



# Nutrition, Tuberculosis (and HIV)

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# Preview

- Overview of the epidemics
- How nutritional status influences TB transmission and treatment outcomes
- WHO Nutritional care and support Guidelines for TB (including evidence)
- Role of food in programs

# Tuberculosis

- **Documented to 8000 B.C.**
- **Infects 2 billion people: (10% develop active TB if untreated)**
- **8.6 million new cases in 2012**
- **#2 infectious disease killer**
  - 6% infant deaths
  - 20% adult deaths
  - 26% avoidable deaths worldwide
- **Highly treatable bacterial infection (for most)**

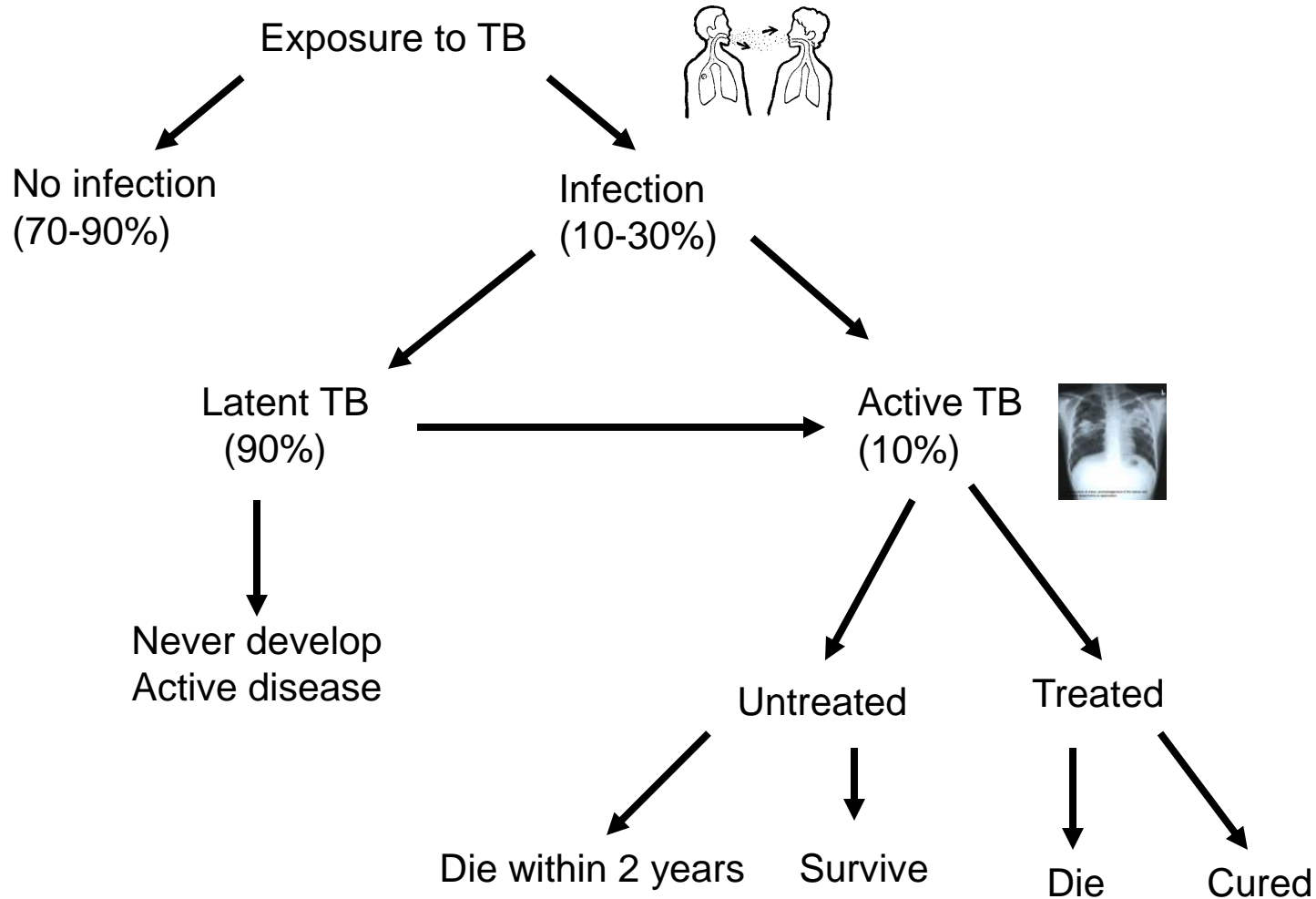


Zink et al, Journal of Clinical Microbiology, January 2003, p. 359-367, Vol. 41, No. 1

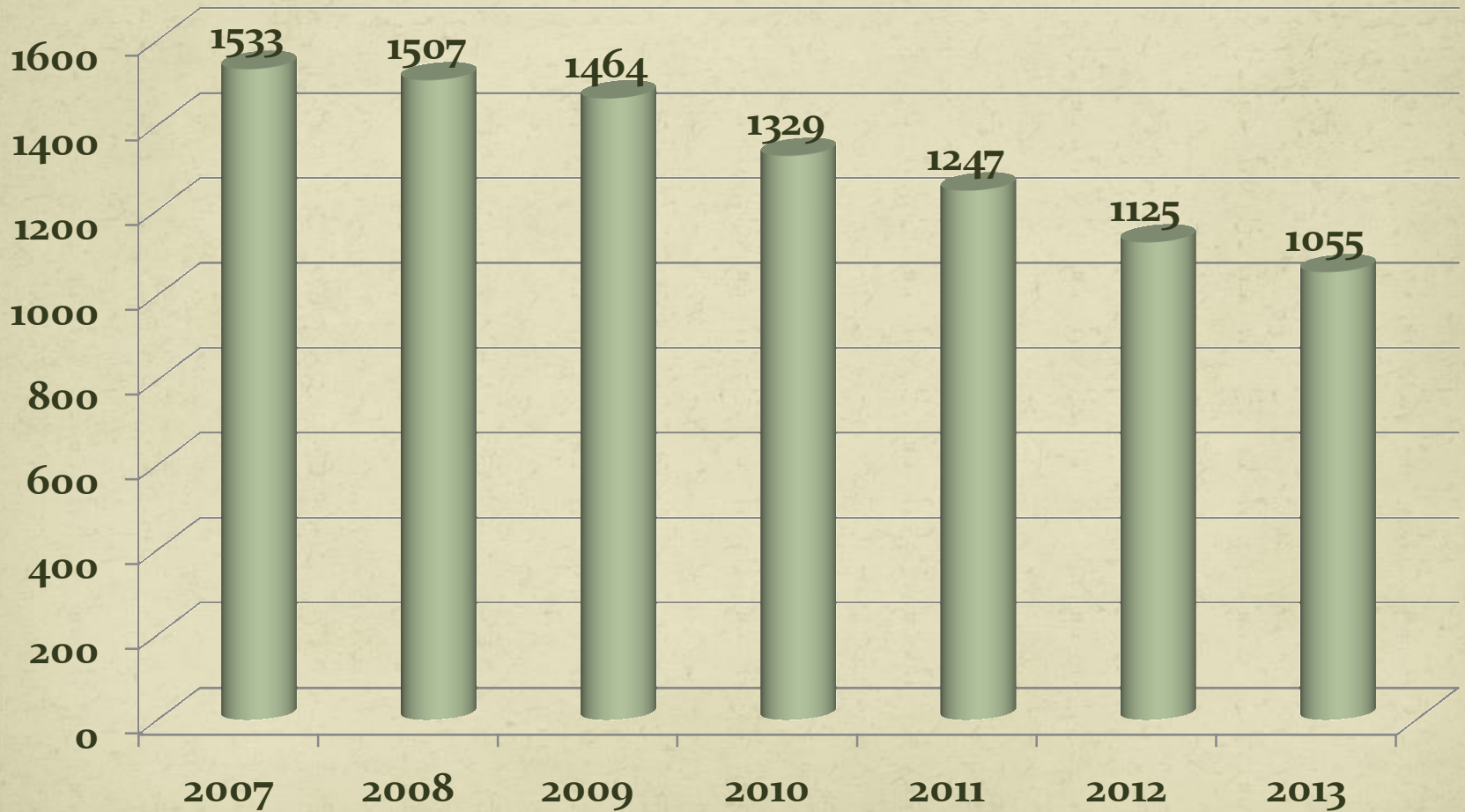
# HIV epidemic overview

- At 35.3 million people living with HIV at end of 2012, 1730 cases in Armenia in 2013
- Highly treatable but not curable
  - Nearly 10 million on ARV drugs
  - 26 million eligible for ARV's
- #1 infectious disease killer
- HIV and TB are co-epidemics: risk of getting active TB if HIV+ is 30x greater

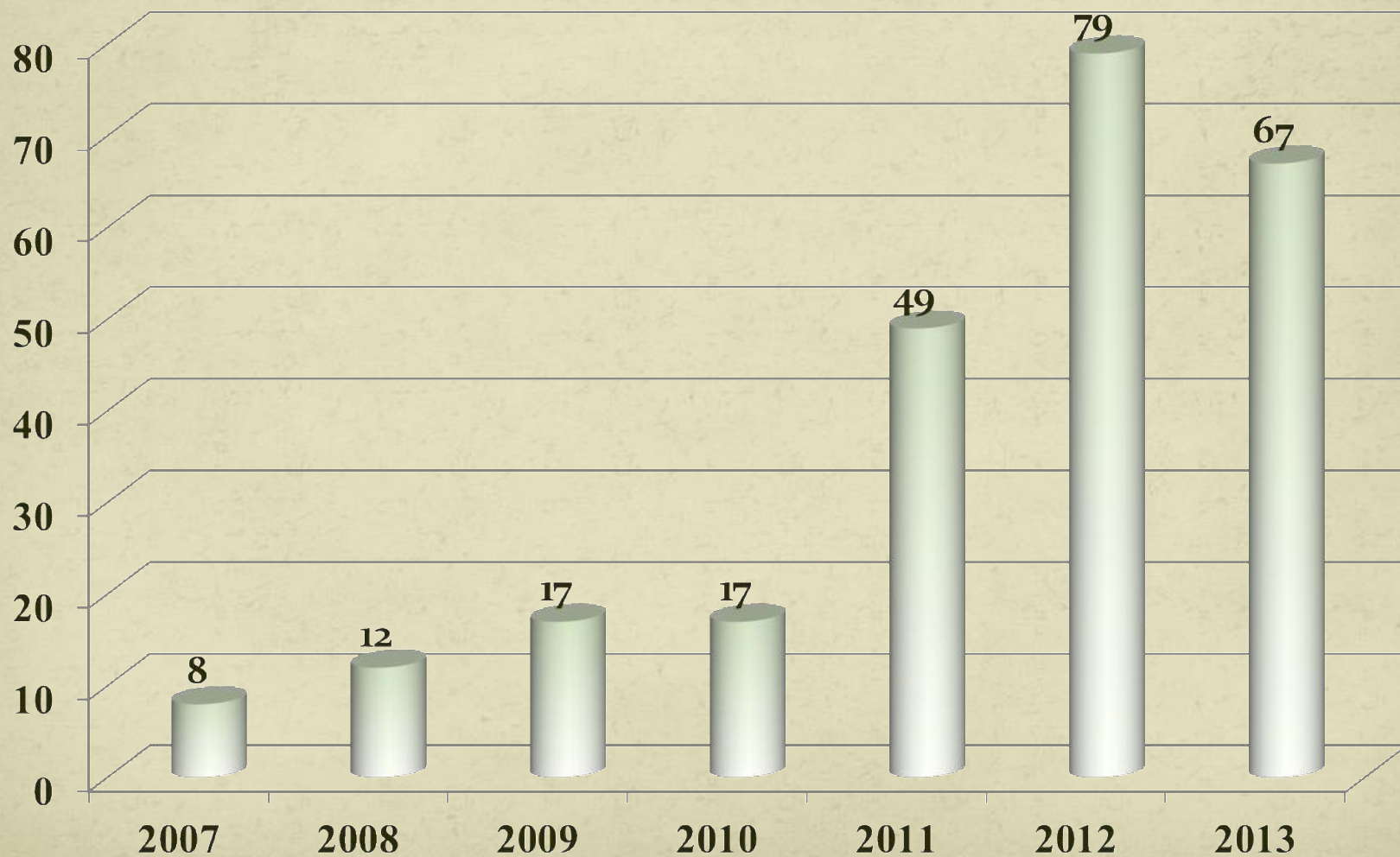
# Natural History of TB Infection



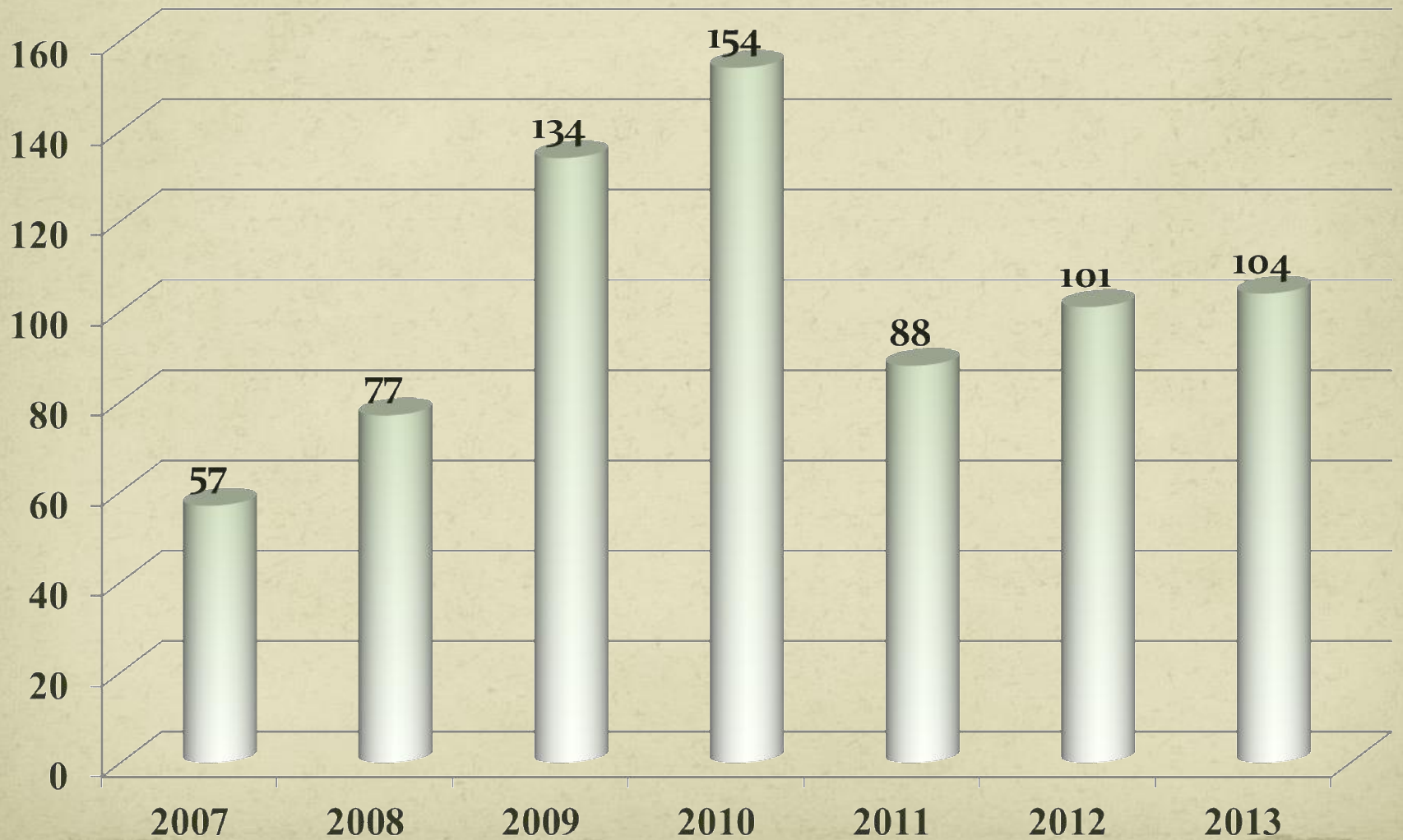
# NUMBER OF NEW TB CASES (2007-2013)



# NUMBER OF TB/HIV CASES (2007-2013)



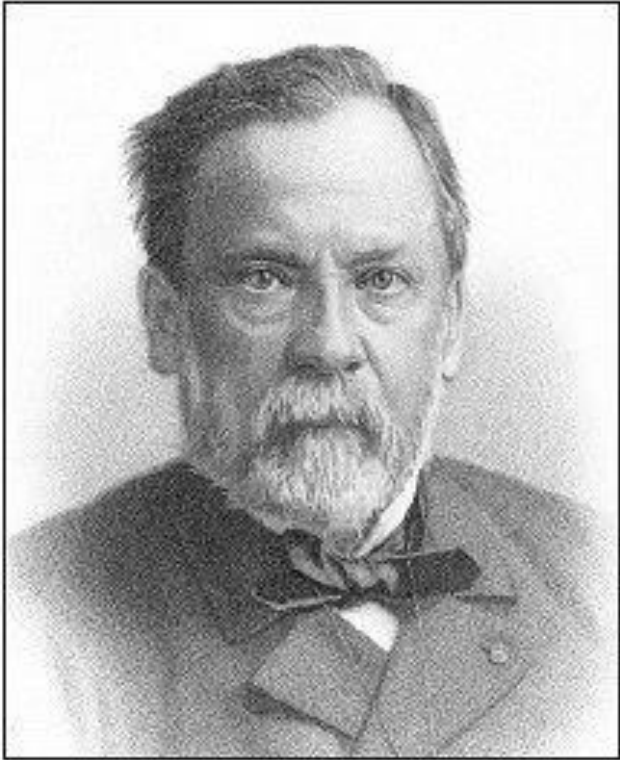
# NUMBER OF MDR TB CASES (2007-2013)





# NUMBER OF TB DEATHS (2007-2013)

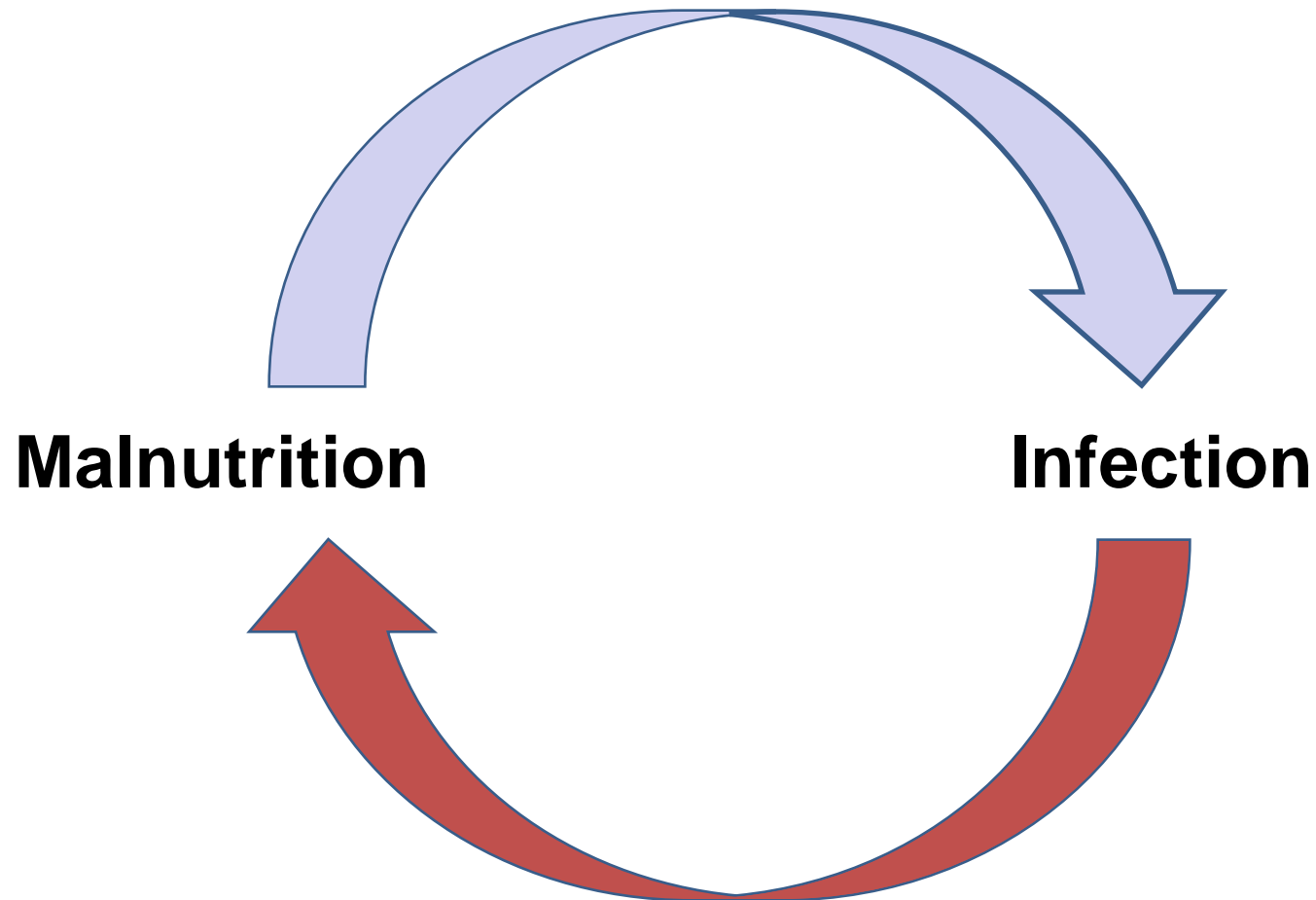




“The microbe is nothing...  
the terrain everything”

# **HOW NUTRITIONAL STATUS INFLUENCES TRANSMISSION AND TREATMENT OUTCOMES**

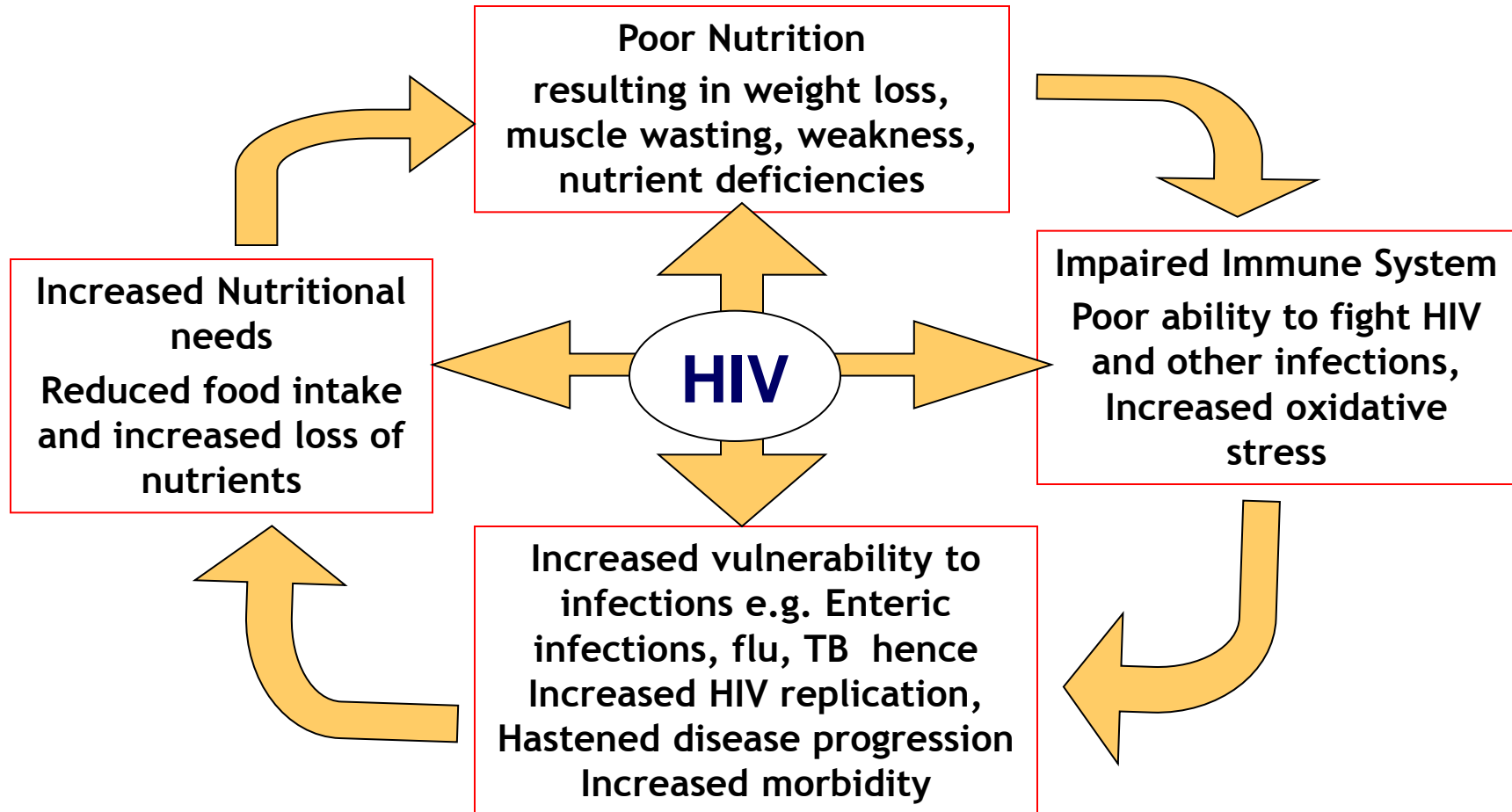
# The “malnutrition-infection” cycle





# Vicious Cycle of Malnutrition and HIV

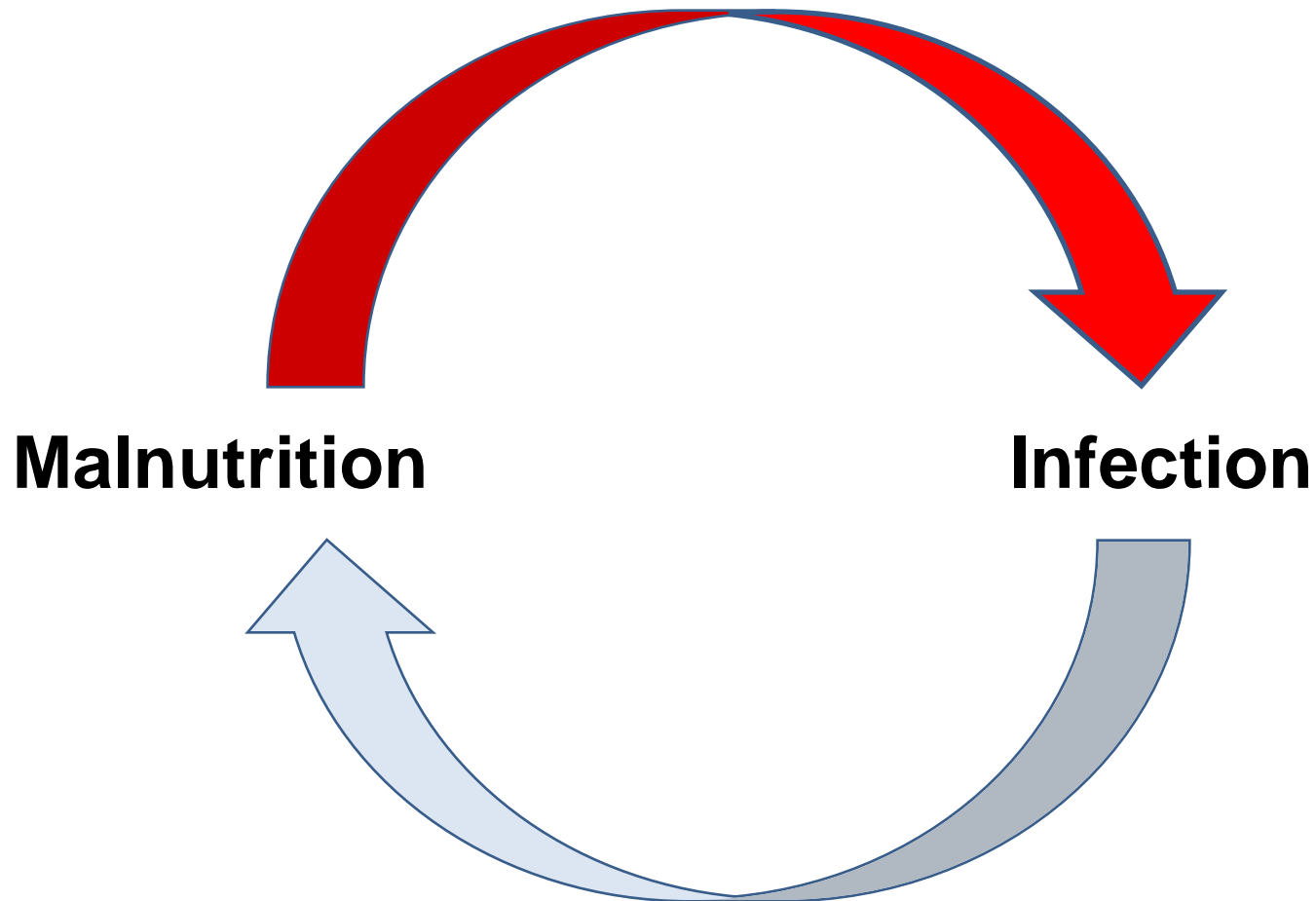
Source: Adapted from RCQHC and FANTA 2003



## Link between HIV and AIDS and Nutrition

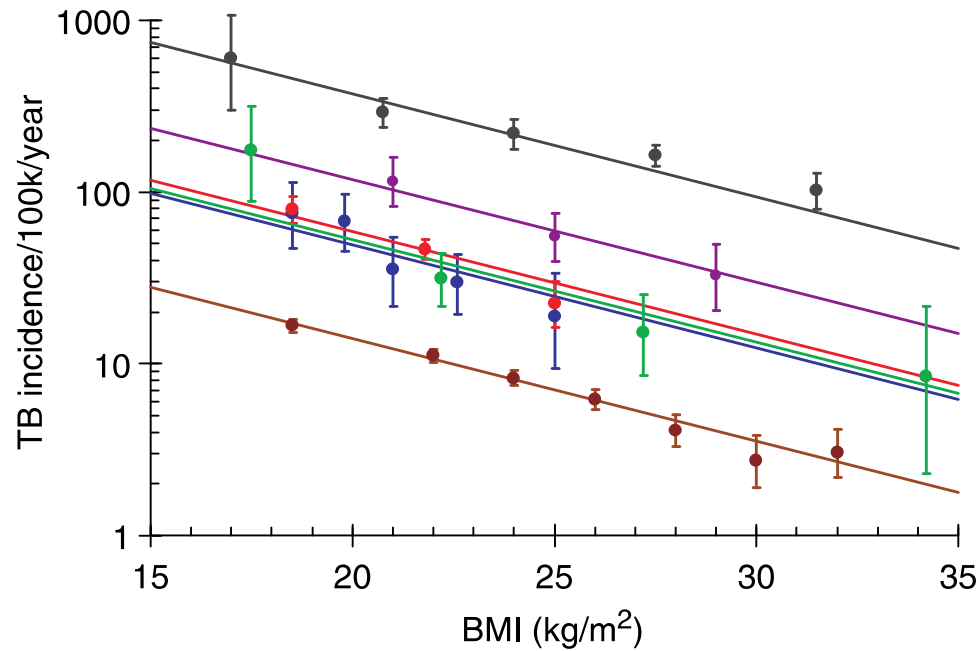
- **Reductions in the amount of food consumed**
  - Lack of appetite, depression
  - Mouth/throat sores
  - Economic reasons (lost income/access)
- **Reduced nutrient absorption**
  - Diarrhoea
  - Infections of the intestinal tract
  - Some medications may influence
- **Increased energy requirements**
  - Classic “wasting syndrome” observed in HIV infection

# The “malnutrition-infection” cycle

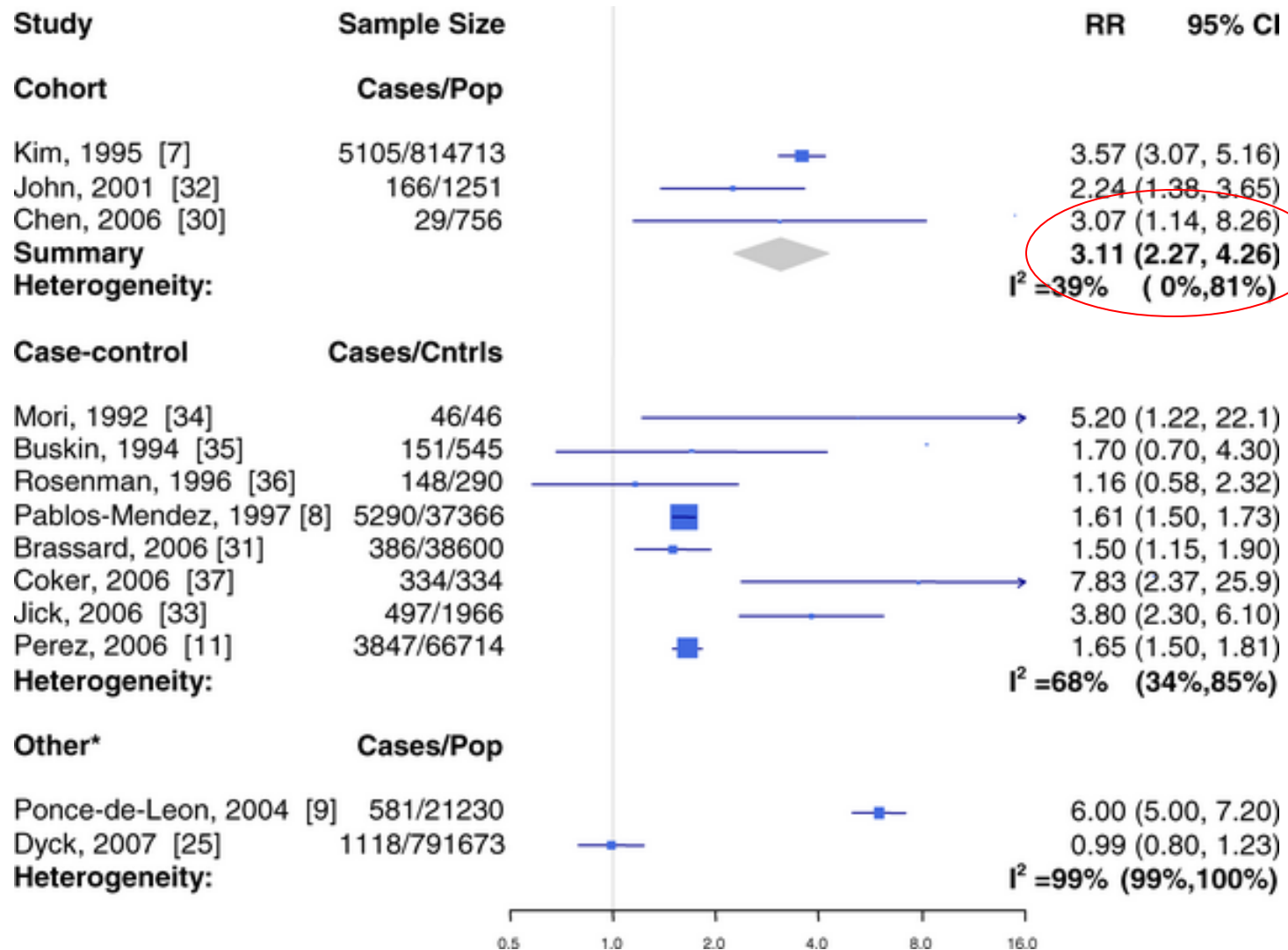




# There is a consistent log-linear association between BMI and TB incidence



# Meta-analysis of 13 studies examining the association between diabetes and TB



Source: Jeon and Murray, 2008

# Treatment outcomes may be worse in people with diabetes

- Prospective cohort study in Urban Indonesia
- 737 patients with pulmonary TB followed prospectively starting as they began treatment
- Outcomes compared by DM status
  - 6 months: 22.2% sputum specimens from DM patients positive for M. tuberculosis vs 7% for controls
  - **Adjusted OR: 7.65, p=0.004)**

**CAN NUTRITIONAL  
INTERVENTIONS HELP IMPROVE  
TREATMENT OUTCOMES OR  
MITIGATE EFFECTS?**

“There was nothing I could do for myself. I could not feed myself properly. I could not look after my daughter. After I started medication it was like I was resurrected.”



PHOTO CREDIT: JONX PILLEMER

## Joseph's unbelievable recovery transformation



**BEFORE**  
**PIH treatment**

**6 months AFTER**  
**PIH treatment**



# Malnutrition, HIV & TB - outcomes

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- Many people start ART or TB treatment in a malnourished state
- Malnutrition, Body Mass Index (BMI) $<18.5$ , is associated with a 2-6 times increased risk of death irrespective of CD4 count, and also as people start ART (Paton et al 2006, van der Sande et al 2004, Zachariah 2006)



# Does undernutrition reduce effectiveness of TB treatment?

## **Khan et al, 2006**

**Followed up 857 subjects, 7.1% relapse rate**

## **Johnston et al, (Plos One, 2009)**

**Meta analysis of 39 studies of patients treated for MDRTB**

- **Finding: Underweight (BMI<18.5) associated with higher relapse risk (19.5% vs. 5.8%, p<0.001)**
- **Finding: Low BMI (<18.5) associated with worse outcomes of patients treated for MDRTB 0.41 [0.23-0.72]**



# Energy/macronutrient requirements for HIV

Nutrient	Population Group	Recommendation*
<b>Energy</b>	Asymptomatic HIV+ adults	Increase of ~10%
	Adults with symptomatic HIV infection or AIDS (including pregnant/lactating women)	Increase of ~20-30%
	Asymptomatic HIV+ children	Increase of ~10%
	Children experiencing weight loss (regardless of HIV status)	Increase of ~50-100%
	Children with severe acute malnutrition	No change from WHO guidelines
<b>Protein</b>	All population groups	No change indicated to date (10-12% of total energy intake)
<b>Fat</b>	Individuals who are HIV- or HIV+ but not taking antiretroviral drugs	No change indicated to date (at least 17% of total energy intake)

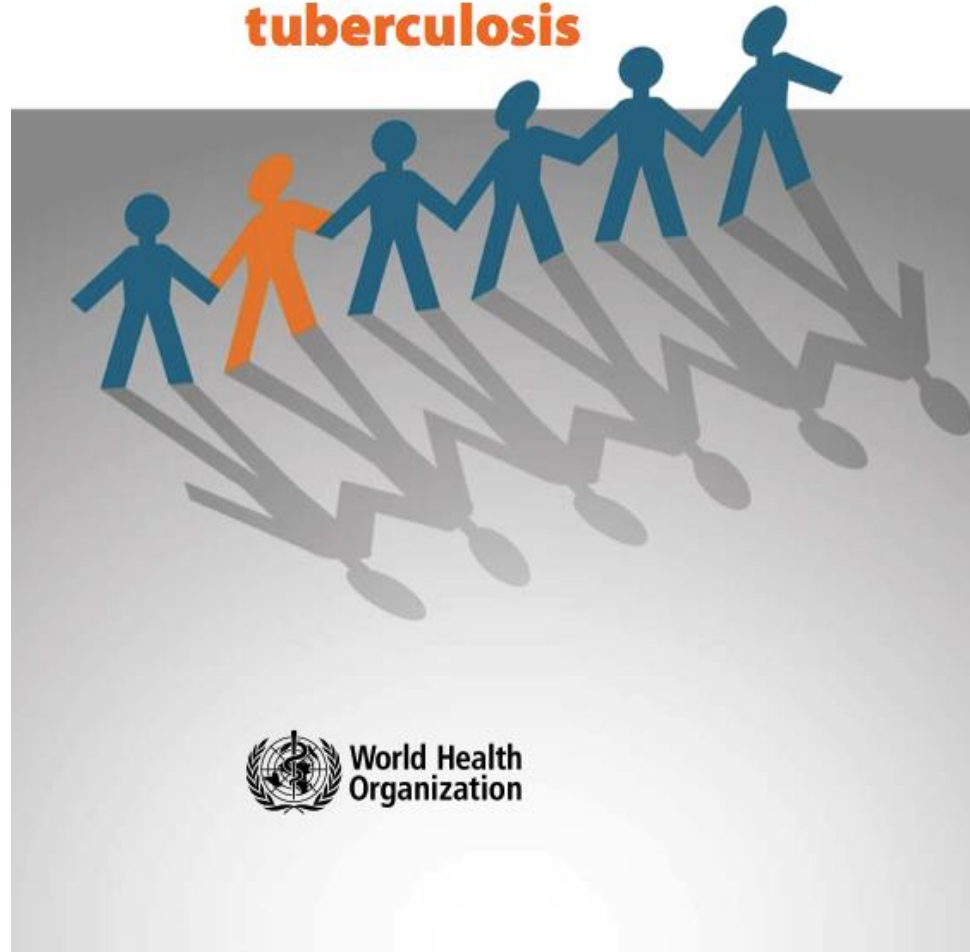
\*Compared with normal dietary requirements from WHO. Sources: World Health Organization (WHO). "Nutrient requirements for PLHIV." Geneva: WHO, 2003;

WHO. "Executive summary of a scientific review. Consultation on nutrition and HIV/AIDS in Africa: evidence, lessons and recommendations for action". Durban, South Africa 10–13 April 2005. WHO, Geneva, 2005

**And 1 RDA of essential micronutrients...**

Guideline:

**Nutritional care  
and support  
for patients with  
tuberculosis**



## Key principles

1. **All people with active TB should receive TB diagnosis, treatment and care** according to WHO guidelines and international standards of care. Concerns about weight loss/failure to gain weight should trigger further clinical assessment.
2. **An adequate diet**, containing all essential macro and micronutrients **is necessary for the well-being and health of all people, including those with TB infection or disease**
3. Because of the clear bidirectional causal link between undernutrition and active TB, nutrition screening, **assessment and management are integral components of TB treatment and care**
4. Poverty and food insecurity are both causes and consequences of TB, and **those involved in TB care therefore play an important role in recognizing and addressing these wider socioeconomic issues**
5. **TB is commonly accompanied by comorbidities** such as HIV, diabetes mellitus, smoking and alcohol or substance misuse, which have their own nutritional implications, and **these should be fully considered during nutrition screening**, assessment and counselling

# Summary of findings: Food or energy dense supplements

Outcomes	Relative effect (95% CI)	N (# studies)	Quality of evidence
Death (6 months)	RR 0.4 (0.07 to 2.25)	202 (2 studies)	Very low
Cured (6 months)	RR 0.9 (0.59 to 1.41)	102 (1 study)	Very low
Treatment completion (6 months)	RR 1.08 (0.88 to 1.33)	365 (2 studies)	Very low
Sputum negative (8 weeks)	RR 1.2 (1.02 to 1.4)	149 (2 studies)	Very low
Mean weight gain (8 weeks)		731 (4 studies)	Moderate
Quality of life (8 weeks)		134 (2 studies)	Low

Recommendation	Quality of evidence	Strength of evidence
Nutrition assessment and counseling at diagnosis and throughout treatment	Not available	strong
Management of severe malnutrition in line with WHO recommendations	Very low	strong
Under 5's with TB and moderate undernutrition managed as other children with moderate malnutrition including provision of locally available/fortified foods to restore appropriate weight-for-height	Low	conditional

# Micronutrients

- Deficiencies of A, zinc, D, E, selenium often common in people with TB
- Unclear causes
- Not enough studies to make conclusion about effect on mortality in HIV- people with TB
- Little or no effect on mortality in those with coinfection
- Stay tuned...

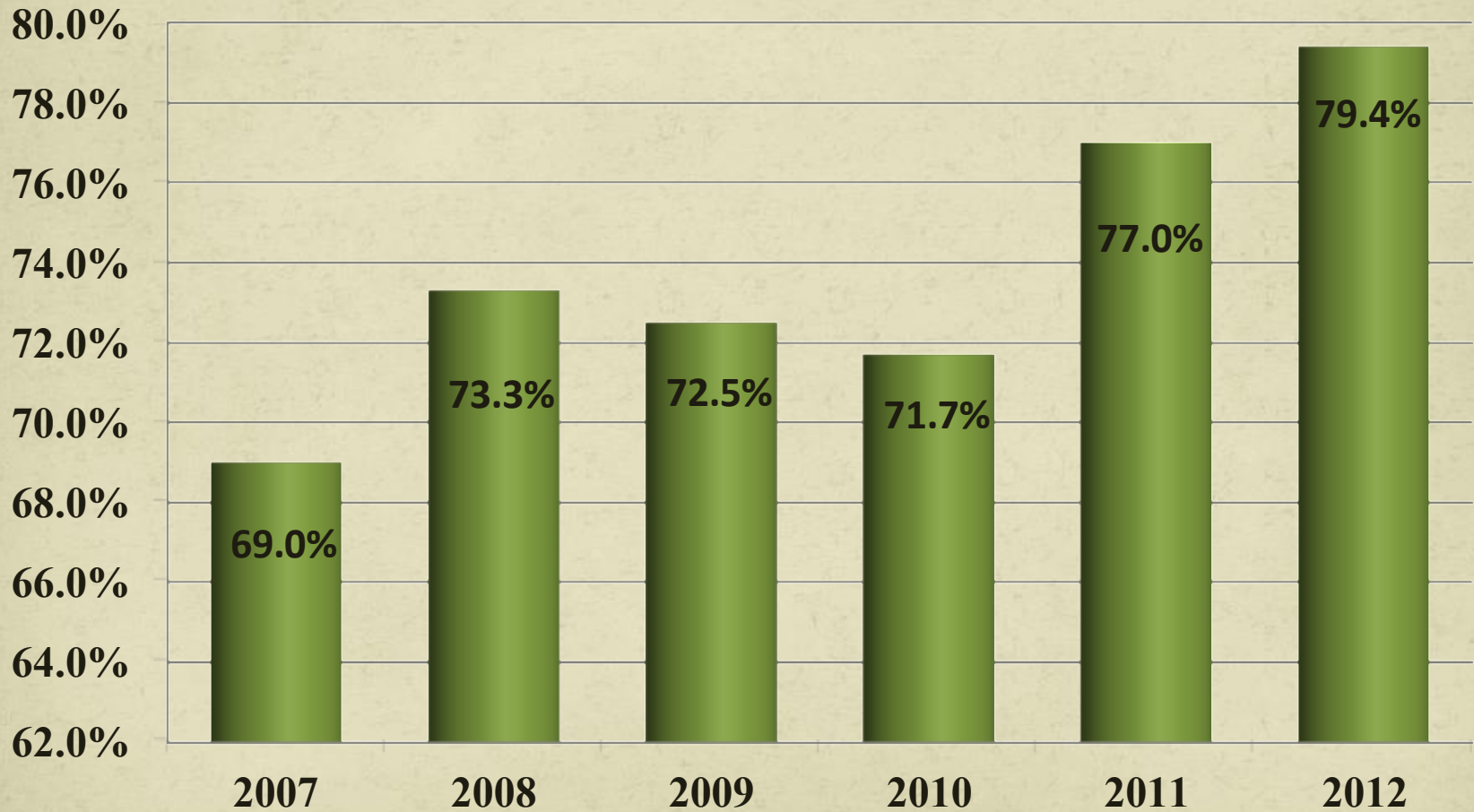
“The overall evidence base on effects of nutritional supplements for TB prevention and care is limited...There is no evidence on improvement of TB treatment outcomes or prevention of progression from TB infection to active disease when using nutritional supplementation as an addition to standard care”

# But...

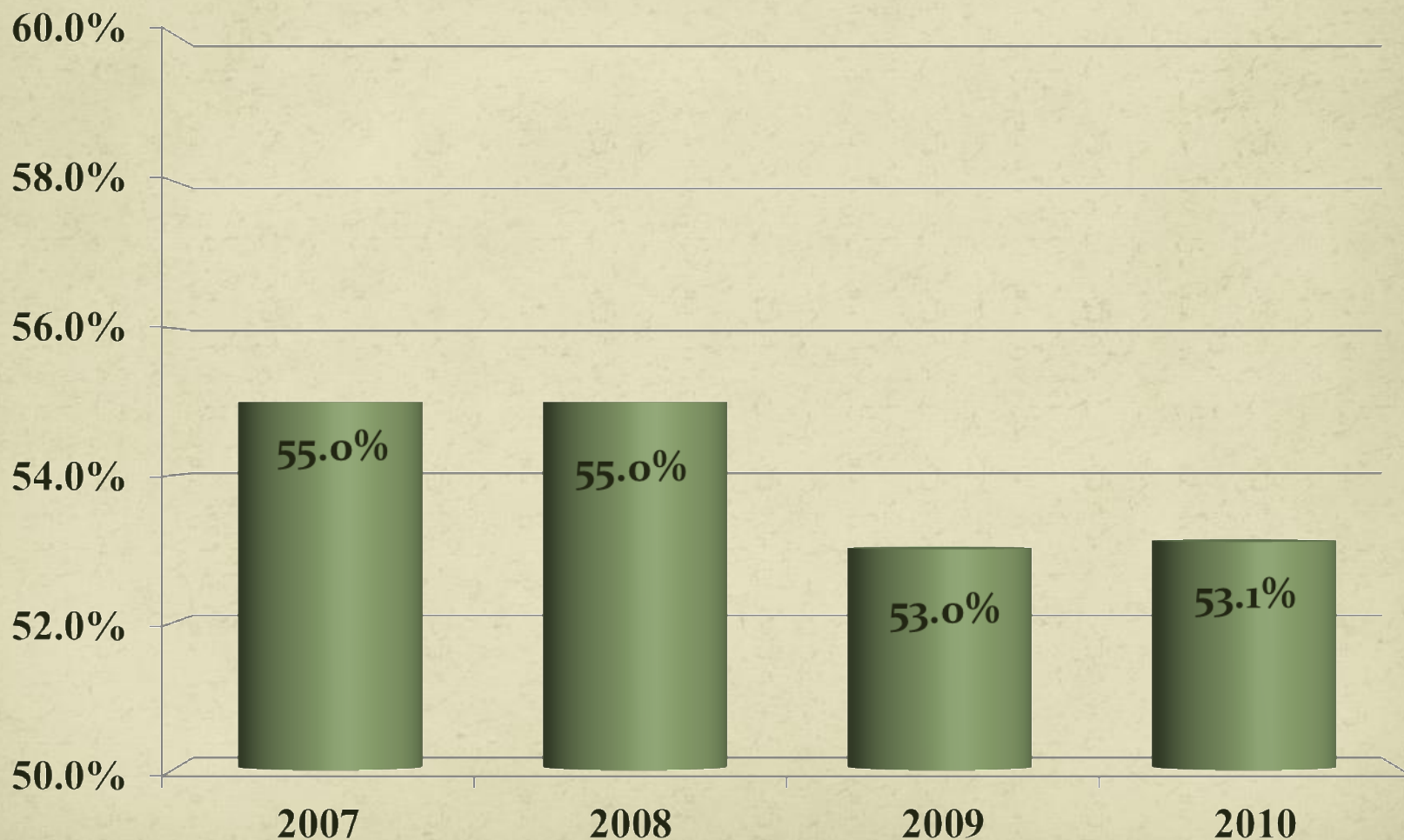
- “This guidance does not consider the provision of food as part of a package of enablers to improve TB treatment adherence or as a means to mitigate the negative financial consequences of TB”.



# TREATMENT SUCCESS RATES AMONG NEW SMEAR (+) PATIENTS (2007-2012)



# TREATMENT SUCCESS RATES OF MDR TB CASES (2007-2010)

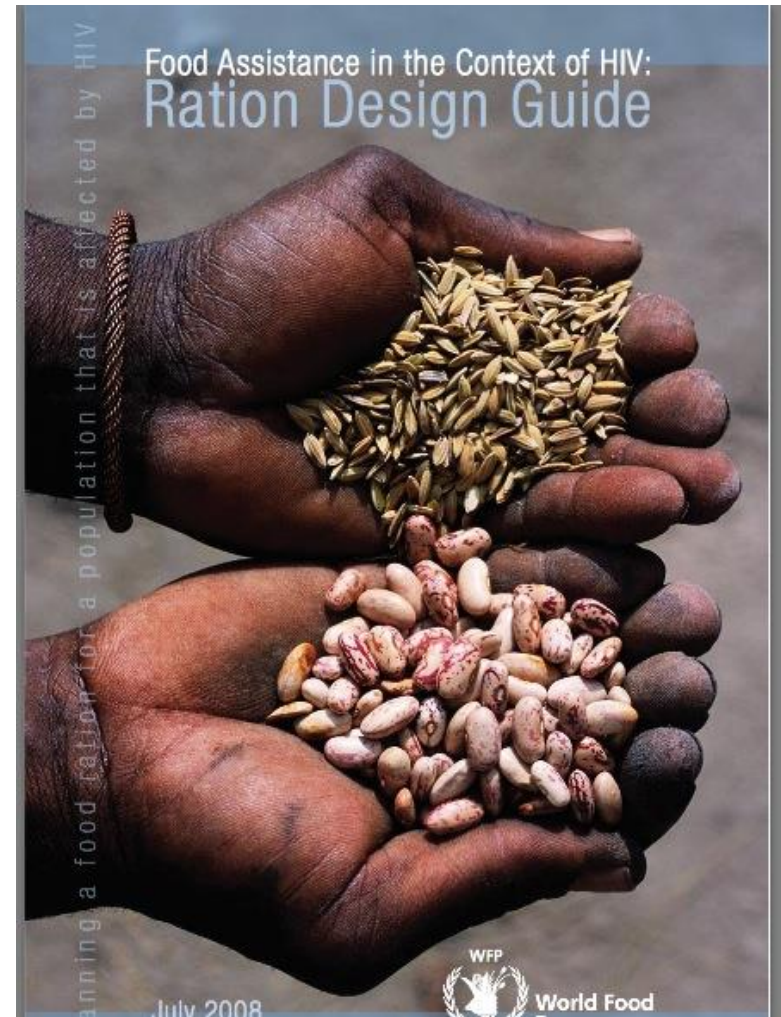


# TB PATIENTS SOCIAL SUPPORT COMPONENT

- TB social support program is implemented with support of GF through Armenian Red Cross:
  - Providing social support for TB patients throughout the treatment,
    - Once in a month for sensitive TB patients
    - Twice in a month for DR TB patients
      - Food packages
      - Hygienic packages
    - Transportation costs for DOT
  - Awareness sessions/trainings for TB patients
- Rehabilitation services in specialized TB sanatorium for TB contact children under age 16

# Role of food

- For people undergoing treatment
  - HIV
  - TB
- For people affected
  - ➔ Not all people with HIV or TB need food support but they do need nutritional support



# Role of Nutrition in HIV & TB

- In addition to medical treatment, nutritional recovery also requires nutrient intake required for rebuilding the tissues (esp. muscle) and physical activity
- Drug side effects, which reduce treatment compliance, can be mitigated with regular and palatable food

**Thus, treating HIV or TB-associated malnutrition requires treating infection(s) and adequate nutrition for rebuilding body tissues**



# How to ensure adequate nutrition?

- Nutrition assessment & counselling (NAC)
- Where necessary augment with special foods (NAC **S**)
  - Ready-to-use foods (for first, fast, recovery from severe malnutrition)
  - Fortified blended foods
  - Complementary food supplements that add high quality nutrients to existing diet
    - Vitamin and mineral supplement
    - Low dose lipid-based nutrient supplement



Judy Pudlowski, International Medical Corps

Household assistance – to support and protect households: food, cash, vouchers



# Thank you

- Dr. Armen Hayrapetyan
- Dr. Saskia DePee