

Anthropometry

- Essential for diagnosis, for prognosis, for treatment, for surveillance
- **Harder than you think** :: time-consuming, labor-intensive
- Need to know :: gender, age
 - Often don't know age
 - Often ignore gender
- Need to measure :: **height, weight, MUAC, edema**
 - Use **height-for-age** to identify stunting
 - Use **weight-for-height** or **MUAC** to identify wasting
 - Also use **edema** to identify severe acute malnutrition (“kwashiorkor”)
- Use **z-scores** to categorize severity of malnutrition
 - WHO growth parameters

Preparations before measuring

- Comfortable location for mother and child
- Flat surface for measuring board and scale
- Seek consent for measurements
- Always have **2 trained people** to conduct height / length measurements
- Calm and control the child during measurements

Weight

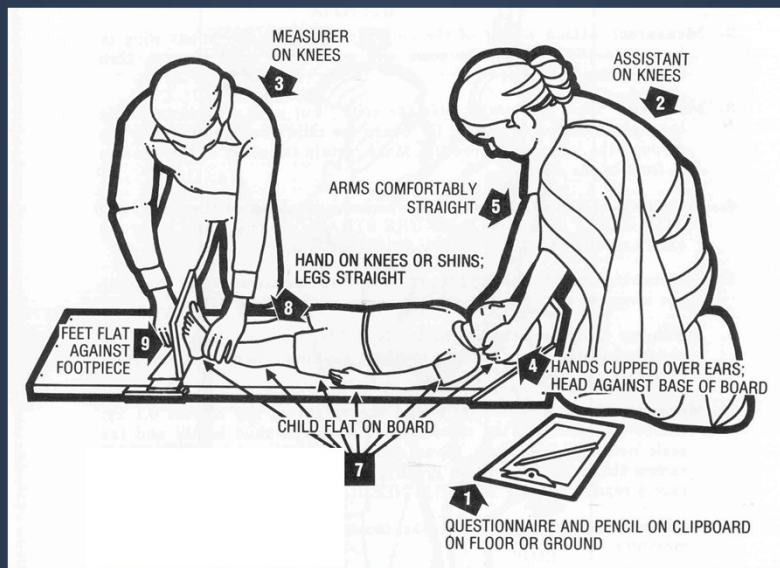
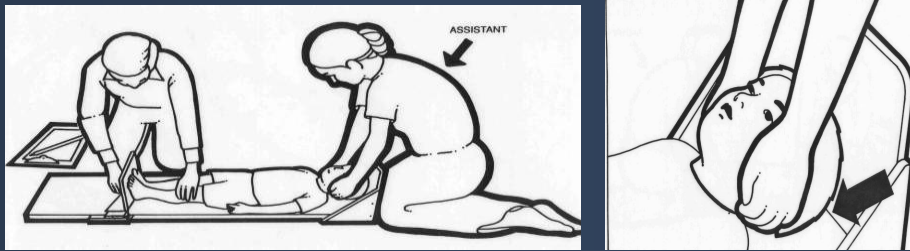


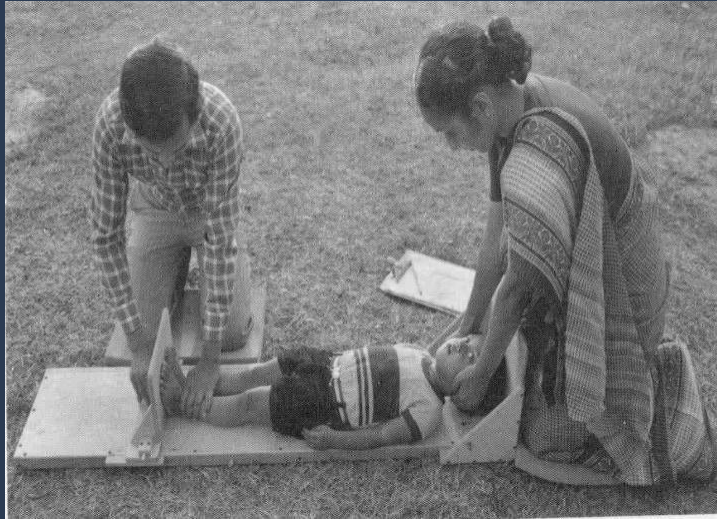
MSF :: Pieri, Sudan



Length

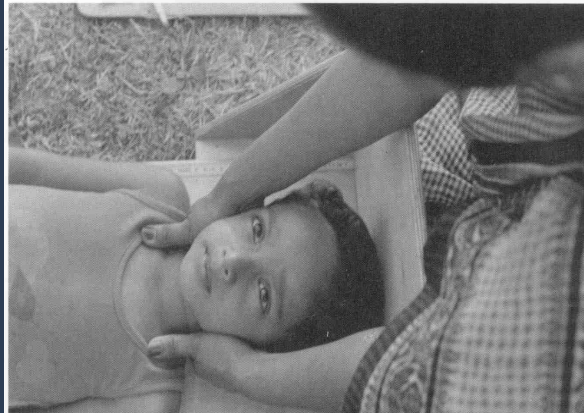
- Measure length for children less than 24 months of age.
- Measure infant without shoes and wearing light underclothing or clean diaper.
- Remove hair accessories that interfere with measurement
- Lay child on their back in the center of the measuring surface.
- Assistant cups the ears to hold the infant's head so the infant is looking upward and the crown of the head is against the headpiece.
- Bring knees together, extend both legs and bring movable foot piece to rest against heels.
- Read measurement to the nearest 0.1 cm. (We actually do 0.5 cm.)





Incorrect positions

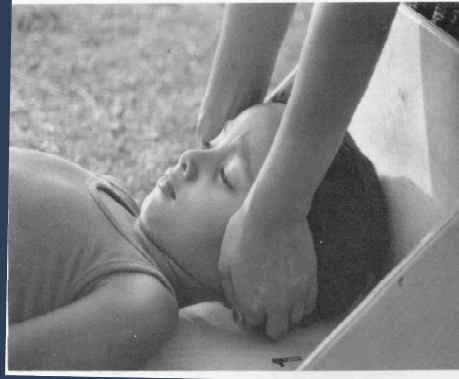
Incorrect Hand Position.
Hands Pressing Against Ears.
Thumbs Pressing on Shoulders



(But this actually works really well since the thumbs help hold down the torso of a squirming child.)

Incorrect positions

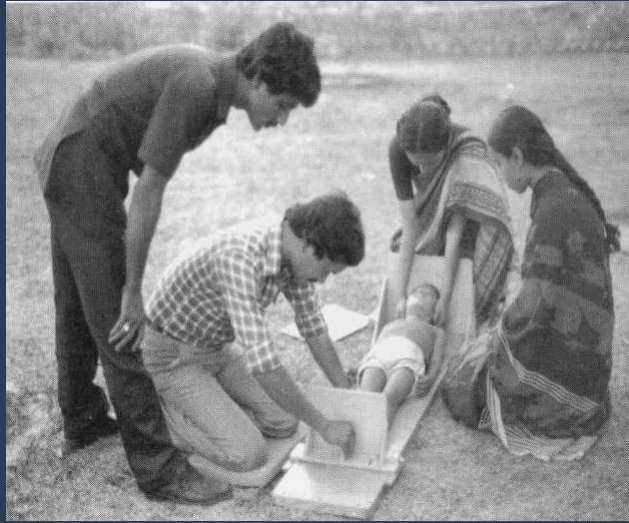
*Incorrect Child Head Position.
Chin Against Chest*



Incorrect positions



Length :: Supervise field staff



Mid-Upper Arm Circumference (MUAC)

- Circumference of the upper arm measured at the mid-point between the tip of the shoulder and the tip of the elbow
- Changes little between 6 months to 5 years
 - Measures lean body mass
 - Can be used in place of weight-for-height z-score to identify malnutrition
- Prospective studies have shown that **MUAC < 110 mm** was the single best anthropometric predictor of death from malnutrition within 6 months
 - Will often identify a different population of malnourished children than weight-for-height, so best to measure both
 - 2009 WHO guidelines suggest using MUAC < 115 mm to identify severe acute malnutrition

Mid-Upper Arm Circumference (MUAC)

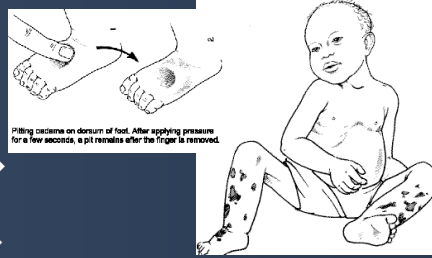


Mid-Upper Arm Circumference (MUAC)



Edema

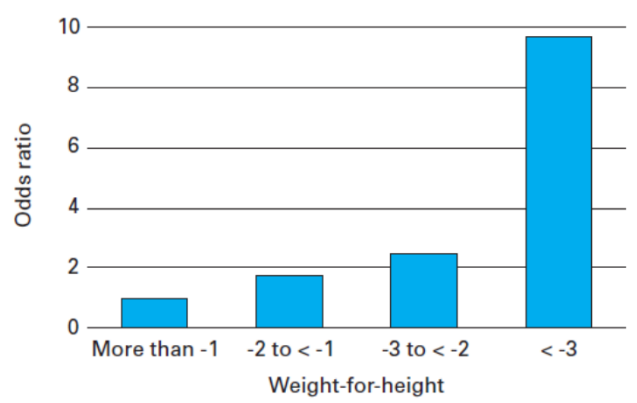
- Nutritional edema is a cardinal physical finding of severe malnutrition
 - Virtually unique to African malnutrition → almost never occurs in Asian or Pacific populations
- Presents on dorsum of hands and feet → **press for 5 seconds, watch for 2 seconds**
- Does **not** reflect primary renal, hepatic, or cardiac disease, and these children do not have ascites
- Etiology unknown :: hypothesized to be impaired ability for repair of leaky cell membranes
 - Micronutrients? Antioxidants?
- Associated with monotonous, maize-based diets in populations facing food insecurity
- **This is the hardest and most subjective part of nutritional anthropometry!**



WHO child growth standards and the identification of severe acute malnutrition in infants and children

A Joint Statement by the World Health Organization and the United Nations Children's Fund

FIGURE 1
Odds ratio for mortality by weight-for-height.
Adapted from reference 9



Note: reference category: children with a weight-for-height > -1 SD.

ANNEX 1

Weight-for-Length Reference Card (below 87 cm)

Boys' weight (kg)					Length	Girls' weight (kg)				
-4 SD	-3 SD	-2 SD	-1 SD	Médian	(cm)	Médian	-1 SD	-2 SD	-3 SD	-4 SD
1.7	1.9	2.0	2.2	2.4	45	2.5	2.3	2.1	1.9	1.7
1.8	2.0	2.2	2.4	2.6	46	2.6	2.4	2.2	2.0	1.9
2.0	2.1	2.3	2.5	2.8	47	2.8	2.6	2.4	2.2	2.0
2.1	2.3	2.5	2.7	2.9	48	3.0	2.7	2.5	2.3	2.1
2.2	2.4	2.6	2.9	3.1	49	3.2	2.9	2.7	2.5	2.2
2.4	2.6	2.8	3.0	3.3	50	3.4	3.1	2.8	2.6	2.4
2.5	2.7	3.0	3.2	3.5	51	3.6	3.3	3.0	2.8	2.5

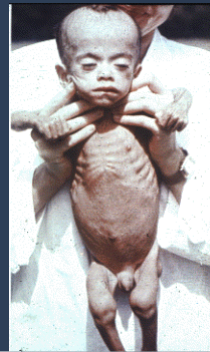
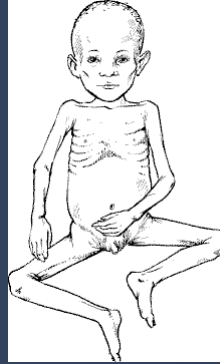
- Determine the child's length
- Is the child's weight above the WHZ = -2 cutoff?
 - YES = the child does not need meet criteria for enrollment → stop here
 - NO = the child is at least moderately wasted → go to step 3
- Is the child's weight above the WHZ = -3 cutoff?
 - YES = the child has **moderate acute malnutrition** → enroll in supplementary feeding program or supplementary food research study
 - NO = the child has **severe acute malnutrition** → enroll in therapeutic feeding program or antibiotics research study
 - Remember that **edema** also means severe malnutrition, no matter what the weight
- The child's target weight is the WHZ = -2 cutoff for children in either feeding program.

Categorization

- Moderate acute malnutrition**
 - Weight-for-height z-score 2-3 SD below mean
 - At risk of progressing to severe malnutrition
 - High risk of further stunting, delayed cognitive development, and other badness
- Severe acute malnutrition**
 - Marasmus**
 - Weight-for-height z-score ≥ 3 SD below mean
 - MUAC ≤ 115 mm
 - Kwashiorkor**
 - Presence of nutritional edema regardless of other parameters
 - Used to be called "protein-energy malnutrition"
 - Perhaps best to call this "edematous malnutrition"
 - Accounts for >80% of the severely malnourished children we see
 - This is why recognizing edema is so important

Marasmus

- Inadequate caloric energy
 - Often tipped over by chronic or repeated diarrhea
- Clinical features
 - Emaciated with loss of subcutaneous fat and muscle
 - Thin, flaccid skin
 - “Little old man”
 - More apathetic than irritable
 - Normal hair
 - Minimal inflammatory signs of infection
- “Wasting”



MSF :: Pieri, Sudan

Kwashiorkor

- Clinical features
 - Edema
 - Ulcerating dermatoses
 - Dry, thin, depigmented, yellow-orange hair
 - Irritable, miserable
 - Rapid progression of infections
 - Higher case-fatality rate than without edema
- Kwa language of Ghana :: “first-second”

