CHAPTER1 8:

# CONDUCT NUTRITION ASSESSMENT AND SURVEILLANCE

## 18.1 Introduction of the Unit of Learning / Unit of Competency

This unit specifies the competencies required to examine client nutrition status. It includes carrying out anthropometric assessments, analyzing biochemical lab results, conducting clinical and physical assessments, conducting dietary assessment, carrying out socio economic evaluation and conducting functionality assessment.

## 18.2 Performance Standard

By the end of this unit of learning/competence, the trainee should be able to identify and conduct anthropometric assessment using the appropriate tools and equipment as per the SOPs and user needs; interpret biochemical assessment results while considering sensitivity and specificity based on biological variation knowledge and WHO guidelines; conduct clinical examination and assess risks as per organizational procedures; conduct dietary survey based on resource materials and workplace procedures; Conduct nutrition surveillance in line with resource materials, WHO guidelines and organizational procedures



## 18.3 Learning Outcomes

### 18.3.1 List of learning Outcomes

i. Carry out anthropometric assessments

ii. Analyze biochemical laboratory results

iii. Conduct clinical and physical assessments

iv. Conduct dietary assessment

v. Conduct nutrition surveillance

## 18.3.2 Learning Outcome 1: Carry out anthropometric assessments

### 18.3.2.1 *Learning Activities*

| Learning Activity | Specific instructions |
|---|---|
| Determine anthropometric measurement<br><br>Determine the anthropometric measurements to collect considering age, client's medical condition & gender. | Identify the client in need of nutritional assessment<br><br>Create rapport with the client<br><br>Consider the setting of the nutrition assessment<br><br>Determine prior medical history of the client<br><br>Observe and maintain confidentiality |
| Determine anthropometric method<br><br>Adults: Take weight, height, waist/Hip circumference, skinfold thickness and Mid Upper Arm circumference (MUAC), body fat composition and distribution and bone densities<br><br>Paediatrics/children: Take weight, height, head circumference, Z-scores, MUAC | Observe client's privacy<br><br>Observe anthropometric measurement procedures |
| Identify anthropometric tools based on the anthropometric measurement method(s) selected | Select tools which are calibrated<br><br>Verify the functionality of the anthropometric measurement tool |
| Evaluate anthropometric measurements | Determine nutritional indices<br><br>Compare the anthropometric results with the reference standards |



### 18.3.2.2 *Information Sheet*

**Definitions**

*Anthropometric measurements:* This refers to a set of non-invasive, quantitive techniques for determining an individual's body composition by measuring, recording, and analyzing specific dimensions of the body.

*Weight:* is how heavy a person is, measured in units such as kilograms or pounds

Height: measurement of a client from head to toe

*Client:* any individual whether child or adult that is under any form of nutritional management

*Body Mass Index:* a person's weight in kilograms divided by his/her weight in meter squared.

*MUAC:* the circumference of the left upper arm measured at the mid-point between the tip of the shoulder and the tip of the elbow

*BIA:* Bioelectric impedance analysis is a method used to estimate body compartments through a mechanism of resistance and reactance. The compartments measured include body cell mass, fat mass, extracellular tissues and fat-free mass

Nutrition assessment is the process by which the nutritional status of an individual is determined. It usually includes dietary history and intake data, biochemical data, clinical examination and health history, anthropometric data, psychosocial data.

**Purpose**

To obtain adequate information in order to:

Identify nutrition-related problems, make nutrition diagnoses and take appropriate action

Evaluate patient/client/group's knowledge, readiness to learn, and potential for changing.

Identify deviation from normal within a given population, e.g a proportion of children with severe malnutrition greater than 4% is an indication of an emergency (sphere standards).



**Types of anthropometric measurements**

- Measurements that assess body size
    - Height
    - Head circumference
    - Weight
- Measurements of circumferences
    - Waist circumference
    - Hip circumference
    - Mid Upper Arm Circumference(MUAC)
- Measurements that assess body composition
    - Measurements of fat mass (Skinfold thickness, MUAC)
    - Measurements of fat-free mass (protein and mineral)
    - Measurement of total body water

Other methods for measuring body composition;

- densitometry- clients are weighed in air and immersed in water; appropriate equations are used to calculate body fat from the difference in weights
- Imaging techniques- use computed tomography or magnetic resonance imaging, to visualize discrete deposits of body fat, especially in visceral region. Dual energy X-ray examination (DEXA) can also be used to predict visceral fat deposits
- Bioelectric Impedance analysis (BIA)- measures the resistace to a small electric current passed through electrodes attached to the hands and feet. The impedance is related to the level of total body water and fat-free mass, which is inversely related to fat mass. This technique is subject to error related to food intake, level of hydration and environmental temperature.
- Dilution techniques- estimation of body water from the concentration of the radioactive isotopes injected into thebody
- Urinary excretion of metabolites-such as creatinine and nitrogen indicates turnover of body protein and is an indicator of the fat-free mass.

| For New Born & Young Children | Adults |
|---|---|
| Weight | Weight (in Kg) |
| Recumbent length | Height (in cm) |
| Head Circumference | Mid Upper Arm Circumference (MUAC) (in cm) |
| Chest Circumference | Waist Circumference (in cm |
| Mid Upper Arm Circumference (MUAC) | Hip Circumference (in cm) |
| | Fat fold thickness |



**Anthropometric procedures**

***Measuring height***

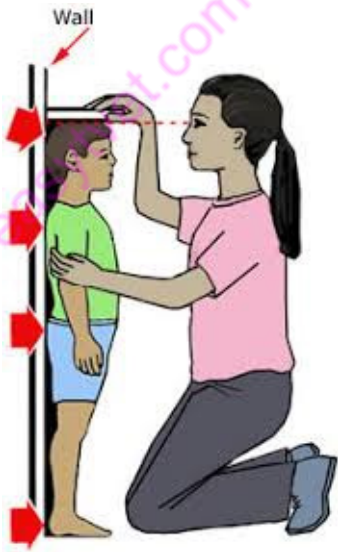
The height of eligible clients is taken to help determine their body mass index (BMI)- which is their weight relative to their height. Being overweight or obese is a significant risk factor for chronic disease.

***Equipment***

- Height board
- Length measuring board/mat
- Stadiometer

**Procedure**

- Ask the client to remove their:
    - Footwear (shoes, slippers, sandals etc)
    - Head gear (hat, cap, hair bows, comb, ribbons, etc)- take on light fabric if not possible to remove everything
- Ask the client to stand on the board facing you
- Ask the client to stand with feet together, heels against the back board and knees straight
- Ask the client to look straight ahead and not look up.
- Make sure eyes are the same level as the ears.
- Move the measure arm gently down onto the head of the participant and ask the participant to breathe in and stand tall
- Read the height in centimetres at the exact point
- Ask the client to step away from the measuring board.
- Record the height measurement in centimetres.



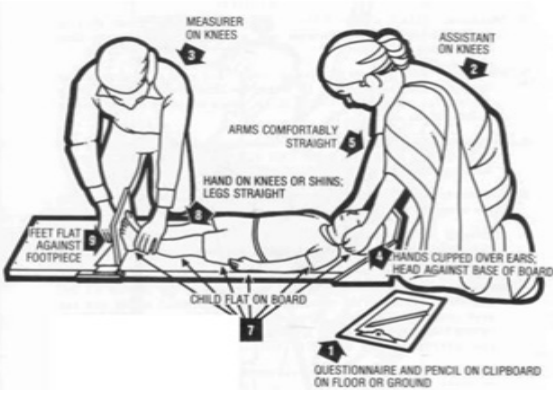

*Source: cdc.gov*

**Measuring length of children <24 months**

Recumbent length refers to the distance measured from crown of the head to the bottom of the feet of infant using infantometer while for adults, a vertical measuring rod or anthropometric rod is used. The measuring rod is fixed on a stable, flat, horizontal surface.

- Child is straightened with the dorsal surface in contact with the surface and oriented along the measuring rod.
- Head bar is placed touching the top of the child's head.

- Eye-angle-external ear canal should be vertical.
- The child's knees should be straightened and footboard placed in contact with the feet.
- The reading is taken followed by second reading and the average is then obtained.




*Source: https://www.slideshare.net/kirugo/growth-monitoringanthropometric-measurements?from_action=save*

### Arm span or total arm length

Measurement arm span is useful those situation in which height is difficult to measure. (Children with cerebral palsy, bed-ridden scoliosis or in aging person).




### Measuring weight

Weight helps in determination of the body mass index. The health worker is encouraged to ensure the scales are placed on a firm, flat surface.

***Equipment***

- Electronic weighing scale
- Beam balance
- Spring balance
- Bathroom scales
- Salter spring machine

**Procedure**

- Ask the client to remove their footwear (shoes, slippers, sandals etc) and socks.
- Ask the client to step onto scale with one foot on each side of the scale.
- Ask the client to stand still, face forward, place arms on the sides and wait until asked to step off
- Record the weight in kilograms on the participant's Instrument (If the participant wants to know his/her weight in pounds, convert by multiplying the measured weight by 2.2).

*Source: whattoexpect.com*

**Taking weight of children**

Infants should be weighed on a paediatric balance-beam that is accurate to within 10g. Any cloth used on pan should either be in place when the zero adjustments are made on the scale or its weight should be subtracted from the infant's weight.

Weighed nude or with minimum clothing. Excessive infant movement can make it difficult to obtain an accurate weight, in which case the weighing can be differed until later in the examination.

**Taking weight of infants using a hanging scale**

Scale is hung onto a stable support such as a tree by the upper hook.

Ensure the dial is at the eye-level.

Weighing parts are hung on the scale and the pointer of the scale adjusted to '0.'

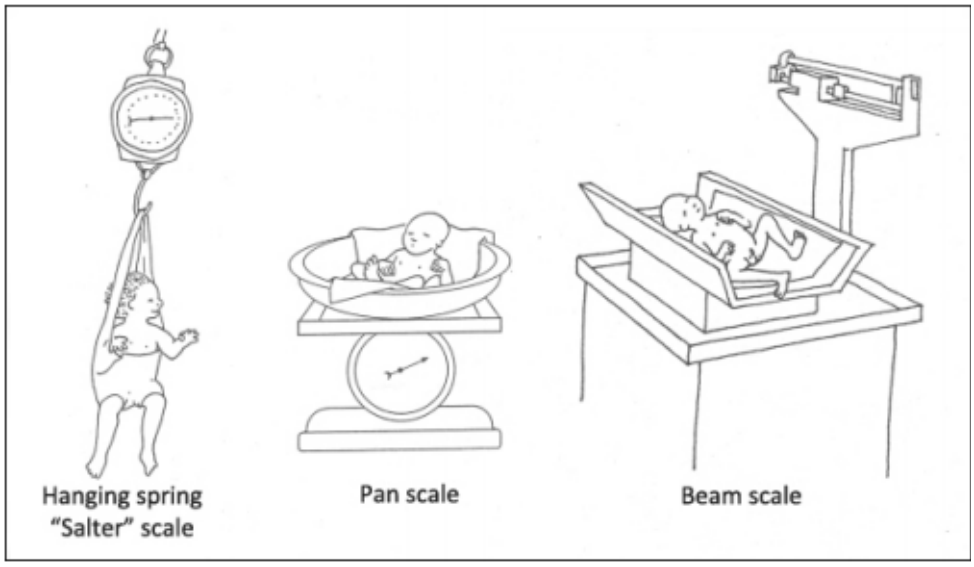
The child is undressed such that (s)he is devoid of heavy clothing.

The child is dressed with the weighing parts.

Straps attached to the scale by the lower hook.

Ensure feet are not in contact with the ground.

Another measurement is taken with the final value obtained by calculating the average.




*Source: Ghana Nutrition assessment, counselling and support (NACS): Training Materials for facility-Based Service Providers (Republic of Ghana, 2013)*

**Body Mass Index (BMI)**

The body mass index (BMI) for adult is a proxy measure for human body fat based on an individual's weight and height, and is calculated by dividing one's weight in kilograms by height squared in meters. BMI provides a reliable indicator of body fatness for most people and is an easy to perform and inexpensive method used to screen for weight categorized that may lead to health problems.



The formula is:

The formula is: BMI = Weight (kg)

$$\text{Height (m)}^2$$

Example: An adult weighing 80kg, and with a height of 165(1.65m)

BMI calculation: 80 ÷ (1.65)2 = 29.35Kg/m$^2$

Classification of body fatness, based on BMI

| BMI Range(kg/m$^2$) | Classification | Risk of Co morbidities |
|---|---|---|
| <18.5 | Underweight | Low (but risk of other clinical problems) |
| 18.6 – 24.9 | Normal range | Average |
| 25 – 29.9 | Overweight | Increased |
| 30 – 34.9 | Obesity class I | High |
| 35 – 39.9 | Obesity class II | Severe |
| >= 40 | Obesity class III (morbid obesity) | Very severe |

*Source: WHO 2003*

From the example above, a person weighing 80kg and with a height of 165cm (1.65m) will have a BMI of 29.38. This individual falls within the pre-obese range for BMI and has a moderate risk for comorbidities.

### Measuring waist circumference

Waist circumference (W.C) is used in addition to BMI for a greater prediction of variance in health risk. The larger the waist circumference (high fat deposition), the higher the risk of onset of non-communicable diseases e.g. diabetes and cardiovascular diseases. Waist circumference measurements are also taken to provide additional information on overweight and obesity. It is taken midway between the lower rib margin and the iliac crest, taken at the end of expiration, reflects visceral adiposity, and is sensitive to weight changes. The arms should be relaxed at the sides.

#### *Equipment*

- Color coded tape measure
- Pen
- Chair for clients to place their clothes



### Privacy

A private area is necessary for this measurement. This could be a separate room, or an area that has been screened off from other people within the household.

### Preparing the client

This measurement should be taken without clothing, that is, directly over the skin or over light clothing. It must not be taken over thick or bulky clothing which must be removed.

### Procedure

This measurement should be taken without clothing, that is, directly over the skin. If this is not possible, the measurement may be taken over light clothing. It must not be taken over thick or bulky clothing. This type of clothing must be removed.

With a tape measure, find the midpoint and mark the point. This is a tape measure and mark the point.

Apply the tension tape over the marked midpoint and ask the participant to wrap it round themselves.

Ask the client to:

- Stand with their feet together,
- Place their arms at their side with the palms of their hands facing inwards, and

- Breathe out gently.
- Measure waist circumference and read the measurement at the level of the tape to the nearest 0.1 cm.

Source: medicalnewstoday.com

Record the measurement on the client's assessment tool.

***Action levels for weight loss, based on waist circumference***

| Action level | Waist circumference (women) | Waist circumference (men) |
|---|---|---|
| Normal | <80cm | <94cm |
| Level 1- no further weight gain | 80-88cm | 94-102cm |
| Level 2- high risk, needs medical advice | >88cm | >102cm |



**Measuring Hip circumference**

Hip circumference is measured at the largest part of the buttocks, with the arms relaxed at the sides. It forms an important component of waist hip ratio (WHR) which can indicate the distribution of body fat between central and peripheral regions. This measurement should be taken without clothing, that is, directly over the skin. If this is not possible, the measurement may be taken over light clothing. It must not be taken over thick or bulky clothing. This type of clothing must be removed.

***Equipment***

- Color coded measuring tape
- Pen
- Chair for client to place their clothes

**Privacy**

A private area is necessary for this measurement. This could be a separate room, or an area that has been screened off from other people within the premises. Hip measurements are taken immediately after waist circumferences.

**Procedure**

- Stand to the side of the client, and ask them to help place the tape around below their hips.
- Position the measuring tape around the maximum circumference of the buttocks.
- Ask the client to: stand with their feet together; place their arms at their side with the palms of their hands facing inwards, and breathe out gently.
- Check that the tape position is horizontal all around the body.
- Measure waist circumference and read the measurement at the level of the tape to the nearest 0.1 cm.
- Record the measurement



Source: thl.fi

**Interpretation of Waist Hip Ratio (WHR)**

Waist Hip Ratio (waist circumference divided by the hip circumference)

Is an indicator used to complement the measurement of BMI, to identify individuals at increased risk of obesity-related morbidity due to accumulation of abdominal fat. The larger the waist hip ratio, the higher the risk of onset of non-communicable diseases. The hip circumference measurement should be taken around the widest portion of the buttocks. waist measurement >80% of hip measurement for women and >95% for men indicates central (upper body) obesity and is considered high risk for diabetes & CVS disorders. A WHR below these cut-off levels is considered low risk (See the following Table).

***WHO cut-off points for waist hip and risk of metabolic complications***

| | Men | Women | Risk of metabolic Complications |
|---|---|---|---|
| Waist hip ratio | >0.90 | >0.85 | Substantially Increased Risk |

(Source WHO, 2008)

**Mid Upper arm circumference**

This is a measure of the circumference at the midpoint of the upper arm, which is used, together with the measurement of subcutaneous body fat (by the skinfold thickness at the mid-triceps), to assess muscle circumference and therefore indicate wasting

***Equipment***

- MUAC tape

**Procedure**

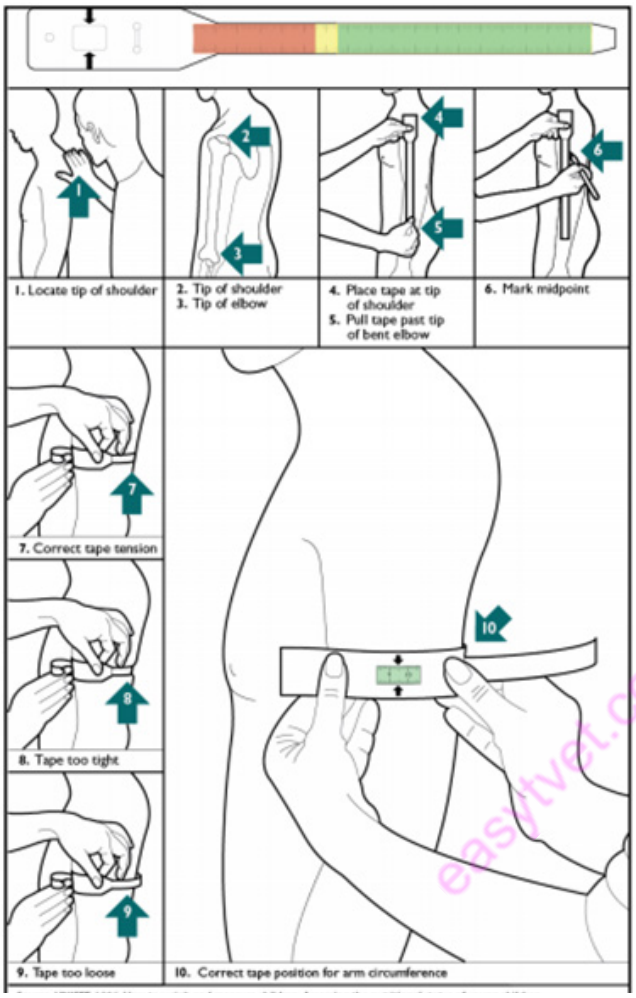
- Ask the mother to remove any clothing covering the child's left arm.
- Calculate the midpoint of the child's left upper arm: first locate the tip of the child's shoulder with your fingertips.
- Bend the child's elbow to make the right angle.
- Place the tape at zero, which is indicated by two arrows, on the tip of the shoulder and pull the tape straight down past the tip of the elbow
- Read the number at the tip of the elbow to the nearest centimetre. Divide this number by two to estimate the midpoint.
- Mark the midpoint with a pen on the arm
- Straighten the child's arm and wrap the tape around the arm at the midpoint.



*Source: unicef.org*

Inspect the tension of the tape on the child's arm. Make sure the tape has the proper tension and is not too tight or too loose

When the tape is in the correct position on the arm with correct tension, read the measurement in the window and record the measurement to the nearest 0.1cm




*Source: Ghana Nutrition assessment, counselling and support (NACS): Training Materials for facility-Based Service Providers (Republic of Ghana, 2013)*

***MUAC cut-offs for SAM, MAM and Normal Clients***

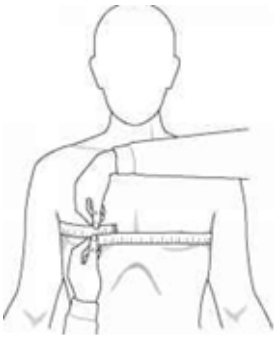
| Group | Severe acute malnutrition (SAM) | Moderate acute malnutrition (MAM) | Normal |
|---|---|---|---|
| Children (6-59 months old) | < 11.5 cm | ≥ 11.5 to < 12.5 cm | Substantially Increased Risk |
| Children (5-9 years) | < 13.5 cm | ≥ 13.5 to < 14.5 cm | ≥ 14.5 cm |
| Children (10-14 years old) | < 16.0 cm | ≥ 16.0 to < 18.5 cm | ≥ 18.5 cm |
| Adolescents (15-17 years old) | < 17.5 cm | ≥ 17.5 to < 19.5 cm | ≥ 19.5 cm |

| | | | |
|---|---|---|---|
| Pregnant/Post-partum women | < 21.0 cm | ≥ 21.0 to < 23.0 cm | ≥ 23.0 cm |
| Adults who are too sick to stand | < 19.0 cm | ≥ 19.0 to < 21.0 cm | ≥ 21.0 cm |


**Head circumference**

This is a good measure of brain growth especially in the first two years of life.

It is of great value in follow-up of low birth weight infants, and children with Central Nervous System abnormalities like suspected post meningitic hydrocephalus. The charts aren't included in the countries growth monitoring cards. Normal head circumference at birth is 34 – 36 cm. Head circumference should increase by 2cm/month for the first 3 months, then by 1 cm/month from 3 – 6 months, then by 0.5c/month from 6 – 12 months. (12 cm for 1st year of life).



**Chest circumference**

It is usually measured at the level of nipples, preferably in mid inspiration-Xiphisternum

In children;

≤ 5years - lying down position

> 5 years - standing position

*Skin fold thickness*

**Advantages of Anthropometric method**

Relatively unskilled personnel can be trained to take the measurements

Equipments are relatively cheap and can be used over and over

Equipment is portable and durable

Procedures are simple, safe and applicable in large surveys

Measure are objective and accurate provided that standardized techniques and procedures are used

Some techniques can be used for screening to identify individuals at high risk e.g. MUAC

Procedures can identify mild, moderate and severe state of malnutrition



**Disadvantages of anthropometric method**

It's difficult to identify micronutrient deficiencies

Some nutritional problems are not associated with body parts

Those severely ill might be difficult when using anthropometry

Physically challenged and elderly might pose a problem when doing anthropometry

Might give false positive measurement especially edema due to severe PEM

**Sources of error in anthropometry**

Faulty equipment which gives inaccurate measurements

Inadequate training

Measurement difficulties

Poor recording

**Rectifying errors of anthropometry**

Adequate training using standardized and evaluated techniques

Equipment should be accurate in measurements and in good order

Make sure that saunter scale is calibrated at zero to ensure no movement of the pointer.

**Indices of nutrition status**

An index is calculation derived from combination of anthropometric measurement.

The age specific measurement, sex, height and weight, MUAC can be combined to give a better meaning. Indices are important in making conclusions about specific measurements.

Nutritional indices are developed through comparing the measurement to standard measurements.

The reference data for children has been developed from the children of the same age, weight and height who is assumed to be normal.

**Nutrition indices for children**

They include;

weight for age W/A general appreciation of nutritional status

combined measurement

NO individual diagnosis but trend assessment

For growth monitoring

height for age H/A measure of linear growth deficit or STUNTING



not sensitive to change

slow progress

Community diagnosis

weight for height/length W/H measure of weight deficit according to

length WASTING

Individual diagnosis

Community diagnosis

Sensitive to change

**Weight for height**

Weight for height measures wasting or acute malnutrition. It is an expression of the weight of the child as proportion of the expected weight for the standard reference child of the same height and sex.

A low weight for height is characterized by wasting and loss of muscle fat. It is an indicator of thinness and identifies acute malnutrition.

A high weight for height is referred to as obesity.

This is the most useful index in emergencies for screening and targeting vulnerable groups.

It is appropriate for examining short term effects/impact such as seasonal changes in food supply, short term nutritional stress brought about by illness

It is also used in evaluation of supplementation feeding

Also used in monitoring &reporting progress of intervention

**Characteristics of weight for height**

Wasting is an indicator of thinness

A measure of acute or recent malnutrition like kwashiorkor and Marasmus

It is appropriate to measure the effect of the seasonal food supply or short term nutrition Stress due to illness

It is used to report the progress of intervention programs.

Its short term and easily managed

Provide adequate food treatment of disease helps correct wasting.

Height for age

Height for age is referred to as stunting.

It is an indicator of past under nutrition & chronic malnutrition

It is an expression of the height of the child as proportion of the expressed height of standard reference child of the same height and sex.

It is a measure of chronic malnutrition i.e. long term and persistent malnutrition normally associated with long term factors as poverty and frequent illness.

It is not appropriate for growth monitoring. A stunted child normally has low height for age.

It cannot measure short term malnutrition because skeleton growth is slow.

It is also not useful for monitoring growth of children and impact of nutrition programme such as supplementary feeding

For children below 2 years or children below 85cm we take their length for age. But for those above 2yrs or 85cm we take their height for age.

Weight for age

It is the comparison of Child's weight to reference weight of a child of the same age and sex.

It measures underweight.

It combines both stunting and wasting and thus a valuable index for use in young children.

It shows the severity of malnutrition.

It is used in monitoring growth of children

**Advantages & disadvantages of weight/age**

**Advantages**

It is sensitive to small changes and thus used for growth & monitoring among children

It will reflect both chronic and acute malnutrition.

**Limitation**

It does not distinguish between adipose tissue or skeletal mass.

It does not indicate whether malnutrition is acute or chronic

It is sensitive to age thus if the age is not well indicated may lead to errors

Cases of edema and ascites may be misleading.

**Anthropometric indicators for children**

| Indicator | Definition | Implication and use |
|---|---|---|
| • Birth weight | The weight at which a baby is born | It is an indicator of maternal nutrition and health status, but has implications for the baby's health and survival |
| Weight | Measured in kg | Mainly affected by acute infection and/or acute food shortage. The child may experience rapid growth after recovery from the infection |
| Head circumference | Measured around the head | Applicable mainly in the first two years as a measure for brain development |
| Mid upper arm | Measured on the left arm | MUAC is a measure of adequacy in nutrition. A useful measure for screening acute malnutrition in the community. Also applicable for bed ridden patients |
| Weight for age | Is a measure of the weight compared to the weight of children of the same age and sex from a reference population | An indicator for acute and chronic malnutrition |

| | | |
|---|---|---|
| Height-for-age | Measure of the height compared to the height of children of the same age and sex form a reference population. | Indicator for chronic malnutrition and is used to identify stunted children |
| Weight-for-height | Measure of the weight compared to the weight of children of the same height and sex from a reference population | Indicator for acute malnutrition and used to identify wasted children |
| Underweight | Weight is below -2SD of expected weight of children of same age from a reference population | Moderate and severe-below minus 2 SD from median weight for age of reference population |
| Stunting | Height is below -2SD expected height of children of same age from a reference population | Moderate and severe-below minus 2 SD from median height for age of reference population |
| Wasting | Weight is below -2SD of expected weight of children of same height from a reference population | Moderate and severe-below minus 2 SD from median weight for height of reference population |
| Failure to thrive | The failure of the child to gain weight for more than 2 months | Important in detecting children who are at risk of malnutrition due to disease or inadequate food intake |
| Body surface area(BSA) | √(height-cm*(weight (kg)<br>3600 | Used mainly for drug prescription for children |
| Body Mass Index (BMI for age) | Weight (kg)<br>Height (m2) | An indicator of nutrition status |



**Growth monitoring in children**

Interpretation of growth curves

This is determining whether the child is growing appropriately or not, this is done by watching the direction of the child's growth pattern.

Normal growth curve; a healthy child's growth curve is parallel to the printed curves on the chart. important consideration on premature infants where growth failure can be over diagnosed, this can be avoided by subtracting the weeks of prematurity from postnatal age when plotting the

growth measurements. The direction of the growth curve is more important than the position of the curve on the chart.

A horizontal growth curve (static); this indicates danger, this means the child is not growing, a sign of disease, especially malnutrition, this makes them prone to recurrent infection as they cannot resist disease, a thorough history should be taken to establish the cause of growth failure, then intervene; relevant and practical guidance to the mother within her means to ensure continuation of normal growth. thereafter growth monitoring helps to determine the adequacy of catch-up growth (successful nutritional rehabilitation associated with growth spurt)

Downward growth curve; indicates a very dangerous situation where the child is losing the weight, this requires extra care immediately, could indicate malnutrition, tuberculosis, AIDS or other medical conditions. Investigations and treatment necessary. Any infant who does not gain weight for a month or a child in 2 months should receive urgent attention, an indicator of the child being malnourished.

Plot points for growth indicators

In order to plot points, one needs to understand the following:

The horizontal reference line at the bottom of the graph which indicates the age of the child.

The vertical reference line at the far left of the graph which indicates weight or length/height.

Plotted point – the point on the graph where a line extended from a measurement on the horizontal line intersects with a line extended from a measurement on the vertical line.



Plotting weight for age

Plot completed weeks, months and years on a vertical line (not between the verticallines) on the mother and child health booklet.

For horizontal line, plot weight for age on or between the horizontal line as precisely as possible.

When points are plotted for 2 or more visits join/connect the adjacent points with a straight line to better observe the trend.

Plot length/height –for-age

Length /height for age reflects attained growth in length or height at the child's age at a given visit. This indicator can help identify children who are stunted (short) due to prolonged under-nutrition or repeated illness. Children who are tall for their age can also be identified, but tallness is rarely a problem unless it is excessive and may reflect uncommon endocrine disorders.

Age is plotted in completed weeks from birth until age 3 months; in completed months from 3 to 12 months; and then in completed years and months.

To Plot length/height –for-age:

Plot completed weeks, months or years and months on a vertical line (not between vertical lines). For example, if a child is 51/2 months old, the point will be plotted on the line for 5 months ( not between the lines for 5 and 6 months)

Plot length or height on or between the horizontal lines as precisely as possible. For example, if the measurement is 60.5 cm, plot the point in the middle of the space between horizontal lines.

When points are plotted for two or more visits, connect adjacent points with a straight line to better observe the trend.

Judge whether a plotted point seems sensible, and if necessary, re-measure the child. For example, a baby's length should not be shorter than at the previous visit. If it is, one of the measurements was wrong.

Note WHO child growth standards, 2008

**Note**

Plot measurements (weight/height) once per month on the child's growth chart

If the measurements are taken more than once in a period of 4 weeks, the subsequent measurements should be recorded on the clinical notes and not plotted.

### Interpretation of the weight/height for age

Z-score lines on the growth charts are numbered positively (-1, -2, -3) or negatively (-1, -2, -3). In general, a plotted point that is far from the median in either direction (for example, close to the 3 or -3 z-score line) may represent a growth problem, although other factors must be considered, such as the growth trend, the health condition of the child and the height of the parents.



### Anthropometric indicators for adults

| Indicator | Definition | Explanation/Use |
|---|---|---|
| Weight and change in weight | Measured as weight in kg. A change in weight is measured as % of initial weight. Several measurements have to be recorded for tracking changes in nutritional status | Excessive weight loss may indicate wasting and presence of chronic illnesses. A 5-10& unintentional decrease in weight is an indication of a health problem |
| Weight measurement in pregnant women | Measured as weight in kg | In this population weight gain of about 1.5kg per month in the last trimester is consistent with positive pregnancy outcomes in developing countries |

| | | |
|---|---|---|
| Mid-upper arm circumference | Measured on the less active hand | MUAC is a measure of inadequacy in nutritional status. The indicator is useful for assessing acute adult undernutrition to determine prevalence of acute malnutrition at the population level and identify those at highest risk of mortality |
| Body mass index | Weight in kg divided by height (M2) | An indicator of nutritional status for non-pregnant individuals. |

**Body Mass Index (BMI)**

This is the way of comparing an individual's weight with that of the reference population. It is the international standard for assessing body size in adults

The main assumption of BMI is that it represents an indirect index of body composition which is fatness correlated with health.

Mainly used for protein energy malnutrition and obesity as it is considered a good index of body fat and protein stores.

BMI = BODY WEIGHT (KGS)/ HEIGHT (M2) ($Kg/M^2$)



It indicates wasting

For adults 20 years old and older, BMI is interpreted using standard weight status categories that are the same for all ages, and for both men and women

Example

If a person is 74 kg and the height is 162cm then the BMI can be calculated as

BMI = body weight

Height ($m^2$)

= 74

1.69 *1.62

=25.87 $kg/m^2$

Thus the person is overweight

**BMI cut-offs for adults**

<16.0 $kg/m^2$ Severe malnutrition

16.0-16.9 $kg/m^2$ moderate malnutrition

17.0-18.4 $kg/m^2$ mild malnutrition

| | |
|---|---|
| <18.5 kg/m$^2$ | underweight |
| 18.5-24.9 kg/m$^2$ | normal |
| 25.0-29.9 kg/m$^2$ | overweight |
| >30 kg/m$^2$ | obese |

**Advantages of BMI**

BMI testing, unlike many of the other methods used to assess weight, requires no special training. Although the calculation may seem complicated on first view, with practice it can be completed easily in just a few moments.

The results are easy to understand; it's simply a matter of looking up your score on a standardized chart.

BMI testing does not require one to remove any clothing, other than shoes during weight taking, which makes it ideal for users who might otherwise be put off by a more invasive procedure

**Disadvantages of BMI**

The body weight includes a number of components, such as muscle mass, fat, internal organs, water and skeletal weight. BMI does not differentiate between these components, so some populations will score badly when, in fact, they are quite healthy.

Muscle and bone weigh significantly more than fat, so it's possible to be heavy but still carry a low amount of body fat e.g. football players, competitive weightlifters, those with large skeletal frames and other very muscular people.

Conversely some athletes may have a very low BMI, possibly classifying them as underweight.

BMI may also be a poor indicator of whether the patient is at risk nutritionally, as an apparently normal weight can mask severe muscle wasting



### *18.3.2.3 Self-Assessment*

1. Define the following terms:

   i. Anthropometric measurements

   ii. Client

   iii. Body Mass Index

   iv. MUAC

2. _____ is a method used to estimate body compartments through a mechanism of resistance and reactance

   A. MUAC

   B. BIA

   C. BMI

   D. XRAY

3. The following measurements are used to assess body composition except

   A. Total body water

   B. MUAC

   C. Fat-free mass

   D. Skinfold thickness

4. Indicate whether the following statements are true or false for waist circumference

5. Larger the waist circumference (high fat deposition), the lower the risk of onset of non-communicable diseases

6. Waist measurement are taken to provide additional information on overweight and obesity

7. The arms should be relaxed and lifted at 180°C

8. It is taken midway between the lower rib margin and the iliac crest and is taken at the end of expiration

9. The WHO cut off points for hip/waist ratio among men is____

   A. >90

   B. >85

   C. >0.85

   D >0.90

10. What are the methods used in determining nutritional assessment and surveillance?

11. What are some of the tools used in determining nutrition assessment and surveillance?

12. A 5 year old boy weighs 20kg and is 130cm tall. The boy has a MUAC of 13cm. Determine his nutritional status.

15. Highlight the advantages and disadvantages of anthropometric methods

### *18.3.2.4 Tools, Equipment, and Materials*

| | | |
|---|---|---|
| Microtoise  | Measured on the less active hand  | Calipers  |
| Spring balance  | Height Boards  | Beam balance  |
| Adult MUAC tapes  | Color-coded measuring tapes  | Salter scale  |
| Children MUAC tapes  | Bathroom scale  | Length Boards  |

Computers with internet

Library and resource Centre

WHO guidelines

MOH policies and guidelines

Skills lab

LCDs, video clips, charts and other teaching aids

Stationery

Invited experts

### *18.3.2.5 References*

Ministry of health (MOH) guidelines

Integrated management of acute malnutrition (IMAM) guidelines, UNICEF, 2015

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### 18.3.3 Learning Outcome 2: Analyze biochemical laboratory results

#### *18.3.3.1 Learning Activities*

| Learning activity | Special instructions |
|---|---|
| Interpret laboratory results as per reference ranges<br>• Serum tests for iron<br>• Plasma albumin test for protein<br>• Urinary tests for thiamin and riboflavin<br>• Amino acid test for protein | Compare the actual results with the cut off points |
| Evaluate laboratory results as per biological variation knowledge | Consider differences in physiological status, genetics, immune status, dietary variables and age. |
| Determine influence of errors<br>• Random and systematic errors<br>• Preanalytical variation<br>• Analytical imprecision<br>• Biological variation | Carry out assessment against reference change values (RCV)<br>Identify any inter and intra-observer variations |
| Identify diagnostic sensitivity and specificity | |



#### *18.3.3.2 Information Sheet*

**Definitions**

*Biochemical/Laboratory tests:* biological tests of blood and urine to determine levels of particular nutrients or by-products of their utilization.

*Biological variation:* the natural variability in laboratory parameters due to physiologic differences among subjects and within the same subject over time

*Albumin:* the most abundant (55% to 650/o of total) plasma protein; a negative acute-phase respondent with a long half-life; maintains plasma oncotic pressure and acts as a transport protein.

*Sensitivity:* is a measure of test's ability to accurately generate a positive result for subjects who have the condition that is being assessed

*Specificity:* refers to a measure of test's ability to correctly generate a negative results for the subjects who do not have the condition being assessed

*Lipid profile:* is a blood test that measures the amount of cholesterol and fats called triglycerides in the blood

*Complete blood count (CBC):* blood tests used to evaluate the overall health of a client and detect a wide range of disorders such as anemia.

*Creatinine:* a chemical breakdown product of creatine phosphate; used as a marker of renal function and muscle mass

*Ferritin:* a protein that sequesters iron in a form readily activated for transport; found primarily in the liver and other iron storage sites; plasma ferritin is proportional to intracellular ferritin and useful in assessing iron status

Laboratory data can be used by the nutrition professional to support subjective judgment and clinical assessment findings. To add to this, because numeric values do not themselves connote personal judgment, this kind of data can often be passed on to a patient or client without perceived blame. Laboratory test results provide objective data for use in the process to assess nutrition status, identify nutrition diagnoses, and monitor and evaluate nutrition care outcomes.

Laboratory tests are ordered to diagnose diseases, evaluate treatment plans, monitor medication effectiveness, and evaluate medical nutrition therapy (MNT).

**Specimen types**

*Whole blood:* collected with an anticoagulant if entire content of the blood is to be evaluated; none of the elements are removed; contains red blood cells, white blood cells, and platelets suspended in plasma.

*Serum:* the fluid obtained from blood after the blood has been clotted and then centrifuged to remove the clot and blood cells.

*Plasma:* the transparent (slightly straw colour) liquid component of blood, composed of water, blood proteins, inorganic electrolytes, and clotting factors

*Blood cells:* separated from anticoagulated whole blood for measurement of cellular analyte content

*Erythrocytes:* (red blood cells).

*Leukocytes:* (white blood cells) and leukocyte fractions.

*Blood spots:* dried whole blood from finger or heel prick that is placed on paper and can be used for selected hormone tests and other tests such as infant phenylketonuria screening.

Other tissues (obtained from scrapings or biopsy samples)

Urine (from random samples or timed collections): contains a concentrate of excreted metabolites

Stool (from random samples or timed collections): important in nutritional analyses when nutrients are not absorbed and therefore are present in the stool.

*Constituents of the common serum chemistry panels*

| Analytes | Reference range | Significance |
|---|---|---|
| **Serum electrolytes** | | |
| Na+ | 135-I+5 mEq/Ll | monitor various patients, such as those receiving total parenteral nutrition or who have renal conditions, chronic obstructive pulmonary disease, uncontrolled diabetes mellitus (DM), various endocrine disorders, ascitic and edematous symptoms, or acidotic or alkalotic conditions; decreased K* associated with diarrhoea, vomiting or nasogastric aspiration, some drugs, licorice ingestion, and diuretics; increased K+ associated with renal diseases, crush injuries, infection, and hemolyzed blood specimens |
| K+ | 3.6-5 mEq/Lf | |
| Cl- | l0l-111mEq/Lf L | |
| HCO-3 | 21-31mEq/ | |
| Glucose | 70-99 mg/dl (fasting) | Fasting glucose >125 mg/dl indicates DM (oral glucose tolerance tests are not needed for diagnosis); fasting glucose >100 mgldl is indicator of insulin resistance Monitor levels along with triglycerides in those receiving total parenteral nutrition for glucose intolerance |
| Creatinine | 0.6-1.2 mgldl; 53-106 umol/L (males) 0.5-1.1 mg/dl;44-97 umol/L (females | Increased in those with renal disease and decreased in those with PEM (i.e., blood urea nitrogen/creatinine ratio >15:1) |
| Blood Urea Nitrogen (BUN) | 5-20 mg urea nitrogen/dl 1.8-7 mmol/L | Increased in those with renal disease and excessive protein catabolism; decreased in those with liver failure and negative nitrogen balance and in females who are pregnant |
| Albumin | 3.5-5 mg/dl | Decreased in those with liver disease or acute inflammatory disease |
| **Serum enzymes** | | |
| Alanine aminotransferase (ALT) | 4-36 units/I- at37” C; 4-36 units/L | Increased in those with any of a variety of malignant, muscle, bone, intestinal, and liver diseases or injuries |
| Gamma glutamyltransferase | 4-25 units (females) 12-38 units (males | |
| Alkaline phosphatase (ALP) | 30-120 units/L; 0.5-2.0 uKat/L | AST and ALT useful in monitoring liver function in those receiving total parenteral nutrition |

| | | |
|---|---|---|
| Aspartate aminotransferase (AST) | 0-3 5 international units/L; 0-.58 uKatll | |
| Bilirubin | Total bilirubin 0.3-1.0 mgl dL; 5.1-17.0 pmol/L<br>Indirect bilirubin 0.2-0.8 mg/ dL; J.+-12.0 pmol./L<br>Direct bilirubin 0.1-0.3 mgl dL 1.7-5.1pmol/L | Increased in association with drugs, gallstones, and other biliary duct diseases; intravascular haemolysis and hepatic immaturity: decreased with some anaemias |
| Total Calcium | 8.5-10.5 mgldl | Hypercalcemia associated with endocrine disorders, malignancy, and hypervitaminosis D<br>Hypocalcemia associated with vitamin D deficiency and inadequate hepatic or renal activation of vitamin D, hypoparathyroidism, magnesium deficiency, renal failure, and nephrotic syndrome |
| Total cholesterol | <200 | Decreased in those with protein-calorie malnutrition, liver diseases, and hyperthyroidism |
| Triglycerides | 40-160mg/dl and sex dependent | Increased in those with glucose intolerance (e.g., in those receiving total parenteral nutrition who have combined hyperlipidemia) or in those who are not fasting |
| **Constituents of the hemogram: CBC** | | |
| Red blood Cells | +.3-5.9 x 106/mm3 (men) 3.5-5.9 x 106/ mm3 (women) | In addition to nutritional deficits, may be decreased in those with hemorrhage, hemolysis, genetic aberrations, marrow failure, or renal disease or who are taking certain drugs; not sensitive for iron, vitamin B12 or folate deficiencies |
| Hemoglobin concentration | 14-17 g/dl (men)<br>12-15 g/dl (women)<br>< 11 g/dl (pregnant females)<br>14-24 g/dl (newborns) | In addition to nutritional deficits, may be decreased in those with hemorrhage, hemolysis, genetic aberrations, marrow failure, or renal disease or who are taking certain drugs; not sensitive for iron, vitamin B12 or folate deficiencies |

| | | |
|---|---|---|
| Hematocrit | 42%-52% (men)<br>35%-47% (women)<br><33% (pregnant females)<br>44%-64% (newborns) | In addition to nutritional deficits, may be decreased in those with hemorrhage, hemolysis, genetic aberrations, marrow failure, or renal disease or who are taking certain drugs; not sensitive for iron, vitamin B12 or folate deficiencies |
| Mean Cell Volume (MCV) | 80-99 fl<br>96-108 fl (newborns) | Decreased (microcytic) in presence of iron deficiency, thalassemia trait and chronic renal failure, anaemia of chronic disease; increased (macrocytic) in presence of vitamin B12 or folate deficiency and genetic defects in DNA synthesis; neither microcytosis nor macrocytosis sensitive to marginal nutrient deficiencies |
| Mean cell hemoglobin (MCH) | 27-31pg/cell<br>23-34 pg (newborns) | Causes of abnormal values similar to those for MCV |
| Mean cell hemoglobin concentration (MCHC) | 32-36 g/dl 32-33 g/dl (newborns) | Decreased in those with iron deficiency and thalassemia trait; not sensitive to marginal nutrient deficiencies |
| White blood cell count (WBC) | 5-10 x l0r/mmr (>2 yr)<br>6-17 x l0rlmmr | Increased (leukocytosis) in those with infection, neoplasia, and stress decreased (leucopenia) in those with PEM, autoimmune diseases, or overwhelming infections or who are receiving chemotherapy or radiation therapy |
| Chemical tests in urinalysis | | |
| Specific gravity | 1.010-1.025 mg/ml | Can be used to test and monitor the concentrating and diluting abilities of the kidney; low in those with diabetes insipidus, glomerulonephritis, or pyelonephritis; high in those with vomiting, diarrhea, sweating, fever, adrenal insufficiency, hepatic diseases, or heart failure |
| pH | 6-8 (normal diet | Acidic in those with a high-protein diet or acidosis (e.g., uncontrolled diabetes mellitus [DM] or starvation), during administration of some drugs, and in association with uric acid, cystine, and calcium oxalate kidney stones; alkaline in individuals consuming diets rich in vegetables or dairy products and in those with a urinary tract infection, immediately after meals, with some drugs, and in those with phosphate and calcium carbonate kidney stone |

| | | |
|---|---|---|
| Protein | 2-8 mg/dl | Marked proteinuria in those with nephrotic syndrome, severe glomerulonephritis, or congestive heart failure; moderate in those with most renal diseases, preeclampsia, or urinary tract inflammation; minimal in those with certain renal diseases or lower urinary tract disorders |
| Glucose | Not detected<br>(2-10 g/dl in DM) | Positive in those with DM; rarely in benign conditions |
| Ketones | Negative | Positive in those with uncontrolled DM (usually type 1); also positive in those with a fever, anorexia, certain GI disturbances, persistent vomiting, or cachexia or who are fasting or starving |
| Blood | Negative | Indicates urinary tract infection, neoplasm, or trauma; also positive in those with traumatic muscle injuries or hemolytic anaemia |
| Bilirubin | Not detected | Index of unconjugated bilirubin; increase in those with certain liver diseases (e.g., gallstones) |
| Urobilinogen | 0.1-1 units/dl | Index of conjugated bilirubin; increased in those with hemolytic conditions; used to distinguish among hepatic disease |
| Nitrite | Negative | Index of bacteriuria |
| Leukocyte esterase | Negative | Indirect test of bacteriuria: detects leukocytes |



**Types of biochemical tests**

***Static:*** measure of a nutrient or its metabolite in *blood, urine, or body tissue* (an actual measure of the nutrient

Examples: Iron or vitamin A

*Limitations:* may fail to reflect the overall nutrient status (serum may not reflect level of nutrient in tissues)

***Functional:*** reflects the failure of function or physiologic process of the body as a result of nutritional deficiency (somewhat indirect measure)

***Examples of functional assessment:***

Immune response will be compromised by protein deficiency; visual adaption to dark will be compromised by vitamin A deficiency

*Limitations:* May be nonspecific; indicates a general nutritional status, but may not allow id of specific nutrients

**Methods processes/ procedures/ guidelines and content**

***Initial laboratory assessment***

Laboratory tests are based on blood and urine which play the role of indicators of nutritional status, but they are influenced by non-nutritional factors as well

Laboratory results may be affected by medications, hydration status, and disease states or other metabolic processes, such as stress.

Data obtained should be viewed as part of a whole.

Haemoglobin estimation is the most important test, & useful index of the overall state of nutrition. Beside anaemia it also tells about protein & trace element nutrition.

Stool examination for the presence of ova and/or intestinal parasites

Urine dipstick & microscopy for albumin, sugar and blood

**Specific lab tests**

- Measurement of individual nutrient in body fluids (e.g. serum retinol, serum iron, urinary iodine, vitamin D).
- Detection of abnormal amount of metabolites in the urine (e.g. urinary creatinine/ hydroxyproline ratio).
- Analysis of hair, nails & skin for micro-nutrients.



| Type of blood work/ Lab Panel | Components | Comments |
|---|---|---|
| **CBC (Complete Blood Count)** | RBC, Hgb, Hct, MCH, MCV (mean corpuscular volume) and can give some idea of anemias | Red blood cells carry oxygen<br>White blood cells fight infection<br>Hemoglobin is the oxygen carrying protein in red blood cells<br>Platelets help in blood clotting<br>Hematocrit is the proportion of red blood cells to the fluid component or plasma in the blood<br>CBC is done;<br>To review overall health<br>To diagnose a medical condition<br>To monitor a medical condition |

| | | |
|---|---|---|
| | | Monitor medical treatment<br>Abnormal red blood cell, hemoglobin, or hematocrit levels may indicate anemia, iron deficiency, or heart disease<br>Low white cell count may indicate an autoimmune disorder, bone marrow disorder, or cancer<br>High white cell count may indicate an infection or reaction to medication<br>However, diet, activity level, medications, a women's menstrual cycle, and other considerations can affect the CBC results. |
| **Metabolic Panels or Chem profile/panels** (liver profile or comprehensive) | Minerals Na, K, P, Cl, Ca, Alb, total proteins, globulins and liver enzymes (alkaline phosphatase, ALT, AST), byproducts of metabolism (BUN, creatinine, CO2), blood glucose | ALT (alanine aminotransferase) is a liver enzyme; when elevated may signal a liver problem or disease<br>Alkaline Phosphatase (ALP) enzyme indicates a problem in liver, bone, placenta, intestine<br>AST (aspartate aminotransferase) indicates MI, liver disease, drug exposure, musculoskeletal injuries<br>Bilirubin is the pigment in bile, produced from the breakdown of hemoglobin; when elevated may indicate liver problem and results in jaundice<br>BUN (blood urea nitrogen) is the byproduct of protein metabolism; when elevated can signal renal disease or dehydration<br>Creatinine becomes elevated with renal disease<br>Calcium stays very tightly controlled; if low may indicate hypoparathyroidism, renal disease, or pancreatitis; high levels can indicate excessive vitamin D intake. When out of normal range indicates a metabolic problem rather than a true deficiency of dietary calcium.<br>Carbon Dioxide (CO2) indicates acid/base balance in body. Too high indicates alkalosis; too low indicates acidosis<br>Chloride (Cl) works with Na to help with acid-base balance and fluid pressure. Low level may indicate alkalosis and low K; High level may indicate kidney disease or heart disease<br>Glucose (Normal is 70-100 mg/dl) is considered the normal range for a fasting blood glucose level.<br>If a fasting blood glucose level determines 100-125 mg/dL, the person is considered to have impaired fasting glucose, a type of prediabetes |

| | | |
|---|---|---|
| | | A random blood glucose test usually will be below 125 mg/dL; when elevated, may signal diabetes.<br><br>A1C test is a common blood test used to diagnose type 1 and type 2 diabetes. The A1C test may be referred to as hemoglobin A1C, HbA1C, glycated hemoglobin, glycosylated hemoglobin.<br><br>The test reflects the average blood sugar level for the past two to three months and measures the percentage of your hemoglobin (protein in RBC that carries oxygen) is coated with sugar (glycated).<br><br>NOTE:<br><br>Normal A1C 4.5-6% (5% = 97 mg/dL as estimated average blood glucose level)<br><br>Prediabetes A1C 5.7-6.4% (6% = 126 mg/dL as estimated average BG level<br><br>Diabetes A1C >6.5% (7%= 154 mg/dL as estimated average BG level)<br><br>Phosphorus (P) closely relates to Ca; when high may indicate renal failure; when low may indicate a bone disease (rickets or osteomalacia)<br><br>Sodium (Na) maintains acid-base and fluid balance. Low level may be from vomiting, diarrhea, or diuretics, or overhydration; High level may be seen with dehydration.<br><br>Terms: hypernatremia, hyponatremia<br><br>Potassium (K) plays a key role in acid-base and fluid balance; nerve impulses. High level may be seen with renal disease. Low levels may be caused by diuretics, vomiting, diarrhea, eating disorders. Terms: hyperkalemia, hypokalemia |
| **Lipid Panels** | Total cholesterol, triglycerides, LDLs, HDLs, VLDLs | **Total cholesterol:** This is a sum of your blood's cholesterol content; An estimate of all the cholesterol in the blood (good HDL plus bad LDL, for example). Thus, a higher total cholesterol may be due to high levels of HDL, which is good, or high levels of LDL, which is bad. So knowing the breakdown is important.<br><br>**Triglycerides:** A type of blood fat. When you eat, your body converts calories it doesn't need into triglycerides, which are stored in fat cells. High triglyceride levels are associated with several factors, including being overweight, eating too many sweets or drinking too much alcohol, smoking, being sedentary, or having diabetes with elevated blood sugar levels. |

| | | |
|---|---|---|
| | | **High-density lipoprotein (HDL):** Good cholesterol that helps protect against heart disease because it helps carry away LDL cholesterol, thus keeping arteries open and blood flowing more freely.<br>**Low-density lipoprotein (LDL):** Bad cholesterol and a major contributor to clogged arteries. Too much of it in the blood causes the buildup of fatty deposits (plaques) in the arteries (atherosclerosis), which reduces blood flow. These plaques sometimes rupture and can lead to a heart attack or stroke. |

**Advantages of Biochemical Method**

- It is useful in detecting early changes in body metabolism & nutrition before the appearance of overt clinical signs.
- It is precise, accurate and reproducible.
- Useful to validate data obtained from dietary methods e.g. comparing salt intake with 24-hour urinary excretion.



**Limitations of Biochemical Method**

- Time consuming
- Expensive
- They cannot be applied on large scale Needs trained personnel & facilities
- Requires trained personnel and facilities.

## CASE STUDIES

An 83-year-old woman was brought in to the emergency department of Kenyatta National Hospital suffering from mental confusion. Her past medical history showed that she had hypertension, peripheral atheromatosis, and had experienced a previous transitory ischemic attack.

Over the last year, she complained of an inability to perform normal cognitive functions and

Had experienced frequent falls. Her existing medications included ramipril 2.5 mg/day, lansoprazole 30 mg/day and acetylsalicylic acid 100 mg/day.

The patient's blood pressure was 170/100 mmHg and heart rate 70 b.p.m.;

| Laboratory measurement | Results | Normal range |
|---|---|---|
| At admission | | |
| Glucose (mmol/L) | 5.16 | 3.6–6.3 |
| Serum [Na+] (mmol/L) | 120 | 135–146 |
| Serum Urea (mmol/L) | 4.1 | 3.5-6.6 |
| Haemoglobin (g/L) | 109 | 120–160 |
| Haematocrit (proportion of 1.0) | 0.32 | 0.36–0.46 |
| Serum creatinine (µmol/L) | 56.6 | 35.4–79.6 |
| Serum uric acid (µmol/L) | 131 | 208–387 |
| Serum [K+] (mmol/L) | 4.1 | 3.5–5.3 |

Comment on these results.

What further investigations would you recommend and why?



### *18.3.3.3 Self-Assessment*

1. Define the following terms;
   i. Biochemical/Laboratory tests
   ii. Biological variation
   iii. Lipid profile
   iv. Complete blood count(CBC)
2. _____ are the blood tests used to evaluate the overall health of a client and detect a wide range of disorders such as anaemia.
   A. Biochemical tests
   B. Lipid profile
   C. Biological variation
   D. Complete blood count
3. What is the reference standard for fasting glucose for a normal person?
   A. >125 mg/dl
   B. 3-5 mg/dl
   C. 70-99 mg/dl
   D. >100 mg/dl

4. Chloride (Cl) works with Na to help with acid-base balance and fluid pressure. Low level may indicate_____

   A. Alkalosis and low potassium

   B. Acidosis

   C. Renal disease

   D. Liver problem

5. Describe the different types of biochemical tests
6. You are the nutritionist at a national referral hospital and have done a lab request on Complete blood count for your client. The client does not understand why she has to go to the lab. Explain how you would address this matter.
7. Explain the possible explanations for;
8. Presence of Alkaline Phosphatase (ALP) enzyme during liver function test
9. Elevated BUN (blood urea nitrogen)
10. Discuss the factors that may influence discrepancies in biochemical results



### *18.3.3.4 Tools, Equipment, Supplies and Materials*

Computers with internet

Library and resource Centre

WHO guidelines

MOH policies and guidelines

Skills lab

LCDs, video clips, charts and other teaching aids

Stationery

Invited expert

### *18.3.3.5 References*

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## 18.3.4 Learning Outcome 3: Conduct clinical examination

### *18.3.4.1 Learning Activities*

| Learning activity | Special instructions |
|---|---|
| Obtaining Patient medical history<br><br>Take patients complete medical history from the patient, caretaker/relative privy of the patient's condition, referral notes, treatment sheet, nurses cardex and patients files | Elicit current concerns<br><br>Resist the tendency to interrupt<br><br>Probe<br><br>Ask about medications, diet,<br><br>Ask about functional status<br><br>Consider life history. |
| Physical examination and review of systems.<br><br>Head to toes examination of the patient including psychosocial assessment. | Physical observation of the body, hair, nails, eyes, lips, skin, prominence of bones for a clue to a nutrition related condition or deficiencies e.g. wasting, anemia, dehydration<br><br>Documenting the findings as per work procedure. |
| Conduct and document physical examination e.g., paleness of the palm and duration for refill upon pressing the palm, color, texture and distribution of the hair, paleness of the conjunctiva and edema. | Ensure privacy<br><br>Get patients consent<br><br>Observe confidentiality<br><br>Observe hygiene<br><br>Have a chaperone. |



### *18.3.4.2 Information Sheet.*

**Definitions**,

*Clinical examination:* a physical examination that looks for clue to poor nutrition status by assessing the superficial tissues/organs near the body surface

*Edema:* swelling caused by excess fluid trapped in your body's tissues

*Pallor;* an unusual lightness of skin colour compared with your normal complexion. Paleness may be caused by reduced blood flow and oxygen or by a decreased number of red blood cells

*Chaperone*; a person who looks after and accompany a person or group of people or takes care of another one.

*Codex*; quick summary of individual patient needs that is used by nurses and updated at every shift change or any change in patient's condition.

## Clinical examination

It is an essential feature of all nutrition surveys. It is the simplest & most practical method of ascertaining the nutritional status of a group of individuals

It utilizes a number of physical signs that are known to be associated with malnutrition and deficiency of vitamins & micronutrients. Every part of the body can be examined to offer clue e.g. hair eyes skin posture tongue, fingernails, and others.

General clinical examination, with special attention to organs like hair, angles of the mouth, gums, nails, skin, eyes, tongue, muscles, bones and thyroid glands.

The examination requires skill because many physical signs can reflect more than one nutritional deficiency or toxic in the body or even nutrition conditions.

Like other assessment techniques, a physical examination does not by itself provide conclusion but instead may reveal possible nutrient imbalances for other assessment techniques to confirm data collection from other assessment measures.

Clinical data provides information about the individual's medical history, including acute and chronic illness and diagnostic procedures, therapies, or treatments that may increase nutrient needs or induce malabsorption .

Current medications need to be documented, and both prescription drugs and over-the-counter drugs, such as laxatives or analgesics, must be included in the analysis.

Vitamins, mineral, and herbal preparations also need to be reviewed. Physical signs of malnutrition can be documented during the nutrition interview and are an important part of the assessment process.



| Physical exam. | Procedure. | Illustration. |
|---|---|---|
| Hair | Look; spare, thin, coiled and corkscrews<br>Touch/feel; texture and easy to pull out. |  |
| Eyes | Look; pallor and jaundice on the patient's sclera and conjunctiva.<br>Ask for signs of photophobia, night blindness or blurring vision. |  |

| | | |
|---|---|---|
| Mouth. | Look for glossitis, leukoplakia, sore mouth and tongue, angular stomatitis, cheilosis and fissured tongue, bleeding and spongy gums. |  |
| Nails. | Look for spooning and transverse lines. |  |
| Skin. | Look for pallor, follicular hyperkeratosis flanking dermatitis, pigmentation desquamation, bruising pupura. |  |
| Muscles and bones | Wasted appearance of muscles swollen bumps on skull or ends of bones; small bumps on ribs; bowed legs or knock knees |  |
| oedema | Place the client to lie on the examination couch then apply pressure using your thumb to the swollen skin for about 15 seconds to check for lasting indentation |  |

*Clinical signs and nutritional deficiency*

| Body system | Healthy findings | Healthy findings | What the findings reflect |
|---|---|---|---|
| Tongue | Red, bumpy, rough | Sore, smooth, Oedema, purple/scarlet color or swollen | Vitamin B2 and niacin deficiency |
| Skin | Smooth, firm, good color | Patches, edema, in-elastic flaky, dermatitis | PEM esp. kwashiorkor<br>Vitamin B3/ C deficiency/pellagra |
| Teeth and gums | No pain or caries, gums firm<br>teeth bright | Mottled enamel, Missing, discolored, decayed teeth; gums bleed easily and are swollen and spongy | Excessive fluorine/ scurvy<br>Mineral and vitamin status |
| Internal systems | Regular heart rhythm, heart<br>rate, and blood pressure; no<br>impairment of digestive<br>function, reflexes, or mental<br>status | Abnormal heart rate, heart rhythm, or blood pressure; enlarged liver, spleen abnormal digestion; burning, tingling of<br>hands, feet; loss of balance, coordination,<br>mental confusion, irritability, fatigue | PEM and mineral<br>status |
| Nails | Firm, Pink | Spoon-shaped, brittle, ridged, pale | Iron status |
| Muscles and<br>bones | Muscle tone; posture, long<br>bone development<br>appropriate for age | "Wasted" appearance of muscles swollen<br>bumps on skull or ends of bones; small<br>bumps on ribs; bowed legs or knock<br>knees | PEM, mineral, and<br>vitamin D status |

**Edema**

It is not an index but just a sign of severe malnutrition especially presence of kwashiorkor.

It is the presence of excessive fluid in the intracellular tissues of the body.

Nutritional edema is bilateral (on both feet) and is diagnosed using thumb pressure for three (3) seconds then releasing the pressure.

If a depression is left shows signs of edema

It is an indicator of high risk of mortality.

| Grade +(mild) | Grade ++ (moderate) | Grade +++(severe) |
|---|---|---|
| There is bilateral pitting oedema in both feet<br><br>Consider checking the legs and face too to rule out grade ++ or+++ | Both feet plus the lower legs, hands, and lower arms are swollen. This is grade ++ bilateral pitting oedema | It is generalized, including both feet, legs, arms, hands and face |



**Advantages of clinical assessment**

- Less time consuming
- Relatively cheaper than other methods
- Does not require highly skilled man power
- Doesn't require any elaborate laboratory equipment
- One can easily train people on checking signs and symptoms
- Non-invasive
- Fast and easy to perform

**Limitations of clinical assessment**

- Does not detect early cases
- Specificity is low
- Sensitivity is low-not show severity
- Large inter-observer variation
- Large intra-observer variation
- Observer assessment tends to shift with prevalence of the sign in the population applying stringent criteria when prevalence is high

**CASE STUDY**

Patient X was referred from mbale dispensary to the nutrition clinic presenting with complains of bilateral swelling of the lower limbs from the level of the ankle joint to the level of the knee, un evenly distributed hair, sunken alert eyes, sagging skin and irritability

- Identify any key physical observation in patient X
- What are the procedures that you will need to follow during history taking
- Explain the procedure of head to toe examination in patient X
- What are the tools, materials and supplies required during physical examination?

### *18.3.4.3 Self-Assessment*

1. Define the following terms;
   i. Codex
   ii. Pallor
2. The following are signs of a healthy tongue except;
   A. Red
   B. Bumpy
   C. Rough
   D. Smooth
3. Patches and edema on the skin may reflect_____
   A. Kwashiorkor
   B. Vitamin E deficiency
   C. Dehydration
   D. Vitamin B deficiency
4. The type of oedema where both feet and arms are swollen is known as _____
   A. Grade +
   B. Grade ++
   C. Grade +++
   D. Grade ++++
5. What are the factors considered when doing physical examination on a client
6. What systems are reviewed during physical examination of a patient

7.What do you elicit for in the following areas during physical examination

i. Eyes

ii. Hair

iii. Mouth

iv. Nails

### *18.3.4.4 Tools, Equipment, Supplies and Materials*

| | |
|---|---|
| Examination couch.<br>  | Screen<br>  |



Computers with internet

Library and resource Centre

WHO guidelines

MOH policies and guidelines

Skills lab

LCDs, video clips, charts and other teaching aids

Stationery

Invited expert

### *18.3.4.5 References*

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## 18.3.5 Learning Outcome 4: Conduct Dietary assessment

### *18.3.5.1 Learning Activities*

| Learning activity | Special instructions |
|---|---|
| Determine dietary method<br>24 hour recall<br>Food frequency questionnaire<br>Food diary<br>Food records<br>Food history | Select the correct method of dietary assessment<br>Determine the tools for assessing dietary diversity<br>Be keen to identify any possible errors in dietary assessment |
| Conduct dietary recall questionnaire | Carry out a pilot study on the foods commonly consumed by individuals/households<br>Design and administer a food frequency questionnaire<br>Interpret the data obtained |
| Obtain diet history | Design and administer diet history questionnaire<br>Interpret the data obtained<br>Address any contingencies |



### *18.3.5.2 Information Sheet*

**Definitions**

*Dietary assessment;* is data collected that is used to asses a client's food and nutrient intake, lifestyle and medical history within a certain period of time.

*24 hour recall:* This is a structured interview intended to recall and report all food and beverages consumed by the client in the past 24 hours

*Food frequency questionnaire (FFQ):* This is a questionnaire used to obtain frequency and sometimes portion size information about food and beverage consumption over a certain period of time

*Dietary records:* This is a prospective open ended survey method collecting data about food and beverages consumed over a previously specified period of time

*Dietary history:* This is a structured interview method consisting of questions about habitual/ usual intake of food and beverages over a long period of time.

*Dietary intake:* data about food consumption, including information on appetite, eating patterns, and estimations of typical nutrient intake

*Food diary:* a record that is written to show all the foods and drinks consumed during a set time, usually 3 to 7 days, often including information on eating time, place and situation

*Nutrient intake analysis (NIA):* a process by which food, beverage, and supplement intake is evaluated for nutrient content over a specified period of time

*Food frequency questionnaire:* a method of dietary assessment in which the data collected relate to how often and in what amount foods are consumed (e.g., servings per week, month, or year)

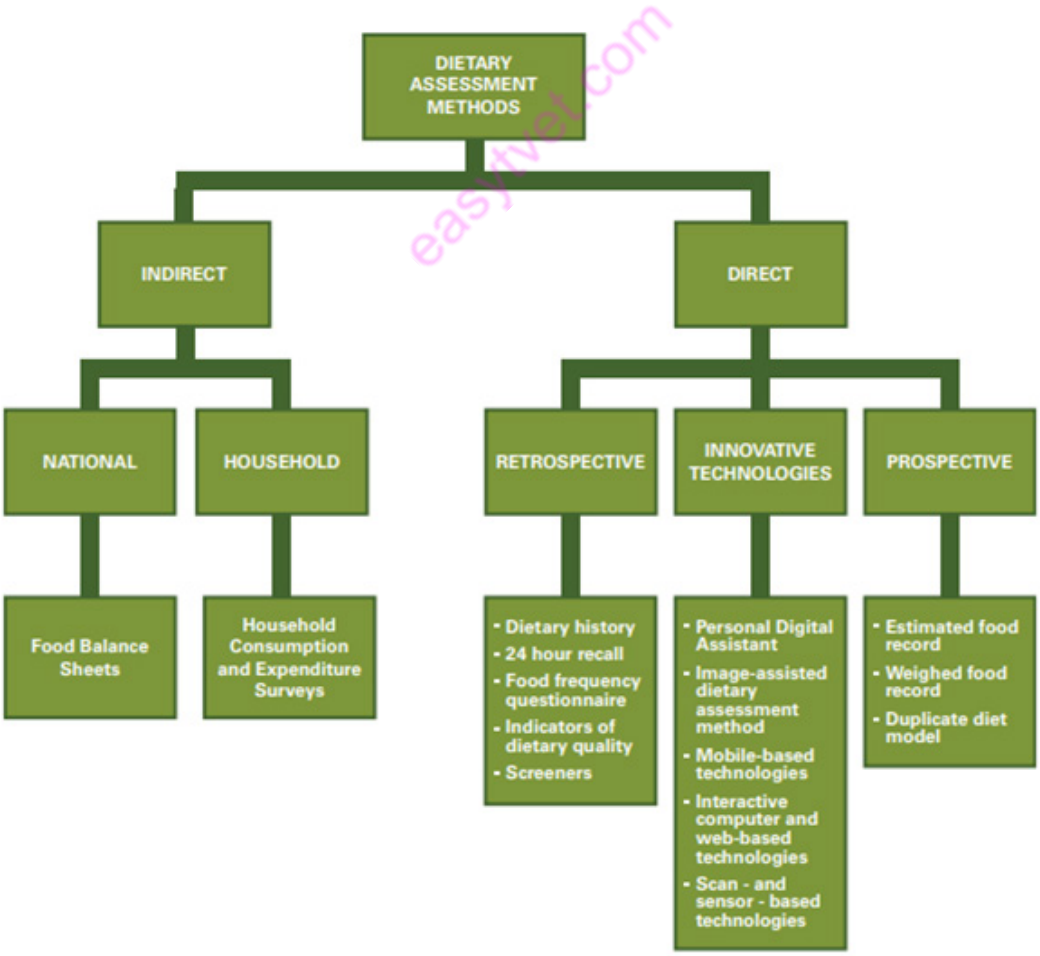
*Household food consumption:* defined as "the total amount of food available for consumption in the household, generally excluding food eaten away from the home unless taken from home"

## Content

### *Dietary assessment*

Dietary assessment method is an evaluation of food and nutrient intake and dietary pattern of a client(s) in the household or population group overtime

Dietary assessment is usually categorized according to the nature of method used i.e. indirect and direct methods.




*Overview of dietary assessment methods to estimate food and nutrient consumption at national, household and individual level*

### Indirect methods

Use secondary information such as food supply, agricultural statistics and food expenditure to estimate food availability at national and household levels.

At national level, food balance sheets (compiled by FAO annually) are used while household consumption and expenditure surveys are used at household level

### Direct methods

Use primary information which are collected using individual based dietary assessment

They are classified into two; retrospective direct methods and prospective direct method.

Three retrospective methods are commonly used to assess the nutritional intake of humans and they collect information on foods and beverages already consumed. They include;

- 24 hours dietary recall
- Food frequency questionnaire (FFQ)
- Dietary history since early life

Prospective methods assess current food intake and they include;

- Food dairy technique
- Observed food consumption
- Duplicate meal method



Estimates obtained from direct methods are used to identify trends in food consumption, food and nutrient intakes, eating patterns, and to evaluate diet–disease associations. Information provided by such methods can also be used to calculate relevant food-based indicators for monitoring and evaluation purposes.

### 24-hour dietary recall

24-hour recall a method of dietary assessment in which an individual is asked to remember the specific food eaten during the past 24 hours. This method involves a trained interviewer asking the client to remember all food & drink taken during that period. Information on 24-hour recall is collected using an open-ended format. Quantitative information on food intake, as described using portion size, allows for the calculation of energy and nutrient intakes. Estimation of portion size is facilitated by the use of measurement aids such as standard household measures, photo atlases, food models, etc. To calculate energy and nutrient intakes, the estimated portion size or the amount of food intake is multiplied by the values of nutrient content in foods as found in the food composition tables. The interviewer then analyses the information. Food models and food photos albums are used when estimating the food portion size consumed. The respondent is presented with a standard food model or food size in the photo album and then the amount of food taken is compared to this standard food size to estimate what was actually consumed.

**How to collect data using 24-hour recall**

Project objectives and budget will determine the study design and sample size. It is important to:

- Understand the characteristics of the target population.
- Define the purpose and research questions of the study.
- A trained nutritionist and dietician is required to conduct this form of assessment

**Target population group**

Characteristics: population groups (e.g. toddlers, pregnant women, elderly, etc.), age, literacy level, numeracy skills and cognitive abilities of the respondents assessed will have an impact on the mode of administration used.

Parents can act as a proxy for children less than eight years old and can assist older children.

Surrogate reporters can be used as proxies for the elderly if there is evidence of cognitive decline. Note that this increases the chances of error, particularly if the individual is under the care of multiple caregivers during the day.

***Food intake and meal patterns.*** It is important to:

Understand the food intake and meal patterns of the target population group and also identify specific subgroups of the population (e.g. shift workers, pregnant and lactating women) who may have different meal patterns.

***Mixed diets (composite diets).*** It is important to

Understand local recipes, identify and record all ingredients consumed and have a strong appreciation of how to measure portion sizes of mixed dishes

**Information on dietary supplements (e.g. vitamins, minerals)**

***Mode of administration***

- Face-to-face interview, computer-assisted recall or telephone administered recall.
- The researcher should explain to the participants that the goal of this interview is to record everything that the participant ate (meals and snacks) the day before, starting with the first thing eaten by the respondent in the morning until the last food item consumed before he/she got up the next morning.
- Method used for recording information (e.g. pen and paper, scannable format)
- Number of recorded days
- Selecting the number of days that will allow for an appropriate estimation of an individual's usual intake.
- A single 24-hour recall does not represent an individual's usual diet (hence multiple days are needed), nor does it take into account daily, weekly or seasonal variations of an individual's food intake.

- The time frame for a 24-hour cycle needs to be defined using reference points applicable to the target population (e.g. first food/drink consumed after waking up in the morning to the last food/drink consumed before going to sleep at night).
- Days selected for conducting the assessment (weekday vs. weekend)
- Non-consecutive days are preferable, helping to capture more of the variability in an individual's diet.
- Including one weekend day in a week is desirable, to capture variability of food intakes during weekends.
- Knowledge and skills of the interviewer. Interviewers should;
- Receive training on conducting a 24-hour recall with standardized procedures, including practice interviews prior to the start of the study.
- Know how to probe the respondent using standardized and non-leading questions that are specific to the food consumption patterns of the target population.
- Ideally have knowledge of local foods, eating patterns, food preparation methods and the specific cultural practices of the study population.

**Conducting a pilot study**

Select subjects and geographic sites that are representative of the actual target population for the pilot study.

Identify any logistical and/or technical problems in the pilot study in order to fine-tune the survey procedures and to identify problems that may occur in the interviews prior to the actual survey, such as discrepancies in interview protocol, recalling and recording of composite dishes and food matching with food composition data.



**Estimating portion sizes**

Using food models, photographs (photographic atlas) or standard household measures to help estimate portion sizes and food intake.

For liquids (e.g. soups or beverages), record quantities as volumes, preferably using the respondents' own household utensils after these have been calibrated.

Conversion factors or a food composition database are required to convert household measures to weight equivalents

It is necessary to have access to a food composition database which is up to date, complete and includes locally available foods as much as possible for nutrient estimation

It is important to assess validity and reproducibility

**Procedures to minimize errors**

Train interviewers prior to the recall to become familiar with the dietary patterns of the study population.

Create a standardized interview protocol.

Calibrate utensils in the home and use standardized methods for portion size estimates.

Use effective probes/prompts to reduce respondent memory lapses.

Utilize multiple-pass interviewing techniques.

**Reviewing the recall data**

Check and identify errors in the dietary data with the respondent during the interview. This should be conducted at the same time as the interview in order to ensure the most accurate information is obtained and to limit missing data.

**Analysis of data from 24-hours recall**

A computer software package is used to analyze the amount of various nutrient consumed per day.

It uses the information from food composition table where the amount of nutrient in 100 grams of a food sample is already known.

It computes the amount of nutrient in each meal component and then calculate the total amount consumed per day.



**Advantages:**

- It is quick, easy, & depends on short-term memory, but may not be truly representative of the person's usual intake.
- This method is quick thus can be used in large surveys.
- Can be used even with illiterate people
- The method is relatively inexpensive/ it is cheap.
- It does not require too much room the respondent hence compliance is high.

**Disadvantages:**

- The respondent may lack the ability to recall accurately the kinds and quantities of food eaten
- Interviewer may experience difficulty in determining whether the day being recalled represents an individual's usual intake
- Risk of exaggeration low intakes and under reporting of high intakes

- It is recommended that this method be used concurrently with the food frequency questionnaires in order to get more accurate intake estimates.

**Food frequency questionnaires(FFQs)**

This is a method of obtaining qualitative description information about usual food intake. It has a set of frequency of consumption by respondent. In this method the subject is given a list (usually closed ended) of around 100 food items to indicate his or her intake (frequency & quantity) per day, per week & per month. This method assesses the frequency with which foods are consumed over a certain period of time so as to determine the diet diversity. Before carrying out study one may need a preliminary survey to determine the foods consumed. The data can be collected either daily, weekly, monthly or yearly depending on the study objectives.

**Key considerations when selecting a food list for FFQs**

Foods selected should encapsulate the objectives of the assessment, e.g. to measure intake of only a few foods and nutrients, or to undertake a comprehensive dietary assessment

Whether to rank individuals' consumption or provide a measure of absolute nutrient intakes.

It is often preferred to put together a comprehensive list of foods and/or of food groups to allow for energy adjustments. Aggregating foods into food groups can be used as a technique to capture specific nutrient(s) or non-nutrient(s) when these nutrients are confined to a relatively small number of foods. However, aggregation of foods into small groups may lead to underestimation of intakes, whereas larger food groupings can lead to overestimation of intakes. Aggregating food can further lead to over counting due to difficulties in reporting combined frequency for a particular food eaten both alone and/or in mixed dishes

The choice of foods in a list is partly data driven and partly a question of scientific judgment. Selected foods can be used to capture the major sources of energy and/or nutrients consumed by the study population, variability in food intake between persons, and of course the study objectives

**How to collect data using FFQs**

Project objectives and budget determine the study design and sample size

One will need to:-

- Define the target population (elderly, children, adolescents etc.), literacy level, and cognitive ability
- Determine frequency categories in the FFQ: times per day, times per week, times per month, rarely, never etc.
- Developing a survey protocol
- A survey should be adapted to local cultural context, e.g. meal patterns, shared dishes, non-standard eating and serving tools.

- A validation exercise can be applied to test the efficiency of the protocol.

### Identifying sources of information

Information on foods consumed by a population can be obtained from national or regional survey data, databases, or from undertaking a focus group discussion with the target population.

### Development of a food list and assigning food codes

Foods selected should represent those commonly consumed by the target population and the food list should be in line with the study objectives.

### Adapting an existing food list

If a similar FFQ already exists, it can be used in its original form or modified/ adapted by adding or replacing foods with items more commonly consumed in the target population, or by adapting the food list to target a specific nutrient. However, changes to an FFQ will require a validation study.

Update the database as required to include all the food components of interest.

Assessing the need for portion size estimation (non-quantitative, semi-quantitative or quantitative)

Determining if the FFQ should collect quantitative information on food intake would depend on the objectives of the study, age of respondents, homogeneity of the target population, standard units available, and the type of information to be collected.



### Estimation of portion size (semi-quantitative or quantitative FFQ)

- Using food models, photographs or household measures to help estimate portion size.
- Supplementary questions (about cooking methods, brand names, etc.)
- Open ended section
- Respondents may record consumption of other foods that are not included in the close-ended food list.

### Mode and time of administration

- Self-administered using paper or web-based formats, or interviewer administered via face-to-face or telephone interview.
- To account for seasonality, the survey can be administered at different times of the year (different foods may be available for consumption during different seasons).
- Method used for recording (e.g. pen and paper, scannable format).

**Length of FFQ**

To reduce respondent fatigue and reporting error, FFQ length should not be too drawn out and food items should be carefully selected.

Increase the number of foods included in a FFQ and at the same time keep the length of the questionnaire short by grouping together items based on food classification or nutrient similarity.

Reference period for the FFQ: e.g. previous weeks, months, etc. Bear in mind that FFQ may not be suitable for recalling diet in the distant past (e.g. the previous year)

**Availability of a food composition database**

Ensure that a food composition database is available which is up-to-date and complete, and includes locally available foods.

**Advantages of FFQs**

- It is inexpensive, more representative & easy to use.
- Covers long period, not influenced by short term changes
- Can capture a range of foods
- It does not affect eating behaviour because it is retrospective
- Has the ability to capture portion sizes



**Limitations of FFQs**

- Long Questionnaire
- Errors with estimating serving size.
- Needs updating with new commercial food products to keep pace with changing dietary habits.
- Reflects more of people's desire than reality
- It is not possible in children<7yrs
- Risk of misinterpreting the self-administered questionnaires

**Diet History**

Dietary history is a detailed dietary record; may include a 24- hour recall, food frequency questionnaire, food diary and other information such as weight history previous diet changes, use of supplements, and food intolerances. It aims to discover the usual food intake pattern of individuals over a relatively long period of time. It is an accurate method for assessing the nutritional status. The information should be collected by a trained interviewer. Details about

usual intake, types, amount, frequency & timing needs to be obtained. Cross-checking to verify data is important.

It is an interview method composed of two parts:

The first part establishes the overall eating pattern and includes a 24h recall: questions like "what did you have for breakfast yesterday?" coupled with "what do you usually have for breakfast?" following through the entire day in this way. Clients are asked to estimate portion sizes in household measures with the aid of standard spoons and cups, food photographs or food models.

The second part is known as the "cross check". This is a detailed list of foods that are checked with the client.

Questions concerning food preferences, purchasing and the use of each food serve to verify and clarify information given in the first part.

**How to collect data using Diet history**

Project objectives and budget determine the study design and sample size

It is very important to understand the specific target population, and the purpose and guidelines for the study.

**Population characteristics**

Consider age (e.g. toddlers, adolescence, elderly, etc.), pregnant/lactating, literacy level and cognitive abilities of the respondents will have an impact on the mode of administration.



**Food and meal patterns**

The nutritionist/dietician needs to understand the food and meal patterns of the target population and identifying specific subgroups of the population who may have different meal patterns (e.g. shift workers, pregnant and lactating women).

**Mixed diets (composite diets)**

It is important to have an understanding of local recipes and to identify all ingredients consumed.

Gather information on dietary supplements (e.g. vitamins, minerals) as well.

Mode of administration for diet history

Face-to-face with an interviewer or computer-administered (interviewer-based or self-administered).

**Length of assessment**

To reduce respondent fatigue and over-reporting, interview length should be kept short.

Reference period for the interview, e.g. previous weeks or months. Keep in mind that recalling diets from the distant past (e.g. previous year) may result in recall bias

**Recording method**

Use of food models, photographs and/or standard household measures.

Brand names, a complete description of the method of preparation and cooking, and the recipes for composite dishes should all be recorded.

**Capacity of the dietary assessment coordinator**

A trained nutritionist is needed to conduct the interview.

The nutritionist should have experience in gathering detailed information on the consumption of food and drink, and information related to the respondents' food habits, e.g. food allergies, seasonal variations and dietetic preferences, etc.

They should know how to probe the respondent using standardized and non-leading questions.

The dietitian or nutritionist needs knowledge of local foods (including brands), preparation methods, recipes and portion size.

**Availability of a food composition database**

Ensure a complete and up-to-date food composition database is available which also includes locally available foods.

**Advantages of diet history**

- It estimates nutrient intakes over a long period of time
- Provides quantitative estimates of energy and nutrient intakes
- Does not rely on the literacy of the respondent
- Provides information on foods that are not regularly consumed
- Does not interfere with normal eating habits
- Provides details of meal patterns, individual foods consumed and usual food intake after completing a single interview



**Disadvantages of diet history**

- It takes about one hour of careful questioning, and the interviewer must be a nutritionist or dietitian experienced in obtaining diet histories.
- Labour-intensive, time-consuming, may not be suitable for young children and elderly respondents
- To obtain detailed information on food intake, longer interview times are needed, resulting in high respondent burden
- Portion size estimation of past meals can be difficult, even with the use of aids
- Requires trained personnel with knowledge of local food culture and eating patterns (interview-based dietary history)
- Requires literate respondents with the ability to estimate portion size (self-administered dietary history).
- Expensive to administer
- Data entry and coding is time consuming and requires trained personnel

### Prospective direct methods

These methods involves recording of the all the food and beverages consumed at the time of consumption, hence allowing for current food intake to be recorded.

The methods involve weighing and recording food, estimating and recording food and duplicate meal method.

### Food diary

Food intake (types & amounts) should be recorded by the subject at the time of consumption. The length of the collection period range between 1-7 days. Reliable but difficult to maintain.

### Observed food consumption

The most unused method in clinical practice, but it is recommended for research purposes.

The meal eaten by the individual is weighed and contents are exactly calculated.

The method is characterized by having a high degree of accuracy but expensive & needs time & efforts.

### Interpretation of dietary data

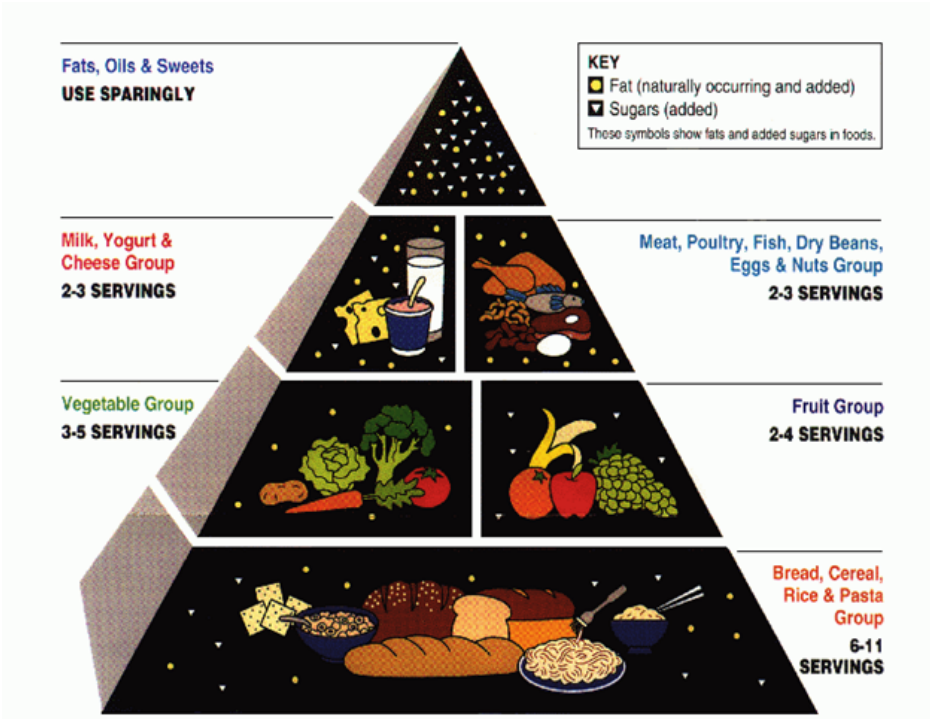
#### *Qualitative Method*

Using the food pyramid & the basic food groups method.

Different nutrients are classified into 5 groups (fat & oils, bread & cereals, milk products, meat-fish, poultry, vegetables & fruits)

Determine the number of serving from each group & compare it with minimum requirement.





### Quantitative Method

The amount of energy & specific nutrients in each food consumed can be calculated using food composition tables & then compare it with the recommended daily intake.

Evaluation by this method is expensive & time consuming, unless computing facilities are available.

### Illustrations

Food Diary

Daily Calorie Goal 2150

| | Meal | Food / Drink | # of Servings | Serving Size | Protein (g) | Carbs (g) | Sugar (g) | Fat (g) | Calories |
|---|---|---|---|---|---|---|---|---|---|
| Tue, Aug 15, 2017 | L | Peanut Butter Sandwich | 1 | 1 | 10.3 | 42.2 | 12 | 14.2 | 327 |
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| | | | | | | | | | |
| 165 | | DAILY TOTALS (Calories Remaining: 1823) | | | 10.3 | 42.2 | 12 | 14.2 | 327 |

| | Meal | Food / Drink | # of Servings | Serving Size | Protein | Carbs | Sugar | Fat | Calories |
|---|---|---|---|---|---|---|---|---|---|
| Wed, Aug 16, 2017 | | | | | | | | | |
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| | | DAILY TOTALS | | | | | | | |

| | Meal | Food / Drink | # of Servings | Serving Size | Protein | Carbs | Sugar | Fat | Calories |
|---|---|---|---|---|---|---|---|---|---|
| Thu, Aug 17, 2017 | | | | | | | | | |
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| | | DAILY TOTALS | | | | | | | |



### CASE STUDY

George is 42 years COPD has been referred to your clinic for dietary assessment. He lives alone and he is always anxious and depressed, his health affects day to day function and is very limited on what he is able to do. He attends physiotherapy twice a week. He has never seen a dietician.

Weight 61.0 kg, height 183 cm

Weight loss has occurred gradually over the last 6 years and has had 5 hospital admissions this year.

To receive lung transplant George must reach a goal weight of 67.0 kg

***Diet history***

- B/F Tea with bread
- Lunch small meal of rice and soup
- Dinner Ugali manage (sometimes too tired to eat)
- Snacks rarely

**Questions**

Prepare a dietary plan to evaluate the effectiveness of your intervention

### *18.3.5.3 Self-assessment*

1. Define the following terms;
   i. Dietary history
   ii. Nutrient intake analysis
   iii. Household food consumption
2. _____ is a structured interview method consisting of questions about habitual intake of food and beverages over a long period of time
   A. Food diary
   B. Diet history
   C. Food frequency questionnaire
   D. Dietary records
3. Which one of the following methods of dietary assessment is in the prospective direct method category?
   A. Duplicate meal method
   B. Household consumption and expenditure surveys
   C. Dietary history
   D. Food balance sheets

4. The procedures to minimize errors during 24-hour recall include;

   A. Create a standardized interview protocol.

   B. Calibrate utensils in the home and use standardized methods for portion size estimates.

   C. Use effective probes/prompts to reduce respondent memory lapses.

   D. All of the above

5. Differentiate between;

   A. Indirect methods and direct methods of dietary assessment

   B. Prospective and retrospective methods of direct methods of dietary assessment

6. Describe the factors you would need to put into consideration when collecting dietary data using;

   i. 24-hour dietary recall

   ii. Food frequency questionnaire (FFQ)

7. Highlight the advantages and disadvantages of using diet history as a method of collecting dietary data

8. Outline the prospective direct methods which are used to assess food intake



### *18.3.5.4 Tools, Equipment, Supplies and Materials*

A file/archive with the name and telephone numbers of the participants and when they can be contacted (which days, and time of the day)

Computerised interview program (alternatively lists with predefined questions)

Picture brochure for food quantification

Telephone equipped with headset

Quiet surroundings

Computers with internet

Library and resource Centre

WHO guidelines

MOH policies and guidelines

Skills lab

LCDs, video clips, charts and other teaching aids

Stationery

Invited expert

### *18.3.5.5 References*

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## 18.3.6 Learning Outcome 5: Conduct nutrition surveillance

### *18.3.6.1 Learning Activities*

| Learning activity | Special instructions |
|---|---|
| Determine method of nutrition surveillance<br>Meaning of nutrition surveys<br>Identify and describe the steps in conducting nutrition surveys (nutrition survey designs, sampling methods, determining sampling size, data collection tools etc | Select the correct method of dietary assessment<br>Determine the tools for assessing dietary diversity<br>Be keen to identify any possible errors in dietary assessment |
| Obtain surveillance information<br>Identify the sources of surveillance information<br>Determine the steps to follow during nutrition surveillance | Conduct nutrition surveillance |
| Determine type of nutrition surveillance systems | Apply nutrition surveillance systems |



### *18.3.6.2 Information sheet*

**Definitions**

Importance of nutrition surveillance

Establish the baseline of a health condition

Understand trends and pattern of disease

Detect outbreaks or emergence of new disease

Estimate the magnitude of health problem

Identify resources needed during and after public health emergencies

Evaluate public health programs and control measures

Determine nature and history of disease

Monitor changes in infectious agents

Set research priorities

Stimulate research

Inform research plan and implementation

Support public health program planning

Monitor changes in public health practice

## Methods of nutrition surveillance

The methods of data collection in Nutritional Surveillance systems are usefully grouped into four categories:

1. Repeated surveys (national sample surveys and smaller-scale surveys),
2. Growth monitoring (clinic based and community based),
3. Sentinel site surveillance (community based and centrally based)
4. School census data.

## Repeated surveys at national level

The main strength of national surveys is that they are representative of an entire population and can therefore be used to assess the impact of national nutrition-related programs. Survey results may also be useful in determining geographical areas for targeting on the basis of high levels of malnutrition.

Weaknesses include the very high costs of implementation, the frequent lack of contextual information, the exclusion of some population groups and the inability to disaggregate data on the basis of gender or socio-economic groupings.

National-level surveys can be expanded or adapted to capture the impact of a major crises and to determine where resources are most needed.



### *Repeated small-scale surveys*

The advantage of repeated small-scale surveys is that they are relatively quick to implement and to analyze.

In emergency contexts, this is particularly important as data on the prevalence of wasting can be used to trigger specific interventions, although this may be problematic in situations of chronic emergency.

The weaknesses of using repeated smaller-scale surveys relate to the often limited scope for data disaggregation which may not be sufficient to allow targeting of particular population groups (targeting may in any case be difficult for political reasons).

The costs, in terms of human resources and staff time, are also high when surveying in widely dispersed communities. Obtaining statistically representative samples in areas of insecurity may also be a problem

## Growth monitoring

Growth monitoring refers to the continuous monitoring of growth (usually weight for age) in children.

Growth monitoring can be conducted by health professionals at Maternal and Child Health (MCH) clinics (clinic-based) or by trained members of the community in villages (community-based).

The main objective of growth monitoring is to monitor and manage the nutritional status of individual children and to mobilize local resources to support nutrition-related activities.

Families with children at risk may be given a food supplement and/or nutrition counseling. Children are usually measured once per month. Community based growth monitoring is mainly used in UNICEF supported programs or by international NGOs

***Clinical-based growth monitoring***

An important strength of clinic-based growth monitoring data is that it is frequently the only regular source of nutritional data available nationally.

Furthermore, as it is frequently an established part of the national health information system, it is an easily accessible source of data providing a potential source of information on trends and allowing comparison between geographical areas.

Through identifying vulnerable geographic areas, targeting decisions can be made. Clinic-based growth monitoring data may be especially useful in emergencies where there is insecurity and it is not possible to carry out surveys.

It may also provide early warning of a deterioration in health and food security.

A major weakness with using clinic-based growth monitoring data is that the population who attend clinics is not representative of the total population.



There are several reasons for this.

Firstly, only 'healthier' children tend to attend clinics for growth monitoring.

Secondly, fewer children over the age of one year attend clinics for growth monitoring as vaccinations are complete and mothers may see no reason to attend.

Thirdly, weighing and recording by clinic staff can be inaccurate.

Nevertheless, the problems of under reporting at clinics is likely to be true in all clinics, thus information collected from different regions of the country can still be usefully compared and changing levels of malnutrition can be assessed.

There are, however, some reported cases in the literature where this is not the case

A further problem with clinic-based growth monitoring is that MCH staff often do not have the time or the training to be able to analyze and act on the population data which they are collecting.

Usually it is necessary for a central body to collect and analyze data sent in from the clinics. This requires resources that many governments do not have. Unless donor funding is forthcoming, therefore, vast amounts of data can be collected but are not analyzed or used.

The system may be unsustainable without outside donor funding and so the system collapses. Clinic-based growth monitoring data also suffers from the constraint that information, which could explain the causes of malnutrition, is not necessarily available.

Growth monitoring data alone is of limited use.

### *Community based growth monitoring*

Community-based growth monitoring is widely supported by UNICEF, international NGOs and, more recently, World Bank supported nutrition programs.

An important element of this approach is to empower communities to gather, interpret and act on nutrition-related information. The strengths of a community-based growth monitoring system is that it can work very well when community nutrition mobilisers are adequately resourced, trained and supported to facilitate communities to deal with nutritional problems.

They can also provide a more comprehensive coverage of the under-five population compared to clinic-based growth monitoring.

The weaknesses of this approach include problems of data accuracy, delays in analysis, lack of contextual information to complement the growth monitoring data and difficulties in ensuring that information receives attention from the district or regional level

## Sentinel site surveillance

Sentinel site surveillance refers to the monitoring of purposively selected communities or service delivery sites in order to detect changes in context, program and outcome variables.

Communities are purposively selected for a number of reasons. For example, a community may be of particular interest because of its innovative farming practices or a community may be particularly vulnerable to food insecurity in times of crop failure.

Data can be collected and analyzed centrally (centrally-based) or by trained members of the community (community-based). Clear distinction may be difficult as centrally based systems may have elements of community involvement.

Centrally based systems are more likely (but not always) to carry out statistically valid anthropometric surveys.

### *Centrally-based sentinel site surveillance*

Centrally-based systems are less costly than national surveys and can reveal more in-depth information on the causes of malnutrition.

Data collectors tend to spend a longer period in the targeted communities (as they are covering fewer areas) and, where the results are pre-processed in the field, rapid feedback can be given to the community.

Where the surveillance targets the most vulnerable communities, this can provide good early warning of crises.

The main weaknesses of the approach are: the lack of inclusion of population groups which may also be of interest but have not been selected; the fact that the data collected is not representative of the wider population and cannot be generalized; and the risk that the data may not be comparable with other survey data

### *Community-based sentinel site surveillance*

Community-based surveillance, as with community-based growth monitoring has the potential advantage of empowering the community whilst at the same time being of relatively low cost when compared to centrally based systems.

This kind of system is particularly useful in emergencies when insecurity prevents representative sampling. The major constraints of the method are that the areas selected may not be representative of the wider population and that data quality may not be high.

These constraints may mean that data are not used by decision-makers because of their unreliability, and that as a result of inaction, the level of community participation is reduced.

Another constraint may be the 'opportunity cost' to those collecting data as there may be no remuneration.

### School census data

Nutritional indicator monitoring is occasionally undertaken in schools.

The usual form of measurement is height for age (height retardation or stunting). First grade children are often measured through censuses that are carried out every two to three years.

The method has been used to identify high-risk populations with poor health, malnutrition and low socio-economic status.

The main strengths of this method are that it is both cheap and provides very good population coverage.



### Importance of nutrition surveillance information

The general purpose of surveillance is to reduce mortality and morbidity through timely prevention and control through;

- Understanding the problem
- Defining priorities
- Setting objectives
- Determining strategies
- Evaluating control/prevention
- Suggesting further research

Initiating surveillance system activities

- Choose a condition that has proved control measures available
- Define how data collected shall be used
- Set a standard case definition
- Use existing system

- Visit those who supply data
- Develop a database
- Develop a regular reporting system for distribution

Sources of surveillance data

- Mortality
- Morbidity
- Case reports
- Epidemic reporting
- Epidemic field investigations
- Demographic and environmental data
- News media

Surveillance processes involve;

- Routine surveillance
- Active reporting
- Sentinel physician reporting
- Laboratory surveillance
- Hospital surveillance
- Data analysis
- Reports and evaluation



**Principal Users of Nutrition Surveillance Systems Information**

1. Government departments
2. Research Institutions
3. International Organizations- WHO, UNICEF
4. Regulatory, advisory and professional bodies

**Nutrition surveys**

Despite all efforts undertaken both nationally and internationally, poor nutritional status is still a fundamental cause of disease and shortened life-span.

Most people are aware that many factors are either directly or indirectly responsible for undernutrition, including insecure food supply, lack of basic education, inadequate health services, deteriorated environment, low income, and inadequate empowerment.

The factors contributing to malnutrition vary from community to community

To improve the nutritional status and improve living conditions in communities, it is necessary to determine the nature, magnitude and causes of malnutrition.

Anthropometric indices are internationally accepted as nutrition key indicators of populations. Additionally, they have been recommended repeatedly as a suitable key indicator for poverty as well.

The use of anthropometric indicators is based on the extensively observed phenomena that a growing child who lacks an adequate intake of food and is repeatedly ill, does not have the body height corresponding to its genetic potential.

Furthermore, inadequate food availability, caring capacity, basic education, health systems, housing and environmental conditions have been proven to be underlying causes of inadequate food intake and repeated episodes of diseases.

To measure the impact of nutrition-oriented programs/projects, i.e. self-standing nutritional programs/projects and nutrition-related programs/projects, it is necessary to collect quantitative information.

Therefore, projects/programs must start with a baseline survey, and such survey must be repeated periodically.

The purpose of nutrition survey findings is to:

Identify emergency affected populations and confirm the occurrence of a food and nutrition emergency.

Estimate the number of malnourished individuals, the kind of malnutrition and target the most vulnerable populations for intervention. It is essential to standardise nutrition survey methods so that findings can be compared to findings of surveys in other areas and over time (see Tables 9-6 and 9-7);

Monitor the adequacy of food and nutrition emergency interventions and improvement in the nutritional status of the affected population. The first survey in an area can be used as a baseline.



**Objectives of a nutrition survey**

To provide information that contributes to the analysis of causes and associated factors and therefore permits a selection of preventive measures, which may or may not be nutritional.

To promote decisions by governments concerning priorities and the disposal of resources to meet the needs of both “normal development” and emergencies.

To enable predictions to be made on the basis of current trends in order to indicate the probable evolution of nutritional problems. Considered in conjunction with existing and potential measures and resources, these predictions will assist in the formulation of policy.

To monitor nutritional programmes and to evaluate their effectiveness.

In emergency settings, the objectives specifically focus on:

A warning system. This is used as a means of highlighting an evolving crisis.

Identification of appropriate response strategies. These may include non-food as well as food assistance to address the underlying causes of malnutrition.

Triggering a response. Nutrition surveillance systems provide a trend analysis focusing on the magnitude of change. This may trigger an in-depth assessment, which in turn may lead to a response.

Targeting. Nutrition information can help target areas that are more at risk or in greater need of assistance.

Identification of malnourished children. Some forms of surveillance can identify acutely malnourished children.

**Challenges**

The most important aspect of a food and nutrition surveillance system is to ensure effective links between information and action. However, the reliability of data, timeliness of reporting, efficient action management and sustainability are challenging. A further challenge is the interpretation of findings. Similar levels of acute malnutrition have different significance, depending on the context. Unless the underlying causes of nutritional disorders are understood, an appropriate response may not be provided.

**Sustainability**

One of the biggest challenges is ensuring effective continuity of the system. One of the main reasons for the failure of surveillance systems in the past was that national or local governments were unable to provide the resources needed to maintain them. When establishing a surveillance system, it is essential to consider and plan for long-term sustainability, especially in areas where there is a high probability of prolonged crisis. Ideally, if a system proves to be effective and sensitive in monitoring change over time, there should be no difficulty in justifying long-term resource provision. An accurate early-warning mechanism that triggers a response is far more cost

**Types of nutrition surveys**

There are four types of nutrition surveys (rapid appraisal, rapid assessment, baseline survey and follow-up survey); each is important for a different type of project or a different phase of a project.

**Rapid appraisal.**

Rapid appraisal methods are quick, low-cost ways to gather the views and feedback of beneficiaries and other stakeholders, in order to respond to decision-makers' needs for information of the nutritional situation, information on the nutritional condition of the target community should first be obtained during the planning phase using qualitative method. Qualitative methods are used. Anthropometric data (such as height and weight) are not recorded in this type of survey.

**Advantages of rapid appraisal:**

- Low cost.
- Can be conducted quickly.
- Provides flexibility to explore new ideas.

**Disadvantages:**

- Findings usually relate to specific communities or localities—thus difficult to generalize from findings.
- Less valid, reliable, and credible than formal surveys.

**Time Required:**

Four to six weeks, depending on the size and location of the population interviewed and the number of sites observed.

**Methods of rapid appraisal**

Selected for their knowledge and experience in a topic of interest. Interviews are qualitative, in-depth, and semi-structured. They rely on interview guides that list topics or questions.

Focus group discussion - a facilitated discussion among 8–12 carefully selected participants with similar backgrounds. Participants might be beneficiaries or program staff, for example. The facilitator uses a discussion guide. Note-takers record comments and observations.

Community group interview - a series of questions and facilitated discussion in a meeting open to all community members. The interviewer follows a carefully prepared questionnaire.

Direct observation - use of a detailed observation form to record what is seen and heard at a program site. The information may be about ongoing activities, processes, discussions, social interactions, and observable results.

Mini-survey - a structured questionnaire with a limited number of close ended questions that is administered to 50–75 people. Selection of respondents may be random or 'purposive' (interviewing stakeholders at locations such as a clinic for a health care survey).

Rapid assessment

Anthropometric data are measured to obtain information on the type of nutritional problems using quantitative methods.

However, the sampling selection and sampling coverage do not allow quantitative conclusions to be made concerning the prevalence of nutritional problems that can be generalized for a broader population.

Both the rapid appraisal and the rapid assessment are suitable for a pre-feasibility study for the assessment of the nutritional situation.

One of these two types of surveys should be used for identification of the project during the planning phase.

### Baseline surveys

The objective of a baseline survey is not to undertake pure research.

As the fundamental causes of malnutrition are known, it is unnecessary to gather scientifically supportable proof of a causal relationship for a nutritional problem.

A survey should record all possible important variables known from literature to be responsible for nutritional problems.

If, for example, no statistical relationship can be identified between nutritional indicators and early weaning in a project area under survey due to the small sample size, the higher percentage of early weaned children should, nevertheless, be included in a problem tree and suitable intervention measures, e.g., nutritional advice, should be considered.

Of course, these variables must be tested for their relevance no later than a pilot testing.

### Importance of baseline studies

Baselines surveys are important for any project for the following reasons:

It is a starting point for a project: One important, and recommended, way of starting a project is to carry out a baseline study. Through its results, a baseline serves as a benchmark for all future activities, where project managers can refer to for the purposes of making project management decisions.



Establishing priority areas/planning: Baseline studies are important in establishing priority areas for a project. This is especially true when a project has several objectives.

Attribution: Without a baseline, it is not possible to know the impact of a project. A baseline study serves the purpose of informing decision makers what impact the project has had on the target community. Accordingly, along with other strategies such as use of control groups, it also helps in attributing change in the target population to the project

Baseline tools are used for evaluation: the tools used during a baseline study are normally the same tools used during evaluation.

Donor requirement: In most cases, it is a donor requirement that a baseline study is carried out as part of the program process.

Since M&E is integral for any donor to establish future project success, they might, and always do compel implementing organizations to carry out baseline studies.

### Objectives of nutrition survey

The following individual activities are part of the process of a baseline survey:

- to initiate dialogues among all groups participating in a project (target group, non-governmental organizations, governmental authorities, donors, and project implementation personnel) concerning the living situation of the poor,

- to assess the needs of the poor, in particular, about their problems in daily life,
- to increase the awareness and sensitivity of the specialists involved in the project and also those responsible for programs designed to improve the basic need situation of the poor,
- to reveal the nature, magnitude and severity of the nutrition- and poverty-related problems and their possible causes,
- to identify the particularly affected target groups,
- to arrive at a causal model (problem tree),
- eventually to propose additional smaller in-depth surveys that are necessary to be carried out to diagnose important causes of poverty problems,
- to identify the appropriate scope of intervention for the improvement of the poverty situation,
- to identify project-defined indicators (poverty-related socioeconomic determining factors) for evaluation,
- to determine the impact of project measures on living conditions of the observed risk groups, and finally to obtain data for cross-sectional comparisons between the country and the project target groups.

**Follow up survey**

A follow-up survey (or multi-round survey or multi- phase survey) is a type of survey in which households included in it are repeatedly interviewed in the second, third, fourth or more visits, to obtain information on vital events by noting the changes in composition of the households that have taken place between successive visits.

The follow-up survey assesses the impact of the project or individual project measures on the nutritional condition of a community (for further information)

**Types of evaluation**

**Context evaluation**: Context evaluation is concerned with the assessment of existing information of the funding agency, the target group and the general programme environment.

Formative evaluation: This is the day to day running of the programme towards acquisition of short term objectives therefore assess programme input, output or services and the general events in the programme environment

**Impact evaluation:** Determine the ultimate effect on the beneficiaries in the long term. It is concerned with ultimate programme indicators.

**Reasons for evaluation**

- Provide useful information for other ongoing or future programme in the community
- To provide useful information to stakeholders
- To determine whether the programme was successful or not

Evaluation indicators should be specific, independent and valid. The evaluators are either insiders who implemented, took part in the planning of the programme and are more knowledgeable about the programme or external people who did not take part in the planning and implementation of the programme.

The external people are more objective than insiders.

**Indicators for nutrition survey**

Anthropometry e.g. weight, height, sex, edema, and age

- Global Acute Malnutrition (GAM)
- Severe Acute Malnutrition (SAM)
- Edema (bilateral edema)

Coverage of feeding centers: check out how well populations have enrolled in feeding programs.

Micronutrient deficiencies: check out for signs of anemia and other micronutrient deficiencies such as goiter for iodine, rickets for vitamin D etc

Mortality: this is most applicable where surveillance systems of deaths are lacking and entails listing all household members with their gender, age and births/deaths

Morbidity: this indicator focuses on the total incidences of diarrhea and acute respiratory illness within a period of two weeks.

Measles and vitamin A coverage

Breastfeeding and complementary feeding practices



**Steps in conducting nutrition surveys**

There are two main steps involved

1. Planning the survey
2. Administering the survey

**Planning the survey**

For a survey plan to succeed, the following principles must be put into consideration;

Review of existing information: involves determination of the nutritional and health status, socio-economic background, food security, cultural issues, geographical location, population and settlement patterns. This information helps one to understand the actual nutrition problem, define appropriate objectives and plan for sufficient equipment and develop an appropriate survey schedule.

Identification of survey goals and objectives: these will help in ensuring that effective outcome of the survey results is achieved. They help to inform the survey coordinator on why the nutrition survey is being conducted and the types of information needed and how this information will be used.

Identification of survey indicators: these indicators will form a range of variables for the survey. The most commonly used indicators include anthropometric indicators, mortality data, morbidity data, infant feeding, care practices and household food consumption patterns.

Selection of survey methodology: this points towards the type of survey design to be used, whether the survey will focus on households or target population only.

Selection of survey sample: sample is a proportion of a total population which is very useful when dealing with a very large target population. Different sampling methods can also be applied to get the representative sample, depending on the goals and objectives of the survey. These include;

- Simple random sampling
- Systematic random sampling
- Stratified sampling
- Two-stage Cluster sampling

The sample size is determined by the expected prevalence of the characteristics to be measured and the desired degree of precision in the estimated. Nutrition surveys require different sample sizes necessitating different types of sampling techniques so as to collect anthropometric, clinical and biochemical data. A sample method for calculation sample size is as follows;



$$n = \frac{k \times t^2 \times (1-p) \times p}{\gamma^2}$$

n= sample size

k= design effect- for simple random sample, use 1

t= confidence interval (1.96 for 95% confidence interval)

p= estimated prevalence of malnutrition

γ= precision

Nutrition survey designs should be constructed by the nutritionists and statistician together. The data collection tools that can be used in nutrition surveys include questionnaires, interviews

Identification of the types of personnel, equipment and resources required for carrying out nutrition survey

Agreement on roles and responsibilities of partners whereby all measures should be put in place to ensure all representatives of each sector represented is involved in the survey

Preparation of activity schedule: a detailed time and activity schedule which are to be completed within the set time frame and cost.

Development of data coaction instruments: these are resources that will be used to collect data and may include; questionnaires, interview schedules, focus group discussion guides and observation checklists

Pretesting of data collection instruments

**Administering the survey**

This step will involve translating the plans into actions as follows;

- Logistical arrangements
- Survey team selection
- Training research personnel
- Supervision of survey process
- Actual data collection activities
- Selection of appropriate data processing methods and ensuring quality control procedures

*Data analysis:* done using appropriate statistical tools. Data entry and clustering should be done then cleaned, analysed and interpreted. Different software can be used to analyse nutrition surveys and examples include; NutriSurvey, Epi-Info software. The most preferred is NutriSurvey because of its convenience in analysing anthropometric and mortality data. However, it lacks capability to analyse other data in the survey like morbidity, feeding practices among others hence Epi Info can be used to cover such.

*Interpretation of data*: this should be done by comparing the actual findings per indicator against a standard reference like the cut-off points in anthropometry.

**Report writing**

Discussion on the survey findings and recommendations

Dissemination of survey findings to the partners, mostly capturing;

Demographics:

- Number of children (categorised in gender)
- Age and age group distributions
- New arrivals (non-regular members)

Nutrition status

Median/mean weight-for-height and height-for-age z-scores

- % severe, moderate and global acute malnutrition (total, age, sex)

- % severe, moderate and global chronic malnutrition (total, age, sex, new arrival status)
- % edema and angular stomatitis

Programme coverage

- % currently enrolled in SFP/TFP and % below -2 z-scores who are not enrolled in SFP/TFP
- % that received vitamin A supplement within last 6 months, last 1 year, last 2 years, last 3 years, last 4 years and % never received vitamin A supplement

Number referred to SFP/TFP during survey

Once the nutrition survey is completed, there is need to follow up with stakeholders on how to use nutrition data generated from survey;

Implement nutrition survey recommendations continue monitoring and evaluation of the situation.

### *18.3.6.3 Self-assessment*



1. Define the following terms
   A. Surveillance
   B. Nutrition survey
   C. Growth monitoring
2. Which of the following is a weakness of repeated small scale surveys?
   A. very high costs of implementation
   B. Frequent lack of contextual information
   C. limited scope for data disaggregation which may not be sufficient to allow targeting of particular population groups
   D. The exclusion of some population groups
3. Which one of the following is not a principal user of nutrition surveillance systems information?
   A. Households
   B. Government departments
   C. Research Institutions
   D. Regulatory, advisory and professional bodies

4. _____ a series of questions and facilitated discussion in a meeting open to all community members. The interviewer follows a carefully prepared questionnaire.

   A. Mini survey

   B. Direct observation

   C. Community group review

   D. Focus group discussion

5. Explain the importance of nutrition surveillance
6. Describe the methods used in nutrition surveillance
7. You are the dietician working at Kakuma refugee camp. One of your key duties is to conduct nutrition surveillance among the populations. Answer the folloing questions in light of this
8. How are nutrition surveillance activities initiated?
9. Identify the sources of surveillance data
10. Highlight the principle users of nutrition surveillance systems information
11. Outline the objectives of nutrition survey
12. Discuss the various types of nutrition surveys, citing their advantages and disadvantages
13. Discuss the steps followed when conducting nutrition surveys



### *18.3.6.4 Tools, equipment, supplies and resources*

Computers with internet

Library and resource Centre

WHO guidelines

MOH policies and guidelines

Skills lab

LCDs, video clips, charts and other teaching aids

Stationery

Invited expert

### *18.3.6.5 References*

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