

ANH 101: Core Disciplines in Agriculture-Nutrition-Health Research

Nutrition

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Outline

- Essential epidemiology
- Nutrition definitions and determinants
- Measuring malnutrition
- Nutrition interventions

EPIDEMIOLOGY

“The study of the distribution and determinants of health-related states or events in specified populations”
(Dictionary of Epidemiology)

SECTION 1: EPIDEMIOLOGY

The Epidemiological Approach

Count



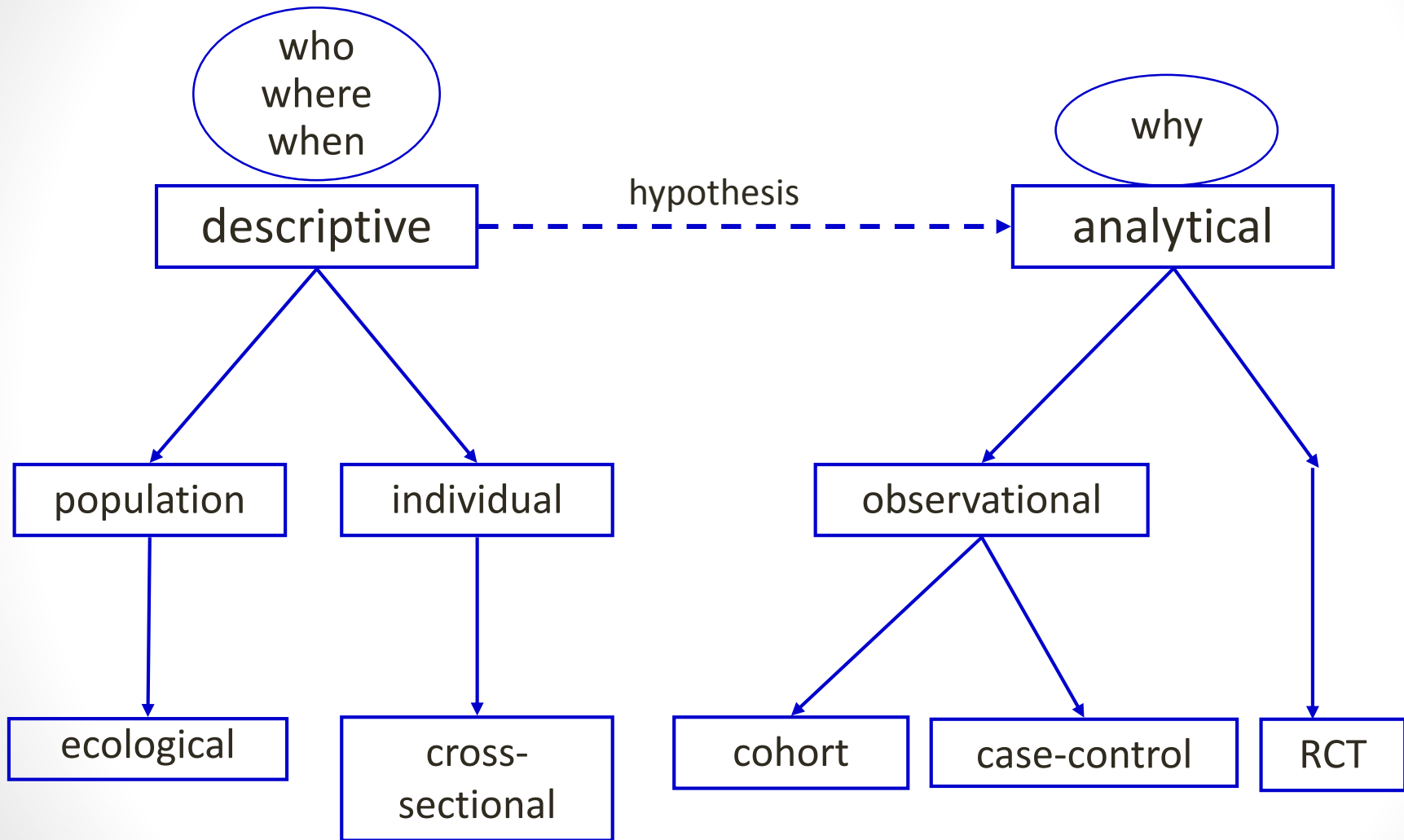
Divide



Compare

- Case definition
- Specified population
- The core of epidemiology
- Compare:
 - Populations
 - Exposure to risk factors
 - Over time

Study designs



Association and causality

Three reasons an association might not be causal:

1. Random Error

- Variation between samples
- Cannot control

2. Bias

- Systematic error in design or conduct
- Can control with careful design

3. Confounding

- A separate variable associated with the exposure or outcome

Bradford Hill's criteria for causality



NUTRITION

“The intake of food, considered in relation to the body’s dietary needs”. (WHO)

MALNUTRITION

“Broad term for a range of conditions that hinder good health, caused by inadequate or unbalanced food intake or from poor absorption of food consumed”. (FAO)

SECTION 2: NUTRITION DEFINITIONS AND DETERMINANTS

Catch-all term

MALNUTRITION

More specific

UNDERNUTRITION

OVERNUTRITION

More specific-
relating to what
we measure

**STUNTING
WASTING
UNDERWEIGHT**

**MICRONUTRIENT
MALNUTRITION**

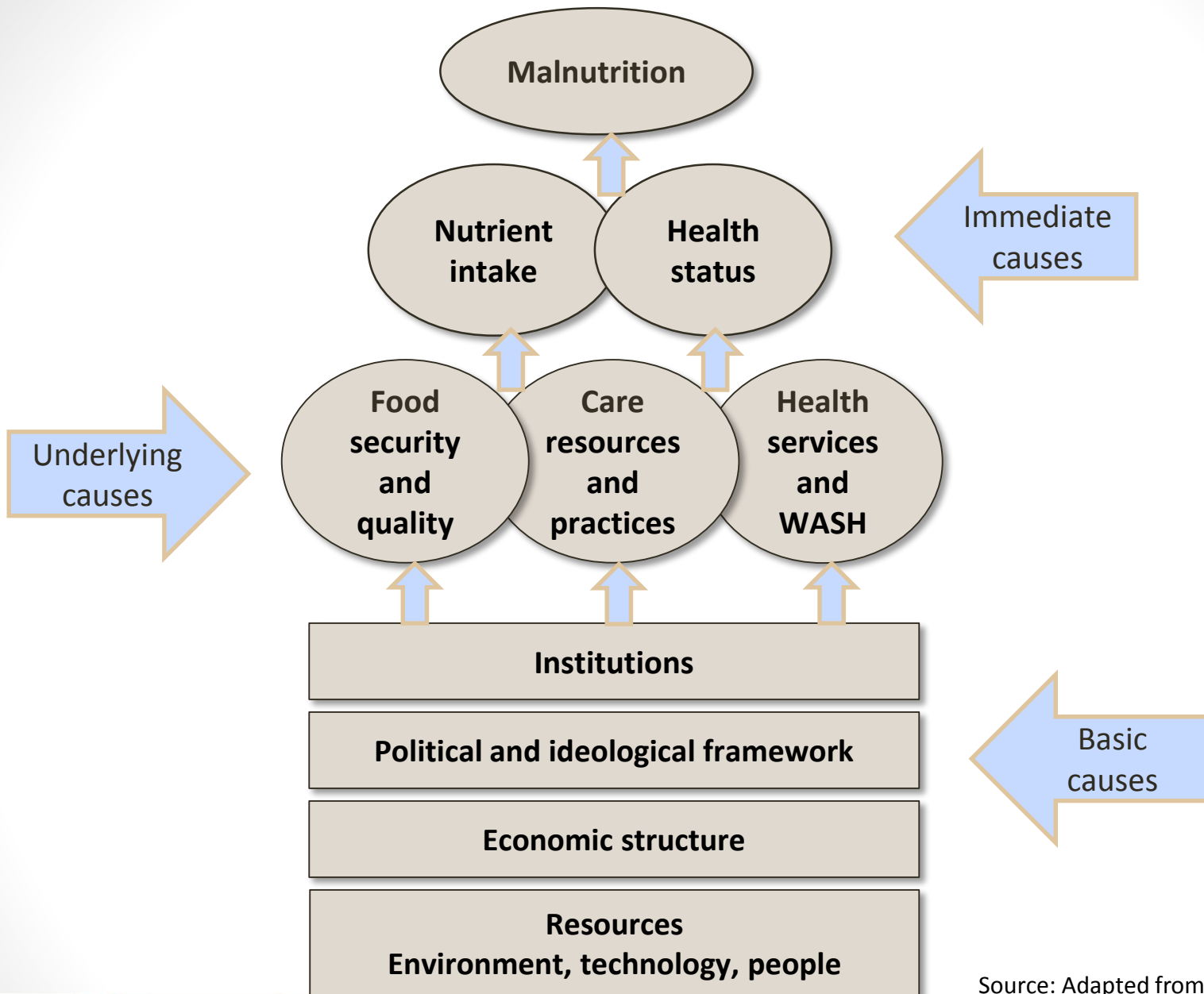
**OVERWEIGHT
OBESITY
NCDs**

What we
measure

ANTHROPOMETRY

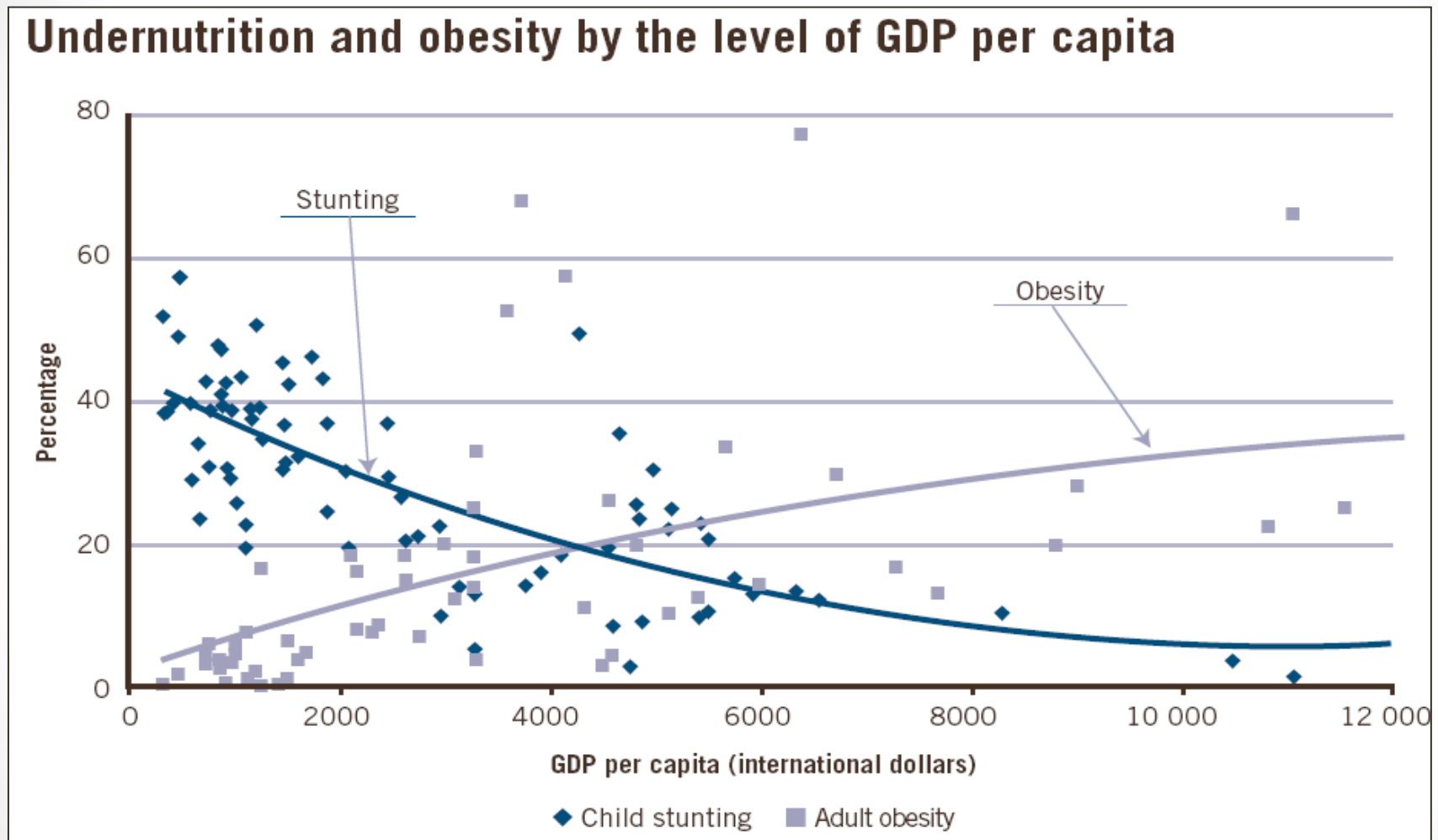
**BIOCHEMICAL
CLINICAL
DIET**

**ANTHROPOMETRY
CLINICAL**



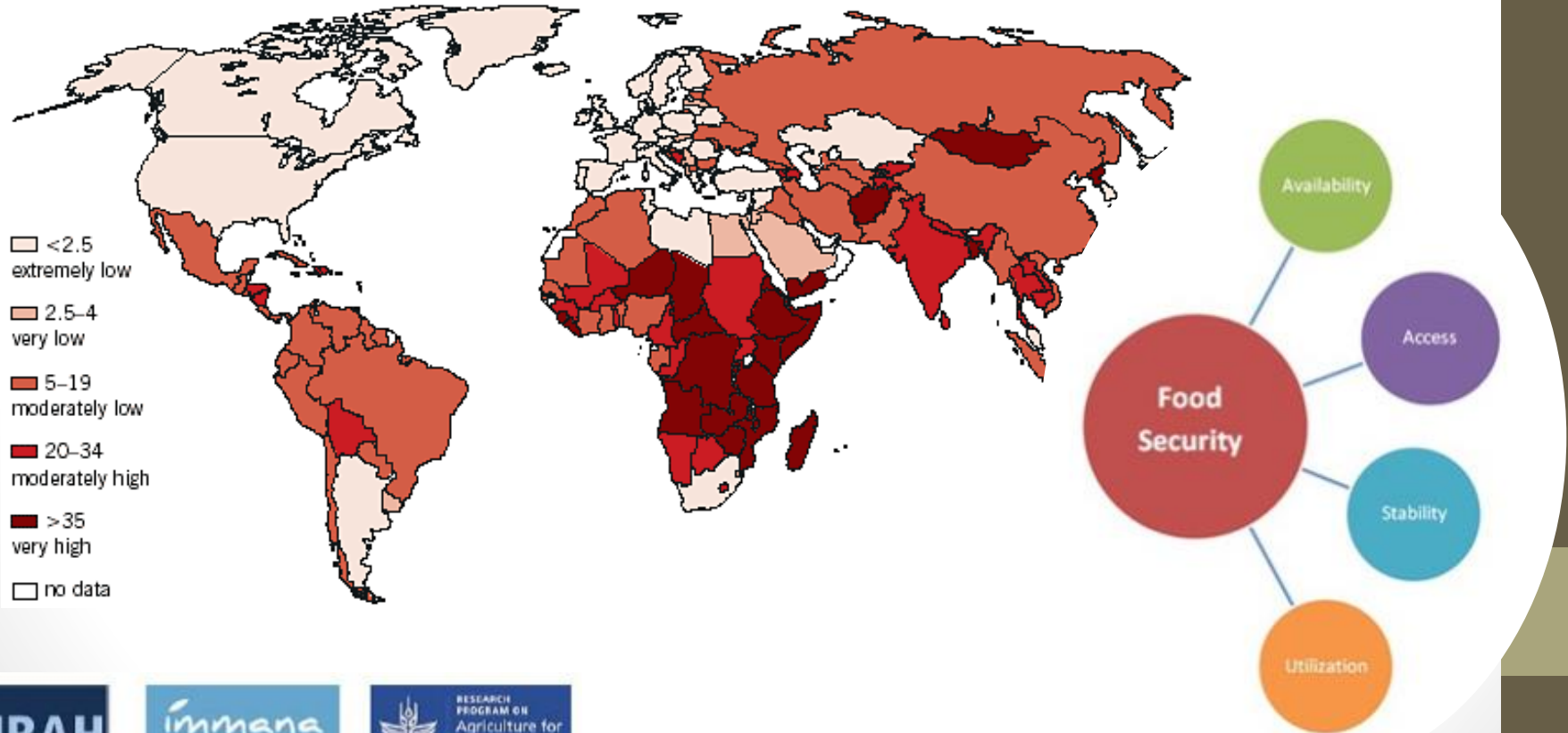
Source: Adapted from UNICEF 1990

Determinants of malnutrition: Economic



Determinants of malnutrition: Food insecurity

- Hunger (lack of calories)
- Usually measured by availability through food balance sheets
 - $(\text{Production} + \text{import} - \text{export}) / \text{population} = \text{per capita calories}$



Determinants of malnutrition: Health and Care



Breastfeeding



Complementary feeding



Health and hygiene

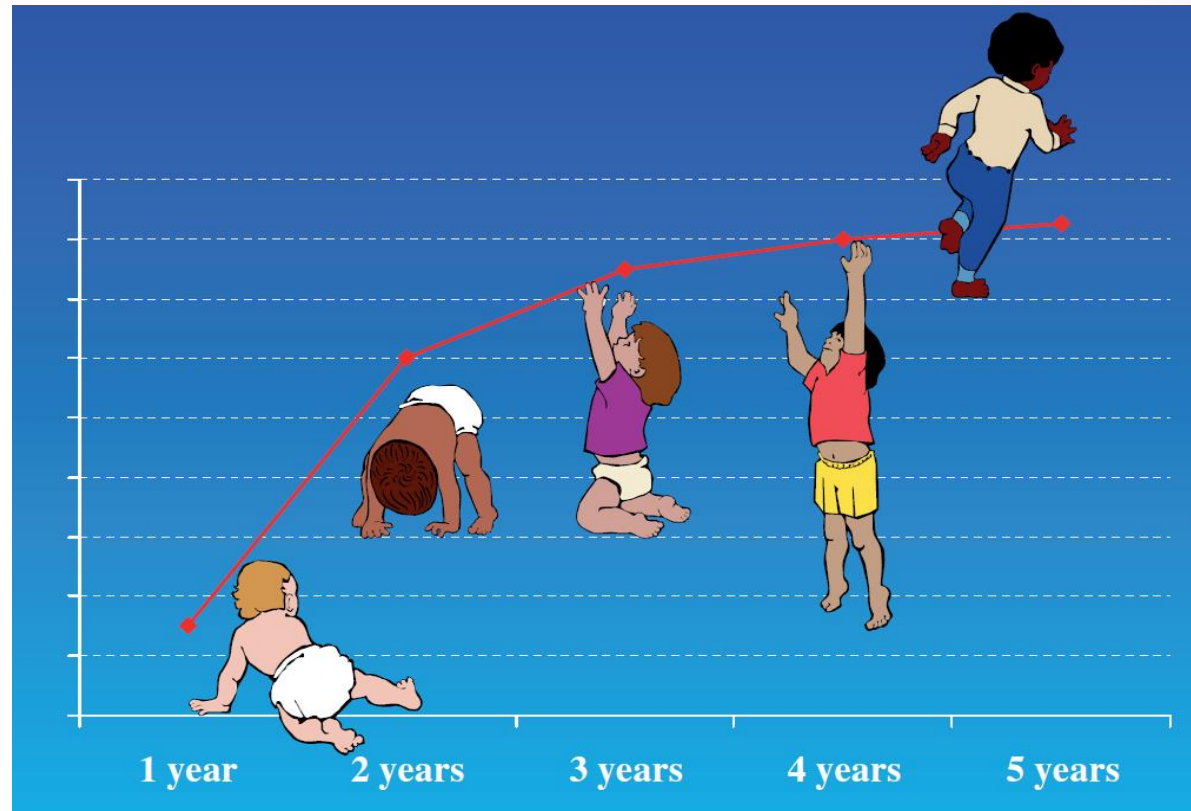
SECTION 3: MEASURING MALNUTRITION

Measuring Malnutrition: The ABCD

- **Anthropometry**—Study of size and measurements of the human body
- **Biochemical**—analyses of blood and urine for vitamins, minerals, amino acids
- **Clinical**—observation of disease in patients
- **Dietary**—assessing the quantity and quality of food eaten

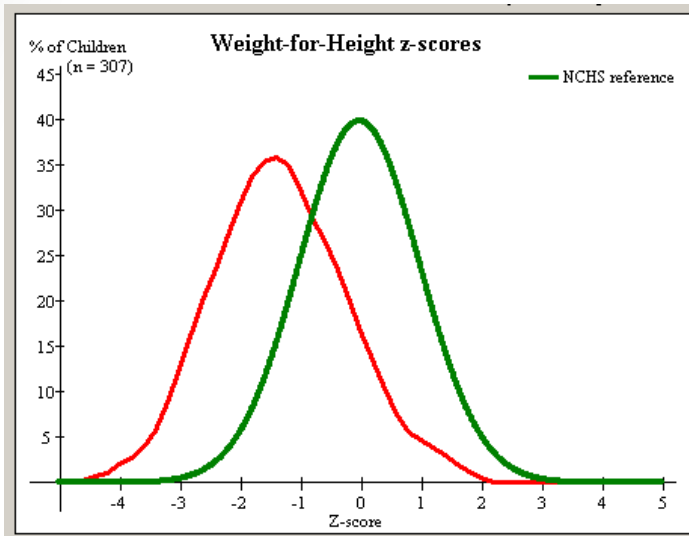
Anthropometry

- Stunting
- Wasting
- Underweight
- BMI

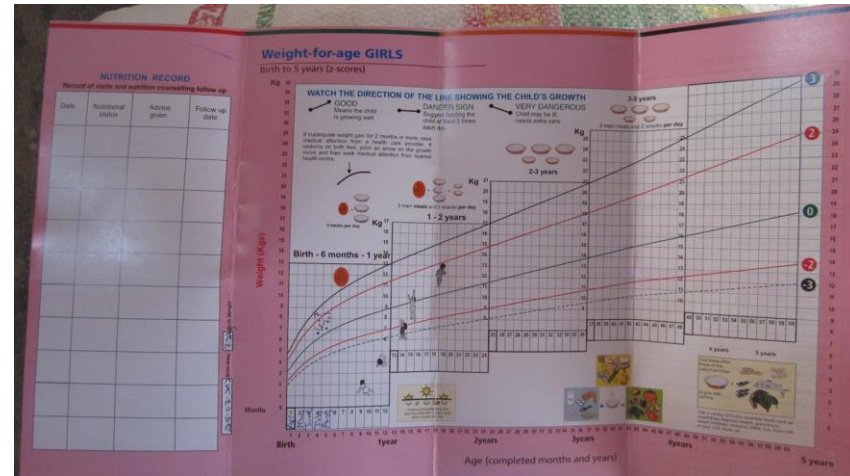


Source: WHO child growth standards : length/height-for-age, weight-for-age, weight-for-length, weight-forheight and body mass index-for-age : methods and development (cover of main Technical Report)

Z-scores and growth charts



Green: Population curve for healthy, well-fed children
Red: Population in a context of high wasting



Growth charts: Tracking an individual child compared to the average.
Being below average is ok, but faltering is not.

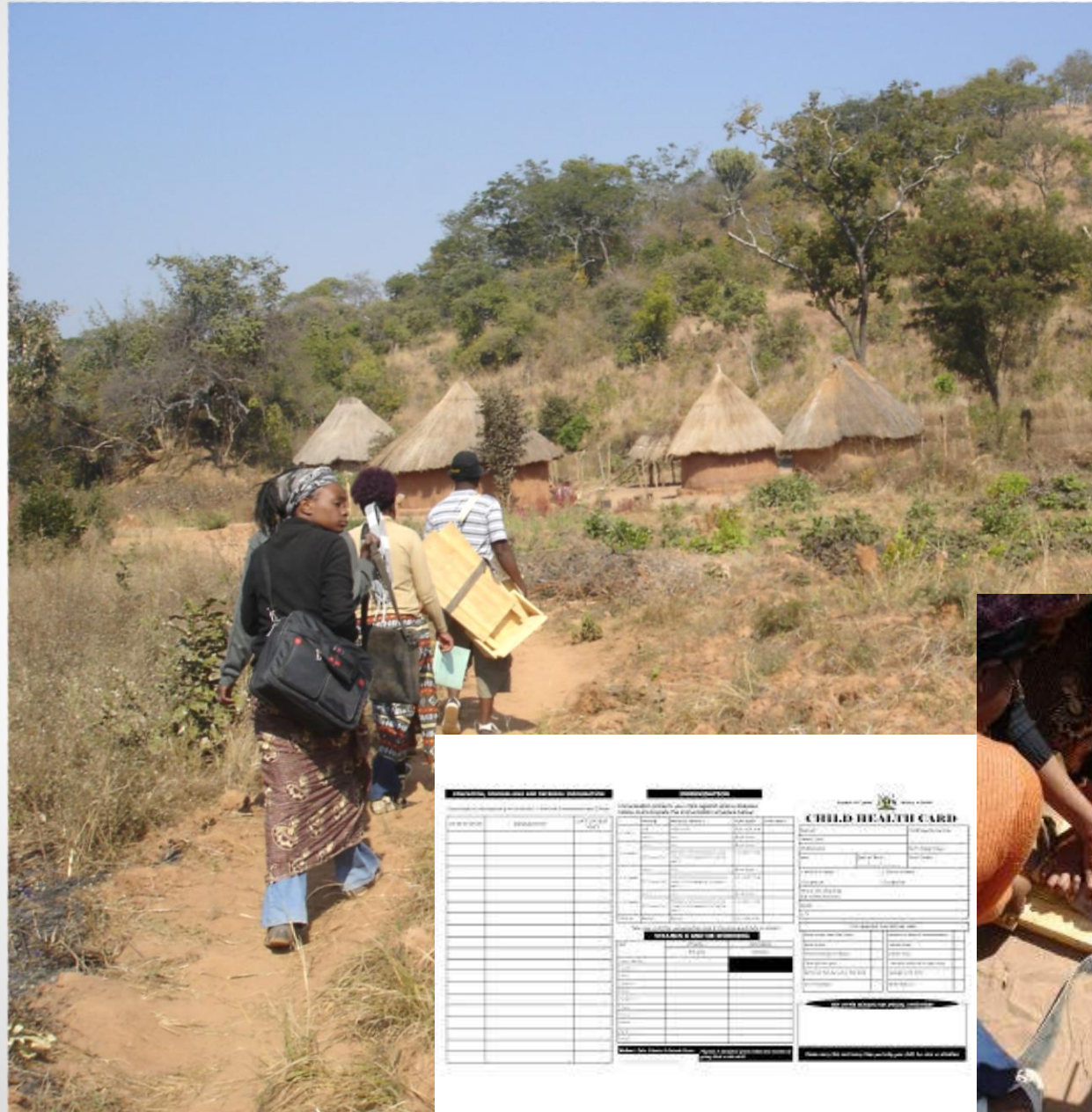
Anthropometry: Stunting



- Chronic undernutrition
- **Low height-for-age** index
- Stunting in childhood is associated with poor cognitive, educational, productivity and income attainment through life
- Globally 25% children under 5y are stunted (165 million)

Two girls, both 12 years old, stand in front of a wall with a black tape line indicating the normal height for a 12-year-old girl (Source: Badham & Sweet, Sight & Life Magazine, issue 3/2010)

Anthropometry: Stunting



PERSONAL, HOUSEHOLD AND SEX-BINDING INFORMATION		IDENTIFICATION	
NAME	SEX	DATE OF BIRTH	AGE
EDUCATION	RELIGION	HEIGHT	WEIGHT
RESIDENCE	ETHNICITY	HAIR	SKIN
CONTACT INFORMATION	HEALTH STATUS	DIAGNOSIS	TREATMENT
DATE OF VISIT	HEALTHCARE PROVIDER	DATE OF NEXT VISIT	REMARKS

CHILD HEALTH CARD

NAME: _____

AGE: _____

SEX: _____

DATE OF BIRTH: _____

HEIGHT: _____

WEIGHT: _____

HAIR: _____

SKIN: _____

DIAGNOSIS: _____

TREATMENT: _____

DATE OF NEXT VISIT: _____

REMARKS: _____

Anthropometry: Wasting



- Acute undernutrition
- **Low weight for height** index
- Wasting is associated with high risk of death, and requires treatment (in-patient or in the community)
- 52 million children under 5y are wasted, 19 million severely wasted

Top: Child at enrollment to feeding centre

Bottom: Same child at discharge

(Source: <http://www.imtf.org/page/info/malnutrition-management/inpatient/>)

Anthropometry: Wasting



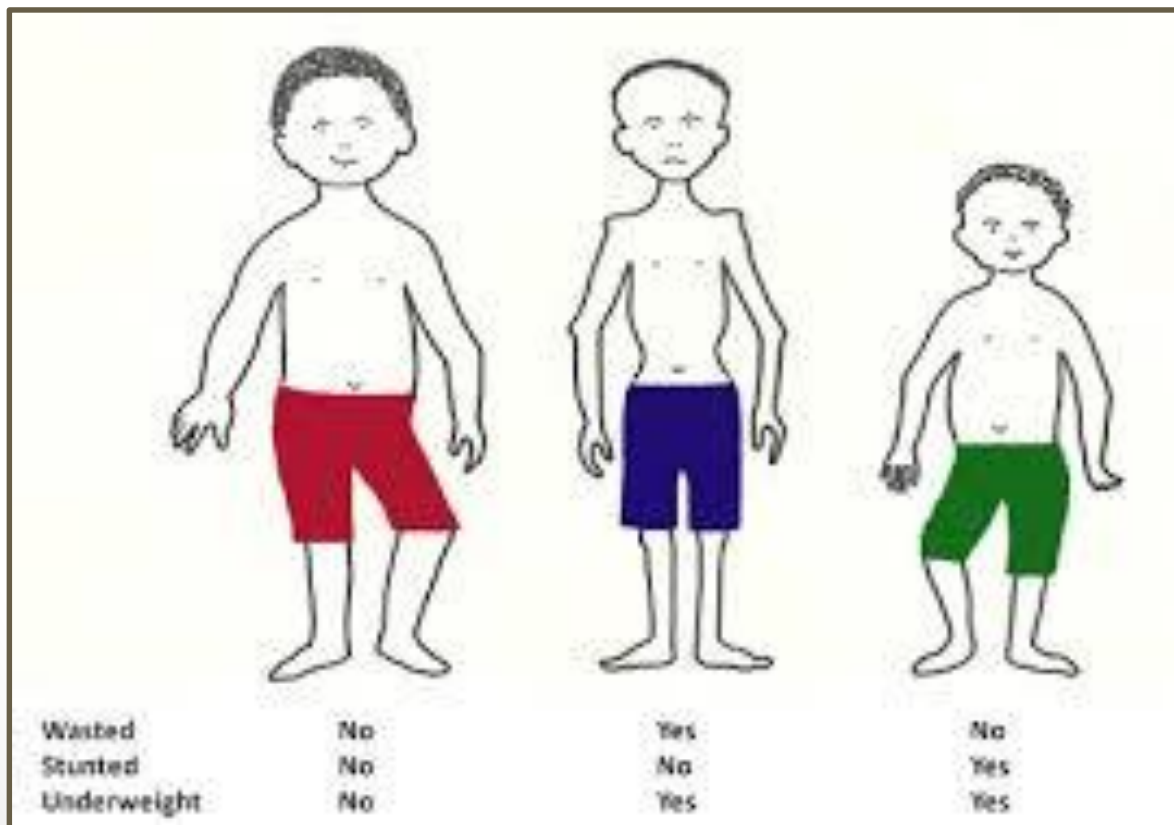
Weight/
Height

Mid-Upper
Arm
Circumference
(MUAC)

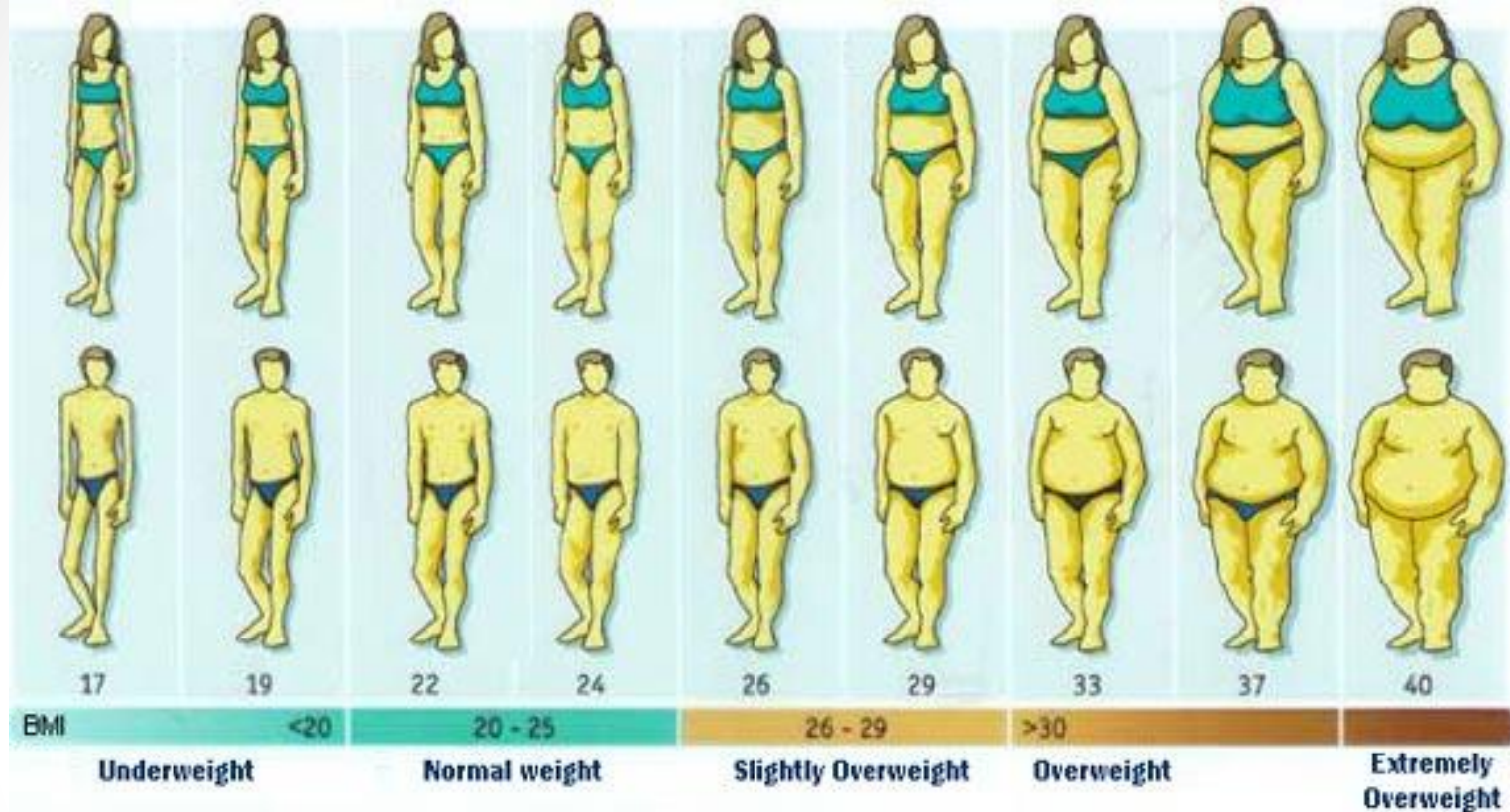


Anthropometry: Underweight

- **Low weight for age index**
- 99 million children under 5y are underweight, 2/3 in Asia
- Underweight is the focus of many international goals

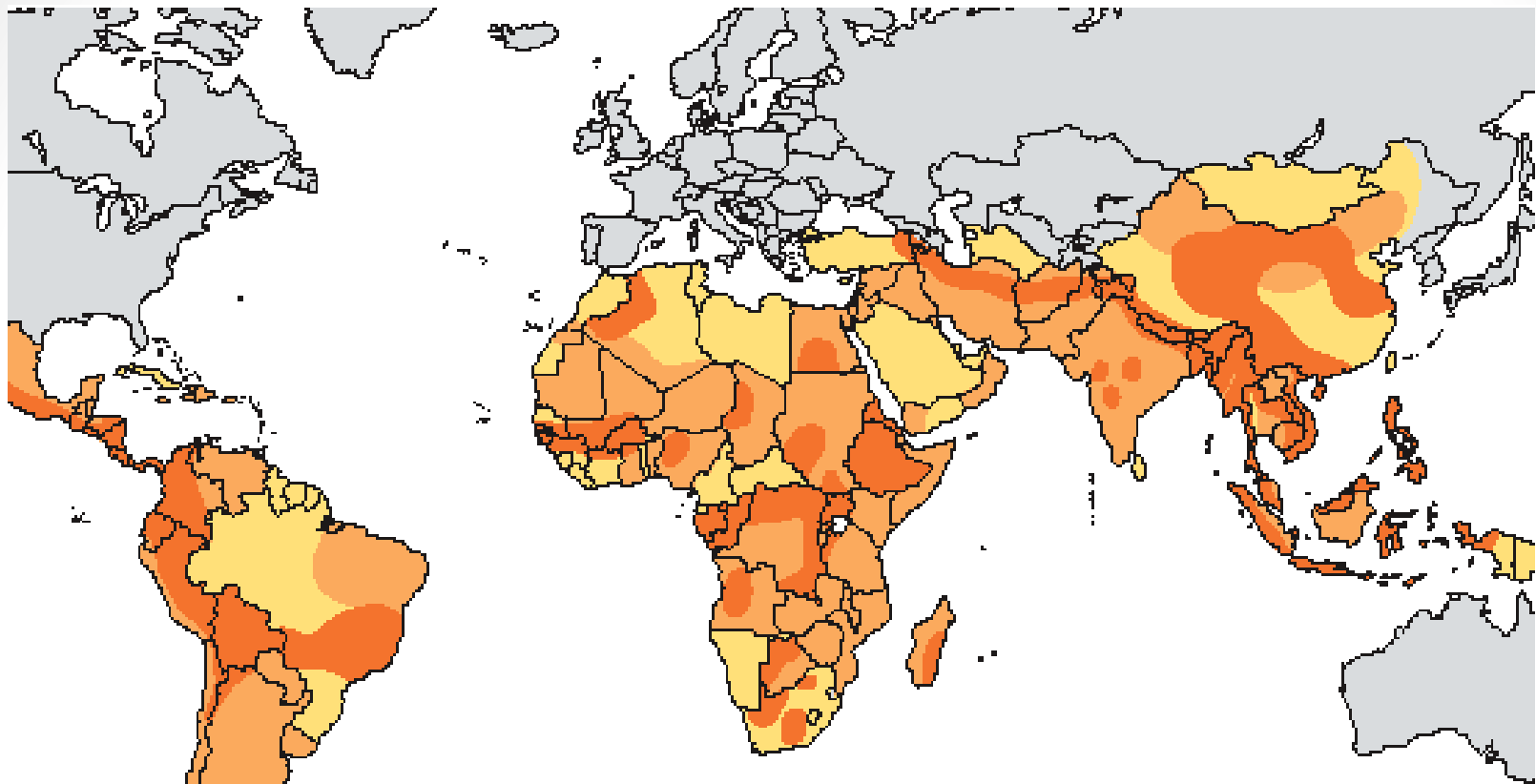


Anthropometry: Body Mass Index (BMI)



$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 \text{ (m}^2\text{)}} \quad (\text{metric})$$

Micronutrient malnutrition



Areas at high risk of micronutrient deficiency

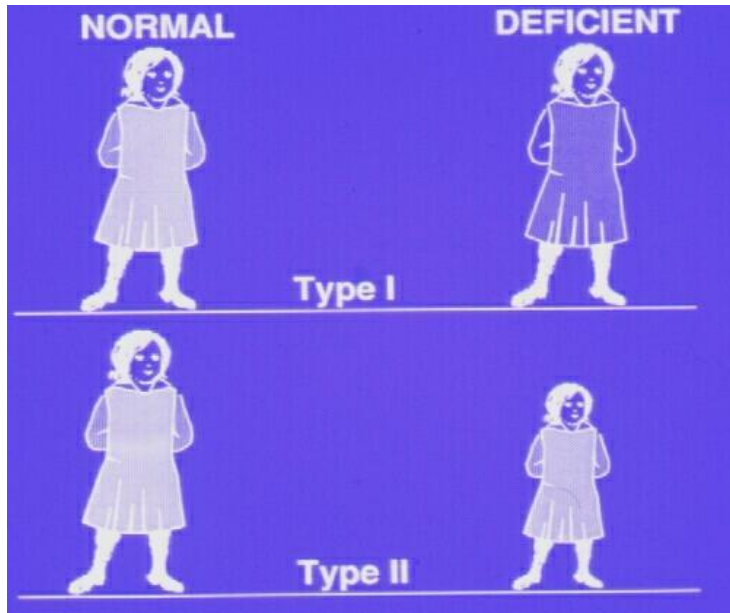
- Iron deficiency
- Vitamin A and iron deficiency
- Iodine, vitamin A and iron deficiency

Source: L

Clinical Measurement

Two types :

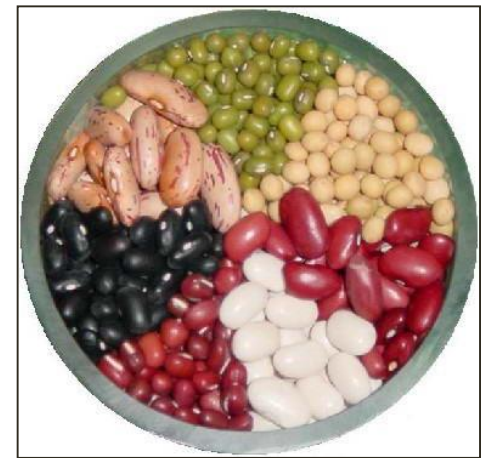
- Type I: Functional Nutrients
- Type II: Growth Nutrients



Biochemical Measurement

Deficiency	Measurement
Iron deficiency anemia	Haemoglobin testing (blood colour)
Vitamin A deficiency	Hemoglobin testing (haermoglobinometer)
Vitamin A deficiency	Serum Vitamin A level
Iodine deficiency	Urinary Iodine level

Dietary intake



Measuring infant and young child feeding

Breastfeeding

- Early initiation of breastfeeding (within 1 hour of birth)
- Exclusive breastfeeding among children under 6 months
- Continued breastfeeding at 1 year (12-15 m)

Complementary feeding

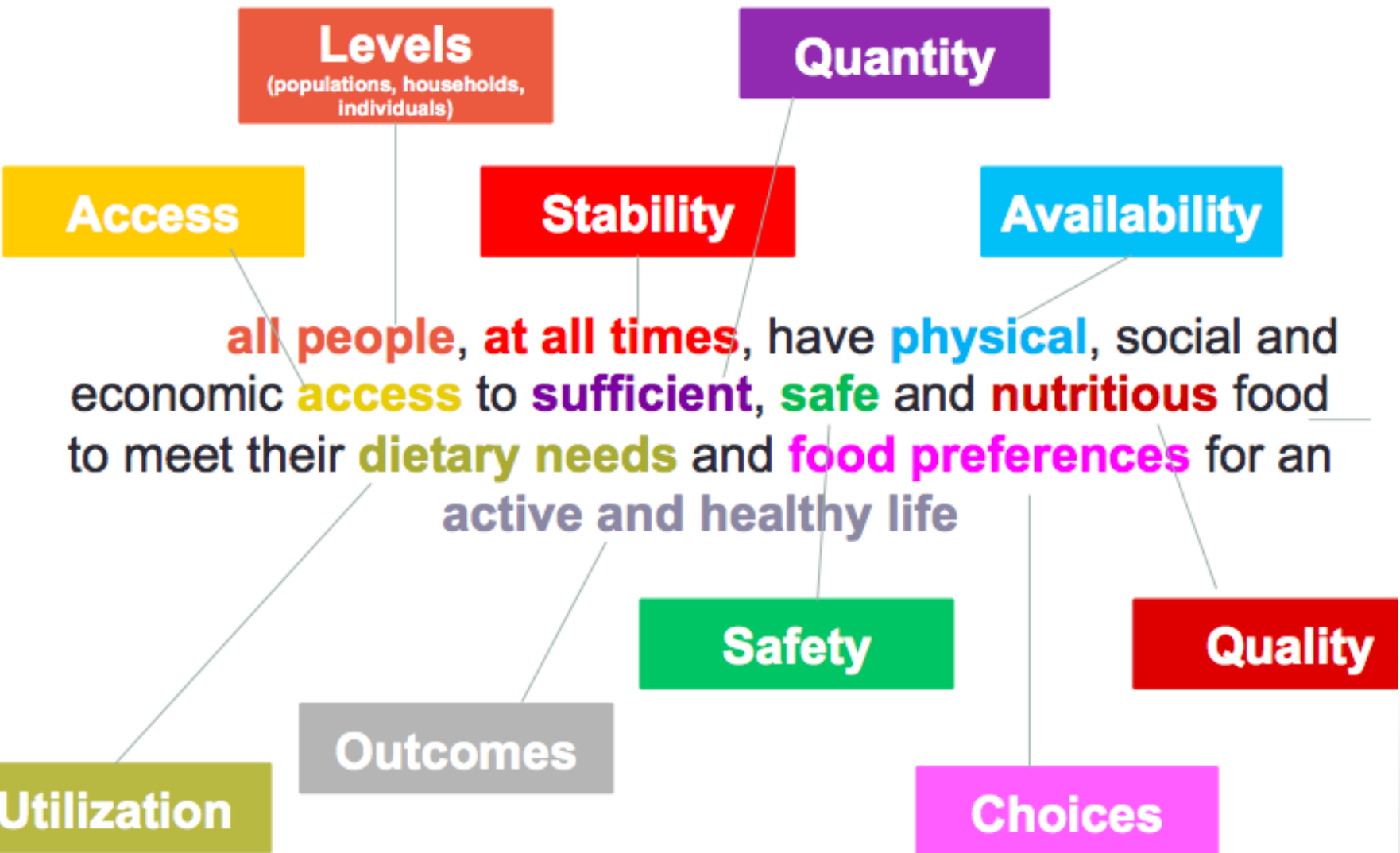
- Introduction of solid, semi-solid or soft food (between 6-8 m)
- Minimum diet diversity (≥ 4 food groups)
- Minimum meal frequency 1
- Minimum acceptable diet 2
- Consumption of iron-rich food 3
- Minimum meal frequency, acceptable diet & consumption of iron-rich food

SECTION 4: INTERVENTIONS

Prevention of malnutrition: Food security

Food security exists when....

FAO (2009)



Prevention of malnutrition: Health



Supplementation



Immunization



Access to health services



Water and sanitation

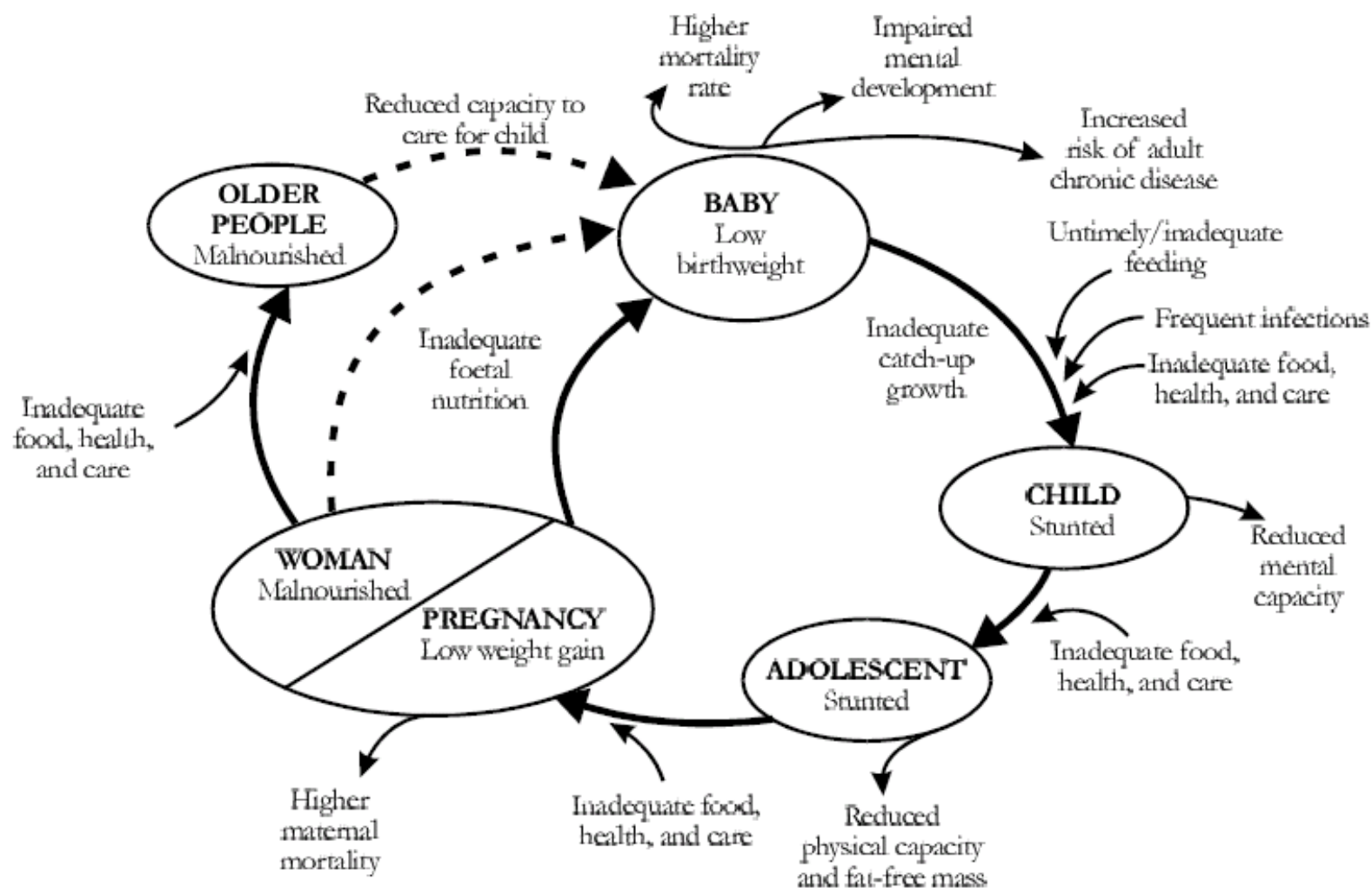
Prevention of malnutrition: Care

- Breastfeeding (early, exclusive, continued)
- Introduction of acceptable foods at the right time
- Dietary diversity (individual child)
- Meal frequency

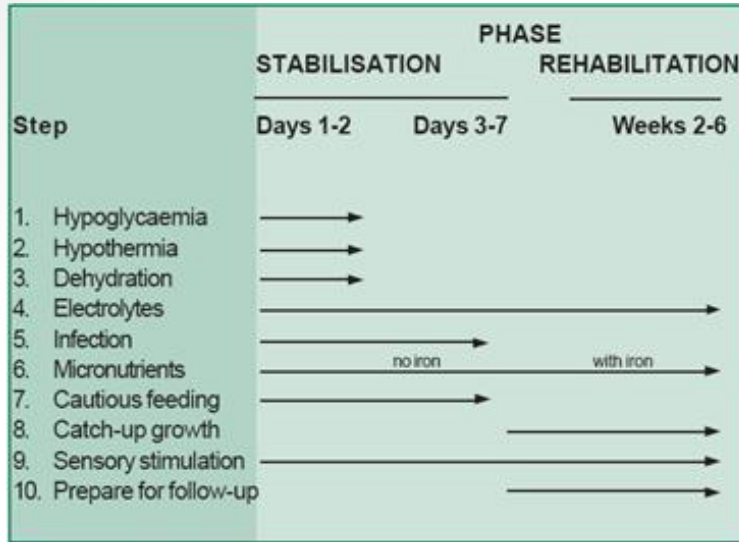


#ostentatiousbreastfeeding

Prevention of malnutrition: Lifecycle approach



Breaking the cycle: Treatment of acute malnutrition



In-patient:

- For children with medical complications or no appetite
- Long process; parent needs to be present

Community-based:

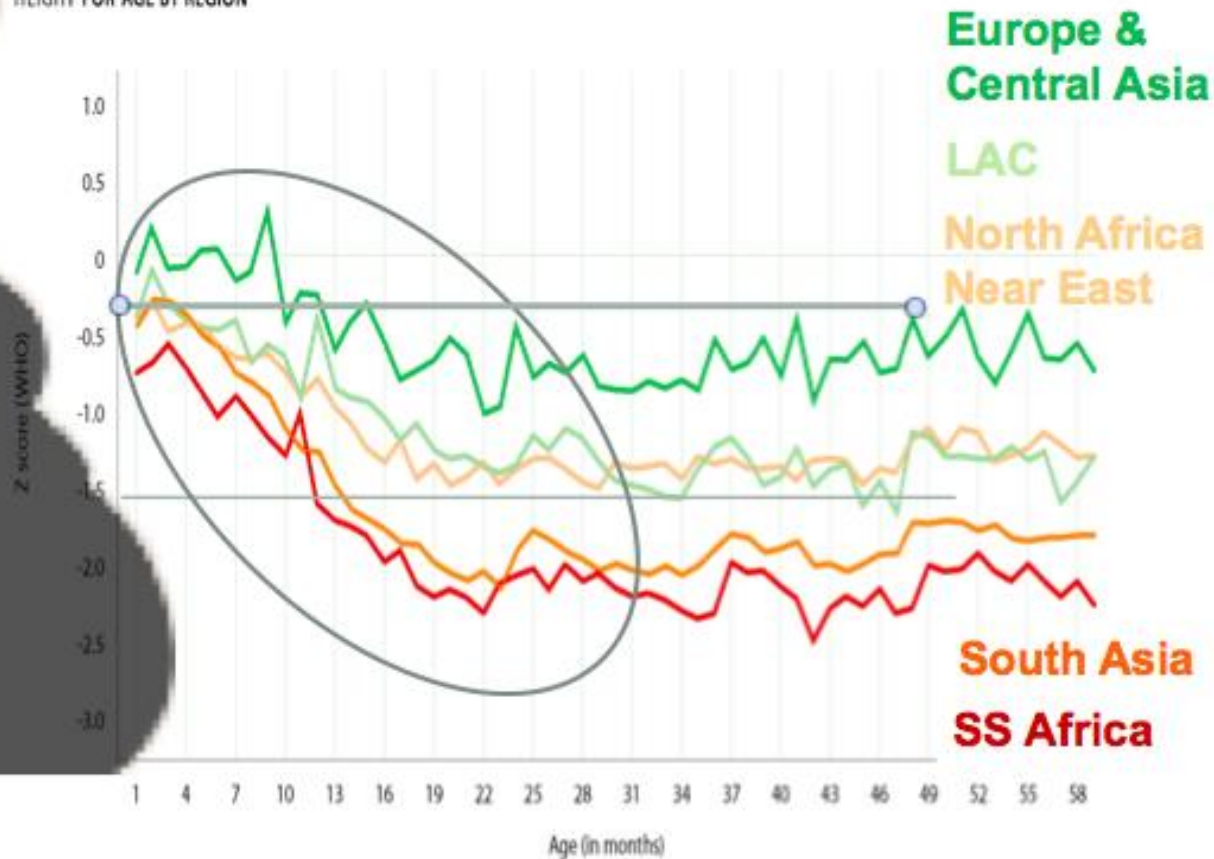
- For children without medical complications
- Allows parents to remain home with other children

Breaking the cycle

The first 1000 Days



HEIGHT-FOR-AGE BY REGION



Source Victora et al. (2010)

Nutrition Specific Interventions

- Interventions or programs that address the **immediate determinants** of child nutrition — adequate food and nutrient intake, feeding, caregiving and parenting practices, and low burden of infectious diseases

Examples



Adolescent, preconception, and maternal health and nutrition

Maternal dietary or micronutrient supplementation

Promotion of optimum breastfeeding

Complementary feeding and responsive feeding practices and stimulation

Dietary supplementation

Diversification and micronutrient supplementation or fortification for children

Treatment of severe acute malnutrition

Disease prevention and management

Nutrition in emergencies

Nutrition Sensitive Interventions

Interventions or programs that address the **underlying determinants** of fetal and child nutrition and development— food security; adequate caregiving resources at the maternal, household and community levels; and access to health services and a safe and hygienic environment— and **incorporate specific nutrition goals and actions**

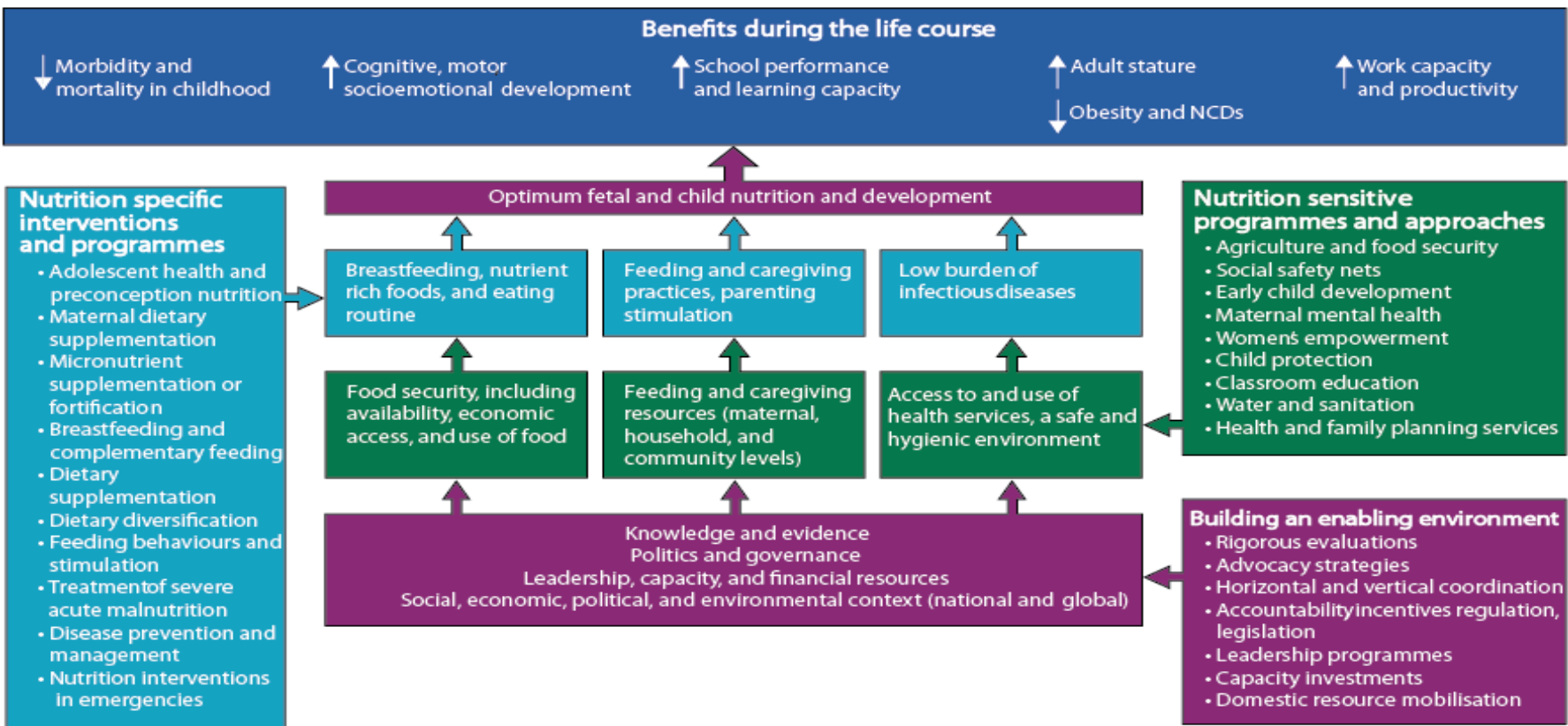
Examples



Agriculture and food security	Social safety nets
Early child development	Maternal mental health
Women's empowerment	Child protection
Schooling	Water, sanitation and hygiene
Health and family planning services	

Source: Lancet 2013

Mapping interventions back to an updated 'UNICEF framework'



Key Literature: Lancet undernutrition series (2013)

Nutrition-specific interventions, if scaled up to 90% coverage, could reduce stunting by 20% (33.5 million fewer stunted children)

Accelerating progress in nutrition requires increasing the nutritional impact of effective, large-scale, nutrition-sensitive development programs

Attention is also needed to the politics and enabling environment of undernutrition reduction if these actions are to be implemented and sustained

Thank you!



Guidelines for measuring household and individual dietary diversity



<http://www.fao.org/docrep/014/i1983e/i1983e00.pdf>



A GUIDE TO DEVELOPING KNOWLEDGE, ATTITUDE AND PRACTICE SURVEYS

<http://www.fao.org/docrep/019/i3545e/i3545e00.htm>



FOOD AND NUTRITION TECHNICAL ASSISTANCE

<http://www.fantaproject.org/sites/default/files/resources/anthropometry-2003-ENG.pdf>

2003 Revised Edition

Anthropometric Indicators Measurement Guide

Bruce Cogill

Indicators for assessing infant and young child feeding practices

PART 2 MEASUREMENT



http://whqlibdoc.who.int/publications/2010/9789241599290_eng.pdf?ua=1



unicef

World Health Organization

LCIRAH
Liverpool Centre for Integrative Research on Agriculture and Health

imn
Integrative Medicine