A User's Guide

MODULE 2. Nutrition Assessment and Classification

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NACS glossary

What is nutrition assessment?

Nutrition assessment includes taking anthropometric measurements and collecting information about a client's medical history, clinical and biochemical characteristics, dietary practices, current treatment, and food security situation.

Why is nutrition assessment important?

Optimal nutritional status—the state of the body with respect to each nutrient and overall body weight and condition—is a powerful factor in promoting health and preventing and treating diseases. Weight loss of 10 percent or more has been associated with adverse outcomes and prolonged hospitalization, and in lean, healthy people, weight loss of more than 35 percent has been associated with death.[1] Nutritional status affects immune response and response to medical therapies. Health care providers assess clients' nutritional status for many reasons:

- To identify people at risk of malnutrition for early intervention or referral before they become malnourished
- To identify malnourished clients for treatment—malnourished people who are not treated early have longer hospital stays, slower recovery from infection and complications, and higher morbidity and mortality
- To track child growth
- To identify medical complications that affect the body's ability to digest food and utilize nutrients
- To detect practices that can increase the risk of malnutrition and infection
- To inform nutrition education and counseling
- To establish appropriate nutrition care plans

The results of a client's nutrition assessment and classification of nutritional status determine all the other elements of nutrition assessment, counseling, and support (NACS) for that individual—including counseling, treatment, and referral to food security and other support.

What is nutrition screening?

Full nutrition assessment can be preceded by rapid and simple identification of people who may be malnourished or at risk of malnutrition and need more detailed nutrition assessment. Nutritionists and trained facility-based health care providers or community service providers can do nutrition screening in health care facilities, during growth monitoring or home-based care, and during support group meetings. Simple nutrition screening can include checking for bilateral pitting edema, measuring weight and mid-upper arm circumference (MUAC), and asking about recent illnesses and appetite.

Nutrition screening requires standardized training in line with national and local health policy. Special training materials may be needed for low-literacy or illiterate populations. Community service providers need government-approved recording and referral materials, and clear guidance on provider roles, whom to screen,

Sample nutrition screening tools

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[1] Feldman, M.; Friedman, L.; and Brandt, L. 2010. *Sleisenger and Fordtran's Gastrointestinal and Liver Disease: Pathophysiology, Diagnosis, Management.* 9th edition. Philadelphia: Saunders. Chapter 4.

how, and how often. They may also need incentives to do accurate and consistent community nutrition screening and make referrals.

If health care providers can't assess every client's nutritional status, what clients should they prioritize?

1. Children under 2 years of age, especially if they are not breastfed
2. Women who are pregnant or up to 6 months postpartum
3. People who report unintentional weight loss
4. People who have been prescribed specialized food products to treat malnutrition
5. People with disease-related symptoms that can be managed through diet
6. People with HIV, tuberculosis (TB), or other chronic diseases

How often should nutrition assessment be done?

The frequency of nutrition assessment depends on a client's age and pregnancy and disease status and on national policies. The recommendations below should be adjusted based on national guidelines.

- **Pregnant/postpartum women:** On every antenatal visit
- **Infants 0–< 6 months of age:** At birth and on every scheduled postnatal visit
- **Infants 6–59 months of age:** During monthly growth monitoring sessions for children under 2 and every 3 months for older children
- **Children 5 years of age and over:** On every clinic visit
- **Adolescents and adults:** On every clinic visit
- **People with HIV:** On every clinic visit and when initiating or changing antiretroviral therapy (ART)

What are the different types of nutrition assessment?

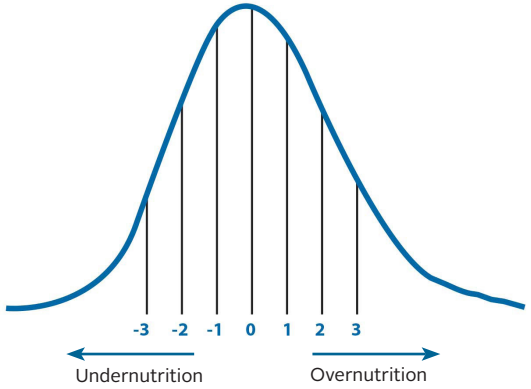
An easy way to remember types of nutrition assessment is **ABCD: Anthropometric, biochemical, clinical, and dietary**.

Anthropometric assessment

Anthropometry is the measurement of the size, weight, and proportions of the body. Common anthropometric measurements include weight, height, MUAC, head circumference, and skinfold.

Body mass index (BMI) and weight-for-height are anthropometric measurements presented as indexes. Each of these indexes is recorded as a z-score. Z-scores are measured in standard deviations (SD), and describe how far and in what direction an individual's anthropometric measurement deviates from the measurement for a healthy person of the same age and sex (median). In the bell curve figure, the z-score for the median (middle) measurement is 0. Z-scores lower than the median have minus signs (e.g., −1). Z-scores higher than the median have plus signs or no signs (e.g., +2 or 2).

Measurement of z-score compared with the median



On the number line below, the arrow points in the direction in which the numbers are getting bigger (to the right of the median) or smaller (to the left of the median).

The further a measurement is from the median (0) on either side, the greater the risk of malnutrition.

Whatever measures are used, the same measures should be used every time a client's nutritional status is assessed in order to compare results.

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Photo credit: Iain McLellan, FHI 360/FANTA

Weight

Weighing is usually the first step in anthropometric assessment and a prerequisite for finding weight-for-height z-score (WHZ) for children and BMI for adults. Weight is strongly correlated with health status. Unintentional weight loss can mean poor health and reduced ability to fight infection. Weighing requires a functional weighing scale that measures weight in kg to within the nearest 100 g. Accurate weight measurement is important because errors can lead to incorrect classification of nutritional status and the wrong care and treatment.

Low pre-pregnancy weight and inadequate weight gain during pregnancy are the most significant predictors of intrauterine growth retardation and low birth weight. To reduce the risk of adverse outcomes, women should enter pregnancy with a BMI in the normal weight category.

Recommended pre-pregnancy BMI*

Pre-pregnancy nutritional status	Pre-pregnancy BMI
Underweight	Less than 18.5
Normal weight	18.5–24.9
Overweight	25.0–29.9
Obese	30 or more

* BMI is not an accurate indicator of nutritional status during pregnancy; during that period, MUAC should be used.

Recommendations on how much weight women should gain during pregnancy vary greatly. In 2009, the Institute of Medicine of the U.S. National Academy of Sciences published revised gestational weight gain guidelines based on pre-pregnancy BMI ranges recommended by the World Health Organization (WHO). However, the guidelines are based on data from Western countries and have been questioned for their appropriateness across other populations. Research is needed to further refine the recommendations for gestational weight gain.

The main anthropometric measurement used for newborns is birth weight, which is not a measure of acute malnutrition. Infants with low birth weight (less than 2,500 g) are at higher risk of physical and cognitive impairments and nutrition-related chronic diseases in later life. All infants lose weight immediately after birth. This is not a problem unless the infant loses 10 percent or more of his or her birth weight. Infants should regain this initial lost weight within 1 week of birth. Most double their birth weight by the end of 5 months.[2] The most common anthropometric measurements used for infants under 6 months are weight-for-length, weight-for-age, and head circumference. Weight-for-length is used to measure acute malnutrition, along with other clinical signs described later under "clinical assessment." Infants under 6 months should be weighed using a balance beam scale or a digital UNISCALE that measures infant weight by weighing the mother and infant together and subtracting the weight of the mother.

How to weigh infants and young children

How to weigh adults

[2] Mayo Clinic. 2014. "Infant and Child Growth: How much should I expect my baby to grow in the first year?"

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How to measure length for children under 2 and adults too weak to stand

How to measure height for children 2 years or older and for adults

Video on measuring height in adults

How to find WHZ in children 0–59 months of age

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Length and height

Measuring length or height requires a height board or measuring tape marked in centimeters (cm). Measure length for children under 2 years of age or less than 87 cm long. Measure height for children 2 years and older who are more than 87 cm tall and for adults.

Weight-for-height

WHZ is an index that is used to assess the nutritional status of children from birth to 59 months of age. It compares a child's weight to the weight of a child of the same length/height and sex in the WHO Child Growth Standards to classify the child's nutritional status. You will need tables with the WHO Child Growth Standards. There are separate WHO Child Growth Standards for boys and girls. WHZ can be used for infants under 6 months, but there are no globally agreed cutoff points for classification of nutritional status.[3]

The Standardized Monitoring and Assessment of Relief and Transitions (SMART) Emergency Nutrition Assessment (ENA) tool, available from the NutriSurvey website, calculates WHZ automatically. The SMART training package is also available online.

[3] Since 2008, the Management of Acute Malnutrition in Infants (MAMI) Project, a collaboration between the Emergency Nutrition Network (ENN), University College London Centre for International Health and Development, and Action contre la Faim, funded by the UNICEF-led IASC Nutrition Cluster, has worked to collect evidence on acute malnutrition in infants under 6 months to define protocols and cutoffs for anthropometric assessment of this age group. Data from 21 Demographic and Health Surveys showed that acute malnutrition based on WHZ in infants under 6 months of age is a prevalent public health problem (Kerac, M. et al. 2011. "Prevalence of Wasting among under 6-Month-Old Infants in Developing Countries and Implications of New Case Definitions Using WHO Growth Standards: A Secondary Data Analysis." *Archives of Disease in Childhood.* Vol. 96, pp. 1008–1013.)

MUAC

Photo credit: Jessica Scranton, FHI 360/FANTA

MUAC is the circumference of the left upper arm measured at the mid-point between the tip of the shoulder and the tip of the elbow, using a measuring or MUAC tape. MUAC measurements in millimeters (mm) are more accurate than measurements in cm. MUAC is a proxy measure of nutrient reserves in muscle and fat that are unaffected by pregnancy and independent of height. Use MUAC to measure all pregnant women and women up to 6 months postpartum. MUAC is also an appropriate alternative for measuring children (instead of WHZ), adolescents (instead of BMI-for-age), and non-pregnant/postpartum adults whose weight and height cannot be measured (e.g., if they cannot stand or no equipment is available). MUAC is not currently recommended for infants under 6 months and should not be used to assess nutritional status in people with edema.

MUAC cutoffs to classify nutritional status in children 6 months to 14 years of age

	Severe acute malnutrition (SAM)	Moderate acute malnutrition (MAM)	Normal nutritional status
6–59 months	< 115 mm	≥ 115 to < 125 mm	≥ 125 mm
5–9 years	< 135 mm	≥ 135 to < 145 mm	≥ 145 mm
10–14 years	< 160 mm	≥ 160 to < 185 mm	≥ 185 mm

Because there are few data on the relationship between MUAC and mortality and other functional measures in adults, WHO has not established standard MUAC cutoffs to classify nutritional status in adults.

A Médecins sans Frontières Switzerland review of literature between 1995 and 2012 declared that MUAC is the preferred indicator to identify acute malnutrition in pregnant women because it is insensitive to changes

Instructions on how to measure MUAC

Video on assessing nutritional status using MUAC

Comparison of anthropometric cutoffs in different countries in Africa

over the total period of pregnancy. MUAC is easy to measure, and it requires only one measurement. It has a relatively strong association with low birth weight, and it does not require knowledge of gestational age. The review found that in pregnant women, MUAC cutoffs for severe acute (SAM) varied from < 210 mm to < 230 mm in national nutrition protocols. It recommended a conservative cutoff of < 230 mm for treatment of malnutrition in pregnant women in Africa and Asia who are at risk of delivering low birth-weight babies.[4] The cutoffs below are suggestions based on current practices.

MUAC cutoffs to classify nutritional status in adults

Non-pregnant/ non-postpartum	Pregnant/ postpartum	Nutritional status
< 185 mm	< 190 mm	SAM
≥ 185 to < 220 mm	≥ 190 to < 230 mm	Moderate malnutrition
≥ 220 mm	≥ 230 mm	Normal nutritional status

The anthropometric indicator cutoffs included in this module are the recommended standards. However, countries may use different cutoffs.

MUAC and WHZ to identify children most in need of treatment for acute malnutrition

MUAC is commonly used in the community to identify and refer children 6–59 months of age with acute malnutrition, and either MUAC or WHZ is used in health facilities to diagnose children with acute malnutrition and enroll them in treatment. WHO recommends using either indicator for diagnosing acute malnutrition but using the same one used for diagnosis to monitor nutritional recovery.

Both MUAC and WHZ are imperfect proxy indicators for the complex clinical condition of acute malnutrition. Evidence shows that MUAC is at least as good as WHZ at predicting the risk of death in children with SAM and selects younger children at highest risk. MUAC is easy to understand and use, encouraging wide use, while WHZ requires a scale, length/height board, and reference tables. Both require training and methodical implementation to ensure reliable measurement and classification.

In some populations, the prevalence of acute malnutrition measured by MUAC and WHZ may differ substantially. The two indicators identify overlapping but not identical groups of children, possibly because of differences in body shape, stunting prevalence, fat distribution, and leg length. For example, stunting is associated with shorter leg length, and some child populations have a larger head, chest, and abdominal circumference in relation to height.

Further studies are needed to understand the influence of body shape and composition, especially muscle mass and body fat distribution, on WHZ and MUAC and their link to health outcomes and the use of anthropometry across different settings. Information on anthropometric indicators will have to complement implementation research, studying contexts and pathways to translate evidence into policies that address the current large global gap between admission for treatment and the burden of SAM cases.[5]

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[4] Ververs, M. et al. 2013. "Which Anthropometric Indicators Identify a Pregnant Woman as Acutely Malnourished and Predict Adverse Birth Outcomes in the Humanitarian Context?" *PLOS Currents Disasters.* Edition 1.

[5] WHO. 2013. *Guideline: Updates on the Management of Severe Acute Malnutrition in Infants and Children*; McDonald et al. 2013. "*The Effect of Multiple Anthropometric Deficits on Child Mortality*"; Blackwell et al. 2015. "*Mothers Understand and Can Do It (MUAC)*"; Grellety and Golden. 2016. "*Weight-for-Height and Mid-Upper-Arm Circumference Should Be Used Independently to Diagnose Acute Malnutrition*"; Briend et al. 2016. "Low Mid-Upper Arm Circumference Identifies Children with a High Risk of Death Who Should Be the Priority Target for Treatment." Submitted for publication; D'Angelo et al. 2015. "*Body Size and Body Composition*"; Mwangome and Berkley. 2014. "*The Reliability of Weight-for-Length/Height Z-Scores in Children*"; UNICEF. 2013. *NutriDash 2013—Global Report on the Pilot Year*.

BMI

How to find BMI for adults using look-up tables

BMI is an anthropometric indicator based on weight-to-height ratio. It is used to classify malnutrition in non-pregnant/non-postpartum adults. BMI is not an accurate indicator of nutritional status in pregnant women or adults with edema. Use MUAC for these groups.

Calculate BMI by dividing a person's weight in kg by the square of the person's height in meters. You will have to convert measurements in cm to m (100 cm = 1 m).

$$\text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2\,\text{(m)}}$$

How to find BMI for adults using a BMI wheel

BMI can also be found using look-up tables or a BMI wheel.

BMI values below or above the WHO range for normal nutritional status (shown in the table below) indicate a need for nutrition interventions to slow or reverse weight loss or to reduce overweight.

BMI	Nutritional status
< 16.0	Severe malnutrition
≥ 16.0 to < 17.0	Moderate malnutrition
≥ 17.0 to < 18.5	Mild malnutrition
≥ 18.5 to < 25.0	Normal nutritional status
≥ 25.0 to < 30.0	Overweight
≥ 30.0	Obesity

Sources: WHO. 1999. *Management of Severe Malnutrition: A Manual for Physicians and Other Senior Health Workers*. Geneva: WHO; WHO. 2013. "Obesity and Overweight." Fact Sheet No. 311.

The British Association for Parenteral and Enteral Nutrition (BAPEN) has a Malnutrition Universal Screening Tool (MUST) that uses weight, height, BMI, weight loss, and acute disease score to determine risk of malnutrition. BAPEN has also developed a MUST iPhone app that can be downloaded onto an iPhone.

BAPEN Malnutrition Universal Screening Tool (MUST)

BAPEN MUST iPhone app

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How to use look-up tables to find BMI-for-age for children and adolescents 5–18 years

How to use a BMI wheel to find BMI-for-age for children and adolescents 5–18 years

WHO reference charts and tables for children and adolescents 5–19 years of age

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BMI-for-age z-score

BMI can be used to measure the nutritional status of adults over 18 years of age because they have completed their physical development. Because children and adolescents are still growing and developing, their age and sex have to be considered when measuring their nutritional status. BMI-for-age is the preferred indicator of body thinness to classify malnutrition in children and adolescents 5–18 years of age.

Below are the WHO BMI-for-age classifications of malnutrition in children and adolescents 5–18 years of age.

BMI-for-age	Nutritional status
< −3 z-score	Severe malnutrition
≥ −3 and < −2 z-score	Moderate malnutrition
≥ −2 z-score and ≤ +1 z-score	Normal nutritional status
> +1 and ≤ +2 z-score	Overweight
> +2 z-score	Obesity

Source: WHO. 2007. "Growth Reference Data for 5–19 Years."

The WHO publishes reference charts and tables for BMI-for-age, height-for-age, and weight-for-age for children and adolescents 5–19 years of age.

Biochemical assessment

Biochemical assessment means checking levels of nutrients in a person's blood, urine, or stools. Lab test results can give trained medical professionals useful information about medical problems that may affect appetite or nutritional status.

Laboratory tests that can identify nutrition problems, along with interpretation of results

Clinical assessment

Clinical assessment includes checking for visible signs of nutritional deficiencies such as bilateral pitting edema, emaciation (a sign of wasting, which is loss of muscle and fat tissue as a result of low energy intake and/or nutrient loss from infection), hair loss, and changes in hair color. It also includes taking a medical history to identify comorbidities with nutritional implications, opportunistic infections, other medical complications, usage of medications with nutrition-related side effects, food and drug interactions, and risk factors for disease (e.g., smoking, alcohol use, overweight) that affect or are affected by diet and nutritional status.

Assessment of nutritional status in infants under 6 months involves checking for clinical signs of acute malnutrition such as visible wasting, bilateral pitting edema, inability to suckle, ineffective breastfeeding, and recent weight loss or failure to gain weight, as well as risk factors such as insufficient breast milk or absence of the mother. Clinical assessment for this age group should also assess infant feeding practices, especially access to breast milk.

Physical signs of malnutrition

How to assess bilateral pitting edema

Video on assessing bilateral pitting edema

Cutoffs to classify nutritional status by different age groups and by pregnancy status

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Clinical nutrition assessment also includes checking for or asking clients about symptoms of infection that can increase nutrient needs (e.g., fever) and nutrient loss (e.g., diarrhea and vomiting), as well as medical conditions (e.g., HIV, celiac disease) that impair digestion and nutrient absorption and increase the risk of developing malnutrition. Medical records should provide information about illness, hospitalizations, operations, diagnostic tests and therapies, and medications that can affect nutritional status.[6]

Some medications can interfere with nutrient absorption, digestion, metabolism, and utilization. Likewise, nutritional status and diet can affect how medications work. Information about the medications clients are taking allows health care providers to counsel them on how to manage drug-food interactions and drug side effects (see **Module 3. Nutrition Counseling**). For children, clinical assessment may also include history of growth patterns, onset of puberty, and developmental history.

[6] Maqbool, A. et al. 2008. "Clinical Assessment of Nutritional Status." In Duggan, C et al. *Nutrition in Pediatrics.* 4th ed. Hamilton, Ontario, Canada: BC Decker Inc.

Bilateral pitting edema

Bilateral pitting edema, also called nutritional edema, is swelling in both feet or legs (bilateral) caused by the accumulation of excess fluid under the skin in the spaces within tissues. Either too much fluid moves from the blood vessels into the tissues or not enough fluid moves from the tissues back into the blood vessels. This imbalance can cause swelling in one or more parts of the body. Bilateral pitting edema is characterized by pitting in the skin (i.e., a visible indentation that persists after the pressure is released from skin that has been pressed by a thumb). Edema is a sign of severe malnutrition ONLY if it exists in both feet or both legs. Other causes of edema, especially in adults, that are not related to nutrition include congestive heart disease, lymphatic disorders, and kidney disease, among other conditions.

Bilateral pitting edema is a sign of severe malnutrition on its own, regardless of the results of anthropometric assessment. Anyone with severe bilateral pitting edema (Grade +++), even with appetite and no medical complications, should be admitted for inpatient management of severe acute malnutrition. A person with bilateral pitting edema Grades + or ++ with appetite and no medical complications should be treated for severe acute malnutrition on an outpatient basis.

Photo credit: Geno Teofilo, Oxfam

Dietary assessment

Assessing food and fluid intake is an essential part of nutrition assessment. It provides information on dietary quantity and quality, changes in appetite, food allergies and intolerance, and reasons for inadequate food intake during or after illness. The results are compared with recommended intake such as recommended dietary allowance (RDA)[7] to counsel clients on how to improve their diets to prevent malnutrition or treat conditions affected by food intake and nutritional status (e.g., cardiovascular disease, cancer, obesity, diabetes, and hyperlipidemia). Several common ways to assess dietary intake are described next.

24-hour recall

This method was designed to quantify the average dietary intake for a group of people, although it can be used to assess individual nutrition intake. During a recall, a client is asked to remember in detail every food and drink consumed during the previous 24 hours. The method can be repeated on several occasions to account for day-to-day variation in intake. Health care providers may prompt clients to remember what they ate or drank by time periods or activities (e.g., just after waking up, before going to bed) or to estimate portion sizes by looking at household measures, food models, household utensils, photographs, or actual food.

Food frequency questionnaire

A food frequency questionnaire is designed to obtain information on overall dietary quality rather than nutrient composition and intake. The food frequency questionnaire examines how often someone eats certain foods, and sometimes the size of the portions. This method is quick and inexpensive but under-reporting is common.

Food group questionnaire

Another way to do dietary assessment is to show clients pictures of different food groups (often available from national nutrition authorities) and ask whether they ate or drank any of those foods the previous day.

How to use a 24-hour dietary recall form

How to use a food frequency questionnaire

How to use a food group questionnaire

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[7] RDA is the amount of each micronutrient (vitamins and minerals) the average person needs each day. The RDA suggests a level of vitamins and minerals that is adequate for approximately 98 percent of healthy people in a population.

Food security assessment

Sample food security screening tool

USAID defines food security as "having, at all times, both physical and economic access to sufficient food to meet dietary needs for a productive and healthy life."[8] This definition includes **food availability** (sufficient quantities of food available consistently to all people in a country, region, or household through domestic production, imports, and/or food assistance), **food access** (adequate resources to obtain a sufficient quantity and quality of food), and **food utilization/consumption** (proper biological use of food by the body).

Programs that provide food support based on food insecurity usually have their own eligibility criteria and often provide food for the entire household. If food support is available in a community, simple screening can determine eligibility.

[8] USAID. 2015. "Feed the Future: What is Food Security."

RESOURCES

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