Nutritional Status Assessment and Analysis

Nutritional Status Indicators

Learner Notes

This course is funded by the European Union and implemented by the Food and Agriculture Organization.

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Learning objectives

At the end of this lesson you will be able to:

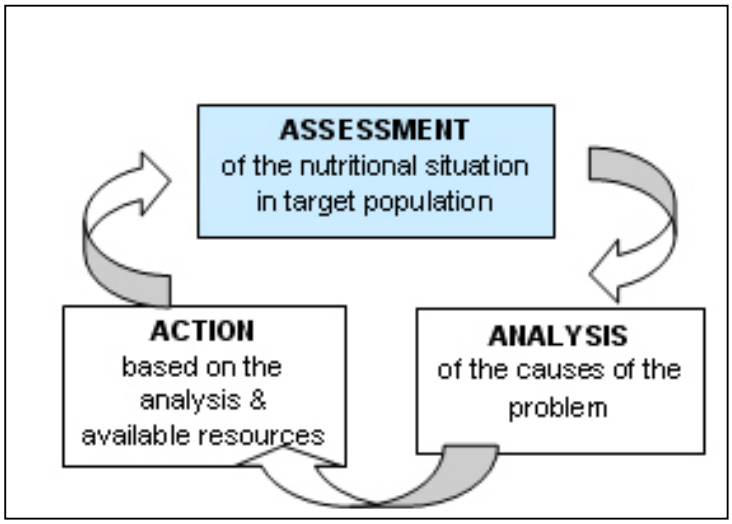
- identify the most commonly used indicators of nutritional status and of causes of malnutrition; and
- apply criteria for selecting nutrition indicators in specific contexts.

Introduction

In order to provide decision-makers with appropriate recommendations on nutrition-related interventions, data and information should cover not only the nutritional status of the target population, but also the underlying causes of malnutrition. This lesson will introduce the most commonly used indicators for measuring nutritional status, as well as the indicators used to understand the immediate, underlying and basic causes of a nutritional problem.

Nutrition and health indicators

Let's consider the Triple-A Cycle model:



The **ASSESSMENT** stage aims to **define the nutritional problem** in terms of magnitude and distribution. For example: percentage of population affected by underweight or low birth weight.

The **ANALYSIS** stage aims to analyse the **causes** of malnutrition as represented in the FIVIMS conceptual framework *(please, see lesson "Assessing nutritional status").*
For example: women's education level, quality and coverage of health services.

Different **indicators** are used for assessment and analysis purposes.

Indicators used to define the nutritional problem

They address the following questions:

- Who suffers from malnutrition?
- What is the type of malnutrition?
- When?
- Where?

→ **ANTHROPOMETRIC and MICRONUTRIENT DEFICIENCY INDICATORS**

Indicators used to analyze the causes of the problem

They address the following question:

- Why are people malnourished or at risk of malnutrition?

→ **FOOD, HEALTH and CARE PRACTICE INDICATORS**

Let's have a look at the most commonly used indicators.

There are three primary anthropometric indices for **children under five years of age**.

These are based on height and weight body measurement and are standardized by sex and age.

Indicator	What it measures/What it is used for
Low weight-for-height	**WASTING** (acute malnutrition). Wasted children are too light for their height (very thin). Wasting is the result of recent rapid weight loss or a failure to gain weight. Wasting can be reversed when conditions improve.
Low height-for-age or Low length-for-age	**STUNTING** (chronic malnutrition). Stunted children are too short for their age. Stunting develops over a long period as a result of inadequate dietary intake and/or repeated infections.
Low weight-for- age	**UNDERWEIGHT** (acute or chronic malnutrition, or both). Underweight children are too light for their age. Children may become underweight either because of wasting or stunting or both.

The following are additional anthropometric indicators. Particularly, body mass index and low birth weight are used to assess the **nutritional status of adults**.

Index/indicator	What it measures/What it is used for
Body Mass Index (BMI)	Calculated as weight divided by height squared, it is commonly used to measure thinness in adolescents, adults and the elderly.
Low Birth Weight (LBW)	It measures newborn weight and is associated with poor nutrition in mothers (although other factors can also contribute to low birth weight).
Mid-Upper Arm Circumference (MUAC)	It is an index of body mass. It is usually measured using a MUAC tape that is placed around the middle of the upper arm. It is particularly good for identifying children with a high risk of mortality.

In-depth information

- **Body Mass Index**

For **adolescents**, the WHO recommends using **BMI for age** as BMI varies greatly, particularly at puberty. However, the value of this index is limited by the fact that the precise age of adolescents is often difficult to establish and the classification proposed by WHO can seriously over-estimate malnutrition in this age group. BMI-for-age Z scores and percentiles for children under 5 years are also included in the new WHO Growth Standards (April 2006). Some agencies like Action Contre la Faim (ACF) have developed special weight-for-height tables for use up until the age of 18 years.

A major difficulty with BMI is that it **varies from one population to another**. Much depends upon the proportion between length of trunk and lower limbs. In populations with long legs, for example, the BMI is lower than those with short legs. As a result, the same BMI in different populations can have a completely different physiological significance so that the use of a single BMI threshold for different populations is open to question. There are also specific difficulties in using BMI to measure **nutritional status of the elderly**. The elderly are often stooped due to curvature of the spine. It is therefore difficult to ascertain their exact height. Although there are ways around this, i.e. using formulae that calculate height based on arm-span measurements, the formulae may need to be population-specific and are largely unproven in terms of determining risk.

- **Mid-Upper Arm Circumference**

The Mid-Upper Arm Circumference (MUAC) is particularly good for identifying **children with a high risk of mortality**. Its diagnostic value lies in the fact that it can be used without reference to age or height, can be carried out quickly and requires little equipment. However, the World Health Organisation

recommends using **MUAC-for-age**. This is because MUAC increase as the child grows, so the smallest children would have a greater chance of being selected on the basis of MUAC criteria only.
The International Committee of the Red Cross has developed a stick which measures **MUAC-for-height**. The increase of MUAC with age is controlled to some extent by assessing MUAC for a given height. However, the estimates of malnutrition given by this indicator are very high, so it should be used with caution. MUAC is not used to assess infants under six months of age.

Now, let's look at the contexts in which these anthropometric indicators are particularly useful[1].

Indicator	What it measures	Contexts where it is useful
Low weight-for-height (Wasting)	Acute malnutrition	EMERGENCIES. Low weight-for-height (and/or the presence of bilateral oedema) is used to measure prevalence of acute malnutrition (wasting) and is mostly useful to detect existing or recent onset of malnutrition. Wasting is the indicator most commonly assessed through nutrition surveys in emergencies. It is effectively a measure of thinness and there is a direct correlation between level of wasting and risk of mortality. As children become better nourished, their weight-for-height will improve quickly. Weight-for-height measurements are therefore used to assess the effectiveness of emergency interventions at population level and also to monitor the performance of malnourished individuals in specialized feeding programmes, sucha as therapeutic and supplementary feeding.
		EMERGENCIES. The Mid-Upper Arm Circumference (MUAC) is particularly good for identifying **children with a high risk of mortality**.

[1] **Clinical forms of malnutrition**

Marasmus and **kwashiorkor** are two clinical forms of malnutrition. Both conditions are associated with growth failure in children but may be distinguished by their own particular clinical characteristics.

The main distinguishing characteristic of kwashiorkor is **oedema** and loss of appetite. Oedema results from the excessive accumulation of extra-cellular fluid in the body as a result of severe nutritional deficiencies. Oedema may be detected by the production of a definite pit as a result of moderate pressure for three seconds with the thumb just above the ankle. Marasmus is identifiable by a severe loss of body weight or wasting. Some children present a mixed form of both marasmus and kwashiorkor, known as **marasmic-kwashiorkor**.

Low Mid-Upper Arm Circumference (MUAC)	Acute malnutrition	This index is particularly useful for screening malnourished children for admission to emergency feeding programmes. Once at-risk children have been identified (with low MUAC), they will then be weighed and measured to determine their weight-for-height. As it is simpler and quicker to take MUAC measurements than weight-for-height measurements, there may be some situations, e.g. limited time in an area due to high levels of insecurity, where rapid MUAC assessments can be used to approximately determine levels of acute malnutrition. However, the **two indicators do not fully substitute for each other** (it is not possible to derive a predicted wasting prevalence from a low MUAC prevalence).
Low height-for-age (Stunting)	Chronic malnutrition	CHRONIC MALNUTRITION. Height-for-age reflects achieved linear growth; a deficit indicates long-term cumulative inadequacies of health and/or nutrition and is therefore referred to as **chronic malnutrition**. **Stunting** is a commonly used term that reflects failure to reach linear growth potential. Stunting is the anthropometric measure most closely associated with poverty and is the indicator of choice in stable situations to show **correlation between chronic poverty and malnutrition**. Stunting is associated with impaired psycho-social development, reduced work capacity and low birth weight children, i.e. stunted women give birth to low birth weight children. It is difficult, if not impossible, to reverse stunting after the age of 2 years.
Low weight-for-age (Underweight)	Acute or chronic malnutrition or both	STABLE SITUATIONS. This index is commonly collected through Maternal and Child Health (MCH) centres as part of growth-monitoring programmes. This index is therefore used mostly in **stable situations** and is less useful in emergencies. Data from MCH centres are collated at district level and then passed onto provincial and national ministry of health levels where they are used to identify geographic areas with the highest levels of underweight. At MCH level the child's weight-for-age is recorded on '**road to health cards**' that show what the weight for age should be. Children and their carers whose weight-for-age falters or drops below a certain level are then given extra support, e.g. nutrition education and supplementary food As weight-for-age is the measure most commonly used at health centres, it can provide invaluable information about where chronic nutritional problems

		are worst and how policies and conditions are affecting nutrition over long periods of time.
Low Body Mass Index	Adolescent/adult/elderly nutritional status	EMERGENCIES and STABLE SITUATIONS. Low BMI is the indicator used to assess nutritional status of adults and is used in both **emergency and stable contexts**. BMI is of particular importance in those emergency contexts where adults may be more vulnerable than children. A low BMI and/or the presence of bilateral oedema are signs of **acute malnutrition** in adolescents, adults and the elderly. Although there are problems with using BMI to assess malnutrition in the elderly, due to age-related factors such as spinal curvature, it has been used in emergencies - for example, in European crises (e.g. Bosnia), where the elderly were particularly vulnerable to malnutrition. The BMI may not allow to properly assess the nutritional status of certain ethnic types who have long limbs (e.g. Dinka) and may over-estimate the degree of malnutrition.
Low Birth Weight	Newborn underweight (proxy for maternal malnutrition)	STABLE SITUATIONS. LBW is measured on newborns and its prevalence is a useful indicator in **stable situations** as a proxy for maternal malnutrition over time. It is a particularly important indicator in **Asian countries**, where maternal malnutrition is common. It is also a useful indicator for measuring **outcome of programmes designed to address maternal nutrition** and resulting intrauterine development.

There has been a significant increase in surveillance of micronutrient deficiency diseases in the past decade. A combination of clinical examination and biochemical testing is used in these assessments. Biochemical tests are either carried out on blood or urine samples. While they can be difficult to carry out in most developing country contexts, they may be vital in situations where there is a strong indication of risk of micronutrient deficiency but a lack of clinical evidence.

In such situations, biochemical assessment can determine whether the population is compromised, and whether clinical manifestations are likely to develop among the population.

The following are indicators used for assessing micronutrient deficiencies:

Indicators	What they measure	Contexts where used
• Clinical signs (pallor, tiredness, breathlessness and headaches) • Low haemoglobin	Iron deficiency anemia	STABLE SITUATIONS IDA results in decreased resistance to infection, impaired learning ability, low birth weight, decreased physical capacity and increased risk of death associated with pregnancy and childbirth. Clinical signs of anemia are monitored in surveillance systems in stable contexts. Women of child-bearing age, school children and children under five are most vulnerable to anemia and surveillance systems may focus only on these groups.
• Clinical signs (night blindness, bitot's spots, corneal xerosis, keratomalacia) • Low serum retinol	Vitamin A deficiency	EMERGENCIES AND STABLE SITUATIONS The consequences of VAD are tragic and include night blindness, irreversible blindness, growth retardation and increased susceptibility to infections and increased child mortality. Pregnant women are also prone to VAD and their children are likely to become deficient. Clinical signs are monitored in both stable contexts and emergencies. Children under five are usually monitored.
• Clinical signs (goitre and cretinism) • Low urinary iodine	Iodine deficiency	STABLE SITUATIONS Iodine deficiency results in disorders like goiter, impaired learning ability and reduced mental function (cretinism) and reproductive complications (miscarriages, still births and infant deaths). Clinical signs are monitored in stable contexts in areas where iodine deficiency is endemic, such as in mountainous areas.

Other **micronutrient deficiencies and relevant indicators are:**

Indicators	What they measure	Contexts where used
Clinical signs (painful joints, minute hemorrhages around hair follicles, swollen and bleeding gums and slow healing).	Vitamin C deficiency (scurvy)	Clinical signs are monitored in emergencies where cases have already been identified. Often part of multiple vitamin deficiency.
Eight clinically recognizable signs of beriberi (five in adults, three in children).	Thiamin (vitamin B1) deficiency	Clinical signs may be monitored in emergencies once cases have been identified. Symptoms are easily confused with other conditions but they are most likely to occur in rice-eating populations.
• Dermatitis, dementia and diarrhea • Cassal's necklace	Niacin deficiency	Niacin deficiency occurs mainly amongst maize-eating populations and appears to mostly affect females over 15 years of age.

Indicators to interpret nutritional status

The indicators described above measure nutritional outcome. **Food**, **health and care** indicators are essential to better interpret nutritional status.

Information on **food intake** helps to better understand the causes of malnutrition and can also be used as a proxy for nutritional outcome.

For example, this can be done through:

- food intake or consumption surveys, which quantify the amounts and types of food eaten;
- dietary diversity score and hunger scales, on which the information can be obtained relatively quickly; and
- food basket monitoring, which is usually carried out at food distribution sites or at household level in emergencies.

Key information on **health and care practices** are needed to analyse the causes of malnutrition. They are collected in both stable and emergency contexts.

In **stable contexts**, information is needed that can inform decisions about longer-term health interventions. It is important to collect information about health services/infrastructure and health-seeking behaviour.

In **emergencies**, information should be restricted more to factors that are either contributing to a public health crisis or that can be rapidly addressed to prevent deterioration in public health.

However, certain care practice indicators (for example, infant feeding practices) can be very relevant in **both stable and emergency contexts**.

In-depth Information

Key information for early assessment

Key indicators for rapid assessment are as follows:

- **Mortality rates** and causes of mortality -- these data can be obtained from mortality surveys, reports from health centres and grave counting (in camps).
- **Demographic profile**, specifically noting whether groups are over- or under-represented, e.g women, infants and young children, pregnant women, unaccompanied children, orphans.
- **Morbidity data** on the most common diseases (measles, diarrhoea, acute respiratory tract infections (ARI) and malaria). Surveys usually assess the percentage of children who have had an illness in the previous 2-4 weeks.
- Presence of **diseases with epidemic potential** (cholera, shigellosis, measles, meningitis, hepatitis, etc). This is critical in emergencies where communicable diseases can spread rapidly and cause large-scale mortality.
- Data on coverage of **immunization and vaccine coverage** (measles, meningitis, etc.). In emergencies, measles vaccination can prevent large-scale mortality.
- Coverage of **vitamin A supplementation**. In situations of nutritional stress, adequate vitamin A status can significantly reduce incidence of infection.
- Predominant infant and young child **feeding practices**, e.g. exclusive breastfeeding rates or age when complementary foods are introduced.
- **Water and sanitation facilities**. For example, number of persons per pit latrine, litres of water available per person per day.
- Number of persons per **shelters**.
- Number of persons served per **health centre, nurse, doctor**, etc.

In-depth information

Additional information for a more thorough analysis of malnutrition

Additional key information on care practices is needed to interpret anthropometric data and allow a more thorough analysis of malnutrition rates and causes. Key information includes the following:

- **Care for women**, especially during pregnancy and lactation. Information includes support offered by health facilities.
- Infant and young child **feeding practices**. Early initiation of breastfeeding and exclusive breastfeeding of infants under six months of age are critical. It is also important to investigate the availability of foods to feed older infants and young children. Feeding methods are also important, e.g whether infants are fed by cup or bottle (in emergencies, bottles are very difficult to clean).
- **Health environment** and **health-seeking behaviour**. Environmental assessment should look at water quantity and quality, fuel, sanitation, housing, facilities for food preparation and cooking.
- **Knowledge/beliefs** (value of child care). Every group of people has customs and traditions about feeding infants and young children that are important to understand and need to be addressed sensitively while promoting best practice.
- Control of **household resources and autonomy**. In many situations, lack of control over household resources determines that mothers and young children do not receive the food or health care necessary for good nutrition.
- **Time constraints** and **social support**. Competing demands on mothers and lack of social support can compromise child feeding and health care practices.

Qualities of a good nutrition indicator

Ideal qualities of a nutrition indicator include:

1. Validity.

It means that the indicator offers a true and as direct as possible measurement of the phenomenon considered.

2. Ease and rapidity of measurement.

These are qualities that are relevant to both the measurer and the individuals being measured. For instance, MUAC is an easy and rapid measure to be taken.

Ease of measurement for the subject is also important. If the measurement is too time consuming or, in the case of measuring the weight-for-age of a child, if it causes the child to become upset, then this can be problematic. Most invasive assessment tools, e.g. collecting information on blood levels of vitamins or vitamin markers, can be one step too far in some contexts.

3. Reproducibility.

It corresponds to the indicator's ability not to be influenced by the person or instrument measuring the data, so that the value obtained will be the same whatever the operator, the place or the measurement instrument. Reproducibility guarantees that an indicator can be measured at repeated intervals in a comparable manner - a quality which is crucial when using the indicator to assess and monitor the situation. For instance, indicators like weight for height are less influenced by a measurer who does not have high- quality skills; on the other hand, even though indicators which require laboratory assessment, e.g. haemoglobin levels, markers for niacin status, are not so prone to inter-individual measurer error, however, high quality skills are needed to take these measurements.

4. Other qualities related to costs and training requirements.

Costs of collecting information on various indicators do not just depend upon the equipment needed to take measurements but also on the time it takes to collect the information, salaries of enumerators, infrastructure in the area where the information is being collected, dispersal of population, etc.

For example, assessing MUAC is likely to be cheaper than assessing weight-for-height. The former involves using a light and fairly cheap tape, while the latter requires weighing scales and a stadiometer (to measure height), which also need some form of transport.

Costs increase further when blood or urine samples are needed: they need to be refrigerated and usually transported long distances to a laboratory.

Selecting indicators

How do you **select** the appropriate set of indicators?

First, it is important to be clear about the **key questions you need answered**. This will determine your choice of indicators. For example: if the question is "Why are infant mortality rates so high?", then you would choose LBW, exclusive breastfeeding rates, BMI of mothers.
Another important principle to consider when selecting indicators is: **keep it simple**.
Obtaining too much information in an assessment results in surveys that take too long a time.
It is therefore vital not only to ensure that anthropometric measurements are limited to those that are critical, but that questions framed to obtain contextual data (disease patterns, seasonal factors, caring practices, etc.) are well thought through, succinct and only address the **key areas of interest**.
It is also essential to ensure that information is collected only on indicators that are going to be analysed. For example, collecting information on attitudes to bottle feeding of infants is useful when you suspect infant feeding practices are inadequate and you aim to promote good infant nutrition.
In many situations, collecting data on **pairs of indicators** may help triangulate findings or clarify answers. For example:

- **Combining LBW with maternal nutritional status (BMI):**

Low birth weight in isolation does not indicate whether the problem is related to nutrition or some other factor, as LBW can be caused by adolescent pregnancies, smoking, etc. If data are also collected on maternal nutritional status (BMI) then it is easier to interpret the causes of LBW.

- **Combining child wasting with maternal nutritional status (BMI)**

Where there is a strong correlation between wasting and maternal nutritional status (BMI), then the implication is that wasting in children is related to infood security rather than to disease.

- **Combining underweight with stunting and wasting**

Where there are high levels of underweight (demonstrated through clinic-based growth monitoring data) then it will be important to obtain data on stunting and wasting to determine which is the predominant form of malnutrition leading to elevated levels of underweight.

Finally, other criteria to take into account when selecting nutrition indicators are the **training needs**[2] of enumerators and data collectors, and the **sustainability** of monitoring and surveillance.
There are a number of systems for conducting nutritional assessments. The education level and skills of those involved in each system vary. The skills required to collect and analyze each type of indicator also vary.
The type of indicator and its interpretation must therefore be selected on the basis of whether it is sustainable once training has taken place and skilled supervisors have left. Simply measuring weight and changes in weight may be the most appropriate system for some community-based programmes.

Interpreting indicators

How do you interpret and analyze the information collected?
There are some reference values drawn from international growth standards. These are assumed to reflect normal individual growth under optimal environmental conditions, and can be applied to individuals everywhere, regardless of ethnicity, socio-economic status and type of feeding.

The nutritional status of the measured individual is expressed either as a **percentage** of the reference value, or alternatively as a **Z-score**.
These are two ways to express how far an individual's nutritional status deviates from the internationally recommended reference population.

In-depth information: calculating percentages and Z-scores

How to calculate percentages and Z-scores?

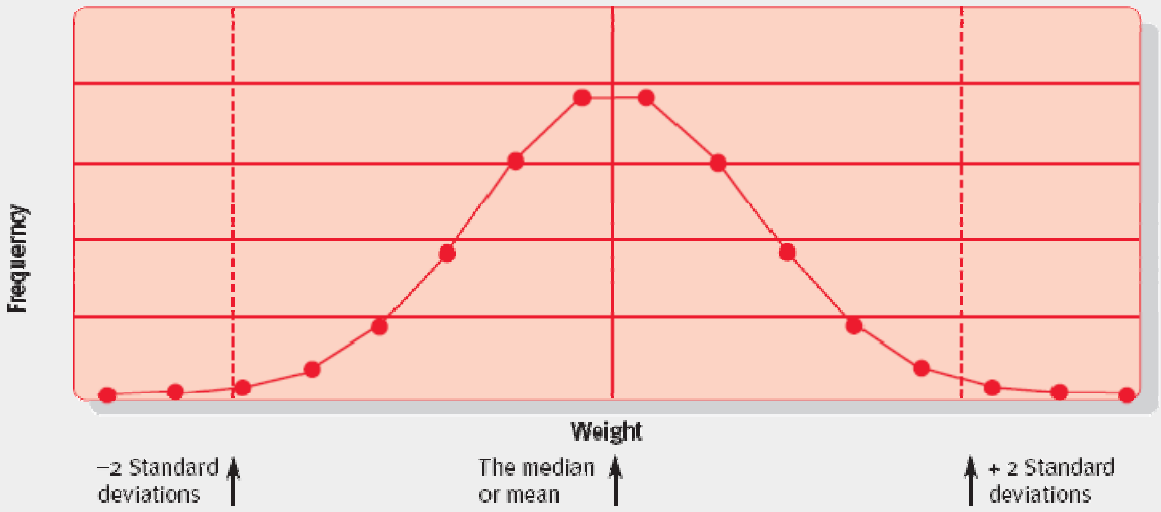
In the reference population, where food, health and care are assured, the anthropometric measurements are normally distributed around the **mean or median**, as illustrated in the diagram below. Percentage of the median and Z-score are two equivalent ways to express how far an individual's nutritional status deviates from the reference population.

Percentage of the median: The percentage of the median is calculated as follows: for example, if the child's weight is 9.4 kg, and the reference value is 11 kg, the percentage of the median is (9.4kg/11kg)*100 = 85%.

[2] Please, see Annex I at the end of this lesson for more information on the skills and training required to collect and interpret nutrition indicators.

In-depth information: calculating percentages and Z-scores-cont

Z-score: The normal range for growth is assumed to lie between –2 and +2 standard deviations, which includes 95% of the reference population. Z-scores are expressed in multiples of the standard deviation: a Z-score of 0 is equivalent to the median while a Z-score of –2 lies two standard deviations below the median.



In order to determine the level of severity of malnutrition of an individual, indicators are compared to **cut-off points**.

For example, a weight-for-height index below 70 percent of the median (or below -3 Z-scores) indicates a level of severe acute malnutrition. In this example, the 70 percent of the median (or -3 Z-score) is the cut-off point for severe acute malnutrition.

Here are the cut-off points for each of the anthropometric indicators:

1. Low weight-for-height

Wasting reflects global acute malnutrition and occurs when weight-for-height is below -2 Z-scores or 80 percent of the median.

Wasting can have the following levels of severity:

	LEVEL OF SEVERITY	CUT-OFF POINTS
WASTING	Severe acute malnutrition	Weight-for-height index below -3 Z-scores or below 70% of the median, and/or presence of bilateral oedema.
	Moderate acute malnutrition	Weight-for-height index is between -2 and -3 Z-scores or between 70% and 80% of the median.

Percentage and Z-score (standard deviation score) are two ways to express how far a child's nutritional status deviates from the internationally recommended reference population.

2. Low height-for-age (or length-for-age)

Stunting reflects growth failure and occurs when height-for-age is below -2 Z-scores or 90 percent of the median. For children below 2 years of age or who are shorter than 85 cm, length is measured instead of height (which means measuring the child in supine position).

Stunting can have the following levels of severity:

	LEVEL OF SEVERITY	CUT- OFF POINTS
STUNTING	Severe growth failure	Height-for-age index below -3 Z-scores or below 80% of the median.
	Moderate growth failure	Height-for-age index between -2 and -3 Z-scores or between 80% and 90% of the median.

3. Low weight-for-age

Underweight occurs when weight-for-age is below -2 Z-scores or below 80% of the median. Underweight can have the following levels of severity:

	LEVEL OF SEVERITY	CUT-OFF POINTS
UNDERWEIGHT	Severe underweight	Weight-for-age index below -3 Z-scores or below 70% of the median.
	Moderate underweight	Weight-for-age index between -2 and -3 Z-scores or between 70 and 80 percent of the median.

4. Low Body Mass Index (BMI)

LEVEL OF SEVERITY	CUT-OFF POINTS
severe energy deficiency	≤ 16
moderate energy deficiency	between 16 and 17
marginal energy deficiency	between 17 and 18.4
normal	≥ 18.5

5. Low Birth Weight (LBW)

The cut-off for LBW is 2.5 kg.

6. Low Mid-upper Arm Circumference (MUAC)

LEVEL OF SEVERITY	CUT- OFF POINTS
severe malnutrition	<110 mm
moderate malnutrition	between 110 and 120 mm
serious risk of malnutrition	between 120 and 125 mm
moderate risk of malnutrition	between 125 and 135 mm
satisfactory nutritional status	≥ 135 mm

Ranges of malnutrition vary considerably across populations. The percentage of the population below the agreed cut-off points expresses the prevalence of malnutrition in a country (or at subnational levels). WHO's classification, based on **prevalence thresholds**, is internationally used to determine the severity of malnutrition.

However, these thresholds are given for guidance and must be **used with caution**, taking into consideration contextual and trend analyses[3].

Severity of malnutrition	Stunting	Underweight	Wasting
Low	<20%	<10%	<5%
Medium	20-29%	10-19%	5-9%
High	30-39%	20-29%	10-14%
Very high	≥40%	≥30%	≥15%

Wasting is a condition associated with current threats to nutritional status, and it is often used to determine whether there is an **emergency**.

[3] **Comment on stunting, underweight and wasting**

Levels of stunting in a country tend to change gradually depending on changes in poverty levels and whether targeted nutrition programmes are working effectively. Levels of underweight are more sensitive to acute fluctuations in food security and health conditions as the measure also reflects wasting.

In stable situations, prevalence of wasting is likely to fluctuate seasonally, reflecting seasonal threats to food security and disease patterns.

Thresholds for prevalence of wasting are used in decision making frameworks for selective feeding programmes[4].

However, there are several problems with these types of decision-making frameworks:

- they re-enforce the 'food aid first' culture of emergency response, which may not always be appropriate;
- they are not consistent with the conceptual framework of underlying causes;
- they do not take account of pre-emergency levels of malnutrition or seasonality; and
- they assume the relationship between malnutrition and mortality to be consistent.

Some organizations have integrated some of these issues into their frameworks. For example:

- **Médecins Sans Frontières**

  Médecins Sans Frontières has now adapted a framework to take account of underlying causes of malnutrition. The new framework gives four stages of food insecurity.For each phase there are thresholds for levels of malnutrition, mortality and general information on food availability and access.
- **The Food Security Assessment Unit (FSAU) in Somalia**

  The Food Security Assessment Unit in Somalia has adopted a five-phase food security classification that uses mortality, access to food, coping strategies, livelihood assets, probability of hazards and civil security as indicators, in addition to prevalence of acute malnutrition.
- **Nutrition Information in Crisis Situations – NICS**

  The UN has a global nutrition information system (**Nutrition Information in Crisis Situations - NICS**), which classifies emergencies according to the severity of nutritional risk.

  The NICS approach classifies emergency situations into five categories relating to prevalence of malnutrition and/or levels of nutritional risk. It is a unique system because it is the only one that considers all underlying causes of malnutrition and key constraints in the delivery of humanitarian assistance as well as prevalence of malnutrition.

[4] **Decision-making frameworks** for selective feeding include a range of aggravating factors which varies between agencies.

A decision-making framework for selective feeding includes:

- general rations below minimum energy requirement;
- Crude Mortality Rate (CMR) above 1/10,000/day; and
- epidemics of measles or whooping cough.

Médecines Sans Frontières adds severe cold and inadequate shelter to the list while the United Nations High Commissioner for Refugees and World Food Programme add high prevalence of respiratory and diarrhoeal disease.

It is also the only system that allows for the possibility that malnutrition and mortality may not rise in parallel.

- **Save the Children UK in Ethiopia**

Save the Children UK in Ethiopia takes account of seasonal and intra-regional differences in prevalence of malnutrition which allows to intervene appropriately in the different emergency stages.

Trend data may be used as an alternative to thresholds. Let's consider the following example:

Example

During the 2001-2003 drought period in southern Africa, levels of wasting in Zimbabwe never reached emergency threshold levels. However, levels of wasting rose from very low levels of 2-4 percent to 8 percent in some districts in a short period. This doubling or tripling of prevalence was a serious situation for Zimbabwe and reflected a dramatic decline in food security. Many argued that emergency interventions were necessary and justifiable even before the 'magic' 10 percent figure was reached.

Many humanitarian agencies would argue that good **evidence of food security decline** should be adequate to trigger a response and that earlier response should be geared towards supporting livelihoods rather than provision of food aid.
Growth monitoring data from Mother Child Health programmes may be able to provide good early warning in some contexts.

Summary

- Appropriate mix of nutrition-related indicators should be selected to measure nutritional status as well as to identify causes of malnutrition.
- The most commonly used anthropometric indicators in children are wasting, stunting and underweight, which are determined respectively by low weight-for-height, low height-for-age and low weight-for-age. Other anthropometric indicators are low Body Mass Index (BMI) for adults, Low Birth Weight (LBW) for newborns and low Mid-Upper Arm Circumference (MUAC) for children.
- Information on nutritional status can be integrated by using clinical signs and biochemical data as indicators of micronutrient deficiencies.
- Information on food, health and care practices is needed to understand the causes of malnutrition in stable contexts as well as in emergencies.
- Ideal qualities of a nutrition indicator include: accuracy, ease of measurement and limited scope for inter-observer variation. Other qualities to take into account are related to costs and training requirements.
- Indicators should be selected based on what key questions need to be answered and by taking into account training needs and cost issues.
- Ranges of malnutrition vary greatly across populations. Thresholds may be used for guidance by decision makers to select nutrition-related interventions. However, they must be used with caution, taking into consideration contextual and trend analyses.

If you want to know more

1. Online resources

- Household food security and household vulnerability to food insecurity: The concepts. IFAD. http://www.ifad.org/gender/thematic/guatemala/guat_2.htm
- Anthropometric indicators measurement guide, 2003 edition. http://www.fantaproject.org/publications/anthropom.shtml
- Field Exchange on Emergency Nutrition Network digital archives 2005. www.ennonline.net
- Improving the analysis of food insecurity. Food Insecurity Measurement, Livelihoods Approaches and Policy: Applications in FIVIMS. S. Devereux et al. 2004. http://www.fivims.net/documents/Final%20Paper5.pdf

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2. Additional readings

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Annex I: Skills and knowledge required

1. Anthropometry

Survey teams for collecting anthropometric data are generally made up of two measurers, with one supervisor who writes up the data on a chart.

In emergencies, some agencies recommend employing no more than four teams, as with a larger number there is a risk of serious discrepancies occurring among the measurements taken and supervision is made more difficult. It is generally advisable to employ people who are already actively involved with the health of the population.

The **training of the supervisor** is a key step in conducting an anthropometric survey.

Training takes from two to three days depending on the number of trainers available and the number of surveyors to be trained.

Training covers:

- presentation of the objectives of the survey
- explanation of the sampling method
- demonstration and practice of the measuring techniques (techniques must be demonstrated and practiced by all surveyors at least 20 times and a standardization test applied)
- preparation of a guide for surveyors
- carrying out a field test.

A locally adapted table of seasons and key events may be used to help estimate a child's age.

Any survey questions to support the anthropometric measurements will need careful explaining during training, to ensure the surveyors interpret them correctly.

- **BMI measurements** can be quite complex, especially where the elderly are concerned or for adolescents where it is unclear what formulae to use. There are also uncertainties around appropriate BMI cut-offs to use for different population groups given different physical characteristics.
- **MUAC measurements** are more straightforward than measurements like weight for height but can still be prone to large inter-individual and intra-individual error if measurers are not well trained.
- **Measurements of weight for age** (under-weight), which are routinely carried out at Mother and Child Health centres by nurses and nursing auxiliaries, require a different set of skills. Ensuring accuracy of age is critical. Measurers also need to be able to enter data on 'road to

health' charts that depict the ideal growth curve for a child. The standard of measurement varies enormously within country programmes and depends on several factors.

- **Clinic-based data** are notoriously difficult to interpret. There are many reasons for this, e.g. fluctuating attendance due to seasonal patterns of work and illness, the bias towards younger children, seasonal patterns of disease affecting rates of under-nutrition, and impact of drought on attendance. It is therefore important that those interpreting data at clinic and district levels are able to interpret the findings in light of potentially confounding factors.

2. Micronutrient deficiency

Clinical diagnosis of **micronutrient deficiency** requires considerable experience and training. Clinical symptoms and signs of conditions like scurvy and beri-beri are easily confused with other conditions, while more common deficiencies like vitamin A deficiency and anaemia that are easier to detect can also be misdiagnosed.

Ideally, diagnosis should be confirmed by laboratory tests. However, in many developing country settings this is not feasible.

Risk of micronutrient deficiency is easier to determine – especially in camp conditions where refugees are largely dependent on external food aid. Food basket monitoring can provide a good indication of risk of outbreak. The micronutrient requirements of infants over six months and young children are often not met in general food rations.

3. Interpreting context factors and causes of malnutrition

Contextual information on food security, health conditions and care practice will help understand the **primary causes of nutritional problems**. While the methodologies for doing this are poorly developed, nutrition surveys must present an analysis that, as far as possible, identifies primary underlying problems that are contributing to the nutritional situation (e.g. recent disease outbreak, crop failure and resulting food shortage).

Indicators on contextual factors must therefore be presented in nutrition surveys and nutritional reports. It is important that this information is not simply presented as reams of data and descriptive information. Skills are needed to condense the information into key findings and priority needs for intervention, which may require considerable analytical training and experience.