limited in low- and middle-income countries where many food products aren't branded or packaged. Companies often want mandatory fortification to ensure that they all incur equitable costs. This needs adequate monitoring from all governments. By mandating fortification through legislation and providing adequate enforcement, governments can provide a common set of rules. Mandatory fortification has been shown to reach a higher proportion of the population and resulting health benefits are distributed more evenly.²⁶

Companies often want mandatory
fortification to ensure that they all
incur equitable costs.

ADVOCACY FOR PARTNERSHIPS TO PREVENT BIRTH DEFECTS AND DEVELOPMENTAL DISABILITIES

Every day, 60 million women are at risk of having a baby born with spina bifida. Actors Boris Kodjoe and his wife Nicole Ari Parker know first-hand about spina bifida and its effects because their daughter, Sophie, was born with the condition. A birth defect, spina bifida can affect a child's brain, their ability to walk, bladder control, and other bodily functions.

To promote its prevention and to further research on improving healthcare and the quality of life for children and adults living with spina bifida, they founded Sophie's Voice Foundation. Through the foundation, they advocate to improve the lives of children around the world by preventing neural tube birth defects. Research has shown that 400 mcg of folic acid taken daily prior to conception and in the first three months of pregnancy can reduce the risk of having a baby with spina bifida by as much as 70 percent. As part of their efforts to inform the American public, the foundation visits hospitals around the world and meets with government officials to increase the efforts to fortify the food system to prevent spina bifida.

In December 2011, the foundation helped establish the Center for Spina Bifida Research, Prevention, and Policy at Emory University in Atlanta. In partnership with the Children's Healthcare of Atlanta and Emory University School of Medicine, and the Rollins School of Public Health at Emory, the center provides national and international leadership in healthcare for individuals with spina bifida with the ultimate goal of eliminating folic acid-preventable spina bifida globally. Through their advocacy efforts, Kodjoe and Parker are pushing for US and International leadership and technical assistance in saving thousands of children around the world from dying or becoming disabled unnecessarily from birth defects and developmental disabilities.²⁵

(submitted by Sophie's Voice Foundation)

A GLOBAL NETWORK LINKING RESEARCH AND PROGRAMS TO CONTROL IODINE DEFICIENCY

In 2015, iodine deficiency is a leading cause of preventable mental impairment and lost IQ points in children worldwide. The result is poor school performance, reduced educability, and a negative impact on a country's social and economic development.

The Iodine Global Network (previously called ICCIDD) was founded in 1986 as a culmination of two decades of epidemiological and medical research which established a link between iodine deficiency and a spectrum of devastating health disorders.

Since the beginning, the IGN's mandate has focused on scientific leadership, global advocacy, alignment, and harmonization of all stakeholders engaged in iodine nutrition programs. In the late 1980s and early 1990s, the IGN and UNICEF embarked on a global campaign to document the magnitude of iodine deficiency in individual countries using innovative diagnostic tools like the Thyromobile, while helping salt producers and Governments design and catalyze salt iodization programs in over 150 countries.

Serving as a liaison between the scientific community and the global health community for iodine issues, the IGN maintains a database of iodine status for all countries (Global Iodine Scorecard), publishes a quarterly Newsletter on iodine programs, and summarizes scientific research on questions that are relevant to salt iodization programs.

But a major role of the IGN is in networking: as a global organization with reach through its structure of regional and national coordinators, it brings together like-minded organizations, agencies, and funders in a worldwide partnership against IDD. The focus on close collaboration and making the most of partner complementarities is particularly important as we move forward, not just to harmonize the iodine efforts but also to align them with the broader nutrition agenda such as SUN (Scaling Up Nutrition), as well as with salt reduction strategies.²⁷

(submitted by the Iodine Global Network)

ADVOCATING FOR MANDATORY FORTIFICATION

The Food Fortification Initiative has been advocating for mandatory fortification since the early 2000s. In addition to its own advocacy efforts, they have created a communications toolkit to share the lessons they've learned along the way with consumer groups, national and international organisations, and governments around the world.

Any fortification advocacy efforts require building a consensus among multi-sector stakeholders and must extend to any influential groups that people trust. For example, in countries where flour or rice is being fortified with folic acid, doctors who treat children need to understand that fortification can prevent neural tube defects such as spina bifida. These doctors may then use their influence to support fortification efforts. In the Solomon Islands, the religious community is very influential. Therefore the Solomon Islands Food Fortification National Committee includes leaders of faith-based organisations in its advocacy efforts. In other countries, vendors who sell fortified foods may influence consumers, and these vendors are key advocacy audiences.

It is essential to extend advocacy beyond education. Creating awareness of the value of improved nutrition or the healthcare savings of preventing vitamin and mineral deficiencies is helpful, but leaders must also be persuaded to take action. For example, in the 1990s, despite scientific findings that folic acid would prevent most neural tube birth defects, the US government agency responsible for fortification standards took no action. Eventually the March of Dimes, a national advocacy group working to prevent birth defects, persuaded the authorities to include folic acid in the US. mandatory grain fortification program. As a result, folic acid is estimated to prevent 1,000 neural tube birth defects each year in the US.²⁸

(submitted by the Food Fortification Initiative)

CARGILL INDIA FORTIFIES EDIBLE OILS WITH VITAMIN A

Just as critical as generating the political will to support food fortification is getting industry buy-in. Some companies make the decision to fortify when it's voluntary out of a social responsibility, or with the hope of gaining a competitive advantage in the marketplace.

After the state of Gujarat, in India, mandated fortification for edible oils produced and sold in the state, in 2008, Cargill India decided to fortify all of their oils across the country rather than limiting their efforts to just one state. To remain competitive and emphasise the social benefits behind the program, the company did not pass the cost of fortification on to the consumer but instead focused its efforts on generating demand for fortified products. Despite the lack of government incentives and the low consumer demand for fortified products, Cargill worked to create awareness about meeting daily nutritional needs, strengthen distribution channels, and introduce financially sustainable models for fortification, paving the way for the private sector to take the lead in oil fortification in India. After a few years, retailers began to experience a 10-20 percent increase in sales of Cargill's fortified oils, demonstrating the potential for private sector initiative.²⁹

PRIVATE SECTOR TAKES THE LEAD ON FORTIFICATION EFFORTS IN BURUNDI

To address high rates of undernutrition, anaemia, and vitamin A deficiency in Burundi, the government took steps to implement a national food fortification program with support from Project Healthy Children. In 2011, Burundi put fortification on the national agenda and adopted the East African Community's fortification standards. A National Fortification Alliance was formed to build support among the various public and private sector stakeholders.

When political turmoil delayed the signing of the legislative decree that would make fortification mandatory, the private sector forged ahead anyway. Premix companies DSM Nutritional Products and BASF donated the initial vitamin A premix and testing equipment needed for Burundi's only cooking oil facility, Savoror, to begin fortifying cooking oil. The Burundi Bureau of Standards began to work closely with industry staff to establish internal monitoring systems to ensure compliance with the national cooking oil standards. Fortified oil can already be found in markets throughout the country and is also being provided to the capital's internally displaced people. Burundi's sugar industry has placed its first order for premix as well and plans to move forward with their fortification efforts. More work is needed to get fortification legislation passed and build an effective national monitoring system in the country, but the high level of commitment shown by the private sector in Burundi is promising for successful fortification efforts.³⁰

(submitted by Project Healthy Children)

²⁷ For more information, please visit: <http://www.ign.org>.

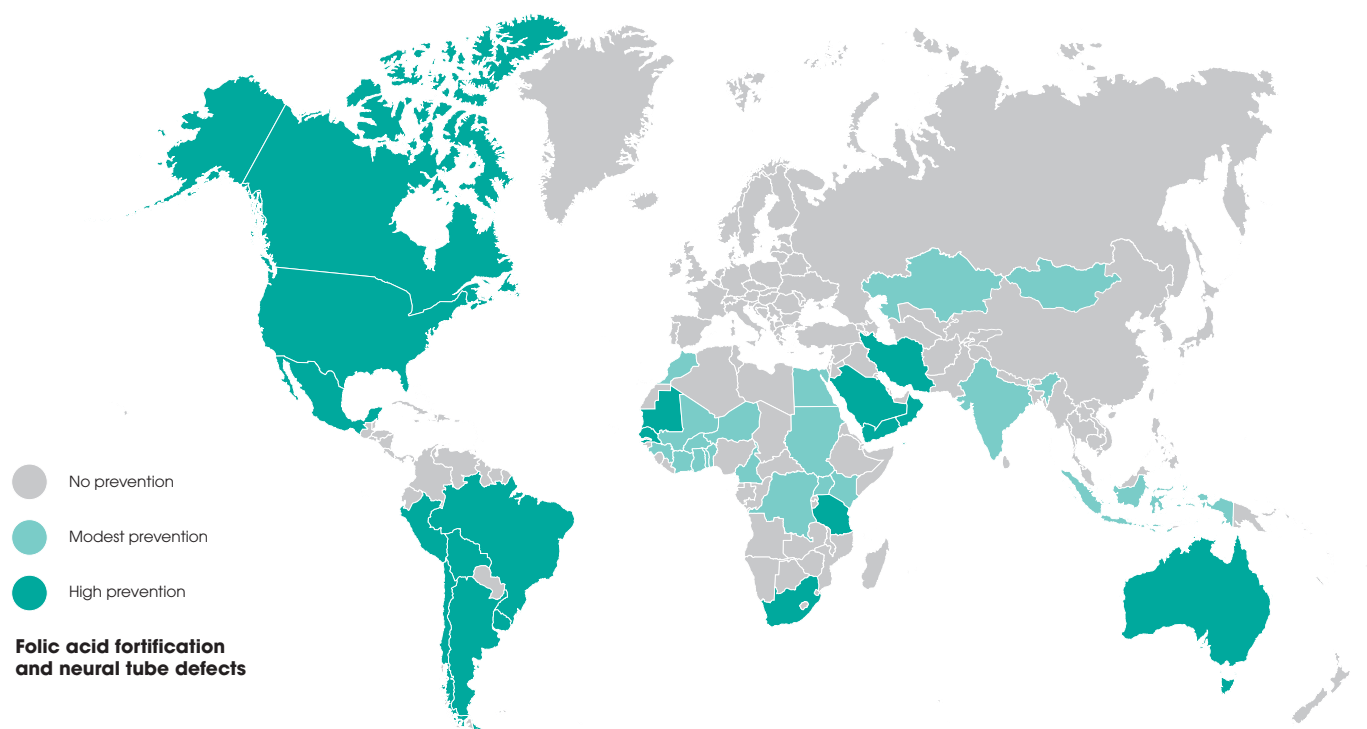
²⁸ Williams, J., Mai, C.T., Mulinare, J., Isenburg, J., Flood, T.J., Ethen, M., Frohner, B. and Kirby, R.S. (2015) Updated Estimates of Neural Tube Defects Prevented by Mandatory Folic Acid Fortification — United States, 1995–2011. *Morbidity and Mortality Weekly Report*, January 16 2015. 64. (01) p. 1-5. Available from: <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6401a2.htm>. (Accessed: July 30 2015). For more information, please download the Food Fortification Initiative's Fortification Communications Toolkit: <http://www.ffinetwork.org/plan/Communications.html>. For more information about advocacy and communications for fortification, please visit <http://www.ffinetwork.org/plan/Communications.html>.

²⁹ Danaf, N, Spohrer, R. and Hagemann, S. Lessons from Business. Cargill India Private Limited: Leading by Example in Fortifying Edible Oil. For more information, please visit: <http://www.cargill.com/150/en/ENRICHED-COOKING-OILS-INDIA.jsp>.

³⁰ For more information, please visit: <http://projecthealthychildren.org/where-we-work/burundi/>.

Folic acid is estimated to prevent
1,000
neural tube birth defects
each year in the US.

GLOBAL STATUS OF FORTIFICATION BY VEHICLE IMPACT OF USI AND FORTIFICATION WITH FOLIC ACID AS STRATEGY FOR PREVENTION IS STRONG



Youngblood, M. E., Williamson, R., Bell, K. N., Johnson, Q., Kancherla, V. and Oakley, G. P. (2013) 2012 Update on global prevention of folic acid-preventable spina bifida and anencephaly, Birth Defects Research Part A: Clinical and Molecular Teratology. 97. p. 658–663.

SALT IODIZATION AND IDD

- Due to USI, iodine deficient countries decreased from 54 to 32 from 2003 to 2011.
- Household use of adequately iodized salt at 75% in 2012 in developing countries, up from 61% in 2002.
- GAIN’s USI programs with data (9 countries) have increased from 72% coverage (2009) to 80.3% (2014)

UNICEF. (2013) Improving Child Nutrition: The achievable imperative for global progress. UNICEF: New York, USA. Available at http://www.unicef.org/nutrition/files/Nutrition_Report_final_lo_res_8_April.pdf (Accessed 28 August 2015).

Household coverage (%adequate)	Countries reporting 2002	%	Countries reporting 2012	%
>90	21	23%	37	29%
70–90	17	19%	27	21%
50–69	17	19%	25	20%
20–49	22	24%	27	21%
<20	13	14%	12	9%
no data	66		29	
total with data	90		128	
total	156		157	

Timmer, A. (2012). Iodine nutrition and universal salt iodization: a landscape analysis in 2012. IDD Newsletter, November 2012. Available at: http://ign.org/newsletter/idd_nov12_iodine_nutrition_landscape_analysis.pdf. (Accessed 28 August 2015).

³¹ Garrett, G. S. and Luthringer, C. (2015). The Urgent Need to Improve Compliance of National Fortification Programmes. Global Nutrition Report News. (June/23). Available from: <http://globalnutritionreport.org/2015/06/23/the-urgent-need-to-improve-compliance-of-national-fortification-programmes/>

³² Ibid.

³³ Nyumuah, R.O., Hoang, T.C., Amoafu, E.F., Agble, R., Meyer, M., Wirth, J.P., Locatelli-Rossi, L. and Panagides, D. (2012) Implementing large-scale food fortification in Ghana: lessons learned. Food Nutr Bull. 33 (4 Suppl). p. S293-300.

Continuous attention and investment by governments in monitoring and enforcement is essential for long-term impact.

INVESTING IN MONITORING AND ENFORCEMENT

Mandatory legislation without effective regulatory monitoring is unlikely to be successful. External quality assurance and quality control results from GAIN-supported fortification programs in 25 countries show compliance rates (fortification according to national standards) that range from 18 to 97 percent, with an average of 45 to 50 percent. While this does not provide a comprehensive assessment, it does indicate a systemic problem with compliance. In addition, many of these non-compliant fortified foods are labelled as compliant, thus misleading consumers on vitamin and mineral content. Fortification programs will achieve limited health impact when foods are not adequately fortified.

While much of the expense associated with implementing fortification programs come in the form of up front capital investments (often provided by external donors), enforcement is a recurring cost that the government bears continually over the lifespan of a fortification program. Resource allocation for monitoring and enforcement tends to be under-budgeted, often due to competing demands for scarce resources or a lack of prioritisation of this critical component of fortification.³¹ In addition, even where capacity and resources exist, there can be political risk in enforcing compliance due to resistance from interested groups.³² Both industry and the government rely on effective quality control regulations and systems – including a good laboratory system and inspectorate – to ensure that fortified foods consistently meet national standards. Continuous attention and investment by governments in monitoring and enforcement is essential for long-term impact.

IMPROVED MONITORING IN GHANA USING PORTABLE TESTING DEVICES

Capacity to test fortified foods for micronutrient content is not always available in many low- and middle-income countries. Sending samples to a central facility or abroad can take several months, and delays can lead to non-compliant products being distributed to markets. For countries with significant imports, border control inspectors play an important role in enforcing compliance. Unfortified food coming into the country deters local food producers and threatens the effectiveness of the programs. With the technical advances of portable devices to measure vitamin content, inspectors are able to quickly obtain compliance results, which can facilitate monitoring.

In 2010, GAIN supported the introduction of a portable rapid test device, the iCheck Chroma®, a field-friendly, low-cost tool for officials to test for vitamin A at the port of entry. This allowed for quantitative results to be obtained almost instantly, facilitating quick decisions on compliance. It also improved the credibility of the Ghana Food and Drugs Board and customs officials by avoiding import delays. In the year after the portable testing device was introduced, data from the use of these devices show that the percentage of adequately fortified vegetable oil increased from 69 to 95 percent.³³

IMPROVING COMPLIANCE IN SOUTH AFRICA

South Africa enacted mandatory fortification of maize meal and bread flour in October 2003 and by 2008, more than 45 percent of the population were estimated to be consuming fortified wheat flour and 67 percent were consuming fortified maize meal. However, despite showing significant reductions in Neural Tube Defects, the reduction in vitamin and mineral deficiencies was limited.

A subsequent review found compliance to be low by all millers, suggesting weak regulatory monitoring and milling practices and suboptimal impact. Fortification standards needed updating: although the fortification levels were initially established according to WHO guidelines, the WHO later went on to both increase their recommended micronutrient levels as well as recommend using a different type of iron than the one used in South Africa's program. Also, because South Africa's mandatory fortification only applied to bread flour and not cake flour, the consumption of non-fortified cake flour may have had an impact on the effectiveness of the program as well.

In 2013, South Africa began to address these issues through special studies, with financial and technical support from GAIN, including for an industry study on recommendations to optimise processes to improve milling quality and streamline the program's monitoring system, as well as a sensory study. Premix trials using the revised WHO formulation are expected to be completed in October 2015. These results, along with the recommendations of the mill variability study, will inform the National Department of Health to finalise the amendment to the fortification regulation in order to update the micronutrient formulation, issue revised monitoring processes and, potentially, add cake flour to the fortification program.

HARMONISING FORTIFICATION STANDARDS ACROSS ECONOMIC ZONES

Using the same standards and regulations across borders can ease some of the challenges low- and middle-income countries face in implementing effective food fortification programs. It can encourage regional trade, expands the size of the market for fortified foods, and facilitate improved quality of fortified products.³⁴ By raising the profile of fortification, regional efforts can also help increase awareness on the consumer side and catalyse advocacy efforts for legislation. Ongoing efforts through the West African Economic and Monetary Union and Economic Community Of West African States (ECOWAS) have sparked a harmonisation process in West Africa that demonstrates the potential for approaching fortification regionally. Harmonisation initiatives are also currently in progress in East Africa and Central Asia.

IMPROVING RURAL HEALTH AND NUTRITION THROUGH SMALL-SCALE FORTIFICATION

Many food industries in low- and middle-income countries are made up of a vast network of small producers, which makes fortification more difficult. By providing technical support and addressing the unique challenges small and medium-sized businesses face in fortifying foods, fortification efforts can actually be beneficial for economic development in rural areas while providing people with the essential vitamins and minerals they need to thrive.

By 2018 it is estimated that maize flour fortified at village level will be available to 7 million people daily in Tanzania

A REGIONAL APPROACH TO FORTIFICATION IN WEST AFRICA

The countries of West Africa rank among the highest in the world in under-five mortality, at an average of approximately 142 per thousand live births.³⁵ More than 42 percent of preschool age children in West Africa are vitamin A deficient.³⁶ West Africa has the among the highest prevalence rates of anaemia among women of reproductive age worldwide.³⁷

After four years of advocacy efforts by nutrition partners, Helen Keller International facilitated negotiations with the Professional Association of Cooking Oil Industries, which adopted a resolution to fortify all cooking oil produced by their 15 member industries with vitamin A. In 2006, the countries of ECOWAS passed a resolution to begin mandatory fortification of vegetable oil and wheat flour in the region, providing strong political support to expand the existing national fortification initiatives to all countries in the region. The Tache d'Huile initiative was launched in 2007 to increase vitamin A intake, facilitate the marketing of fortified vegetable oil, and establish regional standards and regulations. Building on the regional initiative for fortified cooking oil, the Fortify West Africa initiative was launched later in 2007 to promote the fortification of wheat flour.

Ten of the 15 member states have passed mandatory legislation for fortification and all major industries in the region are now participating in fortification efforts. Current estimates indicate that the fortified foods are reaching 55 million people in the region, including 8 million children under five and 6 million pregnant or lactating women.³⁸ However, legislation still differs in each country, impairing trade and making enforcement difficult in the region. For countries that rely on cooking oil imports (especially Guinea, which has no large-scale manufacturer and imports all of its cooking oil), harmonised standards and regulations would allow for equitable access to fortified foods throughout the region and ensure that the foods meet quality standards whether they're produced locally or imported.³⁹

(submitted by Helen Keller International)

³⁴ Sablah, M., Grant, F., and Fiedler, J.L. (2013) Food Fortification in Africa: Progress to date and priorities moving forward. *Sight and Life*. 27(3) p. 18-24.

³⁵ UNICEF (2009). *The state of the world's children: maternal and newborn health*. New York, 2008.

³⁶ Aguayo, V.M. and Baker, S.K. (2005) Vitamin A deficiency and child survival in sub-Saharan Africa: a reappraisal of challenges and opportunities. *Food Nutr Bull*. 26, p. 348-55.

³⁷ WHO. (2014) *World Health Assembly Global Nutrition Targets 2025: Anaemia Policy Brief*. (Online) Available from: http://www.who.int/nutrition/topics/globaltargets_anaemia_policybrief.pdf. (Accessed: July 30 2015).

³⁸ Sablah, M., Klopp, J., Steinberg, D., Touaoro, Z., Laillou, A., and Baker, S. (2012) Thriving public-private partnership to fortify cooking oil in the West African Economic and Monetary Union (UEMOA) to control vitamin A deficiency. *Faire Tache d'Huile en Afrique de l'Ouest*. *Food and Nutrition Bulletin*. 33 (4/supplement).

³⁹ For more information about Helen Keller International please visit: <http://www.hki.org/>

⁴⁰ For more information, please visit: <http://sanku.com/>

⁴¹ For more information, please visit: <http://micronutrient.org/mi-in-the-world/africa/senegal-sahel/>

SMALL-SCALE FORTIFICATION IN TANZANIA

In some countries, those living in rural and remote areas do not have regular access to centrally processed foods. It is often specifically these groups who might benefit the most from food fortification as their intake of essential nutrients may be constrained by the availability and affordability of micronutrient rich foods. In these regions, it has been estimated that 50 to 90 percent of consumers depend on small to medium-scale milling to process staple foods.

Efforts to fortify in these small facilities have faced numerous challenges. Because operations are manual, they have difficulties ensuring accurate dosages of micronutrients. In addition, there are very limited distribution channels, and fortification places significant financial burden on these small millers. To address these challenges, Sanku Fortification designed a technology and business model for village-level mills to fortify effectively. Using this, in a pilot of 45 small scale mills in Tanzania, 160,000 people are reached daily with fortified maize flour. Sanku forecasts that by 2017 it will have 350 dosifiers installed, and by 2018 it is estimated that its fortified foods will be available to 7 million people daily in Tanzania. Through the implementation of a scalable, cost effective, and proven business model, Sanku's goal is to provide fortified foods to over 200 million people around the world by the year 2020.⁴⁰

(submitted by Sanku)

SUPPORTING SMALL-SCALE IODISATION FOR GREATER HEALTH IMPACT IN SENEGAL

Senegal is considered to be the most important salt producing country in West Africa, and their salt is sold throughout the region. In Senegal, like many low- and middle-income countries, much of the salt industry is made up of 10s of 1,000s of small harvesters and processes. The Micronutrient Initiative and its partners have supported these small scale salt harvesters for over 10 years, with activities such as helping them to organise into cooperatives while providing technical support for iodisation and revolving funds for the potassium iodate needed to adequately iodise salt as part of the organisation's efforts to reduce iodine deficiency disorders (IDD). This allows them to pool resources, build solid business models, and attract investment by financial institutions. Micronutrient Initiative Senegal also works with the Ministry of Trade to expand the regional market for salt in a way that supports economic development while increasing access to iodised salt for the most vulnerable. Successful iodisation in Senegal can help reduce IDD both within the country and throughout the region.⁴¹

(submitted by the Micronutrient Initiative)

SOURCING QUALITY AFFORDABLE PREMIX

One of the principal challenges industries face as they begin fortification efforts is sourcing high quality premix of vitamins and minerals. Prices and quality of premix can vary significantly, making it difficult for companies to assess the quality, ensure they're getting a good price, and finance the advance purchase of their premix. Because premix is typically imported, procurement can be risky and cost-prohibitive especially with high customs taxes and

fluctuating exchange rates. More than three months of lead time can be required to procure premix internationally, which is especially difficult for small and medium-sized producers who have a hard time anticipating their premix needs. Ensuring low-cost, quality premix which can be procured, stored and distributed locally, is essential to achieving sustainable and timely access to premix.

GAIN'S PREMIX FACILITY

The GAIN Premix Facility (GPF) was established in 2009 to provide certified quality premix at an affordable cost. It makes sourcing premix easier for businesses by delivering certified quality premix, competitive prices, financial assistance, and a simple process to ensure that a lack of premix does not prevent companies from fortifying their products.

To date, the GPF has a pool of 21 certified premix blenders and 38 certified micronutrient suppliers. Within six years of operations, the facility has sourced approximately \$51 million worth of premix and micronutrients to 43 countries, and the fortified food is estimated to be eaten by over 150 million people every year.⁴²

In Ghana, the GPF helped establish a distributor as salt producers have struggled to access a reliable source of potassium iodate – a barrier in past efforts to iodise salt effectively. The GPF developed a supply model which reliably delivers small pack sizes of affordable, good quality potassium iodate to any producer's doorstep within 24 hours. "It is a relevant and effective solution to some longstanding problems," says Andrew Quashie, Project Coordinator of the local distributor in Accra, Ghana.

TEMPORARY SUBSIDIES FOR PREMIX EASE LARGE INDUSTRIES INTO FORTIFICATION

Following Tanzania's introduction of mandatory food fortification in 2013, 13 large scale food manufacturers are fortifying wheat flour and vegetable oil. While a significant amount of maize meal is milled in villages (see page 21), wheat flour and vegetable oil is only processed in large mills, so these vehicles reach the majority of the Tanzanian population. In order to integrate fortification into the milling process, large industries needed to incorporate fortification into their operational plans and budgets. With the support of GAIN and the Department for International Development (DFID), HKI provided large industries with a sliding scale subsidy for vitamin and micronutrient premix for the first one and a half years of fortification. This support helped build ownership while ensuring sustainability. Under this scheme, the program subsidised 45 percent of the cost of premix for the first six months, decreasing to 20 percent after one year, and ending with no subsidy after one and a half years. This arrangement allowed industries to absorb premix costs over time to achieve 100 percent sufficiency without having a significant impact on their operating costs or increasing costs to the consumer.

(submitted by Helen Keller International)



Better tracking of production, quality, and movement of fortified foods helps to identify gaps and trigger corrective steps to improve programs.

USING DATA TO IMPROVE FORTIFICATION PROGRAMS

Better tracking of production, quality, and movement of fortified foods helps to identify gaps and trigger corrective steps to improve programs. Therefore accurate and up-to-date information and statistics are useful for programs to continuously adapt, address bottlenecks, and achieve impact.

⁴² For more information, please visit: <http://gpf.gainhealth.org/>

INNOVATIVE INFORMATION TECHNOLOGY TOOLS FOR TRACKING PROGRESS IN INDIA

Although India was one of the first countries in Asia to implement mandatory salt iodisation in the 1960s, they stopped mandating iodisation of salt in 2000, leading to dramatic decreases in the consumption of iodised salt. By 2005, only half of the households in the country were consuming iodised salt.

In 2005, the legislation was reinstated and the Indian government began a renewed effort towards reducing iodine deficiency, with an emphasis on reaching remote populations in rural areas that are less likely to consume iodised salt. Despite the return to mandatory legislation, ensuring quality across the supply chain proved difficult. India has over 13,000 producers and the delivery network is extremely complex, making monitoring challenging.

Working with national and international partners, GAIN and India's Salt Department developed an innovative management information system to track the iodine levels of salt being distributed across the country. This online platform allows for centralised data collection that can increase the department's efficiency and allow program managers to make changes to the program to facilitate better access to iodised salt among at-risk people. Industry regulators are now using these innovative tools to track iodisation in real time. These tools can be easily customised for any country and have significant potential to help governments effectively monitor quality of fortified foods.



Food fortification with vitamins and minerals: the way forward

Food fortification is a powerful tool in increasing micronutrient intake and has contributed to the virtual elimination of some life threatening diseases and conditions in developed countries. Fortification has also gained significant traction in low-and middle-income countries. Governments, industry, and civil society have now come together to implement salt iodisation programs in more than 140 countries worldwide;⁴³ 83 countries have mandated at least one kind of cereal grain fortification;⁴⁴ 20 countries have large fortification programs focusing on edible oils;⁴⁵ and nearly a dozen countries fortify condiments.



These figures represent tremendous success in scaling up a proven, highly cost effective and sustainable nutrition intervention. However, if we are going to achieve long-term impact, together we must make sure fortification programs remain relevant by gaining better understanding of the dietary gaps we seek to fill, including addressing changing consumption trends, and by filling critical gaps in programming and evidence in order to expand fortification as needed to new countries and food vehicles as well as improve and sustain existing fortification efforts.

URBANISATION, CHANGING FOOD SYSTEMS, AND VOLATILE FOOD PRICES

The changing global food and nutrition landscape means we must continuously adapt our efforts to prevent micronutrient deficiencies and ensure that these efforts are sustained. Global food prices are becoming increasingly volatile. Historical trends show that when food prices are high, people tend to consume more staples and less diversity of nutritious foods. To ensure that people get critical micronutrients fortification remains essential.

Africa and Asia are urbanising faster than any other region in the world. African cities will be home to over 450 million new residents by 2040, with half of the population projected to be living in urban areas.⁴⁶ At the same time, the food industry is undergoing rapid transformation in countries like India, Nigeria, Kenya, and others, moving from a largely informal fragmented marketplace to a much more commercial and consolidated system. Along with income growth and urbanisation, these changes in the food system are beginning to drive a dietary transition with processed, ready-to-eat, and animal-source foods becoming increasingly important components of people's diets. Especially for poor households, the increased diversity of foods could increase regular dietary intake of essential nutrients, but also tends towards high consumption of fat, salt, and sugar with associated risks. The results of the so-called nutrition transition, both continued nutritional deficiencies and the growing prevalence of overweight and obesity are already highly evident in many low- and middle-income countries often affecting poor and non-poor. As industry and infrastructure expand and facilitate greater access of the population to markets, it is critical that both issues be simultaneously addressed.

As the food sector in these countries begins to shift towards a more industrial environment with staple foods processed at scale, it appears that large-scale fortification remains relevant as a critical tool to close the micronutrient gap. By leveraging these rapidly developing supply and delivery channels, countries can take advantage of the consolidation taking place to improve and, if needed, expand large-scale fortification efforts.

NEW FORTIFICATION APPROACHES EMERGING

The processed food industry often uses salt, wheat flour, and edible oils as ingredients. If these foods are adequately fortified, their contribution to regular consumption of micronutrients can be significant. For example, in Indonesia one pack of instant noodles using fortified wheat flour would provide around 50 percent of the recommended iron intake for children four to six years of age and 10 percent for women of reproductive age.⁴⁷ Using iodised salt in instant noodles, soup stock, and soy sauce in the country could contribute nearly 20 percent of the recommended daily allowance for iodine for adults.⁴⁸ Similarly, fortification efforts are expanding to condiments and seasonings, including soy and fish sauces, curry powders, and bouillon cubes. With eating habits changing, fortifying items such as bouillon cubes could mean there is potential to reach a greater number of people in resource-poor settings. In Senegal, a random sample of bouillon cubes tested for iodine content would have delivered between 7 and 115 percent of daily iodine needs in urban areas and half of this amount in rural areas. This wide range of iodine levels in the salt used in bouillon calls attention to the need for improved monitoring and regulation.⁴⁹

⁴³ UNICEF. (2013) Expanded iodine data (internal report). New York: UNICEF.

⁴⁴ Food Fortification Initiative (2015). Global progress. Available from http://www.ffinetwork.org/global_progress/index.php. (Accessed: 20 July 2015).

⁴⁵ Sablah M., Grant F., Fielder J. (2013). Food Fortification in Africa: Progress to Date and Priorities Moving Forward. *Sight and Life*, Vol. 27 (3), p. 18-24. Available at http://www.sightandlife.org/fileadmin/data/Magazine/2013/27_3_2013/food_fortification_in_africa.pdf. (Accessed 27 August 2015.)

⁴⁶ Kariuki, R.M., Bakalian, A.E., Lall, S., White, R., Parby, JI, Huang, C.Y., Wheeler, S., Gracia, N. L., Dasgupta, B., Mukim, M. and Shi, T. (2013) Harnessing urbanization to end poverty and boost prosperity in Africa: an action agenda for transformation. Africa region sustainable development series. Washington DC: World Bank. Available from: <http://documents.worldbank.org/curated/en/2013/09/18417628/harnessing-urbanization-end-poverty-boost-prosperity-africa-action-agenda-transformation> (Accessed 20 August 2015).

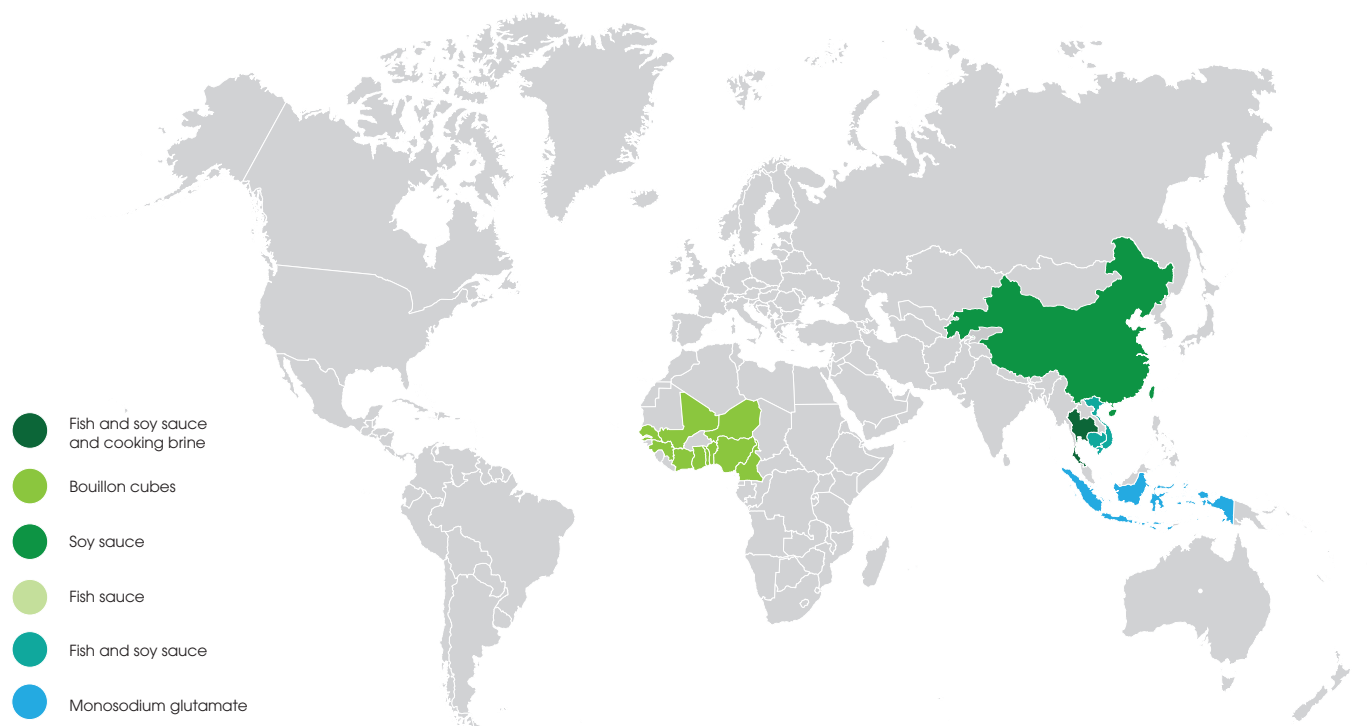
⁴⁷ Spohrer, R., Larson, M., Maurin, C., Lailou, A., Capanzana, M., and Garrett, G. S. (2013) The growing importance of staple foods and condiments used as ingredients in the food industry and implications for large-scale food fortification programs in Southeast Asia. *Food and Nutrition Bulletin*. 34 (2).

⁴⁸ Knowles J.M., Bimo, S.R., Cavenagh, B., Menon R. and Izwardy, D. (2014) Modeling Potential Additional Iodine Intake from the Use of Iodized Salt in the Production of Widely Consumed Processed Foods in Indonesia. Poster presented at the World Congress on Public Health Nutrition. Gran Canaria, Spain.

⁴⁹ Spohrer, R., Knowles, J., Jallier, V., Ndiaye, B., Guinot, P, Kupka, R. Estimation of Population Iodine Intake from Iodized Salt Consumed Through Bouillon Seasoning in Senegal. Accepted for publication in the *Annals of New York Academy of Sciences*, expected 2015.

In Indonesia one pack of instant noodles using fortified wheat flour would provide around 50 percent of the recommended iron intake for children four to six years of age

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Some condiments and seasonings (excluding salt) are being fortified in Africa and Asia, mainly on a voluntary basis. Murphy, P 1995. History of Technology Development for Vitamin A Fortification of Foods in Developing Countries. Rome, Italy. Food and Agriculture Organization. Solon, F. S, Sanchez-Fermin, L. E. and Wambangco, L. S. 2000. Strengths and weaknesses of the food fortification programme for the elimination of Vitamin A deficiency in the Philippines. Food and Nutrition bulletin, 21. 239-246. Report on Regulatory Status of Micronutrient Fortification in Southeast Asia. 2011. Washington, DC. International Life Sciences Institute – Southeast Asia. Preedy, V.R. Srirajakanthan, R and Patel, V. B. 2013. Handbook of Food Fortification and Health From Concepts to Public Health Applications, Volume 2. New York, NY. Humana Press. Mejia, L. and Bower, A.M. (2015). The global regulatory landscape regarding micronutrient fortification of condiments and seasonings. Annals of the New York Academy of Sciences. Issue: Fortification of Condiments and Seasonings with Vitamins and Minerals in Public Health. Early view online edition published 6 August 2015. Nestlé introduces Iron-fortified MAGGI bouillons to consumers in Togo and Benin. Available from: <http://www.nestle-cwa.com/en/nestle-introduces-iron-fortified-maggi-bouillons-to-consumers-in-togo-and-benin>. (Accessed 25 August 2015).



CRITICAL GAPS IN FORTIFICATION NEED ADDRESSED TO ACHIEVE POTENTIAL

After setting the goal of eliminating iodine deficiency worldwide at the United Nations World Summit for Children in 1990, countries around the world have made significant investments in implementing salt iodisation. The investment has been a clear success. Through Universal Salt Iodisation and other iodine interventions, there are now only 25 countries identified as having insufficient iodine intakes.⁵⁰ This is down from 54 in 2003. We are now in an unprecedented position: on the verge of being able to eliminate iodine deficiency at a population level, in a sustainable way.

Similarly, if all current industrially milled wheat flour were to be fortified with folic acid according to WHO guidelines in 18 countries in Africa and Asia, it is estimated that over 50,000 NTDs could be prevented annually through fortification in these countries.⁵¹ Through fortification with iron, if a country follows WHO guidelines and the right factors are in place, we can expect to achieve a 2.4 percent reduction per annum in anaemia.⁵²

These impressive potential outcomes related to iodine, folic acid and iron, can only be achieved when gaps in fortification programs are addressed in a sustainable way. Firstly, improved legislation, regulations and enforcement regimes are needed to ensure clear and consistent mechanisms are in place and to raise overall compliance of fortification programs which currently appear low.⁵³ Regulation on paper will not improve fortification compliance without real incentives as well as strong consequences which drive under-fortified foods out of markets. Effective regulatory monitoring and enforcement will notably require more robust national budget allocations. There is a need for more inspectors, more training, and improved laboratory

micronutrient testing capacities. Resources must be applied strategically and focus on essential proven elements of monitoring fortification programs.

Secondly, and related to the first gap in fortification programming is improved quality assurance and quality control (QA/QC) measures at industry level. In many countries, there is low capacity among industries to fortify with consistent quality (especially among small- and medium-size industries). Ongoing training according to good manufacturing practice and micronutrient fortification and testing is required.

Thirdly, further investment by donors is needed to expand, improve, measure and sustain fortification programs. One 2015 costing estimate for 25 developing countries puts the total donor investment needed to build, improve, and sustain programming for multiple food vehicles over the next 15 years between US\$120-US\$150M.⁵⁴

⁵⁰ Iodine Global Network. (2014) Global Iodine Nutrition Scorecard 2014. Available from: http://www.ign.org/cm_data/Scorecard_IGN_website_02_03_2015.pdf (Accessed: 20 August 2015).

⁵¹ Based on methods from Youngblood M.E., Williamson R., Bell, K.N., Johnson Q., Kancherla V., and Oakley G.P. (2013). "2012 Update on Global Prevention of Folic Acid-Preventable Spina Bifida and Anencephaly, Birth Defects Research (Part A): Clinical and Molecular Teratology, Vol. 97, p. 658-663."; adapted by using a) population consumption estimates from GAIN drawn from sub-grant progress reports, population consumption surveys, industry assessments, and FAO data; b) estimated potential coverage of industrially fortified wheat flour from GAIN and FFI; and c) NTD prevalence estimates from Zaganjor I, Sekkarie A, Tsang BL, Williams J, Razzaghi H, Mulinare J, Sniezek JE et al., "Describing the global burden of neural tube defects: A systematic literature review", poster presentation at the 2015 Teratology Society Annual meeting; Montreal, Canada.

⁵² Barkley, S., Wheeler, K.S., Pachon, H. (2015) Anemia prevalence may be reduced among countries that fortify flour. *Br J Nutr.* 23. (June) p. 1-9.

⁵³ Garrett, G. S. and Luthringer, C. (2015) The Urgent Need to Improve Compliance of National Fortification Programmes. *Global Nutrition Report News.* (June/23). Available from: <http://globalnutritionreport.org/2015/06/23/the-urgent-need-to-improve-compliance-of-national-fortification-programmes/> (Accessed: 20 August 2015).

⁵⁴ GAIN. (2015) Draft 2 of a cost model developed in the build up to the Global Summit on Food Fortification, September 2015.



Fourthly, there is a need to generate more evidence to guide fortification policy and program design. Critical gaps in data to inform nutrition priorities, including fortification interventions, remain.⁵⁵ For example, there is a lack of detail of foods consumed by various target groups, limiting our understanding of potential food vehicles and quantification of the dietary gap we must address for some nutrients.⁵⁶ There are tools available which need to be used more often in program design, monitoring and evaluation. The Fortification Rapid Assessment Tool (FRAT),⁵⁷ as well as the more recent Fortification Assessment Coverage Tool (FACT),⁵⁸ were designed to provide more comprehensive information on the consumption of fortified (and fortifiable) foods among many segments of the population. Additionally, indicators on the use of fortified foods, and sample collection to verify compliance, have been incorporated into national surveillance systems in a few countries (for example, Nicaragua⁵⁹), and modules from FRAT or FACT could be adapted and included in national monitoring systems.

Finally, each of the recommendations above needs to be underpinned by leadership and accountability in the public and private sectors. The challenges outlined in this report can be easily overcome with sustained leadership and commitment. Numerous governments in low- and middle-income countries have demonstrated impressive commitment to improved nutrition by establishing national fortification programs. It is of paramount importance that many of these countries revisit their fortification programs regularly assessing their design in the context of changing dietary patterns, and to ensure they are effective for achieving health impacts and are sustainable.

While food fortification cannot end malnutrition, it is a critical tool as part of national micronutrient deficiency prevention and control strategies. GAIN is excited about the future and the potential of fortification to help address micronutrient malnutrition. With greater donor and government investment to track population needs and enforce program standards, alongside increased private sector commitment, fortification efforts can be expanded and scaled up to substantially reduce vitamin and mineral deficiency disorders around the world and help whole societies achieve their full potential.

⁵⁵ International Food Policy Research Institute. (2014) Global Nutrition Report 2014: Actions and Accountability to Accelerate the World's Progress on Nutrition. Washington D.C. Available from: <http://cdm15738.contentdm.oclc.org/utills/getfile/collection/p15738coll2/id/128484/fileName/128695.pdf>. (Accessed: August 18 2015).

⁵⁶ Engle-Stone, R. and Brown, K.H. (2015). Comparison of a Household Consumption and Expenditures Survey with Nationally Representative Food Frequency Questionnaire and 24-hour Dietary Recall Data for Assessing Consumption of Fortifiable Foods by Women and Young Children in Cameroon. *Food Nutr Bull.* 2015 Jun;36(2). p. 211-30.

⁵⁷ Healthbridge. (2003) Fortification rapid assessment tool (FRAT). Available from: http://healthbridge.ca/FRATguidelines2003_Nov_20081PKE-1222008-1386.pdf. (Accessed: August 11 2015).

⁵⁸ Aaron, G.J. (2014) Assessing coverage of large-scale and targeted food fortification programs: development of a fortification assessment coverage tool (FACT). The Micronutrient Forum Global conference. Addis Ababa, Ethiopia, June 2014.

⁵⁹ INCAP (2004). Sistema integrado de vigilancia de intervenciones nutricionales (SIVIN). <http://www.incap.org.gt/sisvan/index.php/es/areas-tematicas/metodologias-de-apoyo/sistema-integrado-de-vigilancia-de-intervenciones-nutricionales-sivin>.



About GAIN



The Global Alliance for Improved Nutrition (GAIN) is an international organization launched at the UN in 2002 to tackle the human suffering caused by malnutrition. Today nearly 3.5 billion people worldwide are malnourished in some way. Close to 2 billion people survive on diets that lack necessary vitamins and nutrients, while about 1.4 billion people struggle with overweight and obesity. We know that sustainable, nutritious diets are crucial to ending the cycle of malnutrition and poverty. By building alliances that deliver impact at scale, we believe malnutrition can be eliminated within our lifetimes. Today our programs are on track to reach over a billion people with improved nutrition by 2016.



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