

Why Fortify?

Fortification is the process of adding vitamins and minerals to foods to prevent nutritional deficiencies. Wheat flour, maize flour and rice are primarily fortified to prevent diseases, strengthen immune systems, and improve productivity and cognitive development¹.

Fortification is successful because it makes frequently eaten foods more nutritious without relying on consumers to change their habits.

When fortification is appropriately planned, implemented, and monitored, it supplies essential vitamins and minerals to large segments of the population. It is an effective, safe, and economic strategy.

How Much Does It Cost to NOT Fortify?

The nutrients most commonly used in grain fortification are iron and folic acid.

Iron

Iron deficiency is one cause of anemia. Severe anemia results in reduced work capacity, undeveloped physical and mental development, and increased risk of maternal death¹.

Productivity loss associated with anemia varies by type of work: 17% (heavy manual work), 5% (light manual work), and 4% (other work via cognitive effects)². Reductions in cognitive and work performance of substantial portions of the population can have detrimental economic consequences. The table below illustrates the total losses associated with anemia based on data from 10 countries.

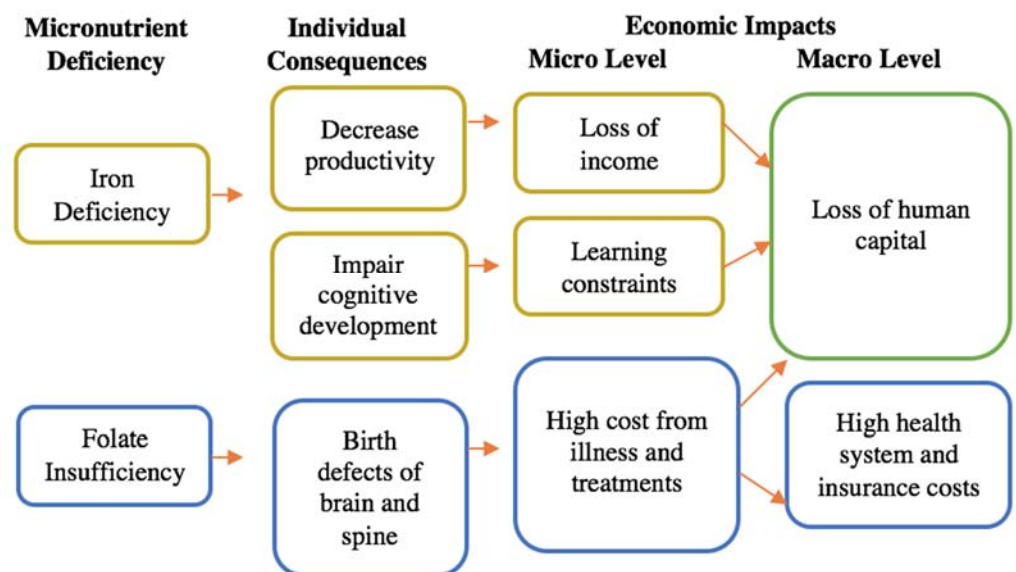
Economic Impacts of Iron Deficiency³

Country	Anemia in Children (%)	Anemia in Males (%)	Anemia in Females (%)	Value of Total Loss (US\$/capita)
Bangladesh	73	60	74	4.10
India	66	50	59	4.81
Pakistan	47	31	37	4.27
Mali	28	33	27	3.32
Tanzania	25	15	15	0.83
Egypt	25	14	17	2.95
Oman	60	14	32	33.05
Bolivia	35	14	16	3.96
Honduras	18	12	14	2.22
Nicaragua	28	31	36	3.25

Folic Acid

Children with spina bifida, a birth defect of the spine that usually results from folate insufficiency, are often permanently disabled and require a lifetime of medical care.

Summary of the Economic Impacts of Iron Deficiency and Folate Insufficiency



Cost-effectiveness of Fortification

Millers usually have a one-time expense for equipment to begin fortification. After that, they have on-going costs of buying a mix of vitamins and minerals to add to flour or fortified kernels to blend with unfortified rice. In 2016, the mix needed for flour was less than US\$ 4 per metric ton of flour⁴. The cost to fortify rice varies based on the technology used; estimates range from US\$ 6 to US\$ 20 per metric ton⁴.

The benefits of flour fortification far outweigh their associated costs, as shown below. Fortifying with iron and folic acid, in particular, is cost effective.

Iron

- For every dollar spent on flour fortification, \$84 is saved by reducing anemia⁵.

Folic Acid

- The cost of adding folic acid to flour is minimal, especially when compared to the cost of treating children with spina bifida⁶⁻⁸.



Summary of Annual Averted Costs and Costs Savings of Fortifying Flour with Folic Acid

Country	Live births with spina bifida prevented with fortification (/year)	Cost of fortification (US\$/year)	Total direct costs averted (US\$/year)	Cost savings (US\$/year)
Chile ⁶	107	0.2 million	2.5 million	2.3 million
South Africa ⁷	406	0.2 million	5.6 million	5.4 million
United States ⁸	767	4-20 million	607.3 million	603 million

Chile calculated the costs of surgical treatment and rehabilitative services for a sample of children with spina bifida through 20 years of age. Flour fortification led to an **annual net savings equal to US\$ 2.3 million**⁶.

South Africa estimated the costs of treating infants with spina bifida and reported an **annual net savings of US\$ 5.4 million**⁷.

The United States included the lifetime costs to care for people with spina bifida plus the value of the time required for others to care for the children. The **annual net savings was US\$ 603 million**⁸.

References

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- ⁵ Hunt J. 2002. Reversing productivity losses from iron deficiency: The Economic Case. *Journal of Nutrition*. 132:794S-801S.
- ⁶ Hertrampf E, Cortes F. 2004. Folic acid fortification of wheat flour: Chile. *Nutrition Reviews*. 62:S44-S48.
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- ⁸ Grosse SD, Waitzman NJ, Romano PS, et al. 2005. Reevaluating the benefits of folic acid fortification in the United States: economic analysis, regulation and public health. *American Journal of Public Health*. 95:1917-1922.

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