

## Costs and Benefits for Reducing Vitamin and Mineral Deficiency

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Efforts to reduce vitamin and mineral deficiency generally fall within two broad approaches:

- health service based delivery (usually of vitamin and mineral supplements to specific groups); and
- food-based approaches. The latter include
  - the fortification of staple and complementary (weaning) foods provided through local markets
  - the encouragement of behaviour change (for example breastfeeding promotion; consumption of vitamin and mineral rich foods through nutrition education, social marketing, and crop production based approaches).

The direct costs of vitamin and/or mineral supplements, and of fortificant premixes for foods are well documented and listed below. However, the cost of the surrounding delivery and marketing mechanisms vary substantially from one country and setting to another, and with the population being targeted. So the costs of scaling up vary a lot as well. Generally the cost per person year of protection against vitamin and mineral deficiencies (VMD) of reaching the poorest with pro-poor interventions is much higher than the cost per person year of protection against VMD for 'universal coverage' strategies - such as large scale staple food fortification; and mass distribution of prophylactic vitamin A to children under five.

All that notwithstanding...

### COSTS:

#### 1- Iodine Deficiency:

The most common approach to controlling iodine deficiency is salt iodization. The cost of adding potassium iodide or potassium iodate to salt ranges between USD 0.02 and 0.07 per kilogram of salt amounting to about 5% of the cost. In most countries this cost is absorbed by consumers within the retail price (although markups in excess of extra cost are not uncommon). The best results have been achieved in countries where salt iodization has been made mandatory resulting in virtual elimination of iodine deficiency disorders. Depending on the country, the cost of controlling iodine deficiency disorders ranges between USD 0.25 and \$ 5.00

#### 2- Vitamin A Deficiency

The most widely used method for controlling vitamin A deficiency is through the prophylactic supplementation of children aged 6-59 months twice yearly. From 1998 up this year in many high burden countries, this was integrated within polio national

immunization days. Adding a vitamin A supplement component to polio NIDs is generally estimated to increase the cost by 2% to 10% depending on the country. In order to provide full coverage against vitamin A deficiency, two doses are required annually. However since polio NIDs are held once per year other campaigns have been used in some countries to provide a second dose. The production cost per single capsule (excluding delivery costs) is low - about USD 0.02 each.

As national Polio NIDs are phased out, alternative mechanisms for vitamin A delivery are being developed. The most promising is the approach of integrating vitamin A supplementation with an “essential package of health services” that would provide the necessary infrastructure for vitamin A supplement distribution. There isn’t yet much hard information on the incremental cost of integrating vitamin A supplementation within essential packages of health services. But it has been estimated to cost between \$1.00 and \$ 10.00 per child per year<sup>1</sup> to provide full protection depending on the country.

### 3- Iron Deficiency Anemia

The use of supplementation as a means for controlling iron deficiency anemia is relatively difficult. Iron cannot be delivered at one time in a large dose as can vitamin A, and must be taken daily – for example by pregnant women – a high risk group. Costs are in the range \$10-14 / per head. However compliance and coverage are often not good unless backed up by good support mechanisms (as is the case in for example Nepal). So the fortification of staple foods such as flour is often the method of choice in many countries. The per capita cost of fortifying wheat flour with iron typically ranges around \$0.12.

### **Africa Specific Costs:**

The following are some specific figures that were calculated for MI for specific programs in Africa:

#### Large-scale Maize meal fortification

Based on current South African mandatory regulations, the incremental public and private sector costs for fortification (with eight key micronutrients including vitamin A) is approximately \$3.50 per metric ton of maize meal, which equates to ~\$0.17 per person

#### Wheat Flour Fortification

Based on current South African mandatory regulations, the incremental public and private sector costs for fortification (with eight key micronutrients including vitamin A) is approximately \$3.25 per metric ton of wheat flour. Wheat flour fortification is

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<sup>1</sup> Lomborg, B ed (2004): Global Crises, Global Solutions – the Copenhagen Consensus 2004. CUP. Table 7.6 p. 404 Chapter 7 (Malnutrition and Hunger by Behrman, J R ; Alderman, H; & Hoddinott, J.)

currently mandatory in Nigeria and South Africa and is voluntarily implemented in several other countries. It is also commonly used in the North Africa region.

### Vegetable Oil Fortification with Vitamin A

The estimated direct cost of fortification for 40 countries was \$16.6 million annually, about \$3.00 per Metric ton, with per capita costs estimated at less than \$0.075 per person per year. With such low costs, and the history of vegetable oil fortification in Africa, in principle these costs could be quickly absorbed into the retail cost of oils. However up front time and costs add to the overall investment required. (A project we have at the start up point in Bangladesh has investment costs over the first 2 years of about \$0.25 per head of population targeted)

### BENEFITS

The benefits of controlling vitamin and mineral deficiency can also be modeled in terms of economic impact. Controlling iodine deficiency and iron deficiency have a direct impact on cognitive development of children and, in the long term, on economic productivity of the workforce. We estimate that African nations lose between 0.4% and 2.7% of their GDP annually as a direct outcome of vitamin and mineral deficiency. Fully controlling vitamin and mineral deficiency in Africa could contribute significantly to improved GDP performance.

The table below shows one global estimate of costs and benefits in US Dollar amounts as well as the cost benefit ratio for each:

**Summary of Benefits, Costs and Cost-Benefit Ratios:**

	Benefits	Costs	Benefits/ Costs
Iodine (per woman of child bearing age)	\$15-130	\$0.25-5.0	15-520
Vitamin A (per child under 6 years)	\$37-43	\$1-10	4.3-43
Iron (per capita)	\$44-50	\$0.25	176-200

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Sources: Vitamin and Mineral Deficiency A Global Progress Report, The Micronutrient Initiative and UNICEF, 2004  
Malnutrition and Hunger, Behrman, J., Alderman, H., Hoddinot, J., in Global Crises, Global Solutions, The Copenhagen Consensus, Cambridge University Press, 2004  
Nutrition Concept Note, Internal Document, The Micronutrient Initiative