Impact of Micronutrient Fortification in Reducing Hidden Hunger

Dr. Denish Moorthy, Technical Advisor, Micronutrients
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COI Statement

No conflict of interest to disclose relative to the content of this conference.
Outline

- Hidden Hunger
- Burden of Disease
- Fortification
- Example: Universal Salt Iodization
- Country Program: SPRING/Uganda
- Lessons and Priorities for Fortification Programs
Hidden Hunger

Micronutrient deficiencies are frequently known as “hidden hunger” as the symptoms of deficiency often manifest only when they become severe, yet the consequences of mild or moderate deficiency have a large social and economic impact on individuals and their communities.
Micronutrient deficiencies are estimated to be responsible for 1.1 million child deaths.

Approximately 10 million pregnant women and five million children are affected by vitamin A deficiency.

Prevalence of iron deficiency anemia range from 11 to 16 percent for pre-school children and 10 to 15 percent for pregnant women.

Approximately 1.2 billion people are affected by zinc deficiency.

This map details worldwide severity of the most common micronutrient deficiencies—vitamin A, anemia, and zinc—using World Health Organization (WHO) children under 5 prevalence data. Severity was coded using a 3-point weighting system based on levels of public health significance cut-offs (low, moderate, and high). Source: HarvestPlus (2015)

http://www.harvestplus.org/content/nutrients
Interventions to Deliver Micronutrients

- Nutrition-sensitive agriculture
- Dietary diversification and modification
- Breastfeeding
- Food fortification
  - Mass fortification
  - Targeted fortification
    - Fortified blended foods (FBF) and ready-to-use food supplements (RUF)
  - Commercial-driven fortification
- Supplementation
  - Point-of-use “fortification”
  - Traditional pharmaceutical presentations
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## History of Food Fortification

<table>
<thead>
<tr>
<th>Year</th>
<th>Micronutrient and Vehicle</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>1922</td>
<td>Iodine in Salt</td>
<td>Switzerland</td>
</tr>
<tr>
<td>1974</td>
<td>Vitamin A in sugar</td>
<td>Guatemala</td>
</tr>
<tr>
<td>1992</td>
<td>Iodine in salt</td>
<td>Global (USI)</td>
</tr>
<tr>
<td>1998</td>
<td>Folic acid in Flour</td>
<td>United States</td>
</tr>
<tr>
<td>1996 &amp; 2000</td>
<td>Iodine in salt; Vitamin A in flour, oil &amp; sugar; Iron in flour &amp; rice</td>
<td>Philippines</td>
</tr>
</tbody>
</table>
An Ideal Fortification Vehicle

- Widely consumed by all population groups
- Little seasonal variation
- Proportional to energy intake/requirements;
- Central manufacturing facilities with QA/QC
- Technology is cheap, transferable & scalable
- No organoleptic changes – taste, smell, texture, color

Retained with different cooking processes
## Commonly Used Staples for Food Fortification

<table>
<thead>
<tr>
<th>Staple</th>
<th>Added Micronutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salt</td>
<td>Iodine (and iron)</td>
</tr>
<tr>
<td>Flour (wheat and maize)</td>
<td>Iron, folic acid, B vitamins, vitamin A</td>
</tr>
<tr>
<td>Sugar</td>
<td>Vitamin A</td>
</tr>
<tr>
<td>Fats and oils</td>
<td>Vitamin A and vitamin D</td>
</tr>
<tr>
<td>Rice</td>
<td>Iron, vitamin A and B vitamins</td>
</tr>
</tbody>
</table>
Grain Fortification Legislation

Mandatory:
- Any: 83
- Wheat: 82
- Maize: 13
- Rice: 6
Impact of Fortification

- Benefit cost ratios:
  - Cognitive ability with correcting iodine deficiency - 30:1
  - Increased cognitive and physical ability with correcting iron deficiency - 8:1
  - Additional human benefits in terms of fewer stillbirths (iodine), and lower maternal mortality rates and neonatal deaths (iron)

- Cost: $0.05/person/year (iodine in salt) and $0.12/person/year (iron in flour)

Horton S, Mannar V, Wesley A. Best Practice Paper Food Fortification with Iron and Iodine. Copenhagen consensus center working paper. 2009, Copenhagen, Denmark
Universal Salt Iodization

- 1920s in Switzerland and United States
- Combat the spectrum of iodine deficiency from goiter and cretinism to physical and mental defects
- Small daily quantities of iodine - 90 μg/day for infants and children to 250 μg for pregnant and lactating women consume
Impact of Universal Salt Iodization

- Evidence: Systematic review of RCTs, non-randomized controlled trials, quasi-experimental & other study designs
- It is significant
  - Risk of goitre (non-randomized controlled trials risk ratio $[RR] = 0.59$ [95% confidence interval $\{CI\} = 0.36$ to 0.95; cohort $RR = 0.30$ [95% CI = 0.23 to 0.41] – [Moderate]
  - Cretinism (multiple cross-sectional Peto odds ratio $[OR] = 0.13$ [95% CI = 0.08 to 0.20]) – [Moderate]
  - Low UIE (multiple cross-sectional $RR = 0.45$ [95% CI = 0.33 to 0.60]) – [Moderate]

Coverage of Universal Salt Iodization

WHO Countries: 194
With Data: 153
Deficient: 25
Sufficient: 116
Excess: 12

Source: ICCIDD. http://ign.org/cm_data/Iodine_2015_With_legend_AI_file.png
Accessed 19th August 2015
Fortification in Uganda

- Model for sustainable fortification partnership
- Voluntary – 2004 [Vit. A fortified oil coverage -95%]
- Mandatory fortification – July 1st 2013
- National Working Group of Food Fortification (NWGFF) – 2002
  - Policy, planning, implementation
  - Social marketing (demand creation) & consumption
  - QA/QC, M&E, Research
USAID-SPRING in Uganda

History: USAID MOST and A2Z Project, now USAID SPRING (Strengthening Partnerships, Results, and Innovations in Nutrition Globally) Project

Support for:
- National Food Fortification Working Group
- Production level – technical assistance, monitoring, training
- Retail & Consumption level monitoring
USAID-SPRING in Uganda

Photos Courtesy: SPRING/Uganda
Lessons and Priorities for Fortification Programs

- Strengthen national surveillance systems – better data for monitoring & impact evaluation
- Regulatory systems and enforcement – clarity in regulations
- Support small and medium fortification industry
  - Technology
  - Internal and external quality assurance
Lessons and Priorities for Fortification Programs

- Flexibility of programs to make changes based on data on consumption patterns
- Awareness generation – policy makers, program implementers, and consumers
- Ensuring quality of fortified foods – technical assistance to industry
- Complement with long term interventions such as increasing dietary diversity
There's more to be done!