A Guide to Nutrition and Food Security Assessments

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Chapter 1

Introduction

Chapter 2

Childhood undernutrition and anthropometry

Childhood undernutrition is an important global public health issue contributing to nearly half of all deaths in children under 5 and is widespread in Asia and Africa. This chapter discusses the various forms of childhood undernutrition, describes the indices used to diagnose them and the anthropometric measurements performed that will provide data to calculate the various indices.

2.1 Forms of childhood undernutrition

Childhood undernutrition manifests in various forms. It is important to note the use of the term undernutrition rather than malnutrition as this guide will not touch upon overweight and obesity. In this guide, the focus will be on two forms of undernutrition: 1) acute undernutrition; and, 2) chronic undernutrition. Childhood undernutrition manifested as micronutrient deficiencies will not be discussed.

2.1.1 Acute undernutrition

Childhood **acute undernutrition** is a condition related to a child's acute inadequate nutrition leading to rapid weight loss or failure to gain weight normally. Situations such as acute shortage of food and/or acute episodes of childhood illnesses such as diarrhoea, acute respiratory infections and/or malaria can bring about this rapid weight loss or weight gain failure in children.

Figure 2.1: Child with Bilateral oedema, skin and hair changes

A. Physical signs and symptoms

Acute undernutrition in a child can manifest in two ways.

1. *Marasmus*: This condition is also called *wasting* given that a child suffering from it presents as *wasted* with an appearance of *"skin and bones"* because of *excessive thinness* that is due to rapid loss of muscle and fatty tissue. Other physical features include the child's face looking like an old man's (*old man facies* due to loss of facial subcutaneous fat), child's rib cage is easily visible and skin folds on buttocks and thighs appearing like *"baggy pants"*.

2. *Kwashiorkor*: Some children with acute undernutrition develop *nutritional oedema*. Oedema is an accumulation of fluid in the tissue, especially the feet and legs and nutritional oedema is specifically characterised as being *bilateral and pitting*. The child with *kwashiorkor* is *withdrawn*, *irritable*, *obviously ill* and *will not eat*. The hair is thin, sparse and sometimes discoloured. The skin has symmetrical discoloured patches where the skin later cracks and peels off.

Figure 2.2: Bilateral pitting oedeam

B. Anthropometric indices

The physical signs and symptoms of acute undernutrition described above are considered pathognomonic of the condition i.e., if these signs and symptoms are found in a child, it is very likley that the child has acute undernutrition. However, other than physical signs, there are anthropometric indices used to diagnose acute undernutrition in children.

1. Weight-for-height/weight-for-length

The first independent criteria for *marasmus* or *wasting* is weight-for-height (WFH)/weight-for-length (WFL). Given *child A*, this child's weight is assessed against the mean weight of a standard group of children in good health with the same height or length as *child A* (length is measured when the child is $<$ 85 cms in height or $<$ 24 months old). *Child A* is expected to have a weight close to the mean weight of the standard group of healthy children if *child A* is also healthy and is not undernourished. However, if *child A*'s weight deviates significantly farther from the mean weight of the standard group of healthy children, *child A* is considered to have low weight for its height and therefore considered *marasmic* or *wasted*. This deviation from the mean, also called *standard deviation (SD)* in statistics, is calculated for each child whose weight and height have been measured and is expressed in terms of *z-scores*. Therefore, the anthropometric index used for *wasting* is weight-for-height z-scores (WHZ) and classification of level of wasting is done based on the following WHZ cut-offs:

WHZ	**Classification**
WHZ $<$ -2SD	Global Acute malnurition (GAM)
-3SD $\geq$ WHZ $<$ -2SD	Moderate acute malnutrition (MAM)
WHZ $<$ -3SD	Severe acute malnutrition (SAM)

2. Mid-upper arm circumference

The other independent criteria for *marasmus* or *wasting* is the *mid-upper arm circumference* or *MUAC*. *MUAC* is a measure of muscle mass and therefore detects loss of muscle mass due to wasting. *MUAC* is a good predictor of mortality and in many studies, *MUAC* predicted death in children better than any other anthropometric indicator. Unlike weight-for-height, *MUAC* is used as an anthropometric index without need for standardisation. The *MUAC* cut-offs used to classify a child as being *marasmic* or *wasted* are:

MUAC (mm)	**Classification**
MUAC $<$ 125	Global Acute malnurition (GAM)
115 $\geq$ MUAC $<$ 125	Moderate acute malnutrition (MAM)
MUAC $<$ 115	Severe acute malnutrition (SAM)

3. Oedema test

The final index for acute undernutrition is *oedema testing* for *kwarshiorkor* cases. This test checks whether *oedema* is present and whether it is *bilateral* and *pitting*. Any sign of bilateral pitting oedema, regardless of WHZ or MUAC classification, is considered *severe acute malnutrition*.

2.1.2 Chronic undernutrition

Childhood **chronic undernutrition** is a condition related to a child's exposure to inadequate nutrition over a long period of time leading to failure of linear growth. Stunted growth reflects a process of failure to reach linear growth potential as a result of suboptimal health and/or nutritional conditions.

A. Physical signs and symptoms

A child suffering from chronic undernutrition is also called *stunting/stunted*. Such a child is said to be short for its age (see below).

B. Anthropometric indices

Like with acute undernutrition, an index is used to classify whether a child has chronic malnutrition or not. This index is called height-for-age (HFA) or length-for-age (LFA). Given *child B*, this child's length/height is assessed against the mean length/height of a standard group of children in good health with the same age as *child B*. *Child B* is expected to have a length/height close to the mean length/height of the standard group of healthy children if *child B* is also health and well-nourished. However, if *child B*'s length/height deviates significantly farther from the mean height of the standard group of healthy children, *child B* is considered to have low height for its age and therefore considered to be *stunting* or *stunted*. This deviation from the mean, also called *standard deviation (SD)* in statistics, is calculated for each child whose height has been measured and is expressed in terms of *z-scores*. Therefore, the anthropometric index used for *stunting/stuntedness* is height-for-age z-scores (HAZ) and classification of level of stunting/stuntedness is done based on the following WHZ cut-offs:

HAZ	**Classification**
HAZ < -2SD	Global stunting/stuntedness
-3SD ≥ HAZ < -2SD	Moderate stunting/stuntedness
HAZ < -3SD	Severe stunting/stuntedness

Chapter 3

Performing anthropometric measurements

As described in Chapter 2, to be able to assess the anthropometric indices for acute and chronic undernutrition four (4) anthropometric measurements needs to be collected: 1) *weight*; 2) *height*; 3) *mid-upper arm circumference (MUAC)*; and, 4) *oedema*. In addition to these anthropometric measurements, information on the child's *age (in months)* and *sex* will also be needed to be able to determine the appropriate reference standards to use in calculating the child's corresponding anthropometric indices. This chapter provides detailed directions on how to perform anthropometric measurements accurately.

3.1 Measuring weight

3.1.1 Equipment: Weighing scales

A. Types of weighing scales

Various types of scales are available to measure the weight of a child: 1) *spring scales*; 2) *hanging scales*; 2) *beam balance scales*; and, 3) *digital scales*.

Spring scales are the most common type of scales used worldwide. *Hanging scales* are a kind of *spring scale* that is hung from a height instead of laid flat on the ground. *Hanging scales* are commonly preferred in many countries because they can be transported easily, can be used in almost any setting (particularly where a flat surface is not available) and are relatively inexpensive. However, they are not very accurate and as such are not recommended for use in nutrition surveys.

Figure 3.1: Bathroom scale (spring)

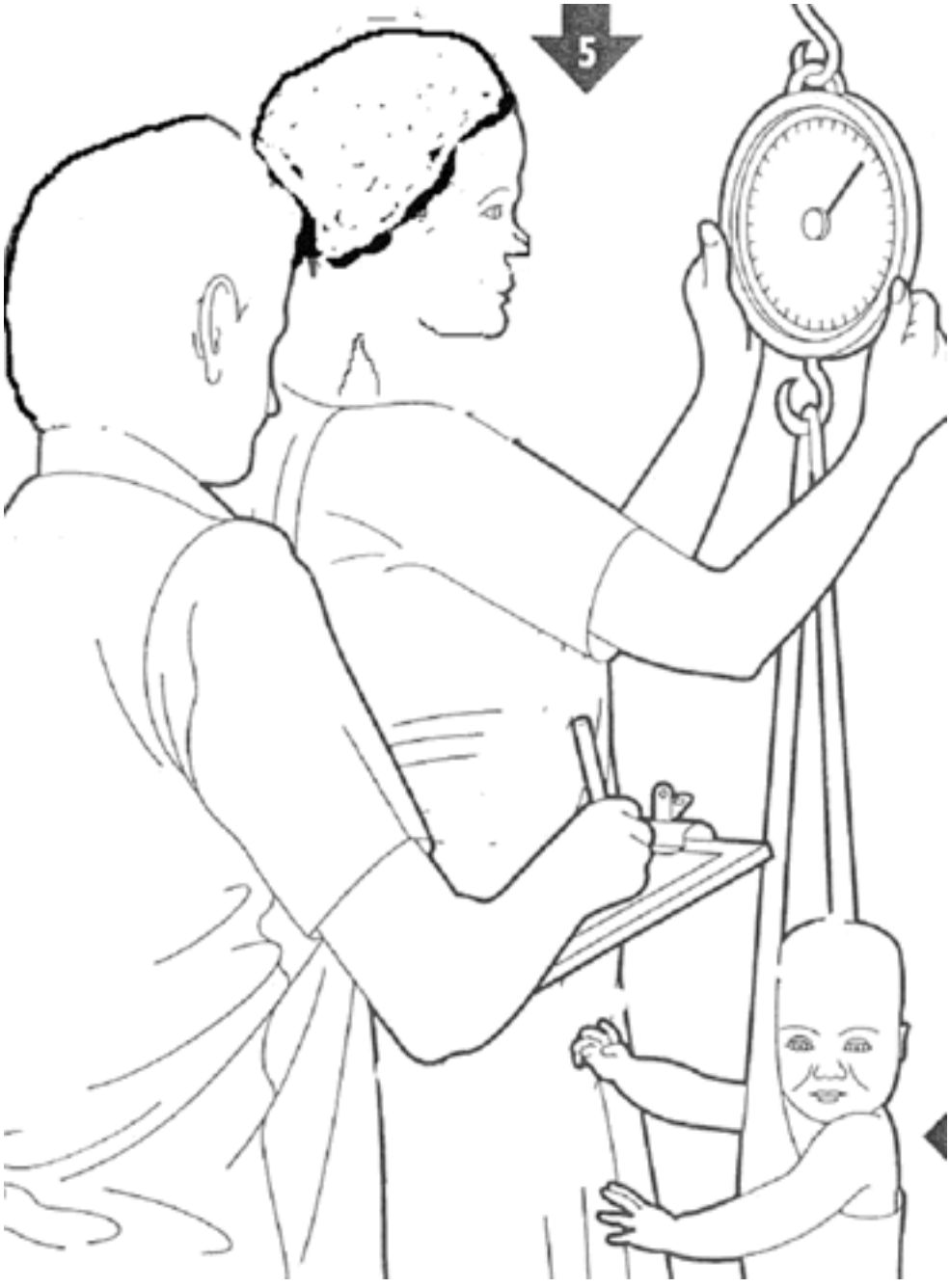

Figure 3.2: Hanging scale (spring)

Figure 3.3: Balance beam scales

Balance beam scales are commonly used in health centers, as they need to be positioned on a flat surface for accurate measurement and are not easily transported.

Digital scales on the other hand are highly accurate (for as long as it is powered adequately and consistently), easily transportable though requiring a flat surface on which to be laid upon. They are generally of high quality and rugged for frequent field use as is needed for a nutrition survey. This is why *digital scales* are what's currently recommended for use in anthropometric measurements in a field survey setting.

In addition to being a *digital scale*, it is recommended to weigh children using a scale with the following features:

- Solidly built and durable
- Electronic (digital reading)
- Measures up to 150 kg
- Measures to a precision of 0.1 kg (100g)
- Allows tared weighing

Figure 3.4: SECA scale model 874

"Tared weighing" means that the scale can be re-set to zero (*"tared"*) with the person just weighed still on it. Thus, a mother can stand on the scale, be weighed, and the scale tared. While remaining on the scale, if she is given her child to hold, the child's weight alone appears on the scale.

Digital scales that allow for **tared weighing** have very clear advantages:

- There is no need to subtract weights to determine the child's weight alone (reducing the risk of error).
- The child is likely to remain calm when held in the mother's arms for weighing.

Currently, the most commonly used digital tared weighing scale is the **UNICEF Electric Scale (UNISCALE)** which is produced by **SECA** (the non-UNICEF branded scale is the **SECA model 890** or **SECA model 874**)

B. General use, care and maintenance of SECA tared scales

1. Place the scale on a hard, level surface (wood, concrete, or firm earth). Soft or uneven surfaces may cause small errors in weighing. It is therefore advisable that each survey team are provided with a wooden plank that can be laid on top of unlevel ground as a way to even out the surface. The plank should be big enough to cover a reasonable surface and sturdy enough to carry the weight of the scale and those being weighed.

2. The scale will not function correctly if it becomes too warm. It is best to use the scale in the shade, or indoors. If the scale becomes hot and does not work correctly, place it in a cooler area and wait 15 minutes before using again.

3. The scale must adjust to changes in temperature. If the scale is moved to a new site with a different temperature, wait for 15 minutes before using the scale again. It is advisable to test the scale before every measurement when the scale is moved and operated in extreme weather conditions.

4. The scale must be tested every single day of fieldwork. This is best done using a labelled standard weight of 2.5 - 5.0 kg. This can be purchased locally, but must be tested initially to ensure that the indicated weight is accurate. Record the results of the daily test of the scale, including the date and weight. Using other types of standard weights is possible, but is not recommended. Some surveys have in the past used filled water bottles for testing, but as water or other liquids evaporate, this technique is flawed. Sand is a viable alternative, but only if labelled weights are not available.

5. Handle the scale carefully:

   - Do not drop or bump the scale.
   - Do not weigh loads with a total weight of more than 150 kg.
   - Do not store the scale in direct sunlight or other hot places.
   - Protect the scale against excess humidity or wetness.
   - Do not use the scale at temperatures below 10^{o} C or above 45^{o} C.

6. The scale is battery-powered. Around 120,000 weighings can be performed with a fresh set of batteries.

Chapter 4

Anthropometric measurement standardisation test

This chapter provides detailed instructions on how to carry out an anthropometric measurement standardisation test as part of a training process in preparation for a nutrition survey.