

# Health & Economic Impact of Vitamin & Mineral Malnutrition in East Asia

Karen Codling & Jacky Knowles  
UNICEF East Asia and Pacific Regional Office

**First FFI Regional Flour Fortification Workshop  
for East and South-East Asia**  
Kuala Lumpur, Malaysia  
18-23 August 2007



# The Global Burden of V&M Malnutrition

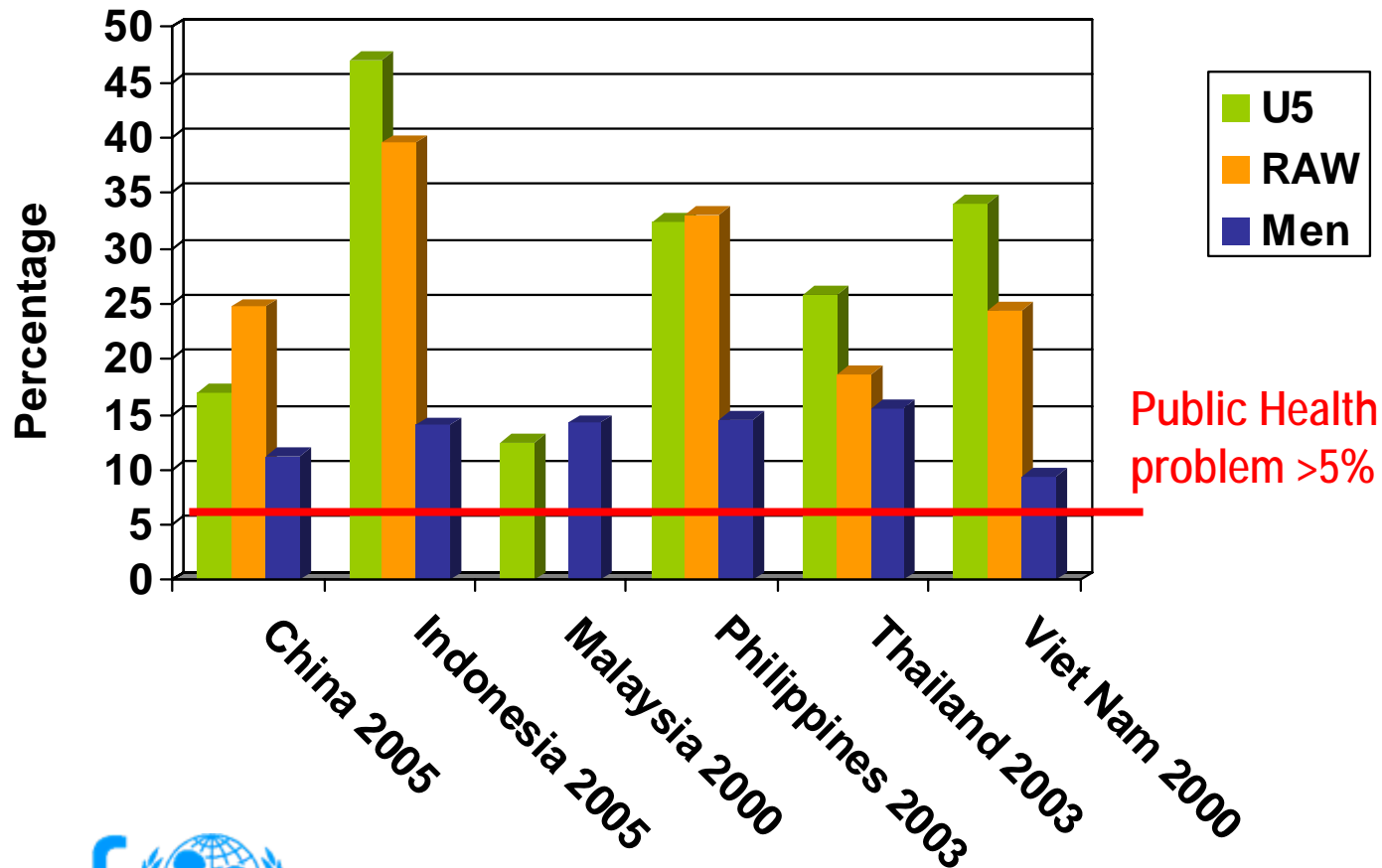
- Vitamin A deficiency
  - 25% of under 5 children
  - 18% of women
- Anaemia (iron deficiency)
  - 37% of the total population
  - Highest in under 5 children and reproductive-age women
- Iodine deficiency
  - 35% of the total population
- Zinc deficiency
  - 20% of the total population

Deficient in some countries

- Thiamine
- Riboflavin
- Vitamin D
- Vitamin C

**Often these deficiencies co-exist in the same individuals, ie. people have multiple deficiencies**

# Levels of anaemia in East Asia: young children, reproductive age women & men

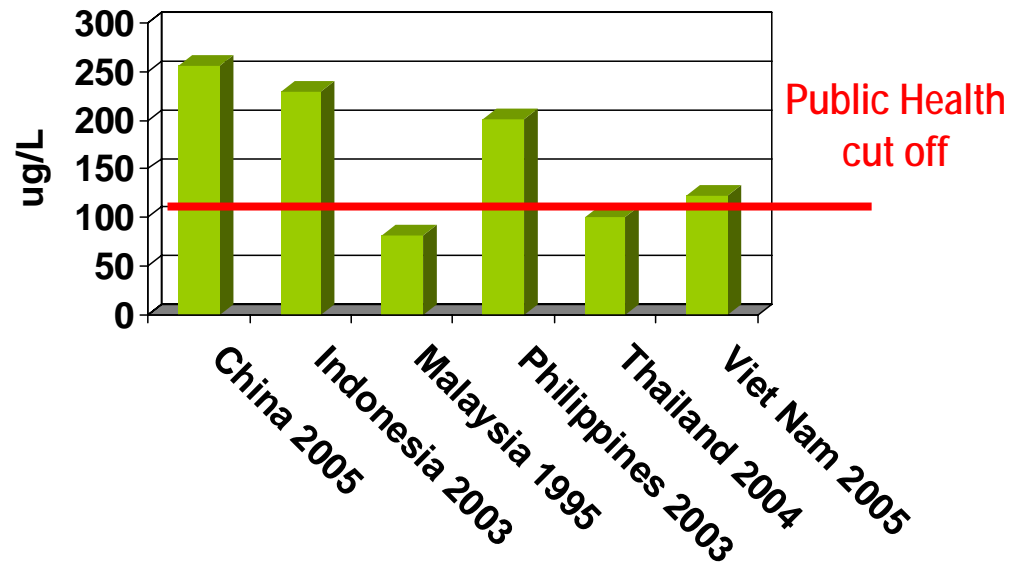


Public Health  
problem >5%

# Vitamin A and Iodine Deficiency in East Asia

- Very few countries have national data on the extent of vitamin A deficiencies
- Indonesia, Philippines and Viet Nam have national supplementation programmes for vitamin A
- Urinary iodine levels generally indicate adequate intake
- In particular in countries with universal iodized salt programmes

**Median Urinary Iodine in School Children**



NB. Thailand data is for pregnant women

# Impact of VMDs: Vitamin A

- Link between vitamin A and mortality due to **measles**, also **diarrhoea** and **other infectious diseases**
- “children 6-59 months old living in vitamin A deficient areas who received vitamin A supplements were on average **20-30%** less likely to die from any cause than children not receiving supplements”
- Increased complications from **measles**
- Possible link with **malaria** mortality and all-cause **maternal mortality**
- **Night blindness** is a reversible consequence of VAD in pregnant women
- VAD is a significant preventable cause of **childhood blindness** in developing countries, which is in turn a deterrent to education
- **No other productivity impacts**

# Impact of VMDs: iron and anaemia

- As a risk factor for mortality estimated to contribute **591,000 perinatal deaths** and **115,000 maternal deaths** globally.
- When combined with the direct impacts of IDA deaths total **841,000 annually**
- Link between pregnancy anaemia and **pre-term birth & LBW**
  - ▶ childhood mortality and morbidity
- Iron deficiency predisposes people to disease through reduced **immune function**
- Iron deficiency directly causes decreased oxygen delivery to muscles and the brain ▶ impaired aerobic capacity and altered **child development**
- Apparent causal relationship between IDA in early childhood and **intelligence in mid-childhood**. Impairments may only be partially reversible in later life.
- Anaemia is associated with **reduced productivity**, in particular manual labour (approx 1.5% less output for every 1.0% that Hb is below standard).

# Impact of VMDs: Iodine

- Maternal iodine deficiency associated with increased risk of **perinatal mortality, childhood mortality, stillbirths, miscarriages, thyroid disorders** and **cretinism**
- In children iodine deficiency causes **deaf mutism** and **mental retardation**
- Average IQ is **13.5 points lower** in iodine-deficient communities than iodine-sufficient communities.
- Future productivity losses due to iodine deficiency are equal to about **0.23% of GDP**

*Metaanalysis on Iodine Research*

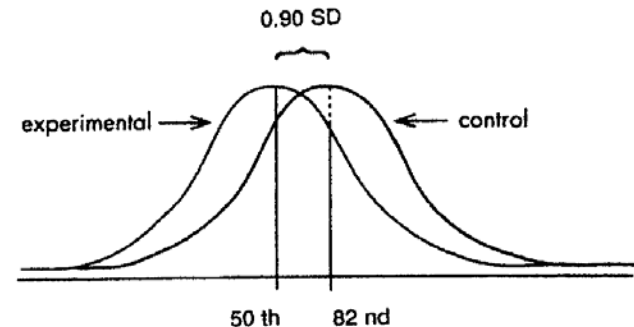


Figure 2. Average effect size in standard deviation units (50th, 82nd = percentiles of noniodine-deficient group distribution).

# Impact of VMDs: Zinc

- Apparent increased **mortality** risk of LBW babies if zinc deficient
- Increased mortality from **diarrhoea**
- Increased severity of **diarrhoea, pneumonia and malaria**
- **No cognitive impacts**
- Associated with **stunting** which affects **adult productivity**; 1% loss in adult height as a result of childhood stunting associated with 1.38% loss in productivity

# Impact of VMDs: Folate

- Increased risk of **pre-term delivery** and **LBW** ► child mortality
- Prevents **congenital malformation**, particularly of newborn central nervous system (neural tube defects)
- Contributes to **anaemia**



# Based on current prevalence global levels....

Vitamin A deficiency	<ul style="list-style-type: none"><li>▪ 9% of child deaths</li><li>▪ 13.2% of maternal deaths</li></ul>
Anaemia in pregnancy	<ul style="list-style-type: none"><li>▪ 18.4% of maternal deaths</li><li>▪ 23.5% of perinatal deaths</li></ul>
Iodine deficiency	<ul style="list-style-type: none"><li>▪ 40 million newborns at risk of mental retardation</li></ul>
Zinc deficiency	<ul style="list-style-type: none"><li>▪ 5.5% of child deaths</li></ul>
Folate deficiency	<ul style="list-style-type: none"><li>▪ 240,000 cases of neural tube defects</li></ul>

# Productivity Losses Associated with VMDs (percent)

Type of VMD	Current Losses (Manual labour)	Future Losses (Child Cognitive Impairment)
Iron deficiency	17 (heavy labour) 5 (blue colour)	4
Iodine deficiency	n/a	10
Vitamin A deficiency	n/a	n/a

# Profiles calculations

- *Profiles* is a tool for nutrition policy analysis and advocacy.
- It uses the best available nutritional, demographic, economic and other data together with relationships from the scientific literature to **quantify the impact of nutritional problems** on current human performance, health, fertility and survival.
- The *Profiles* exercise was used to demonstrate the potential future costs to society and government if nothing is done to address the current problem of anaemia in the six countries represented here.

# Profiles calculations

- **Maternal and perinatal deaths:**
  - MMR, perinatal death rate, number of births
  - Prevalence of anaemia & estimated proportion of anaemia from iron deficiency
  - Relative risk of maternal/perinatal death with an increase in 1g/dl.
- **Value of current and future lost productivity:**
  - Prevalence of anaemia for working age men and women (and children 0-14 years)
  - Total wages, average yearly wage & manual labour as a % of wages
  - Estimated reduction in manual wages due to anaemia (men and women)
  - % economic activity rate (men and women)
  - Proportion reduction in future productivity due to childhood anaemia
  - Lifetime discounting factor (calculated from a standard survival function, life expectancy, the social discount rate, and the ages of workforce entry and exit).

# Impact of iron deficiency, anaemia and folic acid deficiency (per year)

Country (Population in millions)	Maternal deaths (Number)	Perinatal deaths (Number)	Current productivity lost (US\$ million)	Future productivity lost (US\$ million)	Total productivity lost as % of GDP	Estimated number of NTDs (2.45/1,000 LB)
China (1,322)	835	96,841	6,437	1,482	0.3	80-100,000
Indonesia (235)	1,395	21,260	1,488	863	0.6	11,013
Malaysia (25)	25	1,731	345	104	0.3	1,340
Philippines (91)	644	11,429	381	248	0.5	4,944
Thailand (65)	30	1,963	471	189	0.3	2,472
Viet Nam (86)	140	4,513	184	80	0.5	4,038

# Total costs to the region

- Over **3,000** maternal deaths
- Almost **140,000** perinatal deaths

Peru



500 dead, 1,000 missing

- Over **US\$ 9 billion** in lost productivity now
- Potential future losses of almost **US\$3 billion**
- Total productivity losses of **US\$12.3 billion**

## What is the cost of fortification?