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

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Millenium Development Goals

<table>
<thead>
<tr>
<th>MDG</th>
<th>Description</th>
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<tbody>
<tr>
<td>MDG-1</td>
<td>“eradicate extreme poverty and hunger”</td>
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<tr>
<td>MDG-2</td>
<td>“achieve universal primary education”</td>
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<td>MDG-3</td>
<td>“promote gender equality”</td>
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<td>MDG-4</td>
<td>“reduce child mortality”</td>
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<td>MDG-5</td>
<td>“improve maternal health”</td>
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<tr>
<td>MDG-6</td>
<td>“combat HIV/AIDS, malaria and other diseases”</td>
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<tr>
<td>MDG-7</td>
<td>“ensure environment sustainability”</td>
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<td>MDG-8</td>
<td>“global partnership for development”</td>
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MDG 1 Target: Halve, between 1990 and 2015, the proportion of people who suffer from hunger


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<tr>
<th></th>
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<tbody>
<tr>
<td>Sub-Saharan Africa</td>
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<td>22</td>
<td>28</td>
</tr>
<tr>
<td>Southern Asia, excluding India</td>
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<td>22</td>
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<tr>
<td>Southern Asia</td>
<td>24</td>
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<tr>
<td>South-Eastern Asia</td>
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<td>Eastern Asia, excluding China</td>
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<tr>
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<tr>
<td>Latin America &amp; the Caribbean</td>
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MDG 1 Target: Halve, between 1990 and 2015, the proportion of people who suffer from hunger

Proportion of children under age five who are underweight, 1990 and 2007 (Percentage)

<table>
<thead>
<tr>
<th>Region</th>
<th>1990</th>
<th>2007</th>
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<tbody>
<tr>
<td>Southern Asia</td>
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<td>Sub-Saharan Africa</td>
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<td>Western Asia</td>
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<tr>
<td>Eastern Asia</td>
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<tr>
<td>Northern Africa</td>
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<tr>
<td>Latin America &amp; the Caribbean</td>
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<tr>
<td>Developing regions</td>
<td>10</td>
<td>7</td>
</tr>
</tbody>
</table>
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
Three epidemics

TB
HIV
Malnutrition

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
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 intellectual capacity
  - Increase doubleburden: undernutrition + overnutrition (chronic diseases)
Economic Growth is not good enough?

Malnutrition rates and Rice prices

FIGURE 3 The percentage of underweight children (Z-score weight-for-age less than −2 sd) aged 0–59 mos and the weekly expenditure on rice per capita in USD (U.S.) 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

Not poor
- Rice
- Rice and veggies
- Rice, veggies, and eggs
- Rice, veggies, eggs, meat

Less poor
- Rice
- Rice and veggies
- Rice and eggs
- Rice and meat

Moderate poor
- Rice
- Rice and veggies
- Rice and eggs

Very poor
- Rice
- Rice and veggies

Very, very poor
- Rice

International Forum on Food and Nutrition, Rome, 3 Dec 2009
Micronutrients and Total Energy
Timmer, Pearson

Total Energy Intake
Micronutrient rich food

poor \[\rightarrow\] rich

International Forum on Food and Nutrition, Rome, 3 Dec 2009

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 (t = -0.51, P = 0.001, n = 9).

International Forum on Food and Nutrition, Rome, 3 Dec 2009
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)**

- 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

- Improve breastfeeding and complementary feeding
- Improve hygiene and parasite control
- Increase micronutrient intake
- Increase treatment of severe acute malnutrition
- 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
Global summary of the AIDS epidemic  
December 2008

<table>
<thead>
<tr>
<th>Number of people living with HIV in 2008</th>
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<tbody>
<tr>
<td>Total</td>
</tr>
<tr>
<td>Adults</td>
</tr>
<tr>
<td>Women</td>
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<tr>
<td>Children under 15 years</td>
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<tr>
<th>People newly infected with HIV in 2008</th>
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<th>AIDS-related deaths in 2008</th>
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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

Number of people living with HIV

Adult (15–49) HIV prevalence (%)

Number of people newly infected with HIV

Number of adult and child deaths due to AIDS

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Source: UNAIDS/WHO

2009 AIDS epidemic update

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AIDS epidemic update

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2009 AIDS epidemic update
South Africa’s war-like death statistics

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) pathogenesis (from Semba and Tang, 1999).
Low food intake (MNs, energy)
- Poverty, food insecurity
- Difficulty swallowing
- Avoiding diarrhea

Malnutrition:
- Low BMI
- Weight loss
- Micronutrient deficiencies

Malabsorption (fat, carbohydrates, MNs):
- Gut functioning
- Diarrhea

HIV-infection and opportunistic infections

Relationship HIV infection & Malnutrition

Context in resource-limited settings:
- Pre-existing malnutrition, food insecurity, low dietary-quality
- High infection pressure (malaria, TB, parasitoses)
- Higher susceptibility to HIV-infection:
  - higher HIV-prevalence
  - lower epithelial integrity
  - risk behavior

Altered metabolism:
- Increased nutrient needs due to infection
  - from 10% higher resting energy expenditure when asymptomatic to 30% higher when symptomatic
  - increased losses of MNs due to infection
- Inefficient nutrient utilization (catabolic state)
- Changes of hormone production (glucagon, insulin, cortisol, epinephrine) affecting carbohydrate, protein, fat metabolism
- Hypogonadism and adrenal insufficiency

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**

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.

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

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)

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

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?
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


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.

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**Nutrition and Adherence**

- “Although participants welcomed antiretroviral therapy, they feared that transportation and supplementary food costs...would limit accessibility” – Mshana et al, 2006.
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