Economic Impact of flour fortification

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Fortification originated in industrialized countries
But recent progress has been primarily in developing world
One of the highest development priorities!
Industrialized countries have been left behind
Strong economic case for additional investment
Progress of fortification worldwide - 1

• Fortification of flour in UK began 1942 (1949 became mandatory), US 1941 (voluntary), Canada 1949 (mandatory), Australia (1991)
• Addition of folic acid in 1996 (US and Canada)
• Salt iodization began in US 1920’s, Switzerland 1922
• Fortification of dairy and/or oils with vitamin D in US, Canada, UK, Australia, Netherlands, New Zealand, Portugal
Progress of fortification worldwide - 2

• More recently, developing countries have overtaken industrialized countries in extent of fortification: 74 countries now have mandatory flour fortification, 5 voluntary

• Deficiencies have re-emerged in industrialized countries (e.g. iodine deficiency in Australia and New Zealand): 120 countries participating in Universal Salt Iodization

• Only 3 industrialized countries require folic acid in flour, but most developing countries now do so
Fortification – top priority for developing countries

Copenhagen Consensus 2008 – 8 top economists, including 5 Nobel laureates
Copenhagen Consensus results

• 2004: providing micronutrients was ranked #2 (second only to fighting HIV-AIDS)
• 2008: providing micronutrients was ranked #1 (supplements) and #3 (fortification)
• 2012: providing micronutrients (with other interventions for preschoolers) ranked #1
Costs of deficiency: iron

• Iron: in developing countries anemia is associated with
  – 5% lower productivity (light manual labour)
  – 17% lower productivity (heavy manual labour)
  – 4% lower productivity (other work) – related to one-half standard deviation LOWER score on cognitive tests (7-8 IQ points)
Costs of deficiency: folate

• Human costs are paramount;
• Economic costs also large: Yi et al (2011) review:
  – Annual direct cost/patient/year €43,000 in 2003 for NTDs and €12-54,000 for spina bifida in US
  – Spain annual medical costs/patient/year €3,500 spina bifida
  – Other costs for spina bifida are at least twice this (special education, lost productivity of individual)
  – Parents also less able to work, lose additional income
Costs of deficiency: iodine

• Mild iodine deficiency: IQ loss of 1-2 points
• Moderate deficiency: IQ loss of 2-3 points
• Severe: IQ loss of 13.5 points
• Lower IQ is associated with lower years of schooling completed, and lower earnings (Zimmermann et al)
• Definitions: Mild deficiency: median urinary iodine concentration (UIC) 50-99 µg/L; moderate deficiency: UIC 20-49 µg/L; severe: UIC <20 µg/L
Costs of fortifying

• Fortification costs are pennies per person
• Wheat flour fortification costs (depending on exact micronutrient composition, amount consumed) could cost €0.16/person/year
• US cost (folic acid) in 1990’s was €0.02-€0.03/person/year
• Salt iodization costs of the order of €0.04/person/year
Benefit: cost of fortifying

• Studies in 6 countries (US, Netherlands, Australia, New Zealand, Chile and South Africa) suggested in all but one case, fortification was cost-saving, even if only health costs are considered (Yi et al, 2011)

• B:C ratio for 10 developing countries, for iron fortification was 8.7:1 (Horton and Ross, 2003)

• B:C ratio for salt iodization (rough calculation for developing world) 30:1 (Horton et al, 2008)
Anemia, non-pregnant women

Data: Micronutrient Initiative 2009
Anemia, preschool children

Data: Micronutrient Initiative 2009
NTDs per 10,000 births

Data: Eurocat, for 2009
Mild iodine deficiency

Data: Iodine Nutrition Scorecard
Benefits of reducing deficiencies: iron

• Example: UK has anemia rates at least 5 percentage points lower than neighbours (non-pregnant women)
• If productivity benefit is 4% for reduction in anemia, women are 46% of the labour force, the labour share of GDP is 30%, GDP/capita is around €28,000, then benefit is around €8/person/year
• Compares to cost of < €0.16/year
• Excludes benefit of gain of 0.5 IQ points per child
Benefits of reducing deficiencies: folate

• Cost of fortification for Netherlands estimated as €312,000 to €686,000 in 2005 (Jentink et al 2008)
• Compared to lifetime cost per child born with NTD of €128,774 (discounted at 4%)
• 148 children per year born with NTD’s
• Even with only 7 cases/year averted by fortification (conservative), is cost-saving; NTD rates in South Africa fell 30% with fortification
Data

• Eurocat (European surveillance of congenital abnormalities), data for 2009


• Micronutrient Initiative (2009). Investing in the future: a united call to action on vitamin and mineral deficiencies. Ottawa: MI
References 1

References 2
