

Grain Fortification to Address the Sustainable Development Goals (SDGs)

Opportunity

The United Nations adopted 17 Sustainable Development Goals (SDGs) in September 2015 with 169 targets. Meeting these targets by 2030 as hoped will require multiple strategies. In many countries fortifying commonly consumed grain products would be a practical step toward meeting the SDGs.

In general, the SDGs targets include people, the planet, prosperity, peace, and partnership. Some of the overarching themes are to “free human race from tyranny of poverty” and “to heal and secure our planet.” There are also objectives of justice and inclusiveness through protecting human rights and promoting gender equality.

Reducing vitamin and mineral deficiencies is an important tool in achieving the Sustainable Development Goals. Fortification is a relatively inexpensive strategy, benefiting everyone who eats fortified rice or food made with fortified flour, plus it does not require the consumer to change any behavior.

Following are details showing how eight of the SDGs can be addressed with grain fortification, which most often includes adding iron, zinc, and the B vitamins folic acid, niacin, riboflavin, thiamin, vitamin B12 and vitamin B6 to wheat flour, maize flour, or rice. The partnership called for in SDG 17 is also a critical component of successful fortification programs.

SDG 1. No poverty

The capacity for physical work is hampered when people are anemic. Anemia is [estimated](#) to contribute to 17% lower productivity in heavy manual labor and 5% lower productivity in other manual labor. A [modeling exercise](#) in India estimated that a birth cohort of individuals with iron-deficiency anemia (IDA) in 2013 will lose more than US\$ 24 million over their lifetimes as a result of productivity loss due to IDA.



Additionally, the mental capacity that is undeveloped when children are iron deficient affects their academic performance and future earnings potential. Consequently, childhood anemia is associated with a [2.5% drop in wages](#) in adulthood, affecting both productivity and economic growth.

Nutrient deficiencies that can contribute to anemia include iron, riboflavin, folic acid, zinc, and vitamin B12. Currently, more than 80 countries have legislation to add one or more of these nutrients to wheat flour, maize flour, and/or rice. Adding these nutrients to commonly consumed grains is one step toward improving productivity and thereby reducing poverty.

SDG 2. Zero hunger

The target of SDG 2.2 is to end all forms of malnutrition. Of all deaths of children under 5 years, 45% are attributed to [malnutrition](#). This goal specifically mentions stunting. Vitamin and mineral deficiencies increase the [risk of stunting](#) which affects about [2 billion people](#).



Additionally, adequate nutrient intake increases productivity in adults, leading to [improved productivity](#) in agricultural labor. This will increase agricultural production, subsequently providing growth in the food supply and helping to combat hunger.

Fortification is one of the most [effective nutrition interventions](#) in preventing nutritional deficiencies, thus working to reach SDG 2.2.

SDG 3. Good health and well-being

This goal focuses on maternal and newborn health, infectious disease, and non-communicable diseases. Fortification helps to reach goals in each of these categories.



Maternal and Newborn Health

A huge advantage of fortifying with folic acid is the reduced risk of birth defects of the brain and spine. One meta-analysis showed that fortifying wheat flour with folic acid reduced the incidence of these birth defects by [an average of 46%](#).

Anemia during pregnancy increases the risk of maternal and perinatal mortality. Anemia during pregnancy also contributes to low birth-weight infants, which the [World Health Organization](#) (WHO) defines as weighing less than less than 2500 grams or 5.5 pounds. Newborns that are born small are prone to death and diseases while they are young. If they survive, they are at an increased risk for poor mental development in childhood and chronic health problems such as diabetes and heart disease later in life.

Infectious Disease

[Zinc](#) is a mineral that promotes immunity, resistance to infection, and proper growth and development of the nervous system, and is integral to healthy pregnancy outcomes. Zinc deficiencies increase risk of [malaria, pneumonia, and diarrhea](#).

In a 2012 [paper](#), researchers concluded that 17% of the global population is at risk of inadequate zinc intake. While people only need small amounts of zinc, WHO estimates that “worldwide, zinc deficiency is responsible for approximately 16% of lower respiratory tract infections, 18% of malaria and 10% of diarrheal disease.”

Both [Cameroon](#) and [Fiji](#) have reported improvements in the population’s zinc status after grain fortification began.

Non-Communicable Diseases

Anemia is a non-communicable disease. As noted above, nutritional anemia is caused by [vitamin and mineral deficiencies](#), and adding iron, riboflavin, folic acid, zinc, and vitamin B12 to food during the milling process helps reduce the risk of nutritional anemia.

Another non-communicable disease is diarrhea. A [study](#) published in in June 2017 noted that diarrhea remains a leading cause of death globally. The study estimated that 1.31 million people died from diarrhea in 2015, including 499,000 children under age 5 years. While unsafe water and unsafe sanitation remain the leading risk factors, vitamin A and zinc deficiencies also contribute to diarrhea.

SDG 4. Quality education

Poor health in childhood can lead to [reductions in educational achievement](#). While iron deficiency limits cognitive development, children who have adequate iron have more energy to participate in classroom exercises, and they are more mentally prepared to master the material.

A large body of literature documents the positive impact of iron interventions on tests of [cognitive and motor development](#). This [review](#) found, “the available evidence satisfies all of the conditions needed to conclude that iron deficiency causes cognitive deficits and developmental delays and that these can be at least partially reversed by iron therapy, though the effect may diminish among older children.”



SDG 5. Gender equality

Anemia rates in females are much higher than males. While anemia rates decrease for males by the end of puberty, they [remain high](#) for females through reproductive years due to menstruation.

Therefore, reducing anemia by fortifying with iron contributes to boosting females' relative academic performance and worker productivity and helps achieve gender equality.



SDG 8. Decent work and economic growth

The [2017 Global Nutrition Report](#) states there is a 16:1 benefit to cost ratio in fortifying foods in low and middle income countries.

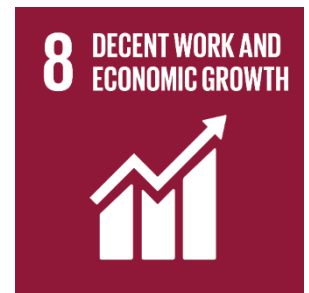
In a [review](#) of the World Bank report [An Investment Framework for Nutrition](#), consultant Julia Dayton Eberwein noted that investing US\$ 10 per child per year above current spending for nutrition-specific interventions would have enormous impacts. She wrote that "Every dollar invested in this package of interventions would yield between US\$ 4 and US\$ 35 in economic returns, making investing in early nutrition one of the best value-for-money development actions."

According to the [2015 Global Nutrition Report](#), the returns on investing in improved nutrition outperforms returns generated by the US stock market over the past 70 years. As of 2017, the cost of undernutrition is at least 8-11% of the gross national product. Reducing this cost could help bring communities out of poverty.

Healthcare expenditures are averted when folic acid (vitamin B9) is included in fortification to prevent birth defects of the brain and spine. Spina bifida is the one of the most common of these birth defects; it cannot be cured, and it often leads to some level of paralysis and bowel and bladder control problems. Total lifetime costs for medical care, development services and indirect costs for patients with spina bifida in 2002 was US\$ 620,484, according to one [literature review](#).

In addition, adults who care for children with [spina bifida](#) spend time making medical appointments, taking children for treatment, and helping children with many daily activities such as toileting and mobility. Adults with spina bifida are very often independent and productive, but they usually require ongoing and often intensive medical care. Moreover, a [study](#) of 88 people in Germany with spina bifida found that physiotherapy was the most used healthcare resource, and more than half the study participants used a wheelchair. The authors concluded that their care givers "might have to either adjust their careers overall or adjust their working schedule, resulting in productivity losses".

All of these examples show how grain fortification could be an effective at promoting decent work and economic growth, working to reach this SDG.



SDG 10. Reduced inequalities

Low- and middle-income countries bear most of the [burden](#) in nutrient deficiencies. This increases the risk of death, morbidity, and susceptibility to negative health outcomes that could be mitigated. The [2015 Global Nutrition Report](#) presents stunting rates by wealth quintile, showing how current inequality predicts future inequality.

Each dollar spent on reducing chronic undernutrition has a thirty-fold payoff, according to the [2012 Copenhagen Consensus](#). The 2008 [Copenhagen Consensus](#) ranked fortification as the third greatest opportunity to fight development challenges, highlighting the opportunities for iron fortification.



SDGs aim to combat inequalities within and among countries. Thus, it is important to note that vitamin and mineral deficiencies can be problems in high-income countries as well as low- and middle-income countries. In the US, for example, fortification of salt with iodine began in the 1920s, fortification of milk with vitamin D began in the 1930s, and the fortification of wheat and maize flour with thiamine and niacin began in the 1940s. These efforts are greatly responsible for the eradication of diseases such as goiter, rickets, beriberi and pellagra, respectively, in the [United States](#). In addition, [767 incidents](#) of spina bifida were prevented in one year after the US added folic acid to its fortification standard. Fortifying with folic acid can [decrease birth defects](#) overall regardless of economic status of a country.

SDG 11. Sustainable cities

[More people now live in cities than rural areas](#), and 30% of urban dwellers live in slum conditions. Urban residents are likely to benefit from fortification of industrially milled flour and rice. Consequently, grain fortification is an opportunity to improve the nutrient intake of a significant proportion of the population, including the urban poor who shop in informal markets.



SDG 17. Partnerships for the goals

While adding essential nutrients to food addresses the above SDGs, maintaining a successful fortification program requires the partnerships called for in this goal. Effective [partnerships](#) are essential for food fortification because no sector can be successful on its own.

[This study](#) of fortification in Chile, Costa Rica, and Guatemala found that cooperation from different sectors is key as each is responsible for a different aspect of the process. Researchers found that a variety of players were responsible in creating effective fortification programs, including the following:

- An influential individual to support fortification
- An institution with research capacity to monitor impact
- Food industry to fortify food
- Policy makers who ensure fortification was mandatory nationwide
- Other agencies to monitor and ensure compliance was enforced

Creating and maintaining effective partnerships is a high-maintenance activity. The first recommendation to any country considering fortification is to form a national alliance. Seek participation and commitment from national leaders representing public, private, and civic sectors. Be sure each stakeholder understands the health and economic benefits for fortification. Involving all sectors early in the process prevents overlooking key information. It also builds commitment from each group to work toward success.

The Food Fortification Initiative brings partners together with the goal of reducing vitamin and mineral deficiencies through food fortification. In doing so, the partners are also taking steps to address nine of the 17 SDGs.

