Hunger in a World of Plenty and the Role of Food in the Fight against HIV/AIDS

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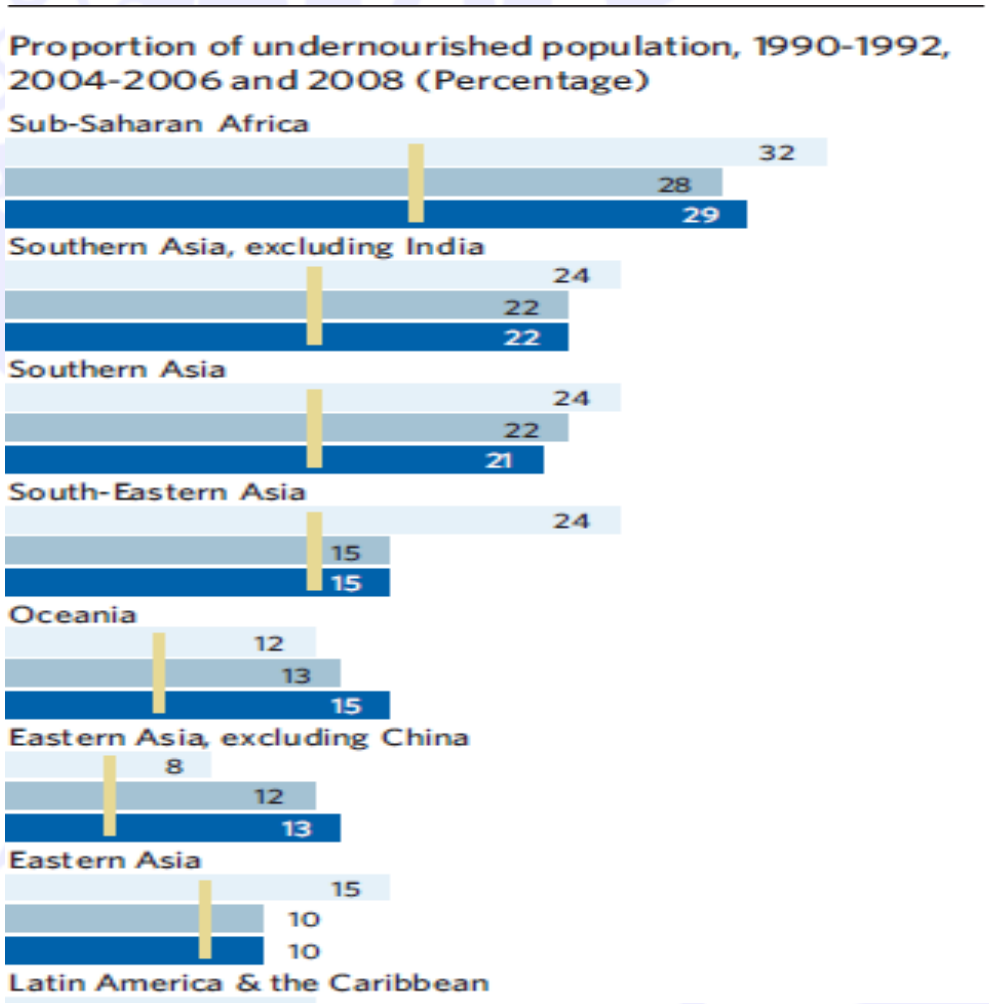
Millenium Development Goals

MDG-1	“eradicate extreme poverty and hunger”
MDG-2	“achieve universal primary education”
MDG-3	“promote gender equality”
MDG-4	“reduce child mortality”
MDG-5	“improve maternal health”
MDG-6	“combat HIV/AIDS, malaria and other diseases”
MDG-7	“ensure environment sustainability”
MDG-8	“global partnership for development”

MDG 1 Target: Halve, between 1990 and 2015, the proportion of people who suffer from hunger



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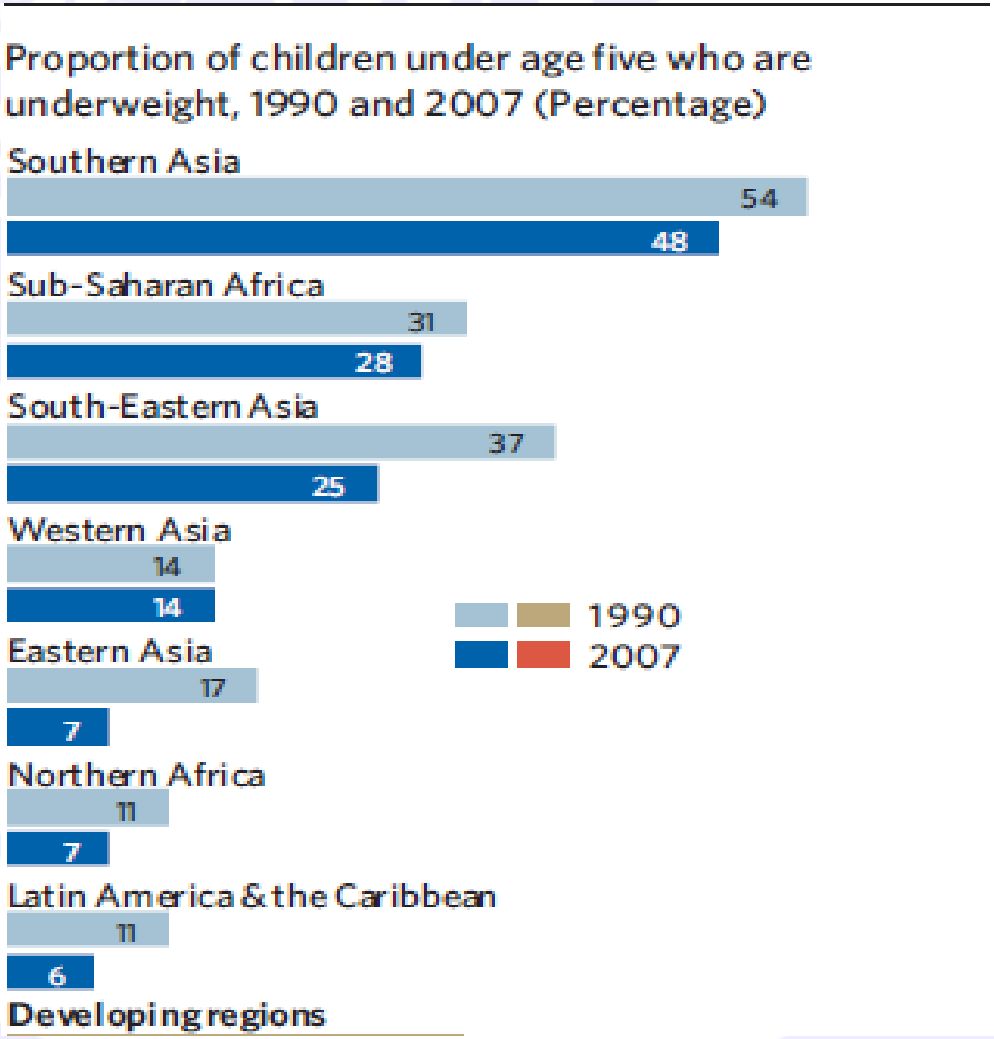
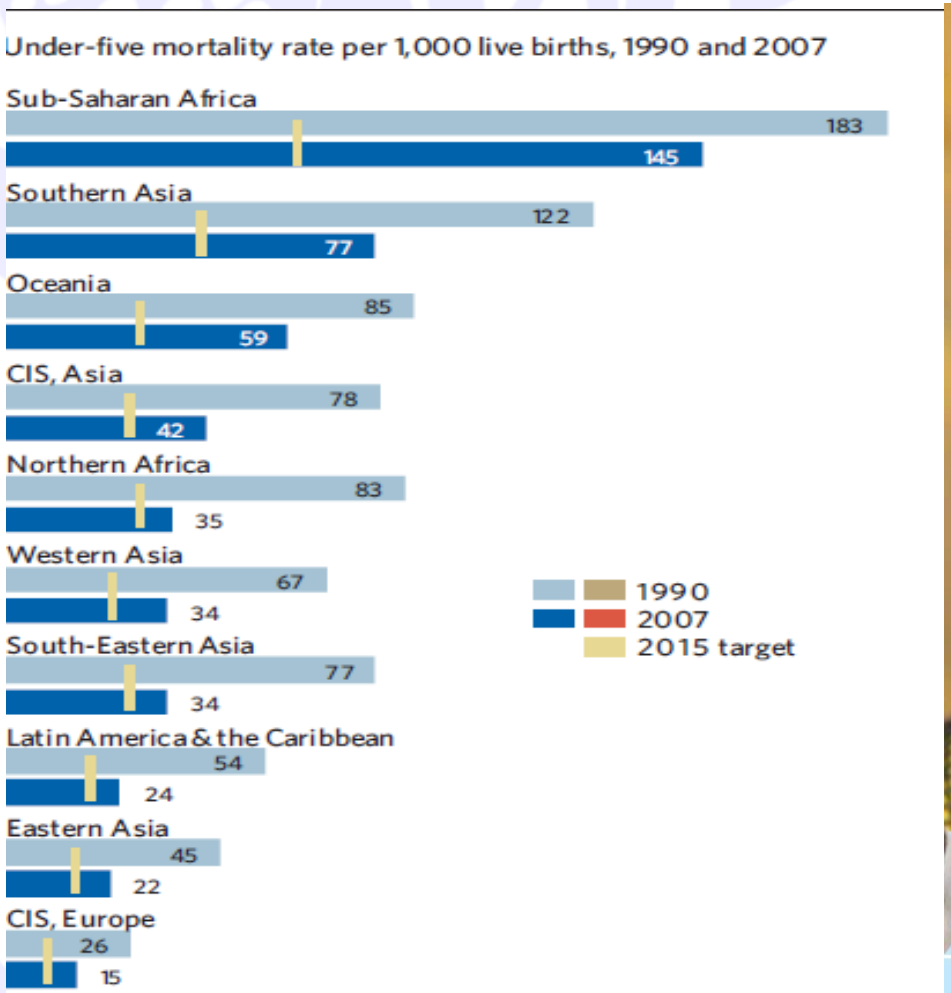
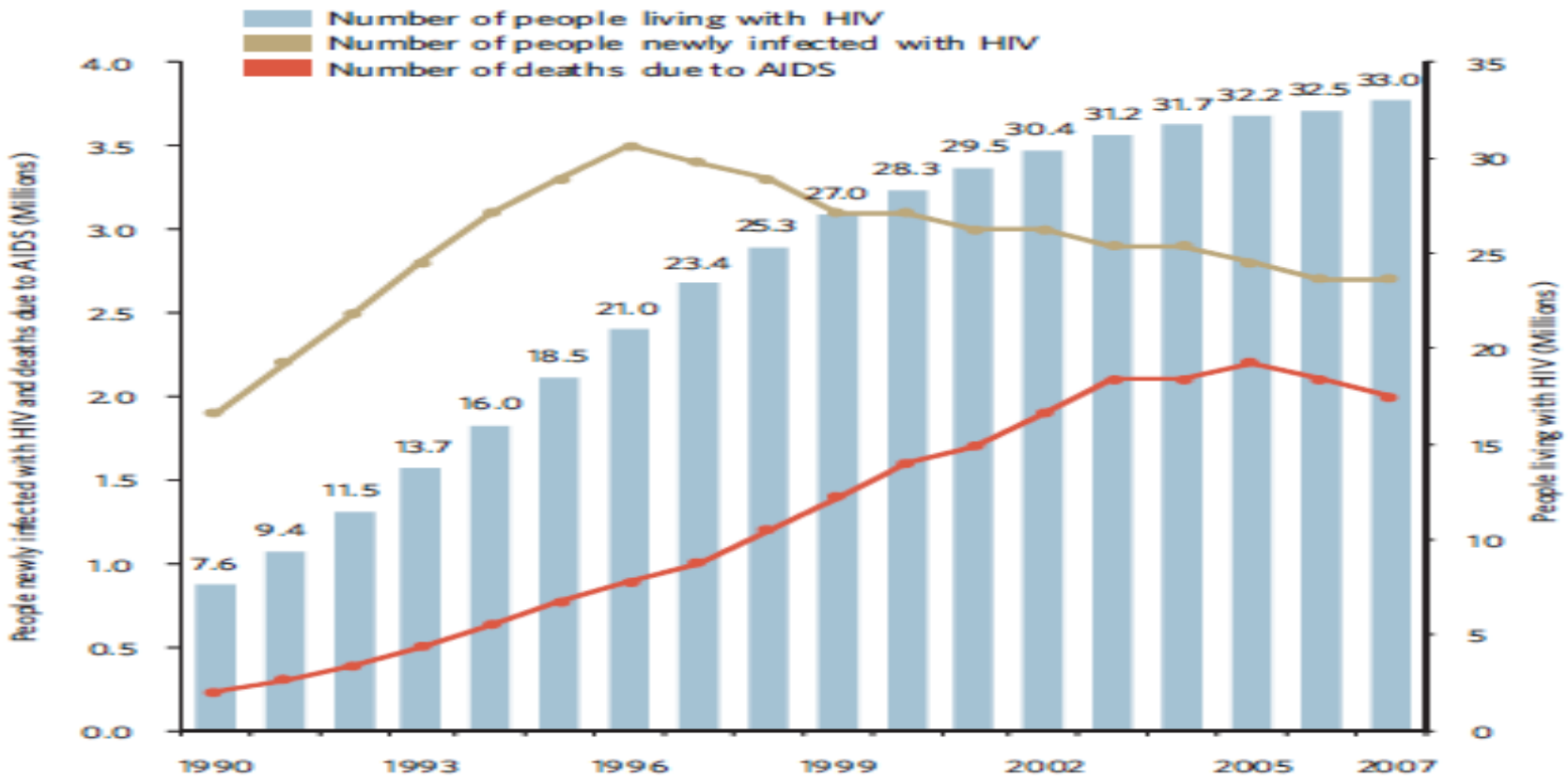


Target: Reduce by two thirds, between 1990 and 2015, the under-five mortality rate

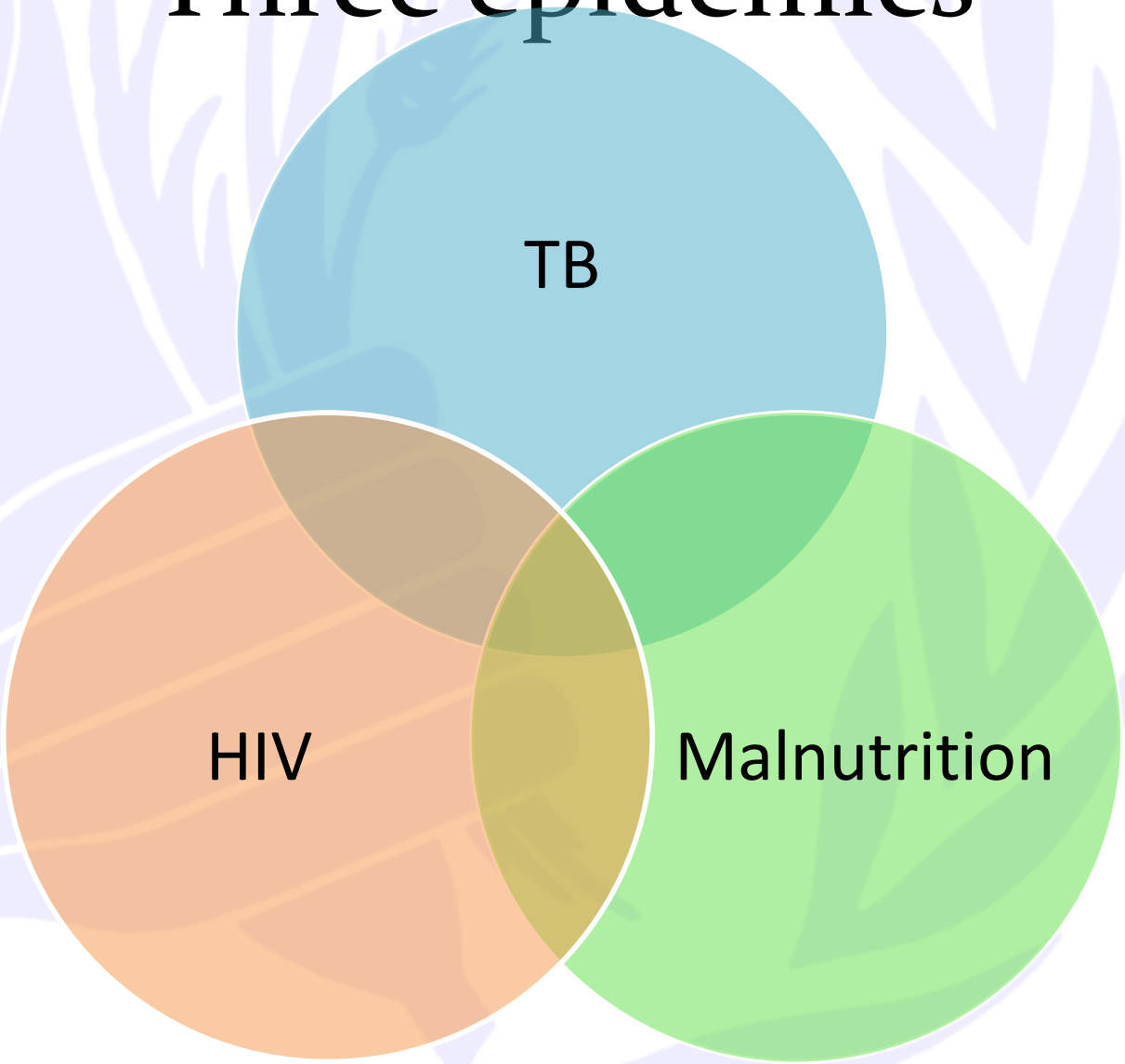


Target: have halted by 2015 and begun to reverse the spread of HIV/AIDS

Number of people living with HIV, number of people newly infected with HIV and number of AIDS deaths in the world (Millions), 1990-2007



Three epidemics



Child Malnutrition in the World

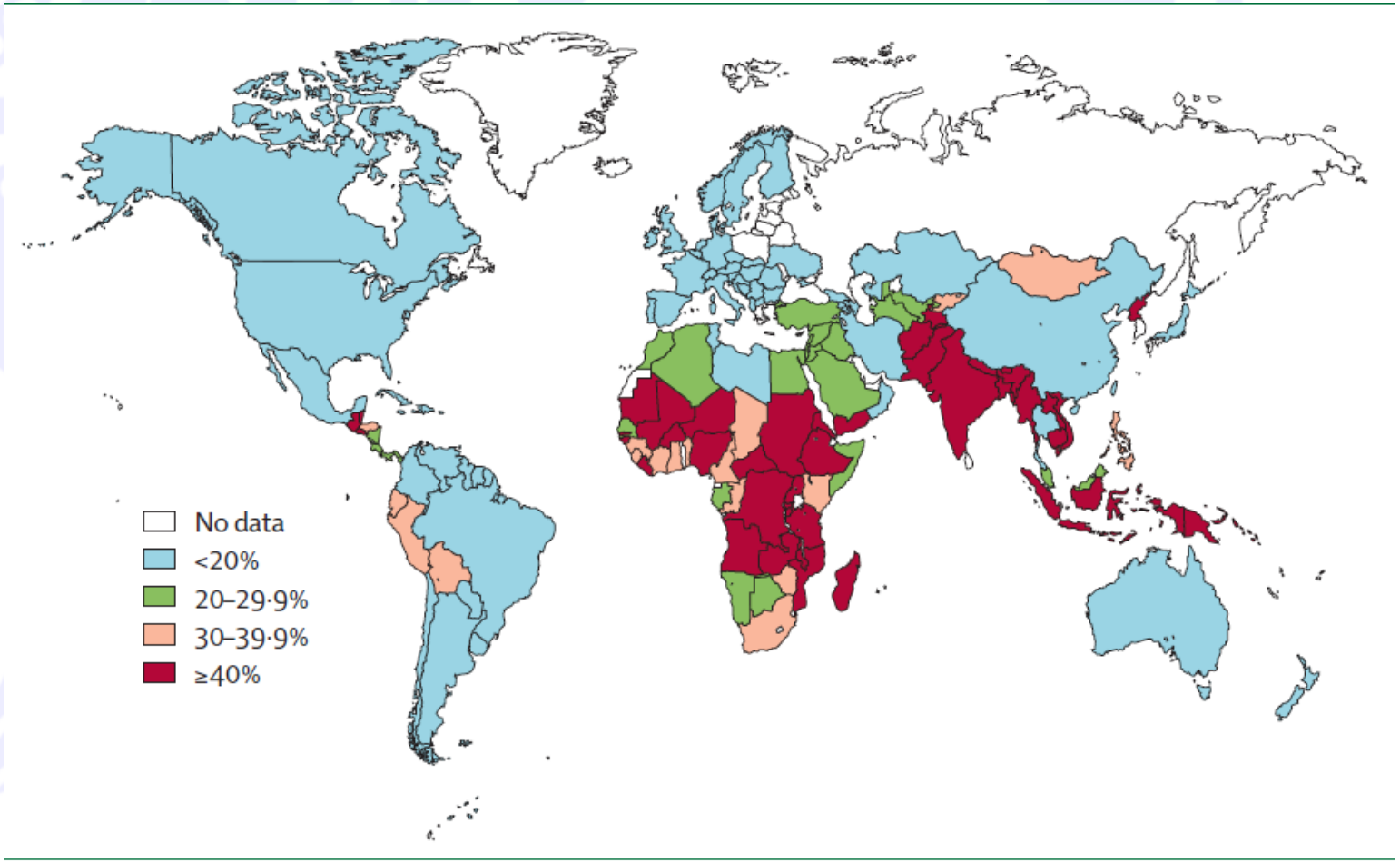
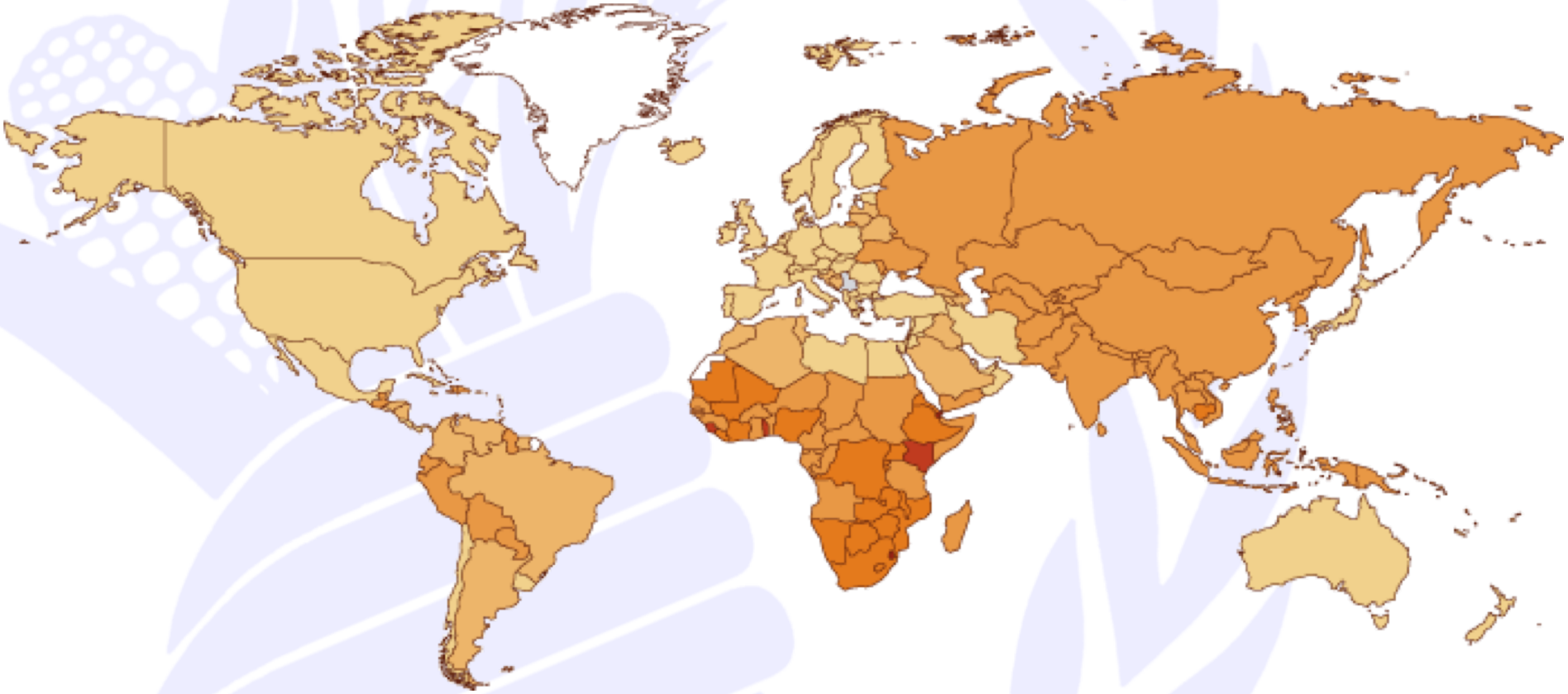


Figure 2: Prevalence of stunting in children under 5 years

TUBERCULOSIS



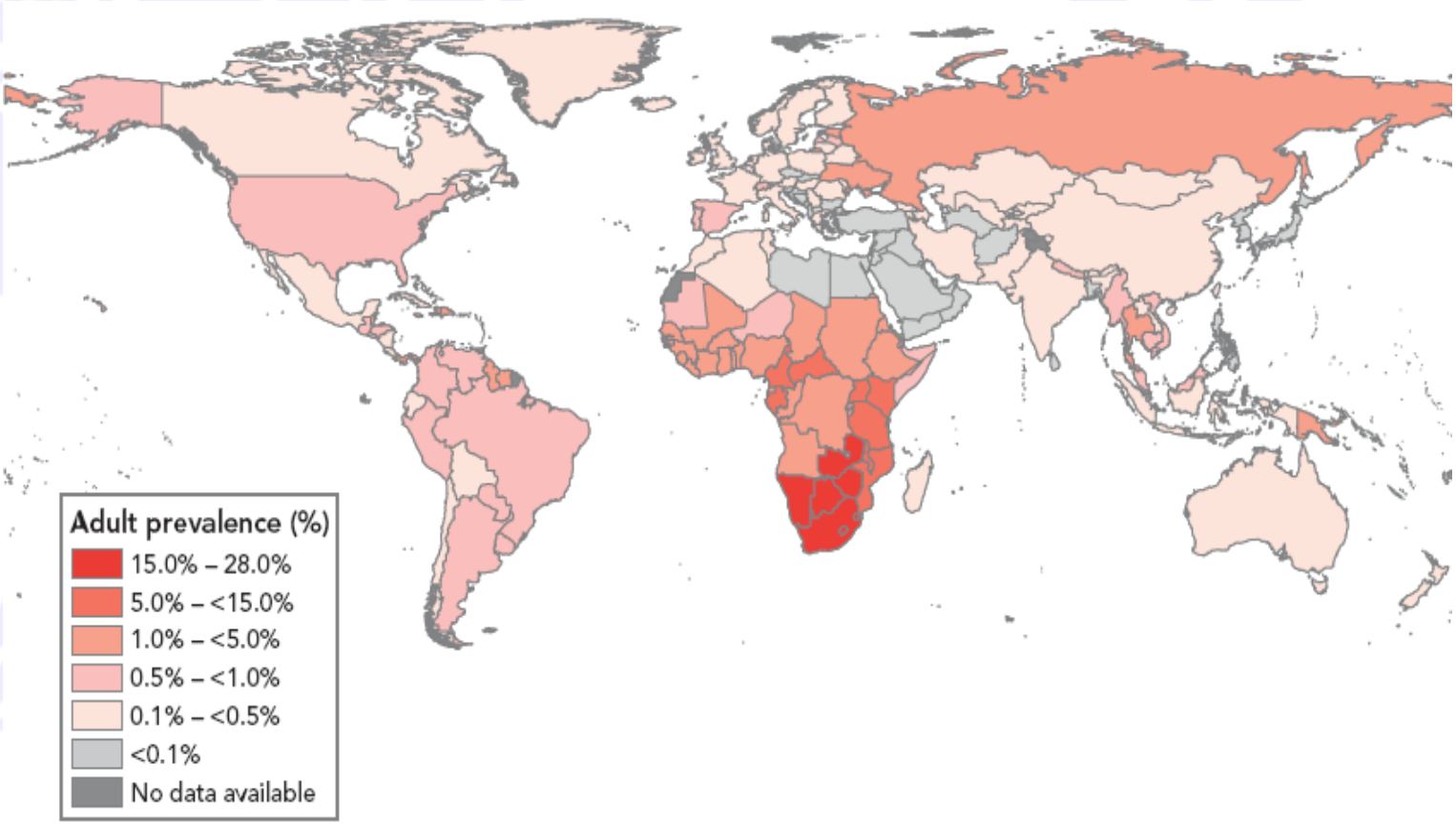
2 billion people infected

9 million new cases of active tuberculosis per year

1.8 million deaths per year

A global view of HIV infection

33 million people [30–36 million] living with HIV, 2007



Hunger Indicators

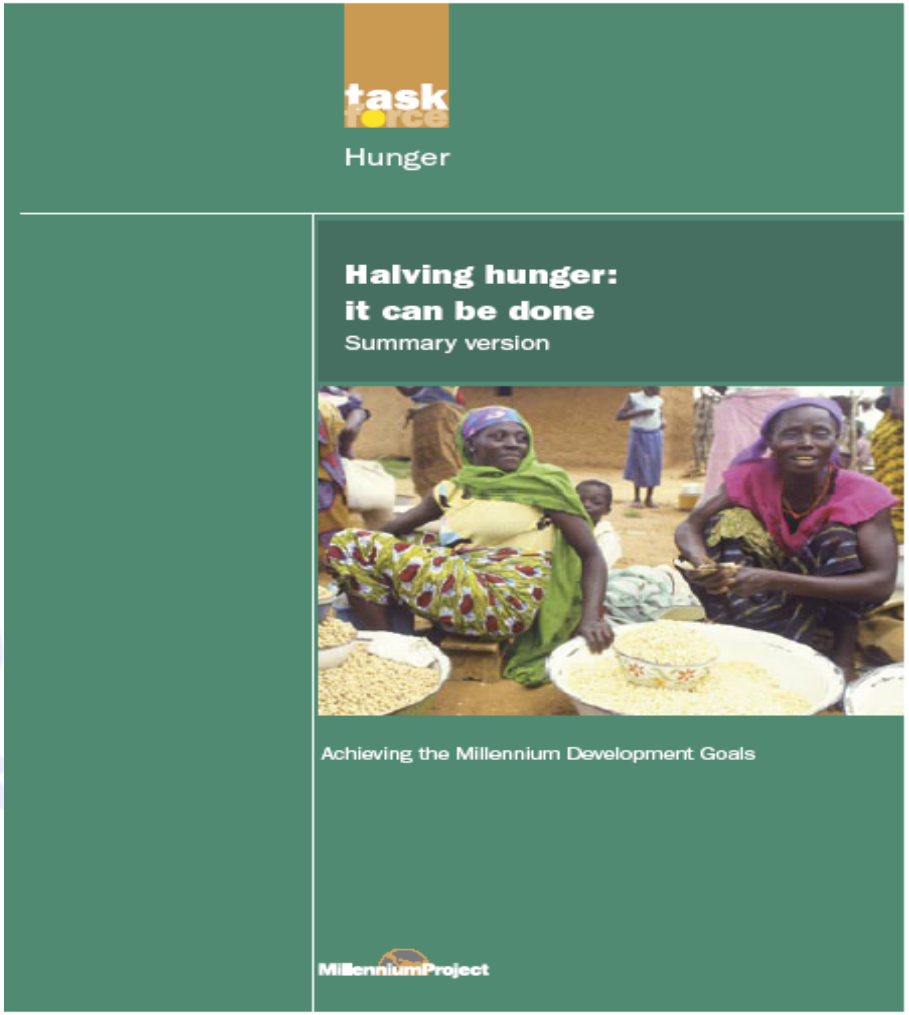
- MDG-1
  - FAO's undernourishment
  - Prevalence of underweight

  - Under-five mortality
  - Infant mortality
  - Prevalence of severe acute malnutrition
    - W/H or MUAC
  - Prevalence of acute malnutrition
  - Prevalence of stunting

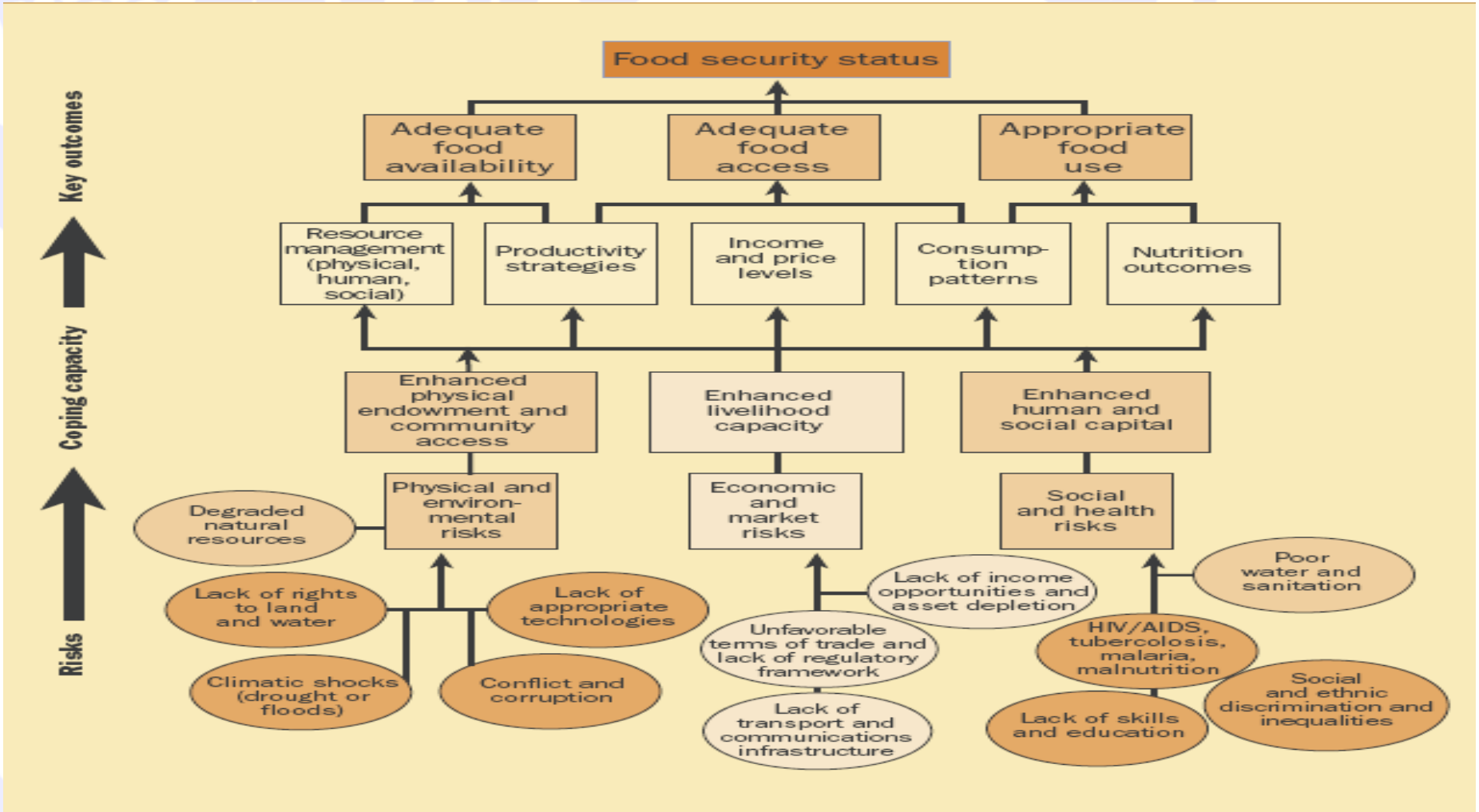
Hunger vs Undernutrition

Hunger Report 2005

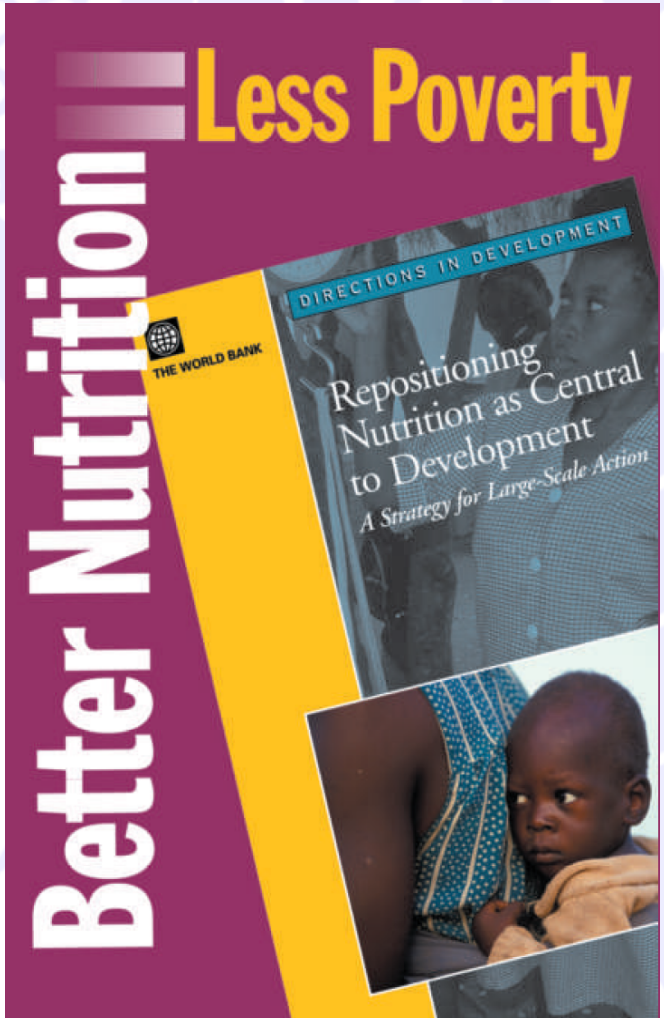
- Emphasis on food production



The percentage of the human population below the minimum level of dietary energy consumption



Repositioning of Nutrition World Bank 2006



- Emphasis on strategies directly tackling the malnutrition problem:
  - Micronutrients
  - Children 0-24 mo
  - Breastfeeding
  - Education

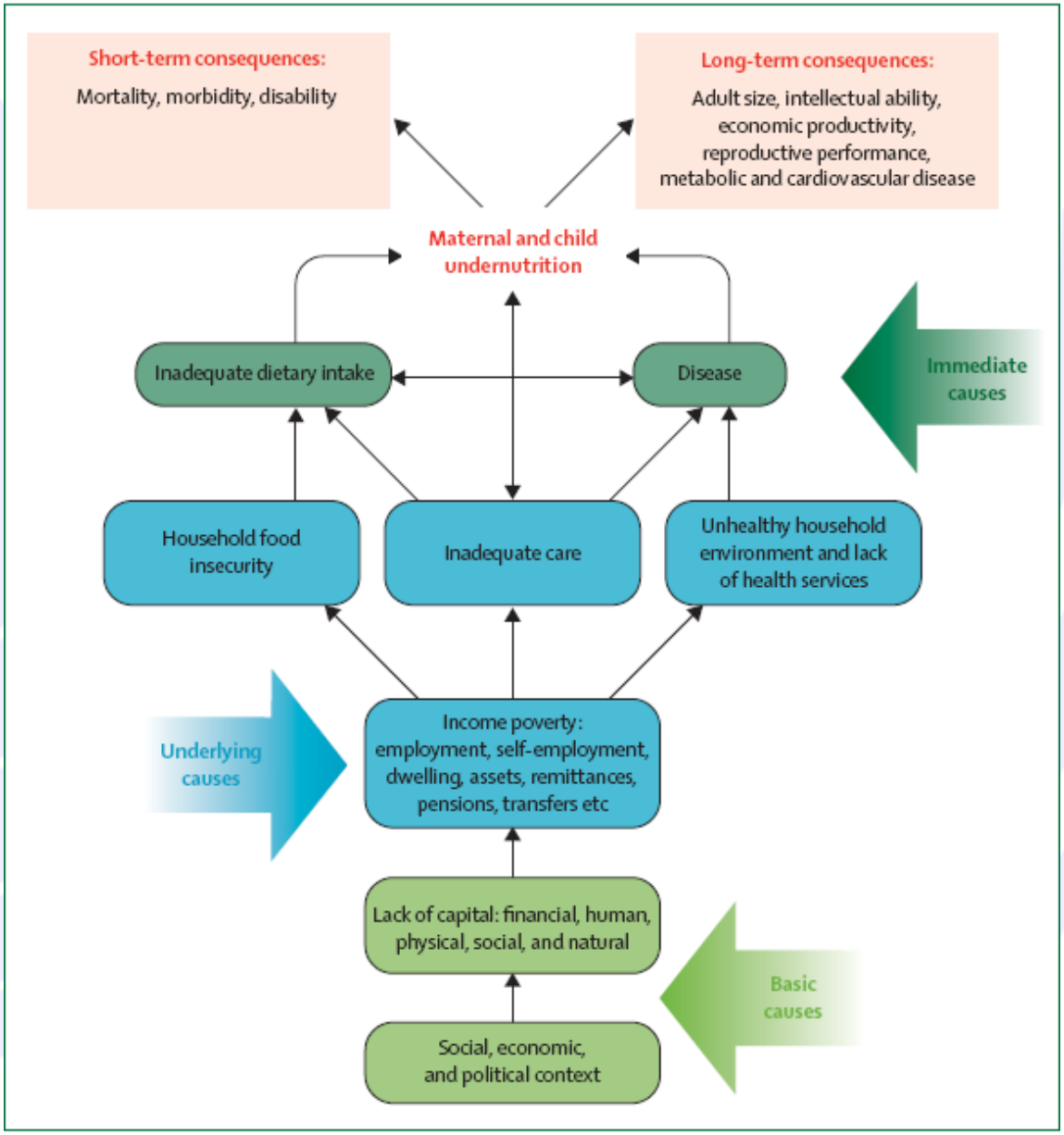
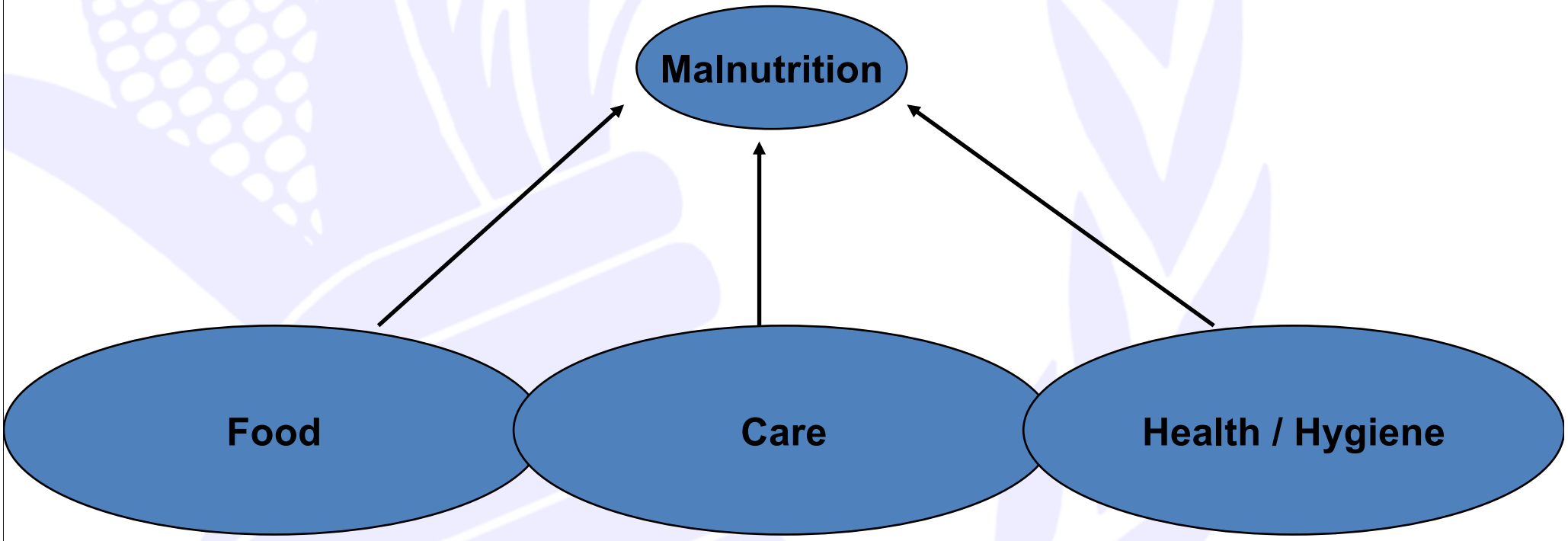
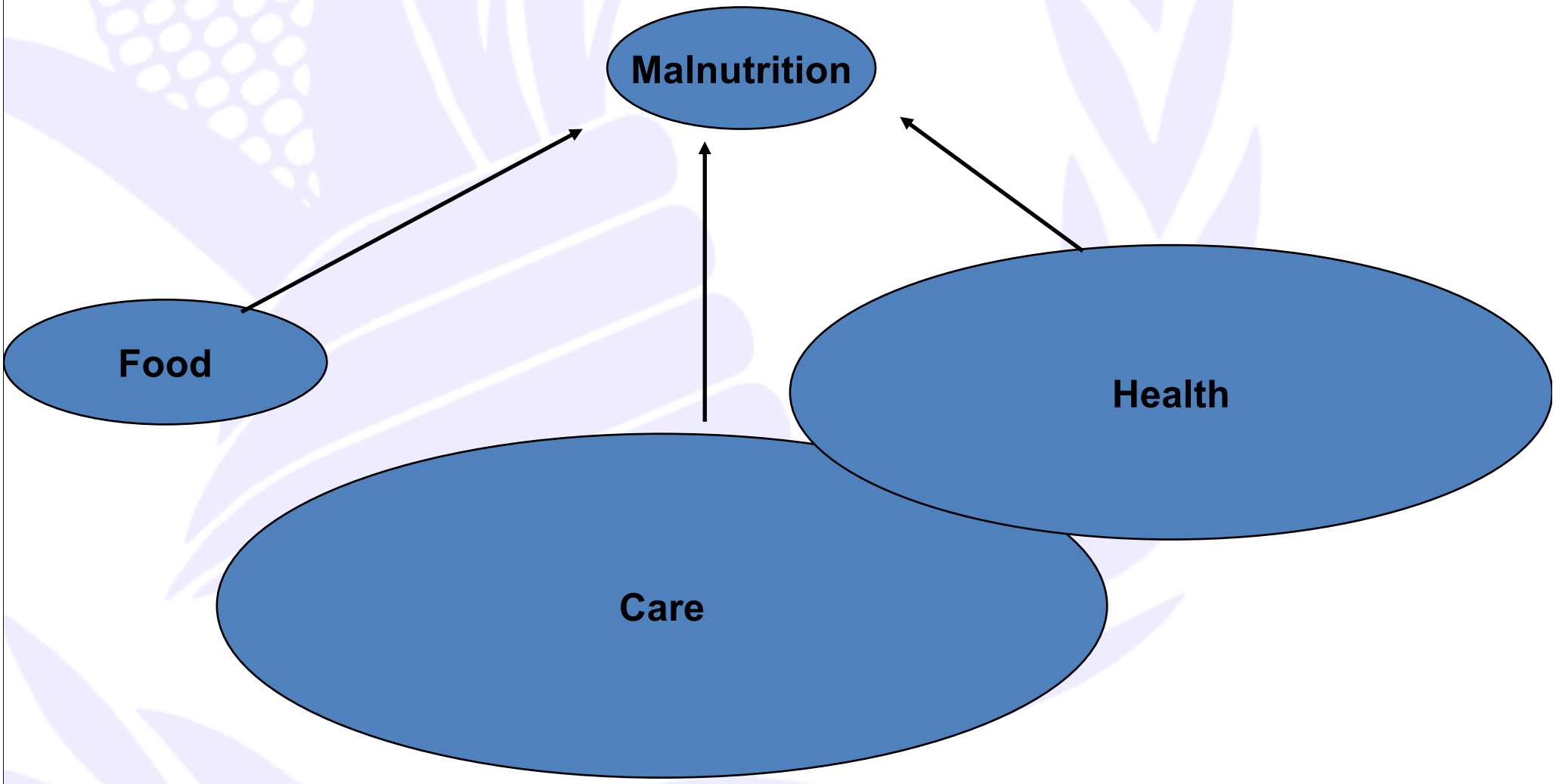


Figure 1: Framework of the relations between poverty, food insecurity, and other underlying and immediate causes to maternal and child undernutrition and its short-term and long-term consequences

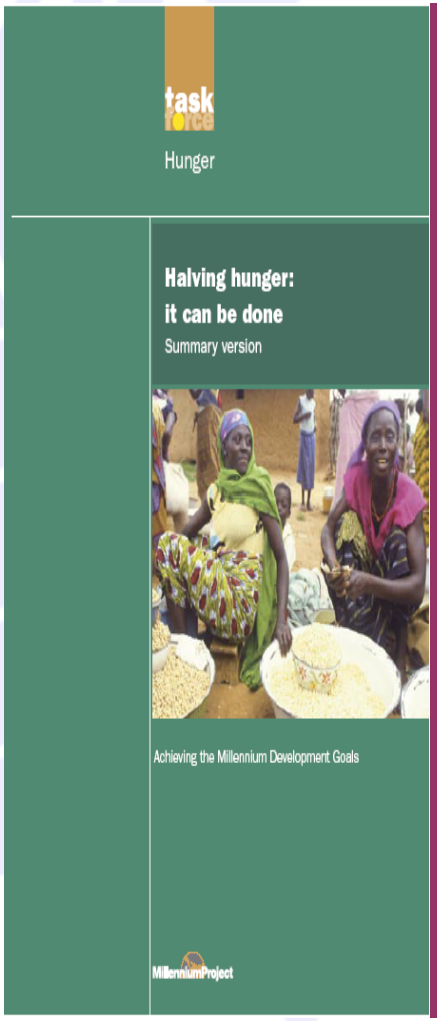
The conceptual framework for underlying causes of malnutrition

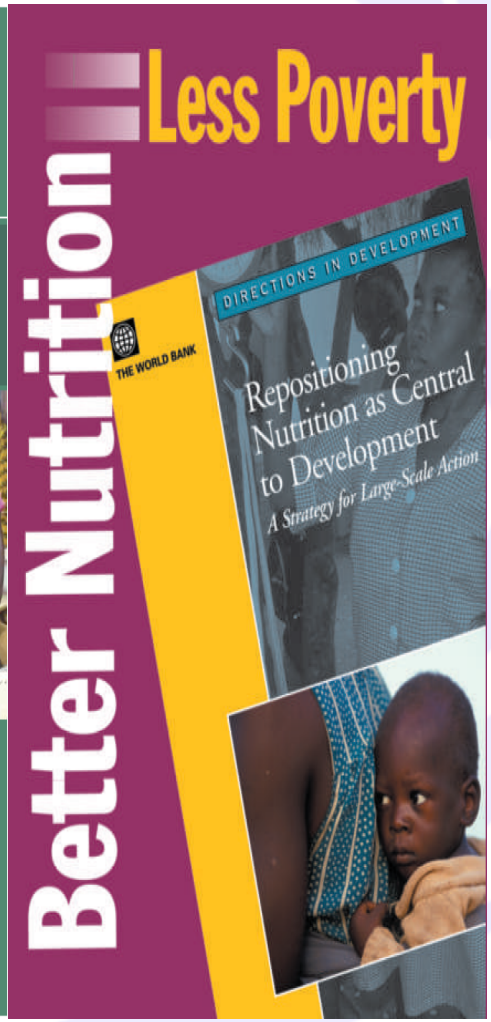


The conceptual framework for malnutrition in practice?



We need all approaches



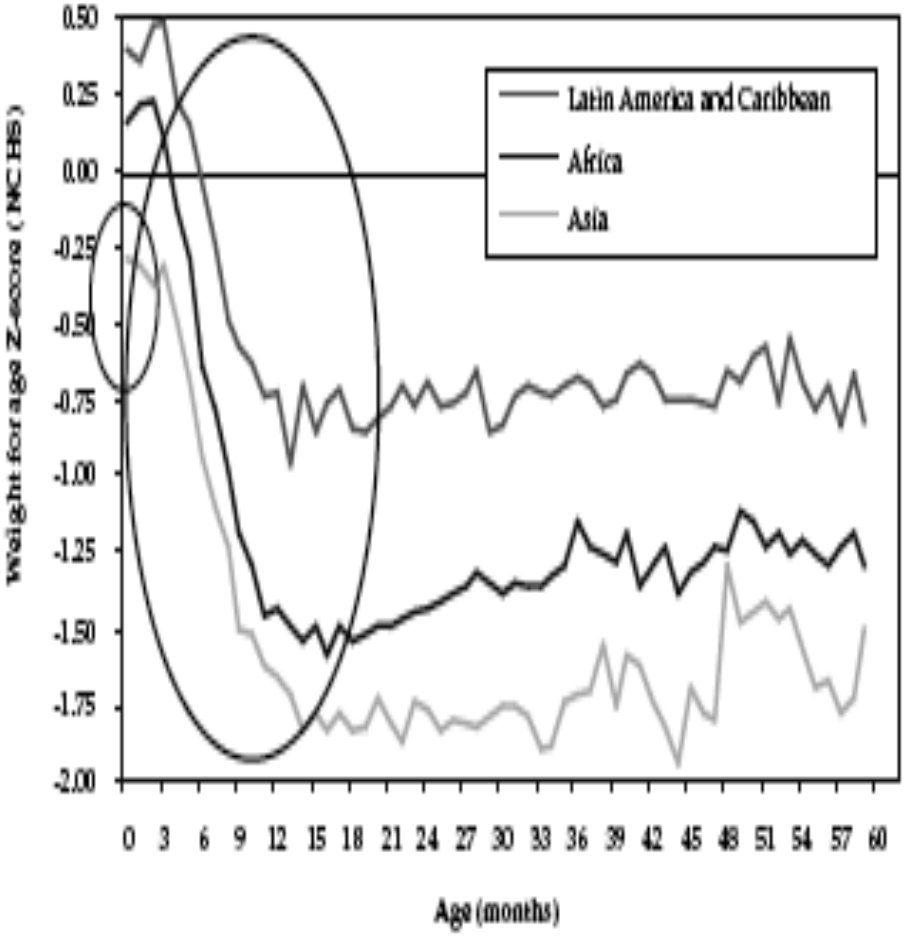


Latest Science in Nutrition I

- Alarming rates of hunger & undernutrition
  - 1.02 billion hungry (FAO 2009)
  - Nearly 200 million stunted & 130 million underweight children (UNICEF)
- Undernutrition:
  - one-third of child deaths
  - > 3.6 million maternal & child deaths

Latest Science in Nutrition II

- Short window of opportunity: **from conception to two years!**
- Weight gain after two years will lead to increase risk of chronic diseases: **e.g., diabetes, cardiovascular diseases, etc.**

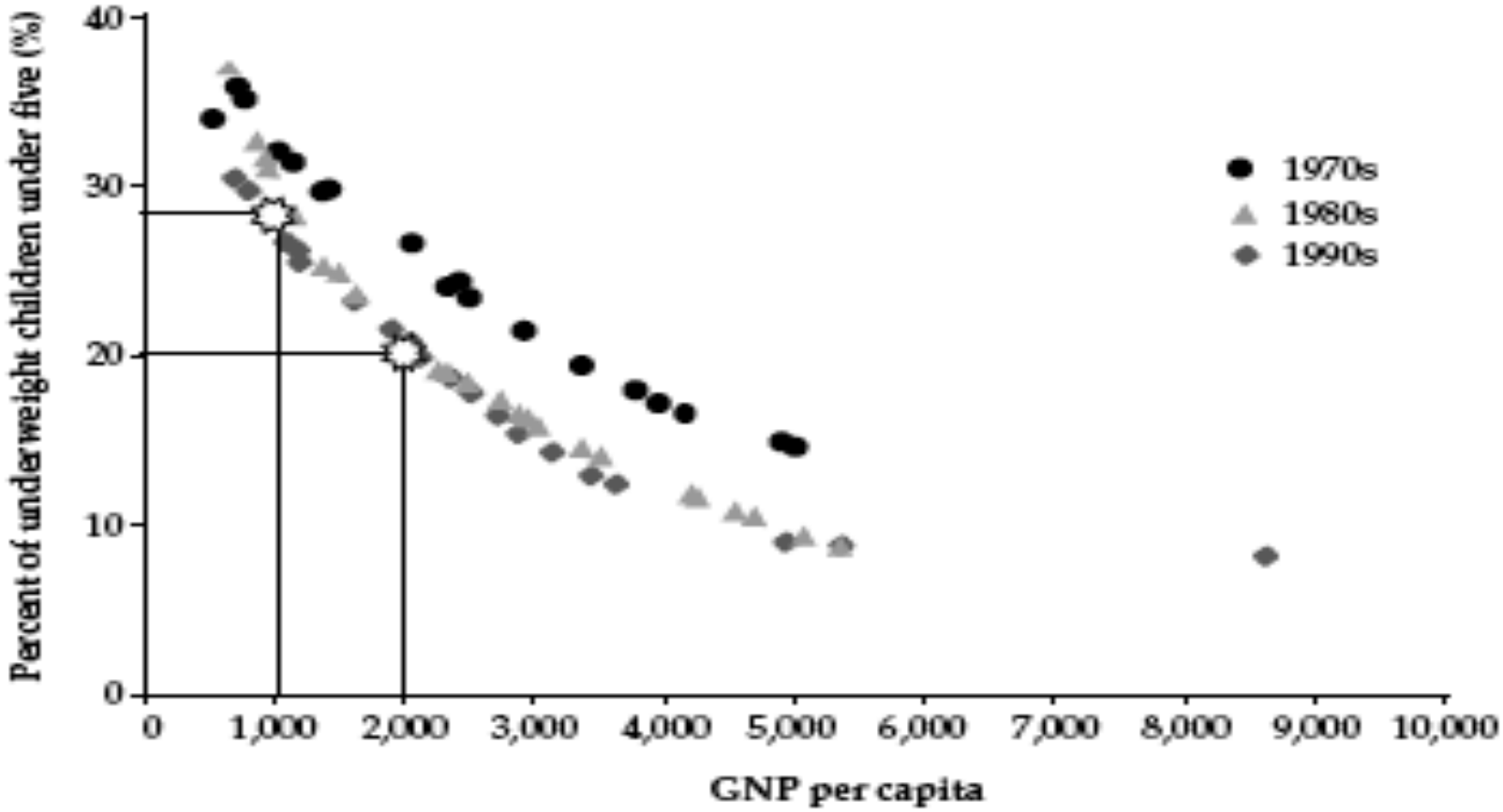


Why is nutrition important?

- **Undernutrition** leads to **increased child mortality** (30-50% underlying cause of deaths)
- **Undernutrition** has enormous economic consequences for countries:
  - **Less productivity, less intelectual capacity**
  - **Increase doubleburden: undernutrition + overnutrition (chronic diseases)**

Economic Growth is not good enough?

Figure 1.2 The income–malnutrition relationship



Malnutrition rates and Rice prices

Torlesse, Kiess and Bloem J. Nutr. 133:1320–1325, May 2003

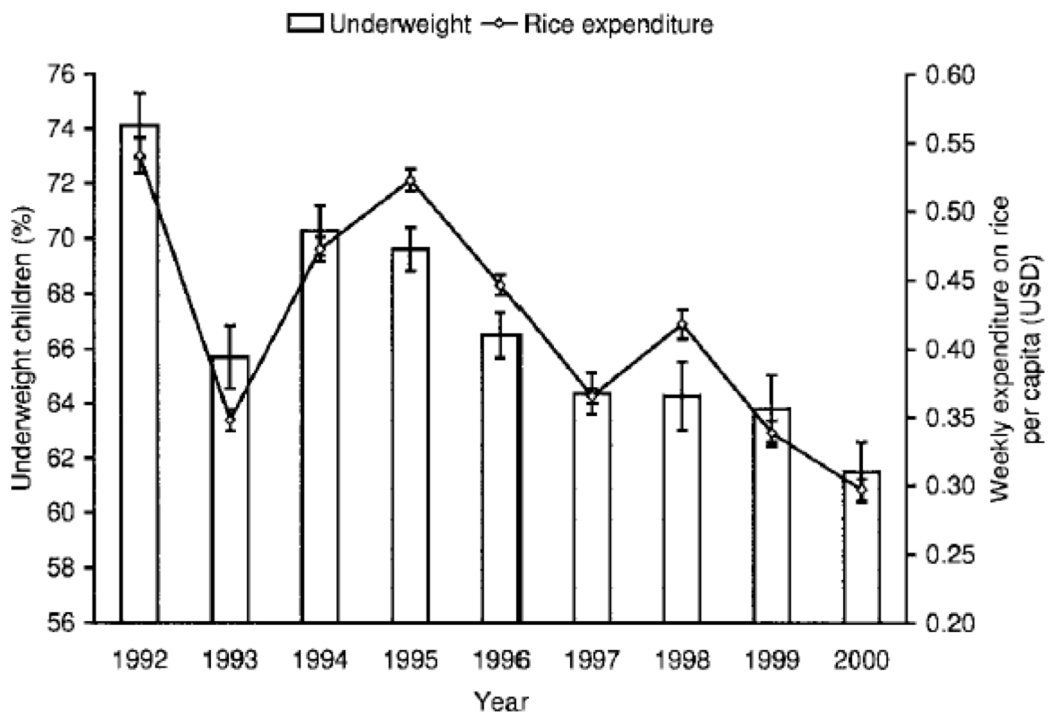


FIGURE 3 The percentage of underweight children (Z-score weight-for-age less than −2 SD) aged 6–59 mo and the weekly expenditure on rice per capita in US$ (USD) in rural Bangladesh during the month of June, 1992–2000. Values for underweight are percentage ± 95% CI and values for expenditure on rice are means ± 95% CI ($r = 0.91$, $P = 0.001$, $n = 9$).

Rice consumption and rice prices

Torlesse, Kiess and Bloem J. Nutr. 133:1320–1325, May 2003

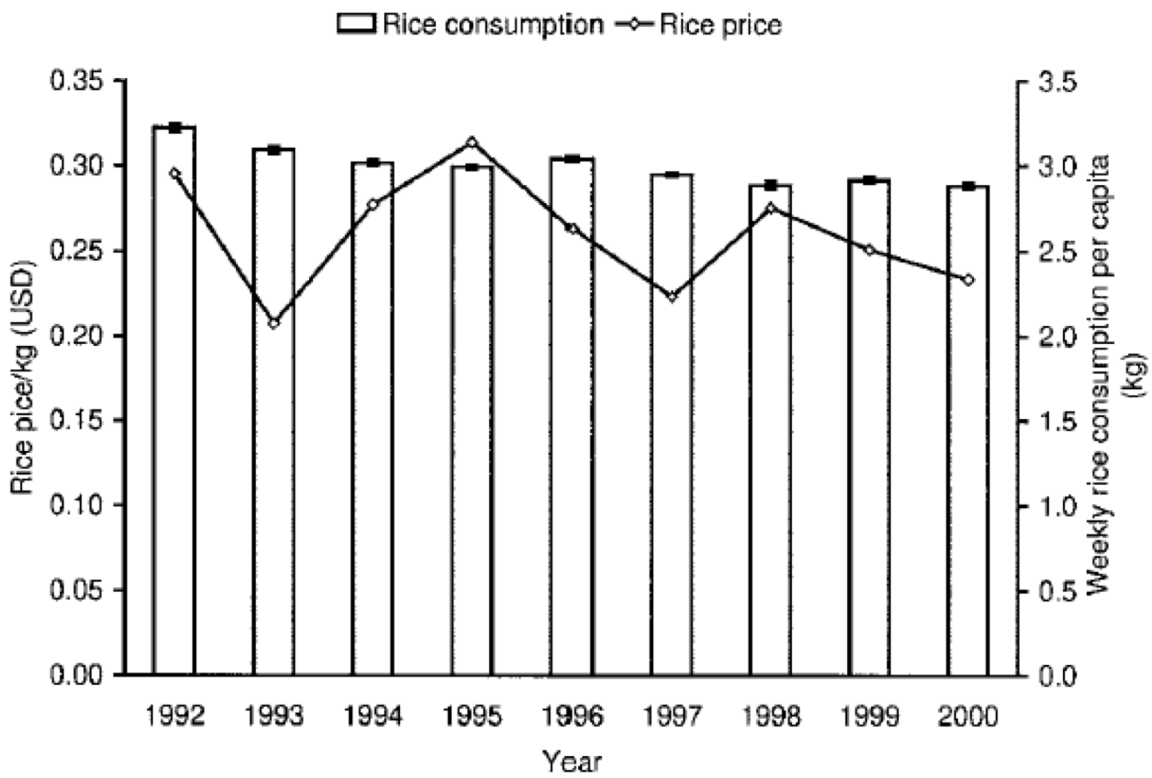
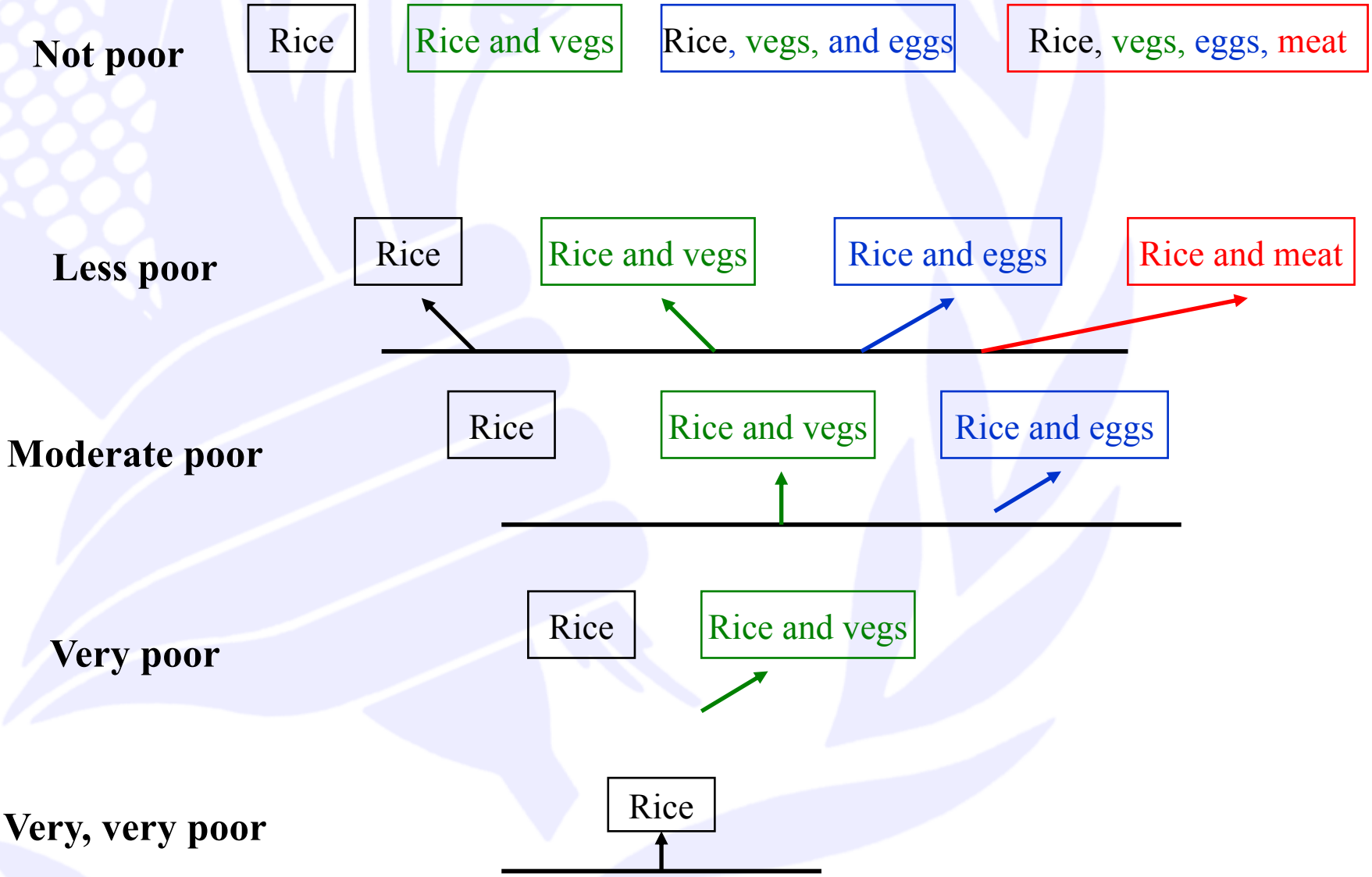
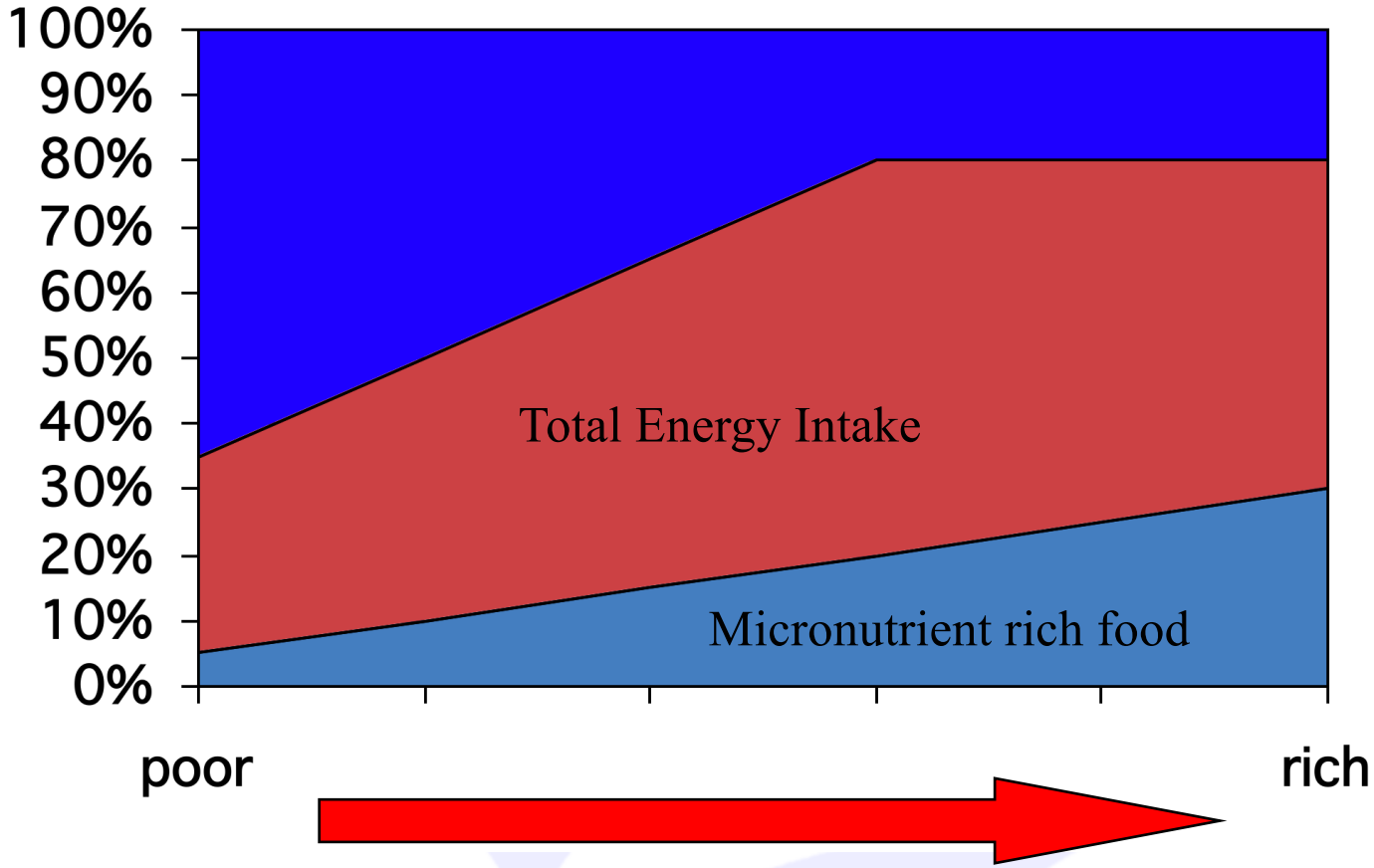


FIGURE 2 The price of rice in US$ (USD) and the weekly rice consumption per capita in rural Bangladesh during the month of June, 1992–2000. Values are means ± 95% CI (r = 0.23, P = 0.55, n = 9). The CI for the price of rice are very small and therefore not visible.

Choices and economic status



Micronutrients and Total Energy
Timmer, Pearson



Non-rice food expenditure and malnutrition

Torlesse, Kiess and Bloem J. Nutr. 133:1320–1325, May 2003

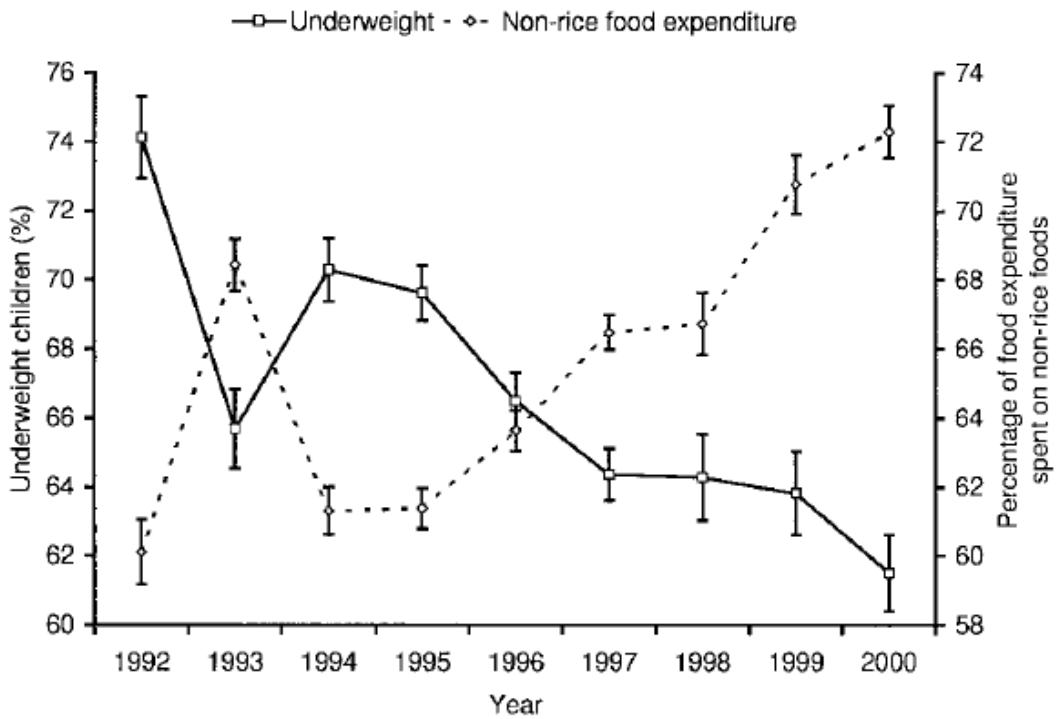


FIGURE 4 The percentage of underweight children (Z-score weight-for-age <-2 SD) aged 6–59 mo and the percentage of food expenditure spent on nonrice foods in rural Bangladesh during the month of June, 1992–2000. Values for underweight are percentage ± 95% CI and values for expenditure on nonrice foods are means ± 95% CI ($r = -0.91$, $P = 0.001$, $n = 9$).

Conclusions

- **Nutrition Security** is correlated with the **non-grain** component of food expenditure.
- Responses should focus on
  - Right food interventions in children less than 24 months to prevent a lost generation
  - Cash/vouchers where availability is not a problem
  - Vitamins and Minerals interventions

Daily cost of a diet and income (SCF UK)

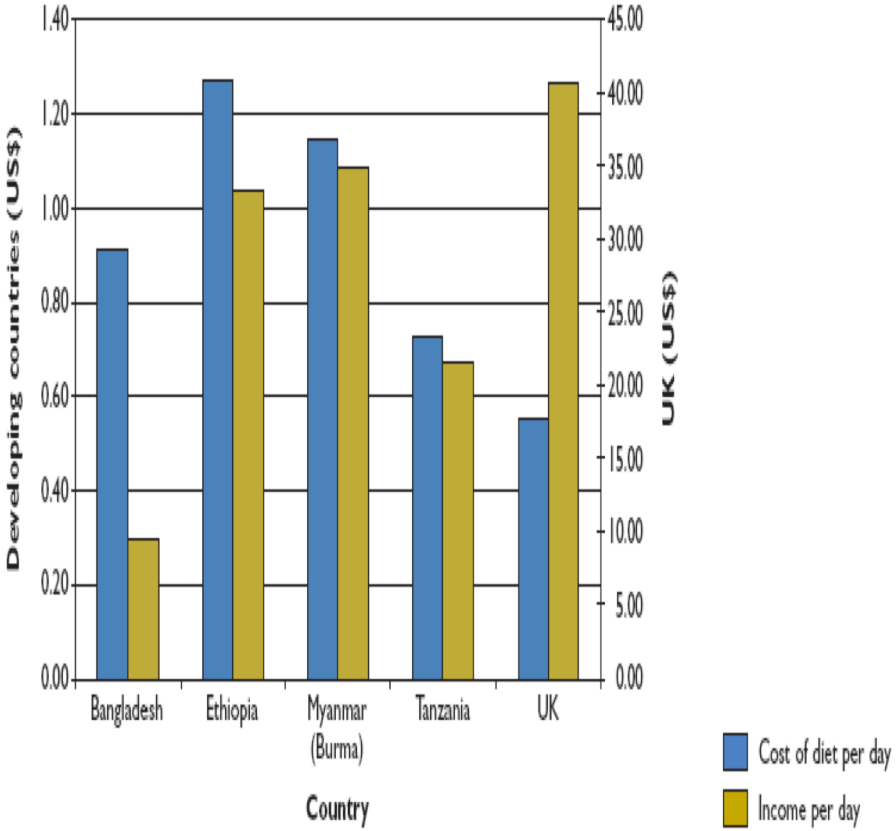


Figure 1: Average daily cost of a diet and daily income (US$) for the poorest

- The research, carried out in four locations in Bangladesh, Ethiopia, Myanmar and Tanzania, showed that between 15 (in Ethiopia) and 79 (in Bangladesh) per cent of households simply couldn't afford to feed their children a healthy diet.
- The comparative cost of the diet compared with the equivalent average weekly earnings in the UK,
  - Bangladesh €2429 a week
  - Ethiopia € 967 a week
  - Myanmar € 834 a week
  - Tanzania € 847 a week

Global Response

- Consensus among the global nutrition community (WHO/UNICEF/WFP meeting on treatment and prevention of malnutrition, Lancet, GAP).
- Many countries are changing their nutrition policies and program designs.
- Many donors are actively engaged in the development of new nutritious products
- The HIV/AIDS field has taught the world not to have double standards

REACH – In-country policy coordination

I. The child is at the center: the aim is to deliver as one

Pillars of the REACH approach

CARE

- Improve breastfeeding and complementary feeding
- Improve hygiene and parasite control

HEALTH

- Increase micronutrient intake
- Increase treatment of severe acute malnutrition

FOOD SECURITY

- Improve availability and diversity of food and support livelihoods (including safety homestead food production, transfer/safety net programs, and strengthening local purchase from smallholder farmers)

Why should the world act?

- High development returns
  - Copenhagen consensus
- Security
- Human rights
- Nutrition is a key determinant of all MDGs

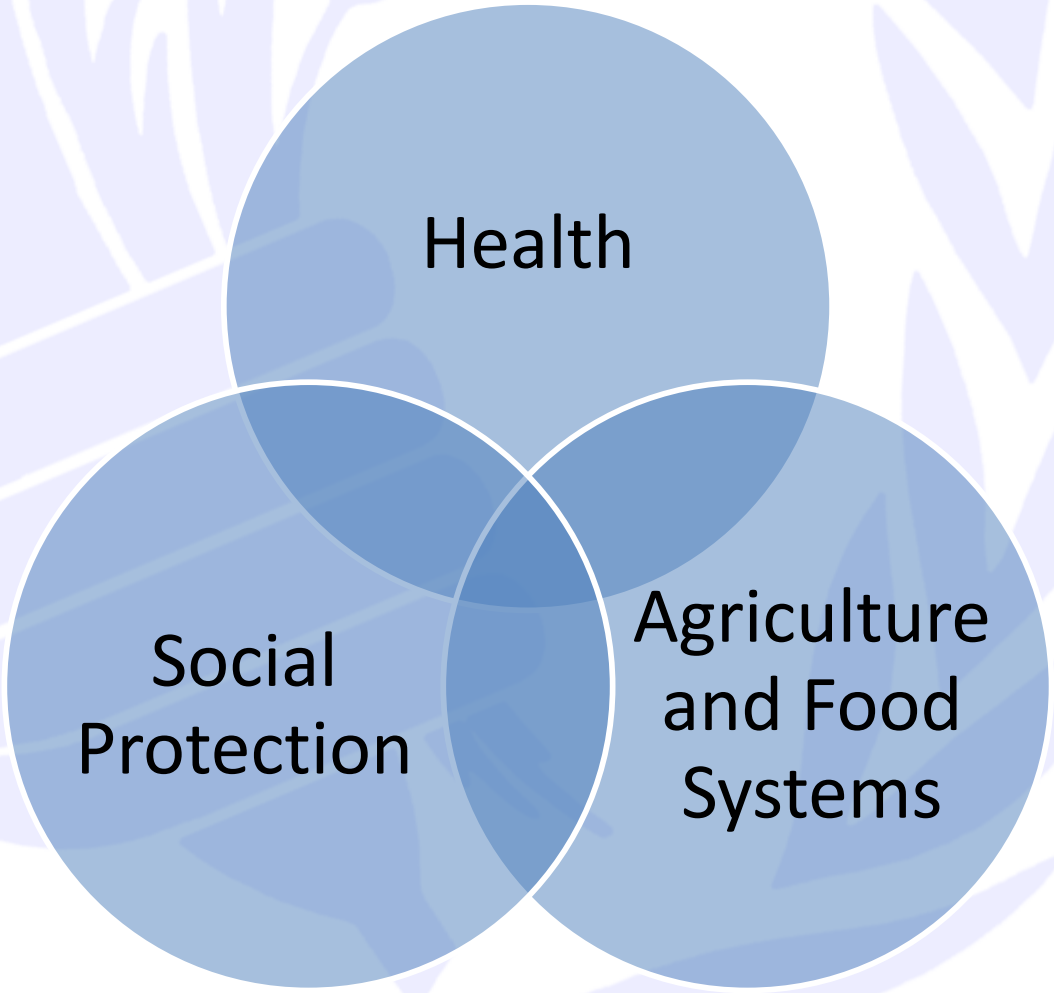
Donors/Governments 2010

- Recognition that nutrition is critical for development (G8, US, EU, DFID, Canada, Brazil, Thailand, China)
- Need for Multi-sector approaches since many donors have health and agriculture divisions
- Private Sector Donors
  - Foundations: Gates, CIFF
  - Private sector: WEF,

Solutions: Public Sector
No need for one framework

- Nutrition specific Interventions
  - Window of Opportunity: -9-24 months
  - Global Action Plan on Nutrition; 10 billion/year
  - REACH/SCN
- Nutrition sensitive development
  - Agriculture and Food Systems
  - Social Protection; food and nutrition safety-nets
  - Health Systems

Sectoral Relationships



Solutions: Private sector

- Sustainable market solutions for the bottom of the pyramid
  - Global: WEF, Multi-nationals
  - Regional
    - Development of better markets
  - National:
    - Local industries
    - Agriculture & Smallholder farmers
    - Water-sanitation industries
    - Pharmaceutical industries

Solutions: Nutrition Movement(s) embrace diversity but one goal

- Making the economic impact of undernutrition visible (Copenhagen Consensus, Latin America Hunger study, China)
- Engaging decision makers as activists for attention to undernutrition. (Brazil, Mexico, Malawi, South Africa, Thailand)
- Civil Society: encouraging public participation in a social movement that empowers households and communities for better nutrition (HIV/AIDS) to make all players more accountable

HIV/AIDS

Global summary of the AIDS epidemic

December 2008

Number of people living with HIV in 2008

Total	**33.4 million [31.1 – 35.8 million]**
Adults	31.3 million [29.2 – 33.7 million]
Women	15.7 million [14.2 – 17.2 million]
Children under 15 years	2.1 million [1.2 – 2.9 million]

People newly infected with HIV in 2008

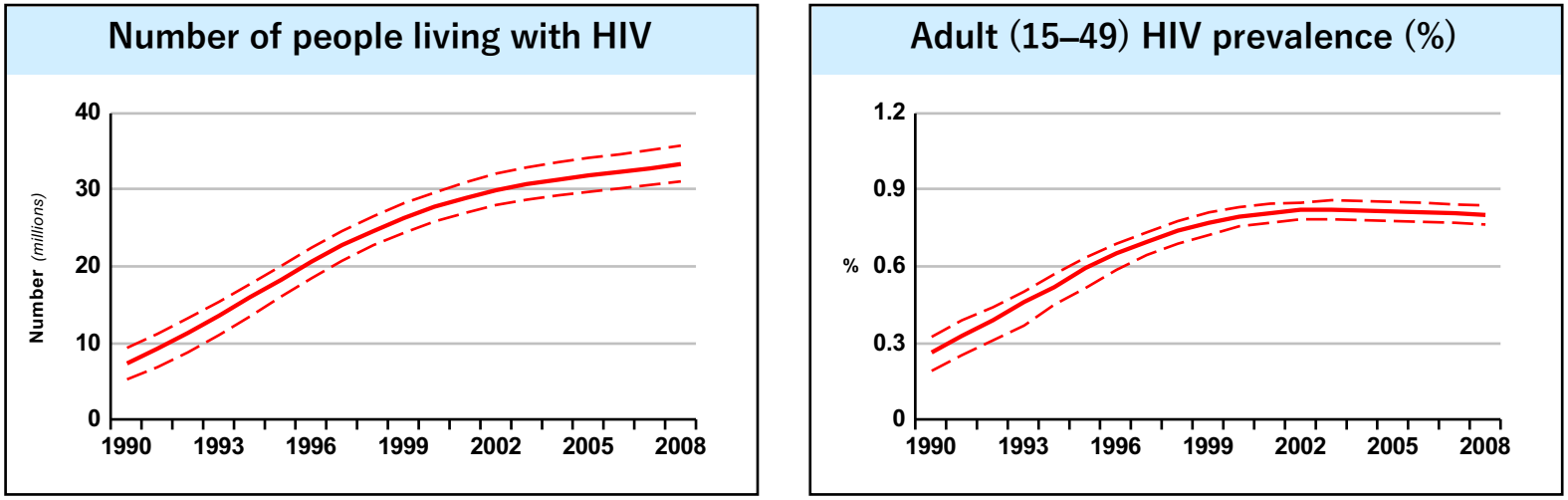
Total	**2.7 million [2.4 – 3.0 million]**
Adults	2.3 million [2.0 – 2.5 million]
Children under 15 years	430 000 [240 000 – 610 000]

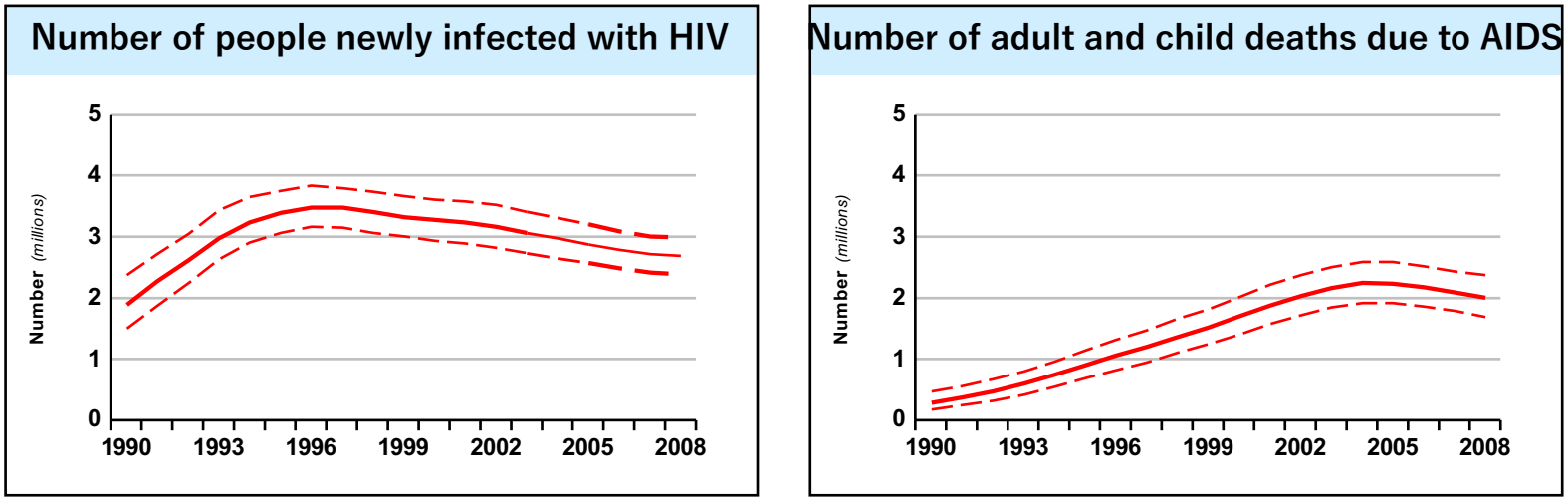
AIDS-related deaths in 2008

Total	**2.0 million [1.7 – 2.4 million]**
Adults	1.7 million [1.4 – 2.1 million]
Children under 15 years	280 000 [150 000 – 410 000]

The ranges around the estimates in this table define the boundaries within which the actual numbers lie, based on the best available information.

Global estimates 1990–2008





Estimate — High and low estimates

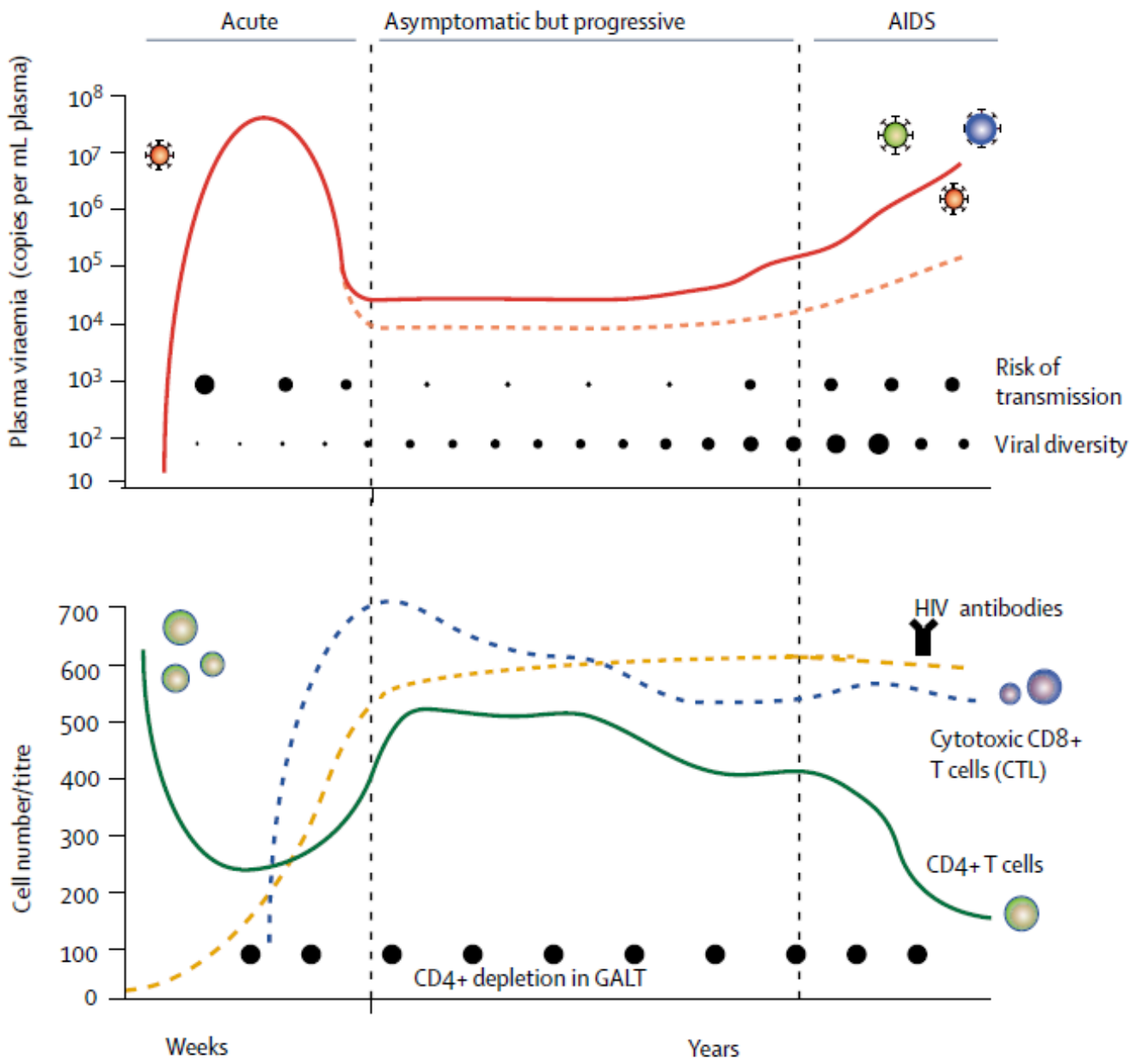
Source: UNAIDS/WHO

2009 **AIDS** epidemic update

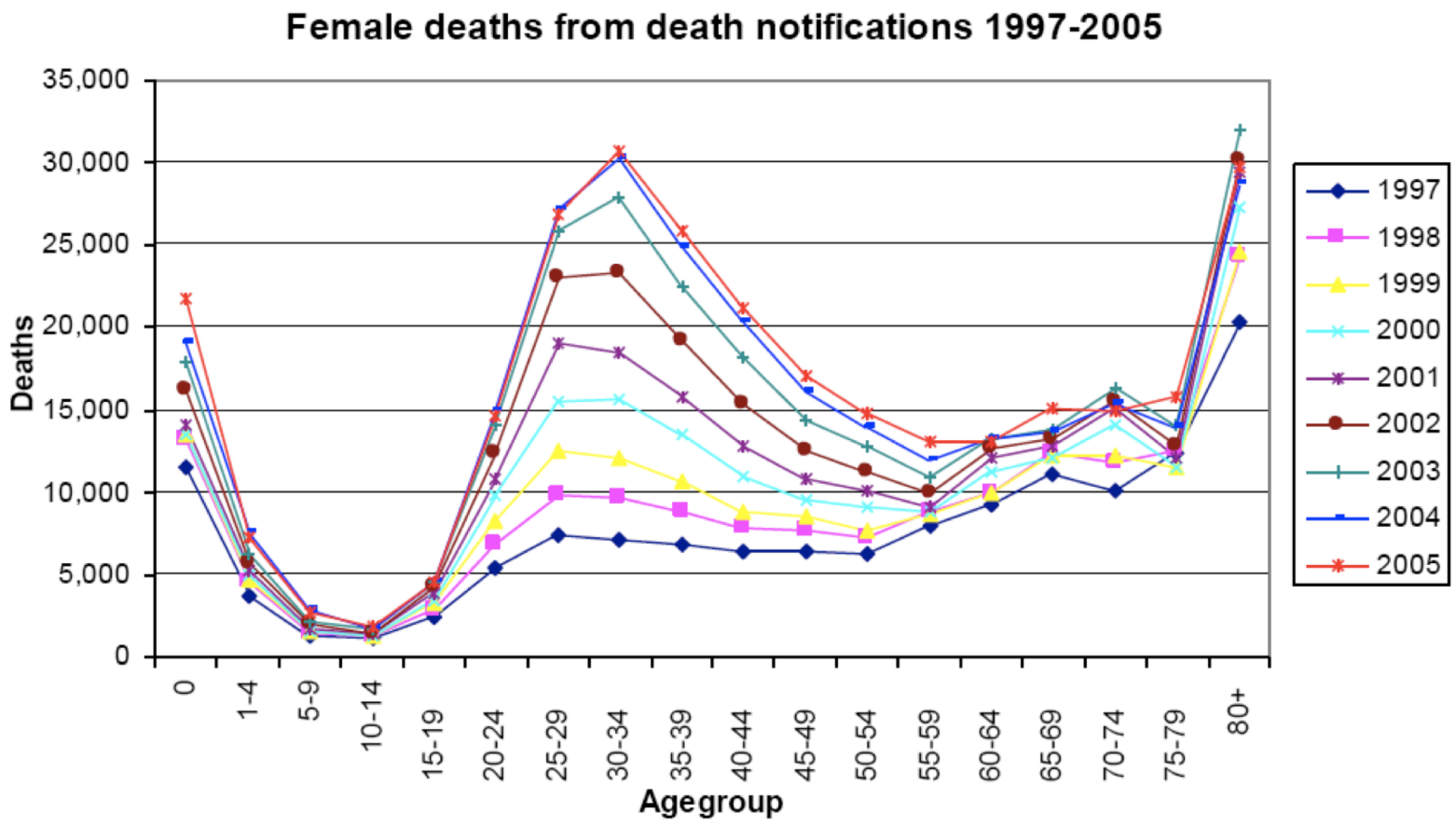
Figure I

UNAIDS

World Health Organization


Acute
Asymptomatic but progressive
AIDS
Plasma viraemia (copies per mL plasma)
10^8
10^7
10^6
10^5
10^4
10^3
10^2
10
Risk of transmission
Viral diversity
Cell number/titre
700
600
500
400
300
200
100
0
HIV antibodies
Cytotoxic CD8+ T cells (CTL)
CD4+ T cells
CD4+ depletion in GALT
Weeks
Years

South Africa's war-like death statistics



DBSA Roadmap process

Interactions of Nutrition and Infection. Scrimshaw, Taylor & Gordon (1968)

"**Infections** are likely to have **more serious** consequences **among persons with** clinical or subclinical **malnutrition**, and **infectious diseases** have the capacity to **turn borderline nutritional deficiencies into severe malnutrition**.

In this way **malnutrition and infection can be mutually aggravating** and produce more serious consequences for the patient than would be expected from a summation of the independent effects of the two."

Tuberculosis deaths, England & Wales, 1838-1970

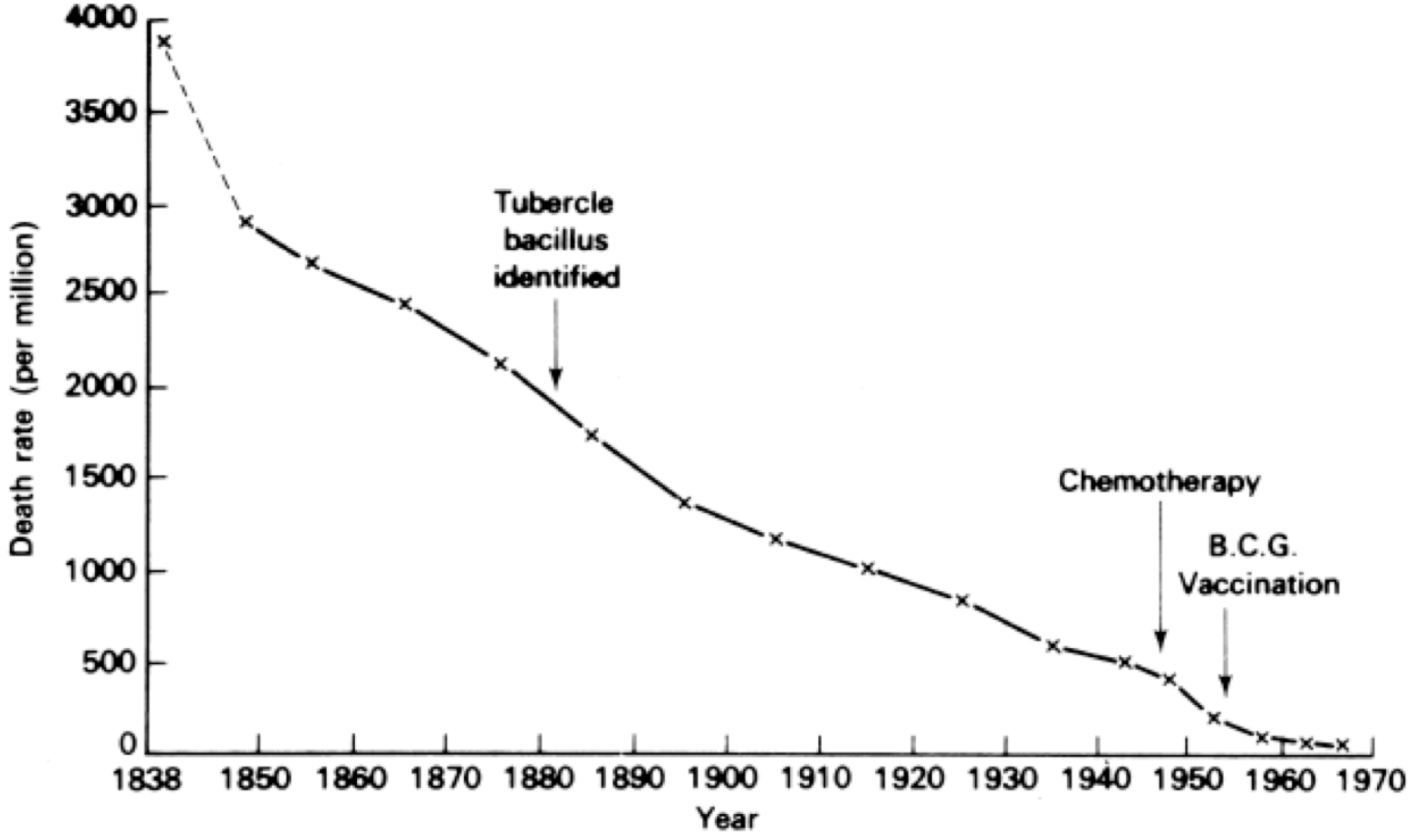


Fig. 10.2. Case fatality rates for tuberculosis. (Based on [49].)

Vicious cycle between HIV infection & Micronutrient Deficiencies

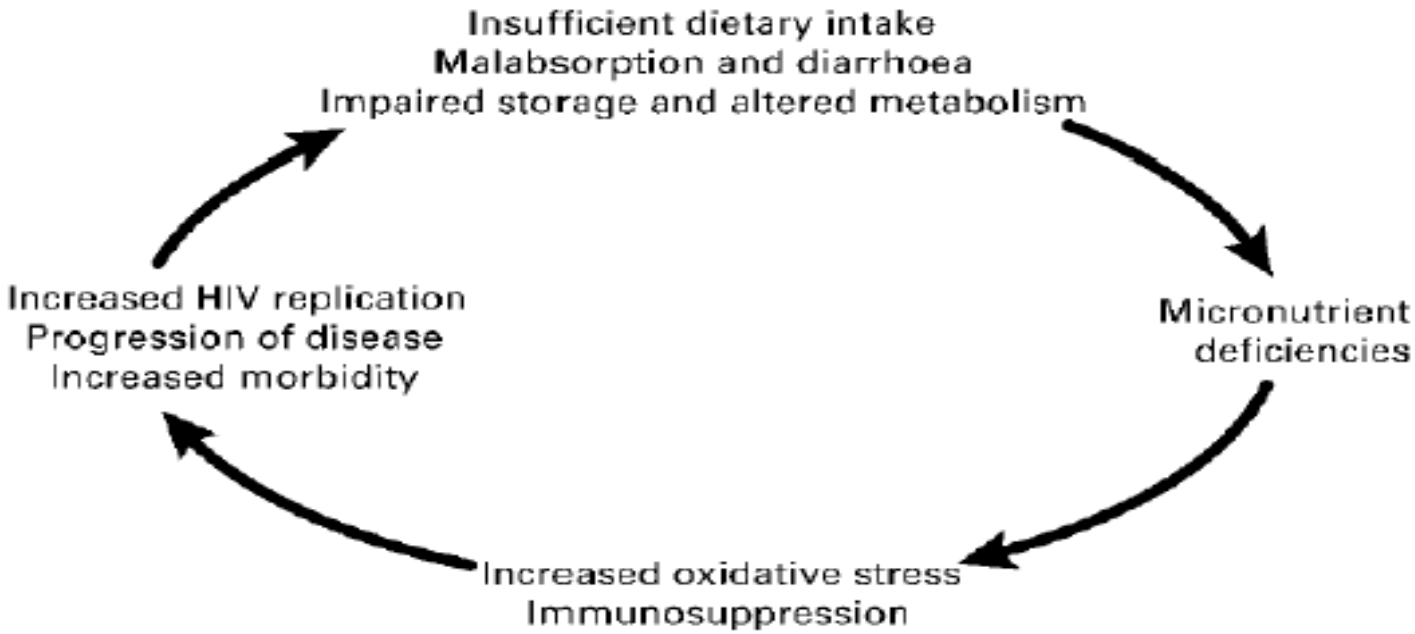
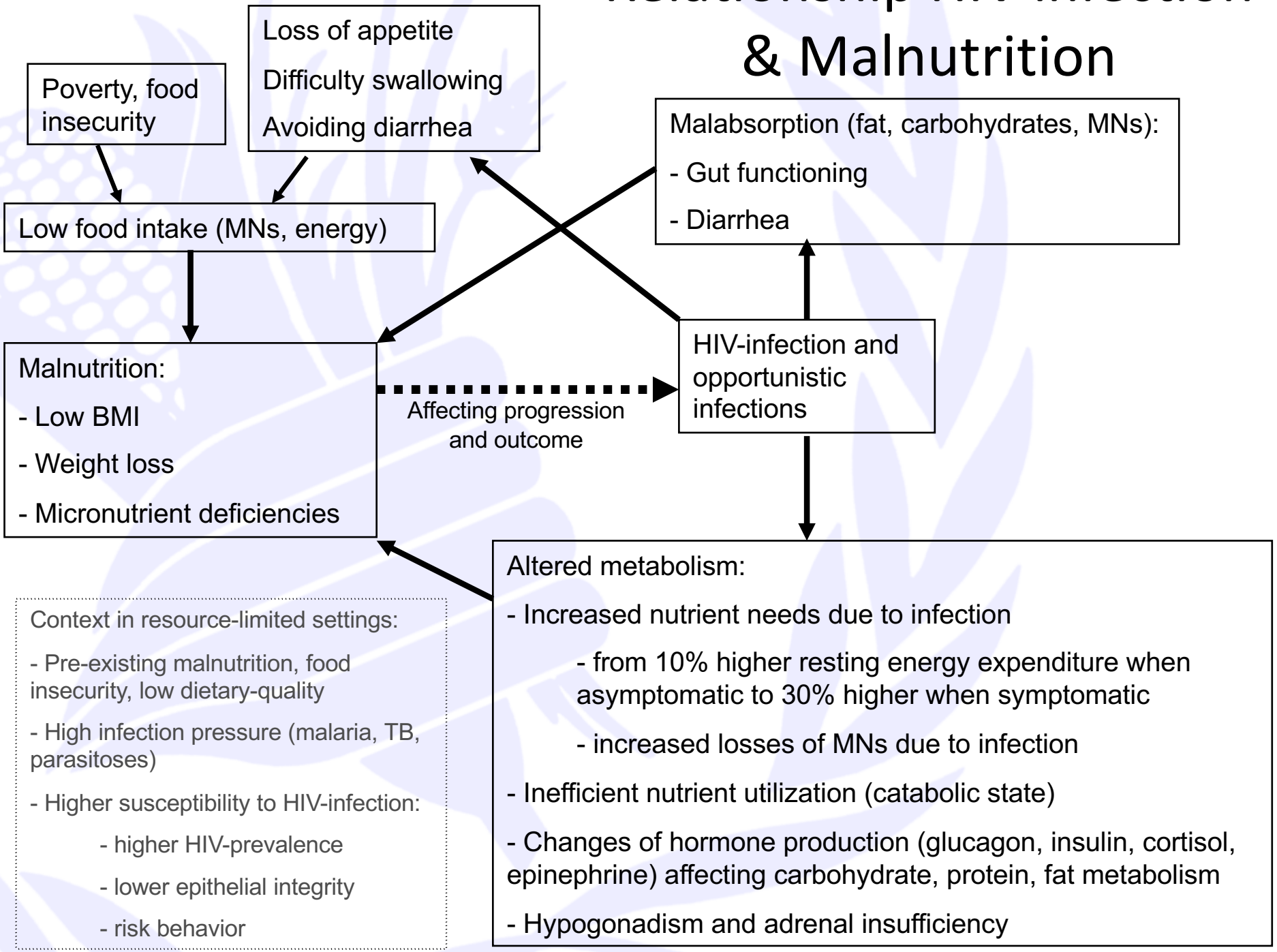


Figure 1. Vicious cycle of micronutrient deficiencies and human immunodeficiency virus (HIV) pathogensis (from Semba and Tang, 1999).

Relationship HIV infection & Malnutrition



How to intervene and for what outcome?

- Reduce viral load through ART
- Treat opportunistic infections
- Treat malnutrition (low body weight) because it is an independent cause of death (Paton 2006, van der Sande 2004, Zachariah 2006)
- Improve diet in order to meet macro- and micronutrient intake recommendations, which is required for the body to rebuild body tissues and function well (immunity, physical activity etc)

Note: Weight loss also occurs among people on ART

Nutrition for Healthy Living Cohort from Boston, all patients on ART

- 18% of patients lost >10% of body weight over serial 6-monthly visits
- 21% lost >5% of body weight sustained for 1 year
- 8% had a BMI <20 kg/m2
- 58% lost more than 1.5 kg in 6-12 months (average 4 kg) (Wanke 2000)
- Of the 29% that reported wasting since diagnosis of HIV, nearly two-thirds developed it after starting ART (Tang 2002)

Treating Malnutrition – Components of Weight Gain

Weight gain

Fat-free mass – required for bodily functions, requires:

- Consuming correct nutrients that build up the tissues
- Exercise (to grow muscles)
- Ability to build tissues (anabolic instead of catabolic state)

Fat mass – constitutes the body's energy reserves and insulation:

- More easily built on positive energy balance, because it doesn't require many different nutrients
- However, too much is associated with:
    - increased triglyceride levels
    - insulin resistance (diabetes)
    - overweight / obesity

Managing HIV Wasting – Resource Adequate Settings

Prior to Initiating Therapies for HIV Wasting:

- Assess HIV control and adjust therapy if warranted
- Treat factors with the potential to impair energy intake and expenditure
  - Opportunistic infections and malignancies
  - Depression or other psychosocial problems
  - GI side effects from antiretroviral therapies

↘

If wasting persists, prescribe nutritional counseling with or without appetite stimulants

↘

If wasting persists, offer therapies targeted at HIV wasting:

- Growth hormone (only therapy FDA approved)
- Testosterone
- Anabolic steroids

↘

After initiating therapy for HIV wasting, monitor response in regard to both weight and energy

Figure 3. Algorithm for management of HIV wasting in resource-adequate settings (from Wanke & Kotler, 2004).

Nutritional management of HIV infection and malnutrition among adults (WHO)

1. **Nutrition assessment**:
- Measure weight, weight change, height, BMI, MUAC
- Assess appetite, difficulty swallowing, nausea, diarrhea, drug-food interaction effects
- Assess household food security

2. **Treating malnutrition**:
- ***Mild to moderately malnourished*** adults (BMI<18.5), ***regardless of HIV status***, should receive ***supplementary feeding***. Usually, fortified blended foods, ready-to-use foods may also be used.
- ***Severely malnourished*** adults (BMI<16) should receive a ***therapeutic food***, nutritionally equivalent to F100. (WHO 1999).

3. **Dietary intake** (WHO 2003 & Hsu 2005):
- ***Energy intake*** in ***asymptomatic*** HIV infection, should be ***increased by 10%***
- During infection, reach maximum achievable intake of 20-30% above normal intake and during the recovery phase, maximum extent possible
- ***Energy % from protein and from fat same as for HIV-negative state***.
- Intake of ***1 RDA of vitamins and minerals***. This may not be enough to correct nutritional deficiencies in HIV infected people, but the lack of safe upper limits for HIV infected people precludes recommending higher intakes.

Purpose and practice of nutrition support

- Treat & prevent malnutrition
  - Severe malnutrition, guidance for SAM in adults
  - Moderate malnutrition – should focus on ensuring adequate nutrient intake, locally available and accessible foods augmented with food supplements
  - Improving balanced nutrient intake to support health and ART
- Studies have looked at
  - Micronutrients – for immune system support
  - Treating malnutrition and assessing impact on HIV-infection outcome (CD4 count, viral load)
  - Food assistance – to bridge energy gap and provide livelihood support – impact on HIV-infection outcome?

Characteristics of food supplement

- Content of supplement
  - Nutrients: macro- and micronutrients, protein quality, essential amino acids, essential fatty acids
  - Anti-nutrients
  - Energy density
- Amount provided per day
- Form of the food (palatability, preparation required)
- Ingredients
- Packaging
- In what setting is the food provided (clinic, community?)

Starting point of patients and context:

- Baseline nutritional status
- Target group (children, women, men etc)
- Food security situation
- Basic diet to which food supplement is added
- HIV-disease stage
- ART (yes/no) and other treatment received

Impact of Food Intervention on Malnutrition and HIV-disease (mortality, viral load, CD4 count)

Total food and nutrient intake:

- What information and counseling is provided to the patient?
- How much of the food supplement does the patient consume, per day and for how long?
- What else does the patient consume?

Treatment adherence and progression of HIV-disease during the study period

Studies on impact of food supplements on HIV-infection outcome

- Rationale
  - Treating severe–moderate malnutrition
  - Adjunct to ART to improve treatment outcome
- Need for food assistance to provide required nutrition depends on basic diet and food security situation
- Most studies done at advanced stage of disease, improving diet can only do so much
- Results from resource-limited settings indicate
  - ART improves BMI
  - RUF & FBF further improve BMI, RUF>FBF
  - Food assistance improves uptake and adherence to ART (livelihood support)
  - Studies too small to assess mortality impact

(Cantrell 2008, Ndhekha BMJ 2009, Ndekha TMIH 2009, van Oosterhout 2009, FANTA & KEMRI preliminary results 2009)

Micronutrients & HIV-infection - Relationship

- Deficiencies of several micronutrients have been associated with accelerated disease progression, increased MTCT, increased genital shedding of HIV, and increased mortality

Micronutrients & HIV-infection – Impact of interventions - 1

- High-dose VAC for underfives reduces morbidity and mortality
- VAC for women (during pregnancy, 10,000 IU/d, or high dose after delivery, 400,000 IU) does not reduce MTCT
- Adverse effect of supplementation during pregnancy and lactation on MTCT was observed when vitamin A (5000 IU/d) was combined with high-doses of beta-carotene (30 mg/d). Effect of beta-carotene, vitamin A or both?
- Inconclusive outcomes of single nutrient supplementation: vitamin E, selenium, zinc or iron

Micronutrients & HIV-infection – Impact of interventions - 2

- Multi-MN suppl some positive results (slower disease progression, reduced MTCT), but composition of supplements and results varied widely. Optimal amount & combination per target group unknown.
- WHO: ensure intake of 1 RDA for all micronutrients
- Academy of Sciences of South Africa: 1-2 RDA, because pre-existing deficiencies and increased utilization and losses during HIV infection
- There is no reason, based on currently available evidence, to withhold public health interventions with micronutrients from populations with a high prevalence of HIV-infection

Conclusions

- **Nutrition management** (i.e. ensure nutrient intake is according to recommendations) of HIV-infection is **essential and should start early** in order to maintain nutritional status and health
- In **advanced HIV-disease** managing nutritional status **requires ART, treating OIs, adequate nutrient intake, management of side effects** of treatment (appetite, nausea), **exercise**, and maybe even growth hormone
- **Nutrition and ART support each other**
- **Local circumstances determine which nutrition and food interventions are most appropriate**

Nutrition and Adherence

- *"Although participants welcomed antiretroviral therapy, they feared that transportation and supplementary food costs…would limit accessibility[1]" –*
- Mshana et al, 2006

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Barriers to Accessing Antiretroviral Therapy in Kisesa, Tanzania: A Qualitative Study of Early Rural Referrals to the National Program

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ABSTRACT

This community-based, qualitative study conducted in rural Kisesa District, Tanzania, explores perceptions and experiences of barriers to accessing the national antiretroviral programme among self-identified HIV-positive persons. Part of wider operations research around local introduction of HIV therapy, the study involved consultation with villagers and documented early referrals' progress through clinical evaluation and, if eligible, further training and drug procurement. Data collection consisted of 16 participatory group discussions with community members and 18 in-depth interviews with treatment-seekers. Although participants welcomed antiretroviral therapy, they feared that transportation and supplementary food costs, the referral hospital's reputation for being unfriendly and confusing, and difficulties in sustaining long-term treatment would limit accessibility. Fear of stigma framed all concerns, posing challenges for contacting referrals who did not want their status disclosed or expressed reluctance to identify a "treatment buddy" as required by the programme. To mitigate logistical barriers, transportation costs were paid and hospital visits facilitated. Participants reported satisfaction with eligibility testing, finding the process easier than anticipated. Most were willing to join a support group and some changed attitudes toward disclosure. However, both experienced and anticipated discrimination continue to hinder widespread antiretroviral therapy (ART) uptake. While simple measures to reduce perceived barriers improved initial access to treatment and helped overcome anxiety among early referrals, pervasive stigma remains the most formidable barrier. Encouraging successful referrals to share their positive experiences and contribute to nascent community mobililzation could start to address this seemingly intractable problem.

Paul Farmer

- "We've proven that people in poor settings with very complex diseases can be treated and cured,"
- "We've had some victories,"
- "**But if I were truly influential, everyone in the world would have the right to healthcare, food, clean water, other basics. That's the goal.**"

Source: *Farmer, 2003*

September 2003, six months later

Source: *Farmer, 2003*