

## Why Fortify?

Fortification is adding vitamins and minerals to foods to prevent nutritional deficiencies. The nutrients regularly used in grain fortification prevent diseases, strengthen immune systems, and improve productivity and cognitive development<sup>1</sup>.

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 death.

Productivity loss associated with anemia varies by type of work: 17% (heavy manual work), 5% (light manual work), 4% (other work via cognitive effects)<sup>2</sup>. Reductions in cognitive and work performance of substantial portions of the population can have detrimental economic consequences.

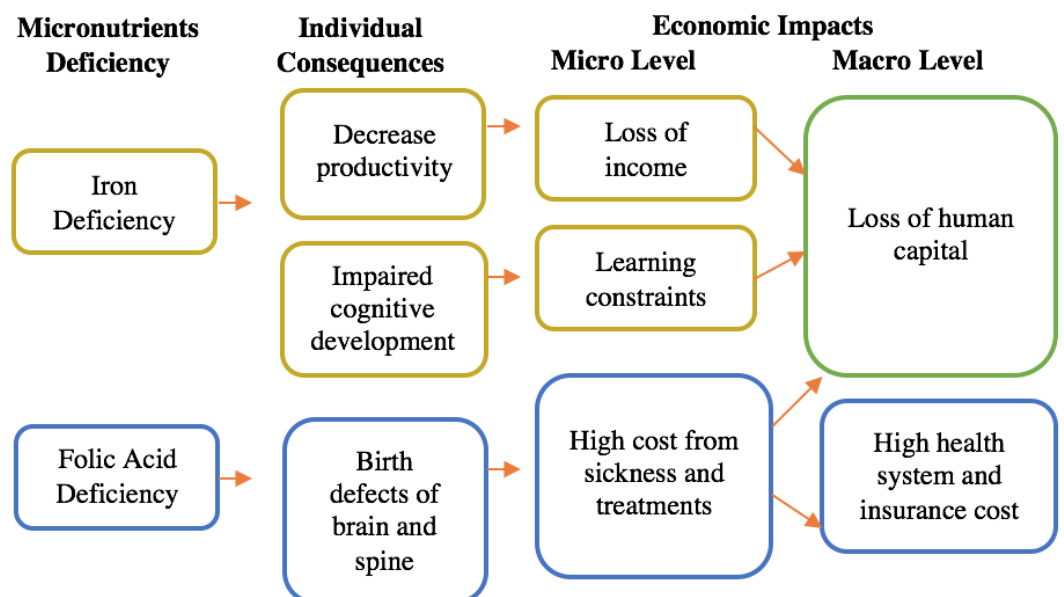
*Economic Impacts of Iron Deficiency<sup>3</sup>*

Country	Percent of Anemia in Children	Percent of Anemia in Males	Percent of Anemia in Females	Present Value of Total loss (US \$/capita)
<b>Bangladesh</b>	73	60	74	4.10
<b>India</b>	66	50	59	4.81
<b>Pakistan</b>	47	31	37	4.27
<b>Mali</b>	28	33	27	3.32
<b>Tanzania</b>	25	15	15	0.83
<b>Egypt</b>	25.2	14	17	2.95
<b>Oman</b>	60	14	32	33.05
<b>Bolivia</b>	35	14	16	3.96
<b>Honduras</b>	17.5	12	14.3	2.22
<b>Nicaragua</b>	28	31	36	3.25

### Folic Acid

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

### Summary of the Economic Impacts of Iron and Folic Acid Deficiency



## Cost-effectiveness of Fortification

Millers usually have one-time expenses 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. The on-going cost for flour is usually less than US\$ 3 per metric ton. The cost to fortify rice varies based on the technology used; estimates range from US\$ 6 to US\$ 20 per metric ton.

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

### Iron

- For every dollar spent on flour fortification, \$84 is saved by reducing anemia <sup>4</sup>.

### Folic Acid

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



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

Country	Live births with spina bifida prevented with fortification per year	Cost per child (US \$)	Cost of fortification per year	Total direct cost averted per year	Cost savings (US \$/year)
Chile <sup>5</sup>	107	\$1,200	.2 million	2.5 million	2.3 million
South Africa <sup>6</sup>	406	\$7,027	.2 million	5.6 million	5.4 million
United States <sup>7</sup>	767	\$791,900	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 in twenty years. Flour fortification leads to an annual **net savings of 2.3 million international dollars**<sup>5</sup>.

South Africa estimated the costs of treating infants with spina bifida and reported a **net savings of 5.4 million US dollars annual with flour fortification**<sup>6</sup>.

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 with flour fortification is 603 million US dollars**<sup>7</sup>.

## References

- <sup>1</sup> Food Fortification Initiative (FFI). Why Fortify? Atlanta, USA: FFI, 2012. Available from [www.FFInetwork.org](http://www.FFInetwork.org).
- <sup>2</sup> Horton, S. 2006. Symposium: Food Fortification in Developing Countries. The Journal of Nutrition 136:1068-1071
- <sup>3</sup> Horton S, Ross J. 2003. The economics of iron deficiency. Food Policy. 28:51-75.
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- <sup>5</sup> Hertrampf E, Cortes F. 2004. Folic acid fortification of wheat flour: Chile. Nutrition Reviews 62:S44–S48.
- <sup>6</sup> Sayed A-R, Bourne D, Pattinson R, Nixon J, Henderson B. 2007. Decline in the prevalence of neural tube defects following folic acid fortification and its cost-benefit in South Africa. Birth Defects Research Part A: Clinical and Molecular Teratology 82(4):211-216.
- <sup>7</sup> 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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