Consequences of micronutrient deficiencies in Africa – Now is the time to act!!
Today’s presentation

1. Under nutrition, micronutrient deficiency and its impact on child survival and morbidity

2. Global and Continental trends in addressing Micronutrient Deficiency

3. Food Fortification and its role in reducing MND
Conceptual Framework of Undernutrition

- Nutritional Status
- Diet → Health
- Household Food Security
- Care of Mother and Child
- Environ. Health, Hygiene & Sanitation
- Human, Economic, and Institutional Resources
- Political and Ideological Structure
- Ecological Conditions
- Potential Resources

Adapted from UNICEF
Causes of Child Mortality

- Neonatal: 37%
- Acute respiratory infections: 17%
- Diarrhoea: 16%
- Malaria: 7%
- Measles: 4%
- Injuries: 4%
- HIV/AIDS: 2%
- Other: 13%

Globally more than one third of child deaths are attributable to under-nutrition.

195 Million under-fives in the developing world are stunted

- >90% of the developing world’s stunted children live in Africa and Asia and
- 80% of them live in 24 countries
And beyond Survival...

Nutrition is also important for:

- Physical growth
- Behavioral development, cognitive function
- School attendance, performance
- Ultimate income-generating capacity,
- Economic development
- Risk of non-communicable diseases
Further Global evidence...

Lancet Nutrition Series-February 2008

- Analyzed data from five long-standing prospective cohort studies

- Noted that indices of maternal and child undernutrition (maternal height, birthweight, intrauterine growth restriction, and weight, height, and body-mass index at 2 years were related to adult outcomes (height, schooling, income or assets, offspring birthweight, body-mass index, glucose concentrations, blood pressure).

- Undernutrition was strongly associated, with shorter adult height, less schooling, reduced economic productivity, and—for women—lower offspring birthweight.
Micronutrients?

Most important MND?
- Vitamin A deficiency, iron deficiency, and iodine deficiency disorders
- Followed closely by other nutrients, such as zinc, calcium, riboflavin, vitamin B6 and B12, and folate

Children and women of reproductive age are especially vulnerable:
- Higher physiological needs
- Unfavorable intrahousehold food allocation patterns
- Poor quantity, frequency, and quality of complementary foods and inadequate
- and breastfeeding practices
# Micronutrients?

<table>
<thead>
<tr>
<th>Micronutrient</th>
<th>Effect on Health</th>
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<tbody>
<tr>
<td><strong>Vitamin A deficiency</strong></td>
<td>✓ Growth faltering, ✓ impaired motor and cognitive development, vision, and immune system ✓ In children estimated to account for approximately 20-24% of child mortality from measles, diarrhea, and malaria, and ✓ 20% of all-cause maternal mortality ✓ Extreme deficiency leads to blindness and death</td>
</tr>
<tr>
<td><strong>Iron Deficiency</strong></td>
<td>✓ In young children, iron deficiency may impair growth, cognitive development, and immune function. ✓ In school-aged children, it can affect school performance, ✓ in adults it may lower work capacity. ✓ <strong>Iron deficiency anemia</strong> is responsible for tens of thousands of maternal deaths each year</td>
</tr>
<tr>
<td><strong>Iodine Deficiency</strong></td>
<td>✓ Particularly damaging during pregnancy, as it retards fetal development, ✓ Results in a range of intellectual, motor, and hearing deficits in the offspring</td>
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<tr>
<td><strong>Zinc Deficiency</strong></td>
<td>✓ In WRA, may result in pregnancy complications, low birth weight, impaired immune function, maternal and infant mortality and morbidity, ✓ In children, growth faltering in infancy and childhood ✓ Reduced immune function and more susceptible to a variety of infectious diseases</td>
</tr>
</tbody>
</table>
Global deaths and disability-adjusted life-years (DALY) in children < 5 yrs attributed to micronutrient deficiencies

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Death</th>
<th>% of death in children &lt; 5yr</th>
<th>Disease burden (1000 DALYs)</th>
<th>% of DALYs in children &lt; 5yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitamin A</td>
<td>667,771</td>
<td>6.5</td>
<td>22,668</td>
<td>5.3</td>
</tr>
<tr>
<td>Zinc</td>
<td>453,207</td>
<td>4.4</td>
<td>16,342</td>
<td>3.8</td>
</tr>
<tr>
<td>Iron</td>
<td>20,854</td>
<td>0.2</td>
<td>2,156</td>
<td>0.5</td>
</tr>
<tr>
<td>Iodine</td>
<td>3,619</td>
<td>0.03</td>
<td>2,614</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Black et al, Lancet 2008
Identifies nutrition interventions among the most cost effective interventions to advance global welfare if $75 billion of resources were available over a four year period:

#1: Micronutrient supplements for children (Vitamin A & zinc)

#3: Micronutrient fortification (iron and salt iodisation)

#5: Biofortification

#6: Deworming & other nutrition programs in schools

#9: Community based nutrition promotion

Out of a total of 30 interventions...
MND- Vit A

Vitamin A Deficiency Among Preschool Children by Country: 1995 - 2005

Note: VAD is serum retinol <0.70 μmol/l
Data is based on countries and areas with survey data and regression-based
MND- Iron

Anaemia Among Preschool Children By Country

Category of Anaemia Public Health Significance
- Normal < 5.0%
- Mild 5.0% - 19.9%
- Moderate 20.0% - 39.9%
- Severe ≥ 40.0%
- No Data

MND- Iodine

Median urinary iodine concentrations in children 6-12 years (µg/l)

- Uganda: 463.8
- Rwanda: 297.5
- Namibia: 216.3
- United Republic of Tanzania: 203.3
- South Africa: 176.8
- Kenya: 117.9
- Burundi: 70
- Mozambique: 60.3
- Zambia: 60
- Ethiopia: 24.5
Key Interventions for Elimination of Micronutrient Deficiencies

- **Supplementation**
  - Single multiple or micronutrients

- **Fortification**
  - Foods for the general population (flour, oil, salt, sugar)
  - Fortification of specific foods, incl home-fortification

- **Promotion of optimal feeding & diversified diets**
  - Optimal breastfeeding (early BF initiation, EXBF for 6 months, continued BF for up to 2 years)
  - Micronutrient-rich foods, including animal source foods

- **Public health measures**
  - Infection control
  - Hygiene
  - Immunization
Supplementation..success

Two Dose Vitamin A Coverage of Children 6-59 months


<table>
<thead>
<tr>
<th>Country</th>
<th>%</th>
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<tbody>
<tr>
<td>Zimbabwe</td>
<td>20</td>
</tr>
<tr>
<td>Comoros</td>
<td>20</td>
</tr>
<tr>
<td>Kenya</td>
<td>27</td>
</tr>
<tr>
<td>South Africa</td>
<td>39</td>
</tr>
<tr>
<td>Swaziland</td>
<td>44</td>
</tr>
<tr>
<td>Eritrea</td>
<td>49</td>
</tr>
<tr>
<td>Uganda</td>
<td>67</td>
</tr>
<tr>
<td>Burundi</td>
<td>80</td>
</tr>
<tr>
<td>Angola</td>
<td>82</td>
</tr>
<tr>
<td>Mozambique</td>
<td>83</td>
</tr>
<tr>
<td>Ethiopia</td>
<td>88</td>
</tr>
<tr>
<td>Tanzania</td>
<td>93</td>
</tr>
<tr>
<td>Malawi</td>
<td>95</td>
</tr>
<tr>
<td>Zambia</td>
<td>96</td>
</tr>
<tr>
<td>Madagascar</td>
<td>97</td>
</tr>
<tr>
<td>Somalia</td>
<td>100</td>
</tr>
</tbody>
</table>
Supplementation.. More limited success
Addressing IDA..

- Anaemia in pregnant women remains a severe Public health problem- (Uganda, Tanzania, Kenya, Madagascar, Malawi, Burundi & Zambia)

- While it can be prevented and treated by iron folic acid (IFA) supplementation, access remains a concern - with only Burundi and Zambia having the highest coverage among the 12 ESA countries at 50 & 44 % respectively.

- With limited reach of IFA supplementation countries need to seriously consider alternative strategies including promotion of diversified diet and fortification.

- Countries could draw on existing experiences of mandatory large scale wheat and maize flour in partners countries and accelerate action
Three of the 12 countries-Burundi, Kenya and Uganda have achieved the Universal Salt Iodisation.

Another 3 countries are nearing the USI goal-Rwanda, Zambia and Madagascar.

Household access to iodised salt is below 50 percent in remaining countries-Tanzania, Mozambique and Ethiopia, requiring urgent priority attention.
Why do we need to fortify? 
- Example Tanzania

- Vitamin and mineral deficiencies are severe problems in Tanzania causing a heavy burden of disease and disability as well as exacting a heavy economic toll
Why do we need to fortify?

During the processing of grains and oil, essential vitamins and minerals are lost, making these foods less nutritious after processing. Fortification replaces nutrients lost during the processing of foods and can add other vitamins and minerals and can that way also be used to address micronutrient deficiencies.

Loss of vitamins and minerals during milling of wheat

- Thiamin
- Riboflavin
- Vit. B6
- Folate
- Iron
- Niacin

Nutrient retention vs. Degree of milling
In most of the regions, diets are deficient in vitamin A, iron, zinc and Iodine. These deficiencies are of Public health concern.

Everyday bulky foods do not offer the density of essential nutrients that people need, particularly during periods of high physiological needs and acute vulnerability.

Large scale micronutrient malnutrition and its consequences call for immediate and large-scale action.

Fortifying major food vehicles - wheat or maize flour, sugar and oil is highly most cost-effective strategy to address micronutrient malnutrition.
Thank you!
UNICEF, WB/Tanzania