From malnutrition to nutrition security

Martin W. Bloem, MD, PhD Senior Nutrition Advisor/WFP Global Coordinator UNAIDS World Food Program

“Nurturing development: Improving human nutrition with animal-source foods”

Institute of Food and Agricultural Sciences (IFAS), University of Florida March 29 to 30, 2017

From malnutrition to nutrition security

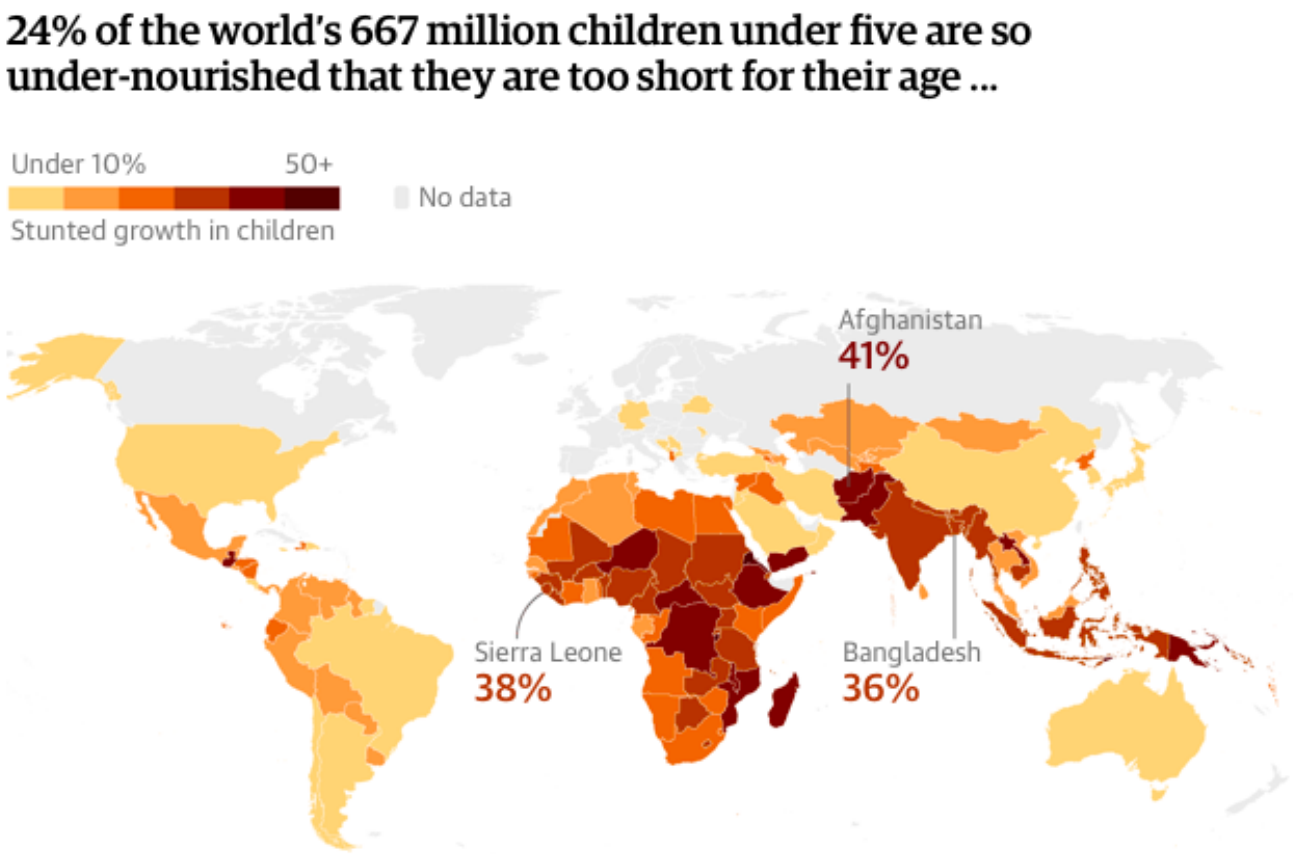
- Definition of food and nutrition security
- Prevalence of Malnutrition in all its forms
- Prevalence and Causes of Stunting
- Economic growth and malnutrition
- Anthropometry in the Netherlands and US in the past 70 years
- Sustainable approaches of production of nutrient dense food in Africa

Food Security and Nutrition Security

- **“Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life.”**

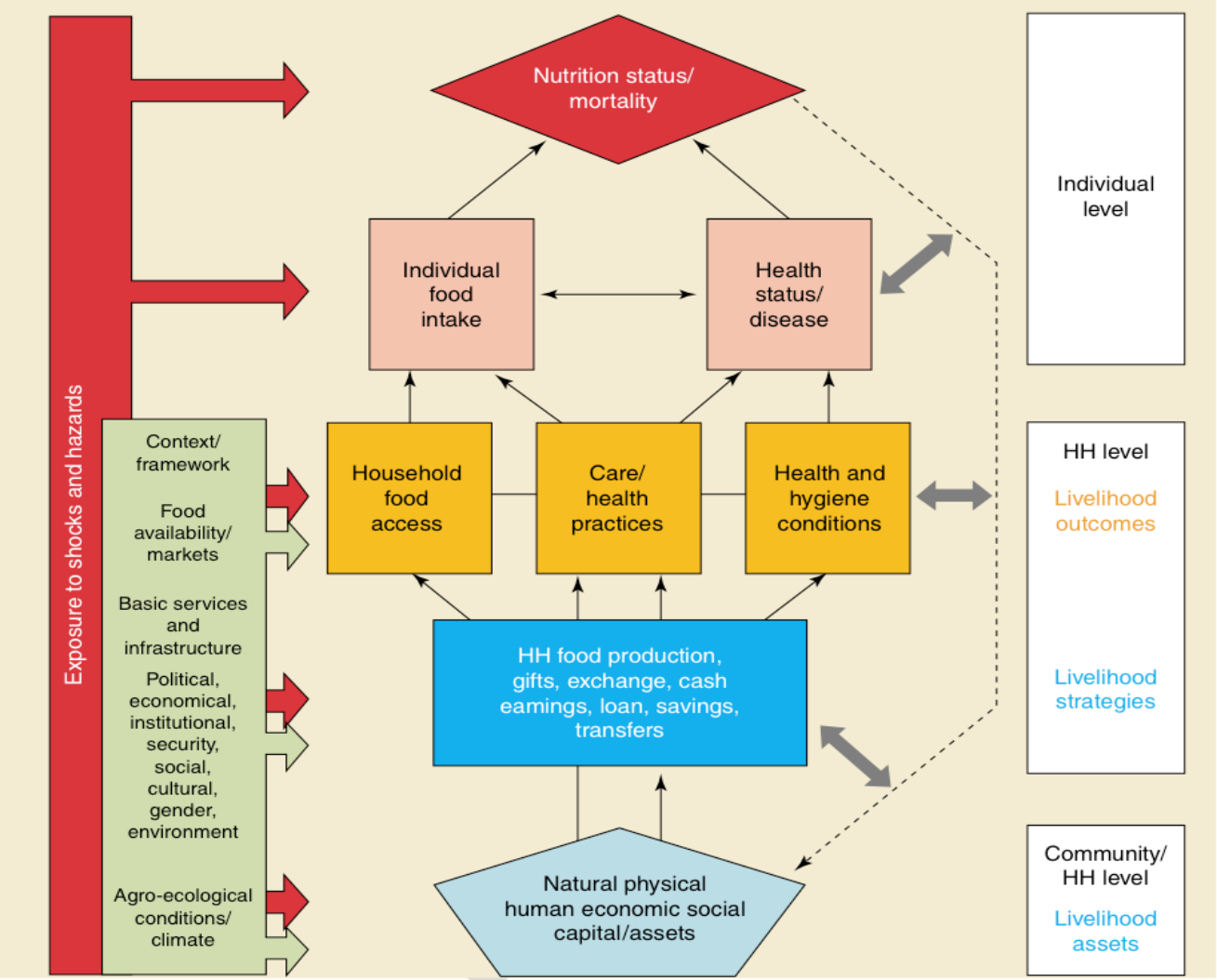
The scale of malnutrition in 2016

24% of the world's 667 million children are stunted



What does a child need to grow optimal?

A child grows through an adequate intake of nutrients (proteins, fat, KH, vitamins and minerals)



A child grows through an adequate intake of nutrients (proteins, fat, Carbs, vitamins and minerals)

- Breastfeeding
  - 0-6 months exclusive
  - 7-11 months
  - 12-23 months

- Formula
  - In case of child can not be breastfed:
    - Optimal nutrients but expensive
    - No anti-infection properties
    - Long-term health is better in breastfed children
    - Preparation needs clean water
- Complementary foods
  - Animal source proteins and micronutrients (milk)
  - Fortification with other essential nutrients
  - Theoretically possible to make by parents but very difficult

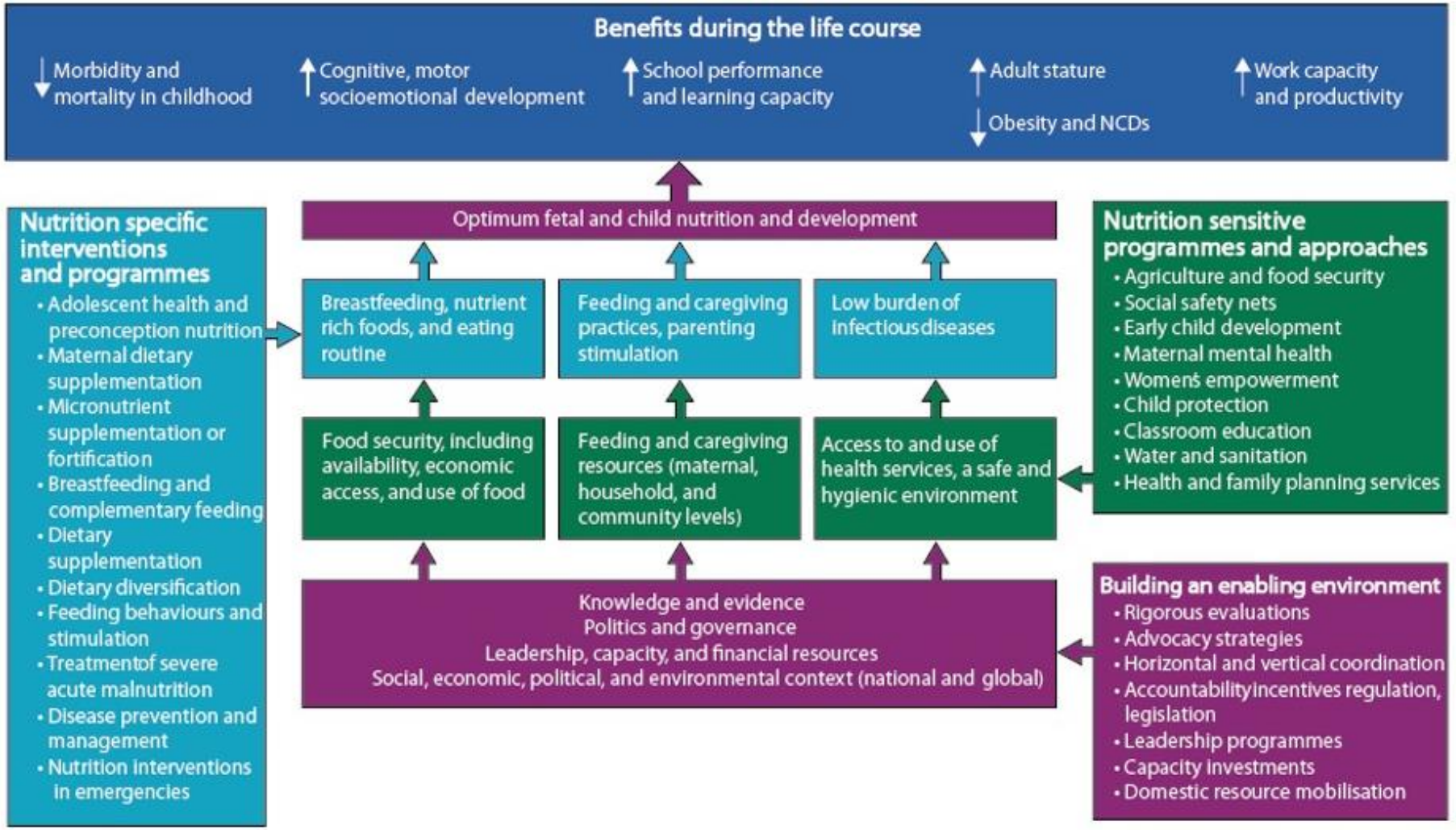
Exposure to an unhealthy environment and diseases diminishes the effectiveness of food intake

- Clean environment
  - Housing
  - Dirty playgrounds
  - No access to water and sanitation
- Medical
  - Access to health services
  - Vaccinations
  - Treatment of diseases
  - Optimal microbioma

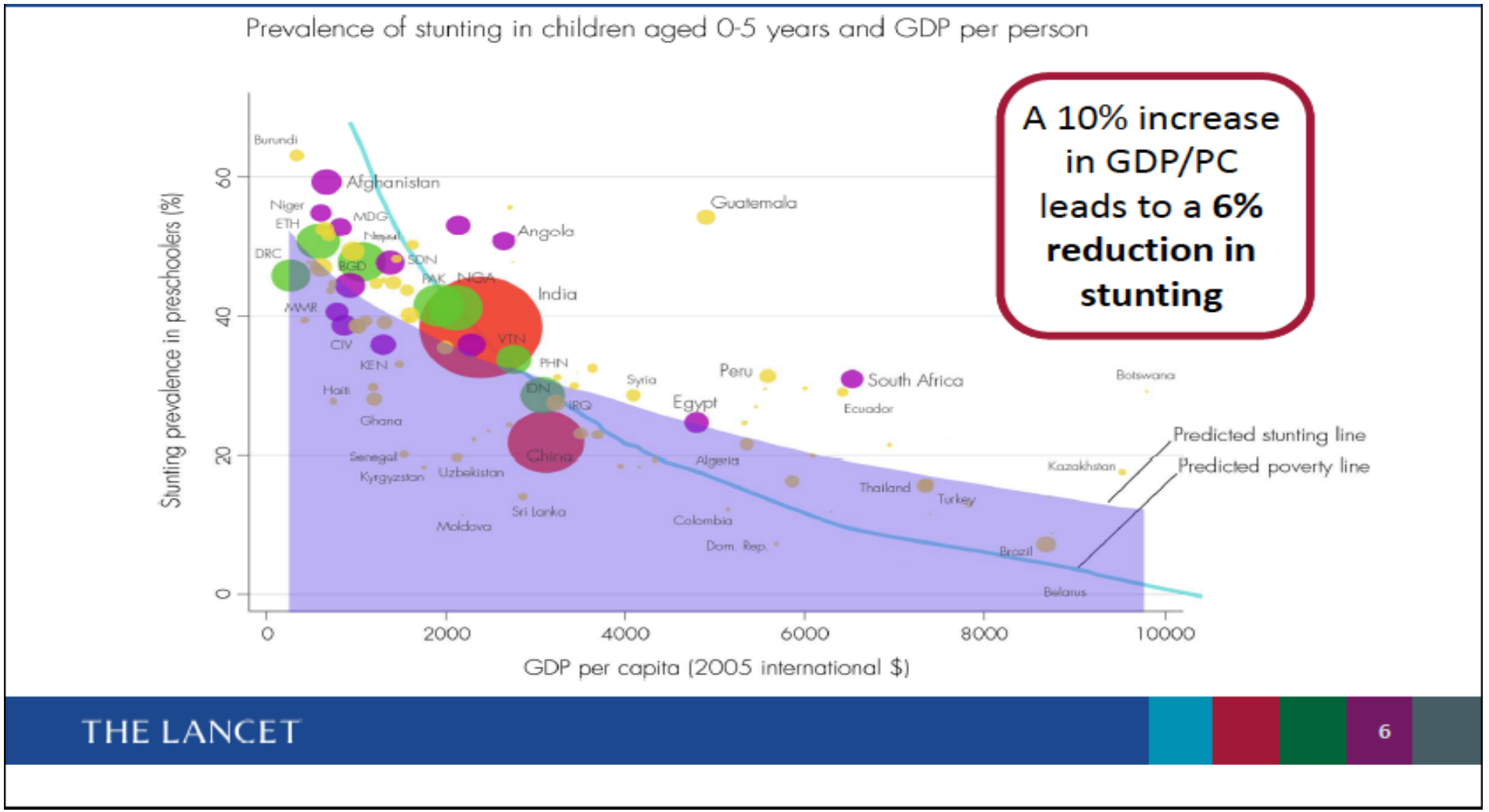
Environmental Enteric Dysfunction (EED)

- Environmental enteric dysfunction (EED) is a disorder of the small intestine, which begins early in infancy particularly among poor people living close to animals.
- Gut structure loses its absorptive capacity, and its small intestine's function is impaired.

A child grows through an adequate intake of nutrients (proteins, fat, KH, vitamins and minerals) Lancet 2013



Improvements in the economy usually have a marked effect on nutritional outcomes



Food Production and Undernutrition

Community and International Nutrition

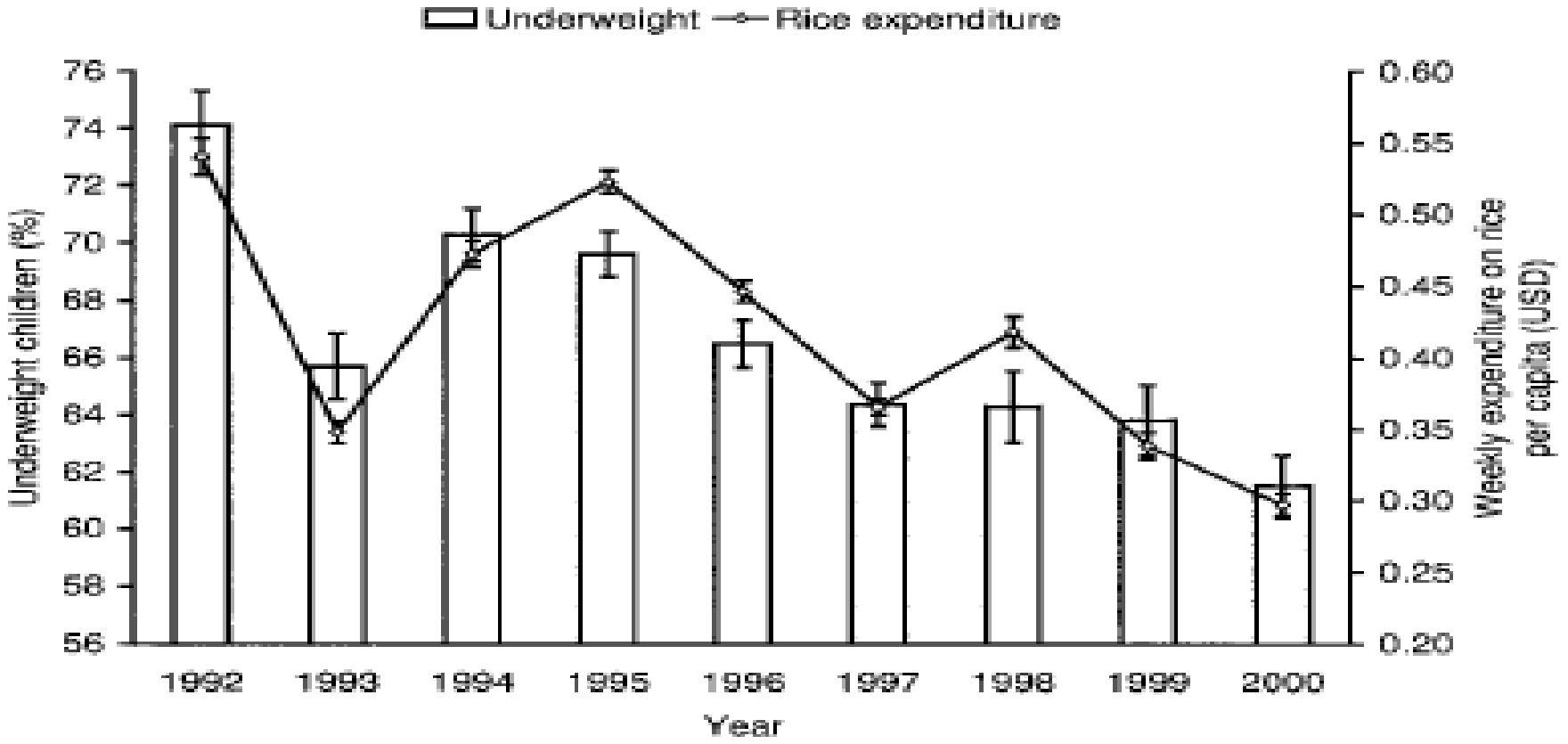
Association of Household Rice Expenditure with Child Nutritional Status Indicates a Role for Macroeconomic Food Policy in Combating Malnutrition

Harriet Torlesse,*[1] Lynnda Kiess[†] and Martin W. Bloem[‡]

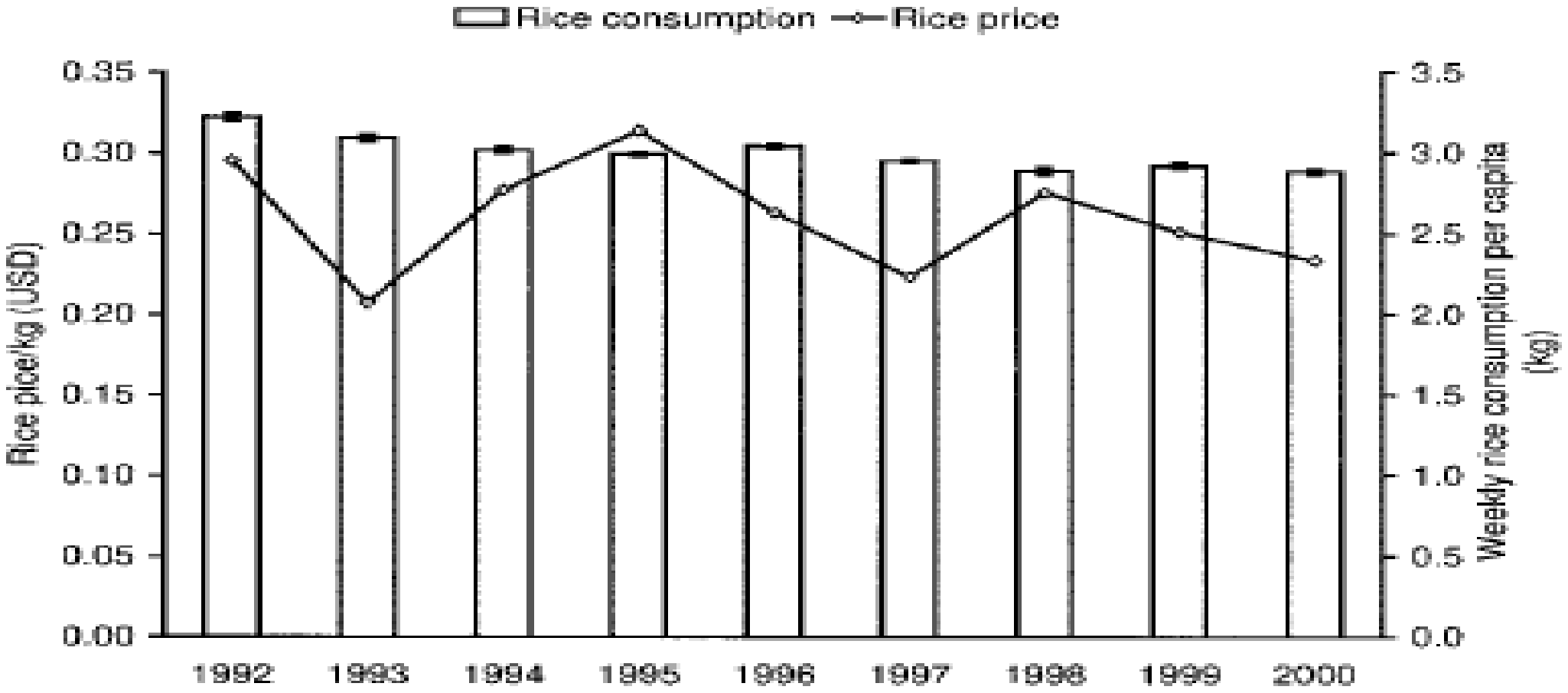
Helen Keller International, Gulshan 1212, Dhaka, Bangladesh; [†]Helen Keller International Asia-Pacific Regional Office, Jakarta Pusat, Indonesia; and [‡]Helen Keller International, World Headquarters, New York, NY 10010

ABSTRACT Macroeconomic food policies have the potential to reduce malnutrition by improving access to food, a determinant of nutritional status. However, very little is understood about the mechanisms and the magnitude of the effects of macroeconomic food policies such as food price policies on nutritional status. Data collected by the Nutritional Surveillance Project on a total of 81,337 children aged 6–59 mo in rural Bangladesh between 1992 and 2000 were used to examine how changes in rice price affect child underweight. Rice consumption per capita declined only slightly during the period but rice expenditure per capita varied widely due to fluctuations in rice price. Rice expenditure was positively correlated with the percentage of underweight children ($r = 0.91$, $P = 0.001$). Households were found to spend more on nonrice foods as their rice expenditure declined, and nonrice expenditure per capita was negatively correlated with the percentage of underweight children ($r = -0.91$, $P = 0.001$). Expenditure on nonrice foods per capita increased with the frequency with which nonrice foods were consumed ($P < 0.05$) and with the diversity of the diet ($P < 0.001$). The findings suggest that the percentage of underweight children declined when rice expenditure fell because households were able to spend more on nonrice foods and thereby increase the quantity and quality of their diet. We hypothesize that macroeconomic food policies that keep the price of food staples low can contribute toward reducing child underweight. J. Nutr. 133: 1320–1325, 2003.

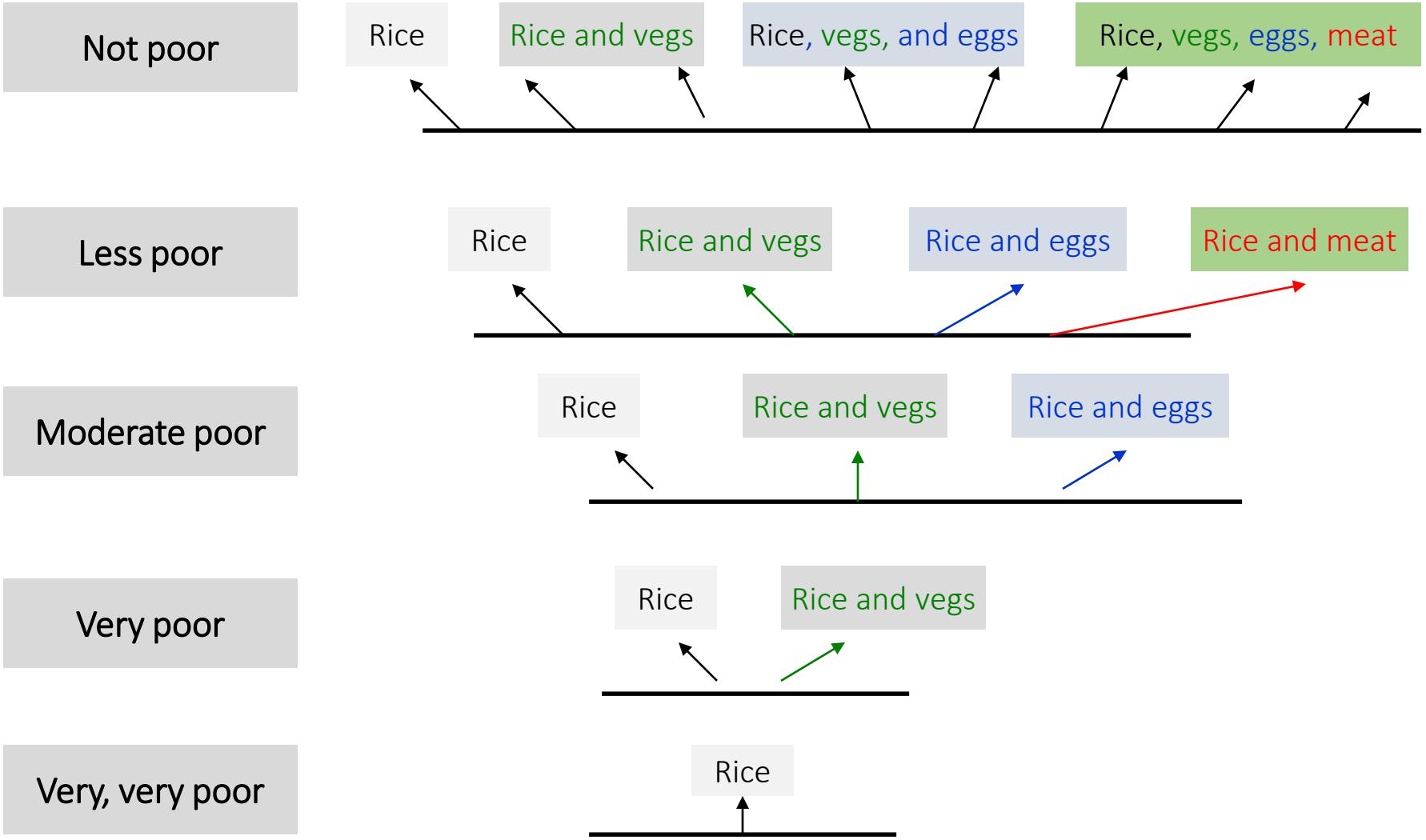
Rice Expenditure and Underweight 1992-2000



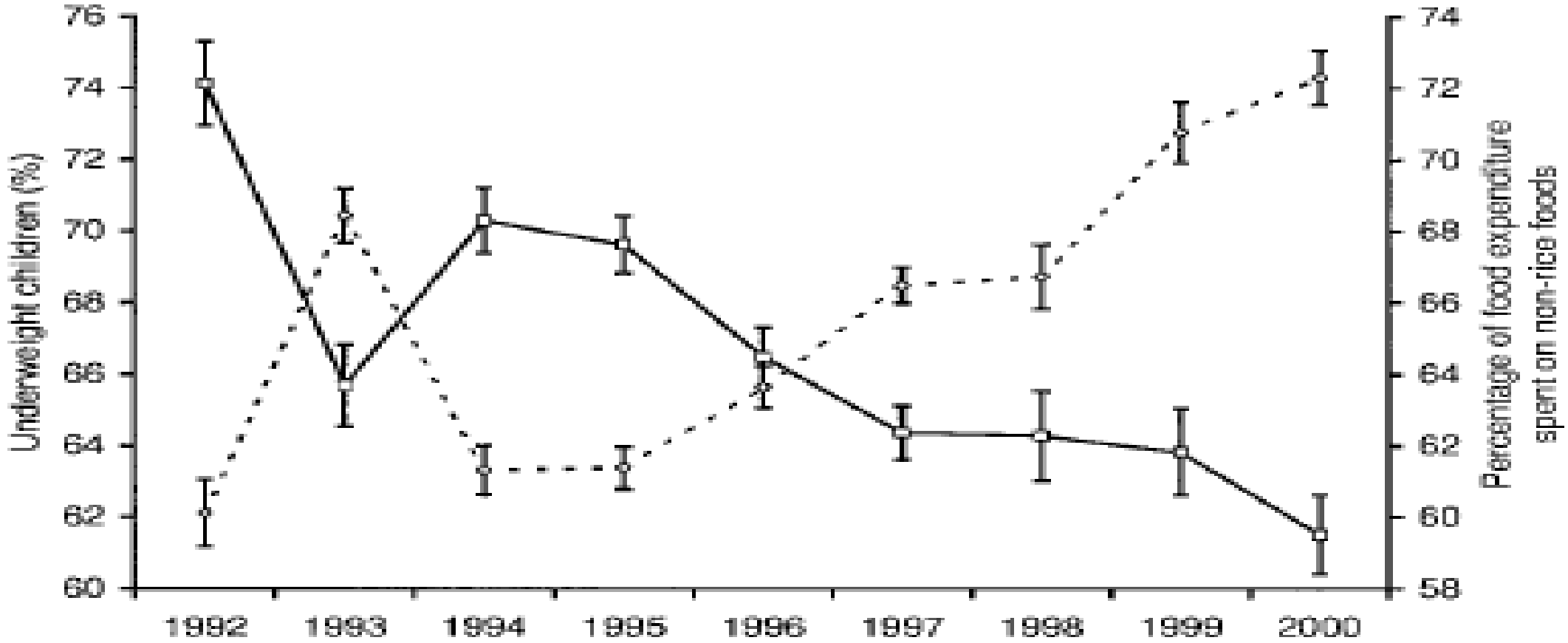
Rice Consumption and The Price of Rice 1992-2000



Increases in households' purchasing power have a direct impact on nutrition



Non-Staple food expenditure and Undernutrition 1992-2000



Dutch population has grown in the last 50 years to become the world's tallest population

Average caloric intake (Kcal)	3,240	+16%	3,770
Body Index mass (% of pop. normal)	25.2 (67%)	+15%	29 (42%)
Waist measurement (cm)	91	+8%	94.5
Time watching TV (hours per day)	3.3	+50%	4.9
Life expectancy (years)	80	+5%	76

Points for reflection

- Despite both countries having booming food industries, Dutch population has grown in the last 50 years, whereas Americans have seen their nutritional outcomes deteriorate
- Even though American diet is unhealthy and induces very high overweight rates, impact is not fully seen on life expectancy
- Impact on the health care system has been drastic (e.g. increased diabetes, heart disease, etc.)

Science or Ideology?

Macrobiotic nutrition and child health

Study Population

- **Macrobiotic children**
  - White
  - Birth weight ≥ 2500 g
  - No congenital disease

- **Omnivorous control children (included in longitudinal cohort study):**
  - Frequency-matched with the macrobiotic group for month of birth, sex, parity, education of the parents, and region of residence

- **Mothers:**
  - On macrobiotic diet for ≥ 3 years at baseline
  - 92% attended special courses/consultations on macrobiotic child nutrition.
  - The educational level was high: **64% of the fathers and 45% of the mothers had completed college or university degrees, as cornpared with 17% for men and 9% of controls**

Macrobiotic nutrition and child health: results of a population-based, mixed-longitudinal cohort study in The Netherlands[1–3]

Pieter C Dagnelie and Wija A van Staveren

ABSTRACT A population-based study on the nutritional status of children consuming macrobiotic diets was carried out in The Netherlands. Participants followed a macrobiotic diet based mainly on whole-grain cereals, pulses, and vegetables. Studies in children aged 0–10 y suggested that growth was retarded mainly between 6 and 18 mo. This was confirmed in a subsequent mixed-longitudinal study (including data on diet, anthropometry, blood chemistry, and pediatric examination) in 4–18 mo-old macrobiotic infants and a matched omnivorous control group. Ubiquitous deficiencies of energy, protein, vitamin B-12, vitamin D, calcium, and riboflavin were detected in macrobiotic infants, leading to retarded growth, fat and muscle wasting, and slower psychomotor development. Breast milk from macrobiotic mothers contained less vitamin B-12, calcium, and magnesium. Supplementation of the macrobiotic diet with fat (minimum 20–25 g/d), fatty fish (minimum 100–150 g/wk), and dairy products (minimum 150–250 g/d) is recommended. *Am J Clin Nutr* 1994;59(suppl):1187S–96S.

KEY WORDS Alternative diets, vegetarianism, macrobiotic diet, nutritional status, growth, psychomotor development, hematology, vitamin B-12, rickets, weaning pattern

Introduction

Alternative dietary lifestyles are usually characterized by some degree of avoidance of foods of animal origin. Concern has been expressed about the risks of nutritional deficiencies, especially in children consuming diets containing little animal food. Since 1966 a number of reports and statements have been made in the United States by groups such as the American Academy of Pediatrics, the National Research Council, the American Medical Association, and others (1–7). One of the diets mentioned frequently as potentially deficient is the macrobiotic diet (1–6, 8–11), a diet restricted in animal food which was introduced in Western countries by Ohsawa (12) and more recently Kushi (13). The concern expressed in these reports is largely based on incidental information from hospital admissions (9–11, 14–23) or deaths (2, 5) of severely malnourished children on alternative diets. Incidental cases of malnutrition, however, do not permit any conclusions to be drawn on the nutritional status of a population. Therefore, a population-based study on the nutritional status of children consuming macrobiotic diets was carried out in The Netherlands. The macrobiotic diet consists of whole-grain cereals (mainly unpolished rice), vegetables, and pulses, with small additions of seaweeds, fermented foods, nuts, seeds, and seasonal fruits. Vitamin D supplements and products of animal origin such as meat and dairy products are usually avoided. Originally, the study was planned to include also a group of lacto-vegetarian children, but this idea had to be abandoned because of lack of funds.

Parts of the results presented in this paper were published previously (24–41). Here, we will specifically address the following two questions: 1) Are reported cases of malnutrition in macrobiotic children incidental, or do they represent ubiquitous deficiencies in the population of macrobiotic children? 2) Is it possible to provide recommendations for improving children's nutritional status that are acceptable within the macrobiotic philosophy?

Methods

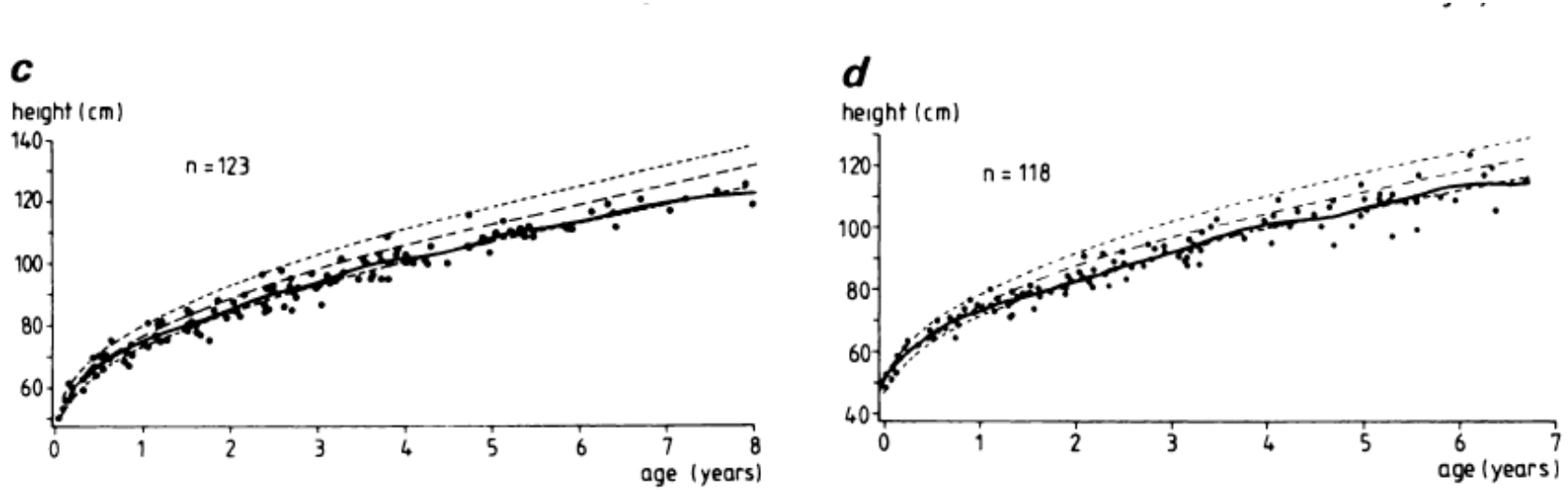
Study design

The research project was approved by the Ethical Committee of the Agricultural University of Wageningen, The Netherlands. The design and methods were extensively described in previous papers (24–40) and will only be briefly summarized here. To identify the age groups most at risk, a cross-sectional anthropometric study was carried out in children aged 0–8 y (n = 243) (29). This study was repeated 2 y later in the same cohort (n = 194) (39). As a next step, a mixed-longitudinal study was performed in 4–18-mo old macrobiotic infants (n = 53) and omnivorous control subjects (n = 57) (30–37). Three cohorts of infants were monitored from 4 to 10 mo (cohort 1), 8–14 mo (cohort 2), and 12–18 mo (cohort 3), respectively. During this period, data on dietary intake, growth, blood chemistry, psychomotor development, and physical deficiency symptoms were collected. This study was followed by an intervention study in macrobiotic infants with nutritional deficiencies (n = 27) (34, 36). To provide a basis for recommendations to the macrobiotic diet,

[1] From the Department of Human Nutrition, Wageningen Agricultural University, Wageningen, The Netherlands.
[2] Supported in part by grants from the Dutch Praeventiefonds and the Dutch Ministry of Agriculture and Fisheries.
[3] Address reprint requests to PC Dagnelie, Institute of Internal Medicine II, Erasmus University of Rotterdam, PO Box 1738, 3000 DR Rotterdam, The Netherlands.

Cross-sectional curves of height (cm) of macrobiotic infants (c=boys, d=girls)

Height (cm) was below reference data from Dutch children, growth was retarded mainly between 6 and 18 months

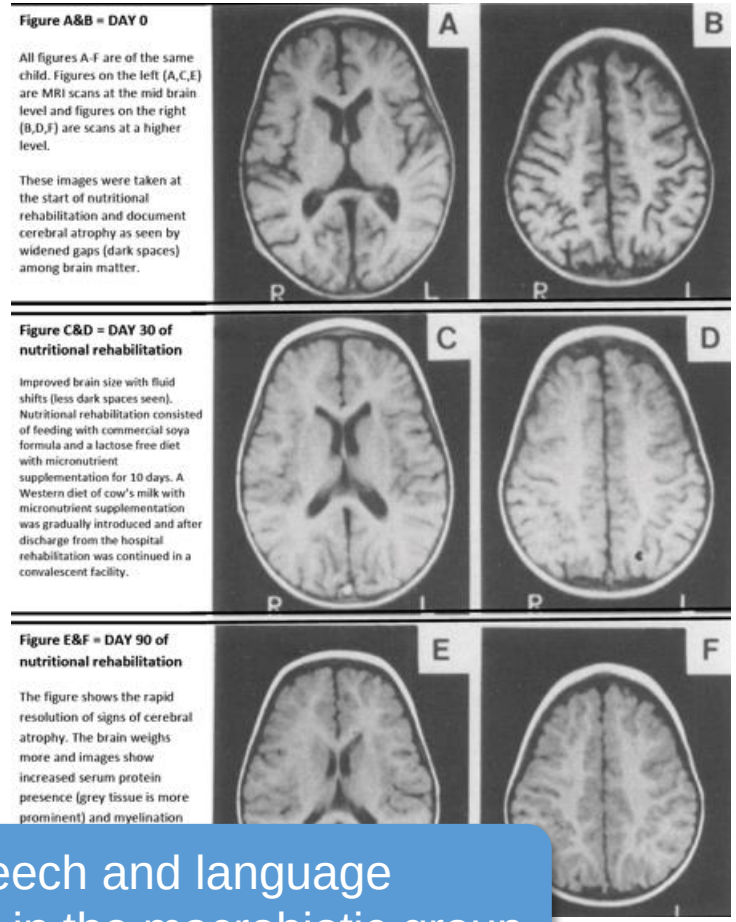


Difference in psychomotor development of macrobiotic infants compared to control infants

TABLE 2
Difference in psychomotor development of infants on macrobiotic diets expressed as SD scores relative to infants on omnivorous (control) diets[1]

	$\bar{x}$	P^2
Gross motor development		
Sitting and head balance	−0.48[3]	0.04
Locomotion	−0.60	0.001
Overall	−0.63	< 0.001
Fine motor development, adaptation	−0.13	0.49
Speech and language development	−0.42	0.03

[1] Adapted from reference 31.
[2] Student's *t* test.
[3] Negative values indicate slower development in the macrobiotic group.



Gross motor development and speech and language development were significantly slower in in the macrobiotic group

The rise and fall of protein malnutrition in Global Health

Annals of Nutrition & Metabolism

Review Article

Ann Nutr Metab 2016;69:79–88
DOI: 10.1159/000449175

Received: August 14, 2016
Accepted: August 15, 2016
Published online: August 30, 2016

The Rise and Fall of Protein Malnutrition in Global Health

Richard D. Semba

Wilmer Eye Institute, Johns Hopkins University School of Medicine, Baltimore, Md., USA

To illustrate the Medical Research Council's Report on the Diets for Boys during School Age.

These figures represent groups of boys who were given an ordinary diet for a year. At the end of that period six groups were given the extras as shown. The average annual gain in weight and height of boys given a pint of milk daily was 6.58 lbs. and 2.63 ins. respectively, whilst the boys given no extras gained only 3.85 lbs. and increased in height only 1.84 ins.

WFP has an important role to play in overcoming global bottlenecks to improved MNCH outcomes with partners

	Nutrition interventions	Global bottlenecks	WFP's contribution
Adolescent girls	• Meeting micronutrient requirements • Food support (i.e., school feeding as an enabler for uptake of services)	**Difficulty of reaching most at-risk girls** (e.g., married, not in school) with nutrition and SRH education	• Partnership with UNICEF, UNFPA – *adolescent girls and pregnant women* • Nutrition for MNCH in emergencies – *PLW, children 6-23 mo* • Increasing access to complementary foods – *children 6-23 mo (partnership with CHAI)*
Pregnant and lactating women	• Meeting micro nutrient requirements • Food support in last trimester and first six months of lactation	**Programming gap** in providing food support to PLWs in food insecure areas	
Children 6-23 mo	• Treatment of MAM • Prevention of undernutrition and stunting	• **Lack of access to** safe, high quality, nutritious **complementary foods** to fill the 'nutrient gap' for young children • **Governments are reluctant** to import good quality comp. foods	

WFP has an important role to play in overcoming global bottlenecks to improved MNCH outcomes with partners

	Nutrition interventions	Global bottlenecks	WFP's contribution
Adolescent girls	• Meeting micronutrient requirements • Food support (i.e., school feeding as an enabler for uptake of services)	• Difficulty of reaching most at-risk girls (e.g., married, not in school) with nutrition and SRH education	• Partnership with UNICEF, UNFPA – adolescent girls and pregnant women • Nutrition for MNCH in emergencies – PLW, children 6-23 mo • Increasing access to complementary foods – *children 6-23 mo (partnership with CHAI)*
Pregnant and lactating women	• Meeting micro nutrient requirements • Food support in last trimester and first six months of lactation	• Programming gap in providing food support to PLWs in food insecure areas	
Children 6-23 mo	• Treatment of MAM • Prevention of undernutrition and stunting	• **Lack of access to** safe, high quality, nutritious **complementary foods** to fill the 'nutrient gap' for young children • **Governments are reluctant** to import good quality comp. foods	

SC+, more appropriate from a nutritional perspective, is not being widely used due to several bottlenecks

Demand side barriers

Knowledge of nutrient needs

- **Lack of knowledge** about what constitutes a healthy nutritious diet for children 6-23 months
  - Nutrient needs of infant and young children require a diverse diet: breast milk, plant & animal source foods and fortified foods

Affordability

- **Using natural foods to meet the nutrient requirements can be expensive** (buy different fresh foods, avoid spoilage, prepare few times a day)
- **Top-end imported** complementary foods are costly

Supply side barriers

Quality & safety of local products

- Locally produced nutritious foods are often of an **inferior quality in terms of nutrient content**
- Products can be non adherent to **international safety standards**

Perceived Sustainability

- **High quality products are imported** from Europe (Italy and Belgium) and USA
- **Governments are hesitant to import SC+** since it is not a sustainable solution for them (in contrast with ARVs?!)

Sustainable, market-based solution to undernutrition in East Africa

Local production of SC+ entails:

- **Development of a nutritious product** for young children that can be **produced locally** in Eastern Africa (SC+)
- Engagement with the **private sector** to invest in the **development of factories** for SC+ in Rwanda and Ethiopia
- Engagement with **smallholder farmers** through WFP's Purchase for Progress (P4P) initiative to **procure raw ingredients**

Governments of Ethiopia and Rwanda are prioritizing increasing access to good quality comp foods (6-23 mos) *use of social safety nets*

Local production of SC+ will prevent undernutrition and support local economies

Preventing undernutrition

- **WFP** will procure SC+ to support national nutrition programming
- **Governments** will purchase SC+ to reach vulnerable children through social protection platforms
- **Mothers** will be able to purchase affordable complementary foods in local markets

Supporting sustainable economic growth

- Factories will provide guaranteed markets for soya and maize, stabilize prices and help **100,000 smallholder farmers increase income**
- Large scale, globally competitive food processing companies will create **employment opportunities**

Stunting prevention needs a multistakeholder approach

…but we should never forget that an adequate intake of all nutrients is a prerequisite to prevent stunting