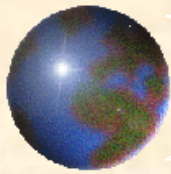


*Economic Consequences of
Deficiencies*

*& Potential Economic
Benefit of Fortification*

Why Countries Will Benefit

The Tanzania Example



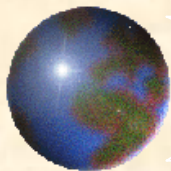
The Copenhagen Consensus 2008



Eight world-renowned economists

Jagdish Bhagwati, François Bourguignon, Finn Kydland*, Robert Mundell*, Douglass North*, Thomas Schelling*, Vernon L. Smith*, Nancy Stokey

(* Denotes Nobel prize winner)



The Copenhagen Consensus 2008

Looked at 10 Development Challenges



Diseases



Air Pollution



Conflicts



Education



Global Warming



Malnutrition and Hunger



Sanitation and Water



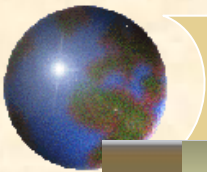
Subsidies and Trade Barriers



Terrorism



Women and Development



...Ranked Fortification as 3rd Greatest Opportunity

CHALLENGE: MALNUTRITION AND HUNGER



About CC

The Participants

The 10 Challenges

Press Room

Contact

Youth Forum

Copenhagen Consensus 2008

The outcome of Copenhagen Consensus in May 2008 is:

The ranked list of solutions ([download the results as pdf-file including comments](#))

Solution	Challenge
1 Micronutrient supplements for children (vitamin A and zinc)	Malnutrition
2 The Doha development agenda	Trade
3 Micronutrient fortification (iron and salt iodization)	Malnutrition
4 Expanded immunization coverage for children	Diseases

The 2008

The

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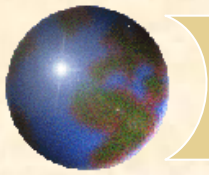
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Why?

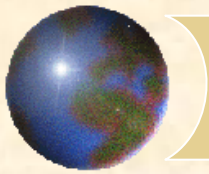
Fortification makes economic sense...

Africa example: Folic acid fortification

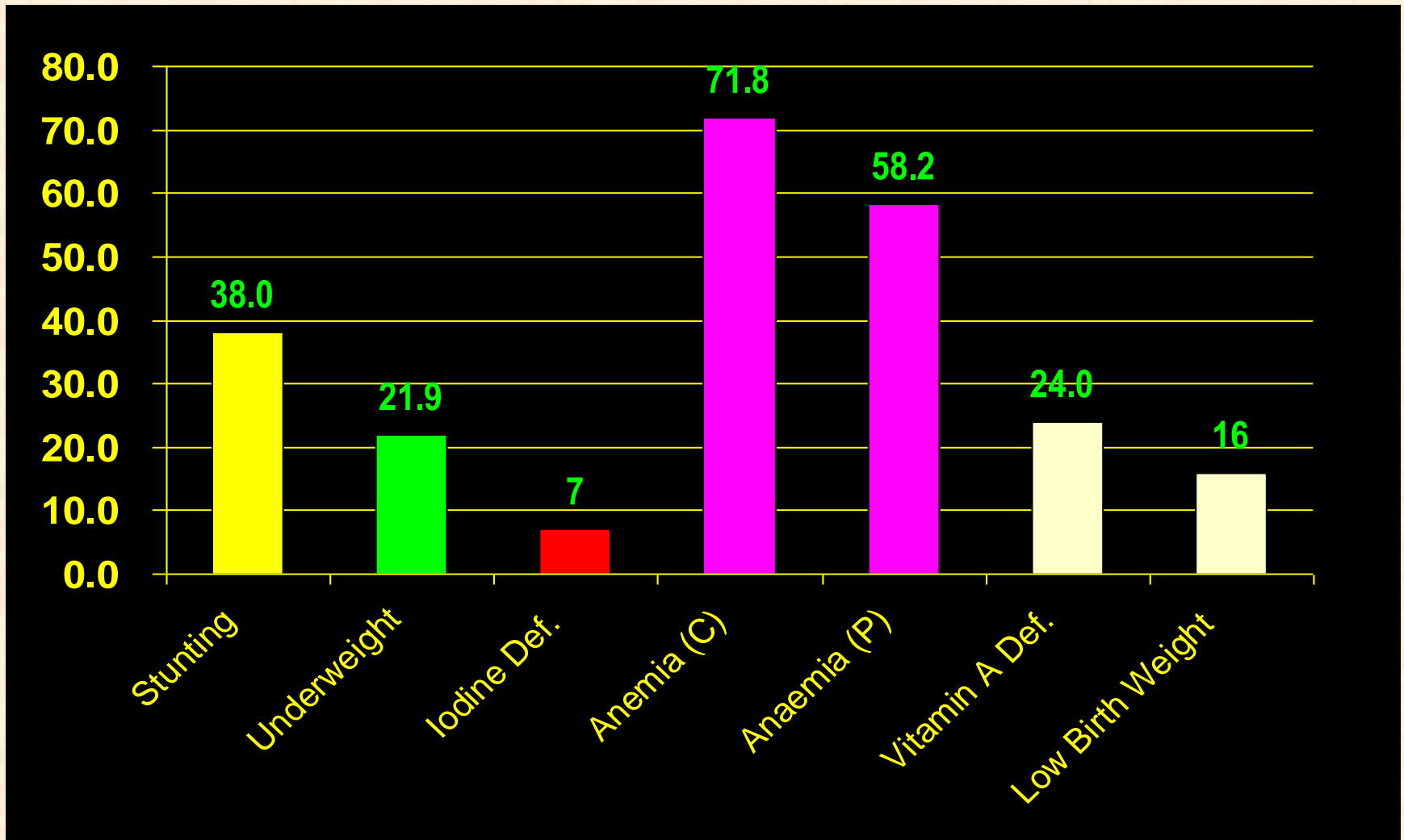
- South Africa began fortification 2003
 - 1.5mg/Kg wheat flour, 2.21mg/Kg maize meal);
 - 22 large millers account for 85% maize, 17 mills 95% wheat
- Neural Tube Defects fell 30.5%
- Benefit:cost 46:1 (hospital cost saved)

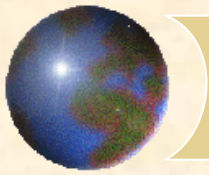
Sayed et al,

Birth Defects Research, 2008



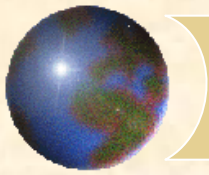
Tanzania – Nutrition Related Indicators





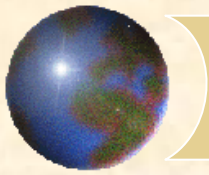
Cost Benefit Analysis Steps followed (1)

- ✦ Identify the target populations
- ✦ Determine economic losses due to micronutrient deficiencies for each group: Iron, Folic Acid, vitamin A
- ✦ Summarize the losses
- ✦ Estimate the potential reduction in deficiency due to food fortification



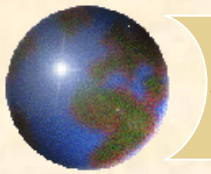
Cost Benefit Analysis Steps followed (2)

- ✚ Select vehicles for fortification
 - ▣ Wheat flour, Maize flour, Vegetable oil
- ✚ Determine the costs of food fortification for each food vehicle
- ✚ Calculate the financial benefit of the food fortification intervention by estimating the losses prevented and subtracting the food fortification costs



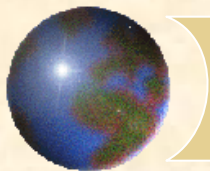
Losses due to micronutrient deficiencies

- ❖ Iron Deficiency Anemia
 - ❑ Children < 6 years (death)
 - ❑ Perinatal and women in childbirth (death)
 - ❑ Adults (lost productivity)
- ❖ Folic Acid Deficiency
 - ❑ Neural Tube Birth Defects
- ❖ Vitamin A deficiency (deaths < 5 years)



The Human Costs

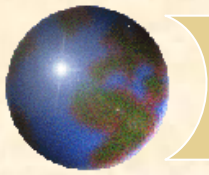
Cause of death	Annual Number	Micronutrient Deficiency
Perinatal due to anemia	18,683	Iron
Maternal mortality due to anemia	1,602	Iron
Neural Tube Birth Defects	3,308	Folic Acid
Children < 5years lack of Vitamin A	5,190	Vitamin A
Total	28,783	



Summary of economic losses

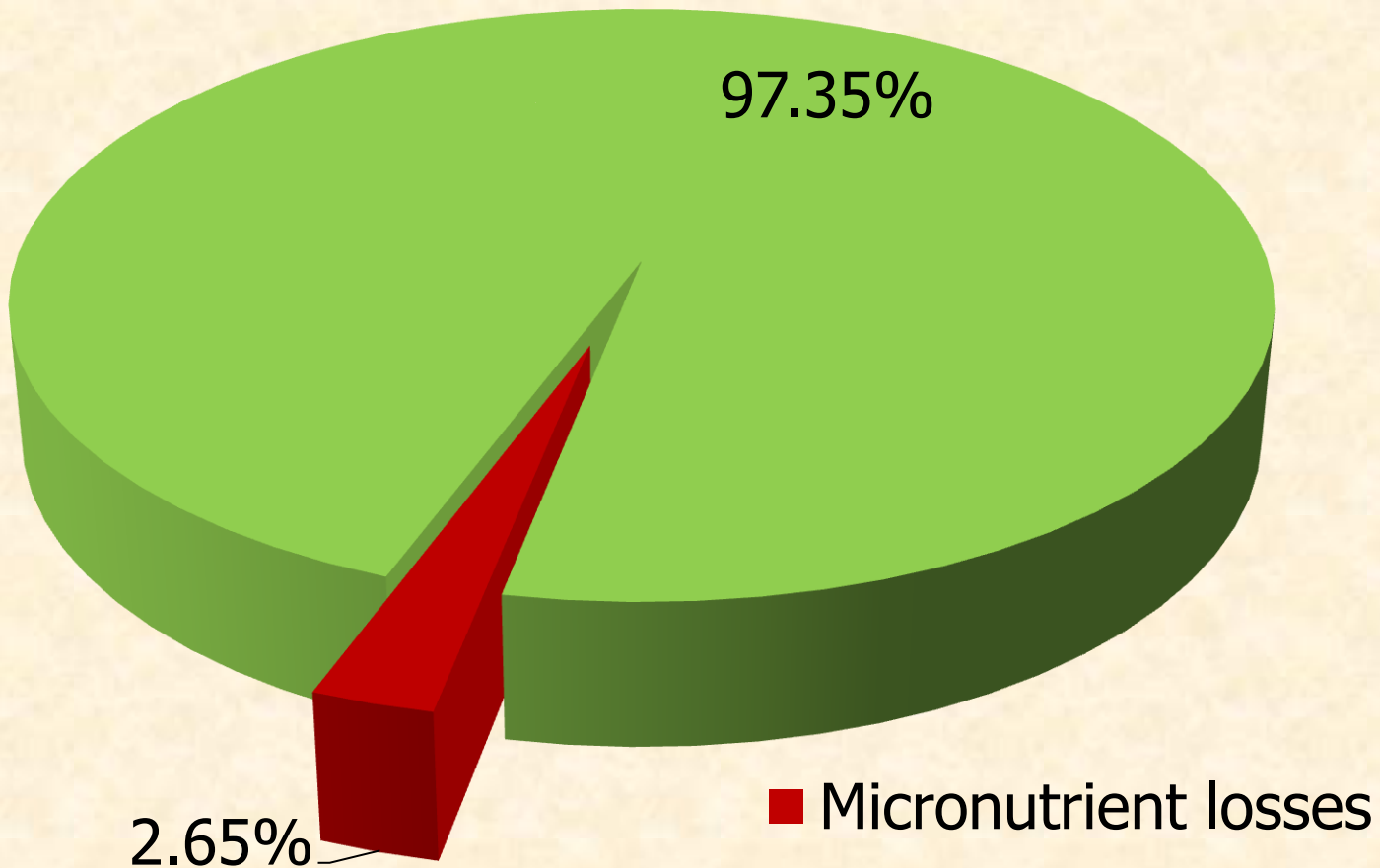
Group	Estimated Losses	% of Total	Projected % Reduction	Economic Losses Averted (benefits)
Anemia				
Perinatal	\$116,324,201	22%	20%	\$23,264,840
Children	\$169,163,266	33%	20%	\$33,832,653
Adults -- Productivity loss	\$167,125,419	32%	30%	\$50,137,626
Adults -- Maternal mortality	\$4,588,867	1%	30%	\$1,376,660
Total Anemia	\$457,201,753	88%		\$108,611,779
Neural Tube Defects				
Deaths	\$20,596,288	4.0%	30%	\$6,178,887
Survivor Lost Productivity	\$6,621,570	1.3%	30%	\$1,986,471
Care & Welfare	\$1,205,300	0.2%	30%	\$361,590
Total NTD	\$28,423,158	5.5%		\$8,526,947
Sub Total	\$485,624,912	94%		\$117,138,727
Vitamin A deficiency	\$32,314,008	6%	30%	\$9,694,202
TOTAL	\$517,938,919	100%		\$126,832,929

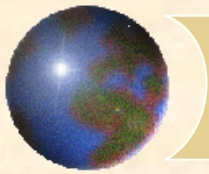
*** Value of lost subsistence agriculture production probably understated ***



Economic losses in Context

...annual % of GDP





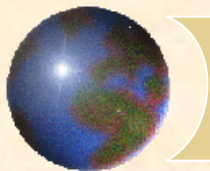
Food Fortification Costs

⊕ Food vehicles:

- ⊠ Wheat flour
- ⊠ Maize flour
- ⊠ Vegetable oil

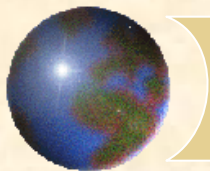
⊕ Types of Costs

- ⊠ Mill Fortification
- ⊠ Legal, Regulatory & Food Control
- ⊠ Social Marketing
- ⊠ Management & Monitoring



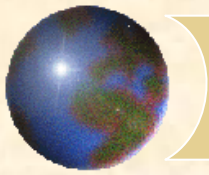
Food Fortification Costs Included

Component	Start-up Costs	Recurring Costs
Mill enrichment	<ul style="list-style-type: none">- Equipment- Installation and training	<ul style="list-style-type: none">- Premix Cost to Distribution Point- Domestic Storage/Distribution- Taxes & Duties- Processing & Certification Costs- Mill Process Labor- Equipment Maintenance- QA: Spot Tests Reagents & labor- Incremental Packaging Cost- Management Overhead- Miller's Margin
Legal, Regulatory and Food Control	<ul style="list-style-type: none">- Sampling, Testing and Enforcement Protocols- Inspector Training- Technician Training- Lab Equipment/Renov.	<ul style="list-style-type: none">- Inspector Salaries- Sampling Visit Transport- Test Materials and reagents- Shipping to Lab- Management
Other	<ul style="list-style-type: none">- Social Marketing- Management	<ul style="list-style-type: none">- Monitoring and Evaluation- Program Management



Food Fortification Costs (e.g., maize)

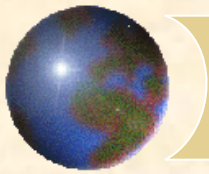
Component	Start-up Costs	Recurring Costs	10 year \$ million	Amortized annual	Cost per MT flour
Mill enrichment	\$18,000	\$9,143,000	\$91,451,000	\$9,145,000	\$4.35
Legal, Regulatory and Food Control	\$89,000	\$ 20,000	\$ 291,000	\$ 29,000	\$0.01
Social Marketing	\$372,000		\$ 372,000	\$ 37,000	\$0.02
Monitoring & program management	\$240,000	\$ 20,000	\$ 440,000	\$ 44,000	\$0.02
Total	\$718,000	\$9,183,000	\$92,553,000	\$9,255,000	\$4.41



Food Fortification Costs

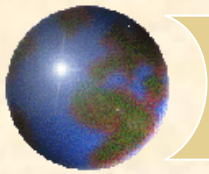
(overall annual average costs)

Food vehicle	Annual costs: US\$
Wheat flour	3.7 million
Maize flour	9.3 million
Vegetable oil	0.9 million
TOTAL	13.8 million



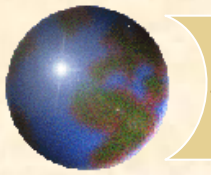
Coverage and consumption levels

Food vehicle	Estimated Population Coverage	Estimated Daily Consumption
Wheat flour	14 million, mostly adults	110 gm
Maize flour	23 million	300 gm
Vegetable oil	30 million	30 gm



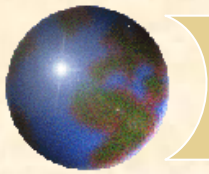
Who pays? Typical Distribution

Expense item	Government/ Development Partners*	Consumer/ Industry
Food enrichment Vitamin & mineral premixes	Government – Favorable tax treatment	Industry – passed along to consumer
Regulations & food control	DP – Start-up Government - Ongoing	Industry – own food monitoring
Social marketing & communications		
Monitoring & evaluation, Program management		



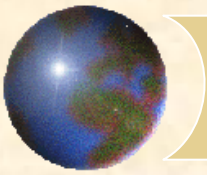
Is it affordable? Annual cost/person

Component	Serving Size (gm)	Cost TZS	Cost USD
Wheat flour	110	354	\$ 0.26
Maize flour	300	647	\$ 0.48
Vegetable oil	30	24	\$ 0.02
Total		1,025	\$ 0.76



Summary of Cost-Benefit Analysis

COMPONENT	Amount	Percent of GDP
Benefits: Annual averted attributable losses <u>probably underestimated</u>	\$126.8 million	0.65%
Costs: Annualized costs Enriched Food Investment	\$ 13.8 million	0.07%
NET ANNUAL BENEFIT	\$113.0 million	0.58%
Estimated lives saved annually	6,767	



Summary of Cost-Benefit Analysis

- Benefit-Cost Ratio: 8.22-1
- means each 1000 shillings spent on food fortification generates 8220 shillings in net savings



