The United Republic of Tanzania

MINISTRY OF HEALTH AND SOCIAL WELFARE

TRAINING PROGRAMME FOR NUTRITION OFFICERS at Regional and District levels

Module Three

Monitoring of Nutrition Situation

Participant's Manual

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TANZANIA FOOD AND NUTRITION CENTER

Center for Development Innovation

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PREFACE

The existence of the newly recruited and the ongoing process in recruiting the district nutrition officers, district nutrition focal persons as well as the Ministerial nutrition focal persons further emphasizes for a need to have an established formal in-service training programme. According to the Needs Assessment done on newly recruited nutrition officers, it was observed that there is there was a lack of skills in assessing nutrition status, designing and planning for nutrition activities, data management, and monitoring and evaluation of nutrition activities. The purpose of this module is to acquaint nutrition personnel with knowledge on nutritional assessment systems, designing and planning of nutritional activities, data management and communication, monitoring and evaluation.

The main focus of this module is on Monitoring of nutrition situation. The module describes various nutrition activities commonly conducted in the country and rationale for their use. The module aims at imparting knowledge and skills on various methods of assessment of nutrition status, surveillance and intervention, different research methods. Ethical principles pertaining to the conduct of nutrition activities are also explained. The module covers monitoring and evaluation of nutrition programs and projects and establishment of monitoring systems and evaluation plans. Computer software needed for management, analysis and interpretation of data and formats of disseminating nutrition information are also described.

This module on Monitoring of nutrition situation has been developed to enable nutrition officers to apply relevant nutrition assessment systems in a given context, and demonstrate correct procedures for collecting dietary, biochemical, anthropometric, and clinical data in nutrition assessment of individuals and population groups. The module will enable NOs to apply research methodologies in designing, planning and conducting nutrition activities for a specific purpose. It is also anticipated that NOs will be able to relate ethical principles in the design, collection, use and dissemination of nutrition data and information. It is expected that NOs will be able to use appropriate statistical methods to analyze nutrition data. It will empower them to design monitoring and evaluation system for nutrition programs/projects for their quality, implementation and effectiveness.

This module is practical oriented, competence-based and relevant within the context of Tanzania. It is envisioned that the module will enhance knowledge, skills and confidence to the nutrition officers in implementing their tasks and monitoring nutrition situation in our country.

ACKNOWLEDGEMENT

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ABBREVIATIONS AND ACRONYMS

ANC	Ante Natal Care
BMI	Body Mass Index
CTC	Care and Treatment Clinics
DDS	Dietary Diversity Score
FFQ	Food Frequency Questionnaire
Hb	Haemoglobin
HDDS	Household Dietary Diversity Score
IYCF	Infant and Young Child Feeding
LBW	Low Birth Weight
MDG	Millennium Development Goal
OPD	Outpatient Department
PMTCT	Prevention of Mother To Child Transmission
SAM	Severe Acute Malnutrition
SPSS	Statistical Product and Service Solutions
RCH	Reproductive and Child Health
MAM	Moderate Acute malnutrition
M&E	Monitoring and Evaluation
MUAC	Mid-Upper Arm Circumference
NBS	National Bureau of Statistics
TDHS	Tanzania Health and Demographic Survey
TFNC	Tanzania Food and Nutrition Centre
UNICEF	United Nations Children's Fund
VAD	Vitamin A Deficiency
WHO	World Health Organization

3.0 MONITORING OF NUTRITION SITUATION

A. Introduction

Malnutrition has remained high over many years without significant improvement especially on chronic malnutrition. Currently, emerging problems of over nutrition and dietary related diseases increase the burden in health care system. Improved nutrition is important for improving intellectual and economic development. Malnutrition in Tanzania has created a new challenge that calls for the acceleration of both short-term and long-term efforts to address the situation. Among the key challenges for scaling-up of nutrition interventions in Tanzania include inadequate human resource. However, the Tanzania government is making progress in recruiting and positioning nutrition officers at the District, Regional and Ministerial levels. The existence of the newly recruited and the ongoing process in recruiting the district nutrition officers, district nutrition focal persons as well as the Ministerial nutrition focal persons further emphasizes for a need to have an established formal in-Service training programme.

This module describes various nutrition activities commonly conducted in the country and rationale for their use. The main focus of nutrition activities will be assessment methods, surveillance and interventions. Nutrition officers will learn different research methods and integrate them in nutrition activities. Ethical principles pertaining to the conduct of nutrition activities will be explained. The module will also cover monitoring and evaluation of nutrition programs and projects and establishment of monitoring systems and evaluation plans. Computer software needed for management, analysis and interpretation of data and formats of disseminating nutrition information will be examined.

B. Purpose

The purpose of this module is to acquaint nutrition personnel with knowledge on nutritional assessment systems, designing and planning of nutritional activities, data management and communication, monitoring and evaluation

C. Learning Objectives

At the end of training, participants will be able to:

i. Describe key nutrition assessment systems
ii. Describe different methods and indicators of nutrition assessment
iii. Explain the nutrition assessment methods
iv. Describe scientific methodologies and techniques in designing and collecting nutrition and nutrition-related data
v. Analyze nutrition and nutrition-related data using various software
vi. Interpret data resulting from nutrition activities using various software
vii. Disseminate nutrition information to various audiences
viii. Describe monitoring and evaluation systems for nutrition program/projects
ix. Develop a monitoring and evaluation plan for various nutritional interventions

D. Learning Outcomes

Upon completion of this module, the nutrition officers will be able to:

i. Apply relevant nutrition assessment systems in a given context
ii. Demonstrate correct procedures for collecting dietary, biochemical, anthropometric, and clinical data in nutrition assessment of individuals and population groups.
iii. Apply research methodologies in designing, planning and conducting nutrition activities for a specific purpose
iv. Apply ethical principles in the design, collection, use and dissemination of nutrition data and information
v. Use appropriate statistical methods to analyse nutrition data
vi. Design monitoring and evaluation system for nutrition programs/projects for their quality, implementation and effectiveness
vii. Interpret data on monitoring and evaluation and recommend appropriate nutrition actions.
viii. Communicate nutrition information to various audiences and levels using various methods and techniques

D. Course Format and Duration

The entire training takes 32 hours**,** not including health breaks or opening and closing ceremonies. The training can be conducted over 32 hours or spread out over a longer period. The module is divided into five independent sessions that can be taught separately or be combined into package as needed. The five sessions are listed below.

i. Overview of Nutrition assessment systems
ii. Nutrition assessment methods
iii. Designing and planning of nutrition activities
iv. Data management, analysis and Interpretation
v. Monitoring and Evaluation of nutrition program and projects

E. Training Methods

The module use different training methods, among others are:

i) Presentations
ii) Brainstorming
iii) Demonstrations/ practical
iv) Field practice visit
v) Case studies
vi) Drama
vii) Stories

F. Teaching/learning materials

Flipchart and stand
Markers
Masking tape
Laptop computer
Printer and cartridge
LCD projector
PowerPoint slides
Handouts
Participant's manual
Weighing scales (child, adult)
Length/height board/stadiometer
MUAC tapes
Skin fold calipers
BMI charts
Hemoglobinometer and consumables
Glucometer and consumables
Nutrition/statistical software SPSS, WHO Anthro, WHO Anthro-Plus and ENA

G. Learning points

3.0 Overview of nutrition assessment systems

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3.1. Nutrition assessment methods
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3.2. Designing and planning of nutrition activities
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- 3.2.3. Mobilization of resources for survey and field work organization
- 3.2.4. Data collection methods and sources

3.3. Data management, analysis and Interpretation
- 3.3.1. Data analysis using appropriate software
- 3.3.2. Interpret data resulting from nutrition activities
- 3.3.3. Disseminate nutrition information to various audiences

SESSION ONE

Duration: 4 hours

3.1 Overview of Nutrition assessment systems

Introduction

Nutritional assessment systems can take one of four forms, survey, screening surveillance, and intervention

3.1.1 Nutritional survey and Screening

A. Nutrition survey

This is a method by which information is obtained concerning the nutritional status of a population or a subgroup (Gibson 2005). Information is collected by asking nutrition related questions in an interview to a representative sample of the population.

Surveys can identify and describe those subgroups 'at risk' of chronic malnutrition and may establish baseline nutritional data and/or ascertain the overall nutrition status of the population

Survey generates information on the extent of existing nutrition problems and it can be used to allocate resources to those groups in need, and to formulate policies to improve overall nutrition of the population

Example of surveys:

Longitudinal survey: Data is collected for the same population over a long period of time. Longitudinal studies are useful in establishing trends over a long period of time

Cross-sectional surveys: This is one of the commonly used survey designs that look into population issues at a given point in time.

B. Nutrition screening

This involves a comparison of an individual's measurements with predetermined risk levels or 'cutoff' points (Gibson 2005).

Screening can be carried out at the individual level as well as on specific subpopulation considered to be at risk

Screening programs are generally less comprehensive than surveys or surveillance studies.

Example screening is used to identify individuals who might benefit from supplementation, food stamp program etc

3.1.2 Nutrition surveillance or information system

Is the ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in the planning, implementation, and evaluation of health/ nutritional programs. Surveillance data are used to inform appropriate response strategies.
Nutritional status is a well-recognised outcome indicator of human welfare; therefore by closely monitoring the indicators that measure nutritional status, a better understanding of the evolving situation of a vulnerable population can be obtained.

It is an ongoing system for generating information on the current and future magnitude, distribution and causes of malnutrition in populations for policy formulations, programme planning management and evaluation".

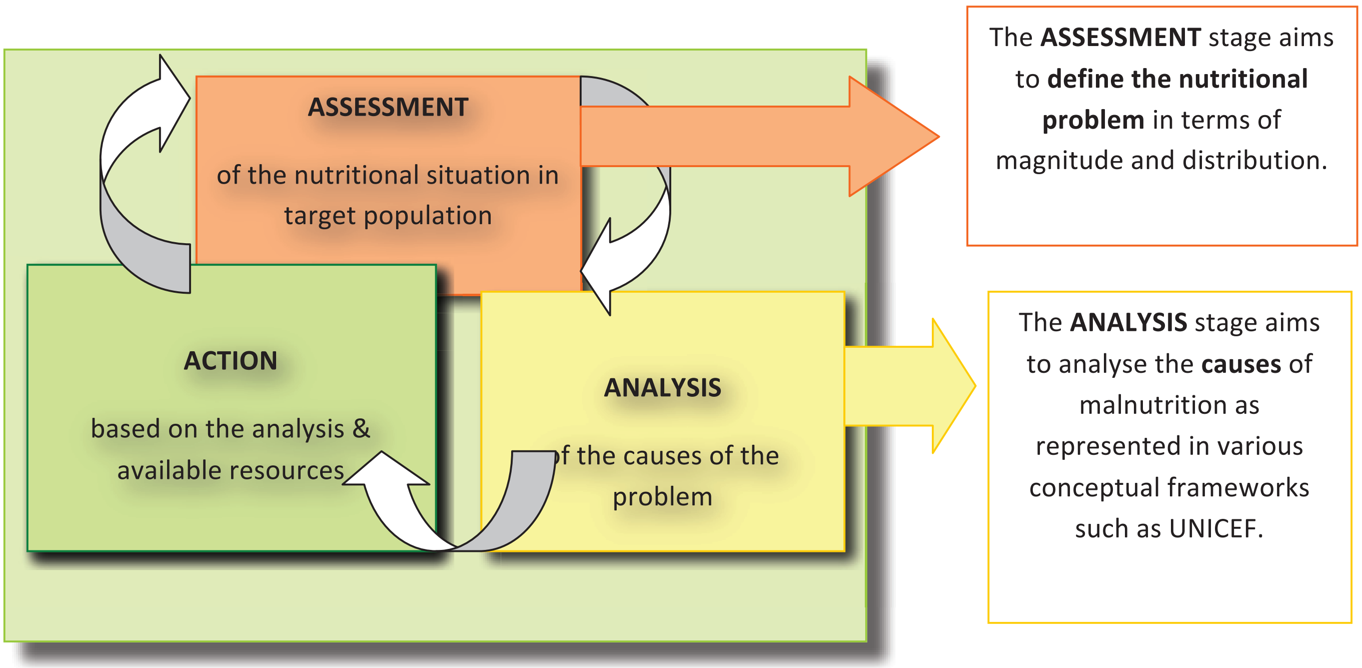
Nutrition surveillance systems vary significantly and will depend on context, type of information needed, frequency of reporting, capacity of staff, and other resources available.
The biggest challenge of all for nutrition surveillance systems is to ensure the link with information and action. Collecting, analysing and reporting on nutrition information without the appropriate response, is meaningless and a waste of resources. Recent experience has demonstrated varying degrees of success for a variety of nutrition surveillance system. However issues such as reliability of data, timeliness of reporting, effective and efficient links to action and sustainability continue to remain a challenge. A further challenge is to ensure how well the nutrition information being reported is interpreted. Similar levels of acute malnutrition can reflect different problems and unless the underlying causes are understood and reported the appropriate response may not be provided.

This session introduces the objectives of nutrition surveillance systems, the different models in use, the different types of information collected, how this information is analysed and interpreted and how it can be linked to action, as well as the challenges faced. In addition case studies of existing examples are provided for reference.

Objectives
The objectives of a nutrition surveillance/information system will depend on the context. In general there are four principles objectives. These are to inform programme design, programme management and evaluation, policy-making and crisis management. These objectives are not mutually exclusive and may also be modified over time depending upon changes in the external environment.

Nutrition surveillance refers to a continuous process and focuses on monitoring trends in the nutrition situation over time rather than providing one off estimates of absolute levels of malnutrition. Figure 1 illustrates the triple A cycle, where an **assessment** of the situation defines the nutrition problem in terms of magnitude and distribution. In the **analysis** phase the causes of malnutrition are explored while **action** is the stage of implementation of recommendations resulting from the analysis. Nutrition surveillance systems should be viewed in the same light, conducting an assessment of the nutrition situation, providing an analysis of the underlying causes and on the basis of this analysis, advocating for the appropriate action. This is done on a continuous basis.

The triple-A cycle model



Source: FAO/EC (2007) Information for action, training materials nutrition indicators

Methods used in nutrition surveillance system

In Tanzania there are many methods employed under a nutrition surveillance system with an ultimate goal of collecting, analysing, interpreting and reporting on information about the nutritional status of populations. Deciding which method to adopt will depend on the objectives, resources, environment and capacities available. The following are the main methods used for surveillance:

- Large scale national surveys
- Repeated small scale surveys
- Clinic based monitoring
- Sentinel site surveillance
- Rapid nutrition assessments
- Rapid screening based on mid upper arm circumference (MUAC) measurement
- Selective feeding programme or services statistics monitoring (monitoring the use of services such as health facilities)

There is no single prescribed method for nutrition surveillance systems in any given situation. What often occurs is that a variety of nutrition information sources are used depending on the context, what is appropriate, available and feasible. It is best to use representative data collected from the population.

Large-scale national surveys

National level representative population based surveys, such as the Tanzania Demographic and Health Surveys (TDHS) are generally conducted five years. Nutrition information is collected with regional and national level prevalence estimates of wasting, underweight and stunting reported. Given the scale and the frequency of these studies they are not appropriate to conduct in an emergency setting. However, they are a useful baseline for comparison of estimates of acute malnutrition at regional levels as well as other health and nutrition indicators such as immunization coverage, care practices and mortality (death) data. This information is generally available on the TDHS websites and is usually stored with the National Bureau of Statistics (NBS) reports.

Repeated small-scale surveys

Small-scale random sample nutrition surveys are the most common method used to assess the nutrition situation in emergencies. Nutrition surveys are designed to provide representative point prevalence estimates of rates of acute malnutrition of children six to 59 months in a given population. Mortality rates can provide a good picture of the severity of the situation. In addition, information to assess the underlying causes of acute malnutrition is collected such as public health status, immunisation coverage, food security and care practices. Such surveys require a certain level of technical expertise and can be very costly with average estimates of US$ 10-15,000 per survey based on experiences from East Africa[1]. Small scale surveys are frequently used as a source of information in emergency nutrition surveillance systems.

Clinic based monitoring

Clinic based monitoring of the nutritional status of children is one method, which is very common and widely used in many countries in Africa. During the 1970's and 80's, heath centre based growth monitoring was established in many developing countries as a component of health management information systems (HMIS). However, over time the efficiency and effectiveness of growth monitoring has been questioned in the absence of parallel development programmes, as a method to reduce high rates of malnutrition in young children.

In an emergency, information from established HIS can be very useful and often may be the only available information about nutrition in the early days of an emergency. In most cases growth monitoring refers to measuring underweight or weight for age. Children who attend maternal and child health clinics (MCH) are measured on each visit and their weight for age plotted on a chart, while health staffs document the results in a register. Ideally the data from these registers is collected at a more centralized level where it is compiled into a larger register, analysed and the results and recommendations reported back to the district and health centre level. However, one of the main challenges of such systems is the lack of timely centralization, analysis and reporting.

While in the information can provide a picture of the level of underweight children in a given community, there tends to be a bias towards younger children (below one year of age) who attend the MCH clinic for immunisation purposes. A further potential bias is toward populations who can actually access the health centre. Those communities who are far from the clinic will not be represented in the sample.

Sentinel site surveillance

This method was also very commonly used in Tanzania in the 1980s and 1990s. Sentinel site surveillance refers to the monitoring of purposively selected communities or service delivery sites, such as a health centre, in order to detect changes in context, programme or outcome variable. Communities are purposively selected for a number of reasons, such as vulnerability to food insecurity in times of stress. Sentinel sites can range from health centres, to villages, to districts. Sentinel site surveillance can be technically sophisticated with large scale assessments at site level or as simple as community based monitoring of a few key indicators. The objectives are to monitor the trends in the nutrition situation in these identified vulnerable areas in order to provide early warning. Community based surveillance also has the potential advantage of empowering the community, being relatively low cost and is particularly useful in emergencies where insecurity prevents representative sampling.

Rapid nutrition assessments

Rapid nutrition assessments are conducted to get a quick snapshot of the nutrition situation. Depending on the context, different indicators can be used such as weight for height or MUAC. Agencies have developed variety tools, which can be modified according to the context, and the type of information considered appropriate to collect. In Tanzania this method has been very useful during the Food Security and Nutrition Assessments (FSNA) or Rapid Vulnerability Assessment (RVA) in areas that are categorized as highly vulnerable to food insecurity. Although the information may not always be representative and thus not statistically valid, the results from a rapid assessment, even of a small sample of children, can provide a basis for determining whether a more detailed assessment is required to establish the actual prevalence of acute malnutrition or whether an emergency response is required. For this reason rapid assessments are an important source of information especially at the onset of an emergency to determine the magnitude and severity of a crisis.

Selective feeding center statistics

Through Clinic based monitoring system one component of the response will be selective feeding for acutely malnourished children. These usually include therapeutic care for the severely malnourished and supplementary feeding for moderately malnourished cases. In selective feeding programmes, statistics are collected on admissions, cure rates, defaulter rates and case fatality rates. These indicators provide a measure of programme quality as well as act as a source of information on the trends in acute malnutrition. By including these indicators in a nutrition surveillance system they can provide useful information of the most vulnerable groups (by profiling the type of individual admitted i.e. children under two years of age, adolescents, their location, etc). They can also help identify the underlying causes of malnutrition such as morbidity (illness) patterns. Monitoring the trends in admissions and assuming reasonable coverage and access can provide additional information on seasonal trends in the nutrition situation (i.e. during the rains pre harvest the numbers of cases admitted to the feeding programmes may increase). One challenge is that NGOs have established different admission criteria for selective feeding programmes making it difficult to compare data between centers. However, monitoring rates of cure, case fatality and defaulting can still contribute to an understanding of the nutrition situation.

Which population groups should be monitored?

In emergencies, acute malnutrition, especially wasting, among children six to 59 months is usually taken as a proxy indicator for the general health and well being of the entire community. This is based on the assumption that young children are more vulnerable than other age groups to external shocks (such as lack of food, or disease) and therefore their nutritional status is more sensitive to change. In addition, this age group tends to be easier to assess in surveys as they have not started school and are generally still at home. Moreover, there are internationally agreed standards and references for assessing nutritional status in children six to 59 months, which do not exist for adults and older people. Other population groups that are commonly being monitored in Tanzania are women of reproductive age and pregnant and lactating mothers.

Classification of indices used in nutrition surveillance

Indices used in nutrition surveillance are drawn from various parameters, these include; biological, ecological and behaviour

- Biological indices
    - Biochemical
- Ecological indices
    - Dietary
    - Anthropometrical
    - Physical (Clinical)
    - Socio economic Status (SES)
- Behavioural indices
    - Ethnological
    - Anthropological

Key points to consider when selecting indicators in Specific Context

- Indicators used to define nutrition problem
- Indicators used to analyse causes of the problem

Indicators used to define nutrition problem, these include;
  - Anthropometric indicators
  - Clinical and
  - Biochemical indicators
  - Dietary indicators

Indicators used to analyse causes of the problem, these include;
  - Food situation indicators
  - Health indicators
  - Care Practice Indicators
  - Economic indicators
  - Health indicators
  - Morbidity
  - Vaccination status and supplementation coverage
  - Water and sanitation
  - Caring Practices
  - Care practices
  - Feeding practices
  - Food situations
  - Food security

3.1.2.2 Indicators to be monitored during the Nutrition surveillance

Indicators can be broadly classified into three categories: outcome, process and context. Outcome indicators refer to change in the prevalence of, for example child wasting or low birth weight, and therefore reflect the immediate causes of malnutrition as represented in the conceptual framework of malnutrition. Process indicators refer to factors such as coverage, quality (per cent defaulters or deaths in selective feeding centre). Nutritional indicators are measures of outcomes. In nutrition surveillance systems, information should be collected both on the nutritional status of the population and on the underlying causes of malnutrition.

3.1.2.3 Challenges of nutrition surveillance systems

Sustainability

One of the biggest challenges facing nutrition surveillance systems is the issue of sustainability and continued effectiveness of the system. There are many examples of information systems that have 'withered' away as donor interest has waned (either because the area served by the information system has not experienced crisis for a number of years or because internal donor funding priorities have changed). Continuation of adequate financial resourcing is therefore crucial.

The continued availability of adequately trained staff who are committed is also essential. All too often staff are expected to take on other roles and do not have sufficient time to support the system to the required standard. Competing activities such as immunisation campaigns, child health days and capacity building workshops often prevent the surveillance activities from being conducted. In addition to competing activities and overambitious workloads, turnover of ministry staff can also worsen this problem as by the time the staff have been trained and become familiar and competent in their activities, they are moved to a different area or division.

Ideally if a system proves to be effective and sensitive to monitoring change over time, this should justify the additional resources. With the current renewed interest in nutrition surveillance systems, and improved quality of data collection tools and analysis, the availability of resources to establish sustainable surveillance systems is increasing with more interest and experience in establishing nutrition surveillance systems as a component of early warning at national level.

Institutional issues

Issues, such as where the system should be housed and how it links with existing early warning systems or health information systems, also need to be considered, in terms of who ultimately makes the decision in terms of the analysis of the information and determines the appropriate response. The challenge for many information systems is that they rely on a range of information sources that cut across several government ministries including health, agriculture and education. This means that no one ministry takes responsibility for the management of the system. Over time it may be abandoned.

Linking information to action

Data collected, which is not linked to action, is pointless and unethical. Nutrition surveillance/information systems should be designed in such a way as to maximize the likelihood that information will elicit an appropriate response if one is needed. There are two main reasons many surveillance systems fail to produce the desired response:

Firstly, there can be a lack of confidence in the data. This is very common when data is based on trends and not on prevalence data. Sometimes, data indicating a deteriorating nutritional trend from the surveillance systems is only accepted if it is confirmed by providing prevalence estimates from representative surveys. The lack of international agreement on standards for sentinel site surveillance or rapid assessments is also problematic.

Secondly, there are political reasons for failing to react to surveillance information. Issues of credibility and political apathy can both to some degree be addressed by involving decision-makers (in government or at international level) in the design of the system. Joint prior decisions about thresholds, institutional location of system and role of data and process of data use in decision making can all help address these potential impediments to effective response. Credibility of systems is also enhanced by transparency and honesty with regard to short-comings and failures where these occur.

SESSION TWO

Duration 8 Hours

3.2 Nutrition Assessment Methods

Aim and Objectives of the session

This session is aiming at equipping participants with knowledge and skills on how to assess and manage nutrition status of an individual or population**.**

At the end of training, participants will be able to

- Describe different methods and indicators of nutrition assessment
- Explain how to use the nutrition assessment methods
- Describe the procedures involved in management of malnutrition

Nutrition Assessment Methods

Brainstorm: Meaning and types of nutrition assessment method

List responses on a space provided below and share your experience to class, then compare your answer with those provided by a facilitator

Write your answer here

3.2.1 Introduction

Nutritional assessment can be defined as the interpretation of information obtained from dietary, biochemical, anthropometrics, clinical studies and variety of other factors (socio-economic & demographic) known to influence nutritional status of an individual or population (Gibson, 2005)

The nutritional status of an individual is often the result of many inter-related factors.

It is influenced by food intake, quantity & quality, & physical health. The spectrum of nutritional status spread from obesity to severe malnutrition (Refer module 1, on nutrition situation)

Understanding measures of nutritional status is critical for the interpretation of nutrition-related development outcomes. Standards, reference values and indicators have been constructed for nutrition outcomes against which the nutritional status of individuals and populations can be compared.

Nutrition assessment methods are structured ways designed in order to establish nutritional status and requirements of an individual or a population, by objective measurements and it is completed with objective parameters and in relation to specific disease-indications.

The information obtained from nutrition assessment is used to determine the health status of individuals or population groups as influenced by their intake and utilization of nutrients.

3.2.2 Uses of nutrition assessment methods

- To identify individuals or population groups at risk of becoming malnourished
- To identify individuals or population groups who are malnourished
- To develop health care programs that meet the community needs which are defined by the assessment
- To measure the effectiveness of the nutritional programs & intervention once initiated

3.2.3 Classification of nutrition assessment methods

Nutrition assessment methods can fall under two main categories;

- ❖ Direct methods
- ❖ Indirect methods.

The direct methods deal with the individual and measure objective criteria, Direct Nutrition assessment methods include;

A. Anthropometric assessment,
B. Biochemical assessment; (Laboratory assessment)

C. Clinical assessment/Physical examination
D. Dietary intake assessment

Indirect methods use community health indices that reflect nutritional influences. These includes

- Vital statistics,
- Socio-economic and
- Ecological variables

3.2.3.1 Dietary Assessment

Dietary assessment is an essential part of nutrition assessment. It provides information on the amount and quality of food consumed by an individual or a population group. Eating habits and dietary patterns can also be assessed by using dietary assessment methods.
Nutrition workers should compare the information with recommended nutrient intake and counsel clients on how to improve their diets.
Dietary assessment Aims at measuring quantity and quality of individual foods consumed from one to several days or assessing the pattern of food use during the previous days/months

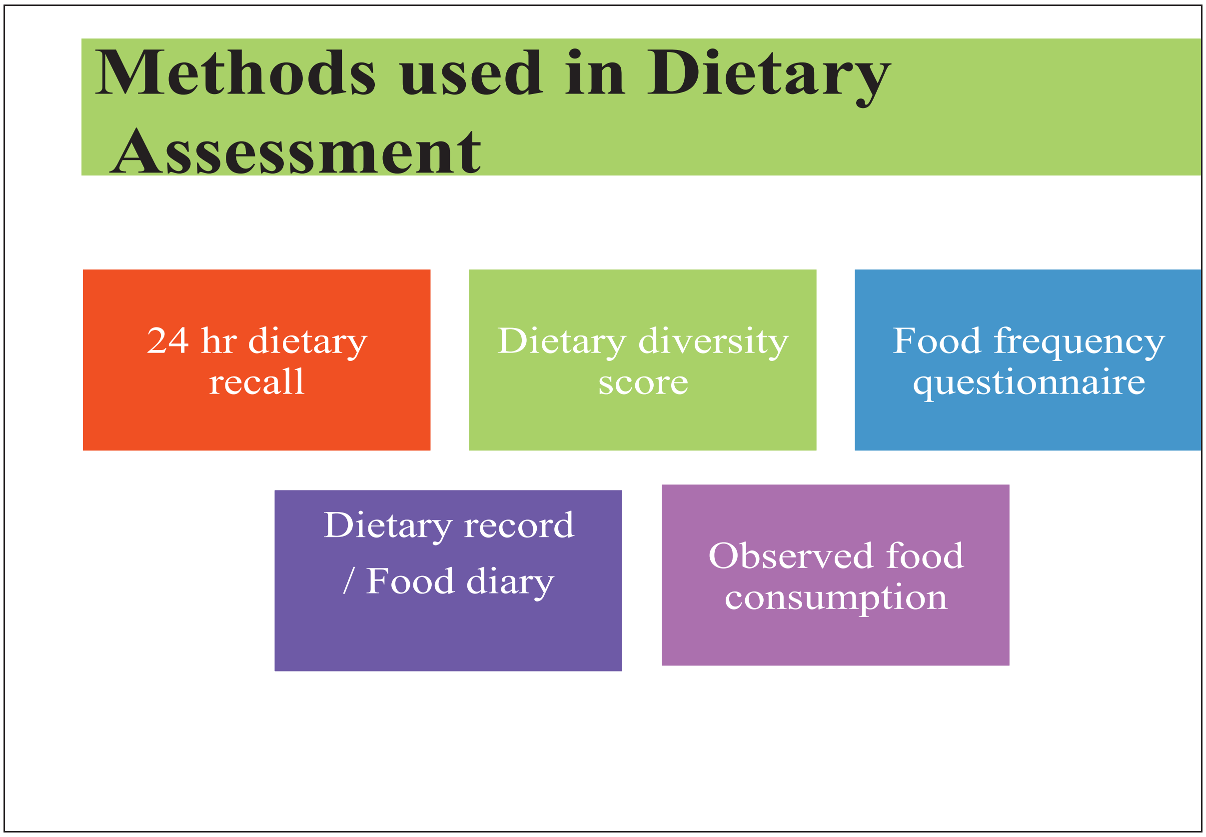
Qualitative and quantitative methods of dietary assessment
Dietary assessment data can be collected as qualitative or quantitative.
A quantitative dietary assessment method provides the amounts and frequency of various foods consumed by individuals and or populations.
Qualitative dietary assessment method provides information on the kind of foods consumed, food preparation procedures, food preferences, cultural influences and attitudes towards foods. Qualitative methods can also be used to complement quantitative approaches.
They are particularly useful when an investigator knows little about the subject being investigated - for example, a group's perceptions or beliefs regarding certain foods.

Qualitative methods also play confirmatory and elucidating roles as well as add depth, substance and meaning to quantitative results. Ideally, a complete food consumption study will integrate both quantitative and qualitative approaches in order to achieve convergence of results.

Examples of quantitative methods; 24hr dietary recall, food frequency, food weigh and record
Examples of qualitative methods; Observed food consumption, food diary, Dietary diversity scores

Methods used in dietary assessments

There are different ways to assess diet, but 24-hour dietary recall and food frequency questionnaire are among the common methods used



i) A 24-hour dietary recall.

Is the commonly used method of dietary assessment in which an individual is asked to recall and recount all foods, beverages consumed during a 24 hour period.

A trained interviewer asks the subject to recall all food & drinks taken in the previous 24 hours.

Actual foods consumed are described, and information on estimated portion weight is collected

Important procedures for collecting 24-hour dietary recall

1. Setting the stage for the interview

The following steps will help in eliciting truthful and complete information:

- Explain to homemaker that you need to know only what she/he actually ate. She/he should not feel embarrassed about any food, as there are no"good" or "bad" foods. No one eats just the right foods all the time.

- Interviews should be conducted in subject’s native language to facilitate accurate and complete responses
- At respondent’s home to ensure accurate estimation of portion size using household utensils
- Do not express in words or facial expressions either approval or disapproval of foods which respondent mentions.
- Do not ask leading questions that would lead participants to feel she/he “should” have had a certain item and, thus, say she/he did

2. During the food recall interview

- First, the order of recall should commence with the first food or drink taken in the day (or, for night workers, from midnight to midnight. Include all foods and beverages eaten or drunk in the last 24 hours.

1) Second, get a complete list of all foods eaten without trying to determine amounts. Use the following types of probes to find what foods were eaten:
   - Probe related to time e.g at what time did you have breakfast
   - Probe tries to get more complete information about foods already reported. e.g What else did you have at this meal?

2) Third, after the respondent names all foods go back over the lists to get additional descriptions and amounts of the food. Also determine if all of the food was eaten or if some was left on the plate
   - If food was eaten in a restaurant, record the name or type of restaurant.
   - Encourage the homemaker to describe foods as clearly as possible
   - Ask to see packages, if available, on pre-packaged foods, and record brand name and other pertinent information

3. Determine the amount of food eaten

Amounts of a food may be given in

- NUMBERS, such as two eggs, one donut, apples
- SHAPES, such as slice of bread .
- DIMENSIONS, such as size of models in a recall pictures
- VOLUME, such as liquids, cooked vegetables, pudding, ice cream 5.
- WEIGHT, such as one kilogram of meat,

In determining amounts, use food models, measuring cups, measuring spoons, house hold measures, raw rice, beans, etc.
When appropriate, ask respondent to bring in the serving container (bowl, cup, glass, etc.) that was used and determine the amount it holds by using rice and a standard measuring cup

A sample of a 24 hour dietary recall form

Name…………….……. Age ……..… Sex …..…… Area……….……..…

Meal time	Name of food or drink	Ingredients	Household measure	Served	Consumed	Net gram served	Net gram consumed

Net gram consumed is calculated based on the food composition table, details will be provided during practical session.

ii) Dietary diversity score

This is another method used in dietary assessment, it involves a count of food groups that a household or an individual has consumed in the previous 24 hours

Dietary diversity score reflects

- The diversification of the diet (quality) and
- Economic ability to access a variety of foods

HDDS is meant to reflect diversification of the diet and the economic ability of a household to access a variety of foods. The Individual Dietary Diversity Scores is aimed at reflecting nutrient adequacy of an individual 9 to 16 food groups are commonly used HDDS uses a set of 12 food groups

Difference between individual and Household DDS

The dietary diversity questionnaire can be used to collect information either at household or individual level. The decision on which level to collect information depends in part on the purpose and objectives of the survey. If assessment of the nutrient adequacy of the diet is of primary concern, it is best to collect information at the level of the individual.

Another important consideration for the choice between household and individual is the frequency of meals/snacks purchased and consumed outside the home. If meals/snacks are purchased and consumed outside the home on a regular basis by one or more family members, administering the questionnaire at the individual level is more appropriate as it is not possible to capture accurately meals/snacks purchased and eaten outside the home at household level.

Procedures

- Describe the foods (meals and snacks) that a person ate or drank yesterday during the day and night, whether at home or outside the home. start with the first food or drink of the morning.
- Write down all foods and drinks mentioned. When composite dishes are mentioned, ask for the list of ingredients.
- When the respondent has finished, probe for meals and snacks not mentioned.
- When the respondent recall is complete, fill in the food groups based on the information recorded above in the below form. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

Form for collecting DDS data

B/fast	Snack	Lunch	Snack	Dinner	Snack

Creating DDS scores and interpretation

How to Create Household Dietary Diversity Scores

HDDS are calculated by summing the number of food groups consumed in the household over the 24hour recall period. In order to do this first you need to transfer information collected from the above form to the following form

Group no	Food group	Yes = 1, No = 0
1	CEREALS	
2	FISH AND SEA FOODS	
3	ROOTS AND TUBERS	
4	PULSES/LEGUMES/NUTS	
5	VEGETABLES	
6	MILK AND MILK PRODUCTS	
7	FRUITS	
8	OIL/FATS	
9	MEAT/POUTRY/OFFAL	
10	SUGAR/HONEY	
11	EGGS	
12	MISCELLANEOUS (specify)	

Interpreting results

There are no established cut-off points for the number of food groups to indicate adequate or inadequate dietary diversity for the HDDS instead mean scores/distribution can be used for analytical purposes to set program goals (FAO 2011)

Strength of DDS

- Clear tool in assessing nutrient adequacy and household food access
- It is clear, rapid and user friendly
- Easily administered at relatively low costs
- Useful tool for assessing changes in the diet

Limitation of DDS

- Does not indicate quantity of foods consumed
- No consensus on selection of scoring system and cutoff points
- Does not take into acount rural/urban differences in dietary diversity also diet variations across seasons

iii) Food Frequency Questionnaire (FFQ)

FFQ aimed to assess frequency of consumption of individual foods or food groups in a specified period of time. It is designed to provide descriptive qualitative information about usual food consumption pattern, that is, the evaluation of habitual diet over the long term

It can also be a semi-quantitive FFQ collecting information of portion size in addition to frequency of consumption

The questionnaire consists of a list of food groups and associated set of frequency of use (daily, weekly, monthly)

The list of food may focus on specific group of food or foods consumed periodically (seasonally) depending on the focus of the study. This method also used by epidemiologists to study association between dietary habits and diseases

How FFQ is done

Subjects are asked to say how often they usually consume an item of food or drink and how much they have (consume) on the day they consumed it . The assessment of portion sizes can be done by using average portion weights available or by asking subjects to describe amounts in terms of household measures or standard portions

Food item	**Per day**	**Per week**	**Per months**
Cereals e.g rice, maize			
Dark green or deep orange vegetables e.g sweet potato leaves, pumpkin leaves, carrots			
Other vegetables (e.g cabbage)			
Legumes e.g beans, peas			
Fruits			
Meat, fish and poultry			
Milk and milk products			
Nuts			
Coffee, tea			
Soft drink			
Alcohol			
Fast food e.g Chips, sausage			

Interpretation of FFQ

Never consumed- Means the food was not consumed in a specified period of time
Less consumed-mean the food was consumed 1-3 times per week
Moderate consumed- means the food was consumed 4-5 per week
Highly consumed-mean the food was consumed 6-7 times
Rarely consumed- means the food was consumed once per month or per year

Group work: 24 dietary recall and food frequency questionnaire

Strength	Limitation
Easy and uniformity of administration	Long questionnaire
Low cost if it is self administer	Huge work is required for their development
Could be used in samples with geographically widespread	Errors in estimating portion size
Can produce more valid and reliable results compare to other recall methods	Requires to be validated in relation to reference method

In this part you are required to form small groups. Each group will practice using one of the methods. Groups 1, 2, and 3 will use 24-hour dietary recall, and groups 4, 5, and 6 will use the food frequency questionnaire. One person in each group will volunteer to share her or his dietary history. Another group member should record the answers. This exercise should not exceed 20 minutes. Then groups will describe their experience practicing dietary assessment.

Strengths and limitations of the methods

iv) **Dietary/Food records**

Estimated food diaries or records are a prospective dietary assessment method which provides detailed data on food and nutrient intakes. Individuals record details of foods and beverages consumed at the time of consumption. Brand names

Date	Time	What I eat	How much

v) Observed food consumption

Researchers directly observing a participant's food intake and behaviors to ascertain foods, brands and portions consumed.

It is often preferable if a participant is not able to identify who the observer is so they do not alter their dietary intake

Direct observation can be used to provide an objective measure of an individuals' dietary intake or to validate another dietary assessment method.

Summary of Dietary assessment methods, strength, limitation and application

	Strengths	**Limitations**	**Applications**
24hour dietary recall	Does not require literacy Relatively low respondent burden Data may be directly entered into a dietary analysis program May be conducted in-person or over the telephone	Dependent on respondent's Memory Relies on self-reported information Requires skilled staff Time consuming Single recall does not represent usual intake	Appropriate for most people as it does not require literacy Useful for the assessment of intake of a variety of nutrients and assessment of meal patterning and food group intake Useful counselling tool
Food Frequency	Quick, easy and affordable May assess current as well as past diet In a clinical setting, may be useful as a screening tool	Does not provide valid estimates of absolute intake of individuals Can't assess meal patterning May not be appropriate for some population groups	Does not provide estimates of absolute intake for individual thus of limited usefulness in clinical settings May be useful as a screening tool, however, further development research is needed
Food records	Does not rely on memory Food portions may be measured at the time of consumption Multiple days of records provide valid measure of intake for most nutrients	Recording foods eaten may influence what is eaten Requires literacy Relies on self-reported information Requires skilled staff Time consuming	Appropriate for literate and motivated population groups Useful for the assessment of intake of a variety of nutrients and assessment of meal pattern and food group intake Useful counselling tool
Dietary history	Able to assess usual intake in a single interview Appropriate for most people	Relies on memory Requires skilled interviewer Time consuming	Appropriate for most people as it does not require literacy Useful for assessing intake of nutrients, meal patterning and food group intake Useful counselling tool

3.2.3.2 Anthropometric Assessment

Nutritional anthropometry is the measurements of the variations of the physical dimensions and the gross composition of the human body at different age levels and degrees of nutrition (Gibson 2005).

The building block or measures used to undertake anthropometric assessment are age, sex, weight and height (or length)

Chronic imbalances between intakes of energy and protein modify the pattern of physical growth and relative proportions of body tissues such as fat, muscle and total body water Anthropometric measurements are of two types:

- Body composition (body fat, fat-free mass)
- Growth (length/height, weight)

I. Application of anthropometric method

Measures of growth in childhood are among the best general proxy measures for constraints to human welfare and are also a highly practical way of describing complex problems. The measurement of growth is widely used to demonstrate the success or failure of interventions. As we saw in poor growth performance (resulting in stunting or wasting) is a strong and feasible predictor of subsequent ill health, functional impairment and mortality. Anthropometry is reflected in the indicators used to assess progress towards MDG 1 the prevalence of underweight children under-five years of age.

II. Advantages of anthropometric assessment

- Procedures are simple, safe, non-invasive and applicable to large sample sizes
- Equipment is in expensive, portable, durable, can be made locally
- Procedures can assist to identify mild, moderate, and severe states of malnutrition
- Methods can be used to evaluate changes in nutrition status over time
- Information is generated on past long-term nutritional history
- Relatively unskilled personnel can perform measurement procedures
- Provided standardized techniques are used, the methods are precise and accurate

III. Limitation of anthropometric assessment

- Relatively insensitive, it cannot detect disturbances in nutrition status over short periods of time or identify specific nutrient deficiencies
- Unable to distinguish disturbances in growth or body composition induced by nutrient (e.g. zinc) deficiencies from those caused by imbalances in protein and energy intake
- Non-nutritional factors (diseases, genetic, diurnal variation, reduced energy expenditure) can reduce sensitivity and specificity of the measurements

IV. How anthropometric assessment is done

As it was indicated earlier in this session, anthropometric measurements is done by assessing body composition and growth part of the body

Body Composition (Body Fat, Fat-Free Mass)

- Methods are based on a model that the body consists of two chemically distinct compartments: fat mass and fat-free mass
- Fat–free mass consists of skeletal muscle, non-skeletal muscle and soft lean tissues, and the skeleton
- The techniques can indirectly assess these two compartments and variations in their amount, and proportion can be used as indices of nutritional status
- Indices are used to identify individuals who are vulnerable to under- or over-nutrition, and to evaluate effectiveness of nutrition intervention programs

Body fat

Fat is the main storage form of energy and is sensitive to acute malnutrition. Alterations in body fat content provide indirect estimates of changes in energy balance

Body fat is the most variable component of the body, differing among individuals of the same sex, height, and weight. Determination of body mass index and body composition is essential in describing the nutritional status of an individual.

Methods of assessing body fat

Methods of assessing body fat are based on fat content of the body and fat distribution in the body.

A. Skin fold thickness

It measures the compressed double fold of fat plus skin. Common sites selected for the measurement of skinfold thickness include triceps, biceps, subscapular and suprailiac.

- Triceps (back of left upper arm): The measurement is performed at the mid-point of the upper left arm, between the acromion process (on shoulder blade) and the tip of the olecranon (on the ulna). To mark the midpoint, the left arm is bent 900 at the elbow, and the forearm is placed palm down across the body. Then the tip of the acromion process at the outer most edge of the shoulder and the tip of the olecranon are located and marked. The distance between these two points is measured using a non-stretchable tape, and the midpoint is marked with a soft pen. The left arm is then extended so that it is hanging loosely by the side, then the examiner grasp the skin about 1 cm above the marked midpoint and the calliper placed 1 cm above below the fingers.
- Biceps (front of left upper arm): The measurement is performed at the midpoint of the front of the upper left arm, at the same level as the triceps.
- Subscapular (below shoulder blade): This skinfold is located 1 cm below and laterally to the angle of the left shoulder blade. Placing the subject's arm behind the back may assist in the identification of the site. The skinfold should angle 450 from horizontal.

- Suprailiac (above hip bone): This skinfold is located at the mid-axillary line immediately superior to the iliac crest. Alternatively, the location can be found approximately halfway between the lowest rib and the top of the hip bone. The skinfold is picked up posterior to the mid-axillary line and parallel to the cleavage lines of the skin.

B. Body circumference

The circumference also changes more during weight gain/loss so it is possible to detect smaller changes over time. Examples of common body circumference measurements are Waist-hip ratio and Mid-upper arm circumference.

C. BMI (Body Mass Index)

Body fat can be estimated from body mass index (BMI), a person's weight in kilograms divided by the square of the height in meters,

- BMI is a reliable indicator of body fatness and an inexpensive and simple way to measure adult malnutrition.
- BMI below established WHO cut-offs indicates a need for nutrition interventions.
- BMI cut-offs are not accurate in pregnant women or adults with oedema, whose weight gain is not linked to nutritional status. For these groups, use MUAC.

Practice: Calculating BMI

Divide into 3 groups. Find the BMIs for the weights and heights of your group member and record the results on the following table. Discuss any difficulties they had finding BMI on the chart.

Two groups will present their results in plenary.

ID	Sex	Height (cm)	Weight (kg)	BMI	Nutritional status
	F				
	M				
	M				
	F				
	M				
	M				

BMI is the preferred indicator of thinness for adults over 18 who are not pregnant or within 6 months post-partum. BMI measures body fat composition compared with that of an average healthy person. If BMI shows that body fat is below established standards, nutrition intervention is needed to slow or reverse the loss.

WHO recommend that adolescent wasting can be assessed by considering BMI for age scores.

Cut-off points for BMI are
Overweight >+2SD (Equivalent to BMI 25kg/m^2 at 19 years
Obesity >+2SD (Equivalent to BMI 30kg/m^2 at 19 years
Thinness <-2SD
Severe Thinness <-3SD

BMI is not accurate in pregnant women and women up to 6 months post-partum because their weight gain is not linked to their nutritional status. Therefore, MUAC is used to measure nutritional status in these groups.

BMI is used to assess the nutritional status of adult PLHIV because PLHIV with progressive or late-stage HIV infection can lose muscle faster than weight and weight loss does not indicate the amount of muscle loss. High rates of muscle loss are associated with higher morbidity and mortality.

Interpretation of percentage of body fat

Percent body fat		
Males	**Females**	**Description**
< 10%	<15%	Thin
11-14%	16-19%	Underweight
15-20%	20-25%	Healthy
20-24%	26-30%	Overweight
25-30%	30-35%	Obese
>30	>35%	Gross obese

Source: WHO 2007

Assessment of Fat-free mass
Fat–free mass is a mixture of water, protein, and minerals, with muscle serving as the major protein store

Assessment of muscle protein can therefore provide an index of the protein reserves of the body

Body muscle, composed largely of protein, is the major component of fat-free mass and serves as an index of protein reserves of the body; these reserves become depleted during chronic under-nutrition, resulting in muscle wasting

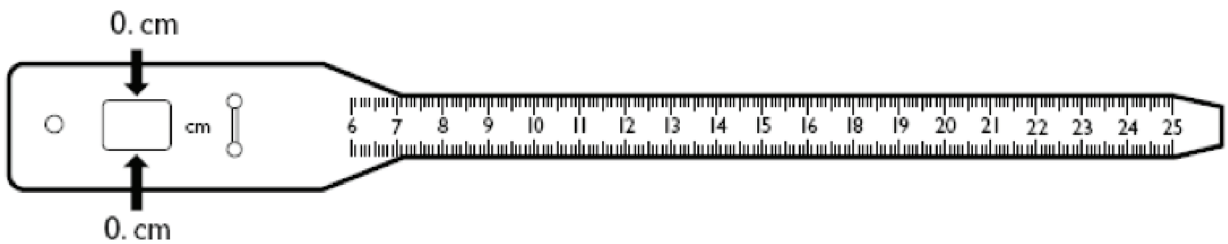
Methods of assessing fat free mass

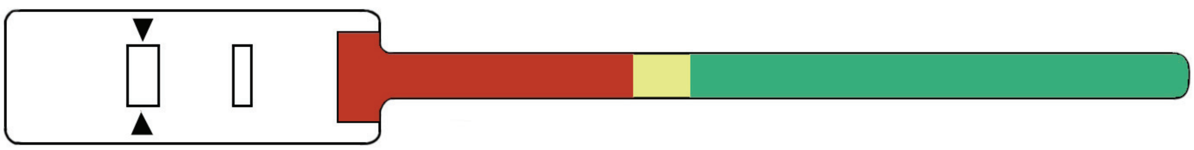
Example MUAC

Mid-upper arm muscle circumference and **mid-upper arm muscle area are** both correlated with measures of total muscle mass and are therefore used to predict changes in total body muscle mass and protein nutritional status

These measurements change with age and disease states, as a result do not provide accurate measures of changes in body protein and cannot be used to detect small changes

Pictures of MUAC tapes





Applications of MUAC measurements

BMI does not account for changes in body composition. Therefore, MUAC is sometimes used instead of BMI to measure nutritional status of different age group. BMI is only used to classify the nutritional status of non-pregnant and non-breastfeeding adults.

MUAC is used to measure children 6 months–17 years, pregnant and lactating women, and adults who are too sick to stand. Also explain that hospital settings and emergence situations MUAC is used to screen and admit children

MUAC is a quick and easy way to measure nutritional status because it only requires a tape measure, but it must be done accurately. Even a ¼-inch error can mean a difference in treatment.

MUAC classification

a. **NORMAL**

Children: Children 6–59 months old: ≥ 12.5 cm
Children 5–9 years old: > 14.5 cm
Children 10–14 years old: > 18.5 cm
Adults: ≥ 22 cm
Pregnant and post-partum adults: ≥ 23 cm

b. **MODERATE**

Infants 6–59 months old: ≥ 11.5 –< 12.5 cm
Children 5–9 years old: ≥ 13.5 – < 14.5 cm
Children 10–14 years old: ≥ 16.0–< 18.5 cm
Adults: ≥ 18.5–< 22 cm
Pregnant and post-partum women: ≥ 19.0 –< 23.0 cm

c. **SEVERE**

Children 6 – 59 months old: < 11.5 cm
Children 5 – 9 years old: < 13.5 cm
Children 10 –14 years old: < 16.0 cm
Adults: < 18.5 cm (includes both non-pregnant, pregnant, and post-partum adults)
Pregnant and post-partum women: < 19.0 cm

Practice

Each pair will be provided with two MUAC tapes for different age groups, and practice on taking measurements and asked them to identify the nutritional status by interpret the findings. Each pair will measure each other's MUAC while the other pair observes, makes suggestions (for example, how to place the tape correctly on the arm or keep the tape at eye level), and records the measurements. the pairs will switch roles so that the other pair will also have a chance to measure each other's MUAC.

a. **Growth Parts of the Body**

Growth parts of the body can be assessed based on two common measurements, these include; weight and height

How to measure weight (for children)

Key points

- Place the scale on a flat, hard surface
- The solar panel should be in good light.
- Mention that the mother would undress the baby.
- To turn on the scale, cover the solar panel for a second (literally one second). Wait until the number 0.0 appears.

- Ask the mother to remove her shoes. Then ask her to step on the scale and stand still. Ask her to remain on the scale even after her weight appears, until you have finished weighing the baby.
- After the mother's weight is displayed, tare the scale by covering the solar panel for only a second and then waiting for the number 0.0 to appear along with figure of a mother and baby.
- Gently hand the "baby" to the mother. In a moment, the "baby's" weight will appear.

Note: If the scale takes a long time to show 0.0 or a weight, it may not have enough light. Reposition the scale so that the solar panel is under the most direct light available.
Also If a mother is very heavy (such as more than 100 kg) and the baby is light (such as less than 2.5 kg), the baby's weight may not register on the scale. In such cases, have a lighter person hold the baby on the scale.

Demonstration how to measure body weight

Demonstration
You will be asked by a facilitator to volunteer as a mother, and prepare a "baby" that will weigh over 2 kg, such as 2-3 handbags or a bag holding several water bottles or books. You will follow the procedures and key points mentioned earlier in doing this demonstration

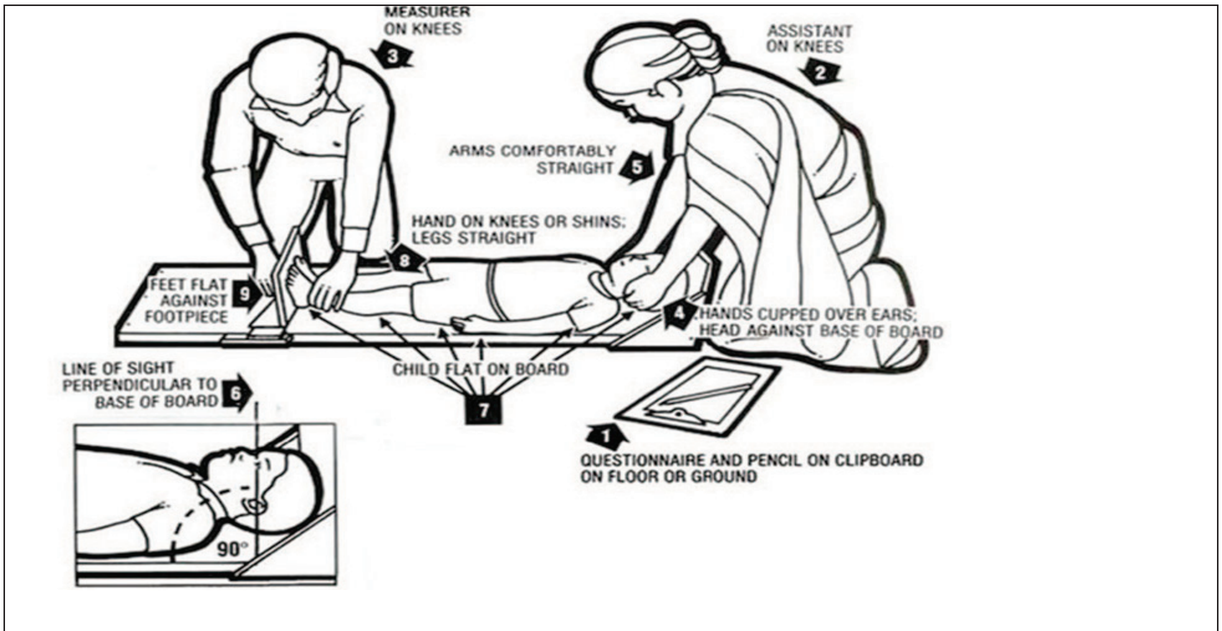
Height measurements
Height can be measured in two ways: a lying down position (recumbent) or in standing position. The first position i.e recumbent is meant for children and this is referred to length, the second position is meant for adults, this is called height

Measuring length
Key points

- Place the length board on a sturdy surface, such as a table or the floor. Cover the length board with a cloth or paper towel.
- Stand on the side where you can see the measuring tape and move the footboard.
- Explain to the mother that she will need to place the baby on the length board herself and then help to hold the baby's head in place while you take the measurement. Show her where to stand when placing the baby down. Also show her where to place the baby's head (against the fixed headboard).
- When the mother is ready, ask her to lay the child on his back with his head against the headboard, compressing the hair.
- Quickly position the head so that the child's eyes are looking straight up (imaginary vertical line from the ear canal to the lower border of the eye socket is perpendicular to the board).

- The person assisting should stand behind the headboard and hold the head in this position (see illustration below) Check that the child lies straight along the board and does not change position
- Hold down the child's legs with one hand and move the footboard with the other. You will have best control if you hold the child's legs at the knees (with one finger between the knees) and gently press them down.
- While holding the knees, move the footboard against the soles of the child's feet. The soles should be flat against the footboard, toes pointing upwards. If the child bends the toes or arches the foot, scratch the soles slightly and slide in the footboard quickly when the child straightens the toes.
- Read the measurement and record the child's length in centimetres to the last completed 0.1 cm (this is the last line that you can see)

Illustration on how to measure length



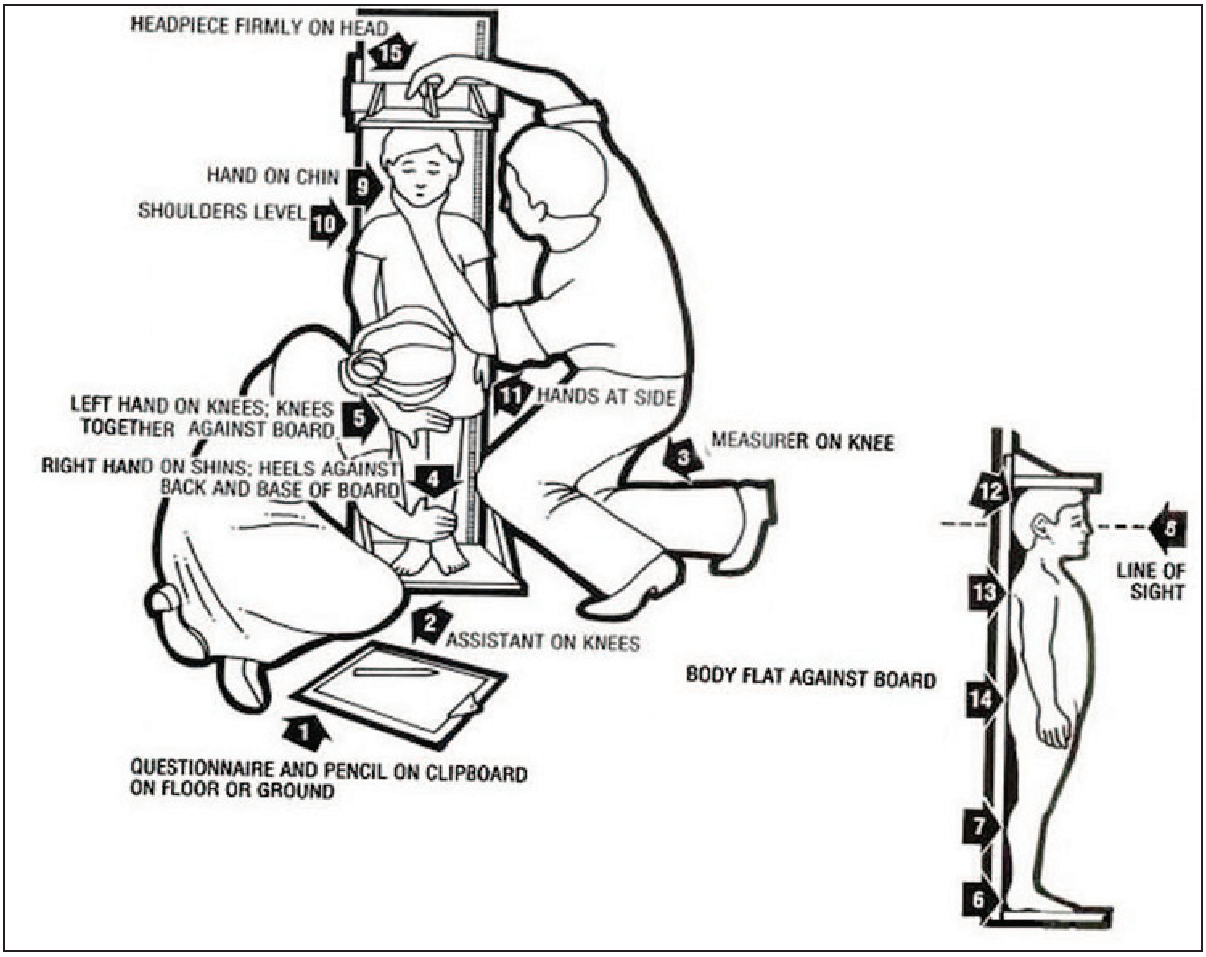
Source: UNICEF, 1986, How to weigh and measure children: assessing the nutrition status of young children)

Measuring of Height

Key points

- Place the height board with its back against the wall, so that it sits flat on the floor and cannot tip backward.
- Position a person or (a doll) on the baseboard with the back of the head, shoulder blades, buttocks, calves, and heels touching the vertical board.
- Position the head and hold the chin in place with your left hand. For a child Push gently on the tummy to help him to stand to full height.
- With your right hand bring down the headboard to rest on the top of the head. (These positions are illustrated on the below picture)
- Read and record the measurement to the last completed 0.1 cm. This is the last line that you can actually see.

Illustration on how to measure height



Source: UNICEF, 1986, How to weigh and measure children: assessing the nutrition status of young children

Practice using the equipment

You will be asked to come up in pairs and try measuring weight, length, and height. Course facilitator will also guide you on how to use the scale, length and height boards. Since there are no children present to measure, this practice will just give some experience handling the equipment and learning where to position oneself when taking a measurement. When each pair has practiced with one piece of equipment, they can move to the next.

Measuring weight

Each participant will have a turn using the scale to measure an adult (their partner) and then a "baby," getting a feel for the quick covering of the solar panel to tare the scale, and pausing for the scale to re-register.

Measuring height

- You will practice measuring height by measuring one another. Then asked to pretend to measure a child (e.g. a large doll or a stick).

- Participant who act as an assistant: will Kneel to the left of the child; holding the child's knees, ankles and tummy to keep the legs straight; watching that feet are flat and heels, calves, buttocks and head are against the back board; talking to the child to focus and soothe him; and watching that the child stays in position. Both people should kneel or crouch down to the level of the child (not bend over).

- The measurer: Kneeling on the right side of the child standing on the board, left hand holding the child's chin and right hand operating the headboard; eyes even with the child's head in order to see the last completed 0.1 cm

Measuring length

- Each pair of participants will practice on measuring the length of a large doll (or stick).

  Assistant: Behind the headboard to hold the child's head

  Measurer: On the side of the length board with the measuring tape, where he or she can hold the knees, move the footboard, and read the measurement.

Video demonstration

In this section, the course facilitator will show you the selected section of the Anthropometry Training Video. The video was used to train staff in the WHO Multi-centre Growth Reference Study (MGRS).
Some of the sections will not apply to this training course, and will be skipped. The equipment used in the course may be different from the equipment in the video, there fore you are required to focus on weighing and measuring techniques rather than the equipment itself.

Summary of Three indices
The advantages and disadvantages of the three indices and the information they can provide is summarized below:
Weight-for-age: Low weight-for-age index identifies the condition of being underweight, for a specific age. The advantage of this index is that it reflects both past (chronic) and/or present (acute) under-nutrition (although it is unable to distinguish between the two).

Height-for-age: Low height-for-age index identifies past under-nutrition or chronic malnutrition. It cannot measure short-term changes in malnutrition. For children below 2 years of age, the term is length-for-age; above 2 years of age, the index is referred to as height-for-age. A deficit in length-for-age or height-for-age is referred to as stunting.

Weight-for-height: Low weight-for-height helps to identify children suffering from current or acute under-nutrition or wasting and is useful when exact ages are difficult to determine. Weight-for-length (in children under 2 years of age) or weight-for-height (in children over 2 years of age) is appropriate for examining short-term effects such as seasonal changes in food supply or short-term nutritional stress brought about by illness

Interpretation of nutrition status based on indices
The above three indices are used to identify three nutritional conditions: underweight, stunting and wasting, respectively.

Underweight: based on weight-for-age, is a composite measure of stunting and wasting and is recommended as the indicator to assess changes in the magnitude of malnutrition over time.

Stunting: Low length-for-age, stemming from a slowing in the growth of the fetus and the child and resulting in a failure to achieve expected length as compared to a healthy, well nourished child of the same age, is a sign of stunting. Stunting is an indicator of past growth failure. It is associated with a number of long-term factors including chronic insufficient protein and energy intake, frequent infection, sustained inappropriate feeding practices and poverty. In children over 2 years of age, the effects of these long-term factors may not be reversible. For evaluation purposes, it is preferable to use children under 2 years of age because the prevalence of stunting in children of this age is likely to be more responsive to the impact of interventions than in older children. Data on prevalence of stunting in a community may be used in problem analysis in designing interventions. Information on stunting for individual children is useful clinically as an aid to diagnosis. Stunting, based on height for- age, can be used for evaluation purposes but is not recommended for monitoring, as it does not change in the short term such as 6- 12 months.

Wasting is the result of a weight falling significantly below the weight expected of a child of the same length or height. Wasting indicates current or acute malnutrition resulting from failure to gain weight or actual weight loss. Causes include inadequate food intake, incorrect feeding

Brainstorm: How often should an individual be weighed?

- Compare the responses with the information given by a facilitator

How Often Should You Weigh an individual?
As a general rule, at each health visit.
Children under 5: Follow the routine RCH clinic-weighing schedule.
Adults
With normal nutrition status. Every 3 months
With MAM: Every month

With SAM: Every 2 weeks With normal nutritional status: Adult PLHIV with symptoms: At least every month Adult PLHIV without symptoms: At least every 3 months

Summary of Three nutrition indices

- Weight-for-age: Low weight-for-age index identifies the condition of being underweight, for a specific age. The advantage of this index is that it reflects both past (chronic) and/or present (acute) undernutrition
- Height-for-age: Low height-for-age index identifies past undernutrition or chronic malnutrition. It cannot measure short-term changes in malnutrition. A deficit in length-for-age or height-for-age is referred to as stunting.
- Weight-for-height: Low weight-for-height helps to identify children suffering from current or acute undernutrition or wasting and is useful when exact ages are difficult to determine. A deficit in length for age is referred to as wasting
- WHZ, BMI and MUAC cut offs are international reference standards used to classify nutrition status that is SAM, MAM, Normal nutrition status, overweight and obesity.

Interpretation of Nutrition Status Based on Indices

The three indices (W/A, H/A and W/H and are used to identify three nutritional conditions: underweight, stunting and wasting, respectively

The nutritional indices commonly calculated for young children are: Weight for height – an index used to measure wasting or acute malnutrition; Height for age – an index used to measure stunting or chronic malnutrition; Weight for age – an index used to measure underweight (or wasting and stunting combined).

The uses of the above 3 indices with Z score classification and interpretation

Weight for height	
Weight-for-height up to –2SD	= Normal
Weight-for-height <-2SD to –3SD	= Moderate
Weight-for-height <-3SD	= Severe wasting
Weight for Age	
Weight-for-age up to –2SD	= Normal

Weight-for-age <-2SD to –3SD	= Moderate
Weight-for-age <-3SD	= Severe underweight
Height for Age	
Height – for- age up to -2 = Normal	
Height – for- age <-2SD to –3SD = Moderate stunting	
Height –for- age <-3SD	Severe stunting

Discussion

Discuss whether and how you will be able to use the procedures taught in your own working places. Share your experience to the class give their thoughts

3.2.3.3 Biochemical Assessment

Biochemical assessment is the same as laboratory assessment. It is used primarily to detect sub-clinical deficiency states. It provides an objective means of assessing nutritional status (compared to other methods) ie most objective and quantitative data

- Biochemical test often can detect nutrient deficits long before anthropometric measures are altered and clinical signs and symptoms appear
- Biochemical tests can also be used to examine the validity of various methods of measuring dietary intake or to determine if respondent are underreporting or over reporting what they eat

Types of biochemical test

Biochemical test can be categorized into two types, static test and functional test

Static test

- Tests are based on measurement of a nutrient or its metabolite in the blood, urine or body tissue. They can detect subclinical deficiencies.
- Although they indicate nutrient levels in the particular tissue or fluid sampled, they often fail to reflect the overall nutrient status of an individual or whether the body as a whole is in a state of nutrient excess or depletion

Fluids and tissues used include whole blood or some fraction of blood, urine, hair, saliva, amniotic fluid, skin, semen, and buccal mucosa

Functional test

- Functional tests of nutritional status are based on the idea that "the final outcome of a nutrient deficiency and its biologic importance are not merely a measured level in a tissue or blood, but the failure of one or more physiologic processes that rely on that nutrient for optimal performance."
- Tests have greater biological significance than the static tests because they measure the extent of functional consequences of a specific nutrient deficiency
- Functional tests may include:

- Measuring changes in the activities of a specific enzyme(s)
- Concentrations of specific blood components dependent on a given nutrient
- Production of an abnormal metabolite
- Physiological or behavioral functions dependent on specific nutrients e.g. taste acuity for Zn; cognitive performance for Fe

Limitation of biochemical assessment

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

Cut-off points for Blood glucose, Hb levels, Vitamin A levels and Iodine levels.

Fasting blood glucose level (Pre-prandial)

mg/dl	mmol/l	status
Less than 70	< 4	Low levels
70 - 100	4 – 5.6	Normal level
101 - 126	5.61 - 7	Pre-diabetes/impaired glucose tolerance
More than 126	> 7	Diabetic Blood Sugar Levels

Post-prandial blood glucose level

(mg/dl)	mmol/l	Status
<100	<5.6	Low Blood Glucose Level
100 - 140	5.6 – 7.8	Normal Blood Glucose Level
140 - 200	7.8 -11	High Blood Sugar Level
> 200	> 11	Diabetic Blood Sugar Level

Cut-off points for haemoglobin level in blood

Cut-off points for IDA

Group	Normal g/l	Mild anaemia g/l	Moderate anaemia	Severe anaemia
Children (6 - 59 Mo)	≥110	100 – 109	70 - 99	<70
Children (5 - 11 Yr)	≥115	100 - 114	70 - 99	<70
Children (12 - 14 Yr)	≥120	100 - 119	70 - 99	<70
Male 15+ Yr	≥130	100 - 129	70 - 99	<70
Female 15+ Yr	≥120	100 - 119	70 - 99	<70
Pregnant women	≥110	100 - 109	70 - 99	<70
Lactating mothers	≥120	100 - 119	70 - 99	<70

Source: Iron deficiency anaemia: Assessment, prevention and control, a guide for programme managers

Cut-off points for vitamin A deficiency

Serum retinol level	**Status**
≥ 20 µg/100 ml	Normal
< 20 µg/100 ml	Vitamin A deficiency
< 10 µg/100 ml	Severe vitamin A deficiency

Source: WHO 2012: Priorities in the assessment of vitamin A and Iron status in populations

Cut-off points for Iodine deficiency

Urinary Iodine excretion level	**Status**
≥100 micrograms/litre	Normal
<100 micrograms/litre	Vitamin A deficiency
<20 micrograms/litre	Severe vitamin A deficiency

Source: WHO, 2013 Urinary iodine concentrations for determining Iodine status in a population

3.2.3.4 Clinical Assessment (Physical Examination)

i. An overview of clinical assessment of malnutrition

Clinical assessment is the physical examination of an individual for signs and symptoms suggestive of nutritional health and/or clinical pathology. Signs usually come late in the pathogenesis of a disease, unlike biochemical tests that can detect early malnutrition states. Clinical examinations are conducted by the physician (or a trained/experienced clinical staff) on anatomic changes that can be seen or felt in the superficial, epithelial tissues like skin, eyes, hair, buccal mucosa or organ systems (e.g. thyroid, spleen and liver).

ii. How clinical assessment is done

- This uses medical history and physical examination to detect signs (i.e. observations made by a qualified examiner) and symptoms (i.e. manifestations reported by the patient) associated with malnutrition
- It utilizes a number of physical signs, (specific & non specific), that are known to be associated with malnutrition and deficiency of vitamins & micronutrients.
- General clinical examination, with special attention to organs like hair, angles of the mouth, gums, nails, skin, eyes, tongue, muscles, bones, & thyroid gland.
- Detection of relevant signs helps in establishing the nutritional diagnosis

iii. Clinical Symptoms and Signs of Malnutrition

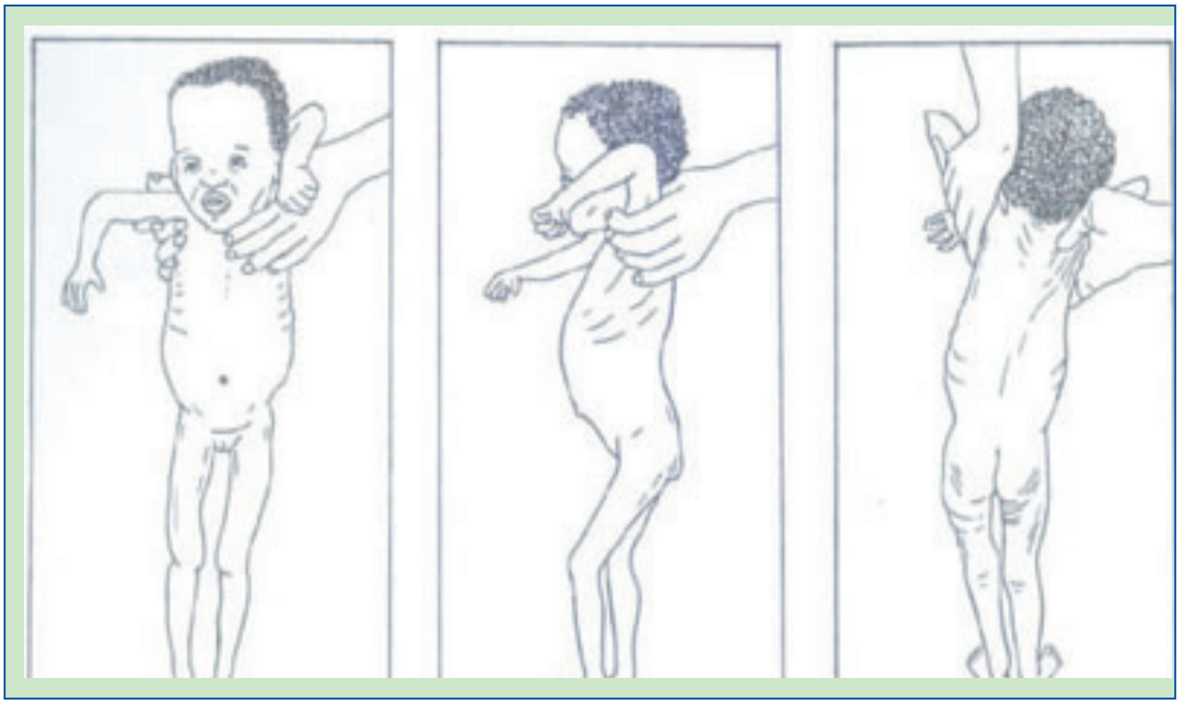
	Sign/symptom	Nutritional abnormality
Mouth		
	Glossitis	Riboflavin, niacin, folic acid, B12 , protein
	Bleeding & spongy gums	Vit. C,A, K, folic acid & niacin
	Angular stomatitis, cheilosis & fissured tongue	B 2,6,& niacin
	Leukoplakia	Vit.A,B12, B-complex, folic acid & niacin
	Sore mouth & tongue	Vit B12,6,c, niacin ,folic acid & iron
	Sign/symptom	**Nutritional abnormality**
Skin	Pale: palms, conjunctiva, tongue	Anaemia: may be due to the deficiency of iron, folic, vitamin B12, acid, copper, protein or vitamin B6
	Flaking dermatitis	PEM, Vit B2, Vitamin A, Zinc & Niacin
	Bruising	Vit K ,Vit C & folic acid
	Sign/symptom	**Nutritional abnormality**
Musculo-skeletal	Gets tired easily, shortness of breath	Anaemia: may be due to the deficiency of iron, folic, vitamin B12, acid, copper, protein or vitamin B6
	Muscles have 'wasted' appearance; particularly in buttocks and thigh. Baby's skull bones are thin and soft	Protein-Energy Malnutrition
	Bow-legs	Calcium and vitamin D deficiency

	Sign/symptom	Nutritional abnormality
Eye	-Bitot's spots (whitish patchy triangular lesions on the side of the eye) -Night blindness, exophthalmia	Vitamin A deficiency
	Photophobia-blurring, conjunctival inflammation	Vit B2 & vit A deficiency

Hair	Spare & thin	Protein, zinc, biotin deficiency
	Easy to pull out	Protein deficiency
	Corkscrew Coiled hair	Vit C & Vit A deficiency

Nail	Spooning	Iron deficiency
	Transverse lines	Protein deficiency
Neck	Goitre (swelling on the front of the neck)	Iodine deficiency disorder

iv. Illustrations of clinical signs of malnutrition



(Source: Ethiopian Federal Ministry of Health, 2010, Training course of the out patient treatment programme of severe acute malnutrition)

A picture of an adult with Severe Acute Malnutrition

Picture of a child with bilateral pitting odema

(Source: UNICEF/Dr Tewoldeberhan Daniel)

Bilateral pitting oedema is a sign of SAM. It can be used to diagnose SAM regardless of a person's BMI or MUAC. Define 'oedema' as the abnormal accumulation of fluid in the interstitial spaces of tissues. Either too much fluid moves from the blood vessels into the tissues or not enough fluid moves from the tissues back into the blood vessels. This fluid imbalance can cause swelling in one or more parts of the body. Explain that bilateral pitting oedema is oedema in both feet and legs in which pressure on the skin leaves a depression in the tissues.

Hair colour change

A lady with of goiter

NOTE:
Overweight and obesity are also signs of malnutrition, in this case they put people at risk of diabetes, hypertension, and heart problems
Clinical signs and symptoms of malnutrition are often **non-specific** and only develop during the advanced stages of nutritional depletion. For this reason, diagnosis of a nutritional deficiency should not rely exclusively on clinical methods

3.2.3.5 Vital Statistics, Socio-Economic and Ecological Variables

Presentation: Vital statistics, socio- economic and ecological variables.

Vital statistics, socio-economic and ecological variables are known to influence indirectly nutrition status of a community. The etiology of acute, sub-clinical and chronic malnutrition is multifactorial, and thus it is the end results of multiple overlapping factors, in the community's physical, biological and, socio and cultural environments. Thus the amount of food and nutrients available to persons of different age group will depend on upon such factors, which are strongly related to malnutrition and can be used to identify individual at risk

Refer module 1, on the conceptual framework of malnutrition

Group Presentation: vital statistics, Socio economic and Ecological variables.

Divide your selves into three groups. Each group should choose one topic below and prepare 10 minutes presentation.

The topics are

- Vital statistics,
- Socio-economic and
- Ecological variables

Procedure to follow on preparing presentation

Read other sources (including books, journals and country reports). Prepare your presentation

Presentation should cover the associated variables for each topic and the link between malnutrition and those variables and how to collect those variables.

Present your results one after another in the plenary session and ask other groups to add their comments and corrections as needed

Vital Statistics

Malnutrition is the underlying cause of many diseases and death, and so vital health statistics can be used as indirect indicators of nutrition status of a community

Vital statistics are the compiled information collected from vital event records. Vital records data are normally used for analysis of health trends, program planning, and policy development. The data can be collected via hospital records.

Example of vital records such as; hospital records on Leading causes of under-five death, Low birth weight babies, Proportion of mothers who are breastfeeding

Socio-Economic Variables

Socioeconomic factors, such as poverty and gender inequality, are important determinants of health outcomes in many low-income countries.

The connection between malnutrition and poverty describes a proven link, especially at the lowest income levels. Poverty is regarded as the root cause of malnutrition and malnutrition perpetuates the cycle of poverty.
Countries with the lowest economic indicators report the highest rate of malnutrition, especially in children.
Low status of women in community and unequal distribution of food within families also contribute to gender inequalities and magnify the problem of malnutrition in a family and community

Ecological Variables
Malnutrition is always an ecological problem; environmental conditions such as climate, soil, storage of food, etc. might contribute indirectly to nutrition outcome of the community.

To collect ecological data, the following examples of variables are used;

- Soil fertility
- Environmental conditions
- Climate conditions
- Amount of food produced
- Household Food accessibility
- Food Amount of food stored etc

Nutrition improvement partly depends on the quality and quantity of nutrients contained in the foods produced. Low nutrient concentrations in foods can cause severe deficiencies in humans and farm animals. Nutrient concentrations in foods depend largely on the quality of soil in which the crops are grown. Although many interventions that aim to enhance food consumption through food production and diversification have shown positive effects on consumer's diets, evidence quantifying the nutritional impact of soil elements to nutrients contained in food produced is limited.
The main micronutrient deficiencies, which occur as a result of low soil concentrations of such elements, include iodine, iron, zinc and selenium

3.2.3.5 Preventing and managing malnutrition

There are several ways, which can be used, in preventing and managing malnutrition, these include:
Food

1. Improve kitchen gardens and backyard gardens.
2. Provide food support.
3. Improve foods by adding nutrients and flavour or removing anti-nutrients.
4. Fortify food through home modification or addition of Sprinkles.
5. Provide food supplements.
6. Modify food by enriching, mashing, fermenting, germination, dehulling or roasting.

7. Improve food security through income-generating activities or microfinance

Health care services

1. Vitamin supplementation
2. Therapeutic feeding
3. Enteral (tube feeding) or parenteral (giving glucose, protein, fat, vitamins and minerals through an IV) nutrition
4. Deworming to prevent iron deficiency anaemia
5. Improving institutional feeding in hospitals, schools and prisons

Behaviour change

1. Growth monitoring and promotion
2. Nutrition counselling and education, including food demonstrations
3. Social marketing
4. Awareness campaigns

Management of Moderate and Severe Malnutrition

Nutrition Services in Health Care Facilities

- Nutrition assessment
- Nutrition counseling
- Nutrition education
- Demonstration of how to prepare nutritious food
- Demonstration of how to maintain good hygiene and sanitation
- Prescription of specialized food products to treat acute malnutrition

At facility level nutrition workers can help prevent and manage malnutrition through nutrition assessment, counselling and support (NACS). Every patient who visits a health care facility should have a nutrition assessment to determine nutritional status. Nutrition workers should then counsel patient on how to improve their nutritional status and refer them for needed medical care or social support. Nutrition support can include prescribing specialised food products to clients with acute malnutrition

Contact points at which health care facilities provide nutrition services

Contact points for nutrition services	
RCH/ANC/PMTCT Maternity ward Medical ward Paediatric ward Outpatient department (OPD) Care and treatment clinic (CTC) Village health workers/Community personnel	

Kind of nutrition services offered by the contact point

Contact points for nutrition services	Nutrition services
RCH/ANC/PMTCT	Nutrition assessment and counselling, including infant feeding counselling Nutrition education
Maternity ward	Nutrition assessment and counselling, including infant feeding counselling Nutrition education
Medical ward	Nutrition assessment and counselling
Paediatric ward	Nutrition assessment and counselling
Outpatient department (OPD)	Nutrition assessment and counselling
Care and treatment clinic (CTC)	Nutrition assessment and counselling Nutrition education Specialised food products for clinically malnourished PLHIV Referral to livelihood support programmes

Nutrition care Plan for management of malnutrition

Final step involved after assessing nutrition status is to make a Nutrition Care Plan for the malnourished individuals

a) Nutrition care Plan for management of SAM

Criteria for classifying children and adults having SAM

Adults MUAC < 18.5 cm **OR** BMI < 16.0 **OR** weight loss > 10% since the last visit **Pregnant/post-partum** MUAC < 19.0 cm	**Children** Severe visible wasting **OR** WFH < – 3 z-scores **OR** MUAC 6–59 months: < 11.5 cm 5–9 years: < 13.5 cm 10–14 years: < 16.0 cm

Refer the session of clinical method of nutrition assessment: Photos of severely malnourished children and adults.

Nutrition care needed by individual with SAM

Nutrition Care for SAM Clients
Routine SAM medicines (antibiotics, folic acid, iron supplements for severe anaemia, vitamin A, measles vaccination for children, anti-malarial deworming) Provide, F-75(as a starter), F-100(as a catch up)/Ready-to-use therapeutic food (RUTF) to provide 100% of energy needs HIV testing (especially for children) PCP prophylaxis if not on ART Counseling on the CNA Daily monitoring if inpatient Weekly or bi-weekly monitoring if outpatient Appetite test, oedema assessment, weight monitoring and medical checks on each visit

Care plan has two parts: Nutrition Care Plan for inpatient treatment of children with SAM and medical complications and Nutrition Care Plan for outpatient treatment of children with SAM and no medical complications .

Criteria for inpatient treatment of SAM.

Criteria for Inpatient Treatment of SAM

- SAM measured by:
  - MUAC or WFH for children and pregnant/postpartum women
  - BMI for non-pregnant/post-partum adults

AND ANY OF THE FOLLOWING:

- Poor appetite (failed an appetite test)
- Concurrent infections
- In outpatient care for 2 months not gaining weight or losing weight or having worsening oedema
- Caregiver unable to provide home care
- Unable to return in 1 week for follow-up

Phases involved inpatient treatment of SAM:

Inpatient care of SAM includes medical treatment and nutritional treatment with specialised food products. The specialised food products are F-75, F-100 and ready-to-use therapeutic food (RUTF). These are prescribed as medicine and should only be used for severely malnourished children, not shared with other people in the family

There are three phases in inpatient treatment of SAM: stabilisation, transition and rehabilitation:

Stabilisation phase (first 1-2days)

Stabilisation covers feeding with F-75 and medical stabilisation, treatment of life-threatening medical complications and correction of micronutrient deficiencies. Children will not gain weight during this phase. They will remain in the stabilisation phase until their medical complications stabilise and appetite improves.

Transition phase (2-3 days)

This phase covers a gradual increase in calorie intake (from 100 kcal/kg/day to 130 kcal/kg/day) leading to some weight gain while preventing overfeeding. The child transitions from F-75 to F-100 or RUTF.

Rehabilitation phase

The child receives intensive feeding to recover lost weight, Breastfeeding is re-initiated and encouraged. If the caregiver is able to manage the child at home and return every 2 weeks for RUTF, train to continue care at home. If not, continue treatment as inpatient. Either F-100 or RUTF or both can be used. The main change in the diet is an increase in the amount of F-100 or RUTF.

Criteria for outpatient treatment of SAM

Criteria for Outpatient Treatment of SAM

ALL OF THE FOLLOWING:

- SAM measured by:
  - MUAC or WFH for children and pregnant/postpartum women
  - BMI for non-pregnant/post-partum adults
- Appetite (passed an appetite test)
- No concurrent infections
- Caregiver willing and able to provide home care
- Able to return in 1 week for follow-up
- Enough RUTF supply in stock

Point to note

Nutrition and health criteria qualify clients for Nutrition Care Plan are

- Bilateral pitting oedema
- Children: WFH < –3 SD **OR** MUAC
  - 6–59 months: < 11.5 cm
  - 5–9 years: < 13.5 cm
  - 10–14 years: < 16.0 cm
- Adults: MUAC < 18.5 **OR** BMI < 16

2.F-75, F-100, RUTF and FBF are the specialised food products which are given to clients who are under Nutrition Care Plan

3.What key messages should be given to include;

- They should not share the specialised food products with others in the family.
- Get weighed every month.
- Increase the energy density of the home diet.
- Manage symptoms and drug-food interactions through diet.
- Maintain good sanitation and hygiene.
- Exercise to strengthen muscles and improve appetite.

5. Interventions/services given to clients with SAM include;

Routine SAM medicines
Cotrimoxazole prophylaxis for HIV-positive clients
Deworming according to national guidelines
Ferrous sulphate tablets if clinical signs of anaemia
200,000 IU of vitamin A if no oedema

6. Adults with SAM should be followed up at every 2 weeks

Give all clients with severe acute malnutrition (SAM) an appetite test to find out whether they can eat ready-to-use therapeutic food (RUTF) on an outpatient basis.

1. Ask the client (or caregiver if the client is a child) to wash his or her hands with soap and running water.
2. Take the client (and caregiver if the client is a child) to a quiet, private area.
3. Give the client or caregiver a sachet of RUTF and show how to open it and eat it from the packet or on a spoon.
4. Do not force the client to eat the RUTF. Children may need gentle encouragement to eat, especially if they are sick.
5. Offer plenty of clean, safe drinking water to the client while eating the RUTF.
6. Watch to see how much the client eats (or ask the caregiver to give it to the child and watch how much the child eats).

Minimum amount of RUTF, malnourished individual should eat to pass the appetite test	
Weight (kg)	**Sachets**
< 4.0	⅛–¼
4.0–6.9	¼–⅓
7.0–9.9	⅓–½
10.0–14.9	½–¾
15.0–29.0	¾–1
≥ 30.0	> 1

b. Nutrition Care Plan for Moderate Acute Malnutrition
Criteria used to classify children and adults having MAM

Criteria for MAM

Adults
MUAC ≥ 18.5–< 22.0 cm
OR BMI > 16.0–<18.5
OR weight loss > 5% since the last visit

Pregnant/post-partum
MUAC ≥ 19.0–< 23.0 cm

Children
MUAC
6–59 months: ≥ 11.5–< 12.5 cm
5–9 years: ≥ 13.5–< 14.5 cm
10–14 years: ≥ 16.0–< 18.5 cm
OR WFH between – 3 and – 2 z-scores
AND Confirmed weight loss since last visit

Nutrition care plan needed for management of MAM

Nutrition Care for MAM Clients

- Treatment of concurrent illness
- FBF to provide 40–60% of energy needs (slightly more for children coming from SAM treatment)
- HIV testing (especially children) and PCP-prophylaxis if not on ART
- Anaemia assessment (supplementation if necessary)
- Deworming
- Counselling on the CNA
- Monthly follow-up and monitoring

Point to note

NUtrition and health criteria qualify clients for Nutrition Care Plan

- Bilateral pitting oedema
- Children: WFH < –3 SD **OR** MUAC
  - 6–59 months: < 11.5 cm
  - 5–9 years: < 13.5 cm
  - 10–14 years: < 16.0 cm
- Adults: MUAC < 18.5 **OR** BMI < 16

Specialized food products are given to clients under Nutrition Care Plan

F-75, F-100, RUTF and FBF

Key messages should be given to adults with SAM?

Do not share the specialized food products with others in the family. Get weighed every month. Increase the energy density of the home diet. Manage symptoms and drug-food interactions through diet. Maintain good sanitation and hygiene. Exercise to strengthen muscles and improve appetite.

Other interventions/services are given to clients with SAM?

Routine SAM medicines
Cotrimoxazole prophylaxis for HIV-positive clients
Deworming according to national guidelines
Ferrous sulphate tablets if clinical signs of anaemia
200,000 IU of vitamin A if no oedema

How often should adults with SAM be followed up? Every 2 weeks

PRACTICAL

Hospital visit: management of malnutrition, instructions to be provided by course instructor

c. Nutrition care for individuals with normal nutrition status

Nutrition Care

for individuals with Normal Nutritional Status

- Counselling to prevent infection and malnutrition through:
  - The Critical Nutrition Actions
  - Micronutrient supplements
  - Growth monitoring and promotion (children)
  - Deworming
  - Child spacing and reproductive health
  - Optimal infant and young child feeding
  - Malaria prevention
- Referral to psychosocial counselling, home-based care, and economic strengthening and livelihoods support

SESSION THREE

Duration 4 Hours and 10 minutes

3.3 Designing and planning of nutrition activities

Session Objectives

At the end of this session, participants will be able to:

- Explain research methodologies in designing, planning and conducting nutrition activities for a specific purpose
- Describe ethical principles in the design, collection, use and dissemination of nutrition data and information

3.3.1 Introduction

The complexity in the design, planning and organisation of nutrition activities will depend largely on the objectives of the activity (one-time or routine assessment or screening, cross-sectional survey or research, intervention, etc), study populations and size, type of research/survey methodologies and techniques to be used, frequency of follow-up, expected duration, and location. Most of the nutrition activities apply and integrate various research methods and techniques in the design, plan, and conduct of the activity. It is important to plan the organisational aspects of the activity in great detail before starting any substantial field activities. The design must be reviewed to identify all procedures and tasks that must be undertaken to meet the objectives, and the logistics developed to carry out these procedures and tasks in a timely manner. During this planning it may become clear that compromises have to be made between what is theoretically desirable and what is logistically possible.

These issues are compiled together to make a study plan or study protocol. Detailed planning is necessary for several reasons, to facilitate review before approval, funding and support, allow estimation of required resources, and for addressing anticipated problems in advance.

3.3.2 Formulation of appropriate questions, hypotheses and objectives

This is the crucial first step, and forms the kernel of all research and nutrition activities. It calls for creativity, innovation and an inquisitive approach. Formulation of study questions and hypotheses in any nutrition activity begins with an awareness, intuition, or suspicion about the possible influence of a particular factor on the occurrence of a phenomenon or disease. Such an idea may arise out of the day to day run of community work, examination of the magnitude and pattern of nutrition problem, laboratory information, discussions with experts from nutrition-related sectors, and examination of questions raised from previous research or about the effectiveness of current or new intervention. Any one of these may lead to formulation of a specific hypothesis.

Appropriate activities are next planned, leading to collection and analysis of data to determine whether any statistical association is demonstrable concerning the interaction between variables defined by the hypothesis. The validity of the observed association is then checked by excluding chance, bias, confounding and so on. Judgment is then made about true existence of the statistical association. This often goes far beyond the data from any single study, but takes into account the consistency of findings from several studies of different designs in different populations by other researchers, both past and present.

3.3.3 Common objectives for designing a nutrition activity include:

- To establish the prevalence of a nutrition problem within specified population groups at defined point in time
- To evaluate the effectiveness of a nutrition intervention/programme/project
- To monitor over time the nutrition situation of a population
- To determine the coverage and utilisation of nutrition and health services
- To determine prevalence of other nutrition-related problems e.g. morbidity, mortality
- To assess possible causes of nutritional problems and linkage with other community and household factors
- To identify possible interventions that addresses the causal factors of morbidities and malnutrition.

Formulated objectives must be specific, measurable, achievable, realistic, and time-bound. They should be linked to indicators to be measured (e.g. incidence of diarrhoea). Objectives will form the basis for the activities and will also serve as the basis for evaluation of the activities. You can start by stating the general objective of your proposal before zeroing in to specific objectives

3.3.4 Study design, sampling and sample size

Once the research objective for a study has been adequately specified in terms of the target population, exposure or interventions as the case may be, and outcomes, the next step is to consider the design of the study.

3.3.4.1 Study design

The term study design is used to describe the combination of ways in which study groups are formed, and the timing of measurements of the variables. Choosing a study design appropriate for the study question is important. Basic study designs include: 1) Descriptive, 2) Observational, and 3) Experimental. Table 1 presents important features of the study designs. Cross-sectional, cohort, case-control and intervention trials are the most commonly conducted studies. Checklist of items to be included during the designing of these studies is presented in Table 2.

Table 1: Basic study designs

Descriptive	**Observational**	**Experimental**
Purpose: Document experience, observations, unusual events, programmes, Begin search for information on which future, more complex study designs would rely	Purpose: Seek causes, predictors, risk factors Investigator observes phenomenon without intervention	Purpose: Evaluate efficacy of treatment/therapy, effectiveness of intervention, impact of programme/project
Examples: Cross-sectional studies Case reports or series Surveys Ecologic studies	Examples: Case-control studies Cohort studies	Examples: Randomised clinical trials Community interventions Health care programmes
Application: Cross-sectional - assessment of calcium intake and blood pressure in healthy populations. Those with higher blood pressure had lower intakes of calcium. It is not clear from cross-sectional data whether those with higher blood pressure altered their diets and their intake of calcium in response to a previous diagnosis of high blood pressure	Application: Case-control - past dietary intake is assessed among individuals with recently diagnosed disease (cases). Data from cases are compared with data of randomly selected sample of individuals from non-diseased (controls) population out of which the cases arose. Cohort - individuals exposed to dietary factors and other risk factors of interest and those not exposed are measured and followed over time to identify those who develop disease	Application: Trial/intervention – individuals are randomly assigned to receive dietary treatment or a control diet or placebo, and followed for the development of the outcome of interest. To demonstrate if and to what extent change has occurred, measurements are taken before-and-after (pre- & post-) or before-during-after trial in diet and control groups

Table 2: Checklist of items to consider when designing commonly conducted study designs

Recommended items	Study designs		
	Cross-sectional	**Cohort**	**Case-control**
Background/rationale	Explain the scientific background and rationale for the investigation		
Objectives	State specific objectives, including any pre-specified hypotheses		
Setting	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection		
Participants	Give the eligibility criteria, and the sources and methods of selection of participants	Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up For matched studies, give matching criteria and number of exposed and unexposed	Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls. For matched studies, give matching criteria and the number of controls per case
Variables	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable		
Data sources & measurements	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group		
	Give information separately for exposed and unexposed groups	Give information separately for exposed and unexposed groups	Give information separately for cases and controls
Bias	Describe any efforts to address potential sources of bias		
Study size	Explain how the study size was arrived at		
Statistical methods	Describe all statistical methods, including those used to control for confounding		
	Describe any methods to examine subgroups and interactions		

	Explain how missing data will be addressed (omitted, assigned a baseline value or group average, or imputed using statistical theory)		
	If applicable, describe analytical methods taking account of sampling strategy	If applicable, explain how loss to follow-up will be addressed	If applicable, explain how matching of cases and controls will be addressed

In addition to these recommended items, experimental designs shown in Table 1 require extra items. These include detailed description of:

- trial or intervention for each study group with sufficient details to allow replication, how and when will be administered
- eligibility criteria for participants
- outcome measures (defined pre-specified primary and secondary outcomes), how and when they will be assessed
- randomisation (participants assigned to comparison groups in the trial on the basis of a chance [random] process characterised by unpredictability)
- blinding (or masking) participants, healthcare providers, data collectors, and data analysts (withholding information about the assigned interventions from people involved in the trial who may potentially be influenced by this knowledge) if intervention permits

Individual reading exercise 1: Issues in study designs

Relate types of study designs learnt in class and what is documented in literature using Handouts 1a and 1b

Handout 1a. Study design

Kirkwood, B.R., Cousens, S.N., Victora, C.G., Zoysa, I. 1997. Issues in the design and interpretation of studies to evaluate the impact of community-based interventions. Tropical Medicine and International Health 2 (11): 1022-1029

Handout 1b. Study design

Eccles, M., Grimshaw, J., Campbell, M., Ramsay, C. 2003. Research designs for studies evaluating the effectiveness of change and improvement strategies. Quality Safety and Health Care 12:47-52

Individual reading exercise 2: Published articles on study designs

Note down the following from Handouts 2a, 2b, 2c and 2d:

- Identify whether it is a descriptive, observational or experimental study design
- Specify the type of design

- Identify objective (s) and assess whether it is SMART?
- Identify study population, location, sampling procedure, frequency of measurements, indicators/variables to be measured and duration

Handout 2a. Cross-sectional design

Rasmussen, J.B., Thomsen, J.A., Rossing, P., Parkinson, S., Christensen, D.L., Bygbjerg, I.C. 2013. Diabetes mellitus, hypertension and albuminuria in rural Zambia: a hospital-based survey. Tropical Medicine and International Health 18 (9): 1080-1084.

Handout 2b. Cohort design

Merchant, A.T., Jones, C., Kiure, A., Kupka, R., Fitzmaurice, G., Herrera, M.G., Fawzi, W.W. 2003. Water and sanitation associated with improved child growth. European Journal of Clinical Nutrition 57: 1562-1568.

Handout 2c. Case-control design

Rodrigues, A., Sandström, A., Cá, T., Steinsland, H., Jensen, H., Aaby, P. 2000. Protection from cholera by adding lime juice to food – results from community and laboratory studies in Guinea-Bissau, West Africa. Tropical Medicine and International Health 5 (6): 418-422.

Handout 2d. Intervention design

Kirkwood, B. R., Manu, A., ten Asbroek, A.H.A., Soremekun, S., Weobong, B., Gyan, T., Danso, S., Amenga-Etego, S., Tawiah-Agyemang, C., Owusu-Agyei, S., Hill, Z. 2013. Effect of the Newhints home-visits intervention on neonatal mortality rate and care practices in Ghana: a cluster randomised controlled trial. Lancet 381: 2184-2192.

3.3.4.2 Sampling methods and techniques

Resources are always limited. It is usually not possible for the researcher to study an entire target population of subjects. A representative sample from the population is studied. Generalisation is then made from the sample to the population from which the sample was taken (the target population), and further beyond to a larger public, to other settings, populations and circumstances. Sampling is a highly technical activity, and it is critical that the sample design be carefully undertaken. The question then arises as to how accurately the sample reflects the entire population. Secondly, how true are conclusions derived from a small number of subjects for numbers several times larger, bearing in mind chance variations. To put it differently, these considerations relate to methods of sampling, and sample size. The aim of all sampling methods is to draw a representative sample from the population. With a representative sample one can confidently generalise the results to the rest of the population from whom the sample was drawn.

There are occasions where you may need to sample the entire population. These include:

- When your population is very small
- When you have extensive resources
- When you don't expect a very high response

There are two basic methods of sampling; **probability sampling** and **non-probability sampling**. **Probability sampling** employs random selection techniques and assures that each subject in the population has a known chance of being included in the sample. Because probability sampling employs random selection techniques, it is more objective than non-probability sampling. In **non-probability sampling**, there is no way of assuring that each subject has a known probability of being included in the sample; and therefore the sample cannot be expected to reflect the entire population. Sample households or individuals are selected because there is reason to believe that they "represent" the population well or that they are well positioned to provide information about the population (e.g. as with key informants). The conclusions of the research in such instances become less reliable or generalisable. On the other hand there is the advantage of convenience and low cost which sometimes outweighs such risks.

Probability sampling is characterised by (1) the use of lists or sampling frames to select the sample, (2) clearly defined sample selection procedures, and (3) the possibility of estimating sampling error from the survey data. A **sampling frame** is a list of potential sampling units, corresponding roughly to villages or city blocks. Sources of sampling frames include administrative records (e.g. records/registers from districts, hospitals, schools, etc) or own frame can be constructed. These sources however have some disadvantages, namely administrative records may not be up to date, and that constructing your own may be too costly especially in large scale surveys. Sampling frame development normally involves two steps: (1) selection of primary units and (2) selection of elementary sampling units within the primary units. In many applications, for example, villages or city blocks will be chosen at the first stage and a sample of households from each at the second. In some cases, individuals from households may need to be selected, adding a third step to the process. Where sampling frames do not exist, a list of villages/towns that cover all of the target population will suffice, but additional stages of sample selection may be needed to produce small enough units to be workable for survey field operations.

Sampling techniques used in probability sampling includes simple random, systematic, stratified, cluster, and multi-stage sampling.

Simple random sampling. It is the simplest design, in which all the members of a population have an equal chance of being selected. The method involves making a list of all members of the population (preparing a sampling frame) and assigning each element a unique identification starting from 1 to the last number of elements **N** in the population. Determine the required sample size **M**. Then using random number tables (or computer-generated random numbers), dice, or any other random mechanism, select a sample of **M** units from the list of **N** elements one at a time without replacement. This technique is easy to use in cases where the population is small. However, its disadvantage is that you need to list every member of the population. Often this is not possible. In addition, the cost is higher and involves considerable planning and expense. It is cheaper to use a conveniently available group. By bad luck, the sample may not be representative because it may not be evenly spread across all sections of the population.

Individual exercise 3. Selecting a random sample using simple random sampling
Select a sample of 10 individuals from the following list using simple random sampling. A table of random numbers has been provided.
Repeat the task using systematic sampling and stratified sampling after learning systematic and stratified sampling techniques
Compare results after performing each technique

Claudia	George	Mary	Rama	Phelis	Francis	Rafael	Alice	Jua
John	Hamisi	Leo	Luka	Amiri	Samwel	Vicky	Bonny	Chiba
Ally	Stella	Oscar	Antoni	Tito	Mwajuma	David	Regina	
Zainabu	Richard	Sikujua	Kido	Maria	Modesta	Elisha	Musa	
Alex	Anne	Onesmo	Ezra	Scola	Beatrice	Hasan	Erasto	
Miriam	Victor	Sihaba	Chale	Elia	Hamida	Koba	Paul	

Procedure. Number the population from 1 to 50. Use the given random number table containing 2 digits. Determine a starting point in the table by randomly picking a number with your eyes closed. For convenience you can start at the top left hand corner. Choose a direction in which to read (up to down, left to right, or right to left). Once a number is chosen, do not use it again. If the starting point is column 2, row 3 on the Table, reading left to right, you would select numbers 47, 18, 30, 42, 01, 14, 04, 46, 24, and 12. These are 10 unique numbers. Retrieve your population list, and select each sample with a corresponding unique number in the list.

Table of random numbers

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1	31	11	09	38	45	07	48	06	19	10
2	49	44	50	15	32	40	03	23	27	34
3	22	47	18	30	42	01	14	04	46	24
4	12	28	37	02	35	21	33	26	08	16
5	29	43	20	39	05	41	13	36	17	25

Systematic sampling

Systematic sampling shares the same information requirements as simple random sampling. However, the technique involves systematic selection of households from a list of all households within the population of interest (i.e. a sampling frame). It is commonly used in small scale surveys where households are arranged (e.g. tents/dwellings in refugee camps or well-organised villages) in a regular pattern. After listing households from 1, 2, 3, ……. to the last (**nth**), determine a sampling interval **K**, where **K = N/n** (**N** is population size in the sampling frame; **n** is the sample size). From the sampling frame, one will therefore select every **Kth** entry until you have **n** sample. The first household should be selected randomly. It is advisable to select a random number **g** as a starting point. It should fulfill the condition **$1 \leq g \leq K$**. If, for example, the number drawn is 4, start with the fourth household or individual on the list. Care must be taken to list households in a random manner. If they are listed in unknown pattern e.g. males topping the list followed by females, resulting sample may bias information. If the list is ordered in an evident pattern, simple random sampling must be applied.

Advantages of using this technique is that it is simple, flexible to implement, and easy to give instructions to fieldworkers. If the list is ordered prior to taking the sample, the sample will reflect the ordering and as such can easily give a proportionate sample. The main disadvantage is that if there is an ordering (monotonic trend or periodicity) in the list which is unknown to the researcher, resulting information may be biased.

Individual exercise 4. Selecting a random sample using systematic sampling

Respond to the following question on how to select a random sample using systematic sampling

Question: A survey is to be undertaken in a village to assess food consumption pattern of children aged 2 to 5 years. A sample size of 120 children/households is needed for assessment. How would you use systematic sampling to sample them?

Procedure: Develop a list of households with children aged 2 to 5 years. Suppose the list contains 360 households. Determine sampling interval K by computing **K = N/n**, 360/120. Sampling interval K will be 3, meaning a sample household will be picked from the list at an interval of 3 households. Choose the starting household at random by drawing a number fulfilling the condition **$1 \leq g \leq K$**. This will be between 1 and the sampling interval K, that is, a household listed as 1, or 2 or 3. If 2 is chosen at random, a household with the second identification number in the list will be selected as a starting point and the first household. The next household will be selected by adding the sampling interval to the first household number, i.e. 2 + 3 = 5. Continue in this way (e.g. 2, 5, 8, 11, 14, etc) until the number of households required has been systematically selected.

Stratified sampling

Stratification is the process of grouping members of the population into relatively homogeneous subgroups before sampling. Each subpopulation is called a stratum. The strata should be non-overlapping (mutually exclusive), with every element in the population assigned to only one stratum. The strata should also be collectively exhaustive: no population element can be excluded. The technique involves sampling each stratum as an independent subgroup, out of which individual elements can be randomly selected. Thereafter, a list is developed of all elements in each subpopulation then selecting a sample of the required size from each subpopulation using simple random sampling or systematic sampling. This often improves the representativeness of the sample. The main reason for using this technique is to overcome the possibility that the population may contain subgroups differing on the variable of interest (e.g. mortality rates by sex, dietary intake by socio-economic status, etc), such that simple random sampling may not capture a representative sample of all sections of the population.

The advantage of this technique is that all the important groups are proportionately represented and the representativeness of the sample is known.
Different sampling techniques may be used in each stratum, which may be desirable especially if the strata correspond to different characteristics e.g. rural versus urban. The disadvantages are that a list of all members from each subpopulation should be prepared, and the proportion of important groups is needed. Cost is also higher.

Stratification is sometimes introduced after the sampling phase in a process called "post-stratification." This is usually done during data analysis. This approach is typically implemented due to a lack of prior knowledge of an appropriate stratifying variable or when the investigator lacks the necessary information to create a stratifying variable during the sampling phase.

Individual exercise 5: Selecting a random sample using stratified sampling
Respond to the following question on how to select a random sample using stratified sampling
Question: You are required to determine the average yield of sorghum per household in three villages of Ward A in a certain district. Total population in the 3 villages is 1120 households (392 in village X; 320 in village Y; 408 in village Z). How would you sample 42 households using stratified sampling, taking the village as the stratification unit?

Procedure: Construct a sampling frame by listing all the households in each village (001 to 392; 001 to 320; 001 to 408). How do we decide on the number of households to select from each village, to make a total of 42 households?

One option is to select equal number of households from each village. Simple random sampling can be used to select 14 households from the sampling frame of each village, using random number tables or any other random mechanism. A second option is to allocate the sample proportionately to the size of the village, that is, a larger sample from the larger stratum and vice versa. This is called proportional allocation.

With 1120 households, proportion of households to sample will be as follows:
Village X: 392 / 1120 = 35%
Village Y: 320 / 1120 = 29%
Village Z: 408 / 1120 = 36%

Determine the number of households to be selected from each village using the calculated proportions:
Village X: 35% × 42 = 15
Village Y: 29% × 42 = 12
Village Z: 36% × 42 = 15

This will make a total of 42 households. Thereafter, simple random sampling can be used to select 15 households from the sampling frame of village X, 12 households from the sampling frame of village Y and 15 households from the sampling frame of village Z. Information regarding sorghum yield can be sought from these households.

Cluster sampling
In this sampling technique, aggregates of subjects rather than individuals are selected. Villages and hamlets in towns/cities are the most common clusters used in sampling. After determining the number of clusters to be included in study/activity, cluster sampling involves three distinct stages: 1) defining clusters and constructing the sampling frame; 2) choosing clusters for inclusion in the sample; and 3) choosing households from within selected clusters for inclusion in the sample. When population sizes of each cluster are available prior to sampling, Probability-proportional-to-size (PPS) is the method of choice. This involves:

- identification of the geographical area of interest
- identification of the age group of interest
- preparing a list of all cities, towns/villages/settlements, and their corresponding population sizes
- calculation of cumulative measure of population size starting at the top of the list up to the last (total cumulative population size)
- determination of sampling interval (SI), by dividing the total cumulative measure of population size by the planned number of clusters to be selected
- select a random number (random start) between 1 and SI as a starting point. Compare this number with the cumulative measure of population size. The unit within whose cumulative measure of size the number falls is the first sample unit
- subsequent clusters are chosen by adding the first number to the sampling interval. This procedure is followed until the list has been exhausted. The resulting number of units should be approximately equal to the target number of clusters
- selection of households in each cluster

A slightly different procedure should be used when cluster population sizes are not available prior to sample selection. In this method, all clusters will have the same chance or probability of selection, or equal probability, rather than the probability being related to their size. Procedures for choosing a sample of clusters with equal probability include:

- preparing a numbered list of clusters, preferably ordered geographically by areas of a city
- calculating the sampling interval (SI) by dividing the total number or clusters by the number of clusters to be selected
- selecting a random number (random start) between 1 and SI as a starting point. The cluster on the list corresponding to this number will be the first sample cluster. Subsequent units are chosen by adding the first number to the sampling interval. This procedure is followed until the list has been exhausted.
- selection of households in each cluster

Individual exercise 6: Using cluster sampling with PPS and equal probability

Read through how cluster sampling is performed using the two techniques. Relate the clusters to villages within districts

Probability-proportion-to size					**Equal probability**	
Cluster no.	Cluster size	Cumulative size	Sampling no.	Cluster selected	Cluster no.	Cluster selected
001	120	120	73	X	001	
002	105	225			002	X
003	132	357			003	
004	96	453			004	
005	110	563	503	X	005	
006	102	665			006	X
007	165	839			007	
008	98	937	934	X	008	
009	115	1052			009	
010					010	
.					011	X
.					.	
.					.	
170 (last)	196	17,219			170 (last)	
Planned no. of clusters = 40 Sampling interval = 17,219/40 = 430.475 Random start between 1 and 430.475 = 73 Clusters selected = 001, 005, 008, ...					Planned no. of clusters = 40 Sampling interval = 170/40 = 4.25 Random start between 1 and 4.25 = 2 Clusters selected = 002, 006, 011, ...	

Multistage sampling

This technique involves more than one stage of sampling and/or a combination of two or more sampling designs. In very large and diverse populations sampling may be done in two or more stages. This is often the case in community-based studies, in which people are to be interviewed from different villages, and the villages have to be chosen from different areas e.g. Wards, Districts, etc. For example, in a study of utilisation of pit latrines in a district, 150 households are to be visited for interviews with family members as well as for observations on types and cleanliness of latrines. The district is composed of 6 wards and each ward has between 6 and 12 villages. The following three-stage sampling procedure could be performed:

- Select 3 wards out of 6 in the District by simple random sampling
- For each ward select 5 villages by systematic sampling (15 villages in total)
- For each village select 10 households by simple random sampling or any other technique. When sampling frame is lacking, you do not have access to random number tables, and you do not know where in the village to begin sampling, simply choosing all 10 households in the centre of the village would produce a biased sample. The following sampling procedure can be used:
- Go to the centre of the village
- Choose a direction in a random way: spin a bottle on the ground and choose the direction the bottleneck indicates
- Walk in the chosen direction and select every second or every third household until you have the 10 households you need. If you reach the boundary of the village and you still have not achieved the sample, return to the centre of the village, walk in the opposite direction and continue to select your sample in the same way until you have 10. If there is nobody in a chosen household, take the next household

Individual exercise 7: Selecting a random sample using multistage sampling

Respond to the following question on how to select a random sample using multistage sampling. Write the sampling stages and procedure.

Question: How would you select students at university Q to participate in a survey to investigate their opinion regarding their university?

Procedure.

- Stage 1. Use stratified sampling to stratify students according to their Faculties (Humanities, Science, etc.)
- Stage 2. Consider courses as clusters and use cluster sampling to select the courses in the selected Faculties
- Stage 3. Use students' lists as sampling frames and select a sample of students using simple random or systematic sampling. If student population is diverse, consider using stratified sampling according to strata created

Individual reading exercise 8. Sampling guide

Relate sampling issues learnt in class with what is documented in literature in Handout 3

Handout 3: Sampling guide

Magnani, R. 1997. Sampling guide. Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington, DC.

3.3.4.3 Sampling unit and challenges of reaching selected households

In addition to sampling methods and techniques, it is important to decide what the sampling unit will be. The sampling unit is a single unit of the population (e.g., a person, a household). Often, more than one sampling unit is required, depending upon the information gathered in a survey. This is important information to have when choosing the sample because it can change the number of households in the sample or make it impossible to interview someone from each household. For example, if one wants to know the prevalence of diarrhoea in children less than 36 months, one would need to interview women with children less than 36 months. This will be important for the sample selection because not every house will have a child of this age category. Thus, sample selection should consider developing a sampling frame of children less than 36 months, sampling frame of households with children less than 36 months, or factor in the need to skip households to find one with a child less than 36 months.

Ideally, all sampled households or individuals should be visited for data collection. No individuals or households may be excluded or substituted for any reason. If household members are absent at the time of data collection, efforts should be made to re-visit it. In some cases, depending on objective of study/survey/activity, anthropometric assessments include ALL eligible children in the selected household, whereas in others, ONLY ONE child per household is chosen randomly for measurements. Other potential challenges with household selection include:

- The person needed to interview is not home. For example, if one needs to interview others with children under five and only the grandmother is at home with the young children.
- The selected village cannot be reached because there have been heavy rains and you cannot cross the river.
- The selected village is very small and has fewer households than are to be interviewed in each cluster.
- Separate households are difficult to identify e.g. three families are living in the same house and eating together
- No one is at home
- Household head refuses to be interviewed

- If any of the above situations are encountered, a supervisor must be notified, and s/he will make a decision regarding the case. Always make a note so that the problem can be considered during analysis.

3.3.4.4 Sample size

Sample size is determined by its measurement indicator (or outcome measures in case of interventions) e.g. stunting prevalence, mortality rate, etc. It may be conducted to estimate some quantity, for example the prevalence of malnutrition, in a specified population with a given degree of precision. Alternatively, an objective may be to establish the difference, or conversely the similarity, between two groups defined in terms of a particular risk factor or treatment regimen. For surveys designed to measure either changes in indicators over time or differences in indicators between project and control areas, the required sample size for a given indicator for each survey round and/or comparison group depends on five factors. The first two are population characteristics and the last three are chosen by the survey designer. They are as follows:

- number of measurement units in the target population
- initial or baseline level of the indicator
- magnitude of change or comparison group differences expected to be reliably measured
- degree of confidence with which it is desired to be certain that an observed change or comparison group difference of the magnitude specified above would not have occurred by chance (level of statistical significance), and
- degree of confidence with which it is desired to be certain that an actual change or difference of the magnitude specified above will be detected (statistical power)

For calculating sample size to determine the prevalence of a nutrition situation, the following should be considered:

- The existing or expected malnutrition prevalence
- The minimum acceptable precision level (confidence level)
- The likely design effect (if the survey is to use cluster sampling)
- Percentage increase to allow for contingencies. It is advisable to increase sample size by a certain proportion (e.g. 5%, 10%, 15%) of the calculated sample to allow for contingencies. This increment is necessary to allow for the following unforeseen events:
- Inability to reach all targeted sample respondents/households e.g. Due to absence, inaccessibility, etc.
- Exclusion of unreliable data from unreliable respondents during cleaning process where implausible information is discarded
- Other contingencies depending on context

In practice, selections of sample size are almost always a trade-off between the ideal and the feasible. On one hand, a sample size that is too small gives results with limited precision and therefore questionable usefulness, while on the other hand beyond a certain level, increasing sample size produces only small improvements in precision yet it may imply a disproportionate increase in cost.

Sample size calculations depend on whether the study seeks to:

- Measure one single variable (e.g. mean, rate or proportion) in one group with a certain precision. Common with descriptive studies
- Compare difference in one variable (e.g. Mean, rate or proportion) between two groups with a certain precision
- Demonstrate a significant difference between two intervention groups
- Sample size may be calculated by using formulae or ready-made tables that many textbooks of statistics provide. The formulae can only be used if one has a rough idea about the outcome of the study or intervention, which is not always the case. Whatever method is used it is important to remember that sample size calculations are based on our best guesses of a solution. The number arrived at simply provides an idea about the most suited number to be included in the study. It is in no way to be considered exact. It is always advisable to call upon a statistician or an experienced researcher who can assist in choosing and using the appropriate formulae.

Individual reading exercise 9: Issues in sample size calculations
Relate types of study designs learnt in class and what is documented in literature using Hand-outs 4a and 4b

Handout 4a. Sample size calculation
Compiled class notes on Sample size calculation based on Varkevisser, C.M., Pathmanathan, I., Brownlee, A. 2003. Designing and conducting health systems research projects, Volume 1: Proposal development and field work. WHO/IDRC, Amsterdam

Handout 4b. Sample size calculation
Whitley, E., Ball, J. 2002. Statistics review 4: Sample size calculations. Critical Care 6: 335-341

3.3.5 Ethical considerations in conducting nutrition activities

Origin of ethical issues in health research
Many of the ethical issues in nutrition activities originate from health research. Scientific research has produced substantial health and social benefits. It has also posed some troubling ethical questions. Public attention was drawn to these questions by reported abuses of human subjects in biomedical experiments, especially during the Second World War. During the Nuremberg War Crime Trials, the Nuremberg code was drafted as a set of standards for judging doctors/physicians and scientists who had conducted biomedical experiments on concentration camp prisoners. This code became the prototype of many

later codes intended to assure that research involving human subjects would be carried out in an ethical manner. These codes include The Belmont Report, US Department of Health, Education and Welfare (1979) and the Declaration of Helsinki World Medical Association (1964-2008).

The codes consist of rules that guide the researchers/investigators or the reviewers of research in their work. They provided a framework, description, critique and support for health research. They ensure the protection of the rights, safety and well-being of human subjects involved in a research or intervention study and to provide public assurance of that protection. Ethical issues are increasingly becoming a concern to sponsoring or funding organisations, institutions, and investigators. Of special concern are vulnerable/disadvantaged subjects, including children, elderly, prisoners, mentally ill persons, low socio-economic communities. These cannot give or refuse consent for themselves and may be vulnerable to coercion or undue influence. In many countries, research and other activities involving human subjects must satisfy formal ethical review committees. The committees will have to approve the study plan or research protocol and procedures. The submission should make clear that the ethical implications of all aspects of the study have been given full consideration by the researchers/investigators. Very commonly a researcher must walk a tightrope, balancing his or her responsibilities to the individual with those related to the improvement of public health. Critical to the conduct of a successful activity is that appropriate discussion with community leaders and study participants or parents in case the study population involves children, should be carried out before the study begins. It is important that the study population cooperates well and accepts conditions of the study. They must feel a part of the study and perceive it to be for their benefit.

Ethical principles governing research on human subjects

Broader ethical principles provide a basis on which specific rules may be formulated, criticised and interpreted. There are four basic ethical principles governing research on human subjects, namely respect for persons, beneficence, justice, and respect for communities.

- **The principle of respect for persons** requires that researchers take seriously the choices of autonomous people, that is, people who can responsibly make their own decisions. Importantly, people lacking autonomy, such as young children or adults with advanced dementia, are entitled to protection. This principle is the source of the moral rules of informed consent and confidentiality. In order for informed consent to be valid, the research subject must have the cognitive capacity to make the choice, be so situated as to choose freely, have adequate information, and understand what is at stake in the decision. Informed consent may not be required when it cannot practicably be obtained and study participation poses only minimal risk. Researchers must also take necessary steps to protect the confidentiality of the research subject's health information.
- **The principle of beneficence** obliges researchers not to harm needlessly and, where possible, to promote the good of research subjects. Two general rules are

considered complementary expressions of beneficent actions in this sense: (1) do not harm and (2) maximize possible benefits and minimize possible harms.

- **The principle of justice** may be defined as the ethical obligation to distribute the benefits and burdens of research fairly. An injustice occurs when some benefit to which a person is entitled is denied without good reason or when some burden is imposed unduly. Researchers have an obligation to ensure that study procedures for the selection of research subjects are equitable. Researchers must neither exploit the vulnerable, nor exclude without good reason those who stand to benefit from study participation. Proposed eligibility criteria to participate should be evaluated, each criterion must be accompanied by a clear justification in the study protocol.
- **The principle of respect for communities** implies that investigators have an obligation to respect communal values, protect and empower social institutions, and, where applicable, abide by the decisions of legitimate communal authorities.

Other ethical principles concerning research on human subjects include:

- Scientific merit of the research proposal
- Equitable selection of subjects who will participate in the research
- Informed consent (individual level)
- Communal consent that involve leaders from different levels (village, district, etc)
- Confidentiality (individual level) of information collected
- Anonymity of communities being investigated
- Coercion/Respect
- Potential benefit and risk of harm need to be considered even if there are some attractive short-term benefits
- Incentives may be provided if necessary after each situation is reviewed in the local context
- Feedback of results to the investigated communities/individuals and implications of the findings and recommendations

The most common ethical mistakes most likely to be committed by researchers include:

- Deception in gaining the cooperation of participants
- Invasion of privacy
- Violation of confidentiality
- Coercion
- Empty promises made to respondents
- Injury or harm to participants, whether physical, psychological, economic, social or political

Application of ethical principles

Ethical review committees or boards of government, academic and research institutions evaluate research protocols involving human subjects according to international standards. The protocols must be submitted for consideration, comment, guidance and approval to an ethics committee. The committee must have the right to monitor on-going studies. In

Tanzania, there is National Institute for Medical Research (NIMR) operating at the national level. They should ensure that the proposed activity is responsive to the nutritional and health needs and priorities of the country and meets the requisite ethical standards. Each institutional review board has their own submission requirements. However, in most cases the submitted package should contain a covering letter, study protocol, informed consent forms, ethical clearance fee, curriculum vitae of investigators, Material Transfer Agreements (if samples will be moved outside host country), Data Transfer Agreement (if data will be moved outside host country), and any other significant requirements. After permission to conduct research is given, investigators are required to submit progress reports.

In the design of interventions, the value of a treatment can only be judged by comparing the results with those of some alternative form of treatment, which should be as appropriate as possible. Comparison or control groups are ideally selected from the same population as the subjects and the benefits, risks, burdens and effectiveness of a new intervention must be tested against those of the best current proven intervention, except in the following circumstances:

- The use of no treatment or placebo is acceptable in studies where no current proven intervention exists; or
- Where for compelling and scientifically sound methodological reasons the use of placebo is necessary to determine the efficacy or safety of an intervention and the patients who receive placebo or no treatment will not be subject to any risk of serious or irreversible harm. Extreme care must be taken to avoid abuse of this option.

At the conclusion of the intervention, study population are entitled to be informed about the outcome and to share any benefits that result from it.

Informed consent and sample of informed consent certificate

Informed consent should basically contain two parts, namely the research information sheet and certificate of informed consent. **The research information sheet** contains **research title; research justification; purpose; description and procedure; voluntary participation; risks, benefits and any inconveniences; confidentiality; and any additional information** e.g. contact information. This information should be read and explained to each study participant, who in turn is allowed to ask questions about the research. An impartial witness should be present during the discussions in cases where the participant is unable to read and/or write. If the participant agrees to participate in the research, she/he signs two copies of the certificate of informed consent. This course of action is generally known as written informed consent. **The certificate of informed consent** is a form containing statements of declarations that the study participant agree to participate in the research. In other cases, participants may agree to participate verbally; this is referred to as a verbal informed consent. After the participant and investigator signs two copies of the form, each person retains a signed copy.

Sample of informed consent certificate

Institution logo and letter head

Informed assent form for ____________________

I, undersigned, ... (first name and surname) have been invited to have my household, family and child participate in ……………… research/intervention. I,

Confirm that I have read, or it has read to me, and understood the information sheet for the above research.

Know what participation in the research means to me and my child, and possible risks and inconveniences.

Have received sufficient time to consider the information and to ask questions that I wanted to ask, to which I have received satisfying answers.

Understand that the information collected regarding our household and family will remain confidential. In case research results are to be disseminated, they will be shown in summative form and will not be identified personally in any report or publication.

Understand that my participation is voluntary, I can choose not to answer any question or all of the questions, and I am free to withdraw, without any penalty, from the research at any time after having informed the lead researcher.

Agree to be re-contacted and note that when and I am re-approached, I will be provided with full information about any additional questions.

Agree to take part in this research voluntarily, and to let my child and family members participate.

____
Name of infant

____________________________ ______________ ______________
Name of parent or guardian Date Signature or Thumb print

In case a parent or guardian is unable to read and/or write, an impartial witness should be present during the informed consent discussion. After the written informed consent form is read and explained and the participant (or guardian) gives verbal consent, the witness should fill in the following information:

____________________________ __________________________
Name of parent or guardian Thumb print of parent or guardian

____________________________ ______________ __________________
Name of person witnessing consent Date Signature or Thumb print

Statement by the researcher/person taking consent
I have accurately read out the information sheet to the study participant/parent of the potential child, and to the best of my ability made sure that the person understands research information. I confirm that the parent was given an opportunity to ask questions, and all the questions asked by the parent have been answered correctly to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.
A copy of this informed consent certificate has been given to the parent or guardian.

______________________________	______________	______________
Name of researcher taking the consent	Date	Signature

3.3.6 Mobilisation of resources for survey and field work organisation

Nutrition activities involve quite a lot of resources, both human and non-human, for considerable periods of time, working under difficult conditions, and thus they should be well arranged, organised and coordinated. For example, each personnel should know what they have to do, when they have to do it, to whom they should report, when and how they should report. All equipment and supplies should be well documented and purchased or hired on time. Personnel should have adequate time to familiarise with the equipment before field work. Other considerations include transportation and road conditions, weather and typography of study location, and other logistics such as accommodation, communication, etc.

Personnel issues
In most of the conducted nutrition field activities, the following key personnel are essential: team leader, field supervisor, field assistants, data entry and data analysis individual. The supervisor should be experienced in carrying out nutrition activities, conducting training, managing teams, and organising logistical needs. The supervisor has the responsibility of ensuring that the activity is carried out as planned. The number of field assistants will depend on the sample size, available funding, time, and other logistical needs. A job description should be prepared for each personnel to be recruited. Preparing such descriptions guides the investigator to work out in advance what each individual will do, and the descriptions inform each staff what is expected of his or her. The job description may specify the workload (e.g. number of questionnaires to be administered per day) and the quality of work expected. The team should if possible be composed of a mix of male/female assistants/assessors, including members with ability to collect gender-sensitive information and to communicate with children. Teams may also include people familiar with the area/people and/or the language.

An estimate should be made of the minimum educational levels and training required for each position. The personnel must be recruited and trained for the specific tasks. A constraint on the size of a field team may be the number of persons who can be accommodated in a vehicle with the equipment they must use in the field. It will be useful to draw up an organisational plan outlining the activities and functions of the team members, with a diagram showing how the team will operate in the field. Detailed descriptions of the procedures to be followed for each of the activities should be included in the field manual (e.g. how questionnaire should be completed, how the items on the form should be checked, what should be done with the form at the end of the day).

Good financial management is essential for staff morale. Salaries and allowances should be paid on time, and petty cash should be available when required. A detailed record of expenditures should be kept together with receipts to account for all funds issued and spent.

Equipment, supplies and logistics

All required equipment and materials must be specified when designing a plan or protocol for a nutrition activity. The choice of what equipment to buy should be influenced by what others in the area have used and whether they have found it satisfactory (and this will include arrangements for maintenance/service). It may be important to order a basic supply of spare parts at the same time as ordering equipment, if local availability is in doubt. When a nutrition activity is being conducted, all equipment should be checked and calibrated each morning.

Provision for transport is essential. Transporting personnel and equipment will require careful planning. Extra time should be allowed for possible mishaps. Maintenance of vehicles and close supervision of their use is vital. Control and discipline of vehicle use are key factors in the conduct of almost all field activities. Maintenance, fuel supply, and the use of vehicles for purposes other than those for which they were intended can pose substantial problems.

Training of field assistants

Training of field assistants is one of the most critical aspects of collecting quality information. Training should be conducted prior to data collection and every assistant should go through the same training regardless of former experience to ensure standardisation of the way the activity will be conducted. The training may initially be done as a classroom-type teaching followed up by practical exercises. The exercise may involve of one interviewer administering the survey questionnaire to another interviewer while others look on, followed by a critical evaluation and discussion of the interview. Only after interviewers have been through a preliminary training should they be allowed to pre-test the interview process in the community. The pre-test will demonstrate further their performance and determine how long it takes to complete individual assessment. This information allows the calculation of the number of households/individuals expected to be covered each day during the actual activity.

During the actual activity, it is important to monitor the performance of each interviewer throughout the activity and to institute corrective training if required. Discrepancies in interviews may identify deficiencies in the interview methods of one or other interviewer.

Introducing the nutrition activity to community leaders

To ensure acceptability, ownership and smooth implementation of the nutrition activity, local authorities in the target area should be sensitised on the intended activity. One or several visits prior to commencement of the activity should be made to village leaders and representatives of various sectors/groups to discuss the activity, learn about the local situation (e.g. map of the area, population, income activities, etc), needs, challenges and opportunities, obtain communal permission to conduct the study, and agree on when to carry out the activity.

Scheduling of field activities

An organisational timetable or work plan (Table 3) should be constructed showing all planned activities and indicating when each task will be under taken.

Table 3: A sample work plan

Activity	**2005**				**2006**			
	Aug	Sep	Oct	Nov	Feb	Mar	Apr	May
Design study tools/instruments								
Recruit and train field staff								
Pre-test tools								
Purchase equipment and materials								
Finalising methods and data processing systems								
Sampling, mapping and enumeration								
Zone A Baseline Follow-up								
Zone B Baseline Follow-up								
Data entry								
Preliminary analysis								
Detailed analysis								
Write reports								

The dates for fieldwork may have to be fixed some time in advance. The time required for preparations and pilot testing may overlap with training, but all three must be completed before the start of the main fieldwork. Planning of nutrition activities must take account of climatic and seasonal factors. These may affect access to the study area (e.g. flooding) and the activities of those in the area such as to make them difficult to survey (e.g. seasonal migrations for work, working on farms during the planting or harvesting seasons). It may be important to plan activities to also take into account market days, local holidays and festivals, and activities of the local medical services (for example, antenatal clinics).

Field supervisor is expected to address problems which are likely to arise during the survey. Any problem encountered and decision made must be promptly recorded in the field diary and included in the final report.

Another issue to be resolved early in the planning is whether the study participants should be examined at a central location, at a series of local collecting points, or be visited for examination on a house-to-house basis. The decision will depend on the procedures to be carried out, nature of equipment to be used (i.e. portable or non-portable), the time assessments will be done, population size and distribution, and the environmental and physical conditions.

3.3.7 Data collection methods and sources

In planning the collection of data it is necessary first to carefully consider what information is required (e.g. assess prevalence, evaluation intervention, etc). A list of all possible sources of information (e.g. questionnaire; laboratory data; clinic-based records; etc) is first prepared. Frequency of data collection should also be considered. Some of the data for monitoring and evaluation of interventions should be collected frequently (baseline, mid-term, final), twice (baseline, final), quarterly, or monthly. The next step is to consider what would be the most cost-effective way of obtaining the required information. Whilst listing the sources of information and means of obtaining it, it is helpful to also list all the variables required for answering the research question, as well as the justification for the use of each in the study. This helps to focus the activity and avoids one from ending up with loaded irrelevant information, or relevant information, which is inadequate in providing the full answer to the study question.

The choice of specific tools and instruments for data collection depends on the objectives (which may include continuity and comparability with earlier data), resources available, and specific cultural considerations. The collection of information by asking a series of questions to members of the study population is likely to be a component of any nutrition activity that involves contact with human subjects. Such information may be relatively simple and straightforward to collect (e.g. a census of the study population in which the names, age, and sex are recorded for the members of each house hold in the study area) or may be very difficult to elicit reliably from respondents (e.g. beliefs about the causes of illness, details of sexual behaviour). Selecting a data collection method should go hand in hand with deciding whom to interview (e.g. head of household, mother, or the oldest adult).

There are two main data collection methods, quantitative and qualitative. Their approaches are compared in Table 1. Approach to be selected will depend on type of study questions, funding, time available to collect information, and number of available assistants to assist with data collection. Field assistants will need training so that data is collected in a reliable and valid way.

Table 4. Comparison of quantitative and qualitative methodological approaches

	Quantitative	**Qualitative**
Analytical objectives	To quantify variation To predict causal relationships To describe characteristics of a population	To describe variation To describe and explain relationships To describe individual experiences To describe group norms
Data format	Numerical (obtained by assigning numerical values to responses) Data is structured in advance by the investigator	Textual, recorded 'as spoken' or 'as it happens' (obtained from audiotapes, videotapes, and field notes) Data is freely defined by the study subjects
Flexibility in study design	Study design is stable from beginning to end Participant responses do not influence or determine how and which questions will be asked next Study design is subject to statistical assumptions and conditions	Some aspects of the study are flexible (e.g. addition, exclusion, or wording of particular interview questions) Participant responses affect how and which questions will be asked next Study design is iterative, i.e. data collection and study questions are adjusted according to what is learned

3.3.7.1 Quantitative methods

A general framework of quantitative methods is that they seek to confirm hypotheses about phenomena, instruments use more rigid style of eliciting and categorising responses to questions, and use highly structured methods such as structured interviews using questionnaires, semi-structured interviews using an interview guide with open-ended questions and surveys. Quantitative methods are fairly inflexible. Study participants are asked identical questions in the same order. The response categories from which participants may choose are "closed-ended" or fixed, requiring limited answers. The advantage of this inflexibility is that it allows for meaningful comparison of responses across participants and study sites. However, it requires a thorough understanding of the important questions to ask, the best way to ask them, and the range of possible responses.

3.3.7.2 Qualitative methods

Qualitative methods are selected when a nutrition question/objective requires in-depth understanding of processes and relationships in the context of the social and cultural situation, explores reasons for certain behaviours, or when providing description of procedures, beliefs and knowledge related to nutrition issues. Instead of generating numerical data supporting or refuting clear cut hypotheses, qualitative research aims to produce factual descriptions based on face-to-face knowledge of individuals and social groups in their natural settings.

Qualitative methods are also used when aspects under investigation are unfamiliar and needs more information for better understanding and for exploration of unknown concepts; to relate particular aspects of behaviour to the wider context. Qualitative research data are collected using a variety of methods, namely in-depth interviews, focus group discussions, structured and participant observations, documents inspection (or content analysis), and photograph inspection.

In-depth interviews: These are informal interviews directed to the knowledgeable people about the problem. The interviews are usually held with local authority representatives (male and female), government staff, various relevant health facility staff, operational agencies, traders, male and female community representatives (religious leaders, teachers etc.), community organisations, etc. These are commonly known as key informants. They should be selected carefully to reflect diverse views and concerns. Interviews can vary in their structure.

They can be semi-structured or in-depth. For semi-structured interviews there is an interview guide with open-ended questions, but answers are constrained by a limited list of topics. Free exploration of an issue is somewhat limited. In-depth interviews involve asking general questions to prompt unbounded exploration of an issue. Follow-up questions are spontaneously created based on the answers of each participant. The best approach in qualitative research is the in-depth interview because the data are detailed, comprehensive, more representative of the phenomenon, and less biased. Interviews are video-taped or audio-taped.

Focus group discussions: A focus group discussion involves one or two investigators/researchers and 6-12 respondents who meet as a group to discuss a given topic. The discussions are usually tape recorded, and sometimes videotaped. One researcher (moderator) leads the discussion by asking participants to respond to open-ended questions that require an in-depth response rather than a single phrase or simple "yes" or "no" answer. A second researcher (note-taker) takes detailed notes on the discussion. Discussions can also be audio-taped. A group of participants are selected in relation to specific issues to be discussed e.g. mother and caregivers to discuss child feeding and care practices/health seeking behaviour; patients waiting for consultation at health facilities to discuss service availability/access.

Observation: Observation is “a purposive or intentional examination of something, particularly for purposes of data gathering. It is a careful watching and noting phenomena as they occur in their natural setting. Observation involves the presence of the investigator in the community/naturalistic settings. The investigator can be an observer or fully participate in the environment. Collection of observation information involves a checklist or a form with what to be observed. A detailed schedule with what to observe and how recordings are to be done is a requirement. There are basically three forms of observation, namely Non-participant observation (may observe without participating e.g. observing a session); Observation with some participation (observation while taking part in some activities); and Participant observation (direct interaction with people and their activities). Without enough skills, results of observation studies may not be exhaustive and may not describe in totality the events in the field.

Observational data are used to describe settings, people, processes, activities, interactions, and meanings of phenomena from the perspective of the participants. Observation leads to greater depth of understanding because phenomena can be observed in context. Examples of situations where observations can be used are transect walks (not following roads or paths) through the study area to observe the overall situation/condition. Key points for observation are water collection points, food and non-food distribution points /queues, latrines and washing facilities, health facilities, etc. Observation of health facilities may be structured to involve observation of physical state of facility, number of staff present, availability of equipment and drugs, queues waiting for treatment, etc.

Disadvantages of non-participant observation are that it is easy to identify the investigator as a stranger among the observed thus the subjects are likely to change their behaviour and act otherwise, and that some salient aspects may not be observed by the researcher. In observation with some participation, the investigator may not observe some other aspects in which he/she does not take part. He/she may also fail to get real meaning of the practices leading to misinterpreting the information due to own perceptions.

Participant observation: In this technique, investigator observes and participates to varying degrees, in the study community settings believed to have some relevance to the research questions. Careful, objective notes about all accounts and observations are written and recorded as field notes. Data obtained through participant observation serve as a check against participants' subjective reporting of what they believe and do. It is also useful for gaining an understanding of the physical, social, cultural, and economic contexts in which study participants live; the relationships among and between people, contexts, ideas, norms, and events; and people's behaviors and activities. Disadvantages of participant observation are that it is time consuming and it is difficult to document all information while one is in the act of participating and observing. In addition, it is an inherently subjective exercise, i.e. reporting or describing what you observe (more objective) versus interpreting what you see (less objective). Filtering out personal biases may take some practice.

Documents inspection (or content analysis): Internal and external documents are valuable sources of qualitative data. Policy and procedure manuals, memos, e-mail messages, personnel files, employee evaluations, mission statements, newspaper and TV accounts are examined for data. Patterns and themes are discovered. For instance, memos circulated between diabetes course instructors may document frequent malfunctions of a vital diabetes education Web site. This information may generate hypotheses related to the ineffectiveness of a diabetes education programme. Also, marketing materials and advertisements on newspapers and TV can be used to assess whether information provided is accurate, effective, adequate, and offers risks.

Photograph inspection. Photographs provide interesting snapshots of company or environmental activities. Photographs of a foodservice operation kitchen may reveal unsanitary conditions, which may contribute to possible food-borne outbreaks. Also, photographs may reflect the context of a phenomenon.

Application of qualitative methods

Qualitative methods use question formats which are open-ended. The study questions amenable to qualitative research are numerous and diverse. Examples include 'Why do some clients with hypertension fail to adhere to a low-sodium diet?' or 'How do mothers on low incomes feel about growing their own home gardens to increase intake of micronutrients?' Qualitative research can be used to investigate how and why nutrition and healthcare professionals behave in particular ways in practice; e.g. 'How do nutrition counsellors deal with hostile clients during consultations?' or 'Why do nurses fail to feed in-patients who are unable to feed themselves?' Furthermore, there are applications in education and training such as 'What are the training needs of community-based resource persons working in district nutrition projects?' or 'How do experienced nutritionists mentor and support newly-qualified staff?'

The data derived from qualitative methods are called field notes. Field notes are handwritten or typewritten notes, descriptions of documents, interactions, settings, behaviours, processes, and activities. Transcripts from audiotapes or video from focus groups and interviews are also called field notes. Preparing these recorded data for analysis requires transcribing all tapes and typing the transcriptions into computer files. Transcription of recordings and typing of field notes should begin as soon as possible after the data collection. To transcribe an audio recording, the transcriptionist listens to the tape and simultaneously writes down or types everything that is said on the tape. Nonverbal sounds (such as laughter, someone knocking on the door, etc) are also often noted on the transcript. Next, backup copies of the tapes should be made. The backup copies should be securely stored. Transcripts may also need to be translated into other language(s) depending on needs.

Analysis of qualitative data involves organising, classifying, and summarising qualitative data; writing a cohesive description of the setting, context, and people; discovering patterns and themes; determining the meaning of phenomena to participants; summarising tentative answers to the study questions; conceptualising hypotheses and theories; and deciding what to report to others. Considering the laboriousness of the process, computer software can expedite data analysis. Common software packages include NVIVO and MAXQDATA. The software assists with creating codes, organising and summarising data, searching for interrelationships between codes, and suggesting themes.

Integrating quantitative and qualitative methods

To achieve greater reliability and validity, a mixture of qualitative and quantitative approaches should be used during initial assessments and surveys. This combination is commonly known as mixed methods or multi-method approach. Qualitative work can be conducted as an essential preliminary to quantitative research e.g. enhancing questionnaire development for subsequent quantitative research. Qualitative methods can be used to supplement quantitative work. It helps to interpret and better understand the complex reality of a given situation and the implications of quantitative data. It can also be part of the validation process, as in "triangulation," where three or more methods are used and the results compared for convergence (e.g. a large scale survey, focus groups, and a period of observation). With interventions, qualitative methods can be used simultaneously with quantitative methods to 1) document the implementation process so as to assess whether the intervention activities are implemented as planned, and 2) describe contextual factors that may influence the effectiveness or ineffectiveness of the intervention (i.e. context, facilitators, barriers, contamination).

Individual reading exercise 10: Qualitative methods

Relate types of study designs learnt in class and what is documented in literature using Handouts 5a, 5b and 5c

Handout 5a. Qualitative research

Pope, C., Mays, N. 1995. Qualitative Research: reaching the parts other methods cannot reach. British Medical Journal 311:42-45 (1 July)

Handout 5b. Qualitative research

Kitzinger, J. 1995. Qualitative Research: Introducing focus groups. British Medical Journal 311:299-302 (29 July)

Handout 5c. Qualitative research

Family Health International. 2005. Qualitative research methods: a data collector's field guide. FHI/USAID, Washington, D.C.

3.3.7.3 Use of secondary data collected by different sectors

Primary data collection activities are expensive, time consuming and requires technical expertise that may not always be readily available. In addition, there are usually many surveys that have been conducted by different government institutions or NGOs which are good sources of health and nutrition data. In many cases, these existing data sources can provide answers to descriptive questions (Who? Where? How many?). On occasion, analyses of a secondary data sources may answer questions related to the causes of a nutrition problem.

There are two main sources of data, namely primary and secondary data. Primary data is mainly collected by the investigator after setting own objectives and study design, sampling and collecting data. Data collected by individuals other than the investigator but intended to be used by the investigator in own study/survey is generally referred as secondary data. Examples of secondary data include previous national nutrition and health situation from Tanzania Demographic and Health Survey [TDHS] and Multiple Indicator Cluster Survey (MICS), household income and food security situation from Household Budget Surveys [HBS] and Vulnerability Analysis and Mapping [VAM]) reports, morbidity and mortality data from health facilities, and other routinely collected information. Ideally they should be used in combination with primary data. Sources of secondary data include government departments and bodies, academic and research institutions, and the private sector. These include Tanzania Bureau of Statistics, Ministry of Health and Social Welfare, Ministry of Agriculture and Food Security, regional and district planning departments. Other secondary data include those previously collected by government development partners such as local and international non-governmental organisations and agencies.

Advantages of using secondary data and other routine information is their low cost, ready accessibility and (when official sources are used) authoritative nature. A major disadvantage is that the data are often not adequate or sufficiently comprehensive for the purposes of the investigation. Because secondary data comes from previous surveys aimed at answering a related, but different set of questions, secondary data alone rarely provides information needed to understand causes, predictors, risk factors, or evaluate effectiveness of an intervention. In this case, they should be supplemented with primary data. It is therefore important to review and examine secondary data for quality issues (validity, accuracy, reliability, etc) before use, especially when using heterogeneous databases and multiple data sources. These include inconsistent definition of terms (e.g. diarrhoea as three or more liquid or semi-liquid stools within 24 hours vs. any number of liquid or semi-liquid stools within 24 hours), information or data may be encoded differently (e.g. infant as child aged 0-1 year vs. child aged 6-11.9 months), and unclear sampling, data collection processes and validation.

3.3.7.4 Development of data collection tools

Research or study tools are physical items that can be used to collect data so as to achieve specified objectives. They can also be used to describe a procedure or process with a specific purpose. Tools used in data collection may have different designations such as "instrument", "questionnaires", "equipment", or "apparatus." For example, anthropometric assessment tools can be used to address the research questions "who suffers from which type of malnutrition." With this example in mind, other nutrition assessment tools such as dietary, biochemical, and food consumption can be developed separately and combined in one larger tool.

In planning the collection of data it is necessary first to carefully consider what information is required (e.g. assess magnitude, evaluate intervention, etc). Table 5 presents some of the nutrition-specific and nutrition-sensitive issues to consider when designing data collection tools. A list of all possible sources of information (e.g. questionnaire; laboratory data; clinic-based records; etc) is first prepared. The next step is to consider what would be the most cost-effective way of obtaining the required information. Whilst listing the sources of information and means of obtaining it, it is helpful to also list all the variables required for answering the research question, as well as the justification for the use of each in the study. This helps to focus the activity and avoids ending up with loaded irrelevant information, or relevant information which is inadequate in providing the full answer to the study question. It may serve time and effort if valid and reliable tools/instruments are available and can be adapted, instead of constructing new tools. This should be an option if current objective(s) are comparable to objectives of the tools to be adapted.

Table 5. Nutrition-specific and nutrition-sensitive issues to consider when designing data collection tools

COMMUNITY RESOURCES
Key geographic characteristics
Type of terrain (mountainous, plains, swampy)
Type of access roads to reach the village (motorable, unmotorable)
Occupation of respondents (farming, pastoralism, mixed, fishing, mining, etc)
Type of inhabitation (densely populated, dispersed)
Availability, number, and access (physical/distance, quality) to public services
Schools
Daily and weekly markets
Water source(s) for domestic use
Water source(s) for animals
Availability (type, number, personnel, other resources) and Access (physical/distance, quality) to health services
Health facility (hospital, health centre, dispensary, health post)
Health services (preventive, curative) provided
Private doctor, pharmacy, traditional healer

Burden of disease (common diseases, groups affected, other diseases)
HIV and AIDS (VCT, PMTCT, Infant feeding and HIV, ART services)
Mortality (magnitude, causes) of newborns, infants, under-fives, maternal
Compilation of health information (type, frequency)
Partners in health service delivery
Village health workers (number, gender distribution, trained or not), TBAs
Village health committees
Local organisations/groups contributing to nutrition and health activities
HOUSEHOLD RESOURCES AND UTILISATION
Household resources (physical and financial: land, livestock, other resources)
Productive assets (seeds, hoe, plough, draught animal, etc)
Crop/livestock production activities
Access to productive assets (employment opportunities, income generation, loans, hiring of equipment, dipping facilities)
Utilisation of health services when needed (preventive purpose or advice/routine e.g. prenatal) and constraints or barriers (financial, social)
HOUSING CONDITION
Housing quality (materials used to construct roof, walls, floor; presence of toilet)
Sanitation
Cooking and lighting fuel
Socio-cultural influences on household food distribution & consumption
Water for domestic uses cleanliness & safety of drinking water
Sewerage systems and refuse disposal
INFANT AND YOUNG CHILD CARE AND NUTRITION
1. 0 – 6 months
Breastfeeding initiation (within 1 hour of birth, etc)
Breastfeeding practices (proper positioning and attachment, signs of effective feeding)
Breastfeed exclusively for the first six months
Frequent, on-demand breastfeeding including night feeds
Breastfeeding during and after illness
Feeding when mother is away or sick
Use of insecticide-treated nets
Immunisations
Physical growth (length-for-age, weight-for-length, weight-for-age)
2. 6 – 23 months
Introduce complementary foods at 6 months (180 days)
Maintenance of breastfeeding
Food consistency (pureed, mashed, semisolid, snacks, family foods)
Food frequency per day/week by age group
Food diversity (variety, micronutrient-rich)
Responsive feeding (slowly, patiently, assist, encourage, explore different food combinations)

Safe preparation and storage of complementary foods
Use of vitamin and mineral supplements
Feeding during and after illness
Use of insecticide-treated nets
Immunisations
Physical growth (legth-for-age, weight-for-length, weight-for-age)
3. 24 – 59 months
Responsive feeding (assist, encourage, explore different food combinations)
Safe preparation and storage of foods (good hygiene and proper food handling)
Food consistency (snacks, family foods)
Food frequency
Food diversity (mixed meal guide/variety, micronutrient-rich)
Use of vitamin and mineral supplements
Feeding during and after illness
Use of insecticide-treated nets
Physical growth (height-for-age, weight-for-height, weight-for-age)
SCHOOL-CHILDREN CARE AND NUTRITION
Dietary pattern (breakfast at home, snack & lunch at school, snack & meals after school)
Dietary diversity (mixed meal guide/diversified food, micronutrient-rich)
School feeding programmes
Use of insecticide-treated nets
Deworming
Anthropometry (height-for-age, weight-for-height, BMI-for-age, MUAC)
ADOLESCENTS CARE AND NUTRITION
Food frequency (mixed meal guide)
Dietary diversity (mixed meal guide/diversified food, micronutrient-rich)
Dietary behaviours
Physical activities
Supplementation with iron and folic acid (girls)
Reproductive health education
Adolescent pregnancies
Anthropometry (height-for-age, BMI-for-age, weight-for-age, MUAC)
ADULTS CARE AND NUTRITION
Dietary diversity (mixed meal guide/diversified food, micronutrient-rich
Work activities
Anthropometry (BMI, waist-hip circumference ratio, MUAC, skin-fold thickness)
ELDERLY CARE AND NUTRITION
Dietary diversity (mixed meal guide/diversified food, micronutrient-rich)
Food frequency (mixed meal guide)
Food preferences, avoidance and their reasons
Health status (illness, treatment) and life style (smoking/drinking)
Functional ability (strength, coordination) and Disability (physical, recent injury,

mobility, housebound, eyesight)
Family life (live alone, adult children far away, regular caregiver, looking after grandchildren)
Psychological or emotional status (grief, memory loss/confusion, mental illness)
Anthropometry (weight, height/armspan, MUAC)
PREGNANT AND LACTATING WOMEN CARE AND NUTRITION
Food frequency (pregnancy: 1 extra serving/day; lactating: 2 extra servings/day)
Dietary diversity (mixed meal guide/diversified food, micronutrient-rich)
Utilisation of ante-natal services
Use of iron and folic acid (IFA) supplements
Use of vitamin A supplement during lactation
Use of iodised salt
Energy expenditure (work load)
Social support (e.g. grandparents, older children)
Breastfeeding problems
Use of anti-malarials (IPT) during pregnancy
Use of insecticide-treated nets
Deworming
Use of Family Planning e.g. birth spacing (lactating women)
Anthropometry (pre-pregnancy weight, monthly weight gain, BMI)
HEALTH SERVICES
Observe and record nutrition services offered at health facilities at contact points:
Ante-natal
Delivery/labour
Post-natal
Immunisation
Growth monitoring, promotion and development
Management of sick child (IMCI guide)

The most common data collection tools are structured and semi-structured questionnaires for interviews. Steps in the construction and use of questionnaires include:

- Definition of the topics to be covered, followed by a detailed outline of the information that will be needed to answer the study question. It is useful to think about possible 'confounders'. One strategy for dealing with 'confounders' is to perform stratified analysis. This would not be possible if information about possible 'confounders' has not been gathered. A list of variables is then prepared in accordance with the information outline. At this stage it is useful to think ahead about variables, analysis and reporting, so that all items that would be necessary to answer the question are included.
- Designing the first draft of the questionnaire and organising the questions in a way that would maintain the flow of thought.

- The questionnaire is revised, and words or phrases that are not likely to be understood by even a few respondents are removed. Short sentences and simple language without any jargon make good questionnaires.
- Pre-testing of the questionnaire (also called piloting). This is usually done with subjects from the same population on whom the questionnaire is to be used. It assesses the ease with which the tool is administered, adequacy of instructions for the interviewer, level of understanding of questions and wording by respondents. Further sorting out of wording/language and redundant information (e.g. questions that produce similar information) is done following the pre-testing.
- The questionnaire is redrafted. If circumstances permit another pre-test is carried out using the same respondents at different times, or different interviewers to check for the reliability of the answers.
- The final draft is prepared.
- Administering the questionnaire.

Characteristics of a good questionnaire

Designing a good questionnaire should consider the following issues:

- Objectives. A good questionnaire seeks to obtain information required to meet all objectives with as few questions as possible. It should be designed around indicators. One should avoid the temptation of including questions on the basis of "just in case." It should provide reliable data; in other words, the same answer will be provided by the same respondent regardless of who asks the question or where the question is asked. It should outline exactly how questions should be asked. Questions and instructions for asking the questions must be clear. In this way, each interviewer will ask the question in the same way.
- Language. If the investigators speak a different language or dialect from that of the study subjects, it will be necessary to translate a questionnaire into required local language. Such translation should always be undertaken with great care and attention to detail, as it is very easy for the sense of a question to be changed greatly. Once a questionnaire has been translated, it should be back translated into the original language by an independent person. Comparing the original text with the back translated version may be very illuminating with respect to possible areas of confusion.
- Simple and clear questions. Questions must be as clear and as simple as possible. Never ask for two pieces of information in one question. Always use simple words for which everyone has the same definition. Avoid jargon and sophisticated language. Simple words will be easier to translate. When the questionnaire is pretested, it will assess whether or not study population understand the questions easily or need to ask for further clarification. If more clarification is needed then the question should be rewritten.
- Questionnaire format. The format of a questionnaire guides the interviewer through the interview process. The easier and clearer the format, the less chance for error.

- Open-ended and closed responses are the two major formats. The question "What do you feel about using oral rehydration solution in the management of diarrhoea?" is open-ended. It provides detailed answers. The respondent is free to answer without limitations imposed by the interviewer. The disadvantage is that the answers are difficult to code, greater time is taken in filling the questionnaire, and respondents may get tired. The question "What type of fuel does your household mainly use for cooking? 1. Wood 2. Charcoal 3. Kerosene 4. Cow-dung 5. Solar 6. Electricity" is close-ended. They have the advantage of being tightly structured, response is easy to code and analyse, and less time is taken in filling the questionnaire. The disadvantages are that the answers have less depth. The respondent is led in pre-determined direction.
- Usually, a questionnaire will begin with a section on demographics or household characteristics. Thereafter, the sections should be ordered accordingly. For example, all of the agricultural production questions should be grouped together, and all the water and sanitation questions should be grouped together.
- The questions should have a logical sequence in a way that leading questions are avoided. For example, it would not make sense to ask a woman if she has ever heard of oral rehydration solution (ORS) and then immediately after ask her what she gives her child when he or she has diarrhea. Because ORS is mentioned in the first question, she might think that this is the desired response and repeat it, aiming to please.
- There will be questions that don't apply to every respondent. For example, if the respondent does not have a latrine, then it doesn't make sense to ask how far the latrine is from the house. You need to skip all questions related to latrines. Instructions to skip some questions should be clearly spelled out in the questionnaire. Filter questions are one of the most important elements of a good questionnaire. With well thought-out filter questions, the survey will flow well, save time and ensure accuracy.
- Numbering and coding. It is important to number all questions because each question and piece of information that will be entered into the computer will be numbered. This way it will be easier to identify later. For each response, there must be a code clearly marked on the questionnaire. The code is a numerical value that is programmed into the computer to represent a certain response. The easiest one is '1 for Yes and 2 for No.' A code like '9' or "99" needs to be decided beforehand for missing data. Similarly, the same numeric code should be decided for "Don't know" answers. Adequacy of the lists of responses to closed questions should be checked (e.g. ensure a food list covers most things normally eaten in the study community). Avoid a large proportion of responses being in the 'Others (specify) category. Some questions are more complicated because they allow multiple responses. In this case, there must be a separate question number for each response. Each response will then be coded as '1 for Yes and 2 for No.' Each response will have a separate heading in the database. For multiple response questions, always provide extra instruction, like 'Multiple responses possible. Tick each component mentioned'

- Length of questionnaire. Adequate time must be allowed for the interviewer to solicit the correct responses to all of the questions included in a questionnaire. It should be long enough to allow the required information to be collected but without unduly inconveniencing the respondent. Neither the interviewer nor the respondent should feel under time pressure to complete the interview. The length of time that an interview will take may not be easy to estimate until when it is pretested.

Group exercise 11: Designing data collection tools

After learning quantitative and qualitative techniques of data collection:

- Design a questionnaire, focus group discussion (FGD) guide, in-depth interview guide, and structured observation checklist for data collection.
- Formulate an objective for each tool as a first step
- Design a one-page data collection tool. Use Table 5: Nutrition-specific and nutrition-sensitive issues to consider when designing data collection tools to assist with identification of issues for inclusion in the tools
- Practice with a colleague how to administer either of the developed tools. All responses should be recorded in a tool/form or sheet of paper

3.3.7.5 Tools validation

The word "validation" simply means assessment of validity or action of proving effectiveness. Tool validation is the overall expression for a sequence of activities taken in order to demonstrate and document that a specific designed tool was investigating what it was intended to investigate, reliable, precise, sensitive and specific enough for appropriate data collection. Validated tools are future proof of quality check (tool, data, method itself), reflect nutritional parameter of interest, and can identify malnourished cases and those who are at risk of being malnourished.

Validating and analysing more variables and cases increases the workload of all data handlers including coding staff, entry clerks, and data editors. When there is a combination of pressure to complete the analysis on time and inefficiencies in training and recruiting staff, the quality of data transmitted from the data manager to the analysts can be questionable. In some cases, surveys have been planned without including a step to check the coding or to verify that the data have been entered accurately.

Criteria used for tools validation include:

- Validity: degree to which the tool gives a true measure of individual's 'risk'
- Reliability: degree to which repeated assessment/measurement of the same variable give consistent results when used by different people; also referred to as precision or reproducibility. Strategies used to ensure reliability (precise measurements) include training all interviewers/examiners to use standardised techniques, use of standardised guidelines for taking each measurement, careful selection of accurate

instruments (e.g. digital Vs manual), and standardisation and calibration of instruments used for data collection
- Sensitivity: ability to identify all the individuals or groups affected by a given risk or characteristic when it is really present
- Specificity: ability to identify those not affected by the risk or characteristic when the risk is absent

Ways in which tools can be validated
- Training of field assistants to ensure data quality and standardise the way the interview/activity will be conducted
- Pre-testing the tools before main activity
- Supervising data collection process to ensure valid data collection and minimise bias. Inadequate supervision affects the implementation and reliability of the data collected. Bias is minimised by adequate training, use of good technique and proper supervision. Supervision of field activities involves:
  - Frequent unannounced spot checks on the field assistants
  - Ensuring that the methodology is closely followed and that any deviations are documented
  - Ensuring that all equipment are functioning and calibrated every day
  - Checking all data collection forms to ensure all sections are accurately filled out
  - After data collection and entry, it is important to check and review the data if it is valid before analysis. It helps to identify suspicious and invalid cases, variables, and data values in the data set. To ensure a high quality of data, often it is a good strategy to have two different persons enters the same data. This can be done by computer software in two different ways: either by entering the same data in two separate data files, which can be compared later, or by entering in double entry mode where the new data immediately are compared with the original data. A computer software can also check the validity of the data format and rejects data which is outside of the appropriate ranges. Individuals who know what the data should look like can review and examine the data for accuracy and consistency. After validation checks, the data set should be edited where necessary.

Summary and session key points
This session introduces important aspects to consider when designing and planning of nutrition activities. Participants will discuss the concept of random and non random samples and introduced to the practice of sampling techniques and sample size requirements. Ethical considerations governing the conduct of health and nutrition activities are reviewed. Basic considerations in mobilisation of resources and field work organisation are covered. The session covers various methods and techniques for collecting quantitative and qualitative information. During the session, participants are given opportunity to design common data collection forms for a given set of objectives.

SESSION FOUR

Duration: 3 hours

3.4 Data Management, Analysis, Interpretation and Dissemination

Aim: To impart skills and knowledge to participants on data management and communication

Learning Objectives

At the end of this session participants will be able to:-

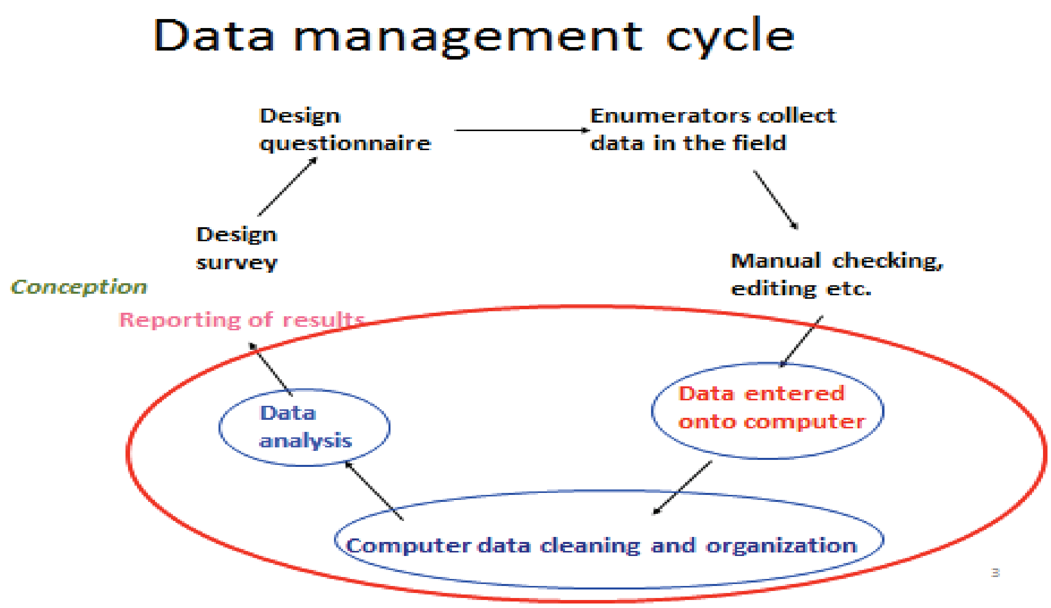
- Build skills in basic data entry, cleaning and analysis as part of data management cycle
- Run various software used in analysing nutrition data such as Emergency Nutrition Assessment (ENA), WHO-Anthro and WHO Anthro-Plus. Other non-nutritional Statistical Production and Service Solutions (SPSS)
- Show skills in data interpretation
- Design dissemination of nutrition information

Pre-requisites

- Participants are expected to have basic computer skills as well as nutritional and statistical software knowledge
- This Sub-session requires participants to have access to computers.
- The software should be installed prior to the start of the training

Overview of data Management

The 'raw materials' from a field or laboratory research activity are called data. These are the numbers resulting from measurements, together with information about where they came from. 'Data Management' refers to any activity concerned with looking after and processing this information. It includes: Looking after field data sheets, entering data into computer files, checking data and preparing for analysis. Data management in most projects or programmes refer to the sequence of interrelated steps from the conception of a research idea to actual implementation finally producing a report. These steps include: Designing a survey, design of a data collection tool (the questionnaire), Data collection from the field, manual checking editing, entering data into computer, data cleaning, data analysis and finally reporting on the results. This section mainly deals with data entry cleaning, organisation, analysis and producing results, which refers to the redline circled stages.



3.4.1 Data processing

Data processing involves:-

i. Coding data
ii. Entering data
iii. Managing data
iv. Cleaning data
v. Recoding data
vi. Handling missing data

i. Coding Data

Coding scheme is a set of rules for creating usable data from questionnaire responses. This should be done as early as possible in design stage and should reflect how data will be used in analysis (For example creation of categorical variables: Sex 1= Male; 2 = Female). Should provide unique codes for various types of valid and invalid answers as well as non-responses e.g. 999.

ii. Data Entry Procedures

There are various methods of data entry, these are:-

- Manual entering the data through the prepared data capture template prepared in the computer. This is the most used in our offices and research exercises in districts.
- Computer assisted personal interviewing (CAPI) Computer Assisted Interviewing (CAPI) is a computer assisted data collection method for replacing paper-and-pen methods of survey data collection and usually conducted at the home or business of the respondent using a portable personal computer such as a notebook.
- Computer-assisted telephone interviewing (CATI). A CATI system is basically a computer system that helps the interviewers to ask questions over the telephone.

The use of Computer Assisted Telephone Interviewing (CATI) system in statistics is not new, pioneer countries have been successfully deployed CATI in data collection for many years.

- Computer-assisted survey entry (e.g., Teleform). Teleform enables you to automatically capture, classify, and extract data and images from paper and electronic documents using powerful recognition technologies to create accurate, process-ready content in real time. You can easily capture information from documents received via post, fax, email, internet, and mobile devices. Through advanced recognition and pattern-matching technologies, TeleForm understands all document types, structured and unstructured.

iii. Data Cleaning

Once data are entered into the computer, they should be verified. The collected data is verified to determine whether it is correct as required. For example, the collected data of all children under five years of age that appeared for nutritional status measurement is verified. If errors occur in collected data for instance exchange of names or age, data is corrected or it is collected again.

iv. Data Management

Data management is the process through which collected data is transformed into a form that computer can understand. It is a very important step because correct output result totally depends on the correct input data. It is important to understand how data files are structured

- The actual data files and the way analysis should be run, in that either the data should be in a categorical, continuous or string form.
- System files that contain the data and the software used for conversion of data files should be known.
- Rows represent cases (units of analysis for instance a household) and columns represent variables data. For example a school attendance data: the rows will represent the students (e.g. Peter, John, Mary) and columns will represent variables such as Names, Time of arrival at school.
- Important to name files to identify source of file and type of data file for instance; Data files (*.dat) systems files (*.sav) syntax files (*.sps) output files (*.spo)

v. Recoding Data

It is often useful to recode original data into new variables. There are different types and uses for recoded variable. For instance Hemoglobin concentration data variable to anemia status. Recoding continuous variables into categorical ones for instance age variable to age categories. Recoding can involve collapsing existing categorical variable into smaller number of categories.

vi. Missing data

Missing data can occur because of non-response: no information is provided for several items or no information is provided for a whole unit. Dropout can be the cause of missing data occurs mostly when doing a follow-up study over time i.e longitudinal studies. In this type of study the measurements are repeated after a certain period of time. Missing data occurs when participants drop out before the test ends and one or more measurements are missing. Sometimes missing values are caused by the researcher -- for example, when data collection is done improperly or mistakes are made in data entry.

Understanding the reasons why data are missing can help with analysing the remaining data. If values are missing at random, the data sample may still be representative of the population. But if the values are missing systematically, analysis may be harder. For example, in a study of the relation between IQ and income, participants with an above-average IQ might tend to skip the question 'What is your salary?' Analysis may falsely show no association between IQ and salary, while in fact there may be a relationship. Because of these problems, methodologists routinely advise researchers to design studies to minimize the incidence of missing values. Missing data reduce the representativeness of the sample and can therefore distort inferences about the population.

Handling Missing Data

- Question: Why is it important to adequately address the issue of missing data?
- Answer: Because non-response often is not random, therefore can introduce systematic bias. Systematic errors are biases in measurement which lead to the situation where the mean of many separate measurements differs significantly from the actual value of the measured attribute.

3.4.2 Databases

What is a database?

A database is any organized collection of data

This may include:

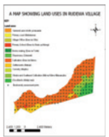
- All research data done in a year
- Nutritional status of children under 5 years of age
- Data on prevalence of malnutrition in a District in 5 years
- Records of nutrition interventions done in a district
- Compilation of nutrition reports for a district;
- Longitudinal tracking of infant deaths, low birth weights; growth rates

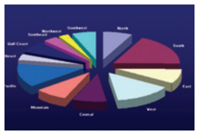
Forms of database

Data can be in form of:-

- Organized tables: such as population of people who are underweight, overweight and obese.

- Spread sheet describing different issues with/with no relation between rows and columns.
- Maps
- Charts
- Photos: such form of data may describe existing conditions
- It is a way to present the primary analysed data


Maps


Charts


Photos

Difference between Data & Information

- Data is : Facts taken as true as the starting point of a piece of reasoning
- Information is: Knowledge about something
- When **data** is transferred to **knowledge** , it becomes an **information**
- **Data** is **useful** only if it **gives information**
- When data is processed, organized, structured or presented in a given context so as to make it useful, it is called **Information**.

Types of Information

There are two types of information

a). Qualitative information

- It is information that cannot be described through numbers,
- It concerns to find qualities rather than quantities
- Qualitative information can be assessed through grades (high/ low, – or good/ bad, or positive/ negative) according to the research objectives
- Data describing the attributes or properties that a variable describes. The properties are categorized into classes that may be assigned numeric values.

For instance: In a Taste Panel:

1=Like very much

2=Like much

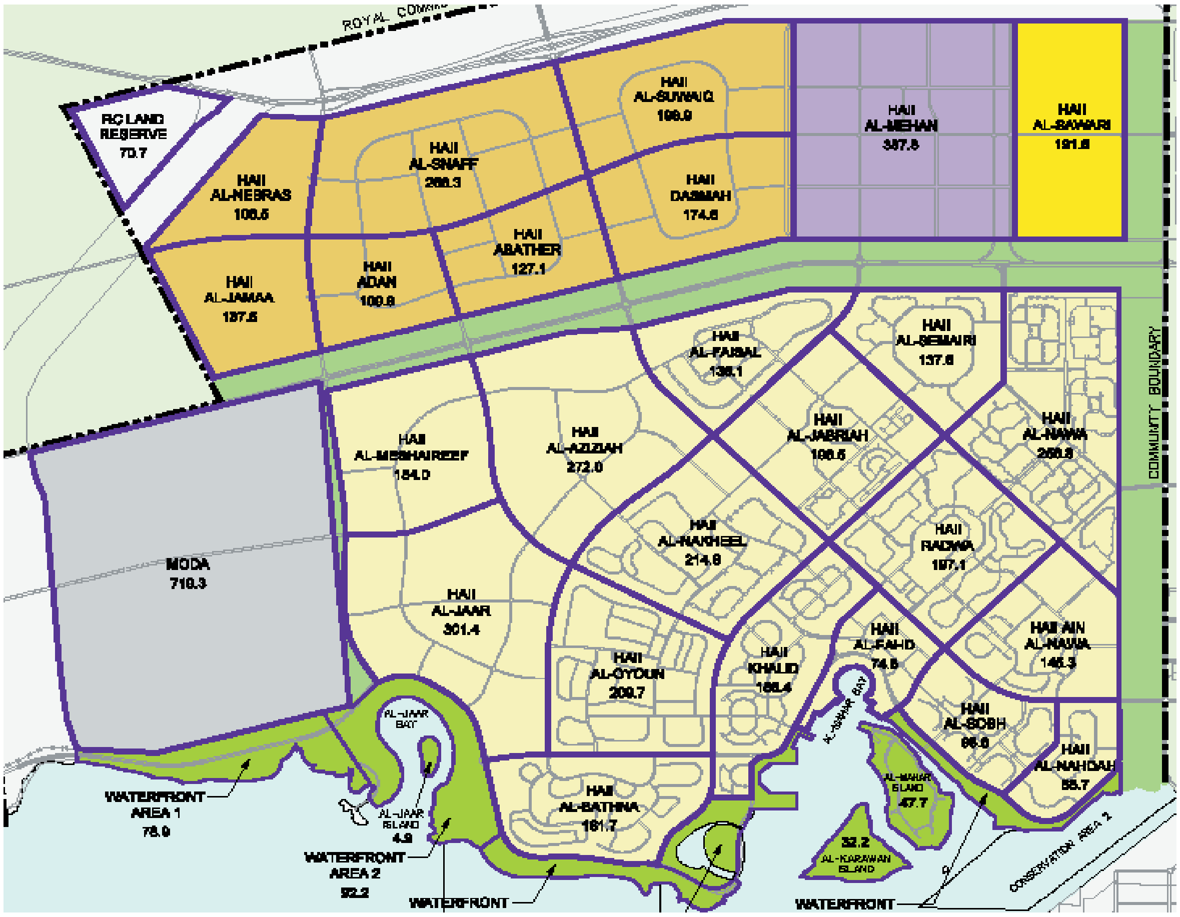
3= Neither like nor dislike

➢ However, there is no significance to the data values themselves; they simply represent attributes of the object concerned.

b). Quantitative information

- It is information that can be described through numbers, counted or expressed numerically for instance in experiments, surveys, manipulated and statistically analysed: examples: Data collected on nutritional status of children or adults.

- It is the way to determine amounts
- This type of data is often collected
- Can be represented visually in graphs, histograms, tables and charts.
- One document can provide both types of information for instance the map below:
    - Quantitative information such as % of different uses
    - Qualitative information such as the location and types of uses

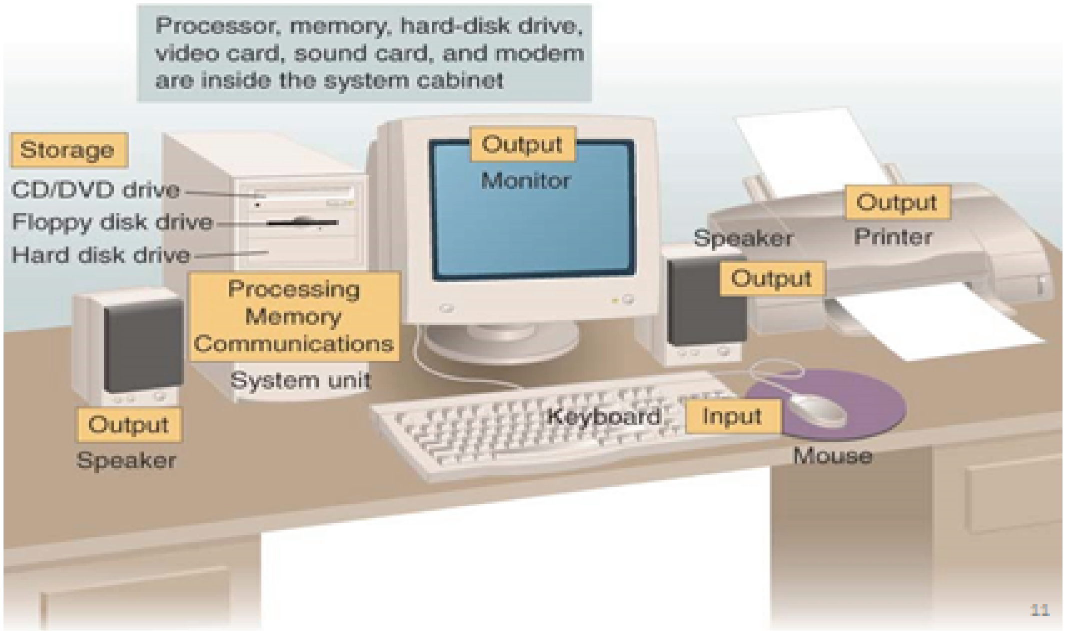


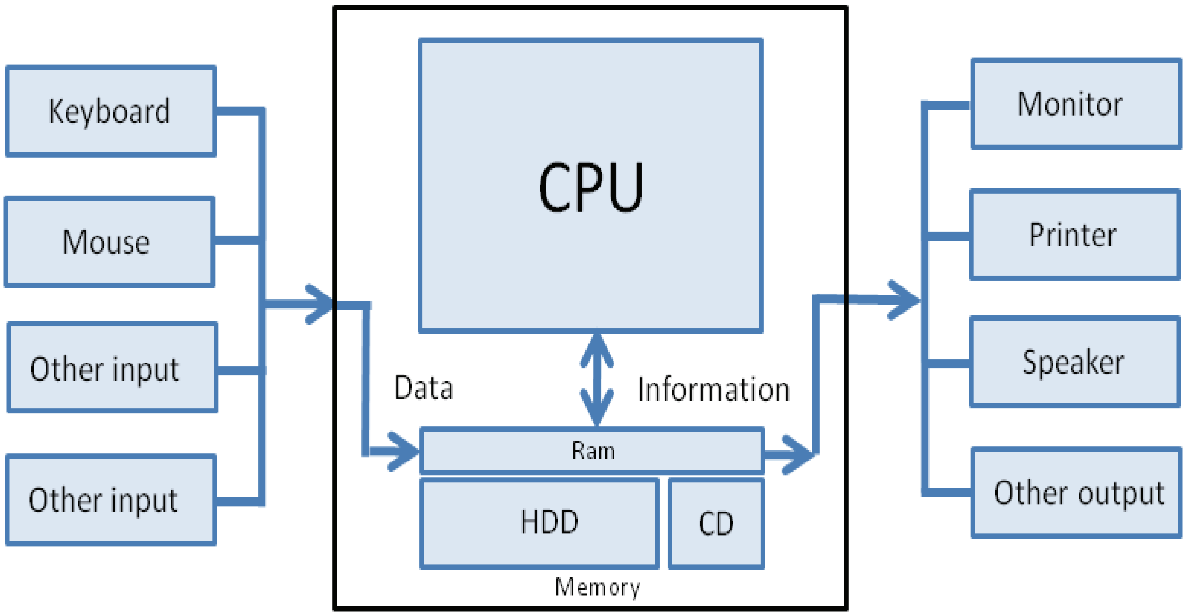
3.4.3 Data entry into a computer

Data entry in a computer requires that a computer should be available, which consist of the hardware and software. Hardware refers to: All the machinery and equipment in a computer system. Firmware refers to: The instructions or programs that reside inside Integrated Circuits. Software includes; all the instructions that tell the computer how to perform a task and Live-ware refers to all the living things aiding computer to work such as data entry operators and programmers.

Data entry software enables researchers to enter data and information into a computer system, where it can be analyzed to answer research questions or to populate an archive of information for future reference. Data entry is also common for councils, companies or firms that must handle paper documents and forms, such as imprest, payment vouchers, invoices, application forms, claim forms, loan documents and so on.

Data entry into a Computer....





Data gathered from the questionnaire are entered into a computer by different mechanisms depending on the requirements of the software of interest.

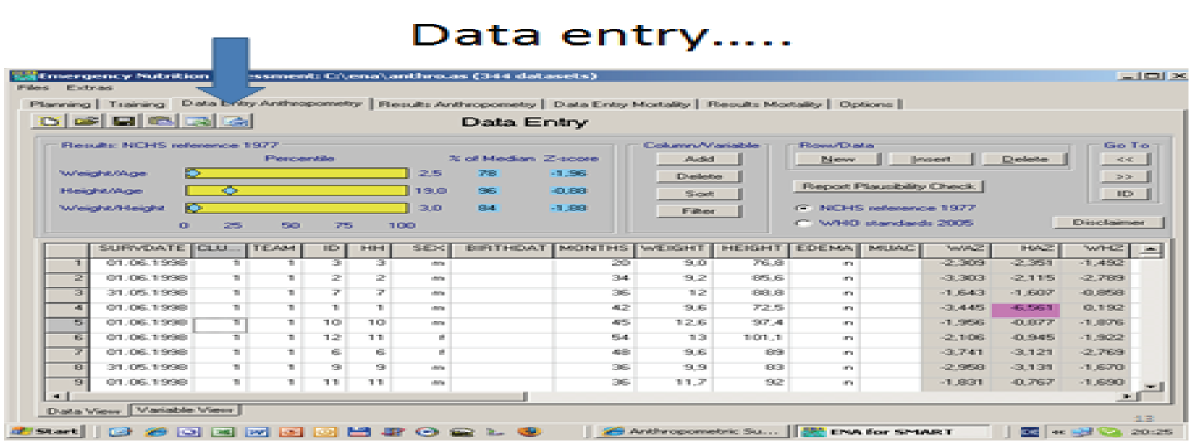
In nutritional software like ENA, WHO Anthro, that are specific for children, the data is entered straight as the data capture template for variables of interest are inbuilt. Therefore questionnaire has to be structured in a way the software requires.

An example of an Anthropometric Survey Questionnaire structure for ENA is presented below: This is the information required to be filled in the ENA spread sheet.

District/Village: ____________ Date: ____________ Cluster number: ________ Team number: ________

Child No.	HH No.	Name (optional)	Sex (F/M)	Birthday	Age in months	Weight (kg) 100g	Height (cm) 0.1cm	Edema (y/n)	% W/H

The illustration below is how the data entry ENA window software looks like. The information regarding each surveyed child should appear in the questionnaire i.e. Survey date, Cluster, Team ID, Household, Sex, Birth date, months, weight, Height, Edema and MUAC



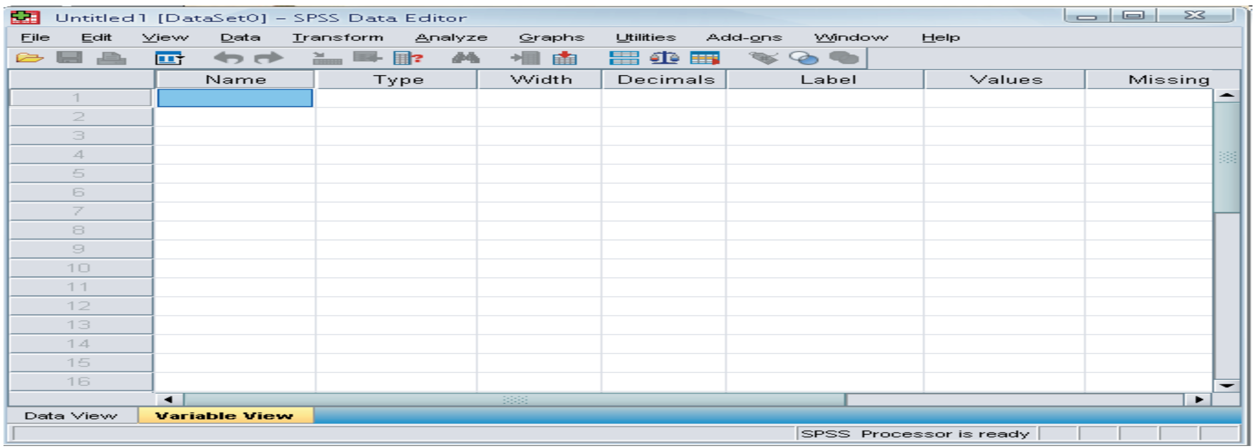
In other questionnaires, that are general or are for various purposes, data entry is done in non-specific software such as SPSS.

- If the questions are coded, a template or data capture is created. An Example of a coded question is: What is the marital status of the respondent? (1) Married (2) Single (3) Divorced (4) Cohabit
- The template or data capture, is another way of writing the whole coded questionnaire in the software before the actual data entry
- Each coded question is entered in the template depending whether is a

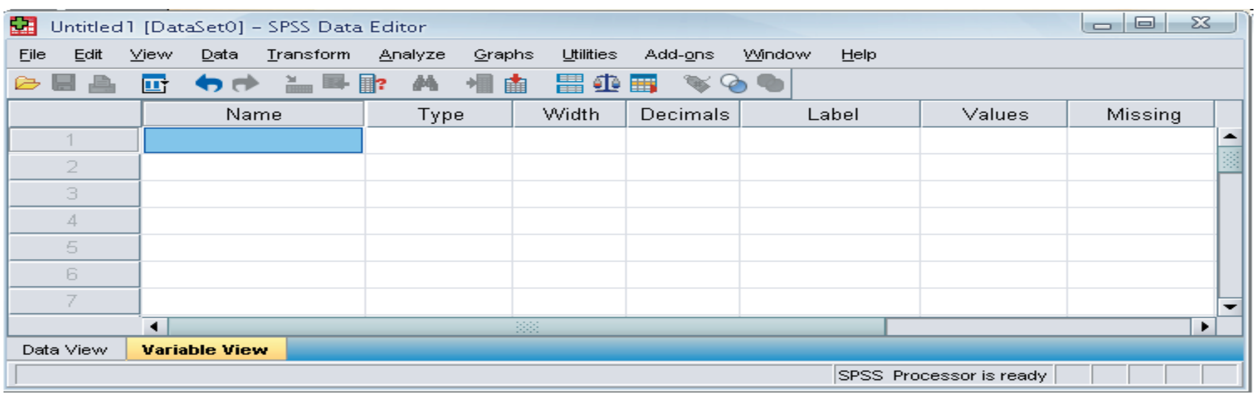
- o Numerical : Entered straight as numerical data is default
- o Categorical: The categories have to be given values
- o Date: Choose the preferred date format
- o String: If a the variable is not numeric for example Name of the respondent

- An Example of a Un-coded question is: What do you consider as best practices for breastfeeding your baby?
  - o This question can have a variety of answers depending on how the respondent explains
  - o The variety of almost similar responses should be lumped together as a group
  - o The groups obtained are given codes and can now be entered in the software as the coded questions

The facilitator will show you how the Data Entry window in SPSS software looks like: The Data view window is where data from the questionnaire is entered. You will be shown how it is normally done by the facilitator.



You will also be shown by the facilitator the SPSS variable window: The variable view window is where the various variables are created from the questionnaire. In fact this is the window where the data template or data capture for the questionnaire is prepared beforehand. The facilitator will show you how it is normally done.



3.4.4 Data Cleaning

After data entry there is a particular need to clean data. Data cleaning is extremely important when the data collection method allows inconsistencies. For instance when a number of people are involved in data collection where several mistakes can be committed. All data cleaning work must be carefully documented and available in a report. Data cleaning includes the following activities as needed

- Removal of outliers: Invalid, impossible, or extreme values may be removed from the dataset. Outliers might also be marked for exclusion for the purpose of certain analyses. For instance: Length in cm of infants under one month old: 54, 56, 52, 55, 51, 75. Therefore an outlier here is a child with 75 cm. This figure might have aroused from (i) Improper typing i.e. 7 was typed first before 5 (ii) A mistake of the recorder during measurement (iii) Mistake of the measurer. In this case you cross-check with the original record sheet and correct accordingly. If you do not find where the mistake was committed then the figure is removed from the data set.
- Labelling missing values: It may be necessary to label each missing value with the reason it is considered missing in order to guarantee accurate bases for analysis.

3.4.5 Data Archiving

You will be informed by the facilitator that, after data entry and cleaning, there are various ways the data is archived for future use. Data is archived for future use by choosing the design or how the data should be organised, storage method and how secure the data is needed to be kept. Data archiving is a general term that covers a broad range of data applications, which refers to basic data management principles or to specific expertise on the following categories:-

- Data design
- Data storage,
- Data security.

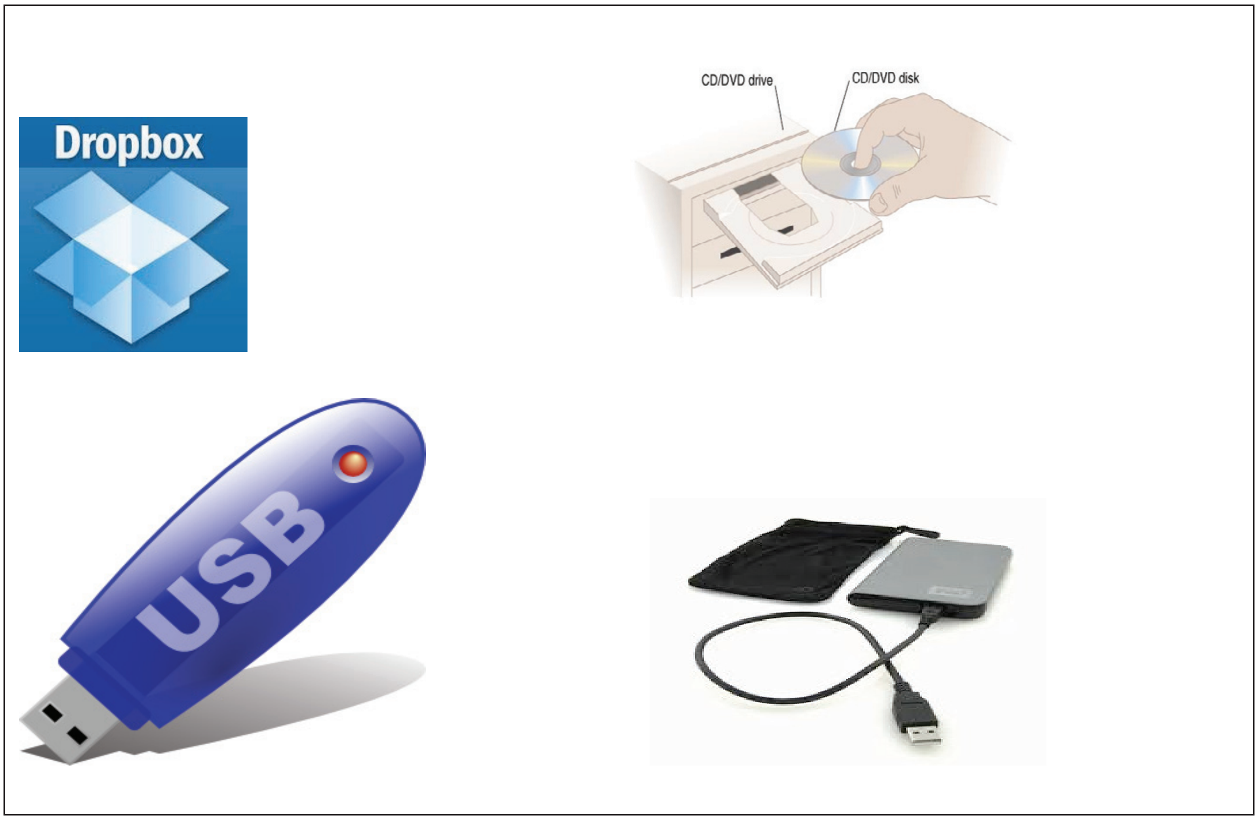
3.4.6 Data design

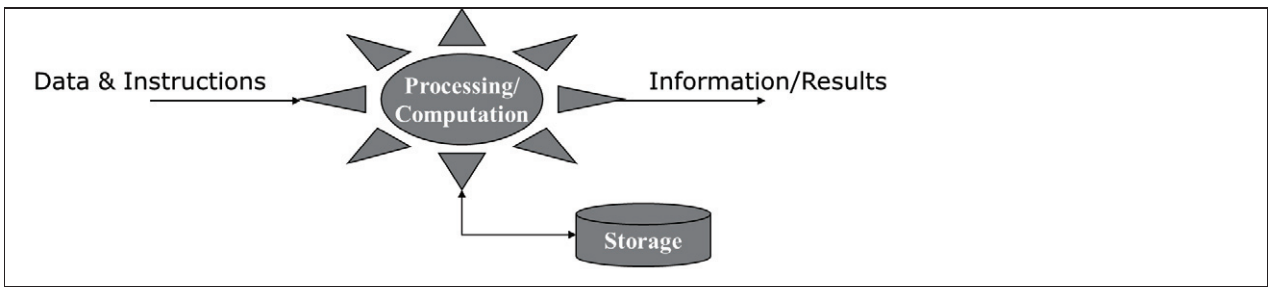
Refers to the way data is organized.

- For instance one can organize the data in form of Tables or Figures in word program
- For some applications, it may make sense to store data in a text format
- Other data has to be organized in a spread sheet format for instance Excel, SPSS (numerical)
- Regardless of what format the developer uses, the data must be organized within the file in a structure that can be recognized by the associated program

3.4.7 Data storage

Refers to the various ways of storing data. This include hard drives, flash memory, hard copies. When selecting an appropriate data storage medium, aspects such as data access and data integrity are important to consider. For example, data that is accessed and modified on a regular basis should be stored on a hard drive or flash media. This is because these types of media provide quick access and allow the data to be moved or changed. Archived data, on the other hand, may be stored on optical media, such as CDs and DVDs, since the data does not need to be changed. Optical discs also maintain data integrity longer than hard drives, which makes them a good choice for archival purposes. The following gadgets, which might look familiar to you, are used for data storage





3.4.8 Data security

This involves protecting the data, which one has collected. Many individuals and research stations store valuable data on computer systems.

- Imagine if your life was stored in your computer, you understand how important that data could be and to what extent you would protect it
    - **Therefore, it is wise to take steps to protect the privacy and integrity of your data**
- Some steps include putting passwords to prevent unauthorized access to your computer

Why do you think data should be archived?

Revision Reading
Data Management reference material Handout 1.1
Data Management Handout 1.2
Data Management Handout 1.3

3.4.9 Data Analysis

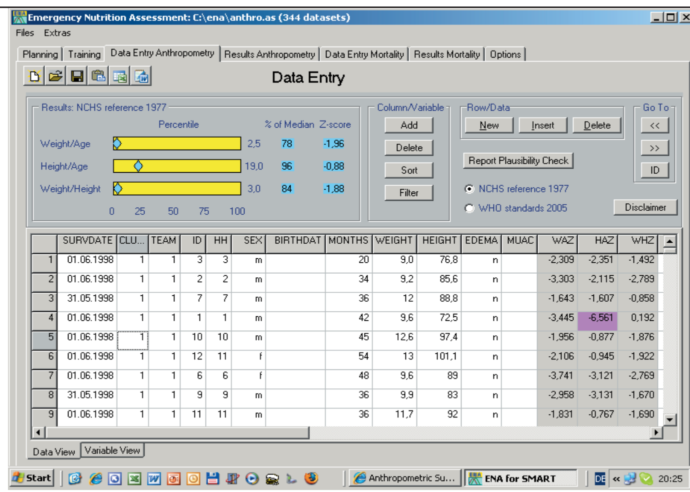
Basically data analysis means turning raw data into useful information. The ppurpose is to provide answers to research/project/program questions. The best quality and well-collected data mean nothing if **not appropriately analysed**—or if **not analysed at all.** Analysis does not mean using computer software package rather, analysis should intend to answer the question: "Is my research/project/program meeting the laid down objectives?" Data can be analysed using different software, including nutrition related software and non-nutrition related software

Different types of Data Analysis software
Nutrition software Include
ENA
EPI-INFO
WHO –Anthro
WHO Anthro Plus
NUTRI-SURVEY
ProPAN
Other software that works with Nutritional Software include
Excel
SPSS

Emergency Nutrition Assessment (ENA)

The acronym 'ENA' stands for Emergency Nutrition Assessment.

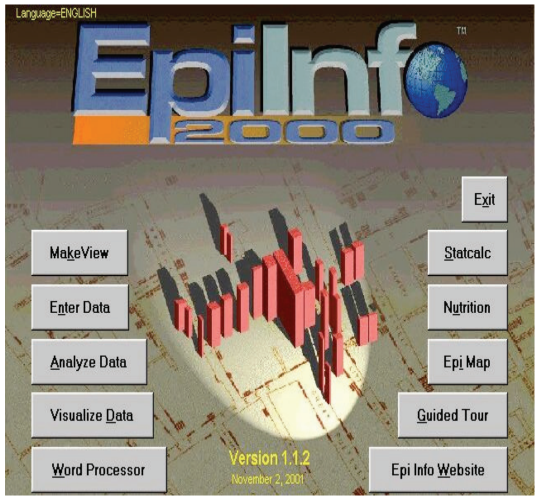
The purpose of ENA for SMART is to make nutrition assessments and mortality rate calculations in emergency situations as easy and reliable as possible. To achieve this it focuses on the most important indicators (anthropometric and mortality data)



EPI INFO

Epi Info is a public domain statistical software for epidemiology which has been developed by Centres for Disease Control and Prevention.

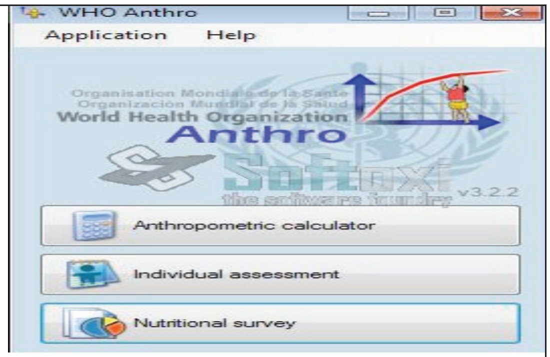
program allows for electronic survey creation, data entry, and analysis. Within the analysis module, analytic routines include t-tests, ANOVA, nonparametric statistics, cross tabulations and stratification with estimates of odds ratios, risk ratios, and risk differences, logistic regression (conditional and unconditional), survival analysis and analysis of complex survey data.



WHO Anthro

Software for assessing growth and development of the world's children (0-5)yrs. The software consists of three modules:

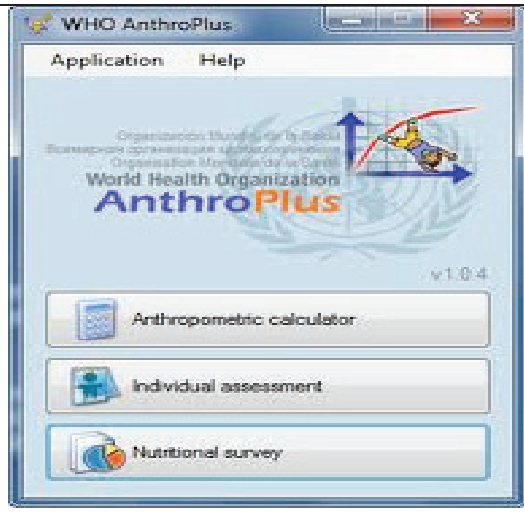
- Anthropometric calculator
- Individual assessment
- Nutritional survey



WHO-Anthro plus

WHO AnthroPlus is the same as WHO anthro except in the age categories.

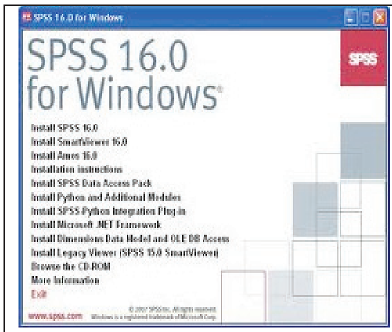
WHO AnthroPlus is a software for the global application of the WHO Reference 2007 for 5-19 years to monitor the growth of school-age children and adolescents. It consists of the following modules:- Anthropometric calculator- Individual assessment Nutritional survey



ProPANProcess for the Promotion of Child Feeding

ProPAN is a set of research tools designed for improving infant and young child feeding practices to prevent early childhood malnutrition A step by step process: Identify nutritional and dietary problems why problems occur Design an intervention to address the problems identified Evaluate that intervention	

SPSS

	Is a software package used for statistical analysis. Originally, it was known Statistical Package for the Social Sciences, later modified to read Statistical Product and Service Solutions One of the most popular statistical packages which can perform highly complex data manipulation and analysis with simple instructions

EXCEL

	Excel is a spread sheet program, Excel is an electronic spread sheet program that can be used for storing, organizing and manipulating data. It organizes information (text and numbers) by rows and columns:

Practical session

Practical session on data Entry and analysis on ENA, SPSS software

You will be guided on how to enter and analyse data by using ENA and SPSS software;

3.4.10 Basic Analyses

Descriptive analysis

These forms the most common data analysis terms that will be used frequently by you in day to day reporting

The most common statistical terms include

(i) Ratio
(ii) Proportion
(iii) Percentage
(iv) Rate
(v) Mean
(vi) Median
(vii) Mode

Ratio

A ratio says how much of one thing is compared to another thing, which means comparison of two numbers expressed as:

- a to b, a per b, a:b
- For instance in the 4 cells below there are 3 blue cells to 1 yellow cell

Ratios can be shown in different ways:

- Using the ":" to separate the values: 3 : 1
- Instead of the ":" you can use the word "to": 3 to 1
- Or write it like a fraction: 3/1

- Ratios can be used to express such comparisons as Nutrition Rehabilitation centers to Malnourished children Calculation a/b

Calculating Ratio

- Example (i) In Kibaha district there are 150 Pregnant women and 50 clinics. What is the ratio of Pregnant women to clinics? 150 / 50, which means: there are 3 Pregnant women per clinic, a ratio of 3:1
- Example (ii) A recipe for pancakes uses 3 cups of flour and 2 cups of milk**.** So the ratio of flour to milk is 3:2

  If you needed to make pancakes for a Lot of people you might need 4 times the quantity, so you multiply the numbers by 4: 3×4 : 2×4 = 12 : 8. In other words, 12 cups of flour and 8 cups of milk.

Proportions

Proportion refers to a ratio in which all individuals in the numerator are also in the denominator. Proportions are used to compare part of the whole, such as proportion of all boys who are less than 10 years old.

Calculating Proportions

- Example(i) If 40 out of 100 Lactating mothers who are on iron supplementation are less than 18 years of age, what is the proportion of young Lactating mothers in the community are on supplementation? 40/100 = 2/5
- Example(ii) If a Community has 12 malnourished Women and 8 malnourished Men, then the proportion of Men who are malnourished is 8/20, or 2/5
- 12+8 = 20
- 8/20
- The multiple can further be reduced to 2/5 = Men

Percentage

Percentage refers to the way expressing a proportion (proportion multiplied by 100). Percentage expresses a number in relation to the whole.

Calculating percentages

- Example(ii) Infant males comprise 2/5 of all the infants born last month, or 40% of the infants are male (0.40 x 100)

  Allows us to express a quantity relative to another quantity. Can compare different groups, facilities, countries that may have different denominators

Rate

Rate is measured with respect to another measured quantity during the same time period. Rate is used to express the frequency of specific events in a certain time period (fertility rate, mortality rate). Numerator and denominator must be from same time period. Often expressed as a ratio (per 1,000)

Calculation of infant mortality rate

Number of deaths ÷ population at risk in same time period x 1,000

- Example (i) 75 infants (less than one year) died out of 4,000 infants born that year
  - 75/4,000 = .0187 x 1,000 = 18.7
  - *19 infants died per 1,000 live births*

- Example (ii) In 2012, Mvomero RCH had 50,000 anemic children. During that same time period, 1,256 children died.
  - 1,256/50,000 = .025 x 1,000 = 25
  - 25 children died (mortality rate) per 1,000 anemic children

Rate of Increase

Rate of increase is used to calculate monthly, quarterly, yearly increases, for instance in nutrition service delivery. Example: increase in number of new complementary foods in the market

Calculation of rate of increase

Refers to the total number of increase ÷ time of increase

- Example Complementary foods in the market in January, 2013 were 10. In December, 2013 there were 33 new complementary foods. What is the rate of increase of complementary foods per month
- Total number of complementary foods =10 +33 = 43;
- 43 - 10 = 33/11 = 3 (3 complementary foods per month)
- So the rate of increase in complementary foods for the last 11 months was 3 complementary foods per month.

Measures of Central Tendency

Measures of the location of the middle or the centre of a distribution of data

- Mean
- Median
- Mode

Mean

The mean refers to the average of your dataset. This is the value obtained by dividing the sum of a set of quantities (For Instance, Households in each village hamlet) by the number of quantities in the set

The formula for the mean of a data set $\{x_1, x_2, \ldots x_n\}$ is

$$\bar{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$$

$$= \frac{x_1 + x_2 + \cdots + x_n}{n}$$

Calculating the mean

- Example (i) :(62+44+56+67+89+56) = 374 ÷ 6 = 62.3
- Example (ii) Number of infants born in January: 60, February: 65, March: 52, April: 56, May: 67, June: 47
- Answer: (60+65+52+56+67+47) = 337÷ 6 = 57.8
  - The mean is sometimes also called the average or the arithmetic mean.
- Example (iii): What is the mean of the data set (10, 20, 30, 40, 50)?
- Answer: Calculate the sum of the data (10+20+30+40+50)
  - Divide by the number of values in the data set to get the mean
  - Since there are 5 values in the data set, the mean is 150/5 = 30
  - *The mean is sensitive to extreme values*

Median

The median refers to the middle of a distribution (when numbers are arranged in order: half of the numbers are above the median and half are below the median). The median is not as sensitive to extreme values as the mean

For odd number of numbers, the median is the middle number
  - Median of 6, 9, 11 = 9
- For even number of numbers, the median is the mean of the two middle numbers
  - Median of 3, 6, 9, 15 = (6+9) /2 = 7.5

Calculating the Median

- Example (i) Counting the number of Ascaris from children's' stomachs
  - Child 1 = 33, Child 2 = 82, Child 3 = 76, Child 4 = 45, Child 5 = 23, Child 6 = 67
  - Answer = 76+45 = 121/2 = 60.5
- Example (ii) Median for an odd number of values. Question: What is the median of (10, 14, 86, 2, 68, 99,1)?
  - Answer: Sort the values. The values in the data set, arranged from the smallest to the largest, are (1, 2, 10, 14, 68, 86, 99)
  - Find the number in the middle: There are 7 values in the data set. Since there are an odd number of values, the median will be equal to the value in the middle, namely, in the 4th position.
  - Therefore the median of the data set is 14.
- Example (iii): Median for an even number of values. Question: What is the median of (11, 10, 14, 86, 68, 91, 1)

- Answer: Sort the values. The values in the data set, arranged from the smallest to the largest, are (1, 2, 10, 11, 14, 68, 86, 99)

- Example (iv) Find the number in the middle: There are 8 values in the data set. Since there are an even number of values, the median will be halfway between the two values in the middle, namely, between the 4th and 5th positions. The value in the 4th position is 11 and the value in the 5th position is 14. The median lies halfway between these two values and is therefore
  - Median of 3, 6, 9, 15 = (11+14) /2 = 12.5

Mode

The to mode refers is the most commonly occurring value in a distribution.

- Example (i) Consider this dataset showing the length of 11 infants, in whole numbers: 54, 54, 54, 55, 56, 57, 57, 58, 58, 60, 60

Simple Frequency distribution of infants lengths

Length (cm)	Frequency
54	3
55	1
56	1
57	2
58	2

- Example (ii) Question. Find the mode of the data set (2, 2, 3, 4, 4, 4, 4, 6, 6, 7, 8, 8, 10, 10).
  - Answer: Count the number of times that each value appears in the data set.

Value	**Count**
2	2
3	1
4	3
6	2
7	1
8	2
10	2

Find the value that appears most often

From the table above we can see that 4 is the only value that appears 3 times, and all the other values appear less often.

- Therefore the mode of the data set is 4.

One problem with using the mode as a measure of central tendency is that we can usually not compute the mode of a continuous data set. Since continuous values can lie anywhere on the real line, any particular value will almost never repeat. This means that the frequency of each value in the data set will be 1 and that there will be no mode.

Key concepts in data analysis

That the purpose working out the basic analysis is to provide answers to research/project/program questions

Descriptive analyses describe the sample/target population and do not define causality – that is, they tell you what, not why

3.4.11 Basic guidance when summarizing data in Tables, Charts and Graphics

Ensure tables graphic has a title

- Label the components of your graphic
- Indicate source of data with date

Tables are normally used as the simplest way to summarize data. Data are presented as absolute numbers or percentages. A data table is a grid, or matrix that has columns and rows. It has a tabular layout with cells that contain information and data with similar characteristics arranged together. You can enter the appropriate rows and columns, and fill in the information as needed depending what you want to present. Most tables show a frequency distribution, which is a set of categories with numerical counts. For instance, in this table xx, you see the year as the category and the number of births as the numerical count.

Table xx: Annual Number of Children Born in Kidete Village

Year	Number of births
2010	75
2011	79
2012	66

Set of categories with numerical counts

In the relative frequency table, you see the proportion of the total number of births between 2008 and 2009 (181) by 1-year intervals.

Tables: Relative frequency

Number of values within an interval x 100

Total number of values in the table

The calculation for the first relative frequency is: 65/118 = 0.3591 x 100 = 35.9 (approx 36%).

To interpret this table, we should look at the relative frequencies. What do they tell us? We can see data across the three decades and what percentage of births occurred in each one. The largest percentage of children was born between 2008 and 2009, compared to the other two years.

Percentage of births annually between 2008 and 2013

Year	Number of births (n)	Relative frequency
2008-2009	65	36
2010-2011	56	31
2012-2013	60	33
Total	181	100

Charts and Graphs:

Charts and graphs are normally used interchangeably to refer visual representation of data, in which the data are represented by symbols such as bars in a bar chart or lines in a line chart. A chart can represent tabular numeric data, functions or some kinds of qualitative structures. Charts are often used to ease understanding of large quantities of data and the relationships between parts of the data. Charts can usually be read more quickly than the raw data that they are produced from. They are used in a wide variety of fields, and can be created by hand (often on graph paper) or by computer using a charting application. Certain types of charts are more useful for presenting a given data set than others. For example, data that presents percentages in different groups (such as "Sweet, Sour, Neither sweet nor sour") are often displayed in a pie chart, but may be more easily understood when presented in a horizontal bar chart. On the other hand, data that represents numbers that change over a period of time (such as "annual revenue from 2000 to 2010") might be best shown as a line chart.

A chart can take a large variety of forms; however there are common features that provide the chart with its ability to extract meaning from data. Typically the data in a chart is represented graphically, since humans are generally able to infer meaning from pictures quicker than from text. Text is generally used only to annotate/explain the data. One of the more important uses of text in a graph is the title. A graph's title usually appears above the main graphic and provides a succinct description of what the data in the graph refers to. Dimensions in the data are often displayed on axes. If a horizontal and a vertical axis are used, they are usually referred to as the x-axis and y-axis respectively. Each axis will have a scale, denoted by periodic graduations and usually accompanied by numerical or categorical indications. Each axis will typically also have a label displayed outside or beside it, briefly describing the dimension represented. If the scale is numerical, the label will often be suffixed with the unit of that scale in parentheses. For example, "Distance traveled (m)" is a typical x-axis label and would mean that the distance travelled, in units of meters, is related to the horizontal position of the data within the chart. Within the graph a grid of lines may appear to aid in the visual alignment of data. The grid can be enhanced by visually emphasizing the lines at regular or significant graduations. The emphasized lines are then called major grid lines and the remainder is minor grid lines.

The data of a chart can appear in all manner of formats, and may include individual textual labels describing the datum associated with the indicated position in the chart. The data may appear as dots or shapes, connected or unconnected, and in any combination of colors and patterns. Inferences or points of interest can be overlaid directly on the graph to further aid information extraction. When the data appearing in a chart contains multiple variables, the chart may include a legend (also known as a key). A legend contains a list of the variables appearing in the chart and an example of their appearance. This information allows the data from each variable to be identified in the chart.

Charts are a good way to visually represent data. Once created, charts can be merged with other technology products to convey an idea, demonstrate content knowledge, and communicate findings. The charts are presented in various forms such as Bar charts, Column charts and pie Charts. Bar Charts -- are very similar to column charts, except they run horizontally on the page instead of vertically like column charts. Line Charts -- are used to show trends over time. Each line in the graph shows the changes in the value of one item of data. For example you could show changes in your weight over a period of months as a result of eating a quadruple cheese and bacon hamburger every day for lunch.

Remember: "a picture is worth a thousand words…"

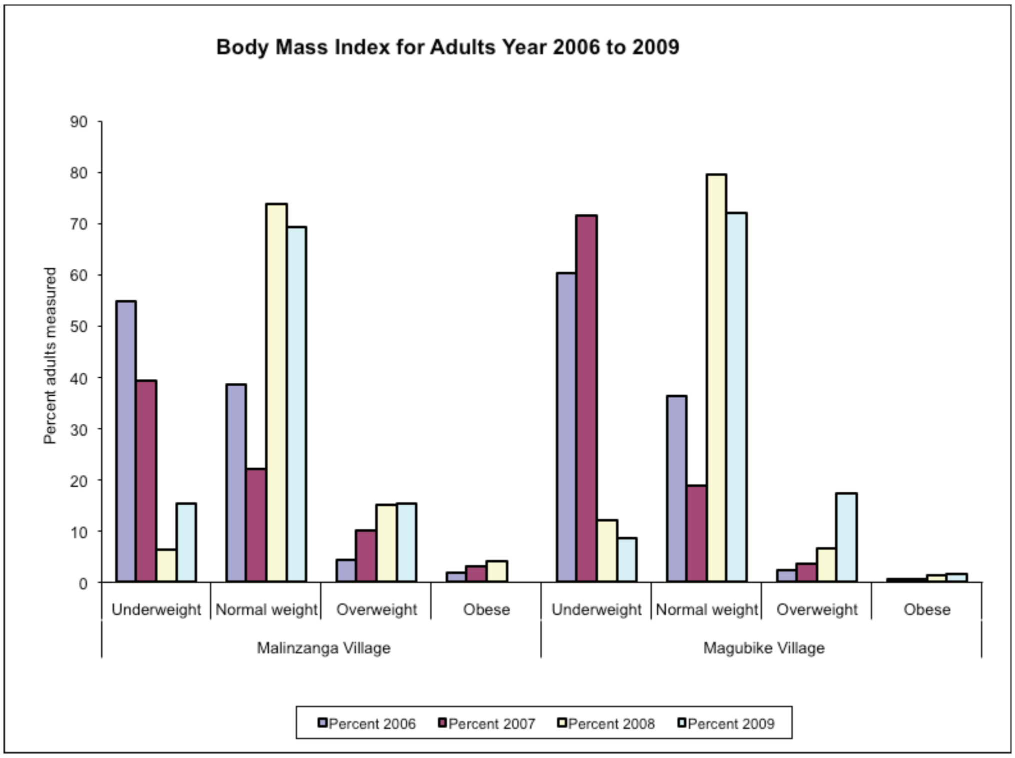
Some examples of charts are presented. This column chart presents the Body Mass Index of Adults in Malinzanga and Magubike villages

The title is: Body Mass Index of Adults in Year 2006 to 2009

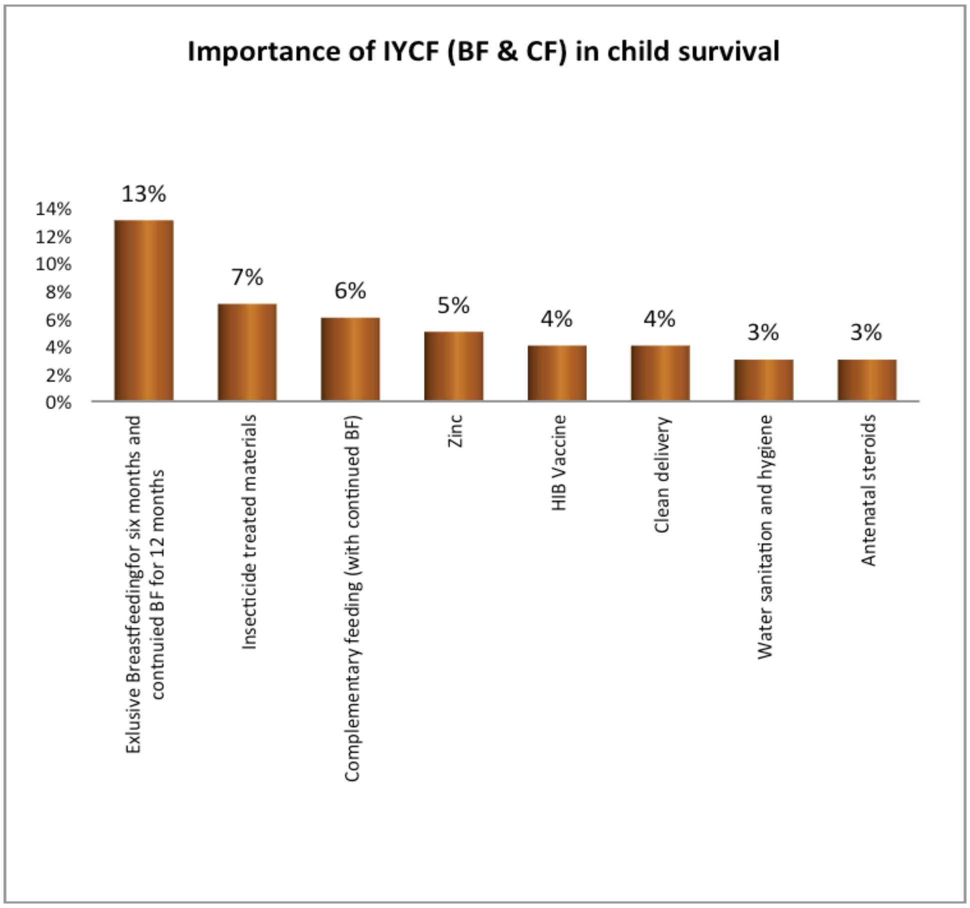
Y-Axis refres to Percentage of adults measured

X-Axis: Categories of Body Mass indices: Underweight, Normal, Overweight and Obese in Malinzanga and Magubike Villages

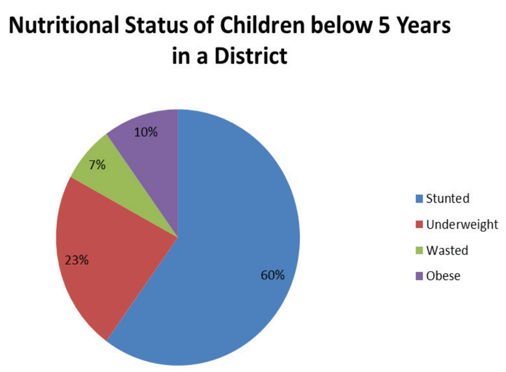
Legend: Gives the various colours referring to the various years from 2006 to 2009



In this other bar chart, shows the Importance of Infant and Young Child Feeding i.e. Breast Feeding & Complementary Foods in child survival in that **Breastfeeding and Complementary food have largest impact on child mortality** of all preventive interventions equal to 19% (i. e. 13% BF + 6% CF). Source: Lancet Child Survival Series 2003.



Pie chart is another visual representations of numerical data. Like in this pie chart it shows how large the prevalence of stunting is in children



Pie charts show percentages, or the contribution of each value to a total. A pie chart always totals 100%.

The chart shows the nutritional status of children below 5 years in a district. For example, the largest portion refers/represents the children who are stunted in the district (60%).

Revision Reading

Data analysis Measures of Central Tendency Handout 2.1
Data Analysis Lecture notes Handout 2.2
Data Analysis Lecture notes Handout 2.3
Data Analysis Lecture notes Handout 2.5
Data analysis Handout 2.6
Data analysis Hypothesis testing Handout 2.7
Data analysis Correlation and Regression Handout 2.8
Data Analysis Charts and Graphs Handout 2.9

3.4.12 Interpretation of the results

Interpretation refers to adding meaning to information obtained by making explanations, comparisons and exploring causes and consequences. There are several questions that are posed when interpreting results such as; does the indicator meet the objective? How does your results compare to other studies for instance the formal Demographic and Health surveys? Are there any Data gaps to warrant conducting further research?

Researchers should describe their results clearly, and in a way that other researchers can compare them with their own results. They should also analyse the results, using appropriate statistical methods to try to determine the probability that the findings may have been by chance, and may not be replicable in larger studies. But this is not enough. Results need to be interpreted in an objective and critical way, before assessing their implications and before drawing conclusions. Interpretation of research results is not just a concern for researchers. Nutrition professionals reading or hearing research results should be able themselves to interpret them correctly, and to assess their implications for their work. Policymakers should also be aware of the possible pitfalls in interpreting research results and should be cautious in drawing conclusions for policy decisions.

Interpreting results of quantitative research

Interpreting descriptive statistics

The mean or average is only meaningful if the data fall into a normal distribution curve, that is, they are evenly distributed around the mean. The mean or average, by itself, has a limited value. There is an anecdote about a man having one foot on ice and the other in boiling water; statistically speaking, on average, he is pretty comfortable. However, in the true sense, he is suffering in both legs and he is actually not comfortable at all. The range of the data and their distribution (expressed in the standard deviation) must be known. It is sometimes more important to know the number or percentage of subjects or values that are abnormal than to know the mean.

Interpreting "statistical significance"

Albert Einstein said, "Not everything that can be counted counts, and not everything that counts can be counted." A statistically significant finding simply means that it is probably caused by something other than chance. Significant does not mean important. To allow proper interpretation, exact P values should be provided, as well as the statistical test used. The term "orphaned" P values is used to describe P values presented without indication of the statistical test used. Statistical tests need to be kept in proper perspective. The size of the P value should not be taken as an indication of the importance of the result. The importance of the result depends on the result itself and its implication. Results may be statistically significant but of little or no importance. Attaching a fancy P value to trivial observations does little to enhance their importance. A statistically significant or even a highly significant difference does not necessarily mean a nutritionally important finding. A difference is a difference only if it makes a difference. Differences may not be statistically significant but may still be important. The differences may be real but, because of the small size of the sample, they are not statistically significant. A P value in the non-significant range tells you that either there is no difference or that the number of subjects is not large enough to show the difference.

Bias

All studies are potentially subject to bias (literally defined as systematic deviation from the truth). Bias is a systematic error (in contrast to a random error due to chance). The effect of bias is called "like is no longer compared with like". Bias has a direction. It either increases or decreases the estimate, but cannot do both. This is in contrast to chance findings that can have any effect on the estimate. If the study sample is not representative of the population, the inference we make from the result may be misleading. Analytical statistics will be of no help if the sample is not representative. Analytical statistics cannot correct our mistakes in designing the study. Every attempt should be made in the design of the study to ensure that the sample is representative. Bias cannot be addressed or corrected by statistics. The main protection is to think of the possibility of the bias and design it out. Using sophisticated computer programs does not guarantee the validity of the study. In computer jargon, they say "garbage in, garbage out". If you feed the computer with the wrong information, you will get a wrong outcome. If the possibility of bias cannot be avoided completely in the planning of the study, the investigators must point this out when they present the findings of the study. Bias can occur when groups being compared differ systematically in a way that is related to the outcome. Main types of bias can occur at two levels: at the level of selection of subjects (selection bias) and at the level of collecting the information (information or measurement bias). Selection bias is a systematic difference between subjects selected for a study and those who are not selected. Loss to follow-up can cause a selection bias. Attrition is the term used for reduction in the number of subjects who remain in a study. Attrition bias occurs when the subjects who drop out of a study are systematically different from those who complete the study. For example, those who develop complications or side effects may be more likely to drop out of the study. Response bias is a specific type of selection bias in which respondents differ systematically from non-respondents to a questionnaire. Measurement or information bias occurs when the methods of measurement or obtaining information are consistently dissimilar in different groups of patients. One type is recall bias. It is encountered, for example, when people with a certain condition are more likely to remember exposure to the variable under study than people without the condition.

Confounding

A Confounding Variable is an extraneous variable whose presence affects the variables being studied so that the results you get do not reflect the actual relationship between the variables under investigation. For instance when conducting an experiment, the basic question that any experimenter is asking is: "How does A affect B?" where A is the probable cause, and B is the effect. Any manipulation of A is expected to result in a change in the effect.

Example 1: If you want to study whether bottle-feeding (Cause) is related to an increased risk of diarrhoea in infants (Effect). It would seem logical that bottle-fed infants are more prone to diarrhoea since water and the bottle could get contaminated, milk could go bad, etc. But if you were to conduct this study, you would learn that bottle-fed infants are less likely to develop diarrhoea than breast-fed infants. It would seem that bottle-feeding actually protected against the illness. But in truth, you would have missed a very important confounding variable - mother's education.

If you take mother's education into account, you would learn that better-educated mothers are more likely to bottle-feed their infants, who are also less likely to develop diarrhea due to better hygienic practices of the mothers. In other words, mother's education is related to both the Cause and the Effect. Not only did the Confounding Variable suppress the effect of bottle-feeding, it even appeared to reverse it - confounding results, indeed!

Example 2: Suppose that there is a statistical relationship between ice-cream consumption and number of drowning deaths for a given period. These two variables have a positive correlation with each other. An evaluator might attempt to explain this correlation by inferring a causal relationship between the two variables (either that ice-cream causes drowning, or that drowning causes ice-cream consumption). However, a more likely explanation is that the relationship between ice-cream consumption and drowning is spurious and that a third, confounding, variable (the season) influences both variables: during the summer, warmer temperatures lead to increased ice-cream consumption as well as more people swimming and thus more drowning deaths

Example 3: A study may find that the risk of lung cancer is more in manual workers. A good investigator will not assume that manual work predisposes to lung cancer, before looking for other possible explanations. The result may, for example, be due to a fact that manual workers are more likely to smoke and it is smoking, not manual work, which is associated with lung cancer.

Example 4: Another example is when an association is reported between herpes virus infection and cervical cancer. Both herpes virus and a number of other infectious agents, which may possibly cause cervical cancer, are transmitted by sexual contact.

Example 5: As an example of analysis for confounding factors we may look at a study of the relationship between the working status of mothers and the duration of breastfeeding. The study may show that women who are employed full-time are less likely to breastfeed for a long duration than women who are employed part-time and women who are not employed. However, the level of education of the mother may be a confounding variable, since it can affect the outcome (duration of breastfeeding) and it may correlate with the working status. Before blaming work for the shorter duration of breastfeeding, there is a need to consider the confounding factor of education. Stratification may be used. A cross-tabulation table may be constructed for mothers at different educational levels, for example those who had no schooling, less than 5 years of schooling, 5–9 years and 10 years or more. For each table, we look at duration of breastfeeding in mothers who are employed full-time, employed part-time and not employed. An alternative way of considering this confounding factor is matching at the design and implementation phase. For each employed mother with less than 5 years of schooling, we would choose a non-employed mother with a similar educational level. Crude rates are the terms used when results have not been adjusted for confounding factors. Adjusted rates are the terms used when results have undergone statistical transformation to permit fair comparison between groups differing in some characteristic that may affect risk of disease.

In simple terms, confounders are all of the "other things" that could explain the result of the research. A careful investigator should look for all possible explanations of the results, before making a conclusion. In good scientific thinking, one should not try to assume one interpretation of the results, when other interpretations are also possible. These examples illustrate the importance of identifying and controlling for possible confounding variables in any research study. A thorough review of available literature should help you do this.

Interpreting results of qualitative research

Qualitative research methods involve the interpretation of textual material derived from talk or observation. In interpreting qualitative findings, the investigators should carefully look into their credibility, dependability, confirmability and transferability. Credibility means interpreting the qualitative data in a way that offers explanations that are consistent with the data collected. Negative findings should be adequately presented and addressed, and alternative explanations considered. As in quantitative research, the investigators should look for confounding variables. For example, a study may reveal that homes sprayed for malaria control had a higher incidence of malaria when sprayed in the afternoon. It could be that sprayers used most of the spray in the morning so that the load to carry in the afternoon would be lighter. To ensure credibility of the interpretation, the investigator should act as the "devil's advocate", considering all potentially competing explanations of the results. Possible sources for bias should be checked, for example observer bias or the influence of the researcher on the research situation. A researcher's background and position will affect the process of qualitative research. The investigator always enters a field of research with certain opinions about what it is all about. In qualitative research, this potential bias cannot be eliminated, but it should be exposed in a process termed "reflexivity". Reflexivity starts by identifying preconceptions brought into the project by the researcher, representing previous personal and professional experiences, pre-study beliefs and qualifications for exploration of the field. During all steps of the research process, the effect of the researcher should be assessed, and, later on, shared. Adequate accounts of these effects should be considered in the limitations and strengths of the study, and transferability of findings. Dependability means that data can be replicated. The replication is not necessarily of the results, but of the process used to obtain the results. Other investigators should be able to replicate the study. Confirmability means that other researchers can have access to the data and can do their own analysis. The concept of "audit trail" enables others, on the basis of the collected data, to review the analysis decisions and verify the interpretations. Transferability means the use of the findings to make inferences to other populations. This may not be possible because qualitative research is often context-specific. Qualitative research emphasizes depth more than breadth, and insight rather than generalization. In such cases, however, there are lessons learnt that may help in understanding the situation in other populations.

Why use the past tense when reporting results?

Just as the **Methods** gives an account of what you **did**, the **Results** section provides an account of what you **found**. The **Results** section requires you to narrate the account as if it is history: it took place **in the past**, and is now being reported as something in the past. This also applies to what your respondents said or reported in any interview or questionnaire responses. Using the past tense helps to **distinguish** what your respondents **said** at a particular place and time, and **avoids implications:**

- That they may always hold those opinions
- That you are reporting what they think or believe, or even
- That their opinions can be **generalised** to a wider population

Reading Revision

Interpretation of Results Handout 3.1

3.4.13 Dissemination

Dissemination means the disclosure of knowledge by any appropriate means through fliers, pamphlets, posters, radio and television broadcasts, publications, conferences and web-based activities. In general it refers to the act of spreading information of an event or research findings widely. Some of its synonyms include: airing, broadcasting, circulation, diffusion, dissipation, propagation, publication and distribution. The dissemination channel designates the means for passing on knowledge and information to target audience or end users. The literature from many different fields makes clear that single-channel dissemination is ineffective compared to multi-channel strategies, which have the greatest likelihood of reaching intended audiences and achieving results.

Means of dissemination

Research reports

Whether it is during emergencies or non-emergency situations, a report with summary page or preliminary results should be out within a week of the survey being completed. If necessary, mark it as a draft report but findings should be disseminated as quickly as possible so that actions/interventions can be planned. The draft report can further be work on by the survey team to make corrections or improve on the explanations to come out with the final document.

Oral feedback to local authorities

Oral feedback to local authorities especially the district council authorities is advisable. It will often have greater impact and allow skeptics to ask questions. It is often insufficient to handout a report. The report, both preliminary and final, should be widely distributed. It can also be posted in the council's website for wider global information.

Flyers, pamphlets, posters

A flier is an advertisement (usually printed on a page or in a leaflet) intended for wide distribution. "A flyer or flier also called handbill or leaflet. Flyers are handed out in the street (a practice known as flyering or leafleting), posted on bulletin boards, or given away during events. Bulletin boards are found on college campuses, in cafés, community meeting houses and small markets. The information on a flier might be having a brief message for instance "Nutrition education messages that address a nutritional problem (deficiency minerals in the body or excess of fats) which has been identified in the population". The messages main aim might be to change eating practices that are considered to be the cause of the nutritional problem.

A **pamphlet** is an unbound booklet (that is, without a hard cover or binding). It may consist of a single sheet of paper that is printed on both sides and folded in half, in thirds, or in fourths (called a leaflet), or it may consist of a few pages that are folded in half and saddle stapled at the crease to make a simple book. Nutrition information such as "The importance of consuming variety of foods to human beings" can be printed in the pamphlet and distributed for targeted people/community to read.

A **poster** is simply a static, visual medium (usually of the paper and board variety) that you use to communicate for instance nutrition ideas and messages. The topic to be presented on a poster might be Iodine Deficiency in Kilosa District in Tanzania. The difference between poster and oral presentations is that you should let your poster do most of the 'talking'; that is, the material presented should convey the essence of your message. However, that does not mean that you can disappear at the scene where the poster is located. You have to 'stand-by-your-poster'! Your task as the presenter is to answer questions and provide further details.

Newspapers, radio & television

A newspaper is a publication, usually issued daily or weekly containing news, comments, features and adverts. Nutrition findings intended for public consumption can be sent through this media. For example if a new complementary food (CF) has been formulated, which is suitable for children under five years old, this information can be published in the newspaper for people to read and try-out to prepare the CF by themselves.

Radio broadcasting is a one-way wireless transmission over radio waves intended to reach a wide audience. Radio broadcasting has for a long period of time been the most popular means of communication and information dissemination in urban and rural settings. Most households have radios and listen to news and advertisement every day. Nutrition Information can be sent through this media to reach a wide number of people at the same time. For example a finding like "According to the 2013 annual report on children measured in routine exercise has found that in Dar-es-salaam Region, childhood obesity attributable to an unhealthy diet is increasing in prevalence". Parents have been urged to be watchful on what they are feeding their children in order to minimize the problem.

Television is a very important tool for the promotional and educational components of national programmes. The combination of visual and audio mechanisms, makes people to get the messages more clearer than only audio through radio. In Tanzania, TV reaches a large audience since a considerable number of households both in urban and rural settings have televisions. The findings from a nutrition survey can be aired through the television. A nutritionist in a district can plan and prepare a TV programme on a certain topic of nutritional importance in order to make communities aware of the problem and how it can be managed. For instance; If diarrhoea is a problem in your area, Plan: Decide what diarrhoeal problem you will be focusing on in your TV programme, who is your target audience, what they should do to solve the problem, and how many different shows you will produce. Pre-test your TV shows to ensure that they are understandable, acceptable, relevant, attractive, and persuasive. Revise your shows based on the comments and suggestions made during the pre-test. In order to have longer impact, nutritional messages, need to be broadcast several times each day to have an impact.

Journal articles and Conference presentation

A journal is a magazine that focuses on a particular discipline or subject matter. Journals are sometimes referred to as magazines, periodicals, or serials. In the nutrition field we have Journals like The Journal of Nutrition, Agriculture and Nutrition Journal. When scientists have information on a nutrition survey for instance or an experiment to add to the body of knowledge in their field of study, they usually write up their findings for inclusion in a scientific journal. However, before it is published, these articles go through a process of peer review. In this way nutritionist are able to disseminate information to their peers in the National and International domain. The language used in these journals is not always understood by the general public. Journal articles are most often **Primary Research** Articles. However, they can also be **Review Articles**. These types of articles have different aims and requirements. **Primary research articles** describe an original experiment or analysis that adds to current knowledge a particular topic such as obesity or under nutrition. These articles will include background information, the methods the nutritionist used, a description of the results, and an analysis of what the results mean in the context of current nutrition knowledge. On the other hand **Review articles** synthesize current research on a specific topic such as Maternal and child nutrition. Often an article will summarize past research, identify important findings in the field, outline recent advances, and point out gaps in a body of knowledge in the specific theme. Review articles are often located in the same journals as primary research articles, but do not report original research. Review articles are a great resource if you're looking for an overview of a small nutrition topic, with complete and current information. Review articles are well-cited, so they can provide a starting point for more extensive research.

A **conference** is a meeting of several persons discussing matters of common concern for instance Nutrition related theme. It is also a gathering of researchers (not necessarily academics) to present and discuss their work Conferences are usually composed of various presentations. They tend to be short and concise, with a time span of about 20 to 30 minutes; presentations are usually followed by a discussion. The work may be bundled in written form as academic papers and published as the conference proceedings. Conferences provide an important channel for exchange of information between researchers. Nutrition Research findings in a district can be can be compiled in form of a paper or power-point presentation to be presented in a conference held at national level or international level. In case it is felt that the information/data is worth publishing then paper is sent to a relevant journal for peer review in finally publication.

Revision Reading

Dissemination Document Handout 4.1
Dissemination_in_Child_Welfare_Briefing Paper Handout 4.2
Dissemination Methods Factsheet Handout 4.3
Dissemination of Information Handbook Handout 4.4
Dissemination Poster Presentation of Research Work Handout 4.5

Internet self-learning videos

Teach Yourself Videos for SPSS data entry, analysis and Interpretation

http://www.as.ysu.edu/~chang/SPSS/SPSSmain.htm
Teach Yourself Videos for Excel data entry, analysis and Interpretation
http://www.free-business-plans.com/excel-videos/index.html?gclid=CJ6cgMnM6roCFcJe3godnXUAjQ
Video showing how to take measurements and surveys in ENA for SMART
http://www.smartmethodology.org/index.php/article/index/capacity_building_toolbox/manual#

SESSION FIVE

Duration: 4hours and 20 minutes

3.5 Monitoring and Evaluation of nutrition programs/projects.

Aim: To instil hands-on knowledge and skills to participants to monitor and evaluate nutrition program/project

Objectives:

- Describe rationale and uses of M&E
- Explain different indicators used in M&E
- Describe steps in conducting M&E
- Describe Outcome/impact evaluation designs

3.5.1 Introduction to Monitoring and evaluation

Monitoring: Is the systematic and continual collection, analysis, interpretation and use of data on key aspects of an intervention and/or its expected results.
It includes group of activities that:

- Follow up priority routine information about program activities and their expected results.
- Follows up the program's costs.
- Compares performance with plan
- Provides information that can be used for program evaluation.

Steps in a Monitoring Process
For a monitoring system to work effectively, it requires the development of a management information system (MIS) for data capture, storage, retrieval and analysis.
There are three main domains of information required in a monitoring system:

- Inputs Resources going into conducting and carrying out the project or program. These could include staff, finance, materials, and time.
- Process set of activities in which program resources (human and financial) are used to achieve the results expected from the program (e.g., number of workshops or number of training sessions).
- Outputs Immediate results obtained by the program through the execution of activities (e.g., number of commodities distributed, number of staff trained, number of people reached, or number of people served).
- Monitoring Asks: What are we doing? How does the situation change over time?
- What monitoring will not answer?
- Why did a program fail to implement its activities?
- What were the reasons for success?

- What was the reason behind reduction in the prevalence or incidence of a Nutrition problem?
- What was the contribution of a specific program or component of a program for observed changes?

Evaluation: Is a systematic process of data collection and analysis, about activities and/or effects of a program, looking to answer an evaluation question.
Program evaluation is the application of **social research methods** to systematically investigate the effectiveness of social intervention programs in ways that are adapted to their political and organizational environments and are designed to inform social action in ways that improve social conditions

Evaluation is used for the following:

- To assess the changes in the target group (e.g., changes in risk behavior)
- To assess the extent to which objectives have been met. It is the process of determining the effectiveness of a program or a project.
- To track the outcomes and impacts of programs or projects at the larger population level, as opposed to the program or project level:
- Outcomes Short-term or intermediate results obtained by the program through the execution of activities
- Impact Long-term effects (e.g., changes in health status). This can be through special studies with wide district, regional, or national coverage.

Evaluation Asks
What have we achieved and how?
How relevant were components of a program in addressing societal needs?
What were the reasons behind observed levels of performance?
What is the contribution of a specific intervention for observed achievements?
How efficient is a program?

3.5.2 The importance of M&E

Monitoring and Evaluation are fundamental activities at all levels.

- Local
- Regional
- National
- International
- Provides information on program implementation and achievement of expected results detect
- Improves program management by informing the decision-making process
- Allows for accounting to stakeholders including donors and users of a program
- Provides Information for planning future resource needs
- Provides useful information for elaborating policies

- Improves effectiveness of advocacy
- In summary, evaluation activities could serve three categories of purposes:

Program Improvement
Constitutes the main purpose of evaluation as a practice and a profession
Evaluations conducted for this purpose are called **Formative Evaluations**.
The purpose; help form/shape programs

Accountability
Evaluations are sometimes conducted to provide summary judgments about a program.

- Goal accountability
- Process accountability
- Outcome accountability

And such information from evaluation activities is usually used by higher level decision makers to make major decisions on program components.
Evaluations serving this purpose are called **Summative Evaluation**

Knowledge generation

- Evaluations sometimes may be designed just to contribute knowledge.
- Such evaluations usually may not have specifically identified users of evaluation findings.
- Like other research activities, findings may be shared with interested ones through publication or other channels.

Indicators used in Monitoring and Evaluation
An indicator is a variable that measures one aspect of a program or project

- It measures the value of the change in meaningful units for program management
- It focuses on a single aspect of a program or project. Defined in a way that captures specified aspect as precisely as possible.

Indicator is a measurement. It measures the value of the change in meaningful units for program management: a measurement that can be compared to past and future units and values. A metric is the calculation or formula that the indicator is based on. Calculation of the metric establishes the indicator's objective value at a point in time. Even if the factor itself is subjective, like attitudes of a target population, the indicator metric calculates its value objectively at a given time.

An indicator focuses on a single aspect of a program or project. It may be an input, an output, or an overarching objective, but its related metric will be narrowly defined in a way that captures that aspect as precisely as possible.

A full, complete, and appropriate set of indicators for a given project or program in a given context with given goals and objectives will include at least one indicator for each significant aspect of program activities.

3.5.3 Characteristics of good indicator

What makes a good indicator?

Fundamentally, good indicators must be valid and reliable measures of the result. The other desirable characteristics listed here all serve in a sense as aids that help guide the design of indicators and metrics toward this ideal or goal of valid, reliable indicators.

Valid: An indicator is valid when it dictates an accurate measurement the activity, output or outcome of the program.

Reliable: An indicator is reliable when it minimizes measurement error, that is when it is possible to measure it consistently over time, regardless of the observer or respondent.

Precise: Indicators should be operationalized with clear, well-specified definitions.

Timely: Indicators should be measured at appropriate intervals relevant in terms of program goals and activities.

Comparable: Where possible, indicators should be structured using comparable units, denominators, and in other ways that will enable increased understanding of impact or effectiveness across different population groups or program approaches.

Class activity

Is the maternal mortality ratio a valid indicator of the impact of a family planning program on women's health? Why or why not? What might be a more valid indicator?

Categories of nutrition indicators

- Nutritional status
- Breastfeeding practices
- Complementary feeding practices
- Micronutrient supplements/fortified foods
- Household food security; vulnerability to food and nutrition insecurity

Nutritional status

- Weight-for-age and/or height-for-age
- Body Mass Index in women
- Anaemia prevalence e.t.c.

Infant and young child feeding practices

- Timely initiation of breastfeeding
- Exclusive breastfeeding rate
- Complementary feeding rate
- Extra feeding for malnourished/recently sick children

Micronutrient Interventions

- Vitamin A supplementation
- Iron supplementation
- Coverage with iodized salt, other fortified foods

Household Food Security/Vulnerability

- Daily meal frequency of family/individuals
- Perceived inadequacy of food reserves in the home/community

3.5.4 Guidelines in conducting M&E activities

Phase A: Planning the Evaluation

- Determine the purpose of the evaluation.
- Decide on type of evaluation.
- Review existing information in program documents including monitoring information.
- Describe the program.
- Develop/refine conceptual framework.
- Assess your own strengths and limitations.
- Put together an evaluation team including stakeholders.

Phase B: Selecting Appropriate Evaluation Methods

- Identify evaluation goals and objectives.
- Formulate evaluation questions and sub-questions.
- Decide on the appropriate evaluation design.
- Develop an evaluation schedule.
- Develop a budget for the evaluation.

Phase C: Collecting and Analysing Information

- Develop data collection instruments.
- Pre-test data collection instruments.
- Undertake data collection activities.
- Analyse data.
- Interpret the data.

Phase D: Reporting Findings

- Write the evaluation report.
- Decide on the method of sharing the evaluation results.
- Decide on communication strategies.
- Share the draft report with stakeholders and revise as needed.
- Disseminate evaluation report.
- Meet with project stakeholders to discuss and follow-up on findings once they have accepted the findings.

Phase E: Implementing Evaluation Recommendations

- Develop a new/revised implementation plan in partnership with stakeholders.
- Monitor the implementation of evaluation recommendations and report regularly on the implementation progress.
- Plan the next evaluation.

3.5.5 Steps in conducting M&E activities

Step 1: engage stakeholders;
Step 2: describe the program;
Step 3: focus the M&E design;
Step 4: collect credible data;
Step 5: justify the conclusions; and
Step 6: ensure that the lessons learned are shared and used.

Stakeholder's engagement

Stakeholders: are people or organizations that are invested in the program, are interested in the results of M&E, and have a stake (or tangible interest) in what occurs with the results.

Stakeholders can be those involved in implementing the program, those served or affected by the program and Primary users of the evaluation

Importance of Stakeholders engagement

- Involving the stakeholders from the start improves the likelihood that they will support the monitoring system and
- Accept and use the resulting information.

Describe the program

Program description in terms of:

- Its components,
- Its expected effects,
- Proposed activities,
- Resources available, and
- The context in which it will be implemented

Monitoring and evaluation plan

M&E plan: describes the system that links strategic information obtained from various data collection sources to decision that will result in program improvement. The function of M&E plan include;

- States how program will measure achievement (accountability)
- Documents consensus of stakeholders (transparency and responsibilities)
- Guide M & E implementation (standardization and coordination)
- Preserve institution memory (it is a living document that needs to be adjusted when the program is modified).

M & E plan involves formulation of Goal, objectives and frameworks for a particular activity in program or project

- Goal: a broad statement of a desired, long-term outcome of a program
- Objectives: statements of desired, specific, realistic and measurable program results

The objective formulated should be SMART

Specific: identifies concrete events or actions that will take place

Measurable: quantifies the amount of resources, activity, or change to be expended and achieved

Appropriate: logically relates to the overall problem statement and desired effects of the program

Realistic: Provides a realistic dimension that can be achieved with the available resources and plans for implementation

Time-based: specifies a time within which the objective will be achieved

3.5.6 Frameworks used in Monitoring and Evaluation

- Frameworks are best understood as useful tools for understanding and analyzing a program.
- Helps to clearly define the relationships among factors key to the implementation and success of a project
- These factors may be internal or external to the program context.
- The framework design process is crucial for developing sound implementation and M&E plans and serves as the foundation for selecting appropriate and useful M&E indicators

Types of frameworks used in M&E

- Conceptual frameworks
- Results frameworks
- Logical frameworks
- Logic models

Conceptual framework

Is a useful tool for identifying and illustrating a wide variety of factors and relationships that may affect program success

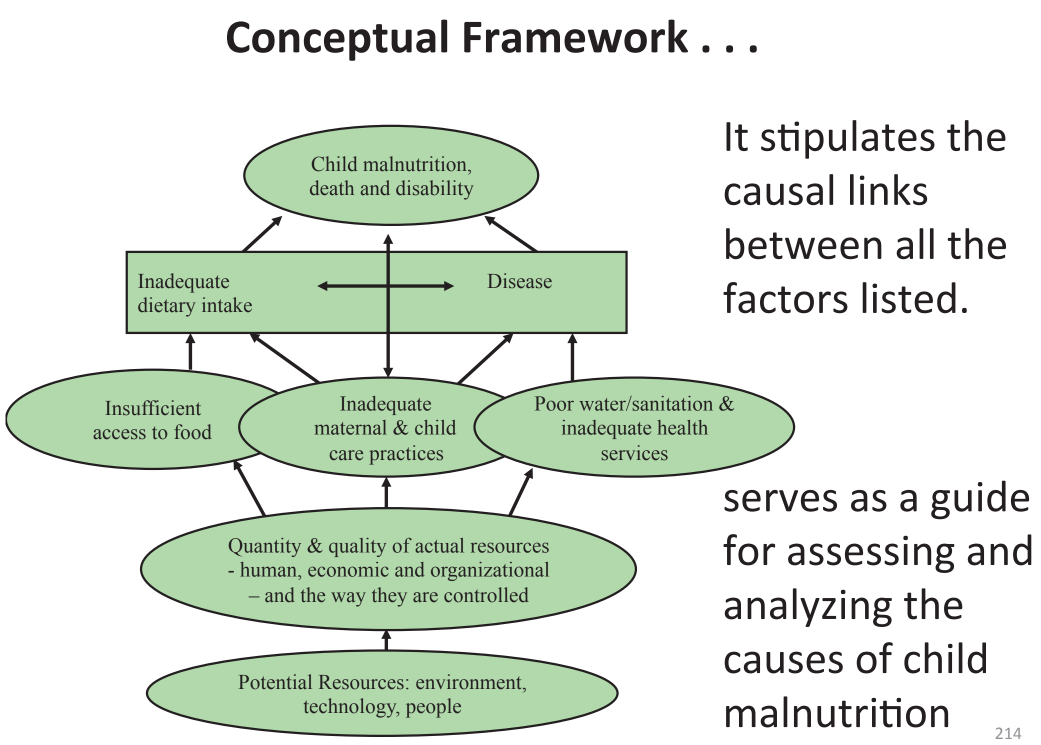
It is also called "research" or "theoretical" frameworks.

It clarifies the relationship of its activities and its main goals to the context in which it operates.

It identifies factors (systems, organizations, government or institutional policies, infrastructure, that may help or hinder the program's success.

Purpose:

- To show where program fits into wider context
- To clarify assumptions about causal relationships
- To show how program components will operate to influence outcomes
- To guide identification of indicators
- To guide impact analysis (causal pathways)



Example of conceptual framework

It stipulates the causal links between all the factors listed and serves as a guide for assessing and analyzing the causes of child malnutrition

Group exercise

Group exercise on developing conceptual framework

Arrange yourselves in small groups of up to 5 people. Each group will be asked to develop a conceptual framework on the problem of stunting in your community, copy the framework using the marking pens onto the large paper. One person from the group will be designated to share this framework with the participants

Results frameworks

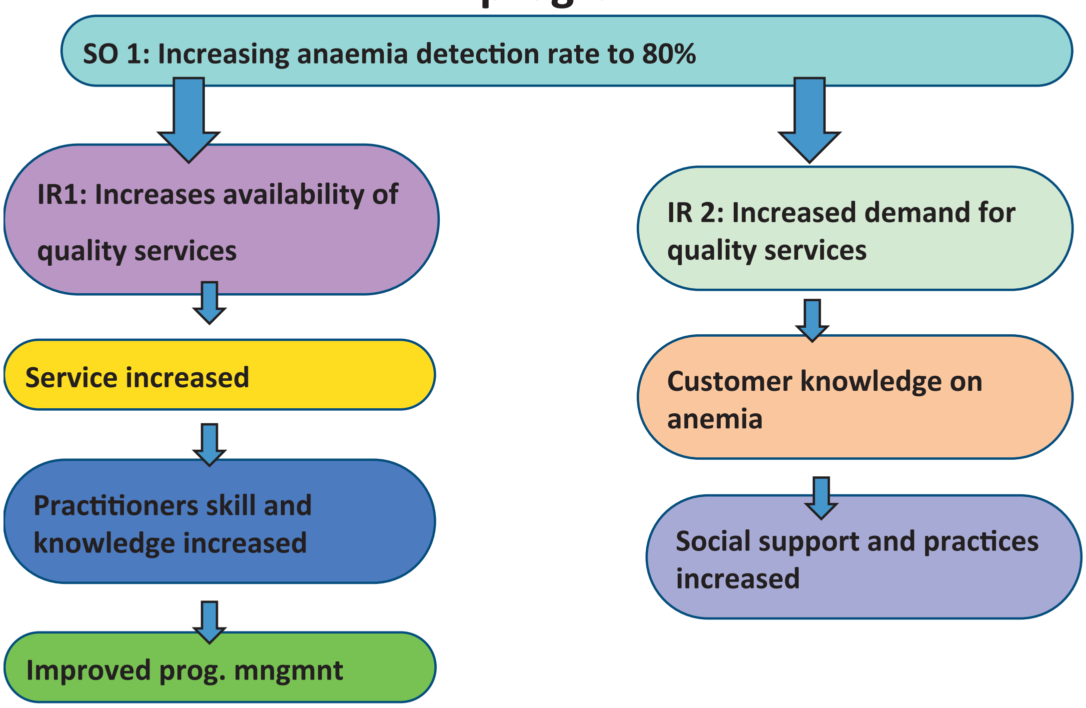
Are diagrams that identify steps or levels of results and illustrate the causal relationships linking all levels of a program's objectives. It is also called Strategic frameworks

Purposes:

Provides a clarified focus on the causal relationships that connect incremental achievement of results to the comprehensive program impact

Clarifies project/program mechanics and factors' relationships that suggest ways and means of objectively measuring the achievement of desired ends

Results Frameworks For anaemia control program



Logical framework

Present a standardized summary of the project and its logic. It is also known as Logframe matrix

A Logframe Matrix is a standardized table that summarizes the important aspects of a project.

Purposes:

- Summarizes what the project intends to do and how
- Summarizes key assumptions
- Summarizes outputs and outcomes that will be monitored and evaluated

Example of logical framework

Logical Framework

PURPOSE	PERFORMANCE INDICATORS	MEANS OF VERIFICATION	ASSUMPTIONS
Implementing cost-effective measures for the prevention and control of anaemia	1. Coverage of anaemia prevention programmes 2. Proportion of patients treated. 3. Proportion of previously treated cases among all cases.	1. Annual reports 2. Annual reports 3. National / local annual notification reports (surveillance)	- Stable political situation, sustained political commitment and financing - Sufficient numbers of competent health care personnel in the government sector

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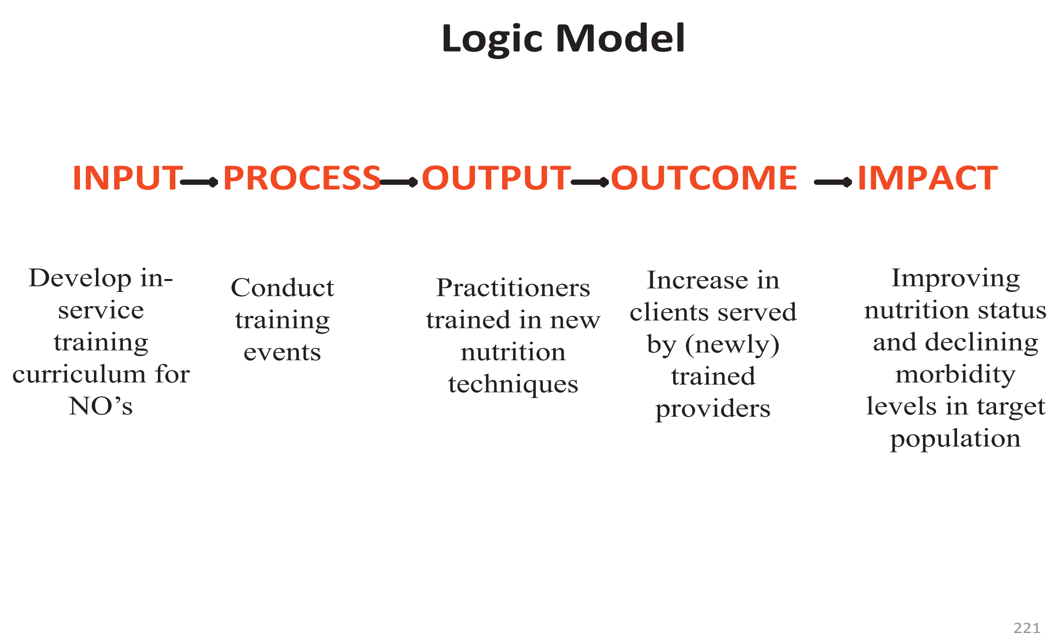
Logic Model

Diagrams that identify and illustrate the linear relationships flowing from program inputs, processes, outputs, and outcomes. Inputs or resources affect Processes or activities, which produce immediate results or Outputs, ultimately leading to longer term or broader results, or Outcomes.

Purposes:

- Provides a streamlined interpretation of planned use of resources and desired ends
- Clarifies project/program assumptions about linear relationships between key factors relevant to desired ends

Example of logic module



A case study

UNICEF has just launched its programme of enhancing child survival and development in Tanzania. Two regions have been selected for programme implementation. Among the many activities, one is to improve exclusive breastfeeding rate by 85% You were highly recommended as a nutritionist to provide scientific input to members of the programme team. Explain how will you address this by using logic model framework.

Summaries of Frameworks

Type of Framework	Brief Description	Program Management	Basis for Monitoring and Evaluation
Conceptual	Interaction of various factors	Determine which factors the program will influence	No. Can help to explain results
Results	Logically linked program objectives	Shows the causal relationship between program objectives	Yes – at the objective level
Logical	Logically linked program objectives, outputs, and activities	Shows the causal relationship between activities and objectives	Yes – at the output and objective level
Logic model	Logically links inputs, processes, outputs, and outcomes,	Shows the causal relationship between inputs and the objectives	Yes – at all stages of the program from inputs to process to outputs to outcomes/ objectives 223

3.5.7 Evaluation designs

Type of evaluation Process and Outcome/impact evaluation designs

3.5.7.1 Process Evaluation

Assessment of the efficiency and effectiveness of individual pre-determined stages of project implementation, beginning with the problem identification (also known as formative evaluation)

- It helps to identify external factors that impact the project outputs

Questions answered by a Process Evaluation

- Are the project components being delivered to the right and intended target group?
- Are there other people who should have been included in the target group?
- Is the coverage of the program adequate?
- Are the supplies being delivered on time and being properly utilized?
- Are there any deviations in project implementation and, if so, have such deviations restricted the possibility of reaching the outcomes/objectives?
- Are there any constraints identified and what are their corrective measures?

Why is it conducted? To determine the cost-effectiveness of strategies in each component of the project cycle
When is it conducted? At every stage of the project cycle
Who conducts it? Project staff and other stakeholders (beneficiaries, donors)
How should the findings be used?
All stakeholders should be involved in using the findings in modification of the program, if the need arises.

3.5.7.2 Outcome/ Impact evaluation

It gauges the extent to which the intervention has caused change in the desired direction at a given time
Why is it done? Want to know the extent to which the intervention has achieved its set objectives.

- It also assists in exposing the positive and negative outcomes from the intervention.
- It highlights whether it's important to document the intervention as a recommendation to stakeholders

When is it done? At a set time depending on the program type
Who does it? Implementers and External evaluators
What questions does an impact evaluation answer?

- Is change due to the intervention?
- Are there other external factors influencing the change?
- How should the findings be used?
- Help a similar program
- Documentation and recommendation
- Help to re-plan

3.5.7.3 Summative Evaluation

Sometimes summative evaluation could be done during continuation or termination of a Program.
Why is it done?

- To determine the extent of achievement of the project
- Determine the ability to move from one level to the next

When is it done? At the end of a program/project plan
Who does it?

- Project implementers
- External evaluators and project implementers
- What questions does it answer?
- Have the objectives been met?
- How effective were the systems in place?
- What strategies did it use in implementing project activities?

- Have the needs changed?
- How should the findings be used?
- To justify extension of the program, used as a learning opportunity.
- For replication of the same in other areas
- Solicit for more/further funding
- To show stakeholders that the project went as planned/for satisfaction of the stakeholders

Challenges of Monitoring and Evaluation

Multi-sectoral programs

Introduced from several sectors, as one package for example, agriculture education and livelihoods; it is difficult to establish if observed changes in nutrition outcomes are attributable to a particular intervention

May need large samples (Challenge in clinical measurements)

Exophthalmia is relatively rare, with a prevalence of about 1% in preschool children. Small sample size does not mean condition is not serious.

Lack of specificity

E.g Anemia is commonly used as an indicator of iron deficiency but people can be anemic for reasons not due to iron deficiency, such as malaria and intestinal parasites

Selection bias

Eg institution based sample

Seasonality

Seasonal variation can affect intake of certain foods

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