

Pediatric Malnutrition & Management of Malnutrition in Emergencies

AAFP Global Health Workshop 2017
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FAMILY PHYSICIANS
STRONG MEDICINE FOR AMERICA



Objectives

- To review the prevalence and consequences of childhood undernutrition globally
- To consider tools for nutritional surveillance, especially in high risk situations
- To discuss interventions for management of malnutrition in emergencies

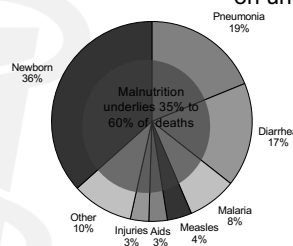
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What constitutes undernutrition?

- Intrauterine growth restriction resulting in low birth weight, most notably small for gestational age infants
- Underweight: low body weight, measured by weight for age in children, and Body Mass Index (BMI) in children and adults
- Stunting (shortness): linear growth deficits
- Wasting (thinness): reflecting low weight for height
- Protein deficiency malnutrition
- Micronutrient deficiencies

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The Impact of Malnutrition on under five Child Mortality



Source: Lancet Child Survival Series

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Synergism of nutrition and infection

- Malnutrition depresses immune function and increases susceptibility to infection
- Anorexia results in decreased intake and increased challenge with feeding

Nutrition ← Infection

- Diarrhea & vomiting increase nutrient losses
- Fever increases energy needs
- Infection disrupts nitrogen balance & increases protein needs
- Infection causes anorexia

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- "More than 35 million mothers and children under 5 die unnecessarily each year due to the underlying cause of undernutrition, and millions more are permanently disabled by the physical and mental effects of a poor dietary intake in the earliest months of life"

- The consequences of maternal and child undernutrition affect immediate as well as future health and well being, and effects can continue into future generations

Source: Lancet Child Survival Series

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children

- 13 million children born annually with growth retardation
- 122 million underweight
- 178 million under 5 year old children are stunted: mostly in sub-Saharan Africa or south-central Asia
- 55 million wasted

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Intergenerational importance of poor maternal nutrition

- Fetal nutritional sufficiency is affected by the mother's **preconceptional nutritional status** (weight status, fat stores, micronutrient status) and her **diet and nutritional status during pregnancy**
- In the short term, fetal nutritional sufficiency is reflected in growth and development in young childhood
- We are beginning to recognize the long term effects of the fetal nutritional environment on the development of adult disease
- Poor maternal nutrition plays out in the next generation with increased risk of infectious as well as chronic disease

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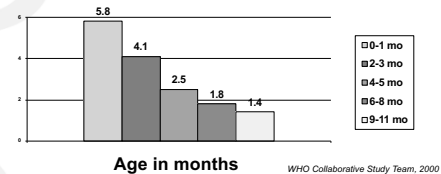
Determinants of malnutrition: The 6 "P's"

- **Production** : agricultural and food production
 - About half of people in developing countries do not have an adequate food supply
- **Preservation**:
 - 25% of grains are lost to bad postharvest handling, spoilage and pest infestation; 50% of easily perishable fruits and vegetables are lost
- **Population**
 - density, distribution, urban migration
- **Poverty**: root cause of malnutrition
 - income inequality, household food distribution
- **Politics**
 - government policies can foster malnutrition directly by how food is subsidized, distributed and indirectly unrest/violence effects market availability of foods and cost of food
- **Pathology**
 - nutrition-infection synergism

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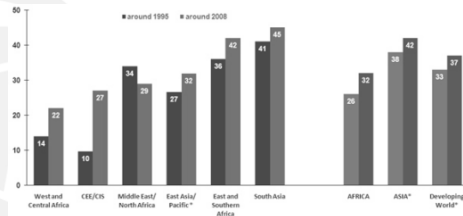
Infant Mortality Risk from Not Breastfeeding

Pooled Odds Ratios



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Trends in the percentage of infants under 6 months old who are exclusively breastfed



*data from MICS, DHHS, and other national surveys, 1995 - 2008

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Purposes of Nutritional Anthropometry

1. Identification of groups at risk of morbidity and mortality
2. Surveillance of a population
3. Tool for individual monitoring and intervention

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Anthropometric Tools

- **Weight**
 - Scale (hanging vs. standing)
- **Height**
 - board for recumbent (0.5 cm longer)
 - various means for upright (standing)
- **Middle Upper Arm Circumference (MUAC):** tape
- **Head Circumference:** tape (<3 YOA)

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Visual Screening for Nutritional Assessment

- Marasmus or severe wasting – shoulders, back, buttocks; ribs easily visible
- Kwashiorkor (protein energy malnutrition) pedal edema, thin/dry hair, very thin arms/legs
- Edema

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Severe Acute Malnutrition

Marasmus (wasting)



Case Fatality: 20 to 30 Percent

Kwashiorkor (edema)



Case Fatality: 50 to 60 Percent

Marasmic
↕
Kwashiorkor

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Edema

- Edema measured with standard technique: 5 seconds of pressure with the thumb, wait 2 seconds, estimate depth of impression left
 - trace is <1/2cm
 - 1+ is ½ cm
 - 2+ is 1cm
 - 3+ is >1cm



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Measuring other Nutritional States

- **Iron Deficiency**
 - Hgb/HCT measurements, pallor – palm and nail beds, conjunctiva, mucous membranes
 - % of households where pregnant women have iron/folate tablets
- **Vitamin A deficiency**
 - keratomalacia, corneal ulcerations, conjunctival Bitot's spots
 - Night blindness (particularly in young children and pregnant women)
 - % of households where children under 5 have received Vitamin A supplement in the last 6 months
- **Iodine deficiency**
 - Goiter
 - % of households with iodized salt
- **Overnutrition**
 - BMI/Obesity measurements
 - Cases/1000 population of CV disease, diabetes

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Most Common Indicators

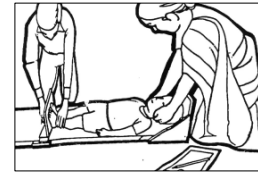
- Weight for Height (W/H) - "wasting"
- Height for Age (H/A) - "stunting"
- Weight for Age (W/A) – "growth faltering"
- Median Upper Arm Circumference (MUAC)

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Figure 1 Weight assessment.
Adapted from "How to weigh and measure children", U.N., 1986.

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In general, children <24 months or who are too ill to stand should be measured lying down

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Length boards

- Two people required to properly measure length



- locally made resources

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Weight for Height (W/H) "wasting"

Advantages:

- age not required
- good for nutritional emergencies

Disadvantages:

- Less sensitive
- Inter-observer Variability in height measurements

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Height for Age (H/A) "stunting"

Advantages:

- frequently associated with poor overall socio-economic conditions which is usually obvious in a given population
- Genetic differences globally

Disadvantages:

- difficult to measure height
- Need age (might be hard in emergencies if separated from parents)

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Weight for Age (W/A) "growth faltering"

Advantages:

- Composite of W/H and H/A
- good for following individual children over time
- Picks up rapid faltering, due to inadequate weight gain (wasting) or concomitant illness
- If slow faltering, directed to get more info - H/A and W/H

Disadvantages:

- does not indicate whether child is short and normal weight or tall and underweight

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Median Upper Arm Circumference (MUAC)

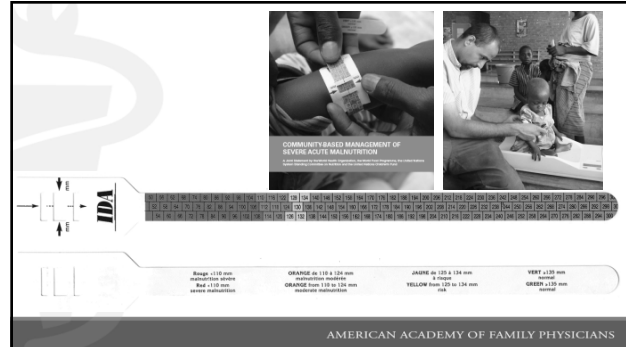
Advantages

- easy to perform
- does not require age
- *May be the "best" predictor of mortality in children at risk*

Disadvantages:

- measurement error
- multiple cut-off values
- Overall, poor correlation with stunting

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The OLD WHO (NCHS) Reference for Growth Charts

- Data from the US were adopted as an international reference
- For birth to 23 months: reference is based on a Longitudinal Survey of about 760 Yellow Springs, Ohio infants followed from 1929-75
 - infants were primarily white, middle class and formula fed
- Age 2-18 based on national cross-sectional samples measured during U.S. Health and Examination Surveys

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What is different about the new WHO Multi-center growth standards (0-5 yrs)?

- Pooled Multi-country assessment – reiterates that children grow similarly when nutritional needs are met
- Breastfeeding is "biologic norm"
- Will play an important part in the early recognition of childhood obesity
 - Brazil, Ghana, India, Norway, Oman, USA
- Full measurement includes: W/H, W/A, H/A, BMI, MUAC/age, head circ/age, triceps skin fold/age, subscapular skin fold/age

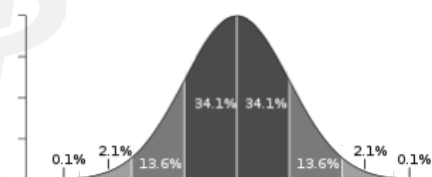
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Z-score

- Most frequently used today in nutritional assessment – multiple computer programs use standard distribution curves (WHO Anthro)
- The basis of WHO and most standard national growth charts – "zones"
 - GREEN = median (50%)
 - YELLOW = Z score of -1 (15th%)
 - RED - Low = Z score of -2 (3rd%)
 - BLACK - Very low = Z score of -3 (<3rd%)

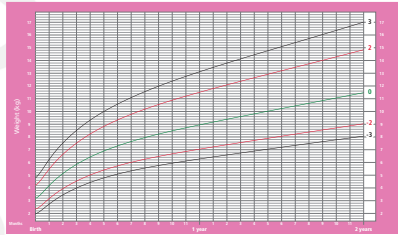
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Standard deviation



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WHO Growth Chart Girl 0-2 years, W/A



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Also include six developmental milestones (3-24 mo)

- Sitting without support
- Standing with assistance
- Hands and knees crawling
- Walking with assistance
- Standing alone
- Walking alone

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Patterns of Anthropometric Findings

- High wasting (>10%) and high stunting (>20%)
 - Emergency famine situations
- High stunting, but low wasting
 - non-emergency
 - multiple SES-based causation, including LBW and genetic differences

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Growth faltering:

- W/A for individual periodic measurements (if age is easily determined)
 - If rapid faltering, due to inadequate weight gain (wasting) or illness
 - If slower, get more info - H/A and W/H
 - Decline over time in anthropometric indicators is much more important than single low measurement

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Malnutrition and Undernutrition in Emergencies



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Major risks for infants and young children in complex humanitarian crisis

- Separation from family
- Hypo or hyperthermia
- Dehydration
- Starvation
- Illness – gastroenteritis, respiratory infection, skin infection, measles and malaria



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Data sources

- **Screening (rapid assessment)**
 - Often done as part of a rapid assessment using MUAC and W/H. Findings should be used cautiously, but can give an indication of relative severity of a situation.
- **Population-based Surveys**
 - Provide a "snap shot" of the situation at a given time. Typically used to establish prevalence of malnutrition, often including data on morbidity and mortality. More intensive and generalizable than screening.
- **Surveillance**
 - Used to identify trends in nutritional status of a population. Mechanisms vary but can include a combination of repeated surveys, sentinel site surveillance, or health service statistics, etc.

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Triage

- Weight for Height
- MUAC
- Signs of micronutrient deficiency
- Complications → medical referral



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Assess:

- Concomitant infections
- Uncontrolled diarrhea
- Dehydration
- Anorexia
- Edema or Kwashiorkor



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Emergency contexts Definitions of global acute malnutrition

	Stunting (Chronic)	Underweight (Both)	Wasting (Acute)
Index	H/A	W/A	W/H or MUAC
Moderate GAM	< -2 SD	< -2 SD	< -2 SD, 70 - 80% Median, or MUAC 11.0 - 12.5cm
Severe GAM	< -3 SD	< -3SD	< -3SD, <70% Median, or MUAC <11.0, or Edema

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Population Benchmarks

Severity	Prevalence of GAM (Global Acute Malnutrition)
Acceptable	< 5 %
Poor	5 - 9 %
Serious	10 - 14 %
Critical	> = 15 %

GAM: children aged 6-59 months on the basis of WHZ <-2

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Food - local



- Local food resources
- Seasonal alterations
- Local food beliefs
- Markets and shops
- Fuel?
- Soap?
- Water?

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Food - imported

- Cost
- Nutritive Value for bulk
- Resources spent on logistics & transportation, set up of distribution
- Issues of safety and storage



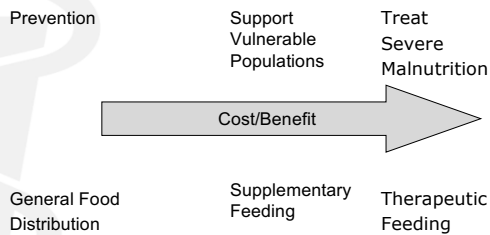
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Resources

- Staff
- Space for clinic, feeding, food distribution
- Safety issues
- Organizational support

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Response



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Supplementary Treatment Options

- Wet vs. Dry Rations (should be take home without clear rationale for on-site feeding) of at least 1000 kcal/day and 40 g protein
- Ration types:
 - Fortified Blended Foods
 - Grain + oil, sugar, salt
 - High energy biscuits
 - Lipid Nutrient Supplements
 - Infant Formula ???

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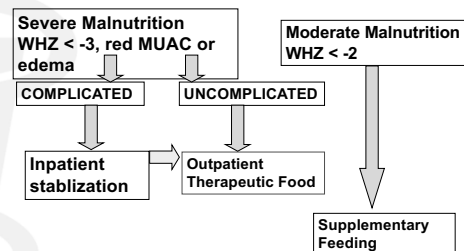
Misconceptions about breastfeeding in emergencies:

- Women under stress lose supply
- Malnourished women have reduced production and poor quality milk
- Women who have stopped nursing, cannot start again
- A weaned infant will not nurse again
- **BREASTFEEDING, AND RELACTATION ARE LIFE SAVING OPTIONS**



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Acute Malnutrition



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Inpatient stabilization

- Dehydration – rehydration formula, IV fluids
- Hypoglycemia – frequent feedings
- Hypothermia – frequent feedings, appropriate protection from environmental factors
- Micronutrient Deficiencies – supplementation of Vitamin A, Zinc, iron/folate
- Anorexia – slow feeding, spoon feeding, even naso-gastric feeding
- Treatment for infections, parasitic infestation, malaria

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Traditional method of treating malnutrition

- Inpatient treatment for both complicated and uncomplicated malnutrition
- Separation of family, cost
- Increased risk of disease exposure (especially diarrheal disease and respiratory infections)
- 2 phases of milk formula - complicated

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- Stabilization phase
 - Low protein milk based formula F-75 (75 kcal/100 cc) for 4-7 days
 - Restore electrolyte balance
 - Treat complications, edema resolves and appetite returns
- Rehabilitation phase
 - High protein, high energy formula F-100 (100kcal/100 cc)
 - Add iron, other micronutrients
 - Start porridge feeds as an inpatient and transition



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Ready to Use Therapeutic Food

- Ready-to-Use Therapeutic Food
- Home-based therapy for the treatment of moderate to severe malnutrition



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RUTF

- First produced as “plumpy’ nut” by Nutriset (France)
- Now numerous local production processes (Malawi, Haiti, Kenya)
- **Ingredients**
 - Milk powder
 - Peanut Paste
 - Oil (palm oil w Vit A)
 - Sugar
 - Vitamin Mineral Mix

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- It is not difficult to feed a child RUTF
 - Few spoons at a time, multiple times a day
 - Continue to breastfeed (or give clean water)
- No cooking required
- No special storage
 - RUTF will not spoil
- No special nursing

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For any child with uncomplicated malnutrition



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Ready to eat therapeutic food

- Child can go home with supply
- Follows up in 1 to 2 weeks
- All recovery done at home
- No family separation
- No social isolation
- Can be followed up in outpatient clinic/feeding center



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Resources

- Refugee health: An approach to emergency situations. MSF. 2008
- WHO Rapid Health Assessment Protocols for Emergencies and WHO Management of Nutrition (1999) in Emergencies (2003)
- Save the Children Emergency Health and Nutrition Toolkit (2005)
- Action against Hunger
- Software – WHO Anthro 2005, Epi Info Emergency Nutritional Assessment (ENA)

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