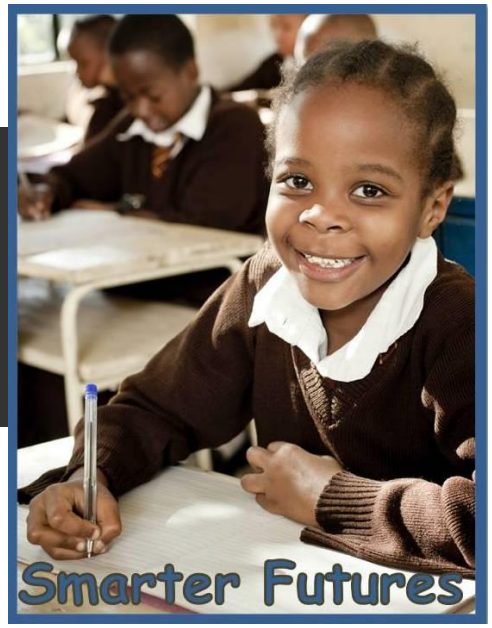
Economic Consequences of Deficiencies & Potential Benefits



Quentin Johnson, Coordinator
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Smarter Futures

With thanks to Jack Bagriansky

Food Fortification Initiative
Enhancing Grains for Healthier Lives

AkzoNobel

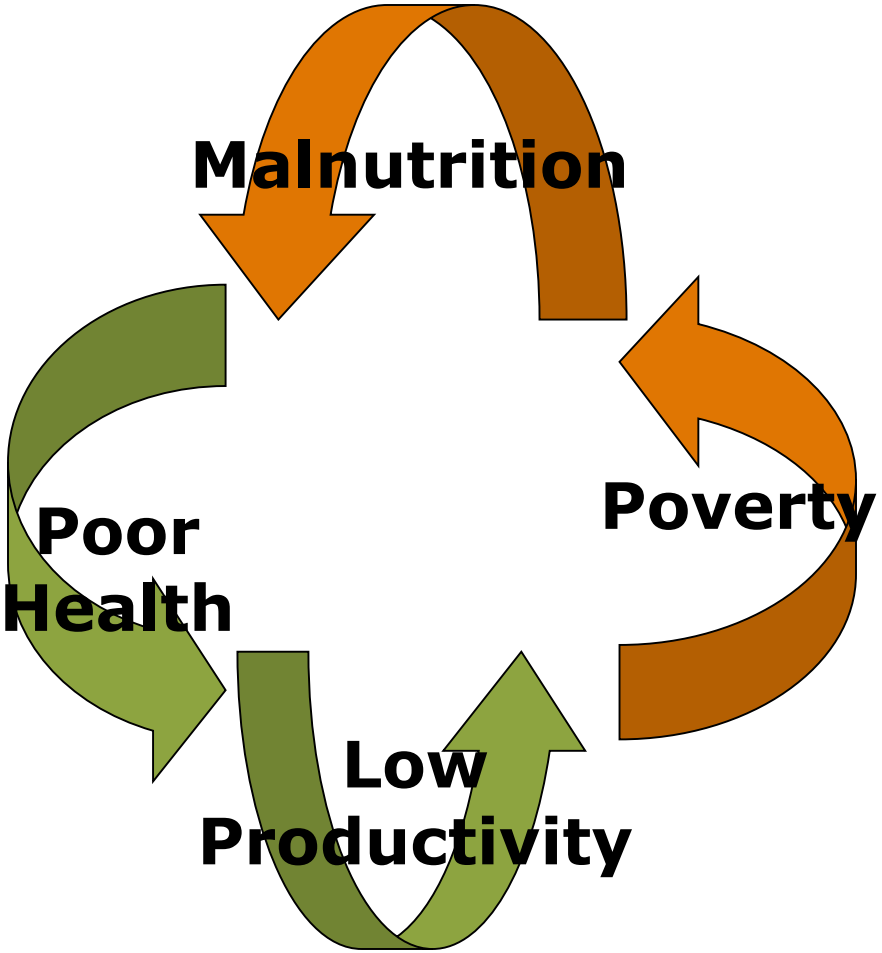
Helen Keller
INTERNATIONAL

IFSBH

Ministerie van Buitenlandse Zaken

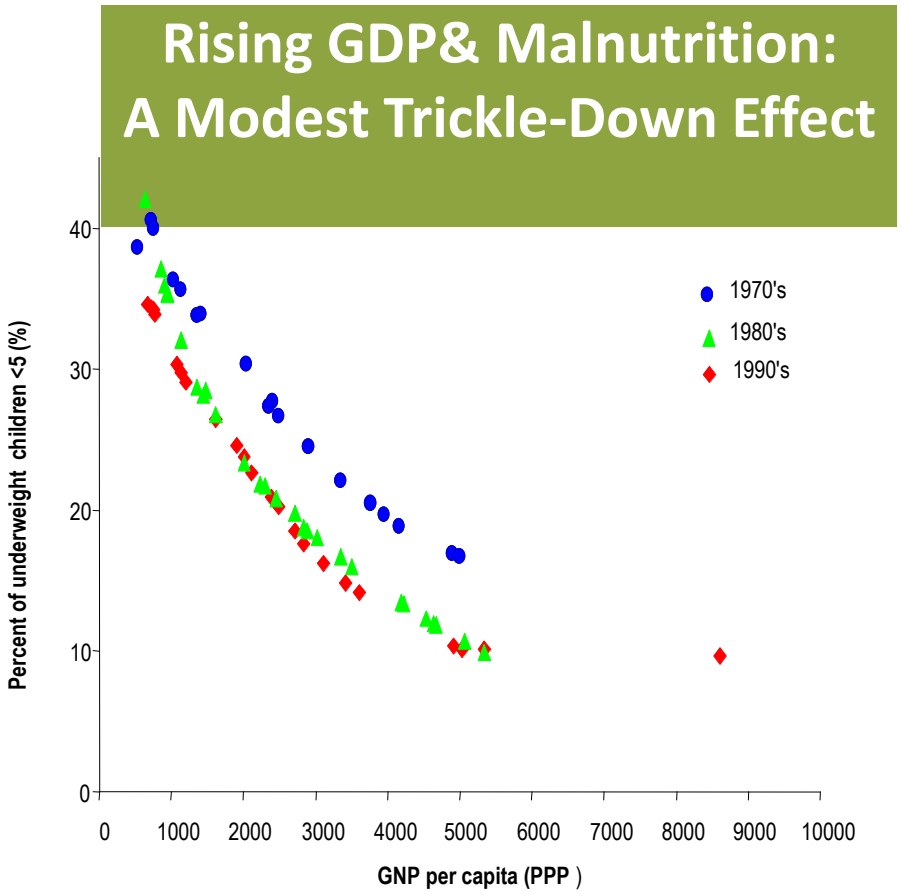
Malnutrition: A Cause or Consequence of Poverty?

- People are Basic Unit of Economic Growth
- Association of poverty and malnutrition.
  - Inverse relation of GDP & Malnutrition
- Two-way Dynamic
  - Poverty is not simply root cause of hunger.
  - Malnutrition causes and reinforces poverty.



Economic Growth Is Not Enough

- More purchasing power and more food reduces malnutrition but…
  - … doubling GDP reduced malnutrition only 2% from 25% to 23%
- Public investment in nutrition interventions can close this gap of GDP growth and improved nutrition.



Source: Alderman (2004)

Vitamin and Mineral Deficiency Contributes to:

- More than one-third of all ***deaths in children*** under the age of 5
- Stunting of an estimated ***195 million children*** under age 5 in developing countries
- Undeveloped ***cognitive capacity***, productivity and earning potential

istockphoto

Tracking Progress on Child and Maternal Nutrition. United Nation's Children's Fund (UNICEF) November 2009 New York City

Cost-effective Investment

Leading economists, meeting every four years, ranked micronutrient interventions among their top three recommendations in 2004, 2008, and 2012.

"One of the most compelling investments is to get nutrients to the world's undernourished. The benefits from doing so – in terms of increased health, schooling, and productivity – are tremendous."

Nobel laureate economist Vernon Smith, part of 2012 Copenhagen Consensus Expert Panel

http://www.copenhagenconsensus.com/projects/copenhagen-consensus-2012/outcome

The Copenhagen Consensus: Highest Benefit Cost Ratio

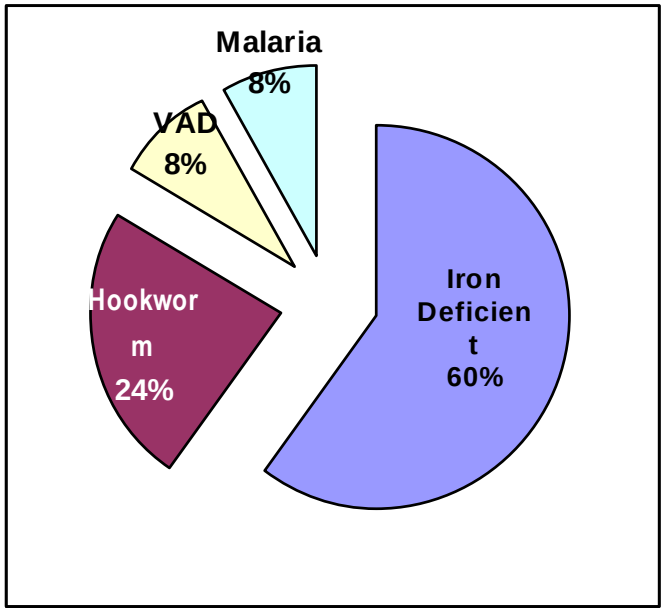
	Solution	Challenge
1	Micronutrient supplements for children (A & Zn)	Malnutrition
2	The Doha development agenda	Trade
3	**Micronutrient fortification**	Malnutrition
4	Expanded immunization coverage for children	Diseases
5	Biofortification	Malnutrition
6	Deworming, other nutrition programs in school	Malnutrition
7	Lowering the price of schooling	Education
8	Increase and improve girl's schooling	Women
9	Community-based nutrition programs	Malnutrition

Nobel Prizewinning Economists: Finn Kydland, Robert Mundell, Douglass North, Thomas Schelling, Vernon L. Smith

Iron Deficiency as Cause of Anemia

- How much anemia is iron deficiency related?
  - "anemia prevalence can generally be taken as indicator of extent and trends of iron deficiency." (WHO)
- Regional Situation
  - No Malaria
  - Limited VAD
  - Limited Hookworm and parasites
- Provisional Estimate of Iron deficiency as cause of anemia: 90%

Global Causes of Anemia (WHO)



Costs of Anemia

Anemia leads to:

- 17% ***lower productivity*** in heavy manual labor
- 5% ***lower productivity*** in other manual labor
- Estimated 2.5% loss of earnings due to ***lower cognitive skills***

The Economics of Food Fortification (2006) by Sue Horton
Photo from The Lewis Family Blog http://lewisesinchina.blogspot.com/2008/04/trek-on-yellow-mountain.html

Example: Summary 10-Year Baseline of Economic Losses:

	Iron Deficiency Anemia				Folic Acid Deficiency			
Year	Perinatal Mortality Future Productivity	Adult Anemia Current Productivity	Childhood Anemia Future Productivity	Total IDA	Death & Disabilty Future Productivity	Medical & Welfare Current Expenses	Total Folic Acid	Total Projected Damage
	$000,000/yr	$000,000/yr	$000,000/yr	$000,000/yr	$000,000/yr	$000,000/yr	$000,000/yr	$000,000/yr
2009	$ 1.57	$ 76.61	$ 4.77	$ 82.95	$ 1.39	$ 0.34	$ 1.73	**84.7**
2010	$ 1.58	$ 77.37	$ 4.82	$ 83.78	$ 1.40	$ 0.34	$ 1.75	**85.5**
2011	$ 1.60	$ 78.15	$ 4.87	$ 84.62	$ 1.42	$ 0.35	$ 1.77	**86.4**
2012	$ 1.62	$ 78.93	$ 4.92	$ 85.46	$ 1.43	$ 0.35	$ 1.78	**87.2**
2013	$ 1.63	$ 79.72	$ 4.97	$ 86.32	$ 1.45	$ 0.35	$ 1.80	**88.1**
2014	$ 1.65	$ 80.52	$ 5.02	$ 87.18	$ 1.46	$ 0.36	$ 1.82	**89.0**
2015	$ 1.67	$ 81.32	$ 5.07	$ 88.05	$ 1.48	$ 0.36	$ 1.84	**89.9**
2016	$ 1.68	$ 82.13	$ 5.12	$ 88.93	$ 1.49	$ 0.37	$ 1.86	**90.8**
2017	$ 1.70	$ 82.96	$ 5.17	$ 89.82	$ 1.51	$ 0.37	$ 1.87	**91.7**
2018	$ 1.72	$ 83.79	$ 5.22	$ 90.72	$ 1.52	$ 0.37	$ 1.89	**92.6**
	$ 16.4	**$ 801.5**	**$ 49.9**	**$ 867.8**	**$ 14.5**	**$ 3.6**	**$ 18.1**	**885.9**
	1.9%	90.5%	5.6%	98.0%	1.6%	0.4%	2.0%	

Average Premix Cost for 1 Metric Ton

One metric ton of flour is about 2,200 pounds, as pictured here. FFI photo.

Wheat Flour:
US$ 3 to fortify with iron, folic acid, and other B vitamins

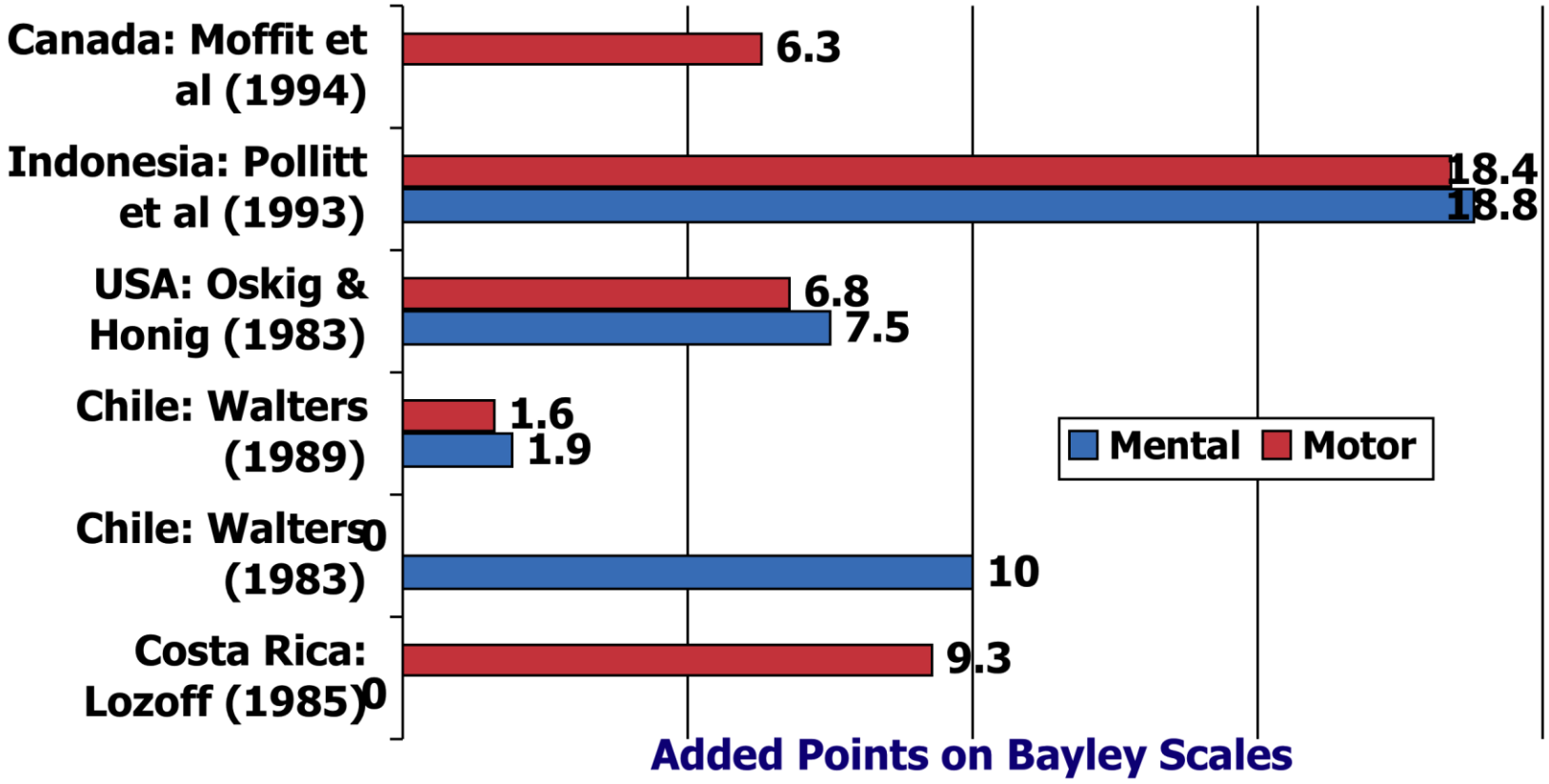
Ground Maize:
US$ 4 to fortify with iron, zinc, vitamin A, folic acid, and other B vitamins

Rice:
US$ 6 to US$ 20 to fortify with iron, zinc, vitamin A, folic acid, and other B vitamins

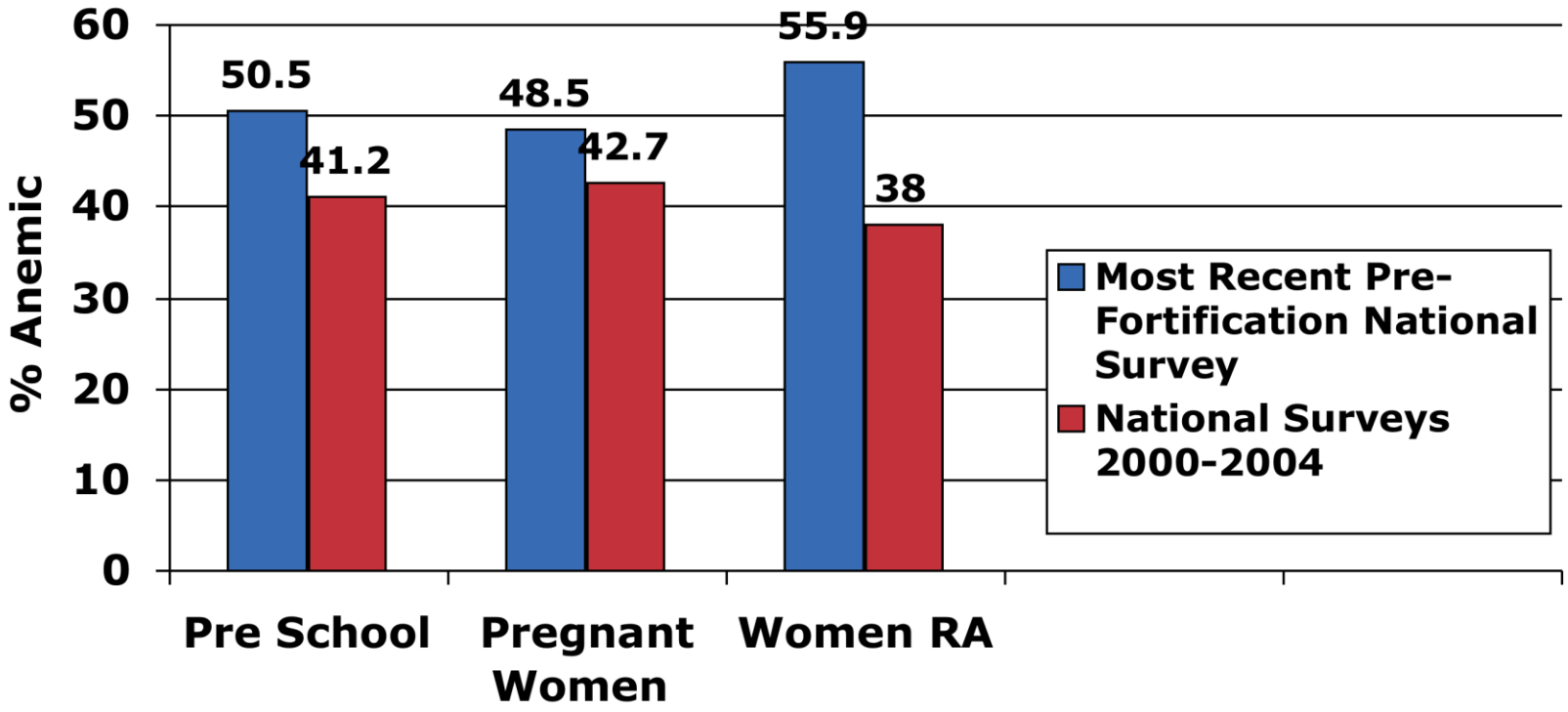
Examples of Fortification Impact

- Cognitive Impact of iron on children
- Impact of Folic Acid fortification in Canada Two-way Dynamic
-
  - Poverty is not simply root cause of hunger.
  - Malnutrition causes and reinforces poverty.

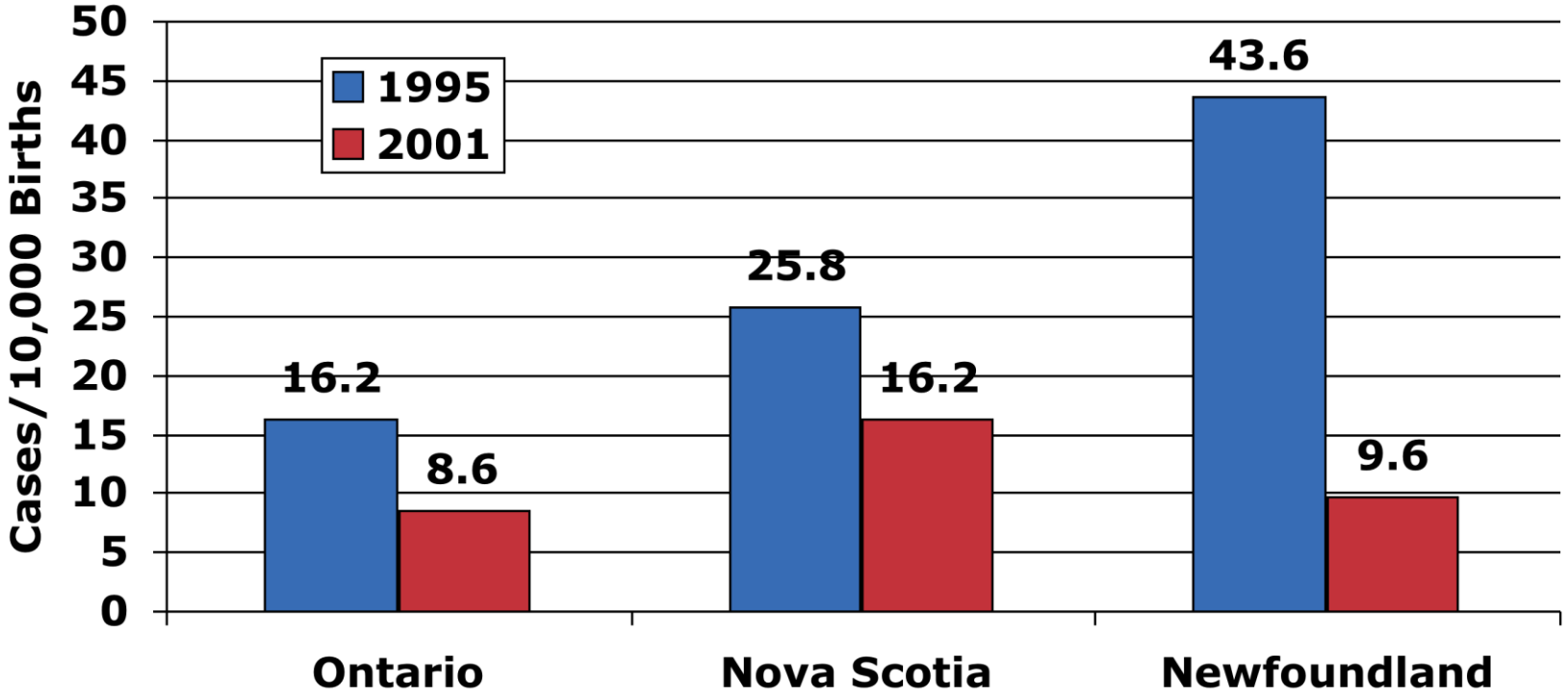
Behavioral & Cognitive Impact on Children



Oman: Pre-Post Fortification National Decrease in Anemia 18-32%

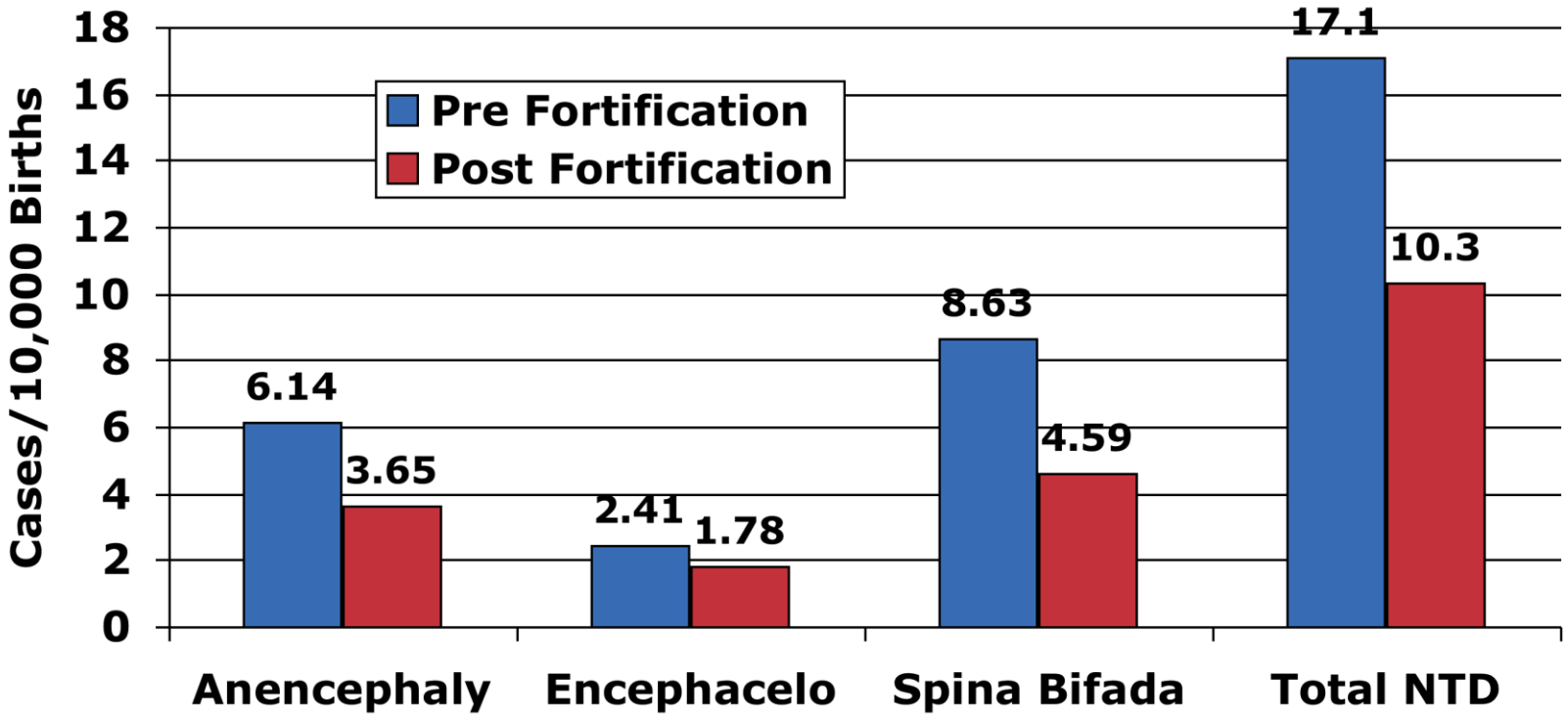


Canada Folic Acid Fortification: 37-78% Decrease in NTDs and Cost savings of about $1 million annually



The number of specialized operations on children born with NTDs in Canada at Toronto Sick Childrens Hospital has dropped from 52 per year before folic acid fortification to 12 per year

Chile Folic Acid Fortification: 40% Decrease in NTDs



Cost:Benefit Ratio for Preventing Spina Bifida

1:12	Chile
1:30	South Africa
1:48	United States

Llanos, A., et. al., Cost-effectiveness of a Folic Acid Fortification Program in Chile. Health Policy 83 2007:295-303.
Sayed, A., et.al., Decline in the Prevalence of Neural Tube Defects Following Folic Acid Fortifcation and Its Cost-Benefit in South Africa. Birth Defects Research 82 2008:211-216.
Grosse, Scott, et. al., Reevaluating the Benefits of Folic Acid Fortification in the United States: Economic Analysis, Regulation, and Public Health. American Journal of Public Health 95 2005:1917-1922.