# OPERATIONAL RESEARCH ON NUTRITION FOR LOCAL GOVERNMENT AUTHORITIES

## TRAINING MANUAL

**Prepared for**

**USAID/Lishe Endelevu Activity**

**Prepared by**

**Africa Academy for Public Health**

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# List of Abbreviations

| | |
|---|---|
| AAPH | Africa Academy for Public Health |
| BMI | Body Mass Index |
| CHMT | Council Health Management Team |
| Co-PI | Collaborating Principle Investigator |
| DC | District Council |
| DED | District Executive Director |
| DHIS-2 | District Health Information System (version 2) |
| DHS | Demographic Health Survey |
| DMO | District Medical Officer |
| DNuO | District Nutrition Officer |
| FGD | Focus Group Discussion |
| HMIS | Health Management Information System |
| IDI | In-Depth Interview |
| INGO | International Non-Government Organization |
| IRB | Institutional Review Board |
| KI | Key Informant Interview |
| LE | Lishe Endelevu |
| LGA | Local Government Authorities |
| MRCC | Medical Research Coordination Committee |
| NGO | Non-Government Organization |
| NIMR | National Institute for Medical Research |
| OR | Operational Research |
| PI | Principle Investigator |
| PPT | Power Point Presentation |
| RHMT | Regional Health Management Team |
| SAM | Severe and Acute Malnutrition |
| SCI | Save the Children International |
| SDG | Sustainable Development Goals |
| SOP | Standard Operating Procedures |
| TAMISEMI | Tawala za Mikoa na Serikali za Mitaa |
| TNNS | Tanzania National Nutritional Survey |
| WASH | Water, Sanitation and Hygiene |
| WHO | World Health Organization |
| WRA | Women of Reproductive Age |

## Table of Contents

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# Module One

## Overview of the Operational Research Training Manual

## 1.1 Module Objectives

*At the end of this module, the participants are expected to understand and be able to explain*

- *Rationale of developing the manual - Introduction*
- *Purpose of the manual*
- *Intended users of the manual*
- *How to use the manual*
- *Organization of the manual*

## 1.2 Trainers Guide

**Facilitation plan**

In facilitating this module, trainers will:

- Apply adult learning principles as much as possible
- Use the summarized content of the module under sub-section 1.1.1 through 1.1.5 in a power point presentation (PPT).
- Involve trainees in a question and answer conversation when delivering the content in order to create two-way communication, and avoid monotony of one voice (trainer) and tap the knowledge of participants.
- Use practical and relevant examples

**Facilitation materials**

Power point projector, flip charts, marker pens, sticky notes, stick-glue/masking tape, note books/ writing pads, pens.

**Hands on activity**

None

**Session Duration**

The session should be covered in a time period not more than 30 minutes.

## 1.3 Module Content

### 1.3.1 Introduction

Operational research (OR) is a scientific method of providing decision makers with a quantitative basis of for decisions regarding the operations under their control. Despite its great potential, OR is greatly underutilized by Regional Secretariat (RS) and Local Government Authorities (LGA) in Tanzania. This could be due to several reasons:

i. Lack of knowledge on the role and relevance of applied research to field operations.
ii. Absence of dissemination or knowledge translation strategy for operational research within the Organization.
iii. Research is added as an additional responsibility on already overworked senior staff.

iv. Lack of dedicated budgets or human resources for research implementation.
v. Inadequate writing and language skills.
vi. No interest in investing efforts for publication in scientific journals (1).

There is enough evidence from literature that attributes proper nutrition to healthy human development and wellbeing. Faltering nutrition has major consequences on children's health, beginning from when they are in their mother's womb since a chronically-undernourished mother is much more likely to give birth to an underweight baby, increasing chances of the baby becoming stunted as a child. Stunting would then have major consequences, including failure for the child/children from attaining their full growth and intellectual potential (2). Possible causes of malnutrition can be classified as:

i. Immediate causes – Inadequate dietary intake
ii. Underlying causes – Inadequate access to food, inadequate care for mothers and children and insufficient health services and unhealthy environment
iii. Basic causes – Resources and control (human, economic and organizational) (3)

Tanzania is committed to improving the nutrition status of its community particularly women of reproductive age and children under the age of five. Nutrition has been incorporated as a priority development agenda. Among the key steps was the development of the national nutritional strategy (2011-16) to help guide the national response and in 2016, nutrition was incorporated for the first time in the five-years national development plan (2016-2021) (4). The desired change in NMNAP is that "Children, adolescents, women and men in Tanzania are better nourished leading to healthier and more productive lives that contribute to economic growth and sustainable development". NMNAP has the primary target to reduce the prevalence of stunting from the current 34 percent to 28 percent by 2021. The key sectors highlighted in NMNAP include agriculture and food security; health and HIV; water, sanitation and hygiene (WASH); education and early childhood development; social protection; and environment and climate change (4).

The Lishe Endelevu activity, which literally means *sustainable nutrition* was developed with the aim of supporting efforts of the government of Tanzania in improving nutrition. The goal of Lishe Endelevu activity is to improve nutrition outcomes for women of reproductive age (pregnant and lactating women and adolescents) and children under-five (5). The activity is being implemented under the results framework that underpin three critical pillars: **strengthened multi-sectoral coordination** for improved nutrition at the local government; **Improved health, nutrition, caregiving and WASH behaviors;** and **Increased access and availability of diverse, safe and nutritious food**. This activity is implemented under the leadership of Save the Children International – Tanzania which also oversees its four consortium partners that include; Deloitte, The Manoff Group, Partnership for Nutrition in Tanzania (PANITA) and the Africa Academy for Public Health (AAPH). Activity areas include Morogoro, Iringa, Dodoma, and Rukwa regions.

### 1.3.2 Purpose of the manual

Evidence from previously conducted assessments have shown a critical gap in the generation and use of evidence through operational research at the LGA level (1). This gap impairs the ability of the LGA to make timely, evidence-based decisions for program improvement and decision

making. This manual is therefore intended to build the capacity of LGA level staff to design and implement relevant operational research geared towards informing nutritional planning and management. Therefore, this manual aims to equip LGA level staff with the following skillsets:

- Identification of priority nutrition areas for operational research at LGA level.
- Basic knowledge and skills in data data collection, management and analysis.
- Scientific report writing for nutritional research and activities.
- Dissemination and sharing of best nutritional practices.

### 1.3.3 Intended users of the manual

This is a facilitator's manual that has been developed to be used by nutrition stakeholders in the nutrition health sub-sector in Tanzania. However, the manual can also be used as a resource and reference material for the graduated trainees when conducting OR.

This manual will be used to build the capacity of RS & LGAs Officials in Lishe Endelevu activity areas and its use is expected to extend beyond the participating LGAs. The LGA officials include all key players at a District Council (DC) level who constitute the Council Multi-Sectoral Nutritional Steering Committee (CMNSC). These include the Council Executive Director and all heads of Council Departments (Health, Agriculture, Livestock and Fisheries, Water, Education, community development, Education, Planning, Finance, civil society and the private sector) in a council. This manual targets RS and LGA level staff as key decision makers at their respective councils who have the need of applying evidence based scientific methods in order to make informed program and policy level decisions.

### 1.3.4 How to use this manual

It is recommended to use this manual as an operation research primer by trainers to impart knowledge and skills of conducting OR to trainees. It can also be used by trainees as a resource and reference material when learning or conducting OR.

Users with a background on OR and nutrition are likely to find this manual more useful than those with limited knowledge on nutrition and OR. This manual should be used as an overall training guide and the facilitation of the training sessions should be complemented by Power point training slides provided with this manual.

### 1.3.5 Organization of the manual

This manual is organized in 6 modules which follow a chronological order that allows the user to incrementally move from one module to the other. The different modules can also be used separately and independently. Trainers are expected to follow the order of the modules in order to deliver meaningful and chronologically organized sessions. The 6 modules include:

1. Overview of the Operational Research Training Manual
2. Introduction to Operational Research in Nutrition Health Programs
3. Planning for Operational Research in Nutrition Services
4. Methods of Data Collection, Management and Analysis
5. Reporting

6. Team Work

# Module Two

## Introduction to Operational Research in Nutrition Health Programs

## 2.1 Module Objectives

*At the end of this module, participants are expected to understand and describe*

- *The concept of operational research*
- *Key elements of operational research*
- *Different types of research designs*
- *Differences between operational research and other types of research*
- *Operational research in Nutrition*
- *What to consider when planning operational research*
- *Why is operational research important for RS and LGAs*
- *Priority areas of nutritional research*
- *Examples of challenging nutritional health indicators in Tanzania*

## 2.2 Trainers Guide

### Facilitation plan

In facilitating this module, trainers will need to

- Start the module by asking participants to write a single sentence that depict their understanding of OR
- Apply adult learning principles as much as possible
- Use power point presentation (PPT) or other alternatives (such as lecture method) as deemed necessary.
- Involve trainees in a question and answer conversation whenever possible
- Use practical examples drawn from OR in the field of nutrition

### Facilitation materials

Power point projector, flip charts, marker pens, sticky notes, stick-glue/masking tape, writing materials.

### Hands on activity

Ask participants to write a short paragraph (maximum of five sentences) describing an example of nutritional health problem that prevails in their districts to which they would consider conducting OR (in groups). The paragraph should also explain why they think that is a priority problem.

Alternatively, the facilitator can also provide a series of examples and ask the participants to choose what they think qualifies as operation research. Then you can have presentations and plenary discussions on the different choices.

### Session Duration

- The session should be covered in a time period of 90 minutes.

## 2.3 Module Content

### 2.3.1 The concept of operational research

Have you ever experienced a situation where you lack evidence for the causes of poor performance despite ongoing efforts at your workplace? This is indeed a common situation in cases where your key role involves planning and decision making. It is thus important to be informed on the possible ways to navigate such challenges. This is when OR becomes handy as one of key tools that can be applied in rational decision making regarding the problem at hand.

Operational research involves the application of scientific methods to solve implementation problems and improve operations, decisions, and management of activities or processes. This can be achieved by collecting and analyzing data, and making meaningful interpretation of findings. Information collected and analyzed as part of the OR processes is used to provide insight and guides those responsible for evidence-based decision making.

### 2.3.2 Key elements of operational research

These are various components of OR. The naming of each component may vary from one person to another. The following are the key elements for conducting an operational research:

1. Introduction
2. Selection and statement of the research problem
3. Formulation of research objectives
4. Research Methodology
5. Work plan
6. Budget
7. Plan for reporting and dissemination of results

The details of each of these components will be covered in the subsequent modules of the manual.

### 2.3.3 Different types of research designs

There are different types of research design which refers to detailed explanation of methods that are used to collect and analyze data for research (6). These include: research population, inclusion/exclusion criteria, sample size and sampling procedures, expected duration of the study, and data collection, management and analysis (7).
In principle, the design of a study defines the study type. Here are examples of some of the most common designs:

| Study design | Description |
|---|---|
| **Observational studies** | |
| **Cross-sectional** | • Involves looking at data from a population at one specific point in time.<br>• Can be used to describe characteristics that exist in a community, but not to determine cause-and-effect |

| | |
|---|---|
| **Prospective studies** | • A research study that follows groups of individuals FORWARD over time |
| **Retrospective studies** | • Conceived after individuals have already developed the outcomes of interest and are followed BACK in time. |
| **Case control studies** | • Two existing groups differing in outcome are identified and compared. |
| **Experimental studies** | • Experimental studies are ones where researchers introduce an intervention and study the effects. |

### 2.3.4 Differences between operational research and other types of research

Operational research is an analytical method of problem solving and decision making that is useful in the management and decision making and management of activities or processes. Operational research in nutrition health program usually consists of analytical methods for problem solving implementation problems and decision making that are useful in the making decisions about management of health and nutrition delivery services. The focus of OR is to constantly guide the program implementation to achieve best results. It modulates inputs and processes involved in the program cycle and strives to produce optimal gains to achieve targets and goals.

This is different from other traditional types of research which are mostly aimed at gathering and generating scientific knowledge and evidence to understand a static situation or answer questions about a problem. However, both utilize similar research methodologies to achieve desired results.

### 2.3.5 Operational research in Nutrition

Despite numerous efforts to curb the burden of malnutrition in Tanzania, progress remains slow. The Tanzania NMNAP has recognized key factors that have been identified in recent analysis and devised concrete actions of removing the bottlenecks (4). These factors range from:

i. Low awareness on the burden of malnutrition
ii. Low investment in nutrition
iii. Inadequate nutrition governance
iv. Inadequate focus on the community and life course
v. Low functional institutional capacity for nutrition at all levels
vi. Inadequate attention to the social determinants of malnutrition

### 2.3.6 What to consider when planning operational research

OR gathers reliable and relevant information about implementation and operations that, once analyzed, guides managers to propose solutions to problems at hand and make decisions. OR for health and nutrition services at district level aim to address priority problems in the health care system.

- It should be action-oriented i.e., aimed at developing solutions and or evaluating district-based implementation problems.

- An integrated multi-disciplinary approach is required, i.e., research approaches from many disciplines are needed since health is affected by the broader context of socio-economic development.
- The research should be participatory in nature, involving all key stakeholders at the district.
- Studies should be scheduled in such a way that results will be available when needed for key decisions.
- Emphasis should be placed on comparatively simple, short-term research designs that are likely to yield practical results relatively quick.
- Emphasize should focus on undertaking low cost studies.

### 2.3.7 Why is operational research important for RS and LGAs

Despite several countrywide health interventions and investments, RS & LGA officials face complex challenges related to health and nutrition programming in their councils. Annually, during and after planning, RS and LGA officials must make decisions about improving quality of health care, where to locate more resources, how to improve maternal and child nutrition and health indicators, and so on. They are also obliged to oversee the implementation of National Multisectoral Nutrition Action Plan (NMNAP) and monitoring its progress through Joint Multisectoral Nutrition Review (JMNR) and Bottleneck Analysis (BNA). Operational Research provides an opportunity for LGAs to generate relevant evidence for nutrition programing and decision making through:

- Improving decision making: OR techniques can reduce key challenges faced by the councils, health facilities, the community on planning and decision making for nutrition by providing data and evidence which can help answer complex implementation problems and facilitate decision making.
- Quality control of council activities: OR techniques can give RS and LGAs the tool that provides better direction and quality control of nutrition health interventions to service providers in the facility and council. RS and LGA officer at the council (e.g. DMO, DNuO) can use OR methods to set up performance standards for facility providers, monitor quality, and identify areas that need improvement.
- Higher productivity of nutritional health interventions: This is through the ability of OR to identify optimal solutions. For example, coming up with optimal utilization of manpower, most desirable use of scorecard or HMIS to monitor nutrition outcomes etc.

### 2.3.8 Priority areas in nutritional research

It is important to consider national priority areas for nutrition programming when considering a specific topic for OR in nutritional health. Areas of priority for nutrition research will vary depending on the magnitude of the existing knowledge gap to address a particular nutrition problem, and this may vary from place to place. Similarly, these priority areas are time-bound and may change over a period of time. The selection of OR priority area in the district should be based on the challenges faced during the implementation of nutrition related activities. As an

example, below is the most recent list of national nutrition research priorities areas (MOHCDGEC, 2016 -2021)[1]:

i. Drivers of nutritional outcomes (e.g. stunting) at household level
ii. Reasons for increase in anaemia among women and children.
iii. Effective measures to address food safety in view of supply
iv. Effective measures to address overweight, obesity and diet related non-communicable diseases
v. Understanding impact of programmatic and policy interventions in the area of nutrition
vi. Applying OR to enhance the quality and effectiveness of nutrition-specific/ nutrition-sensitive, and enabling environment for nutrition interventions.

### 2.3.9 Examples of challenging nutritional health indicators in Tanzania

The OR priority areas described under sub-section 2.3.7 above have been measured from time to time to estimate their prevalence. Below is an example of a set of common indicators which are usually used to estimate the magnitude of some of the nutritional health priority areas in 2018. The LGA can use these indicators to guide selection of areas requiring OR.

- Approximately 3 million children under five years of age are stunted in Tanzania.
- About 4 % of children aged 0-59 months are found to have Global Acute Malnutrition (GAM) and 0.4% suffered from Severe Acute Malnutrition (SAM)
- Prevalence of overweight among children 0 to 59 months of age is ranging from 0.8% in Pemba North to 5.3% in Mbeya
- Only 54% of children 0-23 months, initiated breastfeeding within 1 hour.
- Only 58% of infants under six months of age are exclusively breastfed.
- About 7% of non-pregnant women 15-49 years of age are classified being underweight (BMI<18.5)
- Prevalence of underweight among WRA is higher in age groups 15-19 years (14.8%) and 20-24 years (7.6%).
- The prevalence of anemia in Tanzania is 28.8%.

**Source:** TNNS, 2018 (8)

[1] Facilitators should crosscheck with updated information on nutritional priority areas and adapt them accordingly at the time of training.

# Module Three

## Planning for Operational Research in Nutrition Services

## 3.1 Module Objectives

*At the end of this module, participants are expected to learn and understand the ten dimensions of OR and be able to apply them in OR planning.*

- *Choose a topic for operational research*
- *Defining goals and objectives for Operational Research topic.*
- *Identifying key stakeholders to participate in the operational research*
- *Writing a study protocol*
- *Ethical considerations*
- *Field preparations and Gantt Charts*
- *Budget*

## 3.2 Trainer's guide

**Facilitation plan**

In facilitating this module, trainers will need to

- Apply adult learning principles as much as possible
- Use power point presentation (PPT) or other alternatives as deemed necessary.
- Use participatory approach such as question and answer conversation to retain participants attention throughout the module.
- Display templates of items covered in this module such as work plans/Gantt Charts.

**Facilitation materials**

Power point projector, flip charts, marker pens, sticky notes, stick-glue.

**Hands on activity**

- Take participants through a process of developing SMART objectives in groups
- Ask Participants to develop a Gantt Chart in groups

**Session Duration**

- The session should be covered in a time period of 180 minutes.

## 3.3 Module Content

### 3.3.1 Choose a topic for operational research

Operational research should emanate from the need of an ongoing programs, projects or activities. In order to do so, those planning OR need to review their program to identify areas to which more information is needed to inform plans for improvements. OR topic can also arise from program review meetings, supportive supervision, mentorship visits, workshops, and recommendations from previous research works/reports, instructions by government leaders as well as research agenda set by donors and funding agencies. RS and LGAs staff can follow several steps in order to identify a particular topic for OR. These may include:

1. Conduct a review of performance indicators on district nutrition indicators. There are several ways through which this can be done. One way is to look at program monitoring data and reports. Data sources such as DHIS-2, COMPACT and Score Cards can be able to portray district-based trends of nutrition indicators.
2. Identify a set of indicators where the district is underperforming.
3. Choose among identified indicators a priority program area that requires additional evidence on the causes of underperformance.
4. Involve all key stakeholders to develop a specific topic or research questions for OR based on the priority program area above.

Can you think of any information (quantitative or qualitative) about nutrition health that is not possible to be found from DHIS-2
***Note**: Facilitator should use the already prepared examples of such data included in the facilitation slides and use them to review trainees' responses.*

**What could be a possible research topic from the case study below?**

In Kiraracha village, diarrheal diseases for both adults and children have been prevalent for the last three years without concrete reasons being established. At first it was thought that the source of water, a traditional and natural dam, was infected. Village leaders consulted the district water engineer and a decision to treat the water was made. The dam was treated but still the diarrheal cases at the village dispensary continued to rise. Later on, the district executive director decided to construct a new deep-water borehole for the village and spread draining points in a number of locations within the village. This undertaking was thought to be effective enough to provide clean water for the community and finish the diarrheal problem in the village. Unfortunately, diarrhea cases remained high as per the village dispensary records.

Note: *Facilitator should use the already prepared examples of possible research questions included in the facilitation slides and use them to review trainees' responses.*

### 3.3.2 Defining goals and objectives for operational research topic

Once a decision is made on what is to be researched, the goal for the OR as well as its objectives needs to be set. In principle, the research goal provides the general guideline that explains what you want to achieve on behalf of the studied community through your research. The goal is usually a broad objective stating an overall contribution of the research work to be undertaken. The goal does not specify means of reaching the end results and not necessarily specify the timeframe (though can be included).

***Example:***
*The goal of this research work is to understand WASH practices and the underlying factors in Kirarachi village.*

On the other hand, objectives are*; "clear, concise, declarative statements which provide directions to researchers on what to investigate and which variables of a particular study"* (Jaikumar, 2013).

Objectives dictate what needs to be done, what to explore on, the purpose, location and timeframe for the research. Objective statements are activity and time bound. Setting objectives is very important because wrong and poorly stated objectives will lead to misleading research processes and wrong results.

Objectives should be SMART. A SMART objective is supposed to be specific, measurable, achievable, realistic and time bound.

| | | |
|---|---|---|
| **S** | **Specific** | • Specifically describe the result that is desired in a way that is, detailed, focused and well defined.<br>• It should have a description of a precise or specific behaviour, achievement or outcome.<br>• Use verbs which are action-orientated to describe those actions which need to be taken to fulfil objectives. |
| **M** | **Measurable** | • It should be quantifiable.<br>• By being a measurable, allows you to identify when exactly it has been reached. |
| **A** | **Achievable** | • Should be achievable within the time-frame |
| **R** | **Realistic** | • Realistic objectives take into account the available resources such as, skills, funding, and equipment. |
| **T** | **Time bound** | • Should have a deadline, date or time when the objective will be accomplished or completed.<br>• This helps to create the necessary urgency, prompts action and focuses the minds of those who are responsible. |

Example of SMART Objective

1. *To determine prevalence of hand washing practice in Kiraracha village in December 2020.*
2. *To determine factors influencing handwashing practice in Kiraracha village in December 2020*

### 3.3.3 Identifying key stakeholders to participate in operational research

Every research activity should consider involving all key stakeholders in the development of OR design, research question formation, data collection, data analysis, or review. This include people, organizations and any institutions that have interest in the research processes and its results. This should include:

- Research implementers
- Funding organization/partner
- Users of the findings
- Beneficiaries such as study participants, CSOs etc.
- Members from other related sectors e.g. water, agriculture.

Stakeholders can be involved at a different stage in the process, Stakeholders play different roles but also different influences and power for a successful OR activity. In nutrition and health programs, especially those that operate in the community, we promote active engagement of community and CSOs in research activities to ensure voices of the beneficiaries are included in planning and decision making.

### 3.3.4 Writing a study protocol

Operational Research requires a scientific document that guides the researcher(s) to implement research activities in a systematic manner that was agreed by all stakeholders (Co-Investigators) during the design phase. This guide is what we call a research protocol and consists of the following sections:

- Executive summary
- Introduction
    - Background information
    - Problem statement
    - Rationale
- Study goals and objectives
- Methodology
    - Study design
    - Study sites/area
    - Study populations
    - Sampling and sample size
    - Data collection methods
    - Data management and statistical analysis
- Ethical considerations
- Dissemination of results and publication intentions
- Work plan
- Budget
- References
- Data collection instruments

Not all OR must be arranged according to the above structure; the research team is guided with the scope of work and or instructions from funding agencies and may decide the final structure of the OR protocol. See **Appendix I** for details of each of these sections.

### 3.3.5 Ethical considerations

A complete OR protocol is subject to ethical examination, which ensures research is conducted ethically and does no harm. Usually and by law, there are designated bodies with the mandate to undertake ethical examination of research protocols. The commonest are what are called Institutional Review Boards (IRB). These are found in most of research institutions and in universities. For clinical health research in Tanzania, the national entity is the Medical Research Coordination Committee (MRCC) which is part of the National Institute for Medical Research (NIMR). NIMR has zonal ethical teams such as the Mbeya Zonal MRCC, Mwanza, Tabora and Tanga.

However, there are certain types of OR which may be exempted from ethical review requirement. These include instances where the OR does not involve interview of human subjects outside the healthcare workers and facilities within the respectful RS and LGA and there are no intentions of publications of the OR findings.

Ethical considerations do not end with obtaining the ethical approval but rather go to the point of research design and data collection and management as well as data analysis and presentation. Sensitivity to human rights, privacy and confidentiality are given high considerations in any research. Informed consent should consider all elements of minimizing risks to the participants of OR and is of utmost importance for vulnerable populations such as children, pregnant women, imprisoned people etc. For vulnerable populations such as children, informed consent is usually obtained through parents and legal guardians together with child's assent to participate in the research since children are considered to be unable to provide "true" informed consent. Exceptions exists however, for the case of mature/emancipated minors who can provide informed consent without the presence of their parents/legal guardians.

### 3.3.6 Field preparations and Gantt charts

An important part of the research protocol is the listing of series of activities and their time line which shows what and when the activity would be implemented. This is referred to as a workplan or Gantt chart. When the workplan details such as expected outputs or deliverables, responsible persons, indicators and sometimes means of verifications, this is called activity matrix. Activity matrix are more common in monitoring and evaluation frameworks than in OR. Your facilitator will show you how a typical work plan and or Gantt chart may look like. You can also refer to **Appendix 2** for additional examples of work plans and Gantt Charts.

### 3.3.7 Budget

When submitting an application and proposal for funding, the inclusion of a budget is a standard part of the process. Creating a budget usually involves two major components:

1. The itemized budget;
2. The budget justification

The budget should:

- Be an itemized line-by-line list of each type of expense;
- Be based on informed estimates and actual quotations;
- Be realistic.;
- Correspond to the proposal narrative

**Budget justification**

Many funders request an additional document often referred to as a budget justification. The budget justification goes a step beyond the itemized budget to explain why each item is needed and its purpose, and how the total was arrived at.

The budget justification should:

- Provide a general description of the line item
- Explain how the line item relates to the activities outlined in the work plan.
- Verify the cost of line items by describing how they were arithmetically determined.
- Reflect the itemized budget.

# Module Four

## Methods of Data Collection, Management and Analysis

## 4.1 Module Objectives

*At the end of this module, participants are expected to be able to understand and describe*

- *Categories and types of data*
- *Data collection methods*
- *Designing data collection tools*
- *Sampling technique*
- *Unit of analysis*
- *Calculating sample size*
- *Data collection*
- *Data management and analysis*

## 4.2 Trainers Guide

**Facilitation plan**

Use power point presentation, case studies and group work to facilitate and deliver this module.

**Facilitation materials**

Power point projector, flip charts, flip chart stand, marker pens and masking tapes

**Hands on Activity**

Delivery of this module will use power point presentation, case studies and group work.

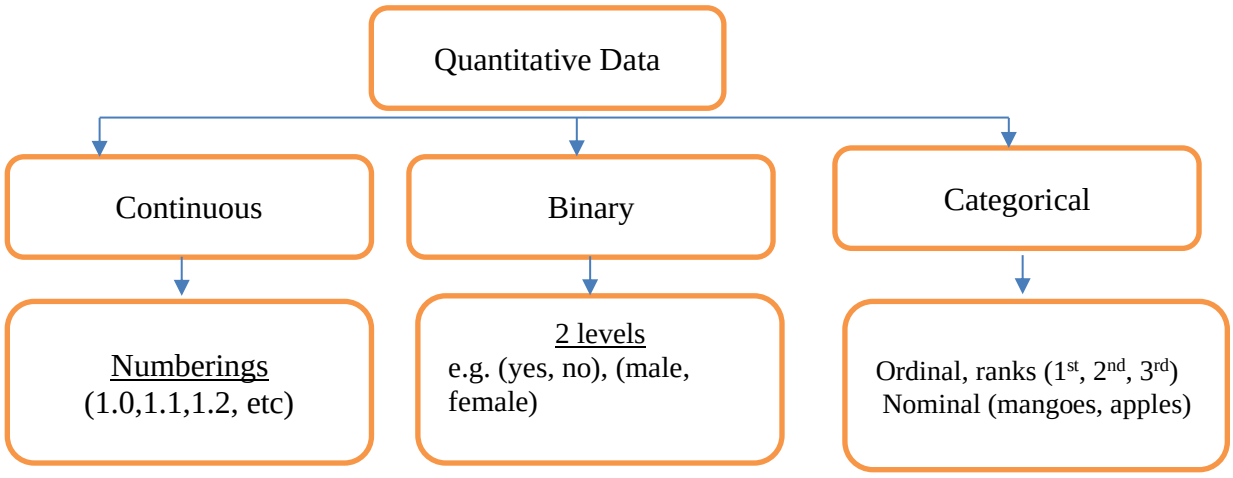
**Session duration**

Time estimated to cover the topic (180 minutes)

## 4.3 Module Content

### 4.3.1 Categories and types of data

There are 2 types of data in research, namely: Quantitative and Qualitative. Numerical (Quantitative) data refers to measures of values or counts, expressed in numeric values. These data can be further classified as continuous, discrete, binary and categorical data.




Qualitative data defines qualities and/or characteristics. It is usually reported in narrative form and does not provide quantifications. Qualitative data can be presented in the form of words which could then be analysed for patterns and meaning through coding. The coding allows the researcher to identify and group together recurring themes in the responses provided.

### 4.3.2 Data collection methods

Data collection is a process of collecting information from all the available and relevant sources to find answers to the research question. Data collection methods can be divided into two categories: (1) secondary methods of data collection and (2) primary methods of data collection.

1. Secondary Data Collection Methods

Secondary data refers to the data that was previously collected for the reasons other than the particular research at hand. Examples of secondary data include DHIS2, TNNS, TDHS etc. Such data are cheaper and more quickly obtainable than the primary data and also may be available when primary data cannot be obtained at all due to time limitations or shortage of resources to conduct data collection.

2. Primary Data Collection Methods

Primary data refers to data that is collected directly by a researcher from the study participants for the reason of that particular research. Collection of primary data can be done using self-administered questionnaires, phone interviews, face to face interviews, observations etc. Primary data collection methods can be divided into two groups: quantitative and qualitative.

**1. Quantitative data collection**

This is the collection of quantitative data. It can be collected using questionnaires. The mode of data collection depends on whether the source is primary or secondary.

**2. Qualitative data collection:**

This is the collection of qualitative data. It can be collected using Focus Group Discussion (FGD), Key Informant Interview (KII) and In-Depth Interview (IDI). Secondary data reviews or document reviews can also be used to collect qualitative data. In most cases, qualitative data collection

methodologies collect responses to open-ended questions. Qualitative data can be in the form of texts, codes, narratives, audio-visual, pictures and drawings/sketches/maps.

### 4.3.3 Designing data collection tools

**Designing study questionnaire**

This section focuses on the design of questionnaires used in quantitative studies or surveys to collect data. They usually include a set of standardized questions that explore a specific topic and collect information about demographics, opinions, attitudes, or behaviours. A quantitative study questionnaire is a list of closed ended questions that are used to collect data about someone or something.

Example of closed ended question

- How old are you?
- What is the number of health care providers trained in nutrition services at this facility?

It can also contain multiple choice questions such as:

- Has the child ever been breastfed?
    - Yes
    - No
    - Don't know

- In the past 30 days, was there ever no food to eat of any kind in your house because of lack of resources to get food?
    - Yes
    - No
    - Don't know
    - Refuse to answer

- How many times in a week do you consume dark green leafy vegetables?
    - None
    - One
    - Two to three
    - Four and above

To design a structured questionnaire, you need to have in mind what is the goal of your tool i.e. which questions are you trying to answer? Who is the respondent? How much time is available? How will you analyse the data?

Data collection tools can be designed from scratch or adopted from previous similar studies. Adapting tools from previous studies needs first to be tested and validated prior to its use in the field.

Use the following steps to design a data collection tool from scratch:

1) List down all general information you need to know to answer your research questions and objectives
2) In each study objectives mention key information to answer it that need to come from the target population (or respondents).
3) In each of the key information above list possible questions that would give you sufficient data to answer the objectives. Think on how these questions and possible responses can be phrased.
4) Divide your questionnaire into sections based on your objectives.
5) Think about how you will analyse and present the data as you design your questionnaire.

**2. Designing guide for qualitative study**

Generally, all tools used for qualitative data collection are called guides. Their specific names depend on the method of data collection used. There are FGD guides, KII guides, IDI guides etc. When the qualitative data is collected by observation, the tool will be known as observation checklist, etc. It is important to note here that an observation checklist sometimes results in quantitative data (i.e. number of scales; measuring tape available in a clinic, etc.). It all depends on how the information from observation is noted down. Occasionally quantitative data can be collected at the same time with qualitative data and a tool for such practice is commonly known as semi-structured questionnaire. It will comprise of closed-ended questions as well as open-ended questions; the later leading to collecting qualitative data.

Qualitative Interviews are usually chosen as a means to collect information because:

- There is a smaller sample size (i.e., key informants)
- In-depth information is required
- The opportunity to ask more open-ended response options

Interviews can be:

- Structured: fixed set of questions that are asked in a pre-determined order
- Semi-structured: fixed questions, but new questions can be introduced
- Unstructured: there may be a goal for the interview but would not have a guide with formal questions

Interviews differ from surveys in that it is more common for questions to be open-ended and the interviewer may add additional questions. Interviewers may also use probes to gather additional information or for clarification if the participant does not fully or incorrectly response to a question. Interviewers should remain neutral throughout the process to avoid introducing bias. Interviewers may influence responses if they have expectations about the answers or if they probe inadequately or inappropriately. Interviewers may also influence the way participants respond by their tone, attitude or reactions to answers.

<u>Example of an open-handed question</u>

- Can you explain to me why there are so many cases of children with a diagnosis of anaemia in this community?

- What are your recommendations to reduce incidence of diarrheal cases in Kiraracha village?

**Focus Group Design**

Focus groups are usually chosen as a means to collect information when there is a need to explore views and perceptions of the community context regarding the subject matter in question. As noted above, it is important for the focus group moderator to make efforts to avoid introducing bias. Because there is more than one participant, it is important to stress that there are no incorrect answers and to ensure that all participants have an opportunity to actively participate.

### 4.3.4 Sample and sampling designs

Study population is a group (i.e., individuals, health facilities) that you are interested in and wish to generalize your results to or draw conclusions about**.**

Sample size is a subset of the population of interest, the individuals who you select to be in the study.

Sampling is the process of selecting a subset of a population to estimate characteristics of the whole population. Sampling frame is the list of the entire population from which the study sample is drawn.

### 4.3.5 Unit of analysis

The unit of analysis of a study is the entity that frames what is being analysed. For instance, a unit of analysis can be individual level, a household level, district level, regional level or national level.

### 4.3.6 Calculating Sample Size

In every study conducted, there is a need to select a representative sample of the target population. This is important because surveying the entire population is often expensive and impossible due to limited resources. Therefore, we need a method to calculate a representative sample size for the entire target population. This will ensure our study has sufficient power to generate unbiased estimates for the study population.

**Quantitative sample size and sampling technique**

There are several sample size formulas based on study designs, population and outcomes. However, for the sake of district based operational research would recommend to use the following:

- Cross-sectional survey sample size estimation for operational research involving interviewing patients and users of health care services. The outcomes of the study determine the sample size estimation formula to be applied. They can be:
    - Proportions such as the prevalence of stunting
    - Means for continuous outcomes such as blood pressure, haemoglobin etc.
    - Rates for example mortality rates, birth-rates etc.
- Purposive sample size for operational research involving health facilities assessment and interviews of health providers.

<u>Survey sample size formula for proportion outcomes:</u>

*(Source: Kirkwood and Stern, Medical statistics,* (9)*)*

$$n = \frac{Z^2 * P(100 - P)}{e^2}$$

Where: n= sample
Z=Standard normal deviation that corresponds to 95% which is 1.96
P= Percentage of the outcome in the general population or from literature. If it is unknown assume 50%
e= Margin of error around P-value which is 5%.

Survey sample size formula for continuous outcomes (means)

$$n = \frac{Z\sigma^2}{e^2}$$

Where: n= sample
Z=Standard normal deviation that corresponds to 95% which is 1.96
σ = Standard deviation of the outcome variable.
e= Margin of error around P-value which is 5%

Survey sample size formula for continuous outcomes (rates)

$$n = \frac{Z^2 \mu}{e^2}$$

Where: n= sample
Z=Standard normal deviation that corresponds to 95% which is 1.96
μ = Rate of the outcome variable.
e= Margin of error around P-value which is 5%

**Example 1:**
District X is planning to conduct a survey to understand determining factors for stunting among under 5 children. Assume the proportion of stunting among under 5 children as reported from the TDHS of 2015 was 32%. Sample size estimation for this survey will then be calculated as follows.

$$n = \frac{1.96^2 * 32(100 - 32)}{5^2}$$

n=334.37
= 335

Therefore, the minimum sample size required to conduct this survey will be 335 participants.

**Example 2:**
An investigator wants to estimate the mean haemoglobin level in women attending ANC clinics in district X. How many women should be enrolled in the study? The investigator plans on using a 95% confidence interval (z=1.96) and wants a margin of error of 5 units. The standard

deviation of haemoglobin is unknown, but the investigators conduct a literature search and find the standard deviation of haemoglobin in pregnant women is 9.7. To estimate the sample size, we consider the larger standard deviation in order to obtain the most conservative (largest) sample size.

$$n = \frac{Z\sigma^2}{e^2} = \frac{1.96(9.7)^2}{5^2} = 7.38 \text{ pregnant women} \approx 8 \text{ pregnant women}$$

Therefore, the minimum sample size required to conduct this survey will be 8 pregnant women.

Purposive sampling procedure

Purposive sampling procedure is where a researcher selects a sample size and study participants based on their knowledge about the study and target population. The participants are selected based on the purpose of the study. For example, you may be conducting a study on why health facilities are not reaching their target on provision of IFA to pregnant women. You will need to select health facilities that would give good representation of the district. The selection criteria may include being urban verses rural, facility type, size of the facilities, public versus private facilities.

**Qualitative sample size estimation.**

Many qualitative research experts agree that, sample size with consideration of representative numbers are not important when using qualitative data collection methods. In most cases, **purposeful sampling approach** is used to target interviewees with reason and judgment based on their knowledge of the research topic and hypothesis. In qualitative research, targeting the right study participants/interviewees and attaining saturation is more important than the number of people interviewed.

However, in order to give weight to the collected information, an expert opinion is used to assign estimated number of FGDs, KII and IDI to a proportion that is likely to lead to saturation and is manageable, given time and available resource. Saturation point is when no new information is coming up but repetition of the same information you have collected in the previous interviews. For example, if you have planned to conduct ten FGDs but after the sixth FGDs you start receiving the same responses. It is recommended to drop the remaining interviews when saturation point is reached.

### 4.3.7 Sampling Procedures

The sampling process comprises several stages:

1. Define the population.
2. Specifying the sampling frame.
3. Specifying the sampling unit.
4. Selection of the sampling method.
5. Determination of sample size.
6. Specifying the sampling plan.

**Selecting the sample.**

There are two basic approaches to sampling: Probability Sampling and Non-probability Sampling.

## Probability sampling

Probability sampling is also known as random sampling or chance sampling. In this, a sample is taken in such a manner that each and every unit of the population has a positive chance of being selected. In this way the sample would represent the targeted study population. Probability sampling can be achieved by using the following sample selection approach:

i. **Simple Random Sampling procedure:** each member of the population is numbered and a given size of the sample is drawn with the help of a random number chart. The other way is to do a lottery.
ii. **Systematic Random Sampling procedure:** This requires number of the entire study population (sampling frame) and choosing study participants using an interval (say every $10^{th}$ person).
iii. **Stratified Random Sampling procedure:** This is when study participants are sampled from strata which are obtained after the study area is divided into specific areas according to characteristics such as rural vs. urban, or facility level.
**iv.** **Cluster Sampling procedure:** This is when study subjects are sampled from clusters obtained after a study area is divided into smaller geographical but similar area such as village or schools.

### Non-probability sampling

Non-probability sampling is a non-random and subjective method of sampling where the selection of the population elements comprising the sample depends on the personal judgment or the discretion of the sampler. Non-probability sampling includes:

i. Accidental/ Convenience/ Opportunity/ Availability/ Haphazard/ Grab Sampling
ii. Quota Sampling
iii. Judgment/ Subjective/ Purposive Sampling
iv. Snowball Sampling.

For the sake of this course and its importance on operational research we will cover details on purposive sampling procedure. This is when a sample is selected with definite purpose in view and the choice of the sampling units depends entirely on the discretion and judgment of the investigator.

### 4.3.8 Data collection

**Quantitative Data**

- The tools may be digitalized to collect data electronically (using tablets or smart phones) or can be paper based.

- Data collector trainings should be conducted to ensure that data collectors are familiar with the operational research in question, are knowledgeable on how to keep respondents comfortable and engaged to share information. They should remain neutral and unbiased to receive all information from respondents.

- Data collection should be conducted in a comfortable, safe and private environment to ensure full confidentiality of the respondent.

- Prior to administering a questionnaire, the participant needs to be fully informed of the risks and benefits of being involved in the study, the right to withdraw from the study at any time and how the anonymity and confidentiality of their data will be handled. This should be done in a simple language which the respondent can easily understand, preferably using their local language. Only through this process can a respondent provide an informed consent to participate in the study and administration of the questionnaire can be done.

- During data collection, it is important to conduct regular/close supervision of the data collectors.

- Conduct regular data checks including spot checks, data verifications, re-interviews of selected participants etc.

- Ensure proper storage and handling of all data collection tools and equipment e.g. electronic tablets, anthropometric equipment etc.

**Conducting a qualitative interview**

Conducting an interview using qualitative tool requires more skills and a deeper understanding of the topic of research. Qualitative interviews include only general questions in the guides and depends heavily on "know how" of the interviewer to come up with probes and additional - follow up questions depending on the answers the interviewee provides.

### 4.3.9 Data management and analysis

**1. Quantitative data management and analysis**

Data analysis process starts with collection of information from the field (e.g. household/ facility survey) or already collected data (e.g. HMIS data, score cards etc.) which allows for data explorations.

## Steps of data management

Once data is collected it must be processed and organized for analysis. If collected data is from various sources, we need to keep a log/record with the collection date and source of data.

<u>Data Cleaning</u>

The data which is collected may contain duplicate records, white spaces or errors in data entry. The collected data should be cleaned – where identified errors are removed or corrected - and be error free prior to analysis. It is advised the person responsible for data cleaning should have a general knowledge of using software for data analysis e.g. excel spreadsheet.

*Exercise - Identify errors from the figure with routine generated data at council level.*

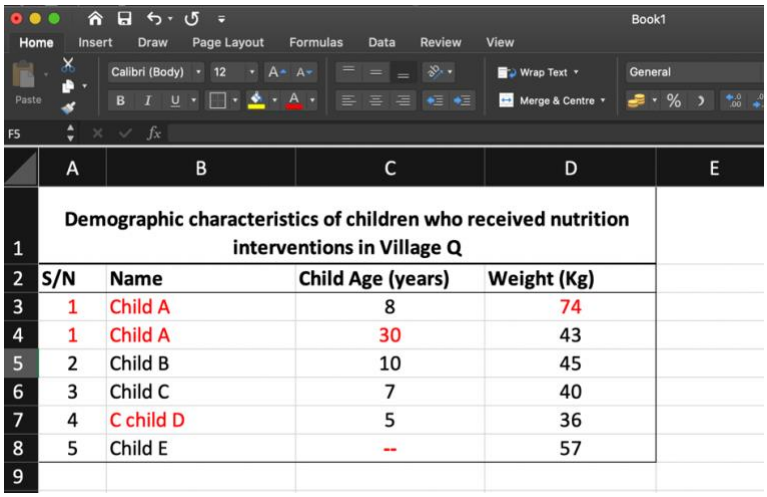
| | | | | Numerators | | |
|---|---|---|---|---|---|---|
| | VAS | VAS | VAS | IFA | IFA | IFA |
| | Geographic Ac | Utilization | Quality | Commodities | Geographic Ac | Quality |
| | Proportion of villages with at least one health facility providing Vitamin A supplementation in the reporting | Proportion of children 6-59 months who have received vitamin A supplementation in the last 12 months (coverage level of the round with the highest | Proportion of children 6-59 months who have received vitamin A supplementation in the last 12 months (coverage level of the round with the lowest performance) | Proportion of children 6-59 months who have received vitamin A supplementation in the last 12 | Proportion of children 6-59 months who have received vitamin A supplementation in the last 12 | #VALUE! |
| | 32% | 97% | 97% | 0 | 50 | - |
| | 79% | 138% | 137% | 0 | 53 | - |
| | 100% | 118% | 118% | 0 | 45 | - |
| | 55% | 122% | 121% | 1 | 27 | - |
| | 53% | 119% | 117% | 0 | 52 | - |
| | 68% | 124% | 108% | 0 | 45 | - |
| | 47% | 64% | 55% | 2 | 34 | - |
| | 45% | 112% | 106% | 0 | 72 | |
| | 34% | 478% | 99% | 0 | 23 | |
| | 58% | 100% | 86% | 0 | 69 | |
| | 63% | 97% | 104% | 0 | 89 | |

<u>Removing unwanted observations from your dataset</u>.

<u>Duplicate observation:</u>

Arise during data collection, such as when you combine datasets from multiple places, scrape data or receive data from clients/other departments.

<u>Irrelevant observations:</u> Are those that don't actually fit the specific problem that you're trying to solve e.g. A child aged 30 years, a pregnant male, etc.



Fix structural Error: Structural errors are those that arise during measurement, data transfer for example typos, mislabelled classes or inconsistent observations. This is mostly a concern for categorical features.

Filter unwanted outliers: Outliers can cause problems with certain types of measurement. For example, mean, standard deviation. However, outliers are innocent until proven guilty. You should never remove an outlier just because it's a "big number." That big number could be very informative. You must have a good reason for removing an outlier, such as suspicious measurements that are unlikely to be real data. For example, an 8 years child of 73kg weight is an outlier. This can be true information or data entry errors. Need to recheck!

Handling missing data**:** We cannot simply ignore missing values in our dataset. We must handle them in some way for the very practical reason that most algorithms do not accept missing values. The best way to handle missing data for categorical features is to simply label them as "Missing". This essentially adds a new class for the feature. This tells the algorithm that the value was missing. This also gets around the technical requirement for no missing values.

Missing numeric data: For missing numeric data, you should flag and fill the values.
Flag the observation with an indicator variable of missingness. Then, fill the original missing value with the mean of the original numeric feature just to meet the technical requirement of non-missing values.

## Data Analysis

Data analysis is guided by study objectives and hypotheses. A detailed data analysis plan needs to be formulated in advance during proposal development stages of the study. It is vital to ensure that the analysis plan will be able to answer the study questions. The process of data analysis starts from simple statistics such as descriptive analysis, cross tabulations to advanced statistical analysis using regression methods.

Once the data is collected and cleaned, it is ready for analysis. During this phase, we can use data analysis tools and software (STATA, SPSS, R) which will help to understand, interpret, and derive conclusions based on the requirements. Simple data analysis can be done through excel such as calculating frequencies, means, medians and percentages.

| | Child | Age | Sex | Weight (kg) | Height (cm) | Received vitamin A supplment |
|---|---|---|---|---|---|---|
| 2 | A | 2 | Female | 10 | 88 | No |
| 3 | B | 4 | Female | 17 | 73 | Yes |
| 4 | C | 5 | Male | 12 | 78 | No |
| 5 | D | 3 | Female | 16 | 77 | Yes |
| 6 | E | 1 | Male | 14 | 48 | Yes |
| 7 | F | 4 | Male | 20 | 92 | Yes |
| 8 | G | 3 | Male | 13 | 45 | Yes |
| 9 | H | 1 | Female | 20 | 90 | Yes |
| 10 | I | 2 | Male | 15 | 77 | No |
| 11 | J | 5 | Female | 10 | 45 | Yes |

**Mean**

It is the average of a set of numerical values, as calculated by adding them together and dividing by the number of terms in the set.

For example; in the table above, what is the average weight of the children?

$$\frac{10 + 17 + 12 + 16 + 14 + 20 + 13 + 20 + 15 + 10}{10} = \frac{147}{10} : \mathbf{14.7}$$

**Median**

It is the middle number; found by ordering all data points in ascending or descending order and picking out the one in the middle (or if there are two middle numbers, taking the mean of those two numbers).

For example; in the table above, what is the median weight of the children?

10,10,12,13,14,15,16,17,20,20

Order the number in ascending order and count from left to right and obtain the middle number

10,10,12,13,14,15,16,17,20,20

Then the middle number are14 and 15 then the median is average of $14 + 15 = 29/2 : 14.5$

**Mode**

The most frequent number—that is, the number that occurs the highest number of times.

For example; in the table above, what is the mode weight of the children?

The mode number of weights of the children are 10 and 20.

**Proportion**

Is the comparative number of the defined indicator in the population to the total number of the defined population.

For example; in the table above, what is the proportion of children who received vitamin A supplementation?

Numerator: the number of children who received vitamin A supplementation 7.

Denominator: Total number of children 10

Proportion: Numerator/Denominator = 7/10*100: 70%
For example; in the table above, what is the proportion of children who received vitamin A supplementation by sex?

**Girls**
Numerator: the number of female children who received vitamin A supplementation 4.
Denominator: Total number of female children 5
Proportion: Numerator/Denominator = 4/5*100: 80%

**Boys**
Numerator: the number of male children who received vitamin A supplementation 3.
Denominator: Total number of male children 5
Proportion: Numerator/Denominator = 3/5*100: 60%

***Conclusion:*** *Across gender, 80% of girls received vitamin A supplementation compared to 60% of boys.*

Analysis can go a step further to disentangle whether the difference we observe between girls and boys is statistically significant. This requires conduction of t-test. It will be covered during the practical session of data analysis.

**In group work:** Use the provided excel dataset to calculate the mean, median, mode and proportion, overall and by sex.

Calculate t-test using excel software for the above group work and provide a statistical conclusion whether there is a significant difference between girls and boys.

Data Interpretation and Visualization

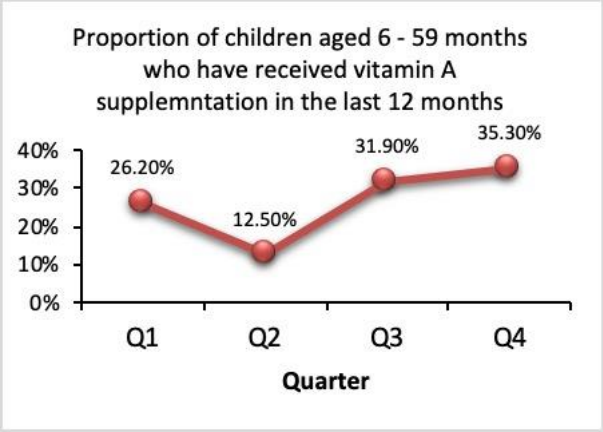
The data interpretation process involves reviewing data through the predefined analysis plan which will help assign some meaning to the data and arrive at a relevant conclusion. We can choose the way to express or communicate data analysis. It can be in the form of narratives, a table or a figure.

Data visualization is very common in daily life; it often appears in the form of charts and graphs. In other words, quantitative data is shown graphically so that it will be easier for the human brain to understand and process it. Data visualization is often used to discover unknown facts and trends. By observing relationships and comparing datasets, we can find out meaningful information.

Types of Graphs and when they should be applied

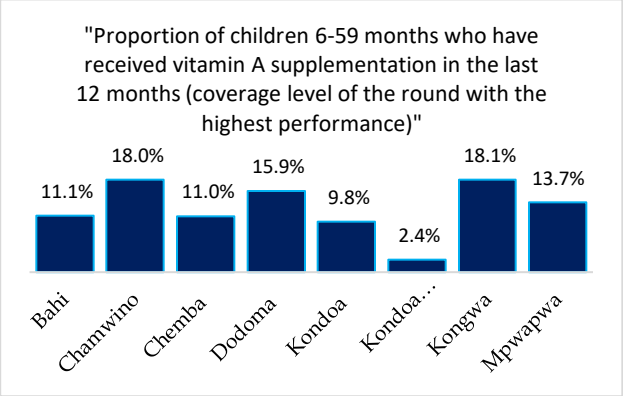
**Line graph:**

A line graph is a graphical display of information that changes continuously over time. Within a line graph, there are points connecting the data to show a continuous change. The lines in a line graph can descend and ascend based on the data. We can use a line graph to compare different events, situations, and information. Example, what can you interpret in the line graph below?



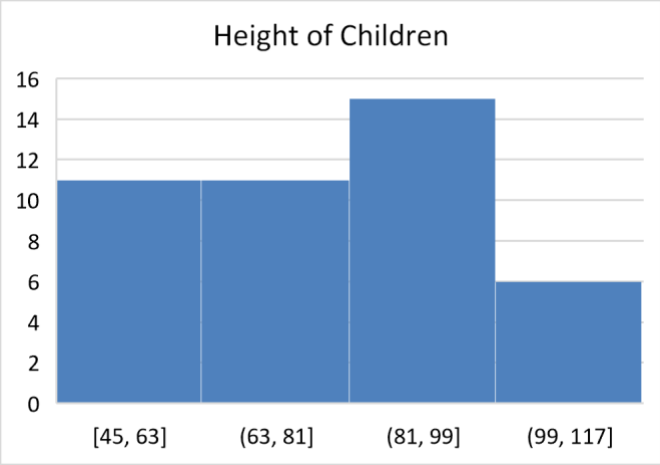

**Bar graph:**

A Bar Graph is a graphical display of data using bars of different heights. Bar graphs are used to display categorical data on the x-axis. For example, can you interpret the bar graph in the picture?



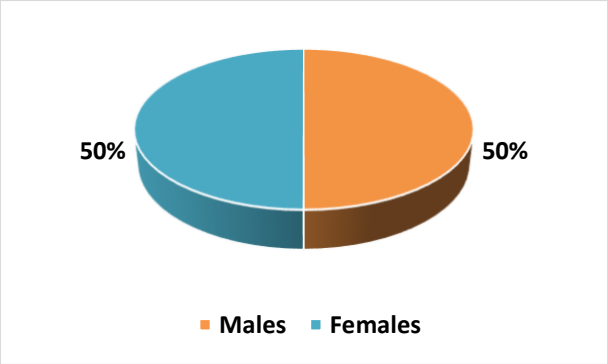
## Histogram:

In a histogram, each bar groups numbers into ranges. Taller bars show that more data falls in that range. A histogram displays the shape and spread of continuous sample data.



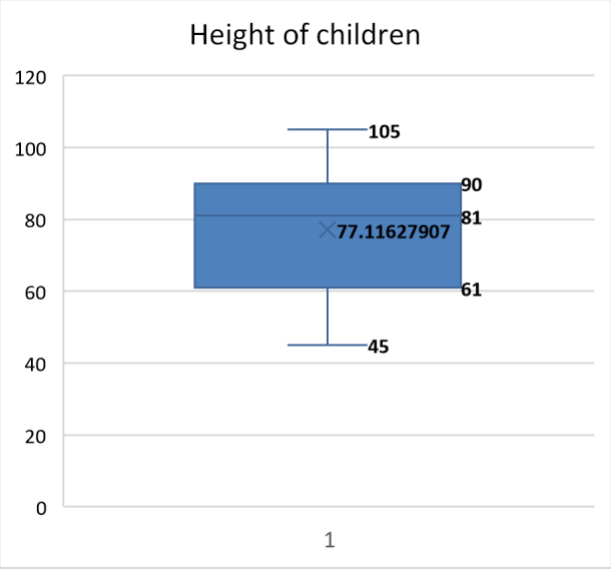

## Pie chart:

A pie chart is a circular statistical graphic, which is divided into slices to illustrate numerical proportion. In a pie chart, the arc length of each slice is proportional to the quantity it represents. For example, see the pie chart showing the number of girls vs boys in the data above.




## Box plots:

A boxplot is a method for graphically depicting groups of numerical data through their quartiles. Box plots may also have lines extending from the boxes (whiskers) indicating variability outside the upper and lower quartiles, hence the terms box-and-whisker plot and box-and-whisker diagram. Outliers may be plotted as individual points. For example, can you please interpret the box and whiskers plot shown in the picture?



**Qualitative data management and analysis**

Unlike quantitative data, qualitative data may constitute narratives, pictures, sounds and or illustrations. As a result, data management involves more tedious work than when handling qualitative data. All data management activities are preceded by first expanding the interview notes as noted in brief during the interview (if notes were taken) or transcribing audio files to text files (if the interview was audio recorded). Of course, like quantitative data, there is sometimes a fair amount of 'data cleaning' that is needed for qualitative data as well after notes or audio are transcribed. Generally, qualitative data management involves organizing the data in a manner that it will allow logical interpretation during the analysis. This may include:

- Organizing all interviews of the same type together (e.g. FGDs alone, KII alone, IDI alone etc.)
- Organizing interviews from the same type of interviewees together (i.e. adult women alone, adolescent girls alone, adult men alone, community leaders alone etc.)
- Naming the interview files systematically, preferably showing in the file name the interview type, the respondent type, institution, location, topic and date. For example: FGD_Adolescent_Poboma Disp_Poboma_Nutrition_08.02.2020.
- Depending on whether the data is analyzed manually (without using a software) or a qualitative data software is used (NVIvo, MaxiQDA etc.), the text files may need to be uploaded to the software platform if the latter is the case for coding.
- A codebook will need to be developed in which thematic areas that constitutes broad topics that either were pre-planned or emerged will be identified and sub topics (sub-themes or sometimes called sub-nodes) will be defined for each sub-theme. These will be used to guide the process of coding of the qualitative data to help identify frequently mentioned topics or issues and help to summarize the findings. Coding simply means taking text (sentences or paragraphs) from various interview scripts and pull them together. This process involves a lot of reading of the transcripts. Coding can be done over a software platform or using excel sheets or any other way that the researchers finds it easier.
- Later on, all coded data will be re-read and summaries of key issues that emerged will be made to provide information on which topics or issues are more prominent than others. These will constitute the key findings.

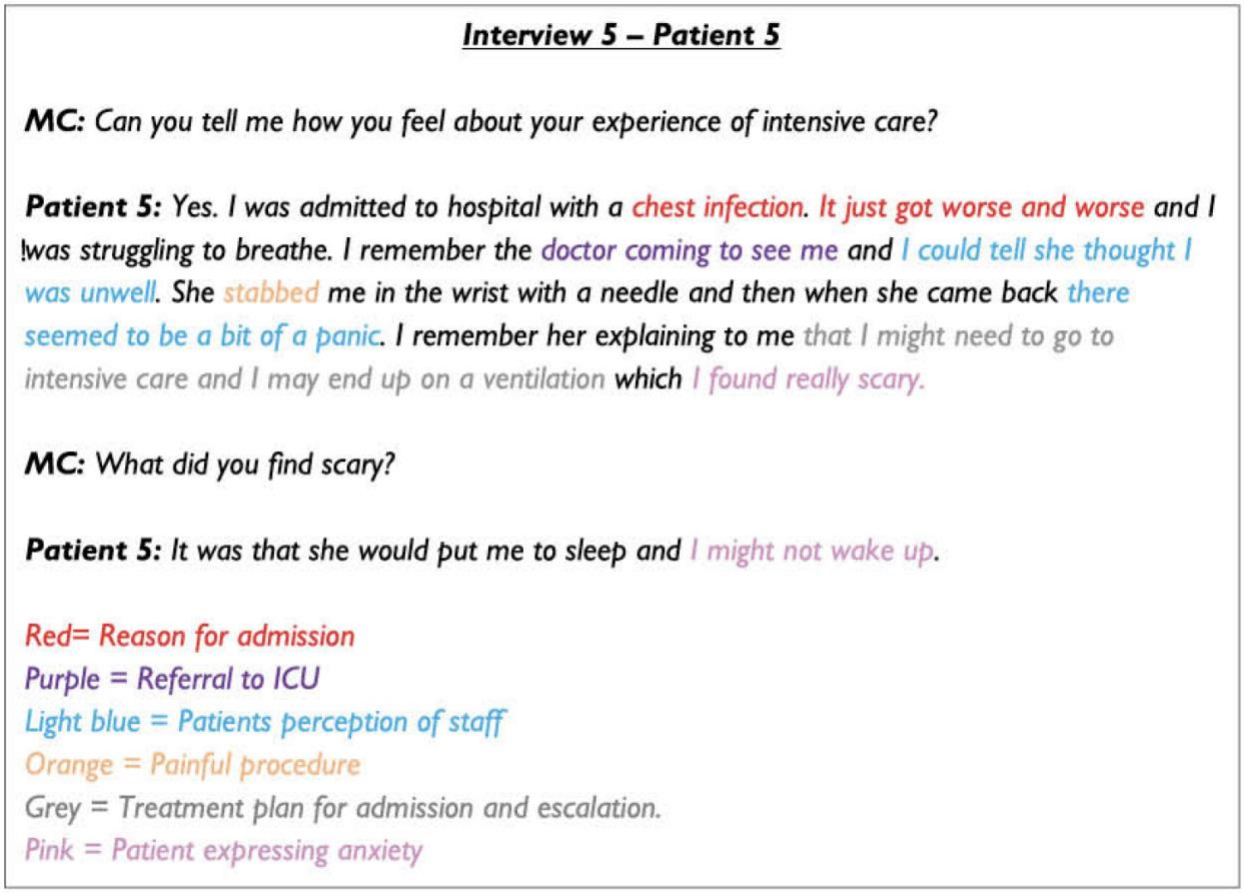
Below are examples of what it means with a codebook and an example of a coded transcript.

Example of a code book with codes.

| Theme/Main Code | Sub-Code | Code definition |
|---|---|---|
| **Gender-related and adolescent-specific issues** with respect to identity (value) | Gender norms and values | • Respondent describes existing gender norms and values associated with being female or male and associated assumptions |
| | Gender norms variation | • Respondent describes how gender norms vary by age group, particularly between adolescent girls and boys (15-19), young women and men (20-24) and older generations (25-49) and up (50+) socially, educationally, socioeconomic status and urban/rural status. |
| **Social relations** (normative roles, duties, and responsibilities of women/girls and men/boys) | Normative gender roles/duties and responsibilities | • The paragraph describes what women and men do and where (location/patterns of mobility) and when (daily and seasonal patterns) does what they do happen |
| **Division of labor by sex and age** in productive and reproductive work within the household and the community | Productive roles that men and women do | • Respondent describes productive roles: (paid work, unpaid work, self-employment and subsistence production)<br>• Respondent describes community participation and/or self- help (voluntary work for the benefit of community as a whole) |
| | Reproductive roles men and women do | • Respondent describes reproductive roles (domestic work, childcare, and care of the sick and elderly) |

*Source*: Mbuyita et al, 2019.

Example of a coded transcript



***Interview 5 – Patient 5***

***MC:*** *Can you tell me how you feel about your experience of intensive care?*

***Patient 5:*** *Yes. I was admitted to hospital with a chest infection. It just got worse and worse and I was struggling to breathe. I remember the doctor coming to see me and I could tell she thought I was unwell. She stabbed me in the wrist with a needle and then when she came back there seemed to be a bit of a panic. I remember her explaining to me that I might need to go to intensive care and I may end up on a ventilation which I found really scary.*

***MC:*** *What did you find scary?*

***Patient 5:*** *It was that she would put me to sleep and I might not wake up.*

*Red= Reason for admission*
*Purple = Referral to ICU*
*Light blue = Patients perception of staff*
*Orange = Painful procedure*
*Grey = Treatment plan for admission and escalation.*
*Pink = Patient expressing anxiety*

***Source***: Research Gate, 2019.

# Module Five

## Reporting

## 5.1 Module Objectives

*At the end of this module, participants are expected to be able to understand and explain:*

- *Objectives and importance of reporting*
- *Structure of the report*
- *Discussing findings in the report*
- *Drawing conclusions and recommendations*
- *Disseminating research findings*

**Facilitation plan**

Use power point presentation, case studies and group work to facilitate and deliver this module.

**Facilitation materials**

Power point projector, flip charts, flip chart stand, marker pens and masking tapes

**Hands on Activity**

Delivery of this module will use power point presentation, previous reports, samples of reporting templates and group works.

**Session duration**

Time estimated to cover the topic (120 minutes)

## 5.2 Module content

### 5.2.1 Objective and importance of reporting

Data that is not reported is 'as good as lost one' – less useful and a waste of resources and time. This objective will not be met if the collected data that answer key research objectives or questions are not reported and shared. In many research works, some researchers tend to report only part of the collected data and there are a lot of data that go unreported.

Reporting is important because it informs what the results from the research work were and informs comparison with other similar research work. Reports also inform recommendations; project programming and management; and policy formulations which can be used to propose and design future interventions or evaluations.

### 5.2.2 Structure of the report

The outline of the report follows the study protocol with an addition of results and discussion sections. It is important therefore to write the study protocol thoroughly because it will guide in writing the final report. Below is a standard outline of a typical research report.

- Executive summary
- List of abbreviations

- Acknowledgements
- Introduction
    - Background information
    - Problem statement
    - Rationale
- Study goals and objectives
- Methodology
    - Study design
    - Study sites
    - Study populations
    - Sampling and sample size
    - Data collection methods
    - Data management and statistical analysis
- Ethical considerations
- Results/findings
- Discussion
- Conclusions and recommendations
- References (of literature cited in preceding sections)

### 5.2.3 Discussing the findings

OR should not be concluded by just summarizing and reporting the results. The results merit some level of discussion to be based on the interpretation the researchers make and which will lead to meaningful conclusions. Discussing research results involves linking findings to objectives of the study as well as comparisons with previous studies. It also involves comparing the results with other studies conducted by other researchers. Discussion of research findings should include also effect of context in which the research was conducted, any other factors that might have influenced the results and potential limitations of the study and how it could affect validity of the findings. A good discussion leads to simple and clear conclusions and ultimately making sound recommendations.

### 5.2.4 Drawing conclusions and recommendations

A conclusion is usually a mix of summary of key findings and interpretations of the findings with reference to the topic researched. It should be connected to the research aims, show the extent to which it has achieved the aims of the study, key findings, usefulness of the findings and what it means to the program. See the example below.

***Key finding***

Inappropriate use of toilets was the main unhealthy practice that all pupils lamented about. Pupils complained on their fellow pupils that toilets were made dirty all the time because some of them were not using them properly. Apart from the inappropriate use of the toilets, pupils also indicated that some of the school toilets are not well constructed to allow good drainage or not repaired in time when damaged. "*Toilet drainage is very poor; they are wet all the time with urine and water....and are so stinky!*" complained one pupil.

***Conclusion***

The studied schools did not have WASH practices regulated by specific regulations or guidelines. As a result, pupils are exposed to a potential health risk from toilets that are of low hygienic status exacerbated by improper and unguided use of the toilets by the pupils. This finding suggests an urgent need for improving sanitation services within the school system.

***Recommendation***
WASH guidelines should be introduced in schools alongside capacitating school teachers on how to implement them. WASH program implementers should consider

- Developing WASH guidelines for schools
- Conducting orientation on how to use the guidelines to school teachers
- Introducing a follow and monitoring mechanism for WASH activities in school
- Producing information, education and communication (IEC) materials for pupils to promote desirable WASH behaviour change.

**Remember!!!**
Key finding or result is *what you saw from data, not your own thinking or interpretation*
Conclusion is *the key take home message from the study findings and its implication to the program.*
Recommendation is *what you propose to be done based on the findings.*

### 5.2.5 Disseminating research findings

Dissemination of research results or findings simply means sharing your results with a wider community. Remember the stakeholders! All stakeholders, at their different levels of interest would like to hear and learn from your research. The level of interest tends to differ and this directs you on how you should package your results for the different audiences. There is no a single packaging of your dissemination content that suits all categories of your key stakeholders or users of researchers in general. Content for policy makers may be different from that for researches and academicians which also can be different from that needed for program managers and service providers.

Here are basic guidelines to disseminating OR findings.

- First identify the target audience (community members[1], service providers, program managers, politicians, donors and funders, national level decision makers, researchers, students and academicians etc.)
- Choose appropriate methods for dissemination
    - Normal report (Donor/work/government/department/etc.)
    - Abstract of the report (decision makers, politicians)
    - Power point slides (meetings, conferencing and symposiums)
    - Scientific publication/paper (scientific community)
    - Blog content, social media extracts
- Selecting your channel/outlet for your dissemination
    - Meetings/conferences/symposiums etc.
    - Peer review journal
    - Newsletters/newspapers/magazines

[1] While most of these groups are usually thought of during dissemination of research findings, communities are often forgotten or not considered as recipients of research results or findings. It is hereby emphasized that whenever possible, OR findings should also be disseminated to the communities that participated in the research

- Websites/blogs/social media

# Module Six
# Team Work

## 6.1 Module Objectives

*At the end of this module, participants are expected to be able to understand and explain*

- *Why they need to work as a team*
- *Guidelines for forming a research team*
- *Common titles used to identify research team members*

**Facilitation plan**

In facilitating this module, trainers will need to:

- Start the module by role playing the importance of team work and working together. This can be demonstrated by actions such as picking a pen, writing, using a single or two fingers versus more than two fingers and always excluding the thumb and have them feel how cumbersome it is.
- Apply adult learning principles as much as you can
- Use power point presentation (PPT) or other alternatives as it suits you but not thoroughly plain conversation.
- Involve trainees in a question and answer conversation whenever possible

**Facilitation materials**

Power point projector, flip charts, marker pens, sticky notes, stick-glue.

**Hands on activity**

Ask participants to conduct a confidential voting using folded pieces of paper to nominate various members of their team to occupy various titles in their research team

**Session Duration**

- The session should be covered in a time period of 60 minutes.

## 6.2 Module Content

### 6.2.1 Why the need to work as a team

*Kidole kimoja hakivunji chawa!* (Mwl Nyerere).

It is almost impossible for one person to conduct OR. The OR stakeholders show how important it is to involve different people in a research process. Among the team that will conduct the research, team work is very important. Can you use the following illustrations to learn how a mix of skills, knowledge and strengths are needed to make a strong and successful team?

## Our hand teaches us about team work! Source: PPT by Professor A. Premji (2008)

The team fingers have difficulty in contacting each other, touching each other tip-to-tip. But the thumb easily touches each one of them, and when you join the thumb and the four fingers, they come together easily

Though Thumb is smaller in size than three of the fingers, it is solid and strong

All the four fingers have three joints each though the thumb has got only two joints. But the thumb is more flexible than each of them

The four fingers are facing the world and are externally directed. Thumb looks towards both the world and also towards the four members.

Fingers cannot work without Thumb. Thumb cannot work without fingers. Fingers need Thumb and Thumb needs fingers

Thumb helps fingers to do different jobs in different forms like holding, pulling, lifting, writing, etc. and adds value in many ways

There is a troublemaker in the fingers. That is the index finger. It points out again and again. 'This is Wrong". "That is Wrong". It threatens. It questions. It disagrees.

But when this aggressive finger joins Thumb, it makes a perfect sign

Very important. Both Thumb and fingers cannot do without bending. While standing rigid no work can be done. When they bend, they can do many things

When Thumb and all the fingers close together in unity, they become a strong iron fist, which can hammer and crash any thing

When four fingers close together and Thumb stands high representing Team it is 'Thumbs-up'. A victory for Team

When all fingers including the thumb join with each other and the palm is held up, it is 'Tyson', fearlessness

### 6.2.2 Guidelines for forming a research team

The illustrations above teaches us how teams should be formed. A good research team should include

- Skills and competence mix e.g. nutrition expert, data expert, etc.
- Experience and non-experience researchers
- Gender considerations

The Council Multisectoral Steering Committee on Nutrition (CMSCN) is one of the best examples of a team with most of these attributes for a strong team. It has a mix of members with varying levels of autonomy for decision making, varying levels of knowledge and expertise in project management, implementation, supervision, monitoring and evaluation, leadership and team work building, etc.

### 6.2.3 Common titles used to identify research team members

Usually, members of a research team assume different roles depending with their knowledge, experience and background in conducting research. Some of the commonly used titles include:

- Principle Investigator (PI) who leads the team and is responsible and accountable for all issues related to the research
- Co-Principle Investigator (Co-PI), who has the role as the deputy PI
- Co-Investigators, usually senior researchers capable enough to implement the research on behalf of the PI and the Co-PI
- Data manager and analyst, who is responsible for managing the research data.
- Research assistants who participate in data collection and data analysis and more but are not entrusted with the project on their own.

Using the example of the Council Multisectoral Steering Committee on Nutrition, the chairperson for the committee might not necessarily be the PI or Co-PI. A member perceived to have more knowledge, skills and experience in research could be appointed by team to be the PI.

Using technical people at district level or your workplace how would you organize yourself and turn it to a research team to undertake OR for nutrition program in your council?

*Recommendation: Use secret voting to see how the recommendations turn around!*

# BIBLIOGRAPHY AND FURTHER READING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# APPENDICES

## Appendix 1: Description of sections of OR protocol

Source: World Health Organization: 2020 (10)

**Project summary**

Like the abstract of a research paper, the project summary, should be no more than 300 words and at the most a page long (font size 12, single spacing). Provided preferably on a separate page, it should summarize all the central elements of the protocol, for example the rationale, objectives, methods, populations, time frame, and expected outcomes. It should stand on its own, and not refer the reader to points in the project description.

**General information**

- Protocol title, protocol identifying number (if any), and date.
- Name and address of the sponsor/funder.
- Name and title of the investigator(s) who is (are) responsible for conducting the research, and the address and telephone number(s) of the research site(s), including responsibilities of each.
- Name(s) and address(es) of the clinical laboratory(ies) and other medical and/or technical department(s) and/or institutions involved in the research

**Rationale & background information**

The Rationale specifies the reasons for conducting the research in light of current knowledge. It should include a well-documented statement of the need/problem that is the basis of the project, the cause of this problem and its possible solutions. It is the equivalent to the introduction in a research paper and it puts the proposal in context.

It should answer the questions why and what: why the research needs to be done and what will be its relevance. The magnitude, frequency, affected geographical areas, ethnic and gender considerations, etc. of the problem should be followed by a brief description of the most relevant studies published on the subject.

**References (of literature cited in preceding sections)**

References can also be listed at the end of Part 1.

**Study goals and objectives**

Goals are broad statements of what the proposal hopes to accomplish. They create a setting for the proposal. Specific objectives are statements of the research question(s). Objectives should be simple (not complex), specific (not vague), and stated in advance (not after the research is done). After statement of the primary objective, secondary objectives may be mentioned.

**Study design**

The scientific integrity of the study and the credibility of the study data depend substantially on the study design and methodology. The design of the study should include information on the type of study, the research population or the sampling frame, and who can take part (e.g.

inclusion and exclusion criteria, withdrawal criteria etc.), and the expected duration of the study

**Note:** The same study can be described in several ways, and as complete a description of the study as possible should be provided. For example, a study may be described as being a basic science research, epidemiologic or social science research, it may also be described as observational or interventional; if observational, it may be either descriptive or analytic, if analytic it could either be cross-sectional or longitudinal etc. If experimental, it may be described as a controlled or a non-controlled study.

### Methodology

The methodology section is the most important part of the protocol. It should include detailed information on the interventions to be made, procedures to be used, measurements to be taken, observations to be made, laboratory investigations to be done etc. If multiple sites are engaged in a specified protocol, methodology should be standardized and clearly defined.

Interventions should be described in detail, including a description of the drug/device/vaccine that is being tested. Interventions could also be in the realm of social sciences for example providing training or information to groups of individuals

Procedures could be biomedical (collection of blood or sputum samples to develop a diagnostic test), or in the realm of social sciences (doing a questionnaire survey, carrying out a focus group discussion as part of formative research, observation of the participant's environment, etc.).

Standardized and/or documented procedures/techniques should be described and bibliographic references, if not provided earlier should be provided. Instruments which are to be used to collect information (questionnaires, FGD guides, observation recording form, case report forms etc.) must also be provided.

In the case of a randomized controlled trial additional information on the process of randomization and blinding, description of stopping rules for individuals, for part of the study or entire study, the procedures and conditions for breaking the codes etc. should also be described.

A graphic outline of the study design and procedures using a flow diagram must be provided. This should include the timing of assessments.

### Safety considerations

The safety of research participants is foremost. Safety aspects of the research should always be kept in mind and information provided in the protocol on how the safety of research participants will be ensured. This can include procedures for recording and reporting adverse events and their follow-up, for example. It is useful to remember that even administering a research questionnaire can have adverse effects on individuals.

### Follow-up

The research protocol must give a clear indication of what follow up will be provided to the research participants and for how long. This may include a follow u, especially for adverse events, even after data collection for the research study is completed.

**Data management and statistical analysis**

The protocol should provide information on how the data will be managed, including data handling and coding for computer analysis, monitoring and verification. The statistical methods proposed to be used for the analysis of data should be clearly outlined, including reasons for the sample size selected, power of the study, level of significance to be used, procedures for accounting for any missing or spurious data etc. For projects involving qualitative approaches, specify in sufficient detail how the data will be analysed.

**Quality assurance**

The protocol should describe the quality control and quality assurance system for the conduct of the study, including GCP, follow up by clinical monitors, DSMB, data management etc.

**Expected outcomes of the study**

The protocol should indicate how the study will contribute to advancement of knowledge, how the results will be utilized, not only in publications but also how they will likely affect health care, health systems, or health policies.

**Dissemination of results and publication policy**

The protocol should specify not only dissemination of results in the scientific media, but also to the community and/ or the participants, and consider dissemination to the policy makers where relevant. Publication policy should be clearly discussed- for example who will take the lead in publication and who will be acknowledged in publications, etc.

**Duration of the project**

The protocol should specify the time that each phase of the project is likely to take, along with a detailed month by month timeline for each activity to be undertaken.

**Problems anticipated**

This section should discuss the difficulties that the investigators anticipate in successfully completing their projects within the time frame stipulated and the funding requested. It should also offer possible solutions to deal with these difficulties.

**Project management**

This section should describe the role and responsibility of each member of the team

**Ethics**

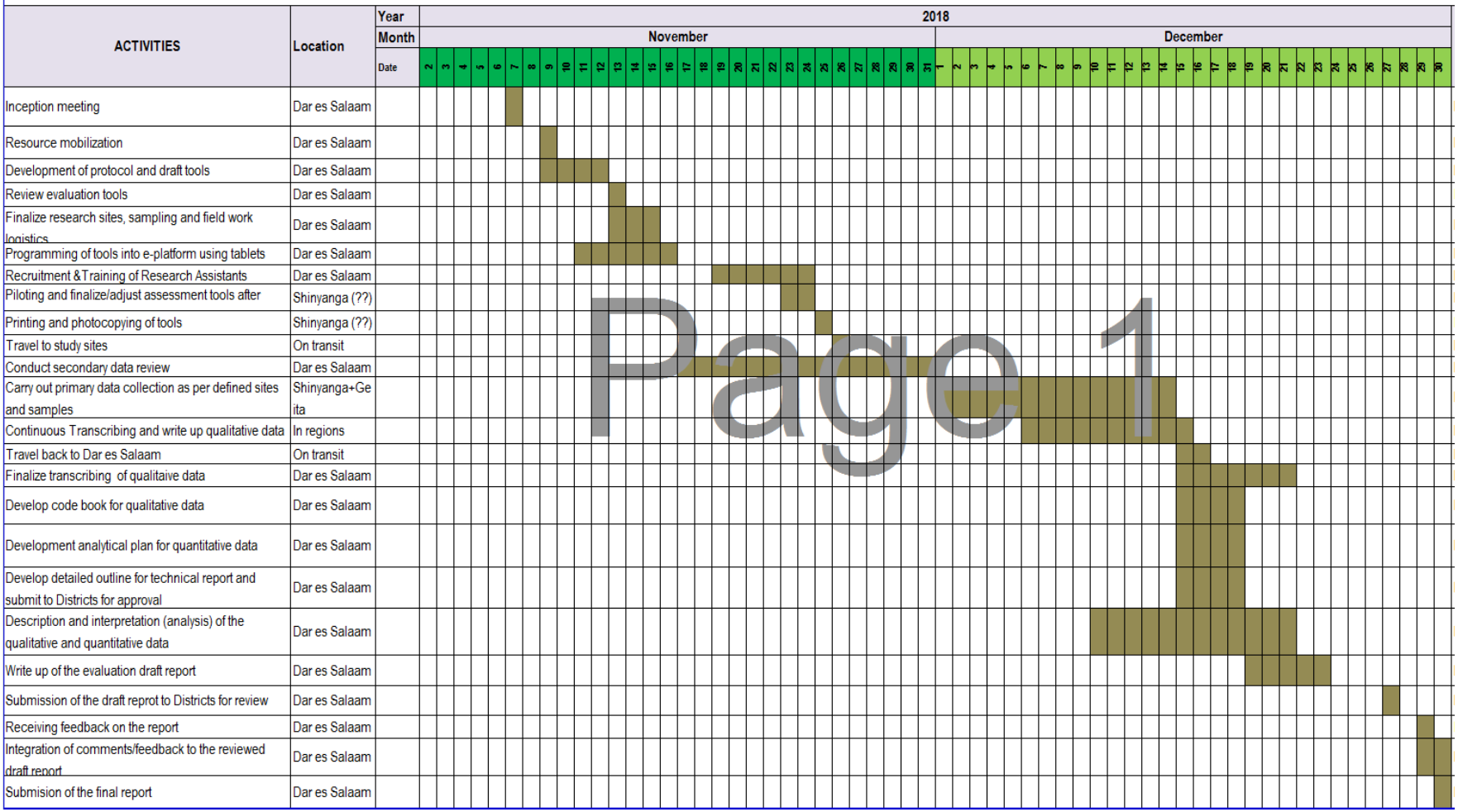
The protocol should have a description of ethical considerations relating to the study. This should not be limited to providing information on how or from whom the ethics approval will be taken, but this section should document the issues that are likely to raise ethical concerns. It should also describe how the investigator(s) plan to obtain informed consent from the research participants (the informed consent process).

**Informed consent forms**

The approved version of the protocol must have copies of informed consent forms (ICF), both in English and the local language in which they are going to be administered. However translations may be carried out after the English language ICF(s) have been approved by the ERC. If the research involves more than one group of individuals, for example healthcare users and healthcare providers, a separate specifically tailored informed consent form must be included for each group. This ensures that each group of participants will get the information they need to make an informed decision. For the same reason, each new intervention also requires a separate informed consent form.

# Appendix 2: Examples of Work Plans and Gantt Chart

**AN EXAMPLE OF A GANTT CHART**



| ACTIVITIES | Location |
|---|---|
| Inception meeting | Dar es Salaam |
| Resource mobilization | Dar es Salaam |
| Development of protocol and draft tools | Dar es Salaam |
| Review evaluation tools | Dar es Salaam |
| Finalize research sites, sampling and field work logistics | Dar es Salaam |
| Programming of tools into e-platform using tablets | Dar es Salaam |
| Recruitment &Training of Research Assistants | Dar es Salaam |
| Piloting and finalize/adjust assessment tools after | Shinyanga (??) |
| Printing and photocopying of tools | Shinyanga (??) |
| Travel to study sites | On transit |
| Conduct secondary data review | Dar es Salaam |
| Carry out primary data collection as per defined sites and samples | Shinyanga+Geita |
| Continuous Transcribing and write up qualitative data | In regions |
| Travel back to Dar es Salaam | On transit |
| Finalize transcribing of qualitaive data | Dar es Salaam |
| Develop code book for qualitative data | Dar es Salaam |
| Development analytical plan for quantitative data | Dar es Salaam |
| Develop detailed outline for technical report and submit to Districts for approval | Dar es Salaam |
| Description and interpretation (analysis) of the qualitative and quantitative data | Dar es Salaam |
| Write up of the evaluation draft report | Dar es Salaam |
| Submission of the draft reprot to Districts for review | Dar es Salaam |
| Receiving feedback on the report | Dar es Salaam |
| Integration of comments/feedback to the reviewed draft report | Dar es Salaam |
| Submision of the final report | Dar es Salaam |

## Appendix 3: Training program

| Time | Topic |
|---|---|
| **Day 1** | |
| 8:00 - 8:30 | -Registration and opening remarks |
| 8:30 - 9:00 | - Overview of the OR training. |
| 9:00 - 9:30 | - Pre-test |
| 9:30 - 10:00 | - Introduction to operational research |
| 10:00 - 10:30 | **Tea break** |
| 10:30 - 13:00 | - Choosing a topic for operational research<br>- Goals and objectives for operational research<br>- Identifying stakeholders to participate in operational research |
| 13:00 - 14: 00 | **Lunch Break** |
| 14: 00 - 14:30 | - Writing a study protocol |
| 14:30 - 15:00 | - Ethical considerations in OR<br>- Work plans and gantt charts |
| 15:00 - 16:00 | - Class activity – Identifying OR topic, formulating SMART objectives, Gantt chart |
| 16: 00 - 17:00 | - Class presentations |
| **Day 2** | |
| 8:00 - 9:00 | - Types of data and data-collection methods |
| 9:00 - 9:30 | - Designing quantitative data collection tools |
| 9:30 - 10:00 | - Designing qualitative data collection tools |
| 10:00 - 10:30 | **Tea break** |
| 10:30 - 11:30 | - Sampling techniques |
| 11:30 - 13:00 | - Sample size calculations |
| 13:00 - 14: 00 | **Lunch Break** |
| 14:00 - 15:30 | - Class activity – Designing questionnaire and calculating sample size |
| 15:30 - 17:00 | - Class presentations |
| **Day 3** | |
| 8:00 - 10:00 | - Data collection, management and analysis |
| 10:00 - 10:30 | **Tea Break** |
| 10:30 - 13:00 | - Data interpretation and visualization |
| 13:00 - 14: 00 | **Lunch Break** |
| 14:00 - 14:15 | - Qualitative Data management and analysis |
| 14:15 - 15:30 | - MS Excel &/SPSS orientation and class practical session<br>• Overview, exploration, data entry, creating and recoding variables |
| 15:30 - 16:30 | - MS Excel &/SPSS orientation and class practical session<br>• Importing excel data, analysis (mean median descriptive tables) |
| | |

| Time | Topic |
|---|---|
| **Day 4** | |
| 8:00 - 9:00 | - Recap of data analysis section |
| 9:00 - 10:00 | - MS Excel &/SPSS orientation and class practical session<br>• Visualization + any other queries |
| 10:00 - 10:30 | **Tea break** |
| 10:30 - 12:30 | - Discussion of findings in the OR report<br>- Writing conclusions and recommendations<br>- Dissemination of OR findings |
| 12:30 - 13:00 | - Team work in OR |
| 13:00 - 14: 00 | **Lunch Break** |
| 14:00 - 15:00 | - Class Activity (case study) |
| 15:00 - 16:30 | - Class Activity (Finalization of OR protocols) |
| **Day 5** | |
| 8:00 - 10:00 | - Group work presentations of LGA OR protocol |
| 10:00 - 10:30 | **Tea break** |
| 10:30 - 11:30 | - Group work presentations of LGA OR protocol |
| 11:30 - 11:45 | - Post-test |
| 11:45 - 13:00 | - GRADUATION (Closing remarks and handing over certificates) |

## Appendix 4: List of contributors

| Contributors | Institution |
|---|---|
| Dr. Mary Mwanyika-Sando<br>Dr. Dominic Mosha<br>Dr David Sando<br>Selemani Mbuyita<br>Isaac Lyatuu<br>Frank Mapendo<br>Amani K. Tinkasimile<br>Mashavu H. Yussuf<br>Magdalene Mbando | Africa Academy for Public Health (AAPH) |
| | |
| Grace Moshi | Ministry of Health Community Development Gender, Elderly and Children (MoHCDGEC) |
| | |
| Dr. Adiel Mushi | National Institute of Medical Research (NIMR) |
| | |
| Mwita Waibe<br>Dr Ndeniria Swai<br>Neema Kweba | The President's Office-Regional Administration and Local Government (PO-RALG) |
| | |
| Sauli Epimack<br>Juliet Itatiro | Tanzania Food and Nutrition Centre (TFNC) |
| | |
| Alex Rutto<br>Gabrielle Nguyen<br>Ntimi Mwakipake | Save the Children |
| | |
| Jane Msagati<br>Octavius Kisinda | PANITA<br>Deloitte |

# Appendix 5: Case Study

## Background

Despite large efforts to strengthen the implementation of Health Management Information System (HMIS), there exist substantial gaps in the quality of data that is being collected at the health facilities. There is published evidence of challenges on quality of data in the routine HMIS. These deficiencies in quality of data have been categorized as completeness, timeliness, reliability, consistency, archiving, and integrity. The listed categories altogether comprise the validity of collected and reported data.

## Objectives

The purpose of this assessment was to generate evidence on the existing gaps in quality of the routine maternal and nutrition HMIS data and its underlying factors to inform processes that are aimed at improving the same. This work has the following aims: assess quality of nutritional data at health facility and district level; determine the factors that influence quality of nutrition data at health facility and district level; and to formulate recommendations for quality improvement strategies in nutritional and maternal health routine data.

## Approach

This assessment reviewed the routine HMIS data collected from maternal and child nutrition health services and interviewed responsible facility and district staff for data collection and reporting to ascertain quality of data and factors affecting it. It was carried out in six councils. These councils were: Councils A, B; C; D; E; and F. Ten health facilities were randomly selected from each district to participate in the assessment, which resulted in a total of 60 health facilities; and 6 councils' Health Management Information System (HMIS) offices.

## Results

**Retrieval:** Approximately, 66.4% of the submitted monthly summary reports were successfully retrieved at the district level. About 97.6% of monthly summary reports were successfully retrieved at health facility level. Labour summary report was the least retrieved among the three types of reports (ANC, Child and Labour reports).

**Timeliness**: 62% of monthly reports were not uploaded timely into DHIS2 in Council A. About 88.3% of child reports were uploaded on time in Council F.

**Integrity:** Council B had no procedures to minimize transcription errors. Council B, C and F had no mechanisms to prevent unauthorized changes to entered data.

**Reliability:** All (100%) councils were found to have data flow and report generation guidelines in place to ensure the same process is followed each time of report generation.

**Completeness**: 81% of child monthly reports were completely entered into DHIS2 database. 42% and 15% of labour summary reports and child registers were completely filled at the health facility level, respectively.

**Consistency:** We found that 87.7% of data was consistent at the district level and 41% consistent at the facility level. Council F had the least consistent rates, with only 5% of child reports and 40% of labour reports being consistent.

## Conclusion

We observed significant differences in quality of data of HMIS system across councils and health facilities. The major data quality issues at the district level were filing and storage of the submitted reports and delay in uploading data into the DHIS2 system. At the facility level, the major gaps in data quality were inconsistency between data sources and a high degree of incompleteness of registers. These findings suggest a need for capacity building and sustained mentorship at district and facility levels for data quality improvement.