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SCHOOL *of* PUBLIC HEALTH

Protein-Energy Malnutrition

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Section A

Causes, Classifications, and Diagnosis

ARCHIVES OF DISEASE
IN CHILDHOOD

VOLUME VIII, 1933.

PP. 423-433

A NUTRITIONAL DISEASE OF CHILDHOOD
ASSOCIATED WITH A MAIZE DIET

BY

CICELY D. WILLIAMS, B.M.

(From the Children's Hospital, Accra, Gold Coast Colony).

■ **Fasting**

- Complete cessation of food intake for variable periods of time

■ **Starvation**

- Severe and sustained reduction in food intake, eventually causing functional and structural damage

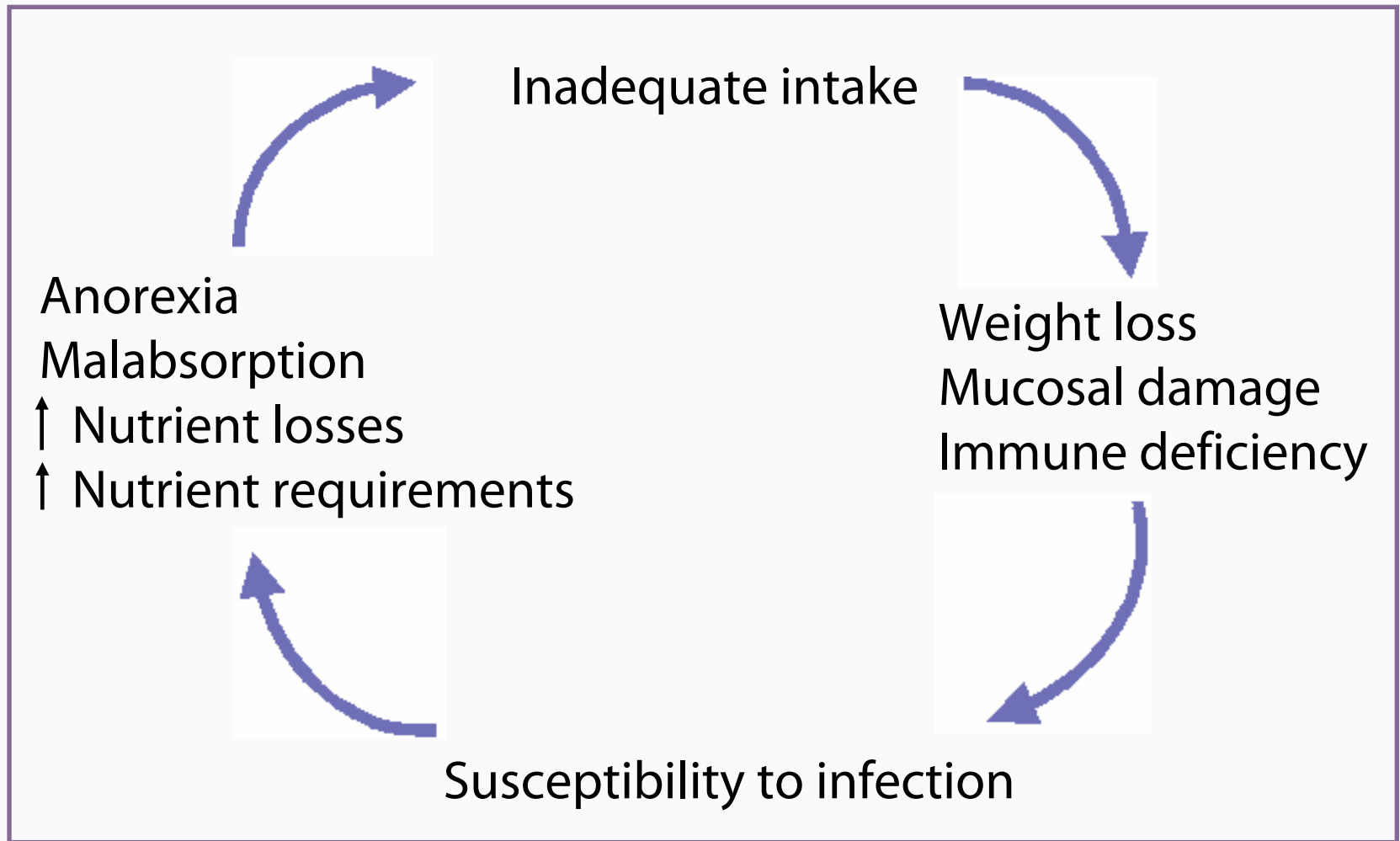
General Classifications of PEM

- Primary, secondary
- Acute, chronic
- Marasmus, kwashiorkor
- Edematous
- By severity—mild, moderate, severe

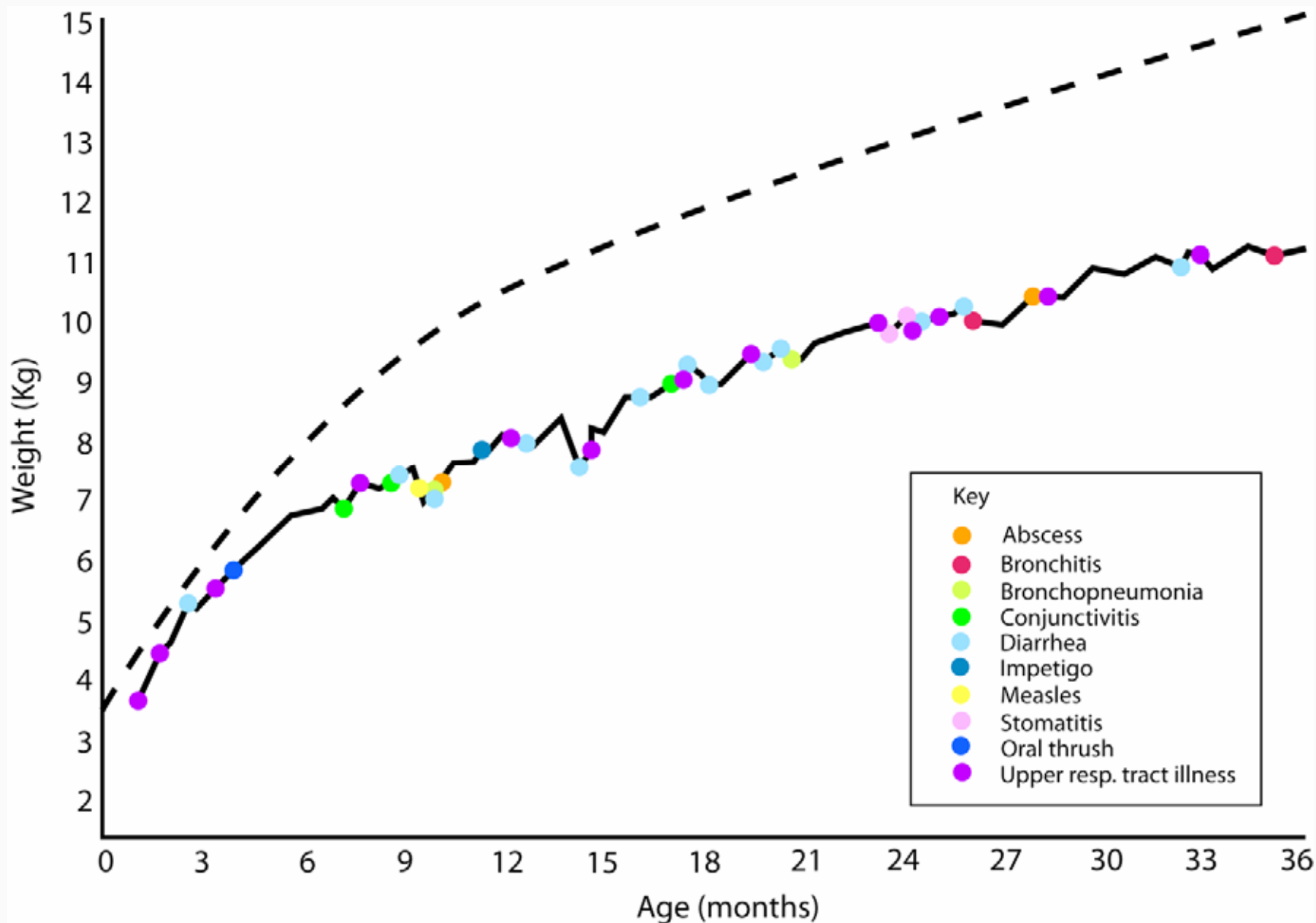
- **Insufficient food intake**
 - Anorexia due to illness
 - Eating disorders
 - Dietary practices or beliefs
- **Insufficient food availability**
 - Civil war, political instability
 - Socio-economic oppression
 - Limited agricultural development

- **Impaired nutrient absorption or excessive losses**
 - Malabsorption syndromes
 - ▶ Primary or secondary
 - Gastrointestinal diseases
 - Short gut syndrome

The Malnutrition-Infection Cycle

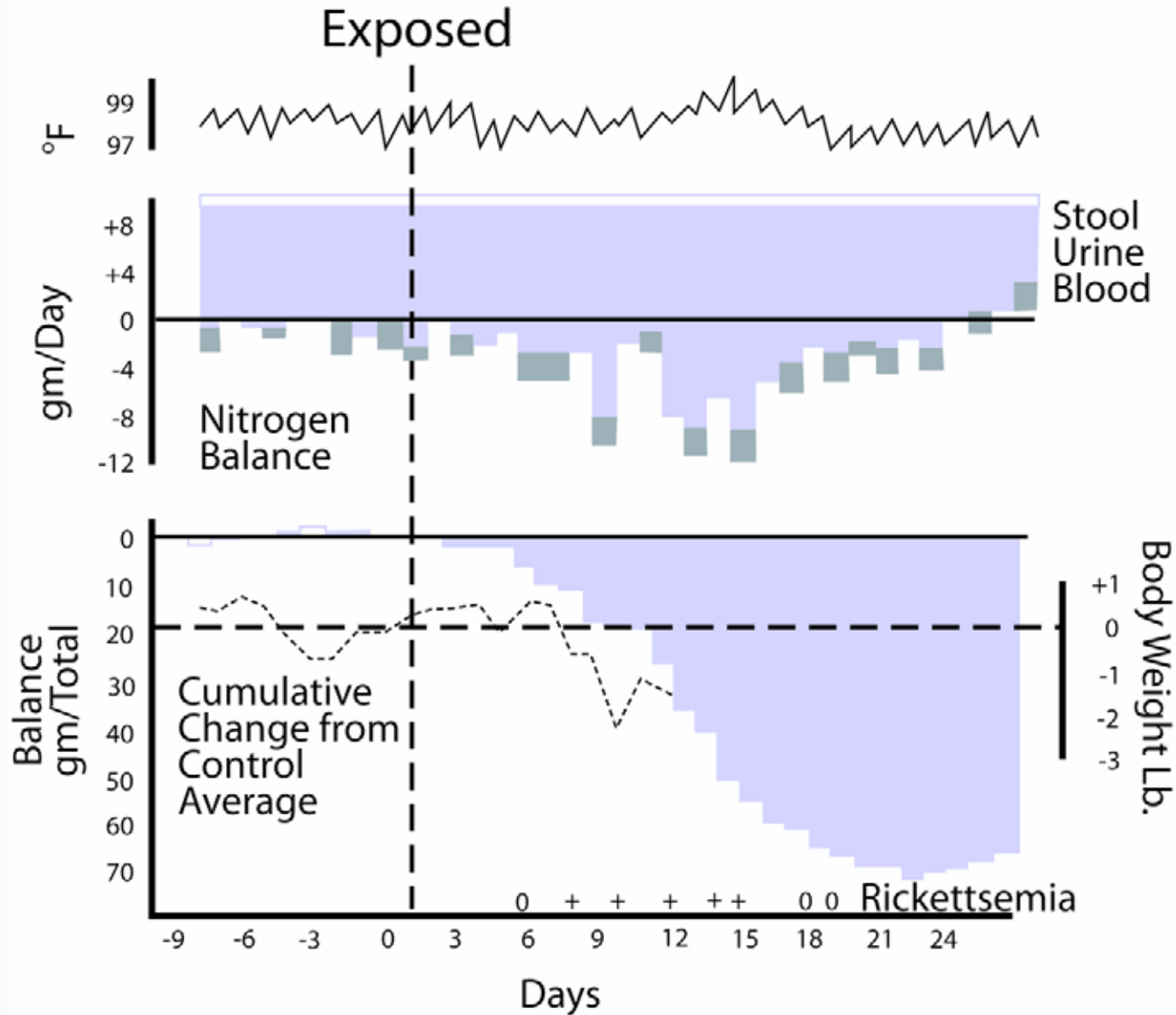


Impact of Common Infections on Growth Guatemala (L. Mata)



Adapted by CTLT from The Children of Santa Maria Conque: A Perspective Field Study of Health & Growth

Nutrient Losses During Infection



■ Weight for age

- Indicates past or present malnutrition
- Used as a population indicator of PEM
- Gomez classification:
 - ▶ I 75–90%
 - ▶ II 60–74%
 - ▶ III <60%

■ Weight for height

- Indicates present nutritional status (wasting)
- Waterlow classification
 - ▶ Mild: 80–89% (–1 to –2 Z)
 - ▶ Moderate: 70–79 (–2 to –3 Z)
 - ▶ Severe: <70 (< –3 Z)

■ Height for age

- Indicates chronic growth delay (stunting)
 - ▶ Mild: 90–94% (–1 to –2 Z)
 - ▶ Moderate: 85–89% (–2 to –3 Z)
 - ▶ Severe: <85% (< –3 Z)

Prevalence of Stunting (%) and Numbers of Children Affected

1980, 1985, 1990, 1995 by Region

Region	Prevalence Stunting				Numbers Stunted (in millions)				% Increase (+) or Decrease (-) in Numbers from 1980 to 1995
	1980	1985	1990	1995	1980	1985	1990	1995	
Sub-Saharan Africa	37.4	38.1	38.7	39.4	26.255	30.832	36.248	42.590	+62
Near East/North Africa	30.8	25.9	23.0	22.2	11.397	10.991	10.865	10.913	-4
South Asia	66.1	61.9	57.7	53.5	88.873	93.237	91.520	89.877	+1
South East Asia	51.9	47.3	42.8	38.3	35.581	32.862	30.119	30.206	-15
Middle America/ Caribbean	31.6	30.4	29.1	27.8	5.398	5.467	5.631	5.626	+4
South America	25.0	21.0	16.9	12.9	8.285	7.309	5.965	4.644	-44
China (1992)			31.4				36.068		
Across all regions (Excluding China)	48.8	45.6	42.5	39.9	175.789	180.698	180.348	183.85 6	+5



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Section B

Pathophysiology, Management, and Prevention

- **Reduced protein synthesis**
 - Cessation of growth
 - Loss of LBM
 - Decreased immune response
 - Loss of epithelial integrity
 - Impaired liver function

- **Negative energy balance**
 - Decreased energy expenditure
 - Loss of fat body mass
 - Apathy, lethargy

■ Stabilization

- Rehydration
- Antimicrobial therapy

■ Refeeding

- Initial—0.7g/k protein and 60 kcal/k energy, Vitamin A
- Target—4g/k protein and 150–200 kcal/k energy
- Iron and other minerals

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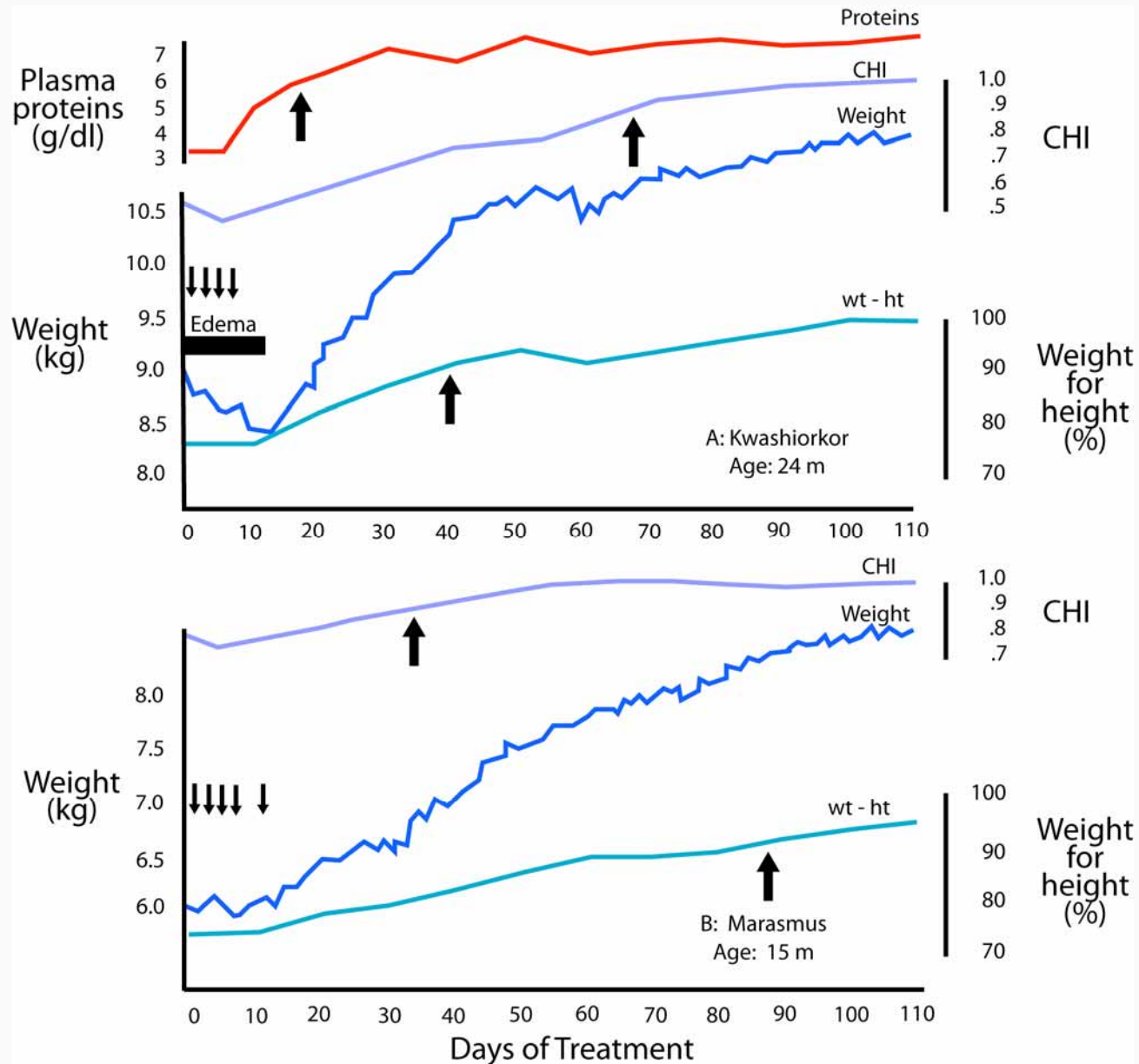
PEM: Indicators of High Risk

- Age < 6 months
- Wt/Ht > 2 Z
- Arm muscle area < 5th percentile
- Serum albumin < 2.5 g/dL
- Serum transferrin < 100 µg/dL

PEM: Indicators of High Risk

- Infection—Pneumonia, measles, sepsis
- Severe dehydration, acidosis
- Stupor, coma
- Hypothermia, hypoglycemia
- Tachycardia, signs of cardiac insufficiency
- Jaundice

Bodyweight Recovery



Prevention

- Breastfeeding
- Adequate weaning foods
- Control of infections
- Education
- Economic development
- Food and agricultural policies