Monitoring and Evaluation Facilitator's Guide

FSN Network M&E Task Force

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The Technical and Operational Performance Support (TOPS) Program is the USAID/Food for Peace-funded learning mechanism that generates, captures, disseminates, and applies the highest quality information, knowledge, and promising practices in development food assistance programming, to ensure that more communities and households benefit from the U.S. Government's investment in fighting global hunger. Through technical capacity building, a small grants program to fund research, documentation and innovation, and an in-person and online community of practice (the Food Security and Nutrition [FSN] Network), The TOPS Program empowers food security implementers and the donor community to make lasting impact for millions of the world's most vulnerable people.

Led by Save the Children, The TOPS Program is a consortium program drawing on the expertise of its partners: CORE Group (knowledge management), Food for the Hungry (social and behavioral change), Mercy Corps (agriculture and natural resource management), and TANGO International (monitoring and evaluation). Save the Children brings its experience and expertise in commodity management, gender, and nutrition and food technology, as well as the management of this 5-year (2010–2015) US$20 million award.

Disclaimer:

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Contact:

The TOPS Program
c/o Save the Children
2000 L Street, NW, Suite 500
Washington, DC 20036
info@thetopsprogram.org
www.thetopsprogram.org

Contents

Abbreviations and Acronyms

AIDS	acquired immune deficiency syndrome
ANOVA	Analysis of Variance
BMI	body mass index
CI	confidence interval
DFD	data flow diagram
DH	Development Hypothesis
DHS	Demographic and Health Surveys
DIP	Detailed Implementation Plan
DQA	Data Quality Assessment
EOP	end of program
FANTA	Food and Nutritional Technical Assistance Project
FFA	Food for Assets
FFP	USAID Office of Food for Peace
FFPO	Food for Peace Officer
FFW	Food for Work
FGD	focus group discussion
FSN Network	The Food Security and Nutrition Network
FY	fiscal year
HAZ	height-for-age z-score
HDDS	Household Dietary Diversity Score
HH	household
HHID	household ID (identification)
HIP	Hygiene Improvement Project
HIV	human immunodeficiency virus
IEE	Initial Environmental Examination
IPTT	Indicator Performance Tracking Table
IR	Intermediate Result
kg	kilogram(s)
KII	key information interview
KPC	Knowledge, Practice and Coverage (survey)
m^2	square meter(s)
M&E	monitoring and evaluation
MCHN	maternal and child health and nutrition

NGO	nongovernmental organization
ODBC	Open Database Connectivity
ORT	oral rehydration therapy
PIRS	Performance Indicator Reference Sheet
PMP	Performance Monitoring Plan
PPS	probability proportional to size
PVO	private voluntary organization
RF	Results Framework
SD	standard deviation
SE	standard error
SI	sampling interval
SO	Strategic Objective
SOW	scope of work
SPSS	Statistical Package for Social Science
SRS	simple random sampling
The TOPS Program	The Technical and Operational Performance Support Program
TIPS	Trials of Improved Practices
TOC	Theory of Change
UN	United Nations
USAID	U.S. Agency for International Development
WAZ	weight-for-age z-score
YR	year
%	percent
#	number
≥	greater than or equal to
<	less than
≤	less than or equal to

Acknowledgements

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Special thanks are extended to Arif Rashid, who drafted the first two modules during his tenure at TOPS; his contribution laid the ground work for this needed resource for the M&E community. Many thanks go out to the TANGO International team that worked tirelessly to write and refine various sections and to identify appropriate exercises and reference materials: Towfique Aziz (all lessons), Mark Langworthy (Module 3 Lessons 3.4.4 and 3.5.1), Tom Bower (Module 3 Lessons 3.3.1 to 3.3.3), Laurie Starr (Module 1 Lessons 1.1 to 1.3, Module 2 Lessons 2.1 to 2.4, and Module 3 Lessons 3.4.1 to 3.4.3), Vicki Brown (Module 3 Lessons 3.6.1 to 3.6.2), and Lisa Woodson (Module 3 Lesson 3.6.2). Additional gratitude goes to Matthew Fornoff, Monica Mueller, and Maryada Vallet for their work on editing and formatting the guide.

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Lastly TOPS wishes to sincerely thank everyone who contributed in any way to the development of this important resource. We hope it will go a long way in improving the capacity of M&E practitioners all over the world wherever they may be.

Edith Mutalya
Senior M&E Specialist
The TOPS Program

Foreword

The Technical and Operational Performance Support (TOPS) Program Monitoring and Evaluation (M&E) Task Force developed the *Monitoring and Evaluation Facilitator's Guide* through a collaborative effort with inputs from a wide range of practitioners, including consultants at TANGO International and M&E practitioners via the M&E Task Force. The guide was developed to support M&E practitioners in the USAID Office of Food for Peace (FFP) community. This publication of this guide marks a significant milestone in The TOPS Program's efforts to create a multiplier effect through empowering senior M&E cadres to strengthen the capacity of M&E among their colleagues and partner organizations. In a way the guide also introduces the "new" mindset that the donor, FFP, has about strengthening program performance measurement and data quality. The M&E Task Force also designed the guide to address the M&E gaps identified through capacity assessments conducted in the past. The tool was developed.

Introduction

The purpose of the *Monitoring and Evaluation Facilitator's Guide* is to provide facilitators with guidance and tips on leading a monitoring and evaluation (M&E) knowledge and skills transfer course. The guide was designed to lead to an interactive, skill-building training and to improve the knowledge and proficiency of both new and experienced staff. The guide is part of a package that consists of the facilitator's guide, PowerPoint slides, exercises/group work, and reference materials.

Preparation for Training

For a training to be successful, it is critical for the facilitator to be knowledgeable in the content he/she is training. Even a seasoned facilitator with the best training skills needs to be confident in the course content.

Before the training, you, as the facilitator, should review all slides, reference materials, and exercises; be prepared to answer questions and explain concepts; and anticipate topics participants may find confusing and plan ways to navigate difficult sections and topics ahead of time.

Additionally, facilitators should come up with ideas to keep the course engaging, interactive, and relevant to the local area. Before the training, facilitators should become familiar with the program(s) and context so that they cite relevant examples in the presentation and exercises.

Summary of the Modules

Module 1 focuses on explaining key M&E terminology and concepts from program design, implementation, and evaluation stages, including Theory of Change (TOC), Results Framework (RF), indicators, targets, quantitative sampling, and gender considerations in M&E. Additionally, the module discusses important tools like the Indicator Performance Tracking Table (IPTT), data flow maps, and their utility.

Module 2 tackles qualitative methods, a line of systematic inquiry that focuses on complex relations between personal and social meanings; individual, social, and cultural practices; and the environment or context in which these practices occur. The module discusses the utility of qualitative methods, the various tools at your disposal, and the complementarity between qualitative and quantitative research. Group work is designed to provide hands-on opportunities for participants to apply the theory to real-world situations.

Module 3 introduces participants to the practical aspects of dataset creation, data management, rudimentary statistical analysis, and tabular and graphical presentation of results in the user-friendly environment of SPSS. Through hands-on experience, participants will learn how to perform such routine tasks as entering and cleaning data, deriving new variables from existing ones, choosing and implementing appropriate analytical techniques, graphing and tabulating their results, and documenting and protecting work. Materials are grounded in examples drawn from commonly encountered situations in food security programing, such as needs assessments and various forms of program evaluation.

Module 1:
Monitoring and Evaluation

Lesson 1.1: M&E Overview

This session is typically presented as a plenary session. The information provided here is primarily meant for users completing the lesson on their own.

The estimated duration of this module is **30 minutes**.

Learning Objectives

Lesson 1.1 will help participants:

- Gain a basic understanding of conceptual frameworks for program design and planning as a basis for designing M&E systems
- Understand basic concepts of and differences between monitoring and evaluation
- Become familiar with key terminology

Companion Materials

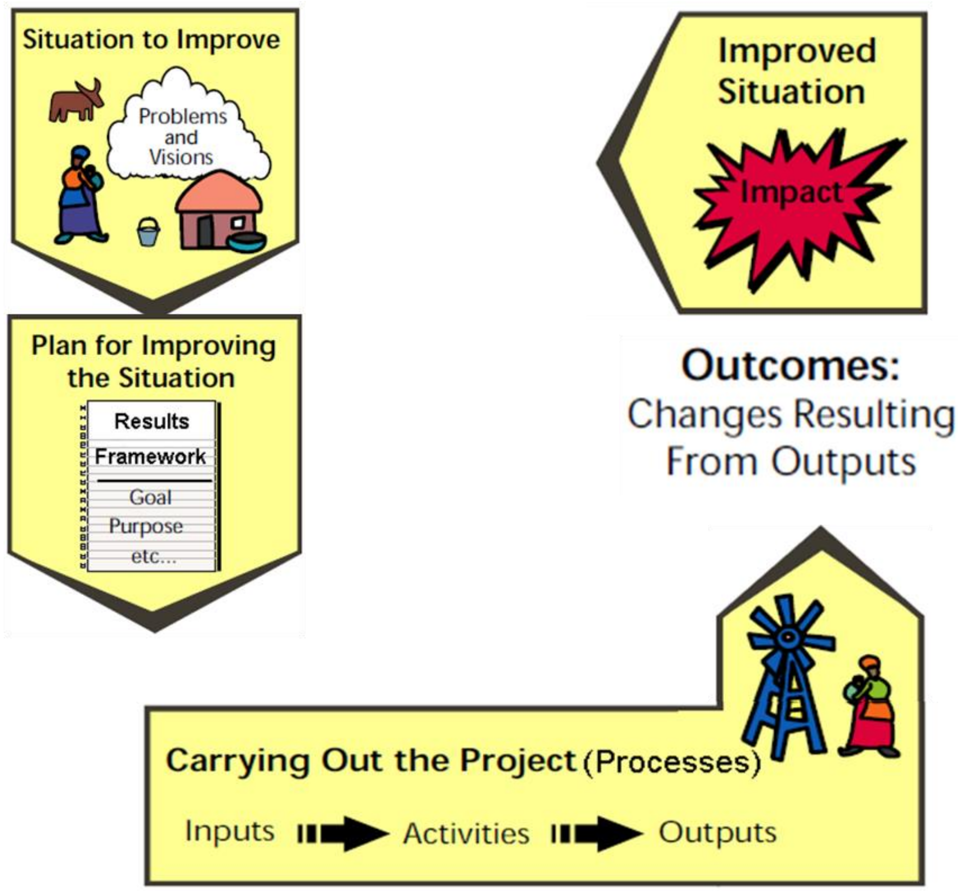
The PowerPoint presentation **1.1 M&E Overview.ppt** accompanies this lesson as a separate file.

Handout 1.1.1: M&E Terminology is provided at the end of this lesson. Be sure to provide copies to each participant.

Slides

Slide 1: Project cycle

Program design and M&E are inextricably linked. Program design is an important step in the project cycle, with the M&E system an output of program design. The M&E system allows for tracking and measuring change, helping to pinpoint where, when and how the processes of change are occurring (or not).



Slide 2: List of terms to review

Facilitator's note: You can also use the accompanying handout on definitions to review and/or familiarize workshop participants with terminology common to M&E.

Terms commonly used in M&E and with which practitioners should be familiar:

- Input
- Activities
- Output
- Outcome
- Impact
- Process monitoring
- Proxy indicators
- Results framework
- Performance Monitoring Plan (PMP)
- Indicator Performance Tracking Table (IPTT)

Slide 3: Inputs

Inputs – Those elements required in order to implement a project

- Trained personnel
- Guidelines and manuals
- Training materials

- Kits, tools, and other supplies
- Resources – cash and in-kind

Slide 4: Outputs

Outputs – What the project delivers as a result of its activities

- Amount of materials distributed (e.g., quantity of seeds delivered)
- Number of beneficiaries that received training (e.g., farmers, health volunteers)
- Number of clients that received counseling (e.g., ante-natal, post-natal)
- Number of people reached
- How much infrastructure was built

Slide 5: Outcomes

Outcomes – the results of the project or changes that occur either immediately or sometime after activities are completed

- Changes in knowledge, behavior, attitudes, and skills
  - Farmers that used a new farming technique
  - Mothers that exclusively breastfeed a newborn
- Changes in systems
  - Ag extension workers are responsive to farmers needs
  - Quality of services provided by maternal and child health and nutrition (MCHN) staff are improved

Slide 6: Impact

Impact – the wider effect of the project on long-term results

- Under nutrition rates decreased
- Food insecurity reduced
- HIV mortality and morbidity decreased
- Household income increased

Slide 7: Process Monitoring

Process monitoring – measures the quality of project and program implementation

- Health promoters demonstrate adequate technical knowledge on most MCHN topics on which they received training
- Agriculture promoters receive proper tools from the project
- The warehouse meets standards established by regulation
- Model gardens established by the project meet quality standards prescribed in guidelines

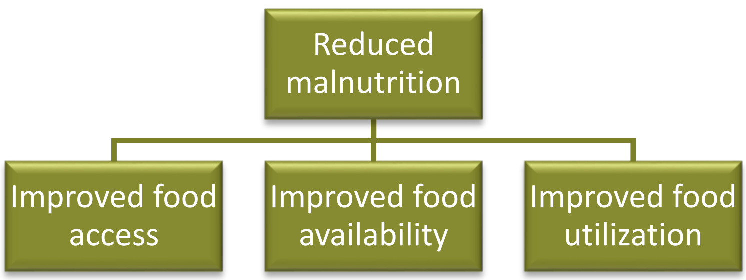
Slide 8: Proxy Indicators

Proxy indicators – an indirect way to measure the subject of interest

- The subject of interest cannot be measured directly. This is particularly the case for more qualitative subjects, like behavioral change, living conditions, good governance, etc. (e.g., HDDS is a proxy indicator for income).
- The subject of analysis can be measured directly but it is too sensitive to do so (e.g., level of income, "safe sex" in the context of HIV/AIDS interventions).

Slide 9: Results Framework

Results framework – a "logic model which represents the food aid program's theory of change by laying out the activities and outputs that will lead to short, medium and long term outcomes and objectives."[1]



Slide 10: Performance Monitoring Plan

PMP is "a tool USAID operating units use to plan and manage the collection of performance data. Sometimes the plan also includes plans for data analysis, reporting, and use."[2]

Slide 11: Indicator Performance Tracking Table

IPTT – a comprehensive list of project indicators "which includes performance indicators (at the impact, outcome and output levels) linked to the food aid program proposal's objectives and baseline and target values for each indicator (estimated)."

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[1] USAID Office of Food for Peace. 2010. USAID Performance Monitoring and Evaluation TIPS: Building a Results Framework. Second Edition.

[2] USAID Office of Food for Peace. 2010. USAID Performance Monitoring and Evaluation TIPS: Preparing a Performance Management Plan. Second Edition.

Slide 12: Stages of project results

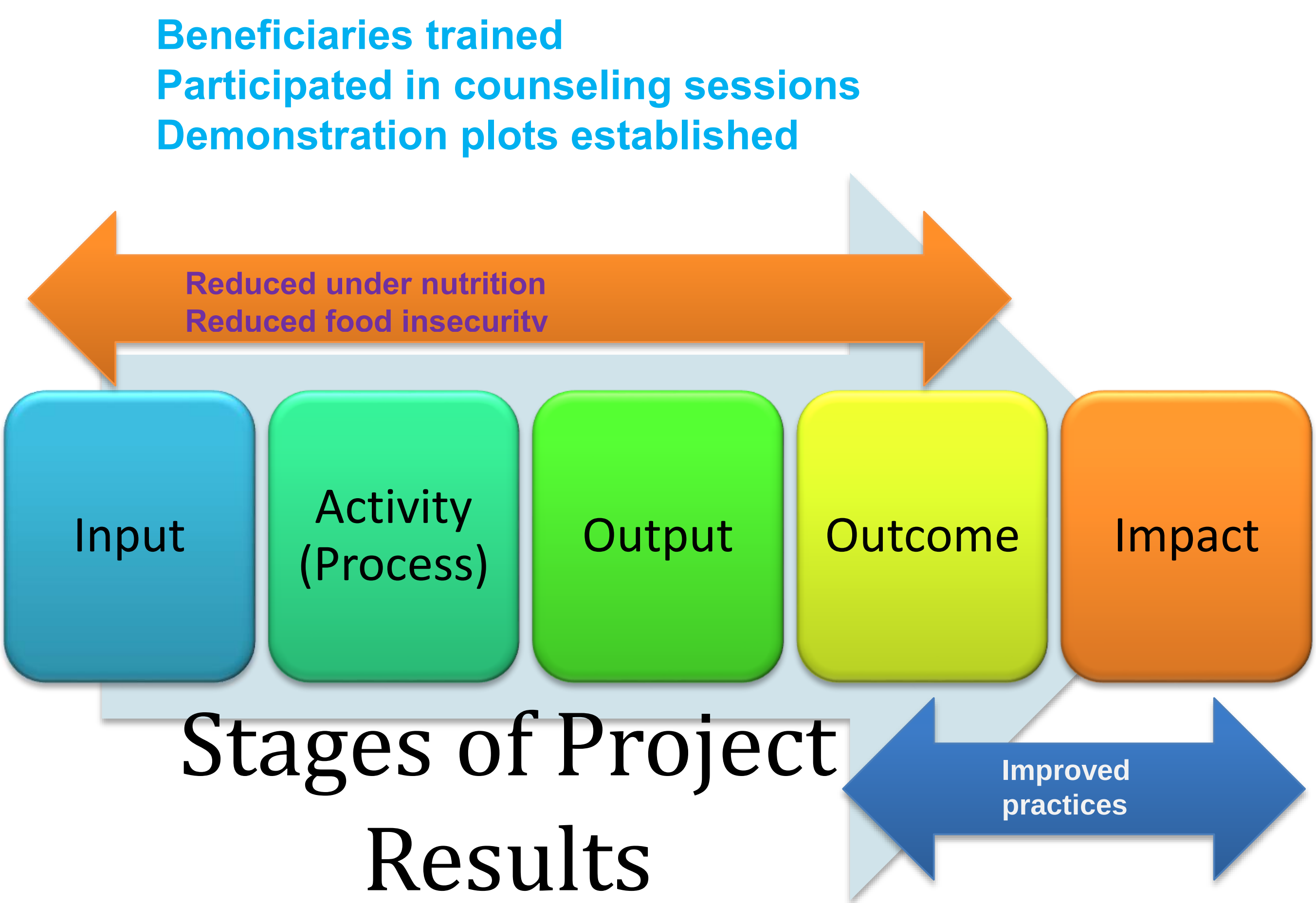
Each level of an M&E system relates to a level in the results framework. At each level, specific measurable objectives and results (early, intermediate and long-term) are identified, and information is collected and analyzed in order to assess project progress, performance and impact.

Input → Process → Output → Outcome → Impact

Slide 13: Results Continuum

Monitoring and evaluation should be approached as a "continual learning process rather than a single information gathering exercise."[3]

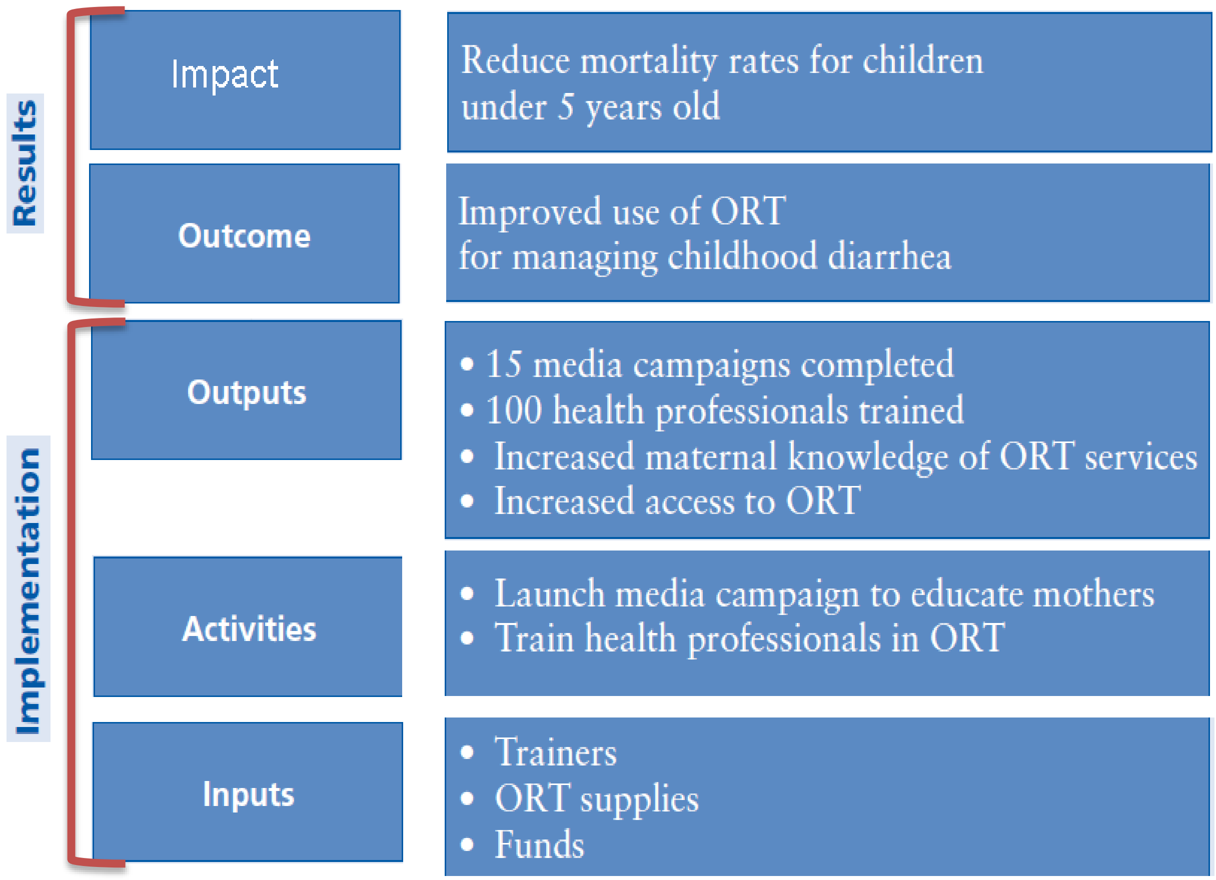
The M&E timeline and data collection levels follow the results framework.



[3] Guijt, I. and J. Woodhill. 2002. Managing for Impact in Rural Development: A Guide for Project M&E.

Slide 14: Results

Every project design employs a *hierarchy of basic elements* known as: *inputs, activities, outputs, outcomes, and impacts*. These elements of project design are also components of the logical framework, the results framework, and the M&E system for that particular project.[4] A project involves a progression of activities beginning from the design phase through implementation to the evaluation stage. A project mobilizes a set of *inputs* (e.g., human and financial resources, equipment) to carry out *activities* (e.g., training sessions, infrastructure building) that generate *outputs* (e.g., number of people trained, kilometers of road built). Outputs contribute to *outcomes*, which are changes in behaviors or systems among project participants (e.g., increased knowledge, improved practices) among the program participants. Outcomes contribute to *impacts*, which are sustainable improvements in conditions at the household, community or regional level (e.g., reduced malnutrition, improved food production).



[4] TANGO International. 2007. Monitoring and Evaluation Manual. Prepared for ADRA International.

Slide 15: Defining Monitoring

What does the "M" in M&E stand for?

- Monitoring is a **continuous** function that uses the systematic collection of data on specified indicators to provide **management** and the **main stakeholders** of an ongoing development intervention with indications of the extent of **progress in project implementation** and **progress in the use of allocated funds**.
- Results-based monitoring also collects and analyzes information to **compare** how well a project, program or policy is being implemented against **expected results**.

Slide 16: Key differences

- Performance monitoring tracks "performance indicators" to see whether desired **results** are occurring and whether implementation is on track.
- Performance monitoring shifts its focus from "how well the activities of the project are being implemented" to answering "whether the goals and purposes of the project are being achieved."
- How can it be evidenced?

Slide 17: Defining Evaluation

What does the "E" in M&E stand for?

- Evaluation is the systematic collection and analysis of information about the characteristics and outcomes of programs and projects as a basis for judgments, to improve the effectiveness and/or inform decisions about current and future programming.
- Often involves measuring changes in knowledge, attitudes, behaviors, skills, community norms, utilization of services & status at population level.

Slide 18: Timing of Evaluations

Evaluations are typically conducted three times during the life of a Development Food Assistance program:

1. Baseline
   - Often a quantitative survey for the baseline
   - A mixed method is preferable over only quantitative method

2. Mid-term evaluation
   - Often a qualitative study; primarily focusing on **the project processes** and an evaluation of the short to medium term **project results**
3. Final evaluation
   - Often a mixed method approach focusing on the effectiveness of the project and capturing learning

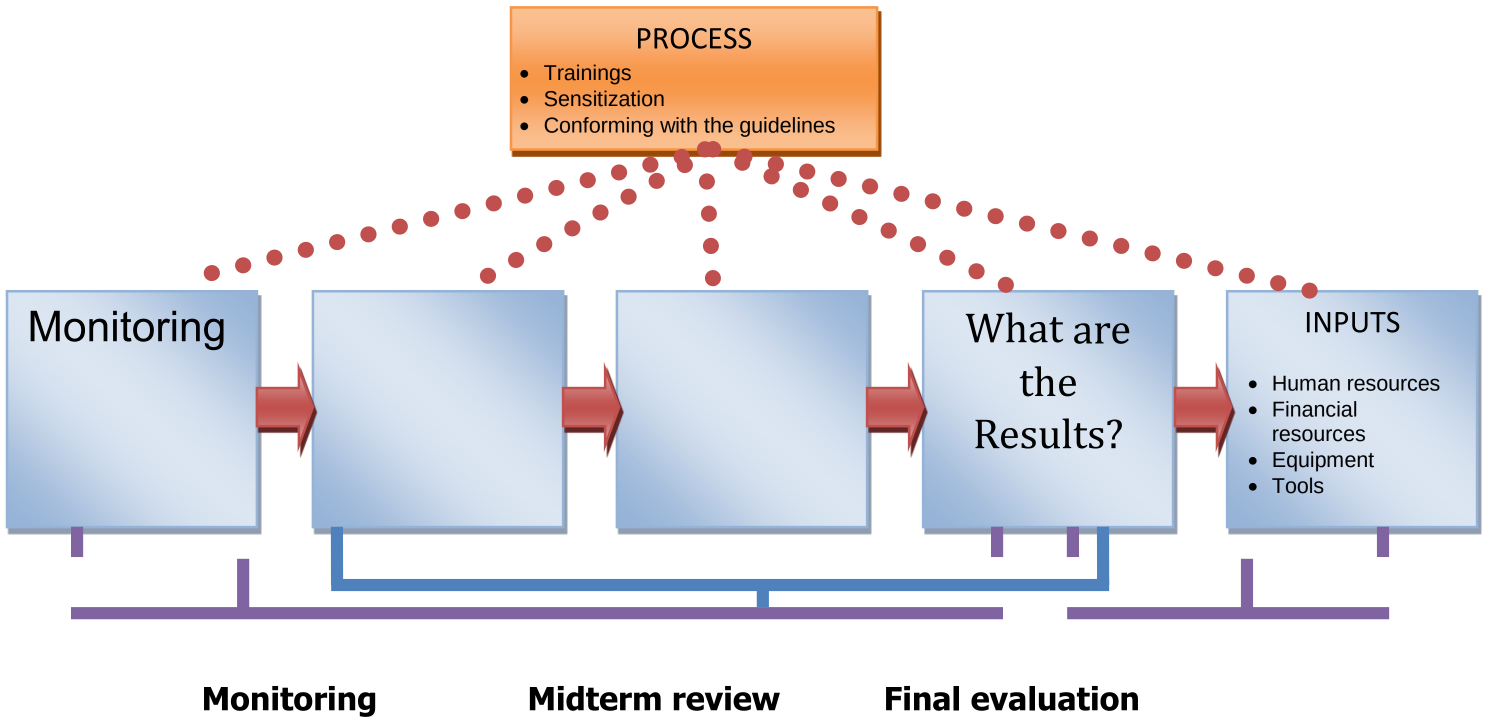
Slide 19: Types of Evaluation

- **Impact evaluations** measure the change in a development **outcome** that is attributable to a **defined intervention**.
- Evaluations are based on **models of cause and effect** and require a credible and rigorously **defined counterfactual** to control for factors other than the intervention that might account for the observed change.
- **Performance evaluations** focus on **descriptive** and **normative** questions: what a particular project or program has achieved, how is it being implemented, how it is perceived and valued, whether expected results are occurring, and other questions that are pertinent to program design, management and operational decision-making.
- Performance evaluations often incorporate **before-after** comparisons. Most Office of Food for Peace projects require a performance evaluation.

Summary of Key Concepts

- Monitoring is a **continuous process** of collecting and analyzing information to compare how well a project, a program or policy is being implemented against expected results.
- Monitoring provides managers and other stakeholders with **regular feedback** and early indications of progress or lack thereof in the achievement of intended results.
- A monitoring and evaluation system is constructed according to the **logical framework** or **results framework** of a project.

Handout 1.1.1: M&E Concepts and Terminology



Components of an M&E Framework

Input: The range of resources used for project implementation such as financial resources, food resources, staff, curricula and materials.

Examples: Money, tons of food commodities, training manuals, organizational capacity, skilled human resources, equipment.

Process: Services that the project provides to accomplish its objectives such as training, workshop, outreach activities, counseling sessions, community mobilizing activities and curriculum development.

Examples: Trainings provided, workshops organized, sensitization sessions provided, quality of the training sessions, level of knowledge of staff or providers on the subject matter, farmer field days organized.

Output: Quantifiable products (number of trainees, immunized children, activities implemented) that result from the combination of inputs and processes.

Examples: Seeds or tree saplings distributed; farmers trained on integrated pest management; mothers trained on feeding practices, demonstration farm established; kilometers of road build, social and behavior change communication manual developed.

Outcome: Changes in human behavior and practices (improved health practices, increased knowledge of nutrition) as well as systems. Systems changes may include institutional competency (e.g., improved health-care systems), policy change (e.g., new or revised policies, change of enforcement) or service changes (e.g., more effective extension system).

> Examples: Acres of land under Systems of Rice Intensification; Farmers are participating in collective marketing, Mothers follow exclusive breast feeding practices until six months of their child; Households demonstrate appropriate hand washing behaviors; irrigation equipment and drains are well maintained; improved quality of counseling sessions by the health volunteers; agricultural extension service providers are responsive to farmers need; new policies enacted and enforced on tree tenure.

Impact: Equitable and durable improvements in human wellbeing and social justice. Long-term results of one or more projects over time, such as changes in morbidity and mortality (often also referred to as long-term objectives).

> Examples: Reduction in levels of under nutrition, increased food security of target households, increased income for practicing farmers; improved safety nets for vulnerable households; increased environmental stability.

Proxy Indicator: Proxy-indicators refer to an indirect way to measure a subject of interest. Proxy indicators are used in cases when the subject of interest cannot be measured directly, or it is sensitive or too complicated to measure or not cost effective.

> Examples: Level of income or, in the context of an HIV/AIDS intervention, "safe sex", In the Office of Food for Peace project, Household Dietary Diversity Score is a proxy indicator to measure income. Asset index is also another proxy indicator measure income.

Types of M&E

Assessments:

- Collection of information and data needed to plan programs/projects and initiatives. These data may describe the needs and risks of the population, as well as the context, level of household and community resilience, program response, household capacities (human, social, financial, physical, and natural), shocks, levels of vulnerability to food and livelihood insecurity.
- A typical food insecurity assessment collects information to answer the following questions:

1. Who are the food insecure?
2. How many are they?
3. Where do they live and why?
4. Why are they food insecure?
5. Does food aid have a role to play?

Input/Output Monitoring:

- Collects data describing the individuals served, the services provided, and the resources used to deliver those services.
- Answers questions such as:
  - What services were delivered?
  - Quality of services?
  - What population was served and what numbers were served?
  - What staffing/resources were used?

Process Monitoring:

- Collects and analyzes information about how project interventions were delivered, level of knowledge of staff and service providers on subject matter, quality of services provided, quality of systems, methods and tools used in the project, and the quality of training and counseling sessions.
- Answers questions such as:
  - Using an example of growth monitoring: What is the quality of growth monitoring sessions? Does the health volunteer follow the process properly (calibrating scale, hanging scale following the recommended process, explain the objectives, seeks permission, unclothe the child before weighing, properly weigh the child, reading the measurement, recording the measurement, have a discussion with the mother about the weight, child status, consequences and steps to take)?
  - Do the staff or service providers have the right knowledge and skills?
  - Whether the commodity tracking and management system is in line with the regulations?

Outcome Monitoring:

- Collects and analyzes information on the immediate results of the project outputs. What others (such as beneficiaries) do on their own (influenced by the project's outputs as well as external factors)? The realization of outcome depends on the quality of outputs and the logic of the project hypothesis being sound.

- Answers the questions:
  - Did the expected outcomes occur, e.g., expected knowledge gained?
  - Did the expected change in behavior occur?
  - Did the expected client use of services occur?
  - Did the expected quality of services improve?

Performance Evaluation:

- Performance evaluations focus on descriptive and normative questions. Questions that are pertinent to program design, management and operational decision making. Performance evaluations often incorporate before-after comparisons, but generally lack a rigorously defined counterfactual.

- Answer questions such as:
  - What a particular project or program has achieved (either at an intermediate point in execution or at the conclusion of an implementation period)?
  - How the project is being implemented?
  - How the project is perceived and valued?
  - Whether expected results are occurring?

Impact Evaluation:

- Collects data to measure the change in a development outcome that is attributable to a defined intervention; impact evaluations are based on models of cause and effect and require a credible and rigorously defined counterfactual to control for factors other than the intervention that might account for the observed change. Impact evaluations in which comparisons are made between beneficiaries that are randomly assigned to either a “treatment” or a “control” group provides the strongest evidence of a relationship between the intervention under study and the outcome measured.

- Both answer the question:
  - What long-term effects have interventions had on key impact indicators and whether the changes in key indicators can be attributable to the project interventions?

Lesson 1.2: Revisiting IPTT: What makes a good IPTT?

A good monitoring and evaluation plan has a system for defining project goals and objectives, setting targets for achievement, and measuring progress against those targets in a consistent, systematic way. While the term "**indicator performance tracking table"** and the acronym **"IPTT"** apply specifically to USAID projects, the design and implementation concepts represented by the IPTT are essential to any tool for tracking project performance.

It is recommended that course participants have on hand a copy of their own project's IPTT while they review this lesson. This will help participants apply their learning to a real-world project with which they are familiar, and be used during the lesson activities. If participants do not have IPTT documents, they may be paired or grouped with others who do; alternatively, the facilitator may provide a sample IPTT for use during the activities.

The estimated duration of this lesson is **2 hours**.

Learning Objectives

Lesson 1.2 will help participants:

- Understand the purpose and components of the IPTT
- Define and distinguish between different types of indicators and how they correspond to the results framework
- Be able to design good indicators and targets based on quality criteria

Companion Materials

Two PowerPoint presentations accompany this lesson as separate files. Use the "IPTT" file for the main presentation. The "Indicator knowledge test" file presents answers to the short "Test your knowledge on Indicators" quiz.

- **1.2 IPTT.ppt**
- **1.2a Indicator knowledge test.ppt**

The following handouts are provided at the end of this lesson. Be sure to provide copies of each to each participant.

- **Handout 1.2.1: Creating Indicators Activity**
- **Handout 1.2.2: Creating Indicators Worksheet**
- **Handout 1.2.3: Sources of Standard International Indicators**
- **Handout 1.2.4: Test Your Knowledge about Indicators**

Slides

Slide 1: What is IPPT?

Indicators and **performance targets** are the backbone of M&E systems. An **indicator** is a variable, measure or criterion that measures one aspect of a program/project: an indicator verifies whether an intended change actually occurred. **Performance targets** represent commitments that development agencies make about the level and timing of results to be achieved by a program (USAID 1996): they are the planned values of indicators. Non-USAID programs may define performance targets similarly. A performance target should be established for each indicator. It may be quantitative (defining a quantity of change) or qualitative (defining a quality of change).

Indicators and performance targets are the key components of the **IPTT**.

IPPT stands for i**ndicator performance tracking table.** The USAID Office of Food for Peace (FFP) requires Development Food Assistance program awardees to develop an IPTT and utilize it for all project phases – from proposal development, project start-up and baseline study, and throughout the life of the project.

"The **indicator performance tracking table (IPTT)** … includes performance indicators (at the impact, outcome and output levels) linked to the food aid program proposal's objectives, and baseline and target values for each indicator (estimated)."

Slide 2: Purpose of IPTT

The IPPT is part of the **M&E plan**. The purposes of the IPPT are to help you:

- Improve the program
- Meet FFP reporting requirements
- Conduct M&E in ways that are not too costly or burdensome
- "Tell a story" about the project

All the indicators in the IPTT should serve at least one of the purposes above. This lesson will go into further detail about what makes a good indicator.

It is important to remember that while the IPTT serves FFP requirements, it is an important M&E tool in and of itself. The IPTT should therefore include not only the indicators mandated by FFP, but additional indicators relevant to program management.

The IPTT should be reviewed on an annual basis. Modifications are permissible; however they must be approved by FFP to be part of the official IPTT. Before making modifications, you should be sensitive to how these changes will affect data collection and analysis over the life of the project. There should be consistency of indicators and sufficient data availability to enable monitoring of the same indicators over time and to compare across baseline, midterm and endline data.

Slides 3–6

These small group exercises are summarized in Slides 3–6.

Objective: Participants review their own IPTT and identify the purposes of different indicators

PART ONE

Time needed: 15 minutes

Instructions: Participants work as partners in two-person teams. Each partner examines his/her own IPTT and identifies:

- One indicator that will be used to report to FFP.
- A different indicator that will be used to improve the program.
- A different indicator that will be used to "tell the story" about the project to other organizations, funders, communities or beneficiaries.

Partners take turns sharing the indicators they have selected and explaining how they each be used for the purpose identified.

PART TWO

Time needed: 15 minutes

Instructions: This exercise may use the same teams as above or combine them into larger groups, depending on the size of the overall group. Each group selects a single section of an IPTT to focus on: all group members will review the same section together.

As a group, label each indicator in the selected section as helping you to:

- Fulfill reporting requirements
- Improve your program
- Tell your story
- NONE OF THE ABOVE

Save this work. It will be used later in the lesson to revise and improve indicators based on lesson content.

To close, the partners from PART ONE rejoin. They should take about five minutes to answer these questions:

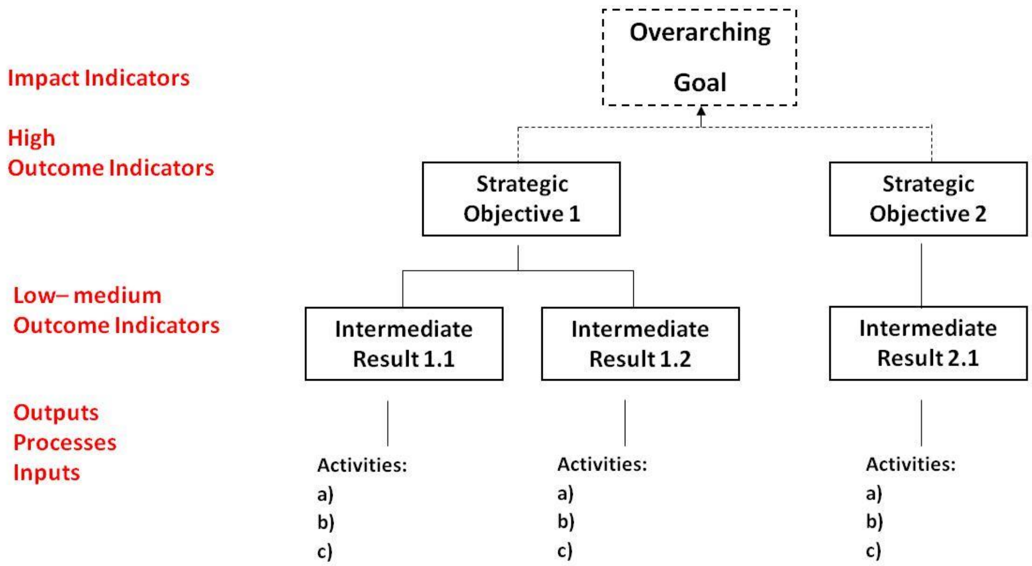
1. What did you learn about indicators or your IPTT that you didn't know before?
2. What do you plan to do differently as a result of what you've learned?

Slide 7: How are RF and indicator levels related?

There are five main types of indicators that measure different aspects of the M&E system, all of which relate to outcomes and the fulfillment of objectives that result in impact:

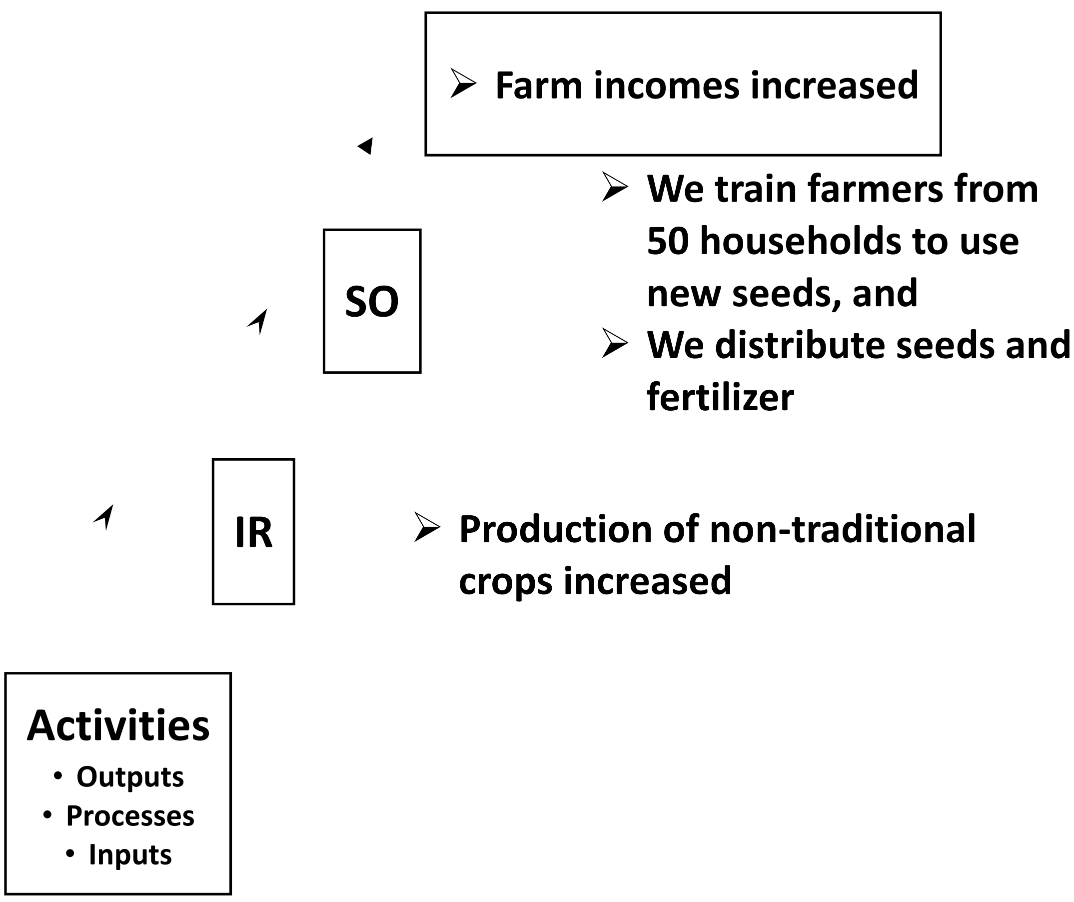
- **Input Indicators**: indicators that measure inputs such as number of training materials, staff members, infrastructure, etc. These indicators describe what goes into a program.
- **Process or Activity Indicators**: indicators that measure process-oriented activities such as the number of training workshops conducted, number of site visits, etc. These indicators describe the number of activities or their level of completion.
- **Output Indicators**: indicators that measure the end results of program components such as the number of staff members trained, number of materials distributed, number of cooperatives established, etc. These indicators describe the goods and services produced by the program activities.
- **Outcome (effect) Indicators**: indicators that measure the change in systems or behaviors resulting from the achievement of an intermediate goal/result/target (objectives), such as the percentage of staff members who are competent (scoring above 75% on competency test), the number of clinics meeting new quality standards or the number of women breastfeeding.
- **Impact Indicators**: indicators that measure actual change in conditions of key problems or unmet needs that have been identified as linked to the program goal such as changes in health status, nutritional status, income, etc.

The graphic below illustrates the correspondence between different types of indicators and the levels of a Results Framework (RF). Note that both strategic objectives and intermediate results are measured using outcome indicators.



Slide 8: Need indicator at every level

The next graphic is an example of a results framework. A complete IPTT should specify indicators and performance targets at all levels of the framework.



Slides 9–10

This exercise is summarized in Slides 9–10.

Objective: Participants practice creating indicators at output, outcome, and impact levels

Time needed: 20 minutes

Handouts:

- Creating Indicators (activity instructions)
- Creating Indicators Worksheet (brief guidelines for formulating each indicator, with a space for recording responses)
- Sources of Standard International Indicators (descriptions of sources and guidance available; Web addresses)

Instructions: Divide the group by counting off by fours: all the "ones" form a group, all the "twos" form a group, etc. Assign the activities listed below to each group:

- Activity 1 (Group 1): Training on proper hand washing techniques
- Activity 2 (Group 2): Training farmers on improved crop management techniques
- Activity 3 (Group 3): Establishing a market information system
- Activity 4 (Group 4): Training on crop storage systems

The task of each group is to design three indicators to measure the causal chain their activity is part of: one **output-level** indicator, one **outcome-level** indicator, and one **impact-level** indicator. Groups should spend about five minutes developing each indicator, for a total of 15 minutes, and write their proposed indicators on flipchart paper. The groups then rejoin and take turns presenting their work. Participants and the facilitator discuss and provide feedback on the relevance, structure, and completeness of the indicators presented. Allow 30–45 minutes for this discussion.

The worksheet below (available as a handout) may be used by groups to record their answers to this exercise. Trainees should be made aware of the handout, "Sources of Standard International Indicators," which lists references useful for indicator development.

Activity assigned to your working group:

Level of the Indicator (result)	General Guideline	Your Proposed Indicator
Impact (SO level)	The change in the condition or situation of the population Measures the highest level of change your project is responsible for bringing about	
Outcome (IR level)	Very often this is a behavior (acting, thinking, feeling) or knowledge change, but not always. There are higher and lower level outcomes, i.e. the higher level outcome could be new practices that a beneficiary uses. A lower level outcome would be the knowledge a beneficiary gains at a training	
Output (activity level)	Direct product of the implementer's activities	

Answer key:

Examples of possible indicators for each activity are given below. This list is illustrative; there are many other possible examples.

Activity	Output indicator(s)	Outcome indicator(s)	Impact indicator(s)
Training on proper hand washing techniques	# of households trained on proper hand washing techniques with proper cleansing agents	% of households that have water and soap or a locally available cleansing agent at a hand washing place	% change in rate of waterborne illness
Training farmers on improved crop management techniques	# of farmers trained on improved crop management techniques in the past 30 days	% of farmers that used at least two improved crop management techniques in the last crop season	% change in crop yield
Establishing a market information system	# daily price information kiosks established in the coverage area in the past year	% of farmers that know current prices of key commodities	% change in household revenue from the key commodities
Training on crop storage systems	# of farmers trained on improved crop storage techniques	% of households that used at least two improved storage techniques in the last post-harvest period	% change in income Proxy: change in HDDS

Slide 11: IPTT checklist criteria

The remainder of this lesson describes the criteria for a good IPTT. It lists important questions to ask when developing and assessing your IPTT.

Slide 12: What jobs can your indicator do?

Does the indicator serve at least one of the following purposes?

Each indicator in the IPTT should be examined to ensure that it serves at least one of the objectives listed here:

- Reporting
- Telling your story
- Improving your program

For example: does the indicator answer questions such as:

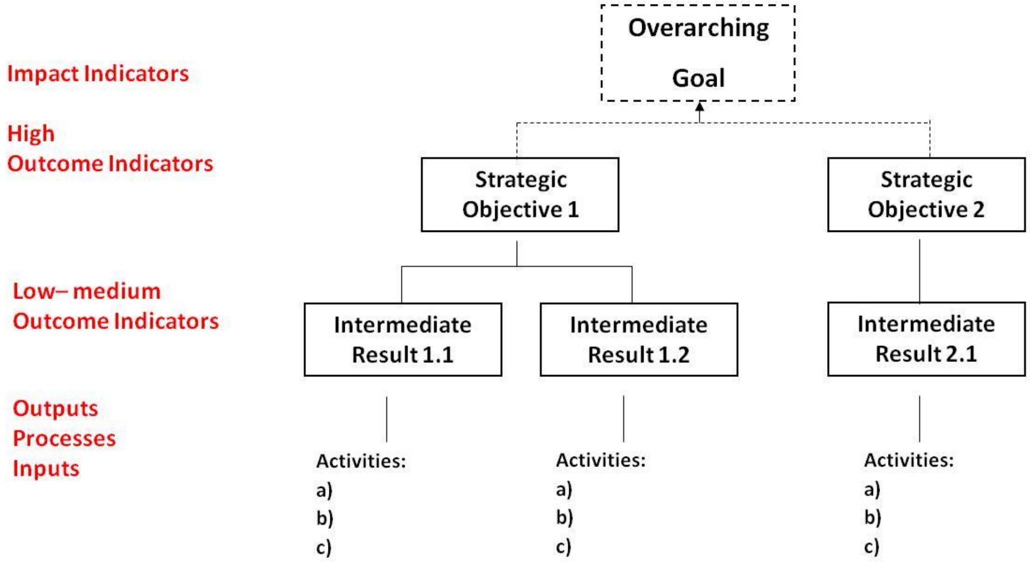
- Is the food security situation improving?
- Are communities and beneficiaries making progress?
- How well are we doing in implementing?

Slide 13: Does each indicator measure a specific result?

Does each indicator measure a specific result?

Collecting and analyzing data requires resources: time, data collection instruments, personnel, funding, etc. Therefore we should take care to ensure that every single one of the indicators in the IPTT serves a purpose that merits this investment. To avoid collecting unnecessary data, M&E systems need to prioritize and identify the indicators that will help track its *most critical* activities. Keep in mind that the activities that are the easiest to collect information on are not necessarily the most useful for measuring project impact.

Recall that indicators are designed to capture data that tell us something about progress at different levels of the results framework. Therefore we need to ask whether each indicator fits the program objectives, interventions and operational context, and whether it corresponds to a specific result. We should also be sure that the type of indicator selected is appropriate to the level of the framework it is designed to measure (see graphic below). If the purpose of the indicator is unclear, then it probably is not a relevant indicator and should be omitted or revised.



Slide 14: IPTT Checklist Criteria: Is each indicator precise and well defined enough to give the reader a clear idea of what is being measured?

Is each indicator precise and well defined enough to give the reader a clear idea of what is being measured?

A good indicator is precise: it is operationally defined in clear terms. Compare these two indicators:

% of children malnourished

versus

"% of children 6–59 months in the target population who are underweight (weight-for-age Z-score < -2)

Which is more precise? The first one is too general: it omits important descriptive information without which it is unclear what to measure and how to measure it (Which children? What is meant by "malnourished"?) The second indicator is better because it is more precise. It gives sufficient detail to understand exactly which children we are measuring (children 6–59 months in the target population) and how we define malnourishment (weight-for-age Z-score < -2).

Slides 15–17: IPTT Checklist Criteria: Is it feasible to collect and analyze the data for each indicator?

Is it feasible to collect and analyze the data for each indicator?

Each indicator in the IPTT should be reviewed to ensure that data collection and analysis for the indicator are technically, methodologically and logistically feasible. In addition, the program must have (or be able to acquire) the resource capacity to collect and analyze data on the indicator.

The following questions should be asked about each indicator in the IPTT to help determine the feasibility of data collection and analysis:

- Can you collect data through either a population-based household survey or from program records?
- Does your program have the expertise and the staff needed to measure this indicator?
- Does it make sense to collect data for this indicator at the time of year you plan to do so (e.g., baseline and final surveys)?
- Can you get a big enough sample size to produce reliable data?
- Does this indicator rely too heavily on recall?
- Would it be good enough to use a proxy indicator for which it is easier to collect and analyze the data?
- Does the usefulness of the indicator outweigh the cost of data collection and analysis?

Slide 18: IPTT Checklist Criteria: Does the IPTT include gender-sensitive indicators appropriate to your RF?

Does the IPTT include gender-sensitive indicators appropriate to your results framework?

Having “gender-sensitive indicators” involves more than disaggregating data by sex, and more than including indicators that are just about women. You IPTT should include indicators that are based on the social context and gender relations, e.g., taking into consideration how [older/younger] men and [older/younger] women relate to each other. They should be based on an understanding of the role gender plays in the results the project wants to achieve.

Some examples of gender-sensitive indicators are:

- Indicators that track men's knowledge about exclusive breastfeeding
- Indicators that track men's participation/involvement in helping women attend pre-natal visits
- Indicators that track who (women or men) has control over (i.e., makes decisions about) using household income or household assets
- Indicators that enable a comparison of women's receipt of inputs to men's receipt of inputs
  - This indicator helps assess whether project resources are distributed equitably.
  - Could be expressed as a ratio: *women's: men's*
- Indicators that enable a comparison of women's use of inputs to men's use of inputs
  - This indicator helps assess whether women and men utilize project inputs differently.
  - Could be expressed as a ratio: *women's: men's*
- Indicators that enable a comparison of women's changes in crop yields to men's changes in crop yields
  - This indicator helps assess whether women and men experience different results from the project intervention.
  - Could be expressed as a ratio: *women's: men's*

(See also Module 1, Lesson 1.7: Gender considerations in M&E)

Slides 19–20: IPTT Checklist Criteria: Does the IPTT use standard international indicators when they exist?

Does the IPTT use standard international indicators when they exist?

When international standards for indicators in the various areas of development are available, the IPTT should seek to employ them. There are several advantages to using standard indicators:

- Standard indicators facilitate comparing and learning from the results of different programs.
- Standard indicators make it easier to conduct mid-term and final evaluations.

Guidelines for standard indicators are available in program areas such as household food security, risk and vulnerability, maternal and child health, reproductive health, HIV and AIDS programming, agricultural development, water and sanitation, micro and small enterprise development, and others. They are useful resources that typically define standard wording and units of measurement for different indicators, as well as standard methodologies for data collection and analysis.

A selection of sources of standards is listed in the handout, "Sources of Standard International Indicators." These include:

- Agri-Gender Statistics Toolkit
- Description of an Agricultural Module for the Population and Housing Census
- Demographic and Health Surveys (DHS)
- Knowledge, Practices and Coverage Surveys (KPC)
- The Hygiene Improvement Project (HIP)

Slides 20–22: IPTT Checklist: Are indicators numbered clearly? …

There are various structure and style issues to check for when reviewing the IPTT. The graphic below is an excerpt from an IPPT:

PROGRAM GOAL: Reduce Food Insecurity of Vulnerable Populations in Western Province							
SO 1: Improved livelihood capacities of vulnerable households							
Impact	1.1 Average Household Dietary Diversity Score (FFP)	**(+)**					
Outcome	1.2 Percent of trained beneficiaries scoring 70% or above on post-test scores	**(+)**					

Issues to check for include:

- **Are all indicators numbered clearly?** Each indicator should have a unique identifying number so it is easy to refer to. The example above shows a numbering structure of 1.1, 1.2, etc.

- **Is each required indicator labeled as such?** Required indicators must be included in the IPTT. It is helpful if the entity requiring the indicator is named in the IPTT. For example, 1.1 and 1.2 above are FFP requirements. Examples of other possible entities are USAID Mission and Government [of the country where the project is being implemented].

- **Is the wording for each indicator neutral?** The wording should indicate how the change is to be measured but not suggest the expected direction of the change. For example:

  INCORRECT: *increase in the % of children exclusively breastfed until 6 months*

CORRECT: *% of children exclusively breastfed until 6 months*

- **Are all the targets in the right place?** Data for indicators may be collected at different points, such as at baseline, annually, and/or at mid-term and final evaluations. The IPTT therefore may include **targets** that correspond to the envisioned level of accomplishment at the end of the project, as well as **benchmarks,** which are used to track planned progress at intermediate points over the life of the project. When reviewing the IPTT, it is important to ensure that benchmarks and targets for each indicator are defined and associated correctly. In other words, the IPTT should properly indicate which targets are annual vs. mid-term vs. final.
- **Are targets clearly defined as cumulative or not?**
- **Do the measurement units/formats specified in the targets match what is specified in the indicator?** Indicators and targets should use the same unit and format of measurement. For example, if the indicator is expressed as a number ("Number of …"), the target should also be expressed as a number. If the indicator is expressed as a percentage, likewise, the target should be expressed as a percentage.

Slides 23–24: IPTT Checklist Criteria: Is each target reasonable?

Is each target reasonable?

Development agencies are committed to a focus on results. "Performance targets lie at the heart of this commitment. They define, in concrete terms, what will be accomplished by when and as a result of the program." (USAID 1996) Performance targets bring the purpose for undertaking a project into a real, defined view. They further justify a project by describing in concrete terms what the project's (donors) investment will achieve by a certain deadline. It is important to set realistic and motivational target levels that can be achieved in the life of the project.

A performance target should be defined for each indicator in the IPTT. Questions to consider when developing these targets are:

- Can you reasonably expect to reach the target? Is the target ambitious enough to make a difference to project beneficiaries?
- Can you justify your targets? For example, is the target based on your organization's past experience with a Food for Peace program or another similar program?

It is important not to set targets that are too high or too low. Targets set too low will not motivate project staff, and targets set too high may result in a project losing credibility.

Test Your Knowledge

Objective: Participants distinguish between indicators at output, outcome, and impact levels

Time needed: 20 minutes

Handout: Test your knowledge about indicators

Instructions: Participants work on their own or in pairs.

Refer to the worksheet, "Test your knowledge about indicators," (available as a handout). Beside each indicator listed, participants write which type of indicator it is: output, outcome, impact or process. Allow 10–15 minutes for this exercise.

The indicators on the worksheet are repeated below. Participants check their answers using the answer key below. Answers to this exercise are also shown in the "Power Point, Indicator types – knowledge test," which may be projected in the plenary session and used for group review and discussion.

Number	Indicators	Answer Key
1	Average Household Dietary Diversity Score	Impact
2	Percentage of farmers that used at least one sustainable agriculture practice and/or technology in the most recent season	Outcome
3	Number of farmers that received training on improved crop storage techniques	Output
4	Kilometers of roads constructed by the project	Output
5	Women's Dietary Diversity Score	Outcome
6	Percentage of underweight (BMI < 18.5 kg/m^2) women of reproductive age (15–49 years)	Impact
7	Number of people trained in child health and nutrition	Output
8	Percentage of MCHN project staff that knows proper breast feeding technique	Process
9	Commodity management system conforms with donor guidelines	Process
10	Percentage of stunted (HAZ < −2) children aged 0–59 months	Impact
11	Percentage of households using an improved drinking water source	Outcome
12	Percentage of underweight (WAZ < −2) children aged 0–59 months	Impact
13	Percentage of households with children aged 0–23 months that have water and soap or a locally available cleansing agent at a hand washing place	Outcome

Number	Indicators	Answer Key
14	Percentage of farmers who practiced the value chain activities promoted by the project in the most recent season	Outcome
15	Roads built by the project conform with minimum standards	Process
16	Tons of food distributed by the project	Output
17	Percentage of farmers who used at least two improved storage techniques in the last post-harvest period	Outcome
18	Number of demonstration gardens established by the project	Output

Summary of Key Concepts

- The **indicator performance tracking table (IPTT)** is a tool used in FFP projects for tracking project performance. Its purpose is to help you:
  - Improve the program
  - Meet FFP reporting requirements
  - Conduct M&E in ways that are not too costly or burdensome
  - "Tell a story" about the project
- The IPTT includes indicators at the **impact**, **outcome**, and **output** levels that link to the project results framework, as well as baseline and target values for each indicator.
- All indicators and targets in the IPTT should be reviewed in light of quality criteria to ensure that the IPTT is an effective, practical and useful tool.

Handout 1.2.1: Creating Indicators Activity

Count off by 4s and get into your groups.

Take the activity assigned to you and create 3 indicators to measure the causal chain the activity is part of, one indicator at each level, output, outcome, impact:

- Activity 1: Training on proper hand washing techniques
- Activity 2: Training farmers on improved crop management techniques
- Activity 3: Establishing a market information system
- Activity 4: Training on crop storage systems

You have **15 minutes** – 5 minutes per indicator! Record your indicators on flipchart paper and be prepared to share your indicators with the rest of the participants

Handout 1.2.2: Develop Indicators at Each Level

Activity assigned to your working group: ____
____
____

Level of the Indicator (result)	General Guideline	Your Proposed Indicators
Impact (SO level)	The change in the condition or situation of the population Measures the highest level of change your project is responsible for bringing about	
Outcome (IR level)	Very often this is a behavior (acting, thinking, feeling) or knowledge change, but not always. There are higher and lower level outcomes, i.e., the higher level outcome could be new practices that a beneficiary uses. A lower level outcome would be the knowledge a beneficiary gains at a training	
Output (activity level)	Direct product of the implementer's activities	

Handout 1.2.3: Sources of Standard International Indicators

Does the IPTT use standard international indicators when they exist?

The Indicator Performance Tracking Table (IPTT) should use standard wording, data collection and analysis methods and standard units for all common international indicators included. Please find below some suggested resources for finding standard international indicators

Agri-Gender Statistics Toolkit

Contains indicators and examples of questions used to measure indicators.

http://www.fao.org/gender/agrigender/agri-gender-toolkit/introduction/en/

Description of an Agricultural Module for the Population and Housing Census

Provides an example of an agricultural module to include in a household-based survey with explanations of each question (explanations include some indicators).

http://www.fao.org/fileadmin/templates/ess/documents/world_census_of_agriculture/Relation_with_Population_and_Other_Censuses__Adriana_/DOC_5.Model_Agricultural_Module.pdf

Demographic and Health Surveys (DHS)

These contain a large number of health related indicators and survey questions. These tend to represent generally accepted "best practices" and many have been scientifically validated.

http://www.measuredhs.com/

Knowledge Practices and Coverage Surveys (KPC)

The KPC contains a standard set of maternal and child health indicators and survey questions used in USAID funded Child Survival projects implemented by private voluntary organizations (PVO).

http://mchipngo.net/controllers/link.cfc?method=tools_modules_kpc2009

The Hygiene Improvement Project (HIP)

HIP had done a number of household surveys with standard indicators measuring access to sanitation and water as well as household hygiene practices.

http://www.hip.watsan.net/

Handout 1.2.4: Test Your Knowledge about Indicators

Time: 20 minutes

Instructions: Please read each of the indicators carefully and identify which type of indicator it is. Is it an output, outcome, impact or process indicator? Please write indicator type next to the indicator.

Number	Indicators	Indicator Type
1	Average Household Dietary Diversity Score	
2	Percentage of farmers that used at least one sustainable agriculture practice and/or technology in the most recent season	
3	Number of farmers that received training on improved crop storage techniques	
4	Kilometers of roads constructed by the project	
5	Women's Dietary Diversity Score	
6	Percentage of underweight (BMI < 18.5 kg/m^2) women of reproductive age (15–49 years)	
7	Number of people trained in child health and nutrition	
8	Percentage of MCHN project staff that knows proper breast feeding technique	
9	Commodity management system conforms with donor guidelines	
10	Percentage of stunted (HAZ < −2) children aged 0–59 months	
11	Percentage of households using an improved drinking water source	
12	Percentage of underweight (WAZ < −2) children aged 0–59 months	
13	Percentage of households with children aged 0–23 months that have water and soap or a locally available cleansing agent at a hand washing place	
14	Percentage of farmers who practiced the value chain activities promoted by the project in the most recent season	
15	Roads built by the project conform with minimum standards	
16	Tons of food distributed by the project	
17	Percentage of farmers who used at least two improved storage techniques in the last post-harvest period	
18	Number of demonstration gardens established by the project	

Lesson 1.3: Introduction to Theory of Change/Development Hypothesis

Theory of Change (TOC) is the process of and product resulting from “communicating what you are trying to accomplish and how you will know that you are making progress.”[5] In particular, TOC helps planners figure out what can be influenced, what impact that might have, and whether they can realistically expect to reach their goal with available time and resources.

USAID uses the term “Development Hypothesis” (DH) to refer to this process. In this lesson, the terms are used interchangeably.

The estimated duration of this lesson is **45 minutes**.

Learning Objectives

Lesson 1.3 will help participants:

- Gain a basic understanding of TOC/DH
- Learn to convert a causal pathway into a results framework

Companion Materials

A PowerPoint presentation—**1.3 Theory of Change.ppt**—accompanies this lesson as a separate file.

Handout 1.3.1: Introduction to Theory of Change is provided at the end of this lesson.

Slides

Slide 1: What is a Theory of Change/Development Hypothesis?

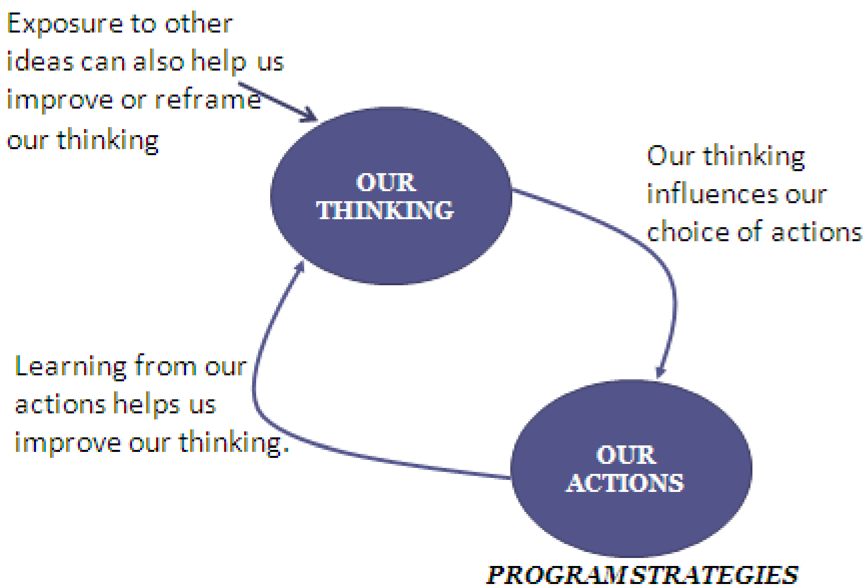
A TOC or DH is a systematic exploration of the links between activities, outcomes, goals, and context.

A TOC conceptual model describes a process of desired change by making explicit how a problem is defined, its underlying causes, the long-term change being sought, and what needs to happen in order for that change to come about.

[5] ORS 2004.

Slide 2: TOC/DH as both process and product

A TOC/DH is a structured thinking process that helps turn theories about what needs to change and why into a **"causal pathway"**. The causal pathway (pathway of change) is a graphic representation of the results of the change process.

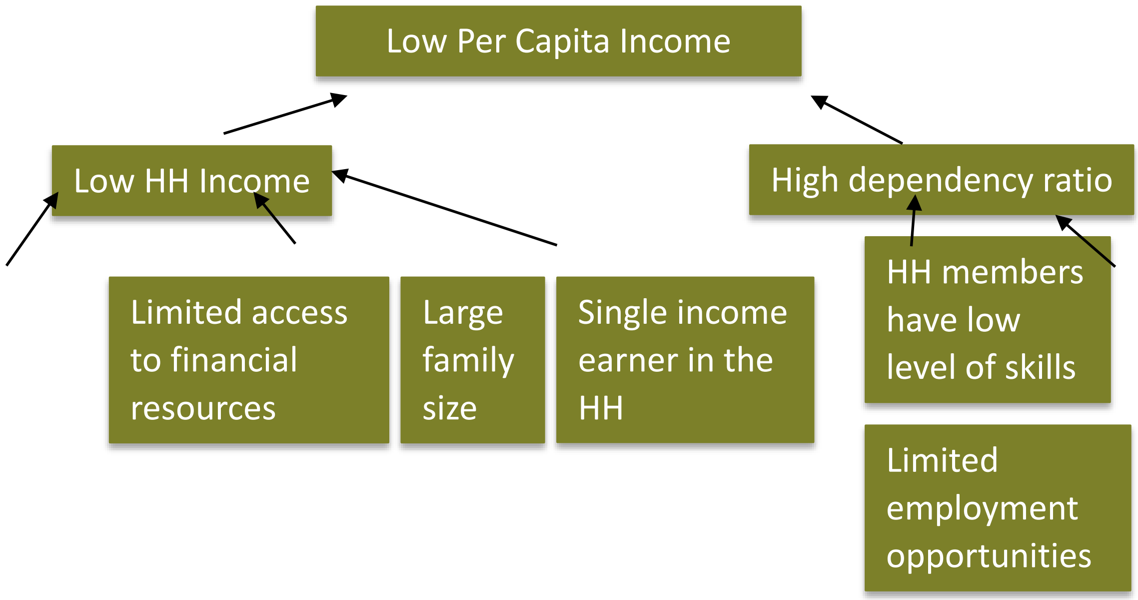


Slide 3: What is a causal pathway?

A causal pathway is a step-by-step backwards mapping process through which a group determines **ALL** the preconditions necessary to reach an ultimate goal. USAID refers to this as Development Hypothesis (USAID 2011).

Developing a causal pathway involves determining the key underlying causes that significantly contribute to the problem and have high synergy with other underlying causes.

In the example below, limitations in skill level, employment opportunities, and access to financial resources all contribute to low income at the household level, which contributes to low per capita income. However, other factors also contribute to low per capita income, including a high dependency ration, which is likewise affected by family size and the number of household members earning income.



Slide 4: Elements of a TOC/DH

Developing a TOC/DH first involves developing a problem statement and associated long-term goal.

Based on the problem and goal, every TOC/DH should include:

- A pathway of change that shows the connections between long-term, intermediate and early outcomes
- Statements that explain how the intervention fits along the pathway of change
- Justifications that explain why the initiatives expect change to occur (assumptions/risks)

Slide 5: Why we need a TOC/DH?

A TOC model is a useful tool for attaining consensus; it helps build a common understanding of the processes needed to achieve a desired change. The model can also help to identify potential weaknesses or gaps, such as certain hypotheses or assumptions that need to be tested, refined, or discarded. Using a TOC model gives your team an opportunity to combine their various disciplinary expertise (education, health, food-security, natural resource management, finance, etc.) in order to design and implement integrated programs. In cases where resources are particularly limited, your team will need to collaboratively prioritize response options.

A TOC/DH:

- Is a participatory process
  - Everyone's assumptions regarding the goals, challenges and conditions that must exist for the initiative to succeed should be openly examined and weighed for accuracy
- Creates realistic program expectations
  - Examination of assumptions/risks helps fine-tune what if achievable within the specified timeframe
- Creates a safe place to be reflective
- Can improve monitoring and evaluation
  - A TOC-based M&E system tests both expected outcomes and underlying assumptions
- Improves understanding about the program logic

Slide 6: Uses

A TOC/DH is useful in that it:

- Helps in decision-making, i.e., whether to carry out/continue an activity
- Aligns program activities with goals
- Helps in monitoring the results chain
- Provides a framework for evaluation

Slide 7: Uses cont. (other advantages)

Other advantages of using a TOC/DH include:

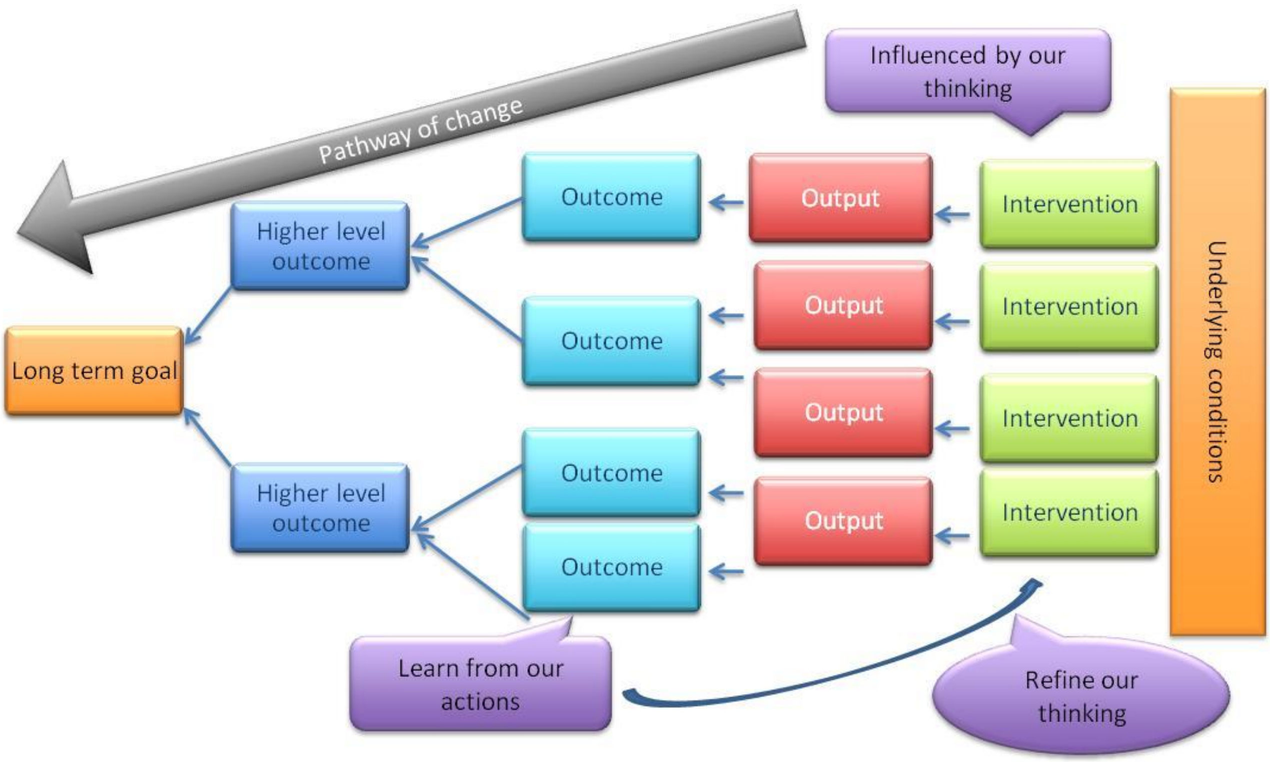
- Identifying gaps between steps and outcomes
- Refining project strategies to achieve goals
- The TOC process allows for changes to be implemented at each outcome level
- Refining assumptions on which the TOC is based
- Improving transparency
- Evaluations based on a TOC/DH approach often carry more weight with donors and other stakeholders

Slide 8: The Pathway of Change

Mapping out a **pathway of change** helps determine what types of responses and approaches will comprise a strategy or program.

A pathway of change is a graphic representation of the underlying causes and related outcomes that are needed in order to reach a desired long-term goal and represents the priorities identified earlier in the process.

All outcomes on a pathway of change should be required to reach the long-term goal and should correspond to the underlying causes being addressed. This logic helps to: a) prioritize the outcomes (and subsequently the actions linked to each outcome) and b) weed out outcomes that may be desired but are unnecessary to achieve the intended goal.



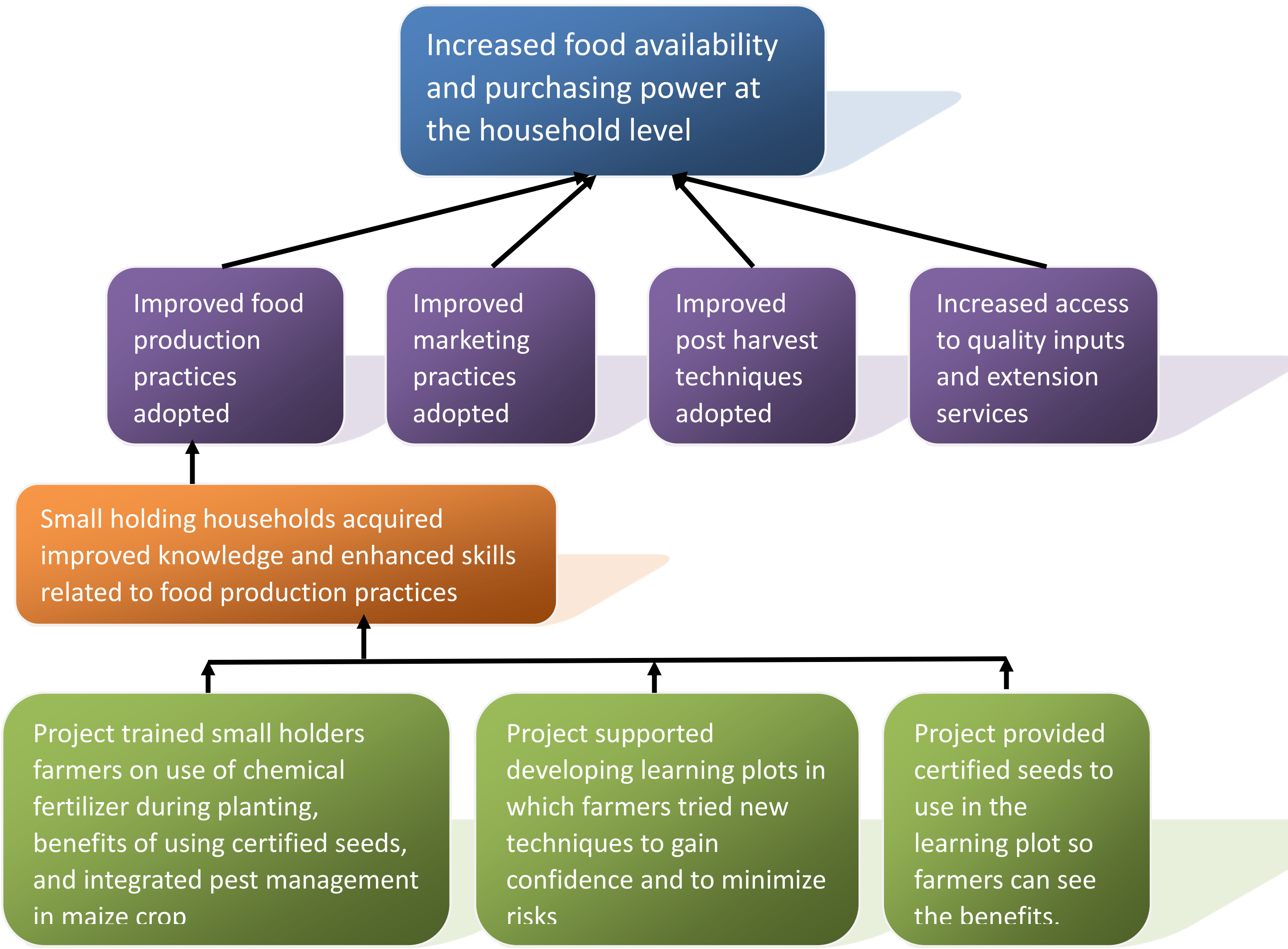
Slide 9: DH steps

Basic steps in developing a TOC/DH involve:

- Identifying the goal
- Map the pathway of change
- Identifying which outcomes your project will address
- Identifying activities that will help achieve the outcomes

Slide 10: Causal Pathway to Results Framework

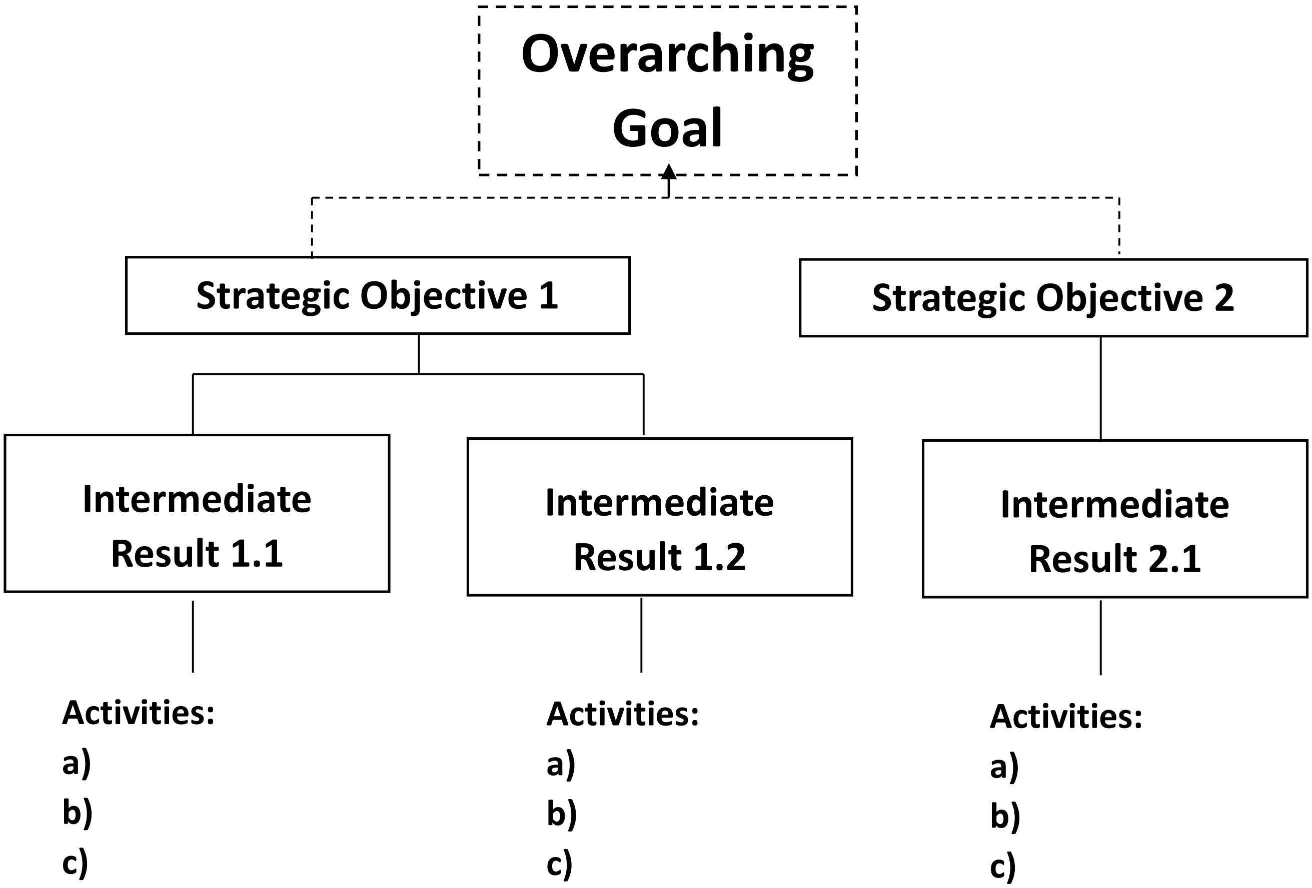
A Results Framework (RF) establishes a hierarchy of objectives or results statements, or a development pathway, to show how project or program designers believe change will come about. It is based on the TOC that the project designers envisioned. Theories of change are reflected in a project's underlying assumptions, articulated strategy, and interconnected actions intended to lead a community or organization to a positive transformation. When a TOC is well captured in a logical framework or RF, program managers can use it to articulate what the programs is trying to achieve and what they think needs to happen to achieve it. Project monitoring processes then look for evidence of activities leading to the anticipated results, or probe to find out why a result is or is not leading to a next higher-level anticipated result.



Source: www.theoryofchange.org

Slide 11: Correlation between RF and indicator levels

Different types of indicators correspond to different levels of an RF. Achievement of a project's overarching goal (long-term outcome) is measured by impact indicators. Strategic Objectives (SOs) and Intermediate Results (IRs) are both measured by early and intermediate outcome indicators.



Slide 12: Basic purpose of RF

An RF is both a design/planning and an M&E tool. It is central to the strategic plan and provides a project-level framework for managers to gauge progress toward the achievement of results and to adjust relevant programs and activities accordingly. In addition, the design of a RF provides an important opportunity for a project implementer to work with the other key stakeholders to build consensus and ownership around shared objectives and approaches to meeting those objectives.

RFs also function as effective communication tools because they succinctly capture the key elements of a strategy for achieving an objective (i.e., project intent and content). The main purpose of the RF is to plan, establish a basis for monitoring and future evaluation of the impact, outcomes and outputs of USAID Office of Food for Peace (FFP)-funded activities and communicate the results to the stakeholders in a meaningful way.[6]

Slide 12: How to determine success

Success is determined by measuring indicators.

Indicators are identified for each outcome being addressed (including early, intermediate and longer-term outcomes).

For example, if the expected outcome of a program intervention (or set of interventions) is that households have adopted improved food production practices and are utilizing them, then appropriate indicators of success might include:

- An increase in crop yield
- An increase in farm size
- An increase in cropping intensity

Slide 13: Defining indicators

Detailed information for each indicator identified in the TOC process helps development of realistic long-term outcomes and increases the feasibility of reaching them within a project's specified timeframe.

Each indicator is composed of four parts:

- Who will be impacted?
- How many will be impacted?
- How much will the indicator need to change in order to signify success?
- When will it change by?

Slide 14: Measuring indicators

For each indicator, determine:

- What measurement tool to use?
- When should measurements occur? (time of year, more than once, etc.)
- Who will conduct measurements?

[6] Adapted from USAID TIPS # 13 Performance Monitoring and Evaluation

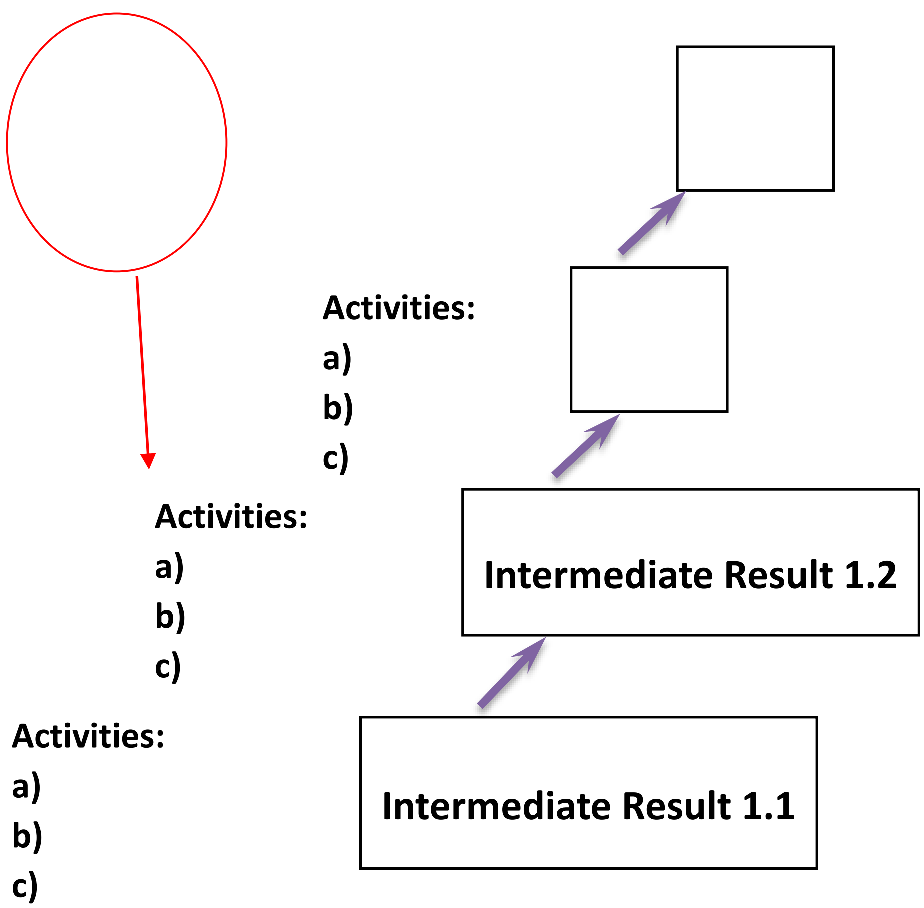
Slide 15: Design interventions

Interventions indicate how certain activities will affect change, i.e., what will be done in order to achieve early and intermediate outcomes and ultimately, the long-term goal(s).

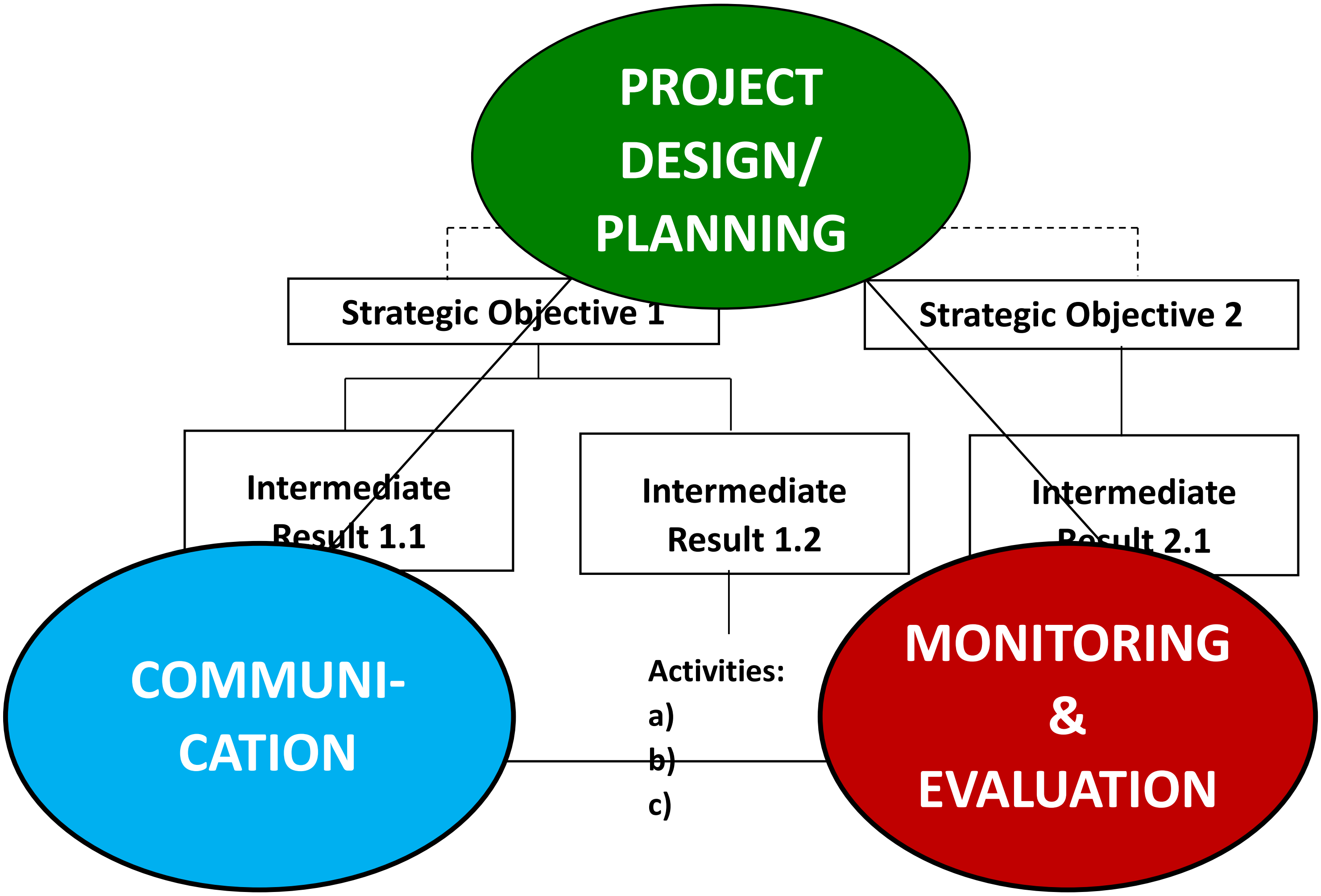
- Determine the interventions (e.g., actions, strategies) to be used in order to achieve identified outcomes and impacts. What will be done, by whom, how and when?
- Test your assumptions. Will the actions identified really work in achieving expected outcomes? Does your organization have the capacity to implement them?

Slide 16: Monitoring in order to identify barriers

Monitoring at each outcome level helps identify barriers to achieving subsequent outcomes.



Summary of Key Concepts



- A **TOC/DH** is both a process (i.e., the systematic exploration of the links between activities, outcomes, goals, and context) and a product (i.e., graphic representation of a causal pathway – or pathway of change.
- A **results framework (RF)** establishes a hierarchy of objectives or results statements to show how project or program designers believe change will come about. It is based on the TOC that the project designers envisioned. The main purpose of the RF is to plan, establish a basis for monitoring and future evaluation of the impact, outcomes, and outputs of activities, and communicate the results to the stakeholders in a meaningful way.
- Developing a TOC/DH involves a step-by-step **backwards mapping process** used to determine ALL the preconditions necessary to reach an ultimate goal.
- **Indicators** are used to measure program success. Indicators are identified for each outcome in the pathway.

Handout 1.3.1: Introduction to Theory of Change[7]

What is Theory of Change?

Theory of Change (TOC) is a rigorous yet participatory process whereby groups and project stakeholders identify the conditions they believe have to unfold for their long-term goals to be met. These conditions are modeled as outcomes, arranged graphically in a causal framework. The methodology used to create a TOC is also usually referred to as Theory of Change or the Theory of Change approach. So, when you hear or say "Theory of Change" you may mean either the process or the product.

Like any good planning and evaluation method for social change, TOC requires participants to be clear on long-term goals, identify measurable indicators of success, and formulate actions to achieve goals. It is distinct from any other method of describing initiatives in a few ways.

- It shows a causal pathway from here to there by specifying what is needed for goals to be achieved.
- It requires you to articulate underlying assumptions which can be tested and measured.
- It changes the way of thinking about initiatives from what you are doing to what you want to achieve and starts there.

In developing theories of change we articulate the assumptions that stakeholders use to explain the change process represented by the change framework. Assumptions are at the basis of all the hypothesized causal connections between early, intermediate, and long term outcomes, and the expectations. Practitioners also make assumptions about how and why proposed interventions will lead to the expected outcomes. Airing assumptions is one of the most valuable parts of TOC as a participatory process, as stakeholders get to hear and challenge one another's understanding of the goals, the challenges, and what must hold true in the environment for the initiative to succeed. Assumptions may be supported by research, which strengthens the plausibility of the theory and the likelihood that stated goals will be accomplished.

[7] http://www.theoryofchange.org

How does Theory of Change work?

TOC maps out your initiative through five stages:

1. Identifying long-term goals and the assumptions behind them
2. Backwards mapping to work out all the requirements necessary to achieve that goal (outcomes/preconditions)
3. Identifying the interventions necessary to achieve the desired outcomes
4. Developing indicators to measure progress on outcomes and to assess performance
5. Writing a narrative to explain the logic of your initiative

TOC process hinges upon defining all of the necessary and sufficient conditions required to bring about a given long term outcome. Backwards mapping requires planners to reason backwards from the long-term goal through the intermediate and early-term changes necessary to reach the goal. This process creates a set of connected outcomes known as a "pathway of change." A "pathway of change" graphically represents the change process as it is understood by the initiative planners and forms the skeleton around which the other elements of the theory may be developed.

During the process of creating the pathway of change, participants articulate as many of their assumptions about the change process as they can. Assumptions can then be examined and weighed for accuracy. There are typically three important types of assumptions to consider: (a) conditions in the environment that planners believe must hold true for the theory to be fulfilled, (b) substantiation for the claim that all of the important preconditions for success have been identified, and (c) justifications supporting the links between program activities and the outcomes they are expected to produce. A TOC-based monitoring and evaluation (M&E) system will test both expected outcomes and underlying assumptions against the model.

The TOC approach to planning is designed to encourage very clearly defined outcomes at every step of the change process. Users are required to specify a number of details about the nature of the desired change, including specifics about the target population, the amount of change required to signal success, and the time frame over which such change is expected to occur. This attention to detail often helps both funders and grantees reassess the feasibility of reaching goals that may have been vaguely defined, and in the end, promotes the development of reasonable long-term outcome targets that are acceptable to all parties.

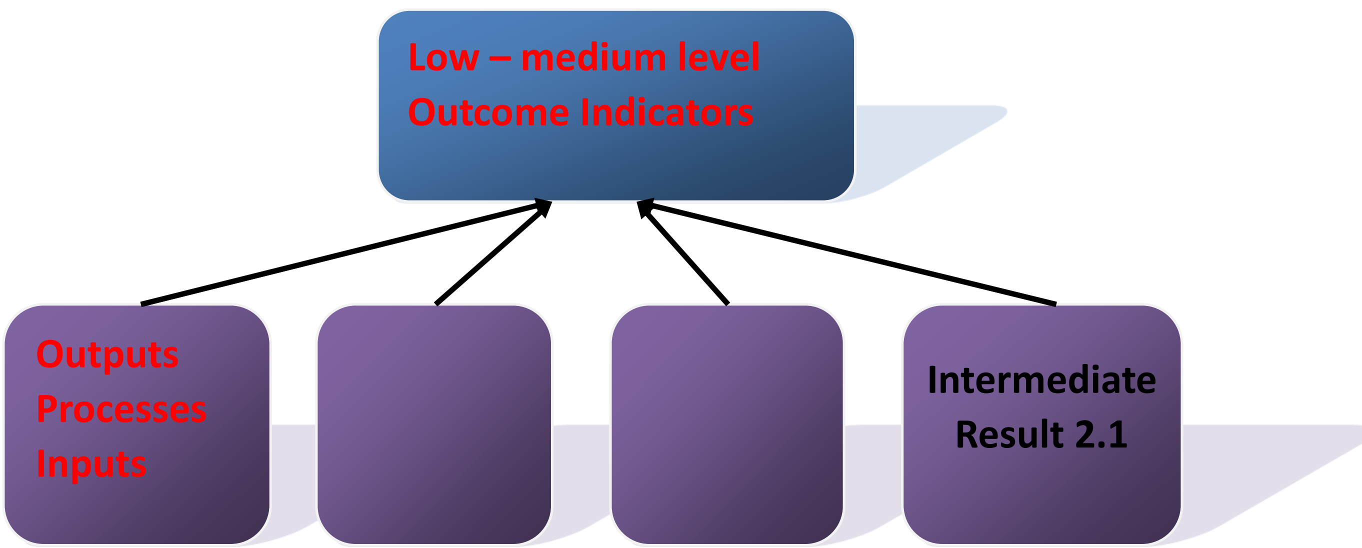
Outcomes

Stage 1: Identifying Long term goals and assumptions

In the first stage of theory development, TOC participants discuss, agree on, and get specific about, the long-term goal or goals. This can be done in a variety of ways, (see our facilitator's guide), but the important thing is to set a good, clear outcome. The quality of the rest of the theory hinges on doing this right!

Then, TOC participants start to design a simple map of the preconditions required to bring about the long-term goal. Beginning the mapping process helps stakeholders to visualize and prioritize their goals as well as specify what they expect to change and for which outcomes they want to be held accountable.

Stage 1: Identifying Goals and Outcomes



Commentary

For this example, the long-term outcome is the increased food availability and purchasing power at the household level. To achieve that goal, the program designers identify four preconditions: households will adopt improved food production practices, households will adopt improved marketing practice, households will adopt improved post-harvest techniques and households will have increased access to quality inputs and extension services. To illustrate the logical importance of the four preconditions, we use solid, arrowed lines to show that the preconditions MUST come before the final long-term outcome.

Assumptions

The program designers also realized that the program could only achieve the goal if the price of the agricultural inputs will not change significantly and there is no change in average precipitation. Any initiative is only as sound as its assumptions. Unfortunately, these assumptions are too often unvoiced or presumed frequently leading to confusion and misunderstanding in the operation and evaluation of the initiative. To address that problem, TOC documents assumptions to ensure agreement for planning and posterity.

For the long-term outcome: "Increased food availability and purchasing power at the household level", these assumptions must be met for the outcome to be achievable:

A. Price of the agricultural inputs will not change drastically

B. No change in average precipitation

C. The government agricultural extension policy remains favorable to small holders

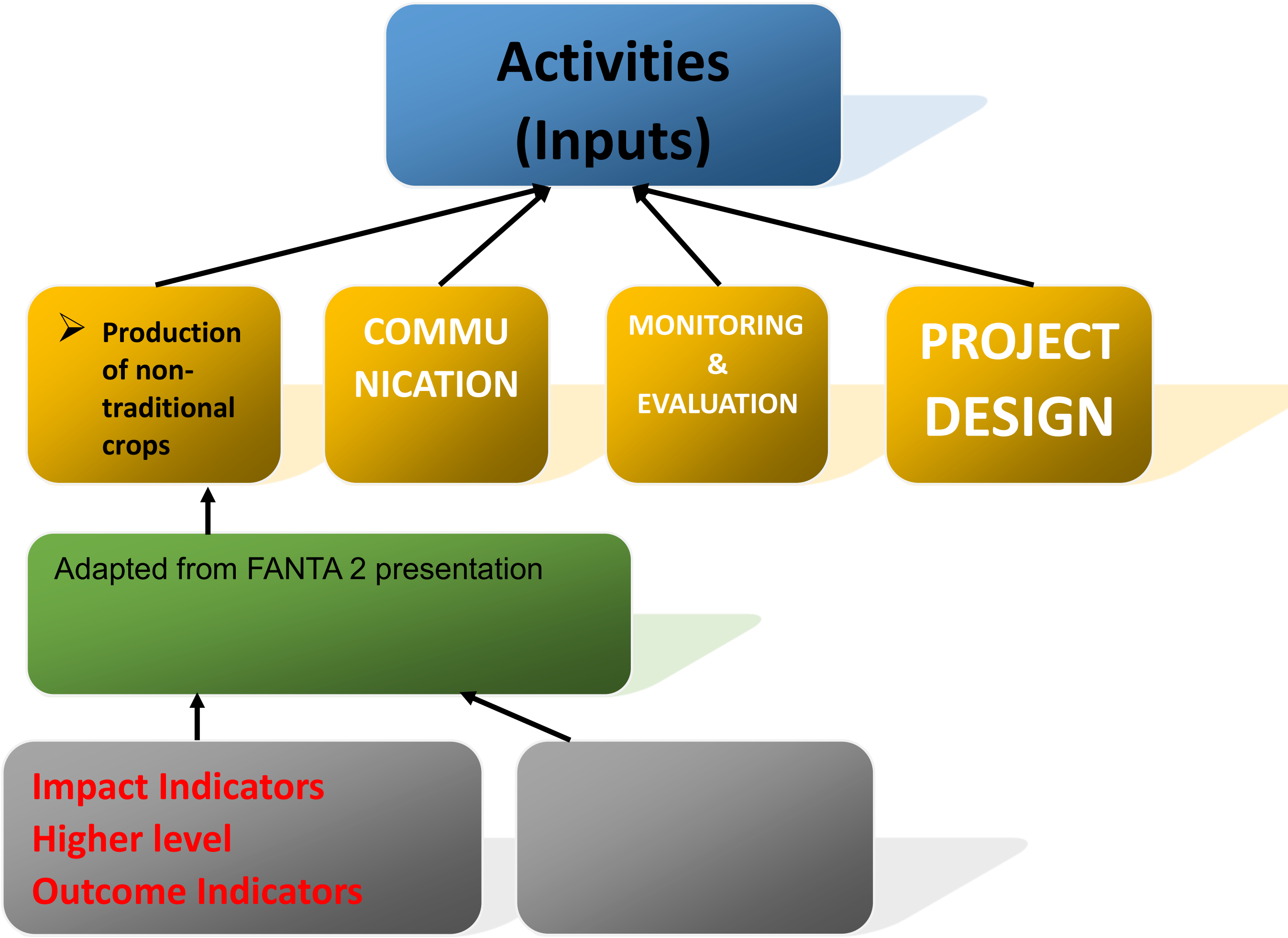
Backwards Mapping

Stage 2: Backwards Mapping

After the first step of laying out the initial expectations and a simple change framework, comes a more detailed stage of the mapping process. Building upon the initial framework, we continue to map backwards until we have a framework that tells the story we think is appropriate for the purposes of planning. This will require much more detail because stakeholders want to identify the "root" causes of the problem they hope to resolve.

Because this work is challenging and most social change programs or broader initiatives have a lot of moving parts, change frameworks usually go through many revisions. Outcomes are added, moved and deleted until a map eventually emerges that tells a story the group can agree on. For the users, the debate is often the most valuable component of TOC because the designers are now jointly defining the expectations, assumptions and features of the change process. TOC participants are required to make explicit, and agree upon, the underlying logic of the initiative improving which improves the productivity and accountability.

Stage 2



Commentary

For the Project Increased Food Security example, program designers asked themselves what the small holder farmers need if they were going to have increased food availability and purchasing power. Specifically, how would the project's participants achieve the four identified preconditions (improved production practices, improved marketing practices, improved post-harvest practices, and increased access to inputs to the ultimate outcome? **Facilitators:** For exemplary purposes the diagram above only shows preconditions for one intermediate outcome.

Developing Indicators

Stage 3: Developing Indicators

The Indicators stage is when details are added to the change framework. This stage focuses on how to measure the implementation and effectiveness of the initiative. By collecting data on each outcome, the initiative can identify what it is or isn't happening and find out why.

Each indicator has four parts: population, target, threshold and timeline.

- Who is changing? (small holder farmers enrolled in the program)
- How many do we expect will succeed? (perhaps 70% of the enrolled farmers)
- How much is good enough? (an increase in average household dietary diversity score by 2 points)
- By when does this outcome need to happen? (by the end of project)

Identifying interventions

After laying out the near complete change framework, we now focus on the role of interventions (those things that the program (or initiative) must do to bring about outcomes).

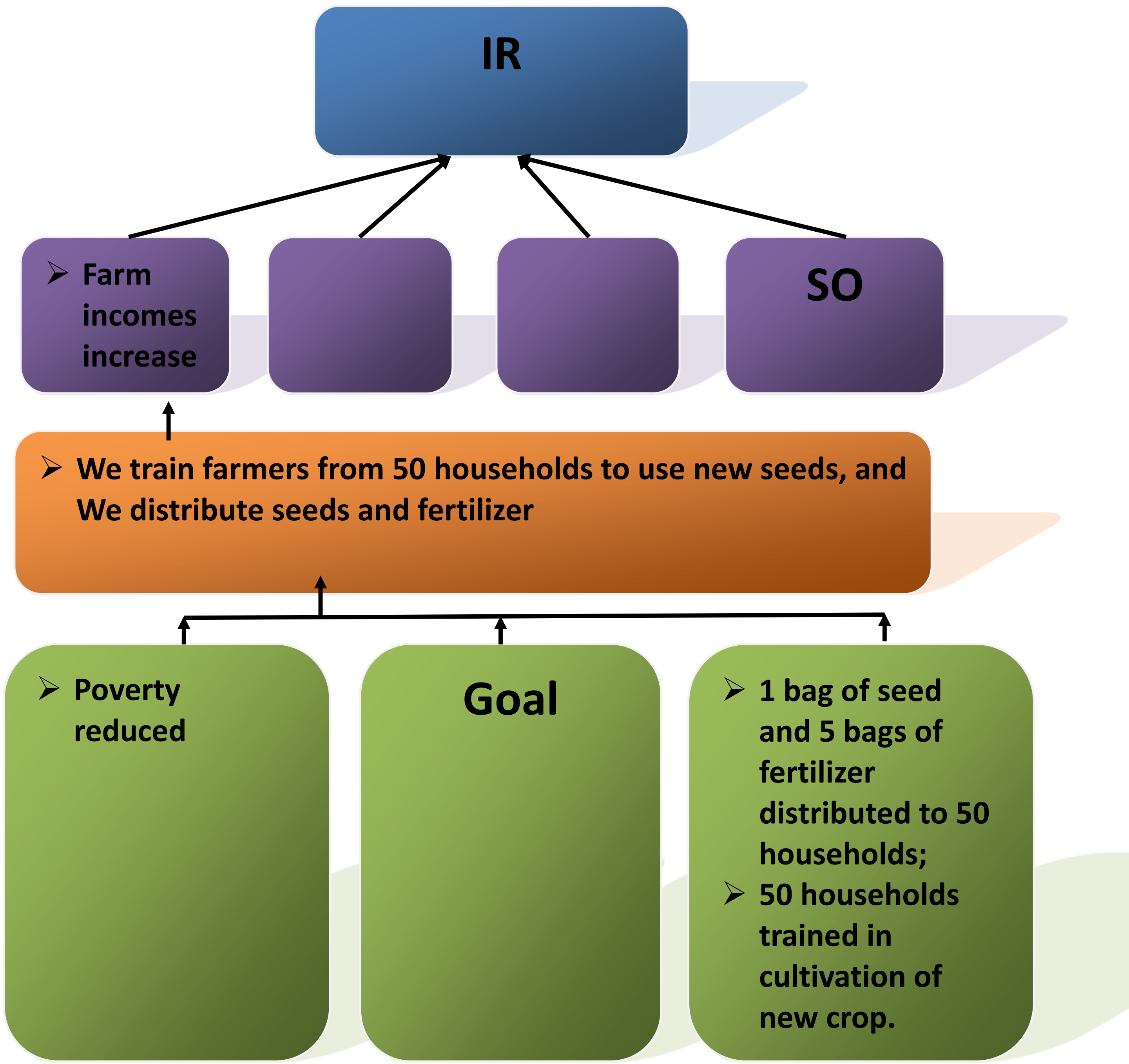
Interventions

As long as the prior preconditions are met, these outcomes will be met. We represent interventions, an initiative's program activities:

1. We believe the outcomes *not* occur at a sufficient level without an intervention
2. The interventions represent actions by the initiative and thus something that the initiative is responsible for
3. The outcomes are control variables; they need to be measured to evaluate the interventions' effectiveness

By identifying interventions, the stakeholders explain how their work is going to change the community. The interventions explain what the stakeholders are going to do to achieve their desired outcomes. The project designers identified three interventions for the first outcome (1) project will train small holders farmers on use of chemical fertilizer during planting, benefits of using certified seeds, and integrated pest management in maize crop, (2) project supported developing learning plots in which farmers tried new techniques to gain confidence and to minimize risks, and (3) project provided certified seeds to use in the learning plot so farmers can see the benefits.

Stage 4: Interventions



Intervention 1: Training on improved techniques

1. We believe the outcomes those arrows lead to *will not* occur at a sufficient level without an intervention.

   Clearly, without providing training, and opportunities to apply the newly acquired skills, small holder farmers would have little chance of achieving the outcome. No matter how great the project is, if there were no training, small holder farmers might not get an opportunity to learn about improved techniques.

2. They represent actions by the initiative and thus something that the initiative is responsible for. The training program is to be designed and imparted by the project staff so they are definitely responsible for how well it is designed and implemented.

3. Since the outcome is a control variable, it needs to be measured to evaluate the interventions' effectiveness.

To achieve its long-term goal, increased food availability and purchasing power at the household level, the staff of the implementing organizations will want to ensure that they are doing the job right. What the participants, donors, and project staff want and need are results. If the project's theory of change is correct then to improve food availability and purchasing power at the household level the small holder participating farmers need to adopt the improved practices promoted by the project, and increased access to the inputs and extension services. Therefore the project needs to measure whether these are happening.

Writing the Narrative

We're almost done! After completing the indicators and the framework, including assumptions and interventions, the participants have to wrap it all up. After capturing an initiative's multiple levels of change, it can be difficult to describe it again in normal language. The narrative helps to bridge that gap by emphasizing the most important components and pathways, so that the users can again see how the initiative creates their desired change.

The narrative also helps stakeholders explain their program to outsiders. Backed up by the change framework, the narrative can give stakeholders confidence in the logical underpinnings of the program. Writing the narrative makes it possible to coherently explain how the sequence and interventions make change possible.

Components of a Narrative

A good narrative sums up the initiative's story. The narrative typically starts from the beginning with the background and goals explaining why they are important and how the initiative's work achieves the goals.

Required elements of a narrative include:

- Background: What is the context and the need
- Long-term goal: The ultimate desired outcome
- Intermediate goals: What and how these goals are important for themselves as well as for the ultimate goal
- Assumptions and justifications: The facts or reasons behind the initiative's features
- Interventions: The initiative's activities and programs
- Program logic: The understanding that guides every step of the initiative

A well-written narrative includes enough detail to clearly capture the program's goals, but only enough to emphasize the unity of logic and action.

Glossary[8]

The following list includes the terms we use and how and when we use them. The actual terms are only important to ensure consistent usage.

Assumption: Conditions or resources that your group believes are needed for the success of your program, and that you believe already exist and will not be problematic. An assumption like a **precondition** is a condition that is necessary for your program's success. Unlike a precondition, it already is in place and does not need to be brought about. When your group states your assumptions, it is a good time to take into account the various conditions that your program's success will rely on. Assumptions are crucial because if they are incorrect it can completely alter how your program works.

Backward Mapping: The process of beginning with your long-term goal and working "backwards" toward the earliest changes that need to occur. This is the opposite of how we usually think about planning, because it starts with asking "what **preconditions** must exists for the **long-term outcome** to be reached?" rather than starting with the question: "What can we do to bring the **outcome** about?" a questions that comes later.

Change Framework: The illustration of your theory. This is a graphic representation of your outcomes and pathways, with interventions, **assumptions** and **justifications** keyed to the diagram.

Indicator: Measurable evidence of meeting a goal. Indicators are visible signs, (e.g. reading scores, attendance) that demonstrate that the outcomes are achieved. Often, indicators can be counted (quantitative), but sometimes evidence will be something

[8] See the Theory of Change Glossary (http://www.theoryofchange.org/what-is-theory-of-change/how-does-theory-of-change-work/glossary/) for all the definitions of the bolded linked terms in this section.

more descriptive (qualitative). Each indicator needs to have four components: **population**, **target**, **threshold** and **timeline**. These answer the questions: Who or what is to reach this goal? (Population) How many of that group do we need to reach the goal? (Target) What level needs to reached — how good is good enough?) (Threshold) By when does this goal need to be reached? (Timeline)

Intervention: The things your program or group of stakeholders will undertake to bring about **outcomes**. Sometimes people use the term strategy or activity. We use strategy to describe the overall focus of the initiative, and activity to describe all the specific actions that make up an intervention. So, for example, an intervention might be "hold literacy classes" and the various activities needed to make that happen would be things like identifying space and teachers, choosing a curriculum, screening students, etc. We indicate where an intervention is needed to bring about an outcome with a dashed arrow leading from one outcome to another.

Justification: Statements about why we expect one set of outcomes to lead to another. Why are the **preconditions** necessary for the outcome to be achieved? Justifications are often based on research, but may also come from past experience, common sense, or knowledge of the specific context.

Long-Term Outcome: The goal you want to reach which is the purpose of your program; for example, academic achievement for youth, or employment for a certain group. All other **outcomes** on your framework are **preconditions** to this outcome.

Narrative: A summary of your theory that explains the **pathways** of change, highlights some of your major **assumptions**, **justifications** and **interventions**, and presents a compelling case as to how and why your initiative expects to make a difference. The narrative may also contain some information that is additional to what is in your **theory**, such as your overall vision, the history of how your initiative came to be, and some community context. The purpose of the narrative is twofold: (1) to convey the major elements of your theory easily and quickly to others, and (2) to better understand how the elements of the theory work as a whole. We usually recommend that narrative shouldn't be more than one or two pages.

Outcome: An outcome is a state, or condition, that must exist for your initiative to work and does not currently exist. An outcome may represent a change in a group of people, organizations, or places. Outcomes are the building blocks of your TOC. Except for the **long-term outcome**, all outcomes on your change framework are also **preconditions** which are necessary for other outcomes.

Outcome Framework: The visual depiction of the **pathway** of outcomes, in which they are placed in sequence showing which outcomes are **preconditions** of other outcomes. This is the first component you will complete in developing your **theory**.

Pathway: The sequence **outcomes** must occur in order to reach your long-term goal. Most initiatives have multiple pathways which lead to the **long-term goal**.

Population: The entity (some common examples are groups of people, organizations or places) your initiative seeks to have an impact on, e.g., students in a certain school, parents, residents of a certain neighborhood. This is one component of an **indicator**.

Precondition: All **outcomes**, except the **long-term outcome**, are also **preconditions**. They are called preconditions because they are conditions that must exist in order for the next outcome in the pathway to be achieved. You can think of them as precursors because they must be achieved before the next outcome in the pathway, and as requirements for the accomplishment of the next outcome.

Target: How many of your **population** you expect will change based on your initiative. For example, do you expect 80% of students in a school to improve in some way? Or do you expect to find jobs for 100 residents? As with all components of **indicators**, your target for your **long-term outcome** should be set by combining your vision for change with a realistic assessment of your resources. Targets for all other outcomes should be based on how many people need to change in order for it to be enough for the next outcome in the **pathway** to occur. For example, if only 20 people take a literacy class, would you be able to raise overall literacy rates in your community by the amount you want?

Theory of Change: A TOC defines all building blocks required to bring about a given long-term goal. This set of connected building blocks — interchangeably referred to as **outcomes**, results, accomplishments, or preconditions — is depicted on a map known as a pathway of change/**change framework**, which is a graphic representation of the change process.

Threshold: How much does your target group need to change? Simply put, "how good is good enough"? For example, if students improve reading scores by one grade, is that sufficient? Or how many sessions must participants attend of a class or workshop to attain the skill being taught? Again, as with the target and timeline, how much change is determined by how much you believe is needed to reach the next **outcome**.

Timeline: By when does the **outcome** need to be reached at the level (**threshold**) and for the number of people you have specified? The timeline for reaching any given outcome depends on the timeline for reaching the outcomes above and below it on the pathway. So, for example, if residents will not have completed a literacy class until the end of the year, it is unrealistic to expect to see an increase in literacy rates in a shorter timeline. Likewise, if the **long-term outcome** is that parents read to their children within three years, you can work backwards to determine by when they need to have increased literacy and motivation.

Lesson 1.4: Data Quality and Data Quality Assessments

Measuring the success of donor-funded programming, as well as enhancing management of such programs, relies heavily on strong M&E systems that produce high-quality data.[9] Decision-makers must have confidence that the data on which their program decisions are based are of good quality.

Several tools exist for assessing data quality, which allow for verifying reported data on key indicators as well as assessing data management and reporting systems. Data quality assessment (DQA) tools provide "a common approach for assessing and improving overall data quality."

The estimated duration of this lesson is **60 minutes**.

Learning Objectives

Lesson 1.4 will provide participants with:

- An understanding of what constitutes "quality data"
- An overview of DQAs

Companion Materials

The PowerPoint presentation **1.4 Data Quality Considerations.ppt** accompanies this lesson as a separate file.

Slides

Slide 1: What do we mean by "data quality"?

There are two basic "realities" to every project – what happens in the field and how what happens in the field is reported and recorded. Project activities are designed to produce results that can be measured, i.e., they're quantifiable. These quantifiable results help make up an **information system**.

[9] Huy et al. 2008. *Routine Data Quality Assessment tool (RDQA): Guidelines for implementation for HIV, TB, and Malaria programs*.

Information systems represent what happens in the field by collecting the results that were produced and recording them in a **data management system**.

Data quality can be defined as the degree to which the data management system represents the facts on the ground.

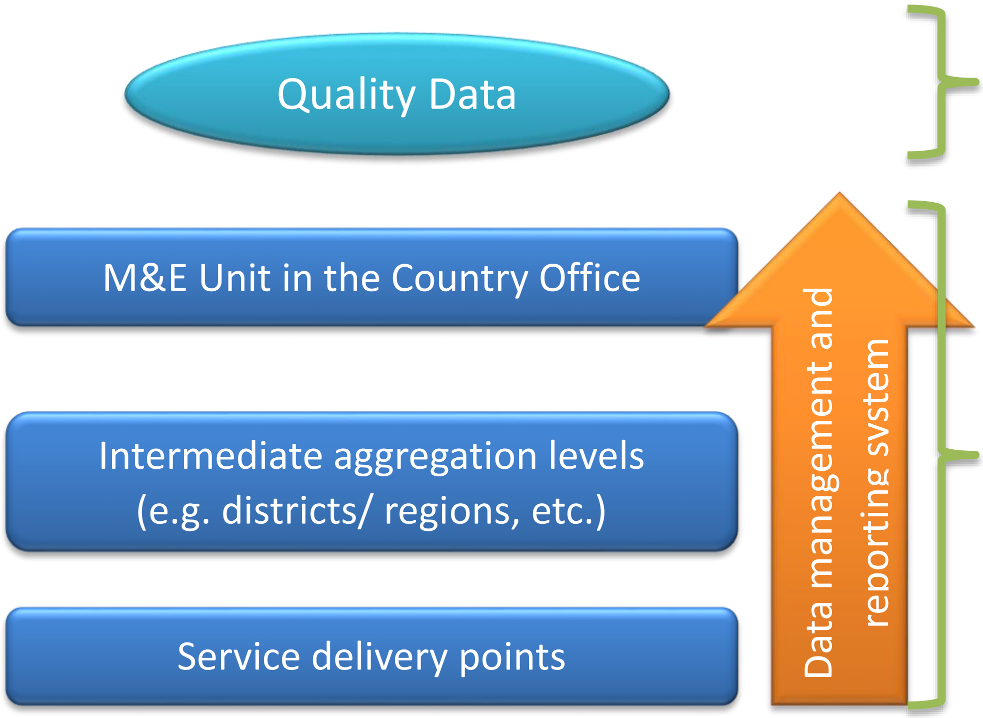
Slide 2: Why data quality?

Attention to data quality is important for a number of reasons.

- Programs are "evidence-based" – Programs are designed and implemented based on evidence, which must be reliable and relevant in order to be effective. A program will only be as good as the data on which it is based.
- Data quality → data use – the ability to use data in decision-making is enhanced by good quality data and limited by data of suspect or inferior quality.
- Accountability – good data helps ensure that limited resources are used as effectively as possible and that stakeholders are accurately informed on the impact of programs.

Slide 3: Conceptual Framework

The quality of reported data has a direct relationship with the data management and reporting systems; stronger systems produce higher-quality data. Key functional components of a data management system must be in place at all levels (e.g., service delivery points, intermediate aggregation levels, and the in-country M&E unit) in order for quality data to be produced and to flow effectively through the system.



Dimensions of Data Quality
Validity, Reliability, Timeliness, Precision, Integrity

Functional components of Data Management Systems Needed to Ensure Data Quality
M&E Structures, Roles and Responsibilities
Indicator definitions and reporting guidelines
Data collection and reporting forms/tools
Data management processes
Data quality mechanisms
M&E capacity and system feedback

Adapted from: Huy et al. 2008

Slides 4–5: Data quality standards

What do we mean when we say “high-quality data”? How do we know that data are of sufficient quality for management and decision-making purposes? Standards for data quality must be necessarily linked to the intended use of the data.

Sometimes there are trade-offs related to data quality. In many cases, implementing agency or USAID relies on data collected by other sources (e.g., government ministries) that is of unknown or uncertain quality (USAID 1996). In these cases, a decision must be made as to whether the data is of “sufficient” quality to provide an acceptable level of confidence in program assessments or whether the data is too suspect as to be useless. How the data is to be used weighs heavily on such decisions.

There are five dimensions (or standards) of data quality:

1. **Validity** –refers to whether the data are accurate in terms of minimizing error (e.g., recording or interviewer bias, transcription errors, sampling error) to a point of being negligible; data must also be representative of the indicator being measured and the indicator must be a valid measure of the result. In other words, to be valid, data must be “correct” in terms of capturing the intended effect of a program/intervention as well as free of errors.

2. **Reliability** – refers to consistency in how data are collected, processed and analyzed. Data generated by a project’s information system are based on protocols and standard procedures. They are objectively verifiable. The data are therefore reliable given that they are measured and collected consistently over time. Reliable data helps ensure that perceived program changes reflect true effects rather than differences in how data were collected.

3. **Precision** –refers to whether the data reflect the full details of the original observation. Data need to have a sufficient level of detail. For example, assume an indicator measures the number of individuals who received training on integrated pest management by sex (male/female). An information system lacks precision if it does not record the sex of the individual who received training.

4. **Timeliness** – Are the data available when needed? Data should be up-to-date (current) and available in a timely manner.

5. **Integrity** – information systems should provide appropriate mechanisms and protocols for data collection, analysis and reporting in order to eliminate/minimize the possibility of data being manipulated (e.g., skewed, biased) to show more (or less) favorable program results. The integrity of data is also compromised by errors, as described above in validity.

Slide 6: DQA

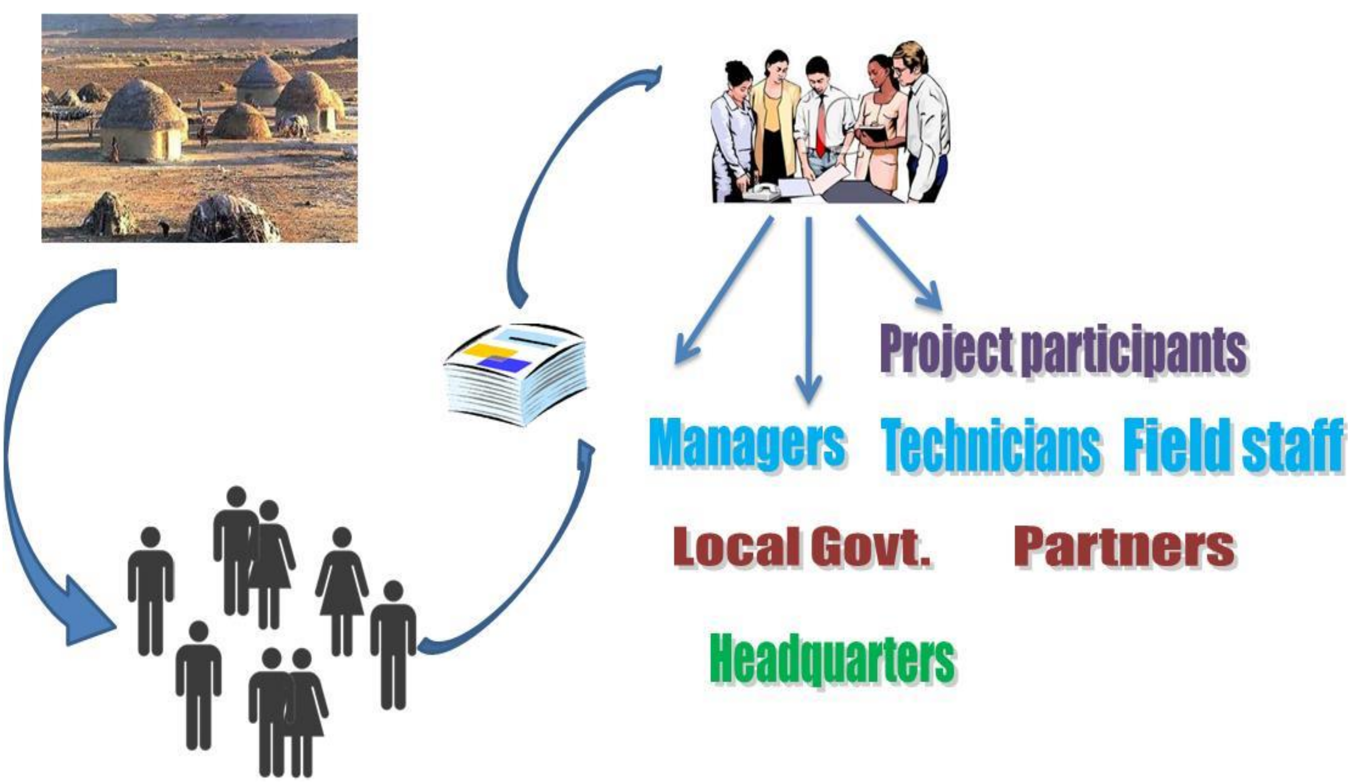
How do we determine whether a data management system is producing quality data (i.e., it meets the five data quality standards)?

A DQA is a periodic review that:

- Helps the USAID Office of Food for Peace (FFP) and the implementing partner determine and document how good certain data are, and to develop action plans for improving both data quality and the system in which it's produced.
- DQAs also provide an opportunity for capacity building of implementing partners. For example, M&E staff can be trained on how to strengthen functional areas associated with data management (e.g., data collection and reporting, data quality mechanisms, M&E structures, roles and responsibilities) in order to improve data quality.

Slide 7: How DQAs work

The diagram below shows how data flows through a project and the connection between on-the-ground reality and the representation of that reality in documentation and reports generated by the information system. DQAs allow for the assessment of the quality of data generated from a project and identify how the data and system that produces it could be improved.



Slide 8: DQA requirements

Basic requirements for DQAs are:

- In fiscal year 2012, FFP revised the Standard Indicators that Awardees need to collect at baseline and final evaluations, and is currently revising the Annual Monitoring Indicators.
- Food for Peace Officers (FFPOs) will only assess Fiscal Year 2011 data for indicators that are applicable for FFP programs awarded before FY2011 and after FY2011 (i.e., indicators that remained unchanged after the revisions).
- This will maximize the number of programs that FFPOs can assess.

Slide 9: DQA standards continued

Indicators to be collected at baseline and final evaluations surveys include:

- Average Household Dietary Diversity Score (HDDS)
- Percentage of underweight (weight-for-age Z-score [WAZ] < -2) children aged 0–59 months
- Percentage of stunted (height-for-age Z-score [HAZ] < -2) children aged 0–59 months
- Number of direct beneficiaries reached (by sector)

Slides 10–11: M&E Systems Assessment Tools

The DQA examines risks to data quality at all levels and functional areas. The graph below presents example systems questions for several functional areas.

Data management processes		Does clear documentation of collection, aggregation and manipulation steps exist?
		Are data quality challenges identified and are mechanisms in place for addressing them?
		Are there clearly defined and followed procedures to identify and reconcile discrepancies in reports?
		Are there clearly defined and followed procedures to periodically verify source data?
M&E capacity and system feedback		Do M&E staff have clear understanding about the roles and how data collection and analysis fits into the overall program quality?
		Do M&E staff have clear understanding with the PMP, IPTT and M&E Plan?
		Do M&E staff have required skills in data collection, aggregation, analysis, interpretation and reporting ?
		Are there clearly defined feedback mechanism to improve data and system quality?

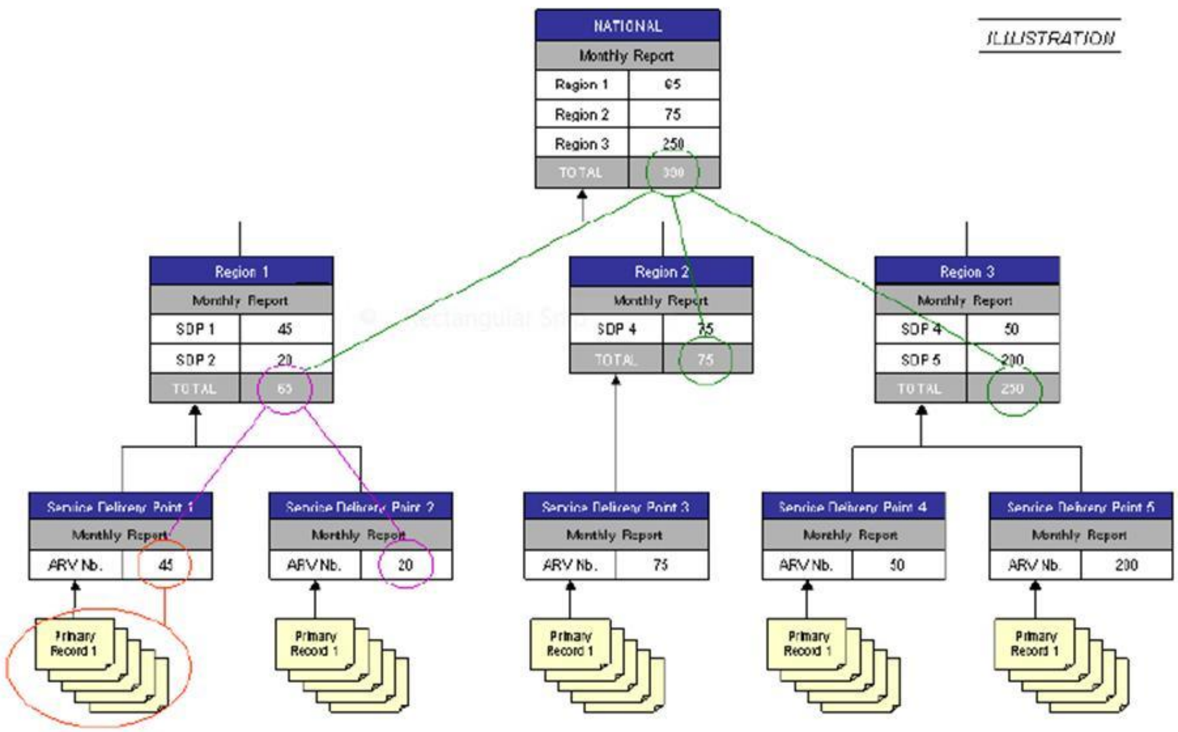
M&E structures, functions and capabilities	1	Are key M&E and data-management staff identified with clearly assigned responsibilities?
	2	Have the majority of key M&E and data management staff received the required training?
Indicator definitions and reporting guidelines	3	Are there operational indicator definitions meeting relevant standards that are systematically followed by all service points?
	4	Has the project clearly documented what is reported to who, and how and when reporting is required?
Data collection and reporting forms/tools	5	Are there standard data-collection and reporting forms that are systematically used?
	6	Are data recorded with sufficient precision/detail to measure relevant indicators?
	7	Are source documents kept and made available in accordance with a written policy?

Adapted from: The Global Fund 2007.

Slide 12: Schematic of follow-up verification

Verification of data (checking data quality) is one of the two main components of a DQA. Data verification entails a quantitative comparison of recounted to reported data, and includes an assessment of timeliness, completeness and availability of reports.[10]

The schematic below shows a trace and evaluation exercise that includes in-depth verification of data at Service Delivery Points and follow-up verification at Intermediate Aggregation Sites and the M&E Unit level.



Source: The Global Fund 2007

Slide 13: Practical DQA Tips

- Build assessment into normal work processes
- Use software checks and edits of data on computer systems
- Get feedback from users of the data
- Compare the data with data from other sources
- Obtain verification by independent parties

[10] Huy et al. 2008. *Routine Data Quality Assessment tool (RDQA): Guidelines for implementation for HIV, TB, and Malaria programs*

Slide 14: DQA realities!

The general principle is that performance data should be as complete, accurate and consistent as management needs and resources permit. Consequently, DQAs are not intended to be overly burdensome or time-intensive.

Slide 15: M&E System design for data quality

An appropriately designed M&E system is necessary to comply with both aspects of a DQA:

- Ensure that all dimensions of data quality are incorporated into the M&E design
- Ensure that all processes and data management operations are implemented and fully documented *(ensure a comprehensive paper trail to facilitate follow-up verification)*

Summary of Key Concepts

- **Data quality** is critical to developing effective M&E systems and for improving program performance.
- DQAs are **periodic reviews** that assess both the design and the implementation of data management and reporting systems.
- There is often a **trade-off** between data quality and available resources.

Lesson 1.5: Data Flow and Uses of Information

This lesson is comprised primarily of a hands-on exercise in which participants work in small groups to produce a data flow diagram. The lesson begins with a short overview of how data flows throughout a project and its importance in M&E systems.

The estimated duration for this lesson is **45 minutes**.

Learning Objectives

Lesson 1.5 will help participants:

- Gain a basic understanding of how data flow affects project management
- Learn to build and utilize data flow diagrams

Companion Materials

The PowerPoint presentation **1.5.1 Data Flow Diagram.ppt** accompanies this lesson as a separate file.

Handout 1.5.1: Data Flow is provided at the end of this lesson. Be sure to provide copies to each participant.

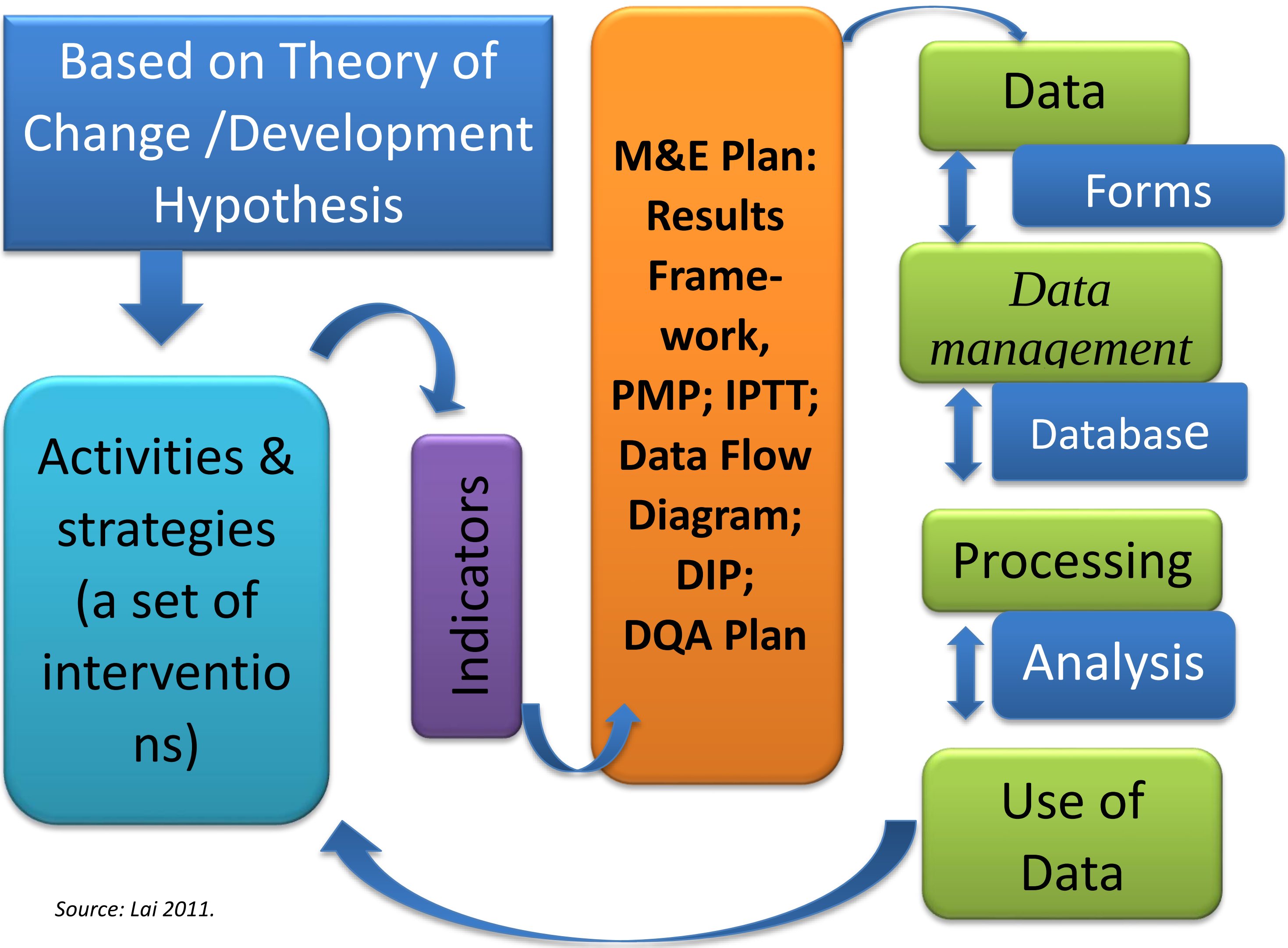
Slides

Slide 1: Data flow diagram

A data flow diagram (DFD) is a graphical representation of how data "flows" through an information system. It shows how a system will operate, what it will accomplish, and how it will be implemented. DFDs show what type of data will go into and come from the system, where the data come from and go to, and where/how the data are stored.

Slide 2: Process of developing an M&E system

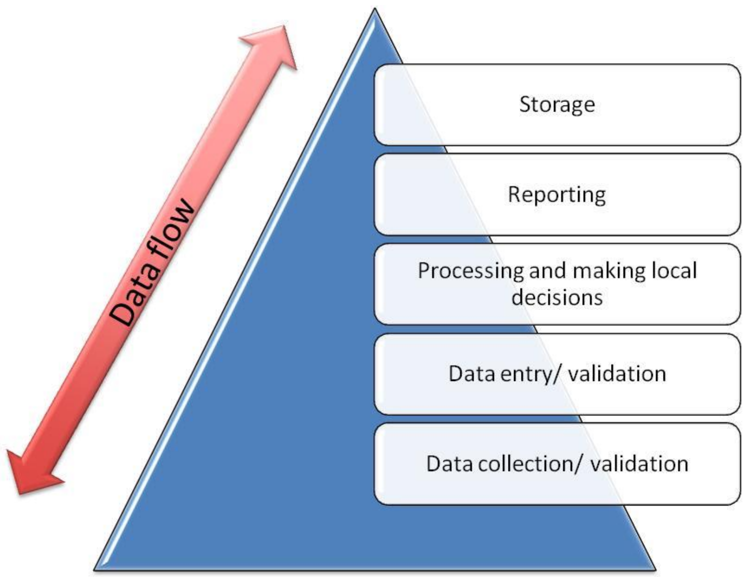
Data flow diagrams are an important component of a project's overall M&E system. The diagram below shows how the data flow diagram fits as part of the M&E plan within a larger system, and the interrelationships between different components of that system.



Source: Lai 2011.

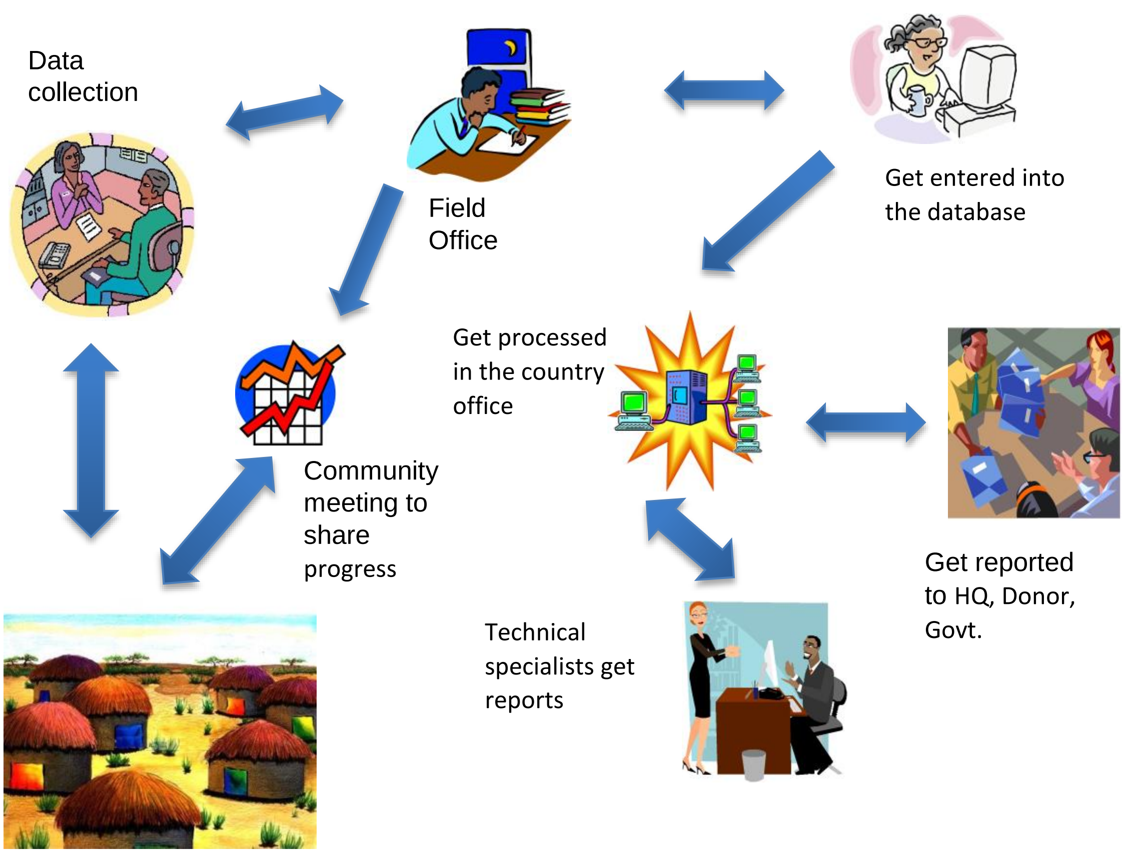
Slide 3: Critical data points

There are specific data roles and responsibilities at different "critical data points" during the M&E process. The graphic below illustrates that data flows both directions across the various critical data points: data collection/validation, data entry/validation, processing and making local decisions, reporting, and storage.



Slide 4: Data flow diagram

The graphic below illustrates that data is being exchanged all the time and in many directions. It is important to understand where data comes from, where it goes, and the dynamics of these processes.



Slide 5: Why your project should have a data flow diagram

There are multiple reasons that a data flow diagram is useful:

- Assists data quality control
- Provides a graphic representation of how data flows through the project and M&E system
- Defines M&E staff roles
- Helps understand where there may be potential data "bottlenecks"
- Clearly outlines how data is collected, validated, processed, stored and used
- Assists in project management

Slide 6: Steps in developing a data flow diagram

Developing a data flow diagram requires a series of requirements or steps, including:

1. Determining how you intend to use a data flow diagram
2. Having a complete and final PMP
3. Completing a critical data point matrix
4. Using MS Visio, PowerPoint or other graphic software to draw the critical data points
5. Adding flowability details:
   - arrows (one way, both ways)
   - color (arrows, text)
6. Adding other details, as appropriate (e.g., trees, forms)
   - Don't overcrowd space!

Slide 7: Developing a critical data point matrix

A matrix can be useful for planning and monitoring data management over the course of a project. It represents in graphic form what data will be collected, how, by whom, when and who validates it for each critical data point (data collection, data entry, processing and analysis, use, and storage). Often, this type of information is included in the IPTT. If not, a data collection matrix can be developed.

The graphic below is an example of a template for a critical data point matrix:

Critical Data Point	Who	What	How	When	Where	Who Validates
Collection						
Entry						
Processing & Analysis						
Use						
Storage						

And here is an example of a completed matrix:

Critical Data Point	Who	What	How	When	Where	Who Validates
Collection	Local Facilitator/village leader	Village activity info	Activity monitoring form	Monthly	Field – village, under a tree	1) Partners 2) Project Officer
Entry	Data Entry & Management Assistant	Village activity info	Database	Ongoing	Main office	M&E Officer
Processing & Analysis	1) DEMA 2) M&E Officer	Database	Excel; statistical software	Quarterly	Main office	Project Manager
Use	1) Program Manager 2) Beneficiaries	Analyzed data; reports	n/a	Quarterly	1) Main office 2) Field- Village, under a tree	1) COP/Country Director 2) Project Officer
Storage	DEMA	1) hard copy 2) soft file	1) shelf/ storage facility 2) Database back up	Ongoing	Main office	M&E Officer

Source: Lai 2011.

The following example is from an IPTT. While this IPTT answers most of the questions we sought to answer in the critical data point matrix above, note that it is not as thorough. For example, it does not tell us how the data will be used to make decisions, or how the data will be stored. These are very important issues to think through when designing the M&E system and remembering what purposes it serves. Therefore it is important to think beyond the IPTT template when making the M&E plan.

		Target Values				Data Collection and Reporting		
Project Outcome indicators	**Baseline**	**YR1**	**YR2**	**YR3**	**YR4**	**Frequency and Reports**	**Data Collection Instruments**	**Who collects data?**
1. Number of participating rural enterprises that realize an increase in sales	0	2	11	26	31			
2. Number of participating rural enterprises functioning as registered businesses one year after final disbursement	0	0	5	15	33			
3. Number of beneficiaries benefitting from improved marketing systems	0	1	4	9	13			

Small Group Work

Objective(s): Participants discuss and develop a data flow diagram for their respective projects

Time needed: 20–30 minutes

Handout: Data flow

Instructions: Ideally, participants will develop data flow diagrams based on their own projects for this exercise in order to receive feedback during the workshop. Where possible, form small working groups of participants who share the same project. In cases where participants are the only representatives of their project, they may be paired with someone else. The idea is for all participants to develop a schematic of how data flows through their program/project.

The task is to draw a diagram of data flow and answer a series of questions related to the data management system (see handout). Before breaking into groups, each participant should receive a copy of the "data flow" handout.

Group work:

1. Within groups, participants should quickly review what a data flow diagram is before discussing how it is being used in their project.

2. Each group should develop a data flow diagram of the M&E system in their project.

3. Using the list of questions provided in the handout, identify those aspects of the process that are going well and those areas that are challenging.

The facilitator and participants work together to review and provide feedback on diagrams developed in this session.

Summary of Key Concepts

- **The data flow diagram** is an important component of a project's overall M&E system and represents what type of data will go into and come from the system, where the data come from and go to, and where/how the data are stored.

- A **critical data points matrix** is a useful way to visually see what data will be collected, how, by whom, when and who validates it for each critical data point.

Handout 1.5.1: Data Flow

Key questions to consider for developing a data flow diagram of your project's M&E system:

1. Are the data being collected and process at the right time and forwarded in a timely manner to the next level of the system?
2. How are the data and results being communicated?
3. In what format(s) are results being communicated?
4. How does feedback occur (by what mechanism)?
5. How are the data being used?
6. Are users of the data providing feedback? Is it reaching you in a timely manner?
7. Do you have adequate resources to collect, analyze, report and communicate your data?

Lesson 1.6: Quantitative Sampling

This lesson introduces the basic concepts of quantitative sampling within the context of M&E and provides step-by-step guidance for determining sample size. This is a long and intense session so it is important that you allow a break before you start discussions on how to estimate sample size.

The estimated duration of this lesson is **1 hour 30 minutes**.

Learning Objectives

Lesson 1.6 will provide participants with:

- An overview of quantitative sampling techniques
- A basic understanding of the terms and methodologies employed in quantitative sampling
- A step-by-step process for determining sample size under two specific conditions

Companion Materials

The PowerPoint presentation **1.6 Quantitative Sampling.ppt** accompanies this lesson as a separate file.

Handout 1.6.1: Sample Size Calculator is provided at the end of this lesson. Be sure to provide copies to each participant. A link to the original excel file—**1.6 Sample Size Calculator.xlxs**—is also provided as a separate file so that participants can automatically calculate sample sizes.

Slides

Slides 1–2: What exactly IS a sample?

A **sample** is a subset of the population under study. Another way of defining a sample is; a sample is a subset or a technically selected part of the population for purposes of making inference about the population and its characteristics.

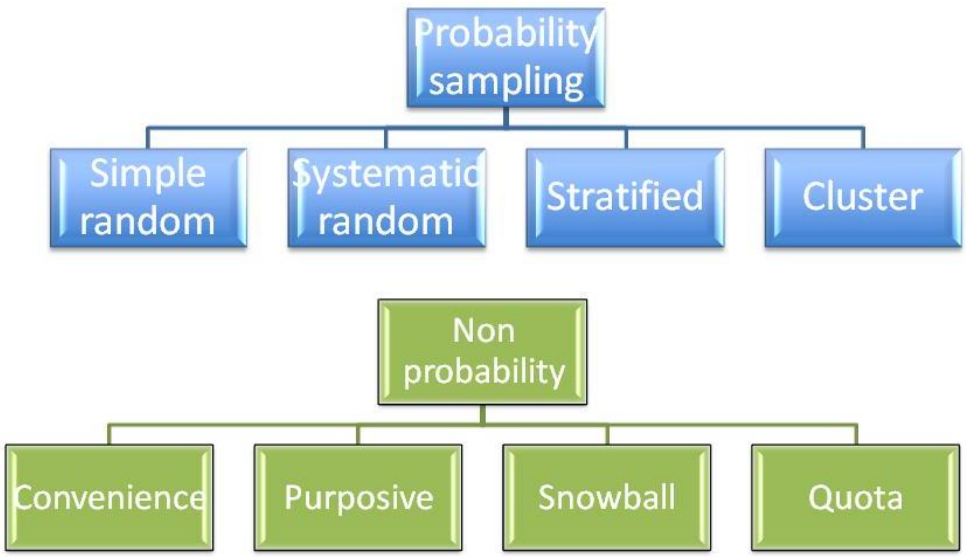
Baseline surveys and other assessments used for evaluation purposes typically draw a sample and conduct a **sample survey** to represent the population in which they are interested. Sampling reduces the time and cost of collecting data about a population by gathering information from a subset instead of the entire population.

A sample may be selected by either **probability** or **non-probability** methods. The main difference is that probability uses random selection, while non-probability sampling does not. This does not necessarily mean that non-probability samples are not representative of the population. However it does mean that non-probability samples cannot depend upon the rationale of probability theory.

Probability sampling allows you to know the likelihood of any member of the population being included in the sample.

Slide 3: Types of samples

The graphic below shows the different types of probability and non-probability sampling.



The following slides go into more detail about specific **probability sampling** methods. **Non-probability sampling** methods are discussed in Lesson 2.3: Qualitative Sampling.

Slides 4–5: Probability Sampling

Probability sampling is a sampling technique wherein the samples are gathered in a process that gives every individual in the population an equal chance of being selected. It is the most common kind of sampling and it entails various methods.

Probability sampling procedures follow probability principles such as "random sampling." It requires that each element have a known, non-zero probability of selection. Probability sampling is based on formal statistical theory, allowing precision and reliable estimates to be calculated, minimizing bias.

Slide 6: Types of Probability Sampling

The four main types of probability sampling are:

- Simple Random Sampling
- Stratified Random Sampling
- Systematic Random Sampling
- Cluster Random Sampling

The following slides describe each of these methods in turn.

Slides 7–8: Simple Random Sampling

Simple Random Sampling (SRS) is the underlying principle for all other probability methods. As indicated in the slide, simple random sampling is the easiest form of probability sampling but rarely used in development projects. In fact, SRS is rarely used as a “stand-alone” method; rather it is used in conjunction with other sampling methods.

The basic steps for conducting simple random sampling are:

1. Determine the sample size (n)
2. List all sampling units in the population or sampling universe (This is the hard part! It must not systematically **exclude** anyone.)
3. Assign a unique number to each sampling unit, beginning with 1
4. Generate n random numbers
5. Select the units that correspond to the random numbers. This is your sample.

Slide 9: Stratified Random Sampling

Stratified random sampling is a probability sampling technique wherein the population is classified according to sub-groups based on some criteria or selected characteristics (e.g., age, socioeconomic status, sex). These groups represent **strata**. A random sample is selected from each stratum.

With stratified sampling, the best survey results occur when elements within each strata are homogeneous (e.g., similar to each other).

Basic steps: Randomly select sampling units from the different strata. **It is important that there are no overlaps of sampling units between any of the strata** (i.e., each subject or sampling unit belongs to only one stratum).

Slide 10: Systematic Random Sampling

Systematic random sampling is a random sampling technique frequently chosen by researchers for its simplicity and periodicity. One of the advantages of systematic random sampling over simple random sampling is that it ensures the population will be evenly sampled (simple random sampling could result in groups or "clusters" simply by chance alone).

Basic steps: The first sampling unit is chosen randomly (e.g., a researcher randomly chooses a number that is less than the number of units in the population). This number (*n)* represents where the selection process begins. **It is important that each unit has an equal probability of being selected as the starting point.** Secondly, each n^{th} subject is chosen (the n^{th} number represents the interval at which units are selected).

Slide 11: Two-stage Cluster Random Sampling

Cluster random sampling is done when simple random sampling is impossible due to the large size of the population. It is the most commonly used sampling technique in development projects and is particularly useful when no sampling frame or list of the population is available but listings of villages, towns, camps, etc. (i.e., clusters) are available.

With cluster sampling, the best survey results occur when elements within each cluster are diverse (e.g., different from each other).

Cluster sampling reduces the cost per sample point (because sampling units are "clustered" in a geographic area, making access easy) but is generally less precise than either simple random sampling or stratified sampling. The increased sample size that often results from cluster sampling often offsets the loss in precision, making it the "best" choice.

Basic steps: Identify the boundaries of the project operational area. Divide the population of interest into geographically distinct groups or clusters (e.g., communities, villages). Randomly select a number of clusters. **It is important that all clusters within the population have an equal chance of being selected.** Randomly select sampling units from each selected cluster.

Slide 12: Two-stage Cluster Random Sampling con't.

Two-stage cluster random sampling involves randomly selecting a subset of sampling units from each cluster selected in the first stage (see slide 11). Clusters may be selected (in stage one) using "probability proportional to size" (PPS),[11] which means that a cluster with more households is more likely to be included than one with fewer households.

Slides 13–15: Key statistical terms

The next three slides review key statistical terms used for determining sample-size.

Confidence interval (CI): the range around a sample measurement that conveys how precise the measurement is (i.e., that the population measurement falls within the interval).

The CI is a +/- figure often reported in survey results.

Example: Given a CI of 4, if 47% of sampled households report they have used certified seeds, you can be "sure" that if the entire population had been asked this question (rather than randomly selected households from within the population), that between 43% (47% - 4) and 51% (47% + 4) of households would have reported that they have used certified seeds.

Confidence level: indicates how sure you can be that the population parameter of interest falls within the specific confidence interval.

It is expressed as a percentage and represents how often the true percentage of the population would pick an answer that lies with the confidence interval.

A 95% confidence level means you can be 95% certain that the population parameter falls within the confidence interval (i.e., that the sampled parameter represents the true population parameter).

The confidence level determines the probability that the CI produced will contain the true value of the population parameter. Most researchers use a 95% confidence level.

Statistical power: the probability of detecting a change given that a change has truly occurred.

A value of 0.9 for power translates into a 90% chance that we will detect a change has occurred when in fact it has (or a 10% chance of missing a change that actually occurred). For a reasonable test of a hypothesis, power should be $\geq$ 0.8.

Power analysis can be used to calculate the minimum sample size required so that one can be reasonably sure of detecting an effect of a given size.

[11] For guidance on PPS, see: Magnani, Robert. 1999. *Sampling Guide*. Washington, DC: The Food and Nutrition Technical Assistance Project (FANTA).

Slide 16: Sampling formula

Step 1. Base sample-size calculation

There are two basic formulas commonly used to calculate sample size required to detect a certain effect. One formula is used for assessments in which you will NOT be comparing the results with those from additional assessments (e.g., no baseline-end line comparisons). The other formula is used when such comparisons ARE anticipated.

For assessments in which comparisons are not expected:

$$n = \frac{t^2 \text{ x } p(1-p)}{m^2}$$

Slide 17: Sampling formula – definition of variables

In this example, the variables are defined as follows:

n	Required sample size
t	Confidence level at 95% (standard value 1.96)
p	Estimated level of the indicator being studied in the survey area at the time of the survey (if not available, use 0.5)
m	Margin of error at 5% (standard value of 0.05)
N	Required sample size for two-stage cluster sampling

Slide 18: Sampling formula – design effect

Step 2. Design Effect

However, the survey is designed as a cluster sample (a representative selection of villages or communities), not a simple random design.

To correct for this difference in design, the sample size is multiplied by the design effect (d).

$$N = n \text{ x } d \quad \left[\text{this formula can also be written as: } N = \frac{t^2 \text{ x } p\ (1-p) \text{ x } d}{m^2} \right]$$

n = Design effect (generally assumed to be 2)

Slide 19: Sampling formula

Thus, when p = 50% (0.5)

Then the calculation is as follows:

$$n = \frac{1.96^2 \times .5(1-.5)}{.05^2}$$

$$n = \frac{3.8416 \times .25}{.0025}$$

$$n = \frac{.9604}{.0025}$$

n = 384.16 ~ **384**

To correct for the difference in design:

N = 384 x 2 = 768

Slide 20: Sampling formula – contingency & clusters

Step 3. Contingency

The sample is further increased to account for contingencies such as non-response or recording errors. A 5% increase is used.

N = 768 + (768 x .05)

N = 768 + 38 = 806

When using cluster sampling, the total sample size must be divided by the number of clusters to determining the sample size per cluster.

Step 4: Calculate sample size per cluster (assume 30 clusters):

N / number of clusters = sampling units per cluster

806 ÷ 30 ~ **27 sampling units per cluster**

Slide 21: Sampling frame

Once the sample size is known, you must determine the sampling frame.

First, list clusters (e.g., villages or communities) and the number of households in each (assuming household is the sampling unit).

District	Village	Number of Households	Cumulative Number of Households
XXX	ABCD	102	102
	EFGH	78	180
	IJKL	96	276
	…		
	…		
	….		6709

Slide 22: Sampling interval

Next, you must determine the sampling interval in order to select the actual clusters (villages) that will be surveyed.

The sampling interval (SI) is determined by dividing the cumulative population by the number of clusters:

SI = 6709/30 = 224

Select a random number (between 1 and the SI) using a random number generator or table, currency note or Microsoft Excel.

Slide 23: Selecting sampling clusters

Using the cumulative column of the table shown in slide 25, find the first cluster whose cumulative number includes the random number.

Assuming a random number of 173, the first cluster would correspond to 180, or village EFGH.

The second cluster is determined by adding the SI to the cumulative population number identified in the previous step (i.e., 180):

180 + 224 = 397

The third cluster is determined by repeating the process of adding the SI to the previously identified number in the cumulative population column:

397 + 224 = 621

And so on…

Slide 24: Selecting sample households

We have previously calculated that 21 households were to be sampled from each cluster (see slide 24). There are several ways to select households to be sampled within each cluster:

- Randomly select 21 households from a list of all households in each sample cluster
- Conduct a random walk

FANTA guidelines on sampling provide detailed guidance of various random selection techniques.

Summary of Key Concepts

- **Samples** are a subset of the population about which inferences will be made.
- **Probability sampling** uses random selection and allows you to know the likelihood of any member of the population being included in the sample
- **Statistical power is** the probability of detecting a change given that a change has truly occurred and can be used to determine the appropriate sample size required to detect an effect of a given size.

Handout 1.6.1: Sample Size Calculator

Important: What is shown on the next page *is only a screen view* of the Sample Size Calculator. **The calculator functions only when it is opened in MS Excel.** The Excel file is formatted so that when the user enters figures into certain cells (e.g., design effect, needed precision, prevalence, etc.), pre-set formulas compute the required sample size.

Sample Size Calculator

Cells highlighted in green with black font are user input.

Cells highlighted in red with blue font are the output.

Z-table		
	97.5%	*1.959*
	95%	*1.645*
	90%	*1.282*
	85%	*1.036*
	80%	*0.8416*

One-time Study
(not comparing baseline to final, "one proportion")

Design Effect: 1

(Use 1 for SRS, LQAS, Stratified Sampling; Use 2 for Cluster Sampling for most surveys.)

Needed Precision: 10%

(Format: 10% for ten percent precision (not 0.1).)

Estimated Prevalence of what you are 50%

(Use 50% if you are measuring multiple indicators or don't know.)

Required Sample Size: 96

Surveys that will be Repeated
(e.g., Baseline and Final, "two proportions")

Design Effect: 2

(Use 1 for SRS, Stratified Sampling; Use 2 for Cluster Sampling for most surveys.)

Z_a 1.645

(Use 1.645 for 95% confidence level, one-tailed test. Z-table provided above.)

Z_b 1.2820

(Power: The probability of detecting a change. Use 1.282 for 90% Power or 0.8416 for 80% Power. Z-table provided above.)

Estimated Baseline Prevalence of what you are measuring: 40%

(If you do not know or are using multiple indicators, use 50% LESS the change that you want to see in points divided by 2. Example: If you want to see a change of 20 points, then the estimated baseline prevalence is 40, since [50-(20/2) = 40].)

Estimated Final Prevalence: 60%

(If you do not know or are using multiple indicators, use 50% PLUS the change that you want to see in points divided by 2. Example: If you want to see a change of 20 points, then the estimated final prevalence is 60, since [50+(20/2) = 60].)

Required Sample Size (at Baseline and at Final): 206

Adapted from spreadsheet provided by Tom Davis, FH Senior Director of Program Quality Improvement

Lesson 1.7: Gender Considerations in M&E

Men and women have different vulnerabilities, capacities, needs and coping strategies in the face of food and livelihood insecurity, shocks, etc. For example, a woman may lose a spouse as a result of conflict or natural disaster, or be required to take on additional tasks if men have out-migrated to seek employment.[12] Also, a food-secure household does not necessarily mean all *members* in the household are food secure: intra-household food distribution may vary by gender in different societies, in different situations, and in response to changing levels of household food security overall.

Tools used for M&E in general – and for gender analysis in particular – should be enable analysts to clearly identify associations between gender and specific issues facing populations in emergencies and developmental contexts (e.g., security, labor allocation, access to credit, and inclusion in social networks).[13] Qualitative and quantitative tools should be designed to capture gender-related information during important stages of M&E development and implementation such as assessments, baseline surveys, the Indicator Performance Tracking Table (IPTT), and regular monitoring exercises. M&E plans should collect gender-disaggregated data to be able to detect whether interventions have any effects that may be differentiated by gender. Gender can also be disaggregated during the tabulation phase of data analysis.[14]

USAID is in the process of developing guidelines for project implementers to track progress toward required gender objectives of USAID-funded projects. Specifically, the USAID Feed the Future initiative is developing guidelines for “empowering women in agriculture,” including an index of indicators and a sample survey instrument that can be used to measure gender objectives of individual projects.

The estimated duration for this lesson is **45–60 minutes**.

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[12] TANGO International. 2004. Emergency Food Security Assessment Handbook. World Food Programme.

[13] TANGO International. 2007 (Draft). Monitoring and Evaluation Manual. Prepared for ADRA International.

[14] Ibid.

Learning Objectives

Lesson 1.7 will help participants:

- Share information about how their projects have addressed gender at different stages in the project cycle
- Practice integrating gender considerations into M&E tools

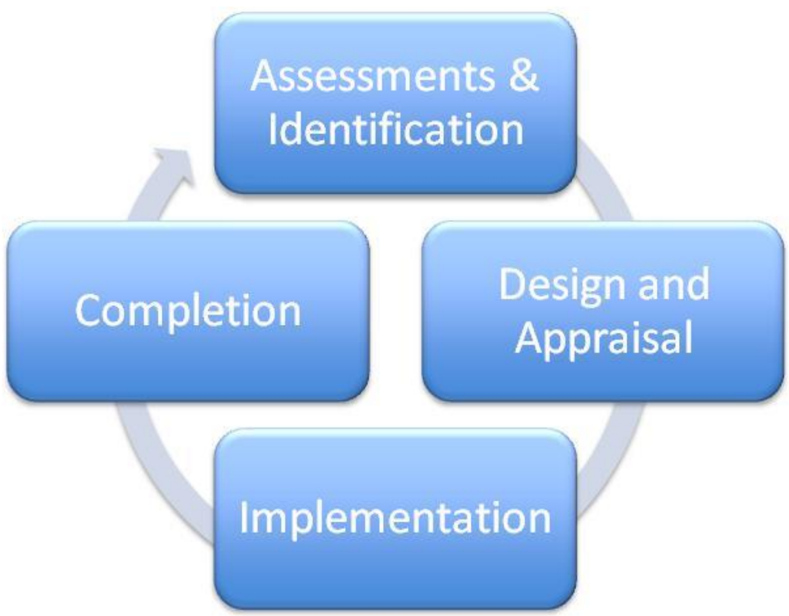
Companion Materials

This lesson is presented primarily as a group exercise. While there is no companion PowerPoint, the lesson provides some basic background for the facilitator.

Handout 1.7.1: Pilot Testing of Agriculture Index is provided at the end of this lesson. Be sure to provide copies to each participant.

Introduction I: Gender and the Project Cycle

The diagram below shows a typical project cycle. Gender should be integrated into each of the stages in the cycle.



Introduction 2: Integrating Gender in the Project Cycle

How should gender be reflected in the different stages of the project cycle?

Assessment and identification:
- Information on social and gender issues is captured and analyzed

Design and appraisal:
- Project includes interventions to close gender gaps
- Project resources are allocated to reflect gender equity

Implementation:
- Gender is integrated into the implementation plan
- Benefits of outputs for men and women are defined and tracked

Completion: Project has made progress on:
- Closing gender gaps
- Empowerment
- Overall social wellbeing for men and women

Introduction 3: Role of M&E in Addressing Gender

What is the role and responsibility of M&E in addressing gender at each stage of the project cycle?

Assessment and identification:
- Collect and analyze information that helps to identify social and gender issues

Design and appraisal:
- Identify gender-sensitive indicators to monitor gender gaps
- Help set targets for the project's gender objectives

Implementation:
- Collect and process gender-sensitive and sex-disaggregated data to track outputs and outcome-level changes
- Develop tools and methods to collect data to reflect gender outcomes and impacts
- Provide gender sensitivity training to staff
- Hire both male and female data collectors

Completion:
- Collect and analyze data to measure intended benefits for men and women
- Evaluate the realistic prospects of sustaining the benefits

Discussion

The facilitator may choose to open the session with the following questions to gauge the group's experience, skills and knowledge about gender in M&E and to stimulate discussion. The facilitator or a note-taker may record the main issues, noting good practices as well as needs for further information that may be followed up on after the training.

Before presentation:

- What is your project doing to integrate gender during the assessment, design and completion stages and at the end of the project?
- Do your M&E tools and methodologies reflect gender issues? How?

After presentation:

- What are the gaps/issues/challenges in integrating gender considerations into your project?
- What are some promising/good practices? (Give examples.)
- Where do you need support?

Take about 10–15 minutes for this discussion.

Small Group Work

Objective: Participants practice integrating gender considerations into M&E tools

Time needed: 35 minutes

Handouts: Pilot Testing of Agriculture Index

Instructions: There are different options for dividing into small groups:

- Participants count off by fours: all the "ones" form a group, all the "twos" form a group, etc.
- Participants are grouped according to those who work on the same project, from the same organization, in the same country, etc.

All participants should have a copy of the handout, "Pilot Testing of Agriculture Index – Uganda: Individual Level Questionnaire."

The tasks for this exercise are:

1. Review the questionnaire. This exercise focuses primarily on the survey questions themselves, so focus attention on those survey modules (Modules B through F).

2. Keeping in mind the project you are currently involved with, select 5–6 indicators from this survey that could be used or adapted in your project to monitor:
   - Change in empowerment of women (select 2-3 indicators)
   - How food insecurity/nutrition is improved by integrating gender considerations (select 2–3 indicators)
3. For each indicator you have selected, what would be the appropriate questions for baseline and endline evaluations of your project?
4. For each indicator you have selected, what would be the appropriate questions for monitoring? (You may also think about appropriate questions outcome monitoring surveys.)

Take about 20 minutes for this work.

At the end of the group work, ask each group to share one or two examples of indicators they selected, how they tailored them to meet their project, and how the indicator integrates gender objectives or gender considerations. Allow 15 minutes for the discussion in plenary.

Keep in mind:

- When a project has explicit gender objectives, the outcomes should tell us something about how food insecurity/nutrition is improved by integrating gender considerations.
- It is not likely that all programs will or should include all of the questions in the survey in the handout. The program context should define what to include; this will vary across countries and also across regions.
- The questions in this survey should be incorporated into the baseline questionnaire appropriately for men and women. However in this lesson we are focusing on understanding the importance of looking at some of the gender considerations from the baseline onwards. For example, let’s look at question C14:

  How many times did you meet with the Ag/extension worker in the last 12 months [or some predefined time]?

If the program is trying to improve gender sensitivity to women farmers’ issues and women’s issues, this is a good question to monitor. We may find, for example, that at baseline, only men meet the target, whereas at end line, both men and women meet the target. Looking at these data, along with data from monitoring throughout the project, may suggest that the intervention met gender objectives for this indicator.

Summary of Key Concepts

- Gender considerations need to be reflected in all stages of the project cycle: design, assessment, implementation and project completion.
- M&E tools should be designed to enable the identification of associations between gender and specific issues facing the population in question, and the effect of the intervention on these associations.

Pilot Testing of Agriculture Index

Uganda: Individual Level Questionnaire

International Food Policy Research Institute (IFPRI) & Associates Research Uganda Limited (ARUL)

INSTRUCTIONS ON ADMINISTRATION:

Enumerator: This questionnaire should be administered to individuals identified in the household roster (Section B) of the household level questionnaire as the primary and secondary respondents. You should complete this coversheet for each individual identified in the "selection section" even if the individual is not available to be interviewed for reporting purposes. Please double check to ensure:

- You have completed the household questionnaire, at least the first 2 modules;
- You have identified the correct individual;
- You have noted the household ID and individual ID correctly for the person you are about to interview;
- You have gained informed consent for the individual in the household questionnaire;
- You have sought to interview the individual in private or where other members of the household cannot overhear or contribute answers.

MODULE A. INDIVIDUAL IDENTIFICATION

Household Identification	Code	Interview details	Code
A01. Household Identification:...		**A07**. Start time of interview (hh:mm=> write in 24 hr time format)	:
A02. Listing number:..		**A08**. End time of interview (hh:mm=> write in 24 hr time format))	:
A03. Name of primary respondent (code from roster in Section B of HH questionnaire): **Surname, Religious: ....**		**A09**. Name/code of enumerator: ………………………………………………………………………..	
A04. Name of respondent currently being interviewed (code from roster in Section B of HH questionnaire): **Surname, Religious: ....**		**A10.** Sex of enumerator**:** Male...........1 Female 2	
A05. Sex of respondent**:** Male........1 Female 2		**A11.** Outcome of interview (enter code from **Code 1**↓):	
A06. Type of household Male and female adult ……………...1 Female adult only……………………2		**A12.** Ability to be interviewed alone (enter code from **Code 2**↓):	

Code list for Module A:

Code1: (A11) Outcome of interview	Code 2 (A12): Ability to be interviewed alone
Completed 1	Alone 1
Incomplete.. 2	With other adult females present.................. 2
Absent 3	With other adult males present..................... 3
Refused 4	With other adults mixed sex present 4
Could not locate 5	With children present................................... 5

MODULE B: (Dimension 1): Role in household decision-making around production and income generation

Enumerator: The purpose of this module is to get an idea about men's and women's relative roles in decision making around income-generating activities. Do not attempt to ensure that responses are the same between the male and female respondent. It is okay for them to be different.

RANDOMIZATION: Enumerator, please check the start time of the interview. If the interview started on an even minute (0, 2, 4, 6 or 8) please follow OPTION A. If the interview started on an odd minute (1,3, 5, 7 or 9) please administer OPTION B. Check which option you follow:

- Option A: Read additional example information for B02/B03 highlighted in grey. ☐
- Option B: DO NOT read additional example information for B02/B03 highlighted in grey. ☐

Code 1: Input into decision making
No input.....1
Input into very few decisions.....2
Input into some decisions.....3
Input into most decisions.....4
Input into all decisions.....5
Decision not made.....6

Activity		Did you (singular) participate in [ACTIVITY] in the past 12 months (that is during the last two cropping seasons)? Yes .... 1 No .... 2 >> next activity	How much input did you have in making decisions about [ACTIVITY]? **CODE 1↑**	How much input did you have in decisions on the use of income generated from [ACTIVITY] **CODE 1↑**
ActivityCode	Activity Description	**B01**	**B02**	**B03**
1	Food crop farming: crops that are grown primarily for household food consumption **Option A (B02/B03 only):** For example, did you have input into decisions about what crops to plant this year or in which plots they would be planted, or which seeds, fertilizer (other inputs) your family would buy?	☐	☐	☐
2	Cash crop farming: crops that are grown primary for sale in the market **Option A (B02/B03 only):** For example, did you have input into decisions about how much of your family's land would be used for growing cash crops, or about the crops to be grown for sale, and the inputs to be used for those crops?	☐	☐	☐
3	Livestock raising: **Option A (B02/B03 only):** For example, did you have input into decisions about the purchase, care, or sale of livestock?	☐	☐	☐
4	Non-farm economic activities: Small business, self employment, buy-and-sell **Option A (B02/B03 only):** For example, did you have input into purchases made for a small business or goods sold?	☐	☐	☐
5	Wage and salary employment: in-kind or monetary work both agriculture and other wage work **Option A (B02/B03 only):** For example, did you have input into decisions about if you or other household members will work outside the home?	☐	☐	☐
6	Fishing or fishpond culture **Option A (B02/B03 only):** For example, did you have input into decisions about when to do fishing, or how to stock a fish pond, inputs for fish culture?	☐	☐	☐

MODULE C (Dimension 2): Access to productive capital

Enumerator: The purpose of this module is to get an idea about men's and women's access to capital or assets and their ability to control use of the resource. Again, do not attempt to ensure that responses are the same between the male and female respondent. It is okay for them to be different. In the case the respondent has no spouse or partner, please enter 98 in C07 and C08.

Productive Capital		Does anyone in your household currently have any [ITEM]? Yes ...... 1 No .... 2 >> next item	How many of [ITEM] does your household currently have?	Who would you say owns most of the [ITEM]? CODE 1↓	Who would you say can use the [ITEM] most of the time? CODE 1↓	Who would you say can decide whether to sell [ITEM] most of the time? CODE 1↓	Who would you say can decide whether to give away [ITEM] most of the time? CODE 1↓	Who would you say can decide to mortgage or rent out [ITEM] most of the time? CODE 1↓	Who would you say would keep the majority of [ITEM] in the case a marriage is dissolved because of divorce or separation? CODE 1↓	Who would you say would keep the majority of [ITEM] in the case a marriage is dissolved because of death of your partner/ spouse? CODE 1↓	Who contributes most to decisions regarding a new purchase of [ITEM]? CODE 1↓
Productive Capital		C01a	C01b	C02	C03	C04	C05	C06	C07	C08	C09
1	Agricultural land (pieces)										
2	Large livestock (oxen, cattle)										
3	Small livestock (goats, pigs, sheep)										
4	Chickens, Ducks, Turkeys, Pigeons										
5	Fish pond or fishing equipment										
6	Farm equipment (non-mechanized)										
7	Farm equipment (mechanized)										
8	Nonfarm business equipment										
9	House (and other structures)										
10	Large consumer durables (fridge, TV, sofa)										
11	Small consumer durables (radio, cookware)										
12	Cell phone										
13	Other land not used for agricultural purposes (pieces, residential or commercial land)										
14	Means of transportation (bicycle, motorcycle, car)										

CODE 1 (for C02 – C09): Decision-making and control over capital		
Self..1 Spouse ....2 Self and spouse jointly ....3 Other household member 4	Self and other household member(s) .. …….5 Spouse and other household member(s)….6 Someone (or group of people) outside the household……….....................................7	Self and other outside people .... …….8 Spouse and other outside people…………..9 Self, spouse and other outside people.........10

MODULE C (Dimension 2): Access to Credit, CONTINUED

Lending sources		Has anyone in your household taken any loans or borrowed cash/in-kind from [SOURCE] in the past 12 months? Yes, cash .... 1 Yes, in-kind .... 2 Yes, cash and in-kind .... 3 No .... 4 >> next source Don't know.....................5 >> next source	Who made the decision to borrow from [SOURCE]? CODE 1	Who makes the decision about what to do with the money/ item borrow from [SOURCE]? CODE 1
Lending source names		C10	C11	C12
A	Non-governmental organization (NGO)			
B	Informal lender			
C	Formal lender (bank/financial institution)			
D	Friends or relatives			
E	SACCOs			
F	Village Savings and Loan Associations (VSLAs)/Merry-go-rounds			

CODE 1 (for C02 – C09): Decision-making and control over capital		
Self...1 Spouse...2 Self and spouse jointly ....3 Other household member 4	Self and other household member(s).. ....5 Spouse and other household member(s)....6 Someone (or group of people) outside the household………...................................7	Self and other outside people ....8 Spouse and other outside people…………..9 Self, spouse and other outside people.........10

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MODULE C (Dimension 2): Access to Agriculture/livestock/fisheries extension, CONTINUED

QNo.	Question	Response	Response options
C13	Where do you typically get information on farming or livestock related topics such as new seeds, technology, crop rotation or animal health?		Government agency or outlet .... 1 NGO or NGO outlet..................................... 2 Private shop/suppliers................................. 3 Community members or cooperative .... 4 Family member .... 5 Media (radio/TV/newspaper)........................ 6 Not applicable/do not get advice.................. 7
C14	Have you (yourself) ever met with an agricultural extension worker or livestock/fisheries extension worker in the past 12 months?		Yes... 1 No .... 2 >> Next section
C15	How many times did you meet with the agricultural extension worker or livestock/fisheries worker in the past 12 months?		[Enter number of visits]
C16	The last time you met with an extension worker, were they a male or female?		Male .... 1 Female .... 2 Both male and female 3

MODULE D (Dimension 3): Income

Enumerator: The purpose of this module is to get an idea about how the surplus of household, men's and women's incomes, after food needs are met, is allocated among other expenditure categories: Do not attempt to ensure that responses are the same between male and female respondent. It is okay for them to be different.

QNo.	Question	Response	Response options/Instructions
D01	Do you alone have any money you can decide what to spend on?		Yes ..... 1 No 2
D02	ENUMERATOR: Skip this question if the respondent has no partner. If the respondent has more than one spouse/partner, ask in relation to the individual being interviewed in the parallel individual questionnaire. In comparison to your partner, do you [READ RESPONSES]:		Earn more money than him/her ..... 1 Earn less money than him/her ..... 2 Earn about the same money as him/her ..... 3 Partner does not earn money ..... 4 I do not earn money ..... 5 Both partner and I do not earn money ..... 6 Do not know how much partner earns 7
Question: Household level			
D03	In the last 12 months, apart from buying food for the family, what else did your household spend its remaining money on?	A B C D E	Code 1↓: List up to 5 in order of importance **[DO NOT PROMPT]** (If filled and not 98 >> Skip to D05)
D04	In the last 12 months, if the household did not have any extra money, what is the reason?	A B C	Code 2↓: List up to 3 reasons in order of importance **[DO NOT PROMPT]**
Question: Individual level			
D05	In the last 12 months, after providing food for the family, what did you (singular) spend your remaining money on?	A B C D E	Code 1↓: List up to 5 in order of importance **[DO NOT PROMPT]** (If filled and not 98 >> Skip to Next Section)
D06	In the last 12 months, if you (singular) did not have any remaining money, what is the reason?	A B C	Code 2↓: List up to 3 reasons in order of importance **[DO NOT PROMPT]**

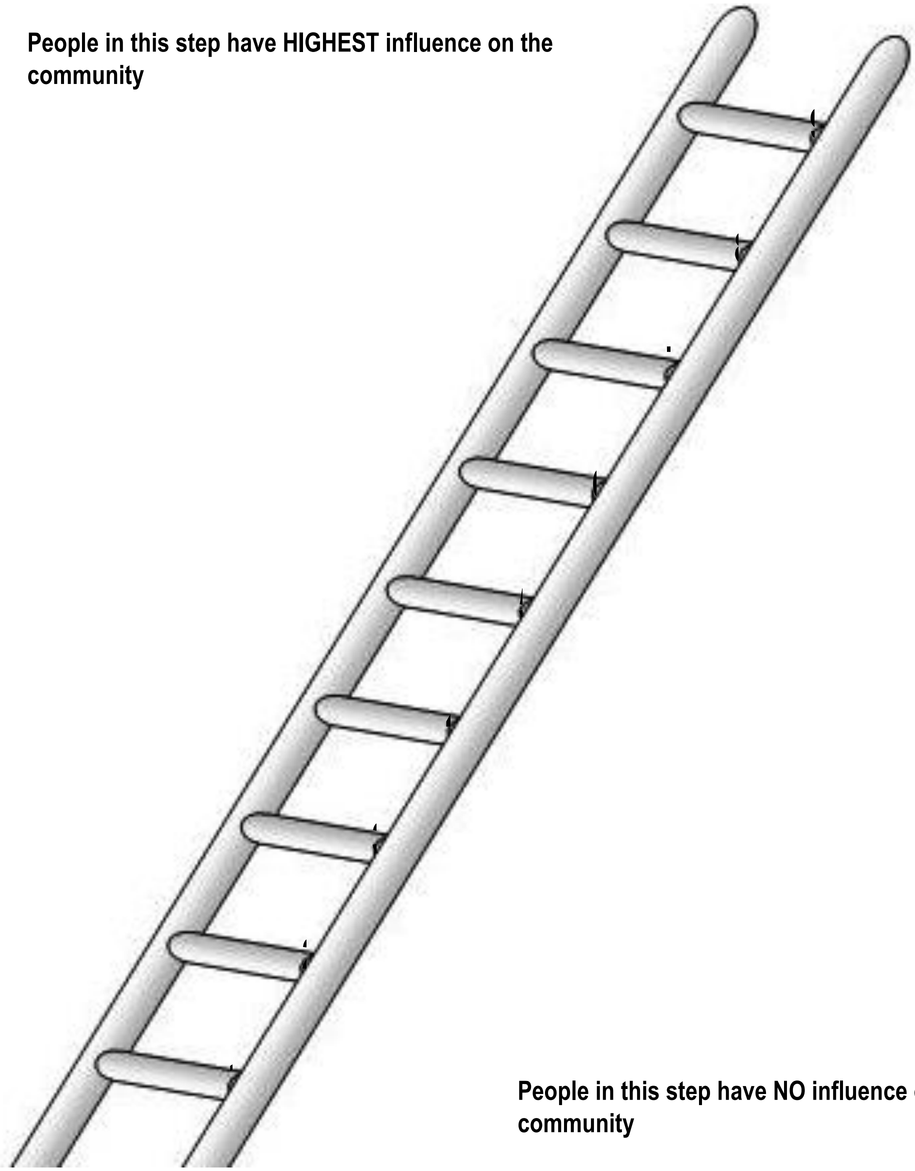
CODE 1: (D03, D05) Spending categories		**Code 2: (D04, D06) Reasons why no extra money**
Clothes/shoes for myself ..... 1 Clothes/shoes for my spouse ..... 2 Clothes/shoes for my children ..... 3 School fees and school supplies for children ..... 4 Consumer durables ..... 5 Housing (improvements and rent) ..... 6 Buy asset for farming ..... 7 Buy asset for business ..... 8 Buy jewelry ..... 9 Services (beauty/hair/etc) 10	Lend money to friends and relatives ..... 11 Make religious/ charitable donations ..... 12 Travel to visit friends/relatives ..... 13 Save for future ..... 14 Medicines or health needs ..... 15 Communication (airtime) ..... 16 Buy consumables (toiletries, paraffin, etc.) ..... 17 Social events (weddings/funerals/sports) ..... 18 Drinking alcohol and smoking ..... 19 Unknown how the money was spent ..... 20 **There is no extra money 98**	Bad harvest ..... 1 Irregular income/business is slow ..... 2 Other negative shock (illness) ..... 3 Unexpected expenditures ..... 4 No control over extra money 5

MODULE E (Dimension 4): Individual leadership and influence in the community

Enumerator: The purpose of this module is to get an idea about men's and women's potential for leadership and influence in the communities where they live. Again, do not attempt to ensure that responses are the same between the male and female respondent. It is okay for them to be different.

QNo.	Question	Response	Response options/Instructions
E01	Do you feel that a [man / woman] like yourself can generally change things in the community where you live if s/he wants to?		No, not at all ....1 Yes, but with a great deal of difficulty ....2 Yes, but with a little difficulty ....3 Yes, fairly easily ....4 Yes, very easily 5
E02	**Do you feel comfortable speaking up in public:**		
E02A	To help decide on infrastructure (like small wells, roads, water supplies) to be built in your community?		No, not at all comfortable ....1 Yes, but with a great deal of difficulty ....2 Yes, but with a little difficulty ....3 Yes, fairly comfortable ....4 Yes, very comfortable 5
E02B	To ensure proper payment of wages for public works or other similar programs?		
E02C	To protest the misbehavior of authorities or elected officials?		
E02D	To intervene in case of a family dispute?		
E03	Have you ever voted in a local or national election?		Yes ....1 >> E04 No ....2 >> E05
E04	If yes, during the last time you voted, did you cast your vote for the person you chose yourself or your spouse chose or somebody else chose?		Yourself ....1 Spouse ....2 Other relative....3 Somebody else ....4 Does not remember 5
E05	***In the last 12 months, have you:***		
E05A	Contributed money or time to building small wells or maintenance of irrigation facilities in your community?		Yes ....1 No 2
E05B	Contributed money or time to building or maintaining roads in your community?		Yes ....1 No 2
E05C	Contributed money or time to town development projects or public works projects in your community?		Yes ....1 No 2
E05D	Contributed money or time to building or maintaining your local mosque/church/temple?		Yes ....1 No 2
E05E	Given money to any other family because someone in their family was sick?		Yes ....1 No 2
E05F	Helped another family out with agricultural labor?		Yes ....1 No 2
E05G	Helped another family out when they needed help with child care?		Yes ....1 No 2
E06.	Please imagine a nine-step ladder, where on the bottom, the first step, stand people who have **NO** influence on the community, and step 9, the highest step, stand those who have influence in the community. On which step are you?		[Enter step 1 – 9] Enumerator Show the ladder in the next page

People in this step have HIGHEST influence on the community



People in this step have NO influence on the community

MODULE E (Dimension 4): Individual leadership and influence in the community, CONTINUED

Group membership		Are you an active member of any [GROUP]? Yes......1 No ......2 >> next group	Do you have a leadership position in this [GROUP]? Yes ..... 1 **>> E09** No....... 2	Have you ever had a leadership position in this [GROUP]? Yes ..... 1 No....... 2	How much input do you have in making decisions in this [GROUP]? Code 1	Is this a single-sex group? Yes..... 1 No....... 2	How often does the [GROUP] meet? Code 2	Out of the last 5 meetings, how many did you attend? [Number of meetings]
	Group Categories	**E06**	**E07**	**E08**	**E09**	**E10**	**E11**	**E12**
A	Agricultural / livestock/ fisheries producer's group (including marketing groups)							
B	Water users' group							
C	Forest users' group							
D	Credit or microfinance group (including SACCOs/merry-go-rounds/ VSLAs)							
E	Mutual help or insurance group (including burial societies)							
F	Trade and business association							
G	Civic groups (improving community) or charitable group (helping others)							
H	Local government							
I	Religious group							
J	Other women's group (only if it does not fit into one of the other categories)							
K	Other (specify)							

CODE 1: (E09) Control over decisions	**CODE 2: (E11) Frequency of meeting**
No input...1 Input into very few decisions................2 Input into some decisions ....3 Input into most decisions ....4 Input into all decisions.........................5	More than once a week ....1 Once a week ....2 Once every two weeks...................... ....3 Once a month.................................... ....4 Anything less frequent than once a month…5

MODULE F (Dimension 5): Time allocation

Enumerator: The purpose of this module is to get an idea about men's and women's time spent in both work and leisure activities and their satisfaction with their time use.

F01: Please record a log of the activities for the individual in the last complete 24 hours (starting yesterday morning at 4 am, finishing 3 am of the current day). The time intervals are marked in 15 min intervals and <u>one to two activities can be marked for each time period</u> by drawing a line through that activity. If two activities are marked, they should be distinguished with a P for the primary activity and S for the secondary activity written next to the lines. Please administer using the protocol in the enumeration manual.

		Night								Morning				Day																																			
	Activity	4				5				6				7				8				9				10				11				12				13				14				15			
A	Sleeping and resting																																																
B	Eating and drinking																																																
C	Personal care																																																
D	School (also homework)																																																
E	Work as employed																																																
F	Own business work																																																
G	Farming																																																
H	Construction																																																
I	Fishing																																																
J	Shopping/getting service																																																
K	Weaving, sewing, textile care																																																
L	Cooking																																																
M	Domestic work																																																
N	Care for children/adults/elderly																																																
O	Commuting																																																
P	Travelling																																																
Q	Watching TV/listening to radio																																																
R	Reading																																																
S	Sitting with family																																																
T	Exercising																																																
U	Social activities																																																
V	Practicing hobbies																																																
W	Religious activities																																																
X	Other, specify…																																																

F01. Continued

			Evening		Night								
	Activity	16	17	18	19	20	21	22	23	24	1	2	3
A	Sleeping and resting												
B	Eating and drinking												
C	Personal care												
D	School (also homework)												
E	Work as employed												
F	Own business work												
G	Farming												
H	Construction												
I	Fishing												
J	Shopping/getting service												
K	Weaving, sewing, textile care												
L	Cooking												
M	Domestic work												
N	Care for children/adults/elderly												
O	Commuting												
P	Travelling												
Q	Watching TV/listening to radio												
R	Reading												
S	Sitting with family												
T	Exercising												
U	Social activities												
V	Practicing hobbies												
W	Religious activities												
X	Other, specify												

MODULE F (Dimension 5): Time allocation, CONTINUED

QNo.	Question	Response	Response options/Instructions
F02	Was yesterday a holiday or nonworking day?		Yes......1 No......2
F03	Regarding the amount of sleep you got last night, was that: [READ RESPONSES]:		Less than average......1 Average......2 More than average......3
F04	*READ:* I am going to ask you a series of questions and I want you to tell me how would you rate your satisfaction on a scale of 1 to 10, where 1 means you are not satisfied and 10 means you are very satisfied. If you are neither satisfied or dissatisfied this would be in the middle or 5 on the scale. How would you rate your satisfaction with:		
F04A	The distribution of work duties within your household?		**Please mark on a scale from 1 – 10** Not satisfied ☹ ......1 ⇩ Neither satisfied nor dissatisfied 😐 ......5 ⇩ Very satisfied ☺ 10
F04B	Your available time for leisure activities like visiting neighbors, watching TV, listening to the radio, seeing movies or doing sports?		
F04C	Your contacts with friends or relatives?		
F04D	Your possibilities of going to other places outside your village?		
F04E	Your power to make important decisions that change the course of your life?		
F04F	Your satisfaction with your life overall?		
F05	During the last four weeks, how many days of your primary daily activities did you miss because of poor health?		Enter number of days [1-28]
F06	Were the last four weeks typical or average in terms of health and activity level?		Worse than average......1 Average......2 Better than average......3
F07	Were you able to complete normal activities in the last 24 hours?		Yes......1 No......2
F08	Do you suffer from a chronic disability?		Yes......1 No......2 **>> F10**
F09	If yes, what kind? [ALLOW UP TO 3 RESPONSES]	**F09_a** | **F09_b** | **F09_c**	Deaf or hearing disability......1 Mobility or missing limbs......2 Speech or language disability......3 Learning or mental impairment......4 Blind or visual disability......5 Chronic health or disease......6 Psychological or emotional......7 Other, specify......8
	ENUMERATOR: If male, stop and proceed to next Module; If female, continue with F10.		
F10	Are you currently pregnant?		Yes......1 No......2
F11	Are you currently breastfeeding?		Yes......1 No......2

MODULE G: Decision making

Enumerator: The purpose of this module is to get additional information about decision making within households.

Again, do not attempt to ensure that responses are the same between the male and female respondent. It is okay for them to be different.

ENUMERATOR: Ask G01 for all categories of decision making domains before asking G02. If household does not engage in that particular activity, enter code for "Decision not made" and proceed to next decision.		When decisions are made regarding the following aspects of household life, who is it that normally takes the decision? If 1 and respondent is male OR If 2 and respondent is female (>> **next domain)** Otherwise >>G02 **CODE 1↓**	To what extent do you feel you can make your own personal decisions regarding these aspects of household life if you want(ed) to? **CODE 2↓**
		G01	**G02**
A	Agricultural production?		
B	What inputs to buy for agricultural production?		
C	What types of crops to grow for agricultural production?		
D	When or who would take crops to the market?		
E	Livestock raising?		
F	Non-farm business activity?		
G	Your own (singular) wage or salary employment?		
H	Minor household expenditures?		
I	What to do if you have a serious health problem?		
J	How to protect yourself from violence?		
K	Whether and how to express religious faith?		
L	What kind of tasks you will do on a particular day?		
M	Whether or not to use family planning to space or limit births?		

CODE 1: (G01) Decision making	**CODE 2: (G02) Extent of participation in decision making**
Main male or husband ....1 Main female or wife...2 Husband and wife jointly...3 Someone else in the household ....4 Jointly with someone else inside the household ....5 Jointly with someone else outside the household ....6 Someone outside the household/other...........................7 Decision not made 98	Not at all …………………………1 Small extent……………………..2 Medium extent………………….3 To a high extent………………..4

MODULE G: Decision making, CONTINUED

ENUMERATOR: This is the last set of questions and it is very important. I am going to give you some reasons for why you might undertake activities in the domains I just mentioned. You might have several reasons for doing each one and there is no right or wrong answer. Please tell me how true it would be to say: If household does not engage in that particular activity, enter code for "Decision not made" and proceed to next decision.		Your actions with respect to [DOMAIN] are motivated by a desire to avoid punishment or gain reward? [READ OPTIONS] **CODE 1↓**	Your actions with respect to [DOMAIN] are motivated by a desire to avoid blame or so that other people speak well of you? [READ OPTIONS] **CODE 1↓**	Your actions with respect to [DOMAIN] are motivated by and reflect your own values and/or interests? [READ OPTIONS] **CODE 1↓**	How satisfied were you with the decisions made in [DOMAIN]? [READ OPTIONS] **CODE 2↓**
		G03	**G04**	**G05**	**GO6**
A	Agricultural production?				
B	What inputs to buy for agricultural production?				
C	What types of crops to grow for agricultural production?				
D	When or who would take crops to the market?				
E	Livestock raising?				
F	Nonfarm business activity?				
G	Your own wage or salary employment?				
H	Minor household expenditures?				
I	What to do if you have a serious health problem?				
J	How to protect yourself from violence?				
K	Whether and how to express religious faith?				
L	What kind of tasks you will do on a particular day?				
M	Whether or not to use family planning to space or limit births?				

CODE 1: Motivation for activity	**CODE 2: Extent of satisfaction with activity**
Always true..1 Somewhat true...2 Not very true...3 Never true ....4 Decision not made 98	Very satisfied .... 1 Somewhat satisfied .... 2 Neither satisfied nor dissatisfied.......... 3 Somewhat dissatisfied......................... 4 Very dissatisfied………………………..5 Decision not made 98

Lesson 1.8: The M&E Plan

This lesson defines the purpose, structure and content of a basic M&E plan. It prepares participants to design and manage an M&E plan for their own projects that will be effective, flexible, and responsive to their particular program and operational context.

The estimated duration for this lesson is **60 minutes**.

Learning Objectives

Lesson 1.8 will help participants:

- Understand the purpose of an M&E plan
- Define the contents of each component in an M&E plan
- Understand the basic evaluation requirements of USAID-funded projects
- Create a basic outline for an M&E plan as a starting point for their own projects

Companion Materials

The PowerPoint presentation **1.8 M&E Plan Overview** accompanies this lesson as a separate file.

Slides

Slides 1–2: What is an M&E plan?

An **M&E plan** is a **flexible guide** to the steps needed to:

- Inform and guide monitoring and evaluation activities
- Document, report, and communicate project activities
- Illustrate progress toward achievement of project goals and objectives

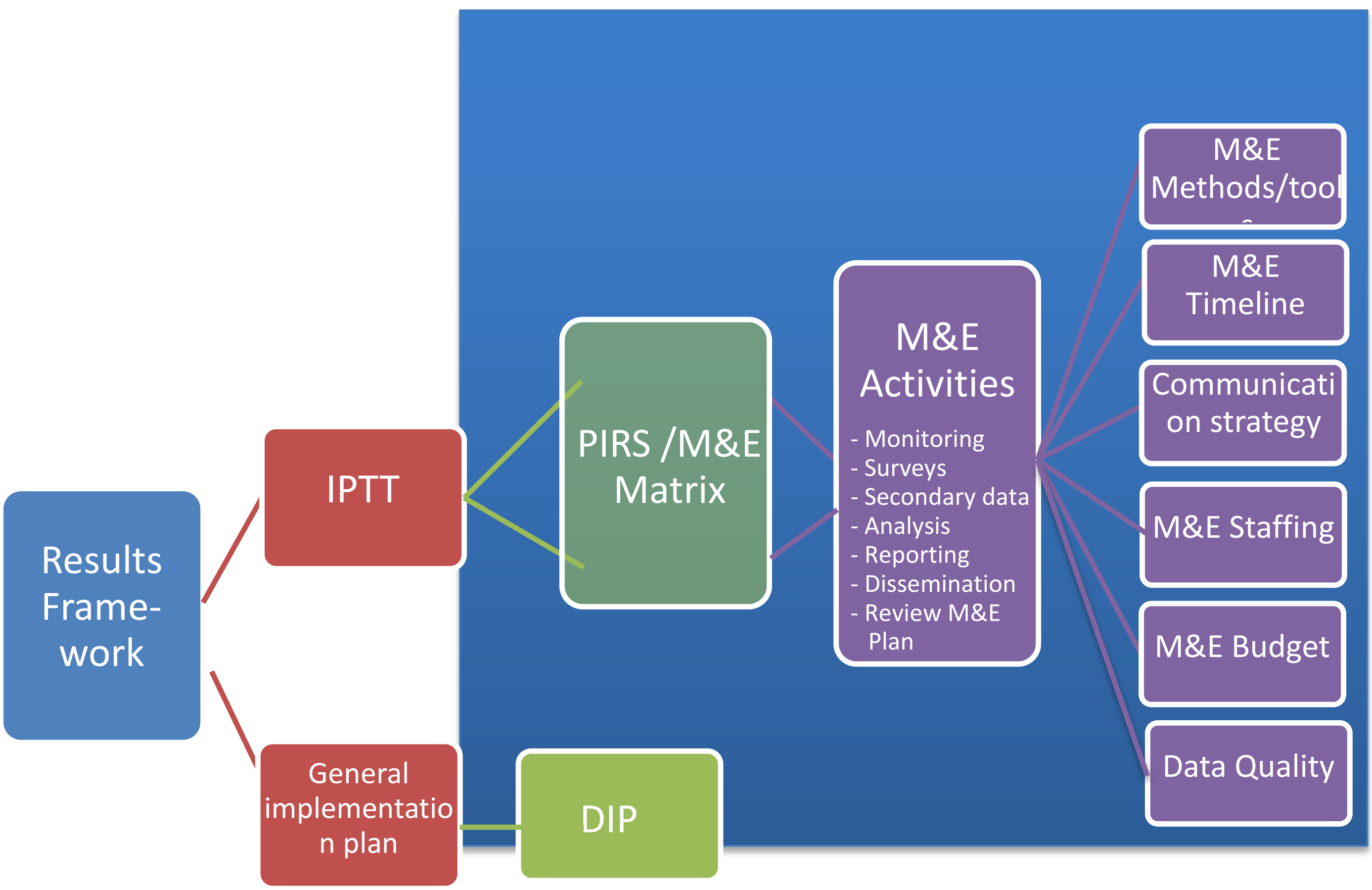
Putting an M&E plan into place is an important step in ensuring successful implementation of any development project. Implementing the plan helps to ensure that relevant data are collected and analyzed in a systematic and timely way, thereby providing program staff with information that sheds light on whether the program approach is working and helping them to make adjustments that will assist the program to reach its objectives. Establishing an M&E plan at the beginning of a project also defines what resources will be needed for effective M&E and contributes to the efficient use of those resources.

Slides 3–4: What are the components of an M&E plan?

The basic components of an M&E plan are:

- M&E goals and objectives
- M&E methodologies & implementation plan
  - Data collection procedures
  - Data management and analysis procedures
  - Reporting and communications plan
- M&E Matrix/PMP
- Calendar of M&E activities
- Instruments for collecting data
- Organizational structure of M&E unit
- Budget for M&E activities

Below is a graphic representation of how these components relate to each other.



Slide 5: Unpacking the M&E Plan: Key components

This lesson proceeds to look at each element of the M&E plan individually, providing descriptions and supplemental information for each one.

Slides 6-8: M&E plan components: results framework (RF)

"A **results framework** …[is a]…type of logic model which represents the food aid program's theory of change by laying out the activities and outputs that will lead to short, medium and long term outcomes and objectives."[15]

Other terms for RF include **logical framework**, or **logframe**.

Below is a graphic representation of a results framework.

Slides 9–11: M&E plan components: IPTT

"The **indicator performance tracking table (IPTT)** …includes performance indicators (at the impact, outcome and output levels) linked to the food aid program proposal's objectives, and baseline and target values for each indicator (estimated)."[16]

[15] USAID Office of Food for Peace. 2009. *Food for Peace Information Bulletin 09-6*. Available at: http://pdf.usaid.gov/pdf_docs/PDACU227.pdf

[16] Ibid.

The USAID Office of Food for Peace (FFP) provides the IPTT template shown below:

United States Agency for International Development
Bureau for Democracy, Conflict and Humanitarian Assistance
Office of Food for Peace

Fiscal Year 2012: Title II Development Program Proposal
Monitoring and Evaluation Materials: Indicator Performance Tracking Table

Indicator	Desired direction of change (+) or (-)	Baseline	Fiscal Year 1			Fiscal Year 2			Fiscal Year 3			Fiscal Year 4			Fiscal Year 5			LOA	
			Target	Achieved	% Target met	Target	Achieved	% Target met	Target	Achieved	% Target met	Target	Achieved	% Target met	Target	Achieved	% Target met	Target	Achieved
SO 1:																			
Impact indicator 1																			
Impact indicator 2																			
IR 1.1:																			
Monitoring indicator 1																			
Monitoring indicator 2																			

Slides 12–14: M&E plan components: M&E matrix/PIRS/PMP

The **Performance Management Plan (PMP)**, or **Performance Indicator Reference Sheet (PIRS)**, is a tool USAID operating units use to plan and manage the collection of performance data. Sometimes the plan also includes plans for data analysis, reporting, and use. It builds on the IPTT.

The PMP includes:

- Definitions for each indicator listed in the IPTT
- Data collection methodology
- Frequency of data collection

An M&E plan should contain an **M&E matrix**, or **Performance Indicator Reference Sheet, or Indicator Matrix,** to track indicators, targets, and achievement against targets over time. The **M&E matrix:**

- Summarizes detailed information for each project indicator
- Serves as a helpful tool for planning and managing data collection, analysis and use
- Expands on the IPTT/PMP to identify key information required for each indicator and summarize the key M&E tasks for the project

Slides 15–16: M&E plan components: key M&E activities

The M&E plan should describe the following main M&E activities in detail:

1. Monitoring, including:
    - Output monitoring
    - Process monitoring (quality monitoring)
    - Outcome monitoring
    - Environmental Indicator Monitoring
    - Commodity end-use monitoring
2. Evaluation
3. Reporting and communications
4. Review of M&E process

Slide 17: Output monitoring

What is output monitoring?

- Reporting and tracking project outputs to compare with targets.
- Facilitate a discussion by asking what is output monitoring? Why a project needs to do it?
- Ask the participants to give examples of output indicators and how they are being tracked in their own project.

What is the source of output monitoring information?

- Project reporting – Ask participants to provide examples.

The M&E plan needs to develop:

- Reporting forms
- Simple database(s) using MS Excel

Slide 18: Process monitoring

What is process monitoring?

- Monitoring the quality of services delivered to beneficiaries.
- Start a discussion by asking what is process monitoring? As we know this is a less commonly practiced monitoring tool, ask the participants whether any of the projects is currently doing it?

What are sources of process monitoring information?

- Surveys of final service providers

The M&E plan needs to develop:

- Sample design
- Instruments
- Analysis plan

Slide 19: Outcome monitoring

What is outcome monitoring?

- Monitoring outcome-level changes of project beneficiaries and institutions
- Answers the question, “To what extent have project interventions altered knowledge, perceptions, and behaviors of beneficiaries?”
- Facilitate a discussion by asking what is an outcome? Examples of outcome indicators. What is outcome monitoring? Why it is important?
- [Don’t go too detail! This session is not about outcome monitoring]

What are sources of information for outcome monitoring?

- Surveys of beneficiaries (example: Knowledge, Practices and Coverage survey [KPC], adoption survey)

The M&E plan needs to develop:

- Sample design
- Questionnaire
- Analysis plan

Slide 20: Environmental Indicator Monitoring

What is Environmental Indicator Monitoring?

- Monitoring the indicators identified in the Initial Environmental Examination (IEE) as negative determination with conditions
- Ask how many participants are familiar with the environmental indicators. How they are being monitored? Which tools are being used?

What are sources of information for environmental indicator monitoring?

- Based on the proposed mitigating measures in IEE

The M&E plan needs to develop:

- List of indicators and mitigating measures
- Instruments
- Analysis plan

Slide 21: Commodity End-use Monitoring

What is Commodity End-Use Monitoring?

- Monitoring end-use of the commodities distributed by the project
- Ask whether commodity end-use monitoring is currently being done in any of the projects. How it is done? Why? Which tools are being used?

What are sources of information for commodity end-use monitoring?

- Sample survey of beneficiaries that received commodities from the project

M&E plan needs to develop:

- Sample design
- Instruments
- Analysis plan

Slides 22–23: Evaluation activities

Evaluating project impacts or higher level outcomes should be taken into consideration from the inception of the project. Most FFP projects require a performance evaluation, which is typically done through comparing ex-ante and ex-post results.

Evaluation in an FFP project is composed of three separate, interrelated events: **baseline assessment**, **midterm review**, and **final evaluation**. The baseline and final evaluations require both quantitative and qualitative components, but FFP does not require a quantitative survey for the midterm evaluation.

In most cases, the evaluations will be external (i.e., a third-party contractor or grantee, managed directly by USAID, will evaluate the projects), and the contract or grant for the evaluation will be managed by an operating unit's Program Office.

Different factors influence the decision of whether an evaluation is **internal** (conducted by the organization's own M&E unit, or a self-evaluation exercise) or **external** (conducted by a contracted firm or consultant external to the organization). One of the reasons to opt for external evaluations, for example, is to control for bias; the donor or sponsoring agency may dictate an external evaluation. Other factors to consider when deciding whether to have an internal or external evaluation are the organization's technical and financial capacity, the evaluation audience, and the purposes of the evaluation.

Slide 24: Evaluation activities

One of the uses of the M&E plan is to guide the M&E units responsible for organizing evaluation activities. These are the basic steps in this process are as follows.

1. Identify study objectives/research questions, target population(s), coverage and reach of study, timeline and budget.
2. Identify specific indicators to be measured.
3. Compile sample frame (from appropriate population).
4. Using information above, develop Scope of Work (SOW) for external consultants.
5. Organize logistics for evaluation studies to support external consultants.

Slide 25: Review of M&E plan

The M&E plan should be regularly reviewed to assess whether the current plan is meeting the objectives and needs of the project. These include:

- Reporting needs to donor
- Project management needs

The review should also be sure to assess:

- Indicators
- Data collection and analysis procedures
- Communication strategy

At minimum, the M&E plan should be reviewed annually. Remember that the plan is intended as a **flexible guide**. It may need to be adjusted based on factors such as changes in resource availability or external factors.

Slides 26–27: M&E plan components: M&E tools and methods

The following tools and methods should be defined in the M&E plan:

- Project monitoring reporting forms
- Database formats and management procedures
- Survey sampling strategy and analysis plans
- Reporting processes and procedures

The selection of appropriate methods for data gathering, sampling, recording, collating and analysis should be carefully considered. It is critical that program managers and M&E staff obtain the input of field staff regarding the feasibility, time requirements, cost implications, and potential constraints to various data collection activities. Unfortunately, detailed data management plans outlining the logistical issues concerning data collection and storage are often left out of M&E planning. Careful consideration of such issues in the early stages of M&E planning is critical for ensuring the timeliness, cost effectiveness and reliability of M&E systems.[17]

Slides 28–30: M&E plan components: M&E timeline

An **M&E timeline** is "a schedule of M&E events, describing procedures and timing for analysis and use of performance data in order to modify activities based on lessons learned."[18]

Considerations for planning the M&E timeline include predictable temporal and seasonal factors affecting data collection and analysis, such as:

- Household/community migration patterns that may affect availability of respondents
- National and religious holidays that affect availability of beneficiaries, key informants, program staff, and/or evaluation team members
- The ability to observe an agricultural or other activity if it only takes place certain times of year

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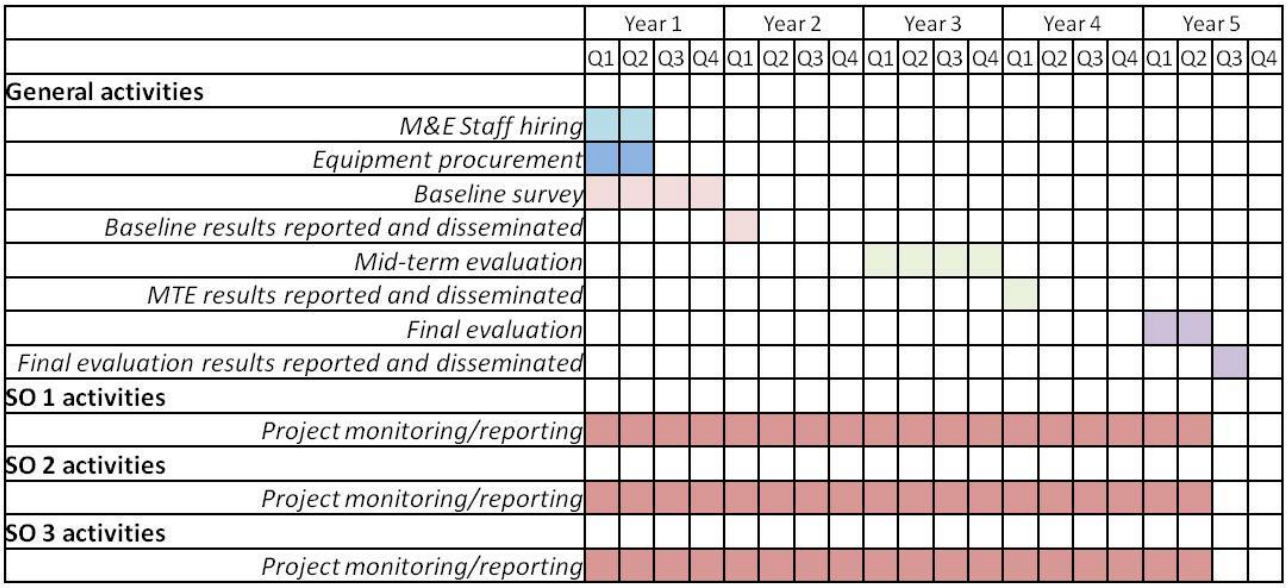
[17] TANGO International. 2007 (Draft). Monitoring and Evaluation Manual. Prepared for ADRA International.

[18] USAID Office of Food for Peace. 2009. *Food for Peace Information Bulletin 09-6*. Available at: http://pdf.usaid.gov/pdf_docs/PDACU227.pdf



Slides 31–33: M&E plan components: *communication strategy*

An important (and often overlooked) component of M&E plans is how to disseminate and use the information obtained by the M&E system. Careful thought needs to be given to disseminating and using M&E information including:

- What information should be distributed?
- Who needs what information?
- Why do they want this information?
- How much information do they want to know?
- How does the information get distributed?
- How often should the information be distributed?

Reporting is the most common way of sharing M&E results and lessons learned. It is a systematic and timely provision of essential information at periodic intervals. However information sharing includes various communication channels, such as formal progress reports, special studies, informal briefs, workshops, informal discussions, posters, pamphlets, meetings, etc.

M&E information is disseminated to different audiences and for different purposes, such as to:

- Funding agencies, for accountability purposes
- Different departments or sections internal to the implementing agency, for program management purposes
- Local stakeholders/communities/beneficiaries, for transparency, for self-management and sustainability, and for learning and reflection purposes

Slides 34–36: M&E plan components: *M&E staffing*

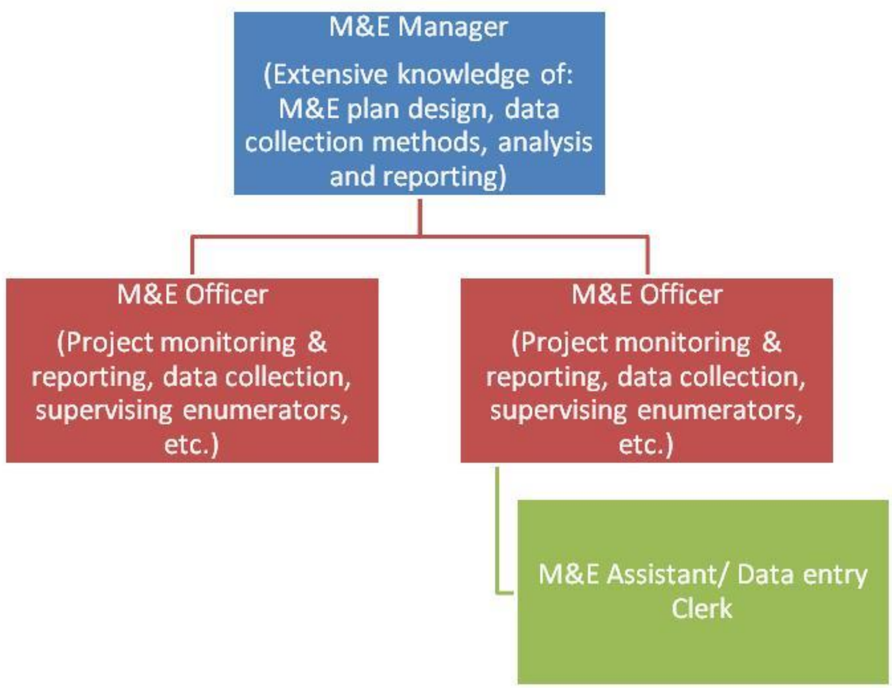
Based on information needs outlined in earlier steps, the following capacities may be required for an M&E unit:

- M&E plan design
- Data collection methods (quantitative & qualitative)
- Data management skills
- Data analysis skills
- Data reporting
- Project monitoring

In addition, as with any organizational unit, it must have management capacity, such as the abilities to manage a budget, to manage permanent and temporary personnel (e.g., enumerator teams, consultants), and to provide or arrange for necessary supervision, training and support.

The figure below illustrates a typical structure for an organizational M&E unit, and basic roles for each staff member.

Sample M&E Organizational Chart

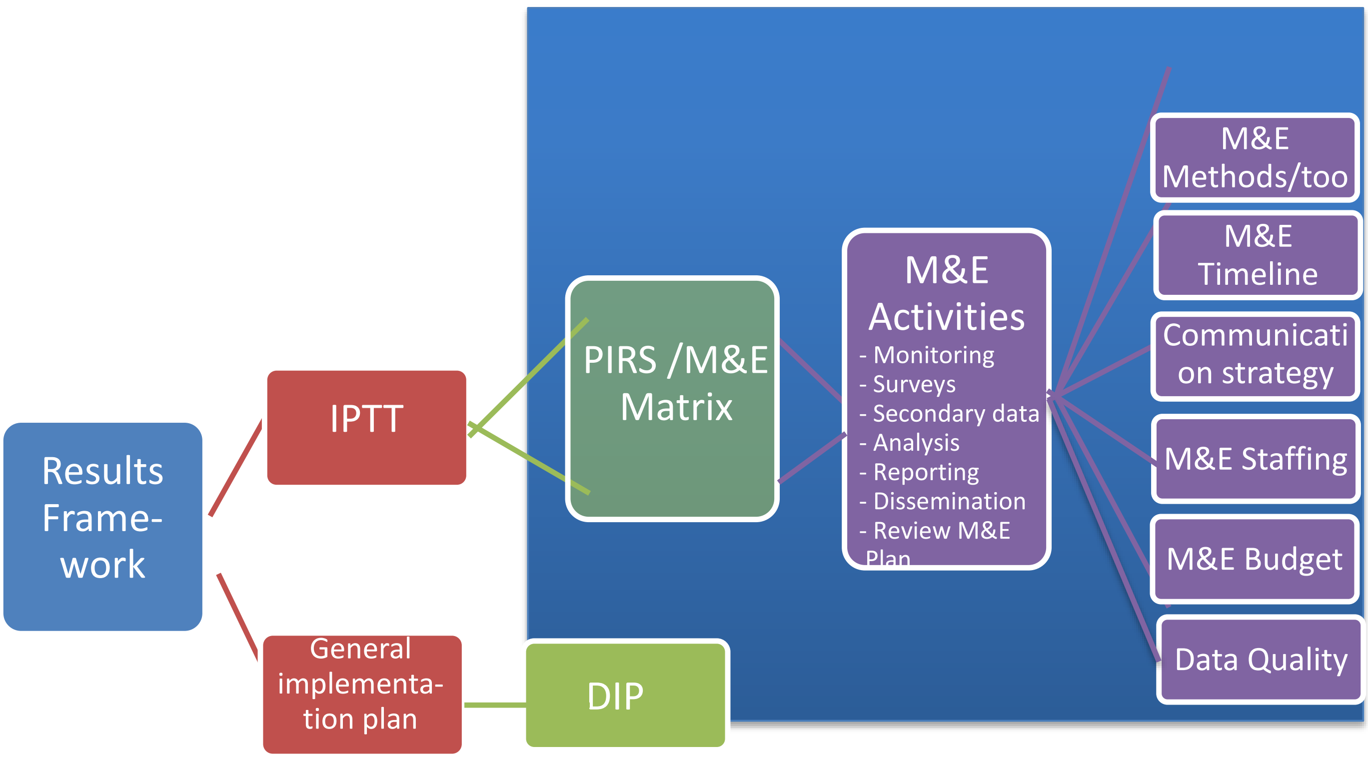


Slides 37–38: M&E plan components: *M&E budget*

One challenge in developing M&E plans for FFP projects is that the M&E budget is normally established before the detailed M&E plan is finalized. Therefore the M&E budget needs to be revisited after the M&E plan is developed to ensure that the plan is adequately resourced: the budget must be aligned with activities in the M&E plan.

Slide 37: We have now identified all the components of an M&E plan

To sum up, this lesson has covered the various components of an M&E plan represented at the beginning of the lesson.



Slides 38–40: Outline for an M&E plan

The following outline of an M&E plan suggests how the various components of M&E planning may be structured in an M&E planning document.

1. Objectives of M&E system
2. Description of project
    a. Results framework
    b. IPTT
    c. PMP/M&E Matrix/PIRS
    d. Project staffing and organizational structure

3. Description of monitoring activities
    a. Description of processes, tools and frequency
4. Evaluation
    a. Description of processes and methodology
5. Reporting and communications strategy
6. Data quality assurance plan
7. M&E review process
8. M&E staffing and organization
9. M&E budget
10. Use of Information in Decision making
11. Annexes
    a. Results framework
    b. IPTT
    c. M&E matrix/PIRS/PMP
    d. Reporting formats for output monitoring
    e. Questionnaire forms for process/outcome monitoring
    f. Timeline for M&E activities
    g. M&E unit organizational chart
    h. M&E Budget

Summary of Key Concepts

- An **M&E plan** is a **flexible guide** to the steps needed to 1) inform and guide monitoring and evaluation activities; 2) document, report, and communicate project activities; and 3) illustrate progress toward achievement of project goals and objectives.
- Key components of the M&E plan are the results framework, IPTT, M&E matrix, monitoring activities (including output, process and outcome monitoring; evaluations; reporting/ communications; and review of the M&E process), tools and methods, M&E timeline, staffing, and budget.
- USAID evaluation policy requires baseline, midterm and final evaluations.

Lesson 1.9: M&E Matrix and M&E Plan Exercise

The M&E matrix is one part of the overall M&E plan. This lesson first describes the contents of the M&E matrix and how they relate to other aspects of the M&E plan. This leads into an extended practice session in which participants will spend 1 ½ days developing an M&E plan, focusing first on the M&E matrix (or Indicator Performance Tracking Table [IPTT]). The lesson includes guidance to help the facilitator organize and implement the work session.

Participants should have on hand – if these have been developed – a copy of their own project's IPTT or M&E matrix, and the M&E plan in order to do the practice exercises in this lesson. (The IPTT may serve as the M&E matrix, so these are not necessarily separate documents.)

The estimated duration for this lesson is **30 minutes**. The extended practice session make take a day to a day and a half.

Learning Objectives

Lesson 1.9 will help participants:

- Define each item that should be included in an M&E matrix
- Understand the relationship of the M&E matrix to other aspects of the overall M&E plan
- Develop or review an M&E matrix for indicators in their own IPTT
- Gain hands-on experience in developing an M&E plan with all components (or revise and improve upon an existing one)
- Create a useful work product – the M&E plan – to apply to their projects

Companion Materials

The PowerPoint presentation **1.9 Content of an M&E matrix.ppt** accompanies this lesson as a separate file.

Handout 1.9.1: M&E Matrix Worksheet is provided at the end of this lesson. Be sure to provide copies to each participant.

Slides

Slide 1: M&E Matrix

The **M&E matrix** is a key component of the overall M&E Plan, and an extension of the Performance Management Plan (PMP). It provides detailed information about how the goal, strategic objectives, intermediate results, outputs and activities will be monitored and evaluated. The M&E matrix covers all the information required to understand, collect, tabulate/analyze, disseminate and report on any indicator.

As shown in the next slides, the M&E matrix contains an outline of headings for the specific measurement objectives and information requirements.

Slide 2: Contents of a M&E Matrix

A matrix should be developed for each indicator that the M&E system will track. This lesson will use the indicator, **Average Household Dietary Diversity Score (HDDS)**, to walk through an example of an M&E matrix.

Slide 3: M&E Matrix

The table below shows an M&E matrix for Average Household Dietary Diversity Score. A complete matrix would contain this information for *all* indicators in the IPTT.

Indicator Title	Average Household Dietary Diversity Score
Description	Household dietary diversity is defined as the number of different food groups consumed over a given reference period. This is a proxy indicator of household food access.
Indicator type	Impact
Direction of Change	Higher is better
Unit	Household
Information need	Number of food groups out of 12 consumed in the past 24 hours
Tabulation	HDDS = Sum (All food groups consumed by a household)
Numerator/Denominator	Sum (HDDS of all households)/ Total number of household
Target group	All households in the program target areas
Data source	Baseline and end-line Surveys
Means of verification	Survey report

Indicator Title	Average Household Dietary Diversity Score
Data collection method	Population-based quantitative household survey for baseline and endline
Strata	None
Frequency of collection	Baseline, and end-line
Data analysis	temporal, among strata, progress towards target
Communication strategy	Survey report, bulletin tailored to the needs and interest of managers, technical team, food security adviser, and field staff; stakeholder presentation and discussion of baseline and final evaluation survey findings
Primary responsibility	M&E Coordinator/M&E Manager

Slides 4–6: Unpacking the M&E Matrix

The contents of each matrix heading are divided across slides 4–6 to guide plenary discussion.

The table below provides guidance and notes for discussion purposes, and illustrates the “Average Household Dietary Diversity Score” example.

Note: Normally, this matrix is formatted so that the headings read across the top of the page from left to right, as shown here:

Indicator title	Description	Indicator type	Etc.
[first indicator]			
[second indicator]			
Etc.			

This creates pages that are very long (horizontally), with small font, which is not practical or easily readable for presentation purposes. Therefore, for ease of presentation, in this lesson and on the PowerPoint slides, the matrix is shown with the headings running vertically.

Matrix Heading	Notes	Example
Indicator title	Indicators are listed in the IPTT. The matrix should include *all* indicators at *all* levels (goal, strategic objective, intermediate results, activities, outputs, etc.)	Average Household Dietary Diversity Score
Description	Describes/defines the indicator; Explains why the indicator is relevant to measuring project achievements	Household dietary diversity is defined as the number of different food groups consumed over a given reference period. This is a proxy indicator of household food access and income
Indicator type	Impact, outcome, process, or output	Impact
Direction of change	Describes the *desired* direction of change (e.g., does the project seek an increase or a decrease in this indicator value?)	Higher is better
Unit	*Examples:* household, farmer, children <2, women, pregnant women, mothers, producers	Household
Information need	Describes what information needs to be collected	Number of food groups out of 12 consumed in the past 24 hours
Tabulation	Describes how the data are tabulated, i.e., what calculation must be performed on the raw data *Examples:* sum, average, percent, percent change	HDDS = Sum (All food groups consumed by a household)
Numerator/ denominator	Often, an indicator is expressed as a percentage. Here, the matrix defines the numerator and denominator used to calculate that percentage. (This heading/category may not be relevant for all indicators.)	Sum (HDDS of all households)/ Total number of household
Target group	Defines the scope of information collection, e.g., which households will be included in the M&E activity	All households in the program target areas

Matrix Heading	Notes	Example
Data source	Defines where or from whom the data will be obtained	Households from a representative sample of the target population
Means of verification	Defines the means of verification for assessing the indicator	Baseline and end-line survey report
Data collection method	Defines how the data will be collected, e.g. quantitative survey, qualitative survey	Population-based quantitative household survey for baseline and end-line
Strata	Defines the sampling strata, sub-groups based on some criteria or selected characteristics (e.g., age, socioeconomic status, sex). These groups represent **strata**.	None
Frequency of collection	*Examples:* monthly, annually; baseline, midterm, end-line	Baseline and end-line
Data analysis	Defines how the data will be analyzed; should reflect the analytical objectives, e.g., will the indicators be compared over time, across strata, relative to baseline, relative to target, etc.	Temporal, among strata, progress towards target
Target and timeframe	Identifies the target value for the indicator and the date/ time period that target value is expected to be achieved	4.5 in Year 5
Communication strategy	Describes the communication channels and tools that will be used to share M&E information with different audiences *Examples of communication channels/tools:* progress reports, informal briefs, workshops, informal discussions, posters, pamphlets, meetings, Web site	Survey report, bulletin tailored to the needs and interest of managers, technical team, food security adviser, and field staff; stakeholder presentation and discussion of baseline and final evaluation survey findings
Primary responsibility	Identifies who is responsible for ensuring that data are gathered, analyzed, reported, etc.	M&E Coordinator/M&E Manager

Slide 7: Performance Tracking Table

Information from the M&E matrix is used to complete the **performance tracking table**. The performance tracking table is simply a document for recording the actual and target value of indicators at different points over the life of the project. It provides basic descriptive information about the indicators and methodology, to enable a "snapshot" of project progress.

The USAID terminology and template for this document is the IPTT; however, other templates/formats may be created to serve the same purpose. An excerpt of a performance tracking table is shown below:

Baseline			Targets (not cumulative)			
Value	Year	Source	Year 2	Year 3	Year 4	Year 5
3.0	2010	Baseline surveys	n/a	n/a	n/a	4.5

Slide 8: Overview of Data Collection for Average HDDS

Completing the template for the M&E matrix with all details is a useful planning tool because it helps to realize the level of effort that will be required to carry out the plan, identify the necessary resources, and establish whether or not the M&E plan is feasible. As noted in Lesson 1.8 M&E Plan Overview, consultation between M&E management and field staff is critical in early planning stages to jointly determine whether implementing the M&E plan is realistic when logistical and resource constraints are factored in.

The graphic below is an excerpt from an M&E plan that has been based on a completed M&E matrix. It contains important information for M&E management, such as that the level of effort required to collect the desired data is HIGH, that there will be two major surveys, that an external evaluator must be contracted, and that the contractor (and the program and M&E staff!) should be familiar with guidelines from the Food and Nutrition Technical Assistance III Project (FANTA).

Measurement Effort	General method	Application
High	Population based household survey of a representative sample in baseline and end-line.	Baseline and end-line survey will be carried out by external independent contractor following FANTA guidelines.

Summary of Key Concepts

- The **M&E matrix** is a key component of the overall M&E Plan. It provides detailed information about all project indicators including what data to collect; how to collect, tabulate and it; and how to communicate and report results.
- Information gathered using the plan outlined in the M&E matrix is used to complete the performance tracking table.
- The M&E matrix is an extension of the PMP.

Extended Practice Session

Objective: Participants develop an M&E plan for their project (or revise an existing plan)

Time needed: 1–1 ½ days (may be adjusted up or down depending on time available)

Handouts: Handout 1.9.1: M&E Matrix Worksheet

Instructions: The overall length of this session is at the facilitator's discretion but a minimum of one day is recommended. The session should allow sufficient time to allow participants to develop, revise and complete the different components of their M&E plan and also allow for time for discussion and feedback. Scheduling factors to consider are overall workshop time available, number of workshop participants, and how those participants are grouped, e.g., if all participants come from different projects, then more time may be needed for the facilitator to provide individual attention, whereas if participants can be grouped by shared project, then less time may be needed because participants may serve as resources for each other.

Participants should come to the extended practice session with any existing M&E plans and plan components such as the IPTT or M&E matrix, because the overall objective of this session is to review, revise and complete those plans, taking into consideration all of the lessons in this module.

Form small working groups of participants who share the same project. In cases where participants are the only representatives of their project, they will work on their own.

The first three hours of this extended practice session should be focused exclusively on the M&E matrix. (Basic directions for this component of the session are found on Slide 9.) This emphasis is recommended to ensure that participants have the opportunity to work through the matrix with workshop support and return to their home offices with sufficient skills for completing the matrix on their own.

The task for this first three-hour segment is to select at least four indicators from one's own IPTT and revise them based on improved knowledge from the workshop. Participants may work on additional indicators as time allows. They may use the handout, "M&E Matrix Worksheet," as a template, but in fact it is simply a guide – it is not necessary to copy indicators from the IPTT into that template: in practice, the IPTT is a type of M&E matrix. The important message of this workshop is that all the information in the M&E matrix template provided in this lesson needs to be thought through in a systematic and intentional way, and recorded in project documents. In this session, participants should be checking their existing IPTTs and/or M&E matrices to ensure make sure that all of the key pieces of information are present and adequate, and revise it as necessary. Throughout the session, the facilitator and fellow participants should work together to develop and provide feedback on the matrices. Allow at least

30 minutes at the end of the session to discuss challenges in the plenary group. Participants should save their work on the IPTT/M&E matrix because it will be continued in the next segment of this extended work session.

The next segment of this session is devoted to developing or revising an M&E plan specific to participants' own projects, building on previous lessons and on completed worksheets related to participants' own projects. Lesson 1.8: M&E Plan Overview should be used as a reference to structure the session and to remind participants what components they need to include. It is recommended that the outline below be written on a flipchart that remains posted throughout the session. The facilitator needs to make sure that at the end of the practice session, participants have developed at least the following sections that appear below in bold and followed by an asterisk (*):

1. Objectives of M&E system
2. Description of project
    a. Results framework
    b. IPTT
    c. Project staffing and organizational structure
3. **Monitoring***
    a. **Description of monitoring activities and methods (M&E matrix)***
4. **Evaluation***
    a. **Description of evaluation activities and methods***
5. **Reporting and communications strategy***
6. M&E review process
7. M&E staffing and organization
8. M&E budget
9. Annexes
    a. Results framework
    b. IPTT
    c. **M&E matrix/PMP***
    d. Reporting formats for output monitoring
    e. Questionnaire forms for process/outcome monitoring
    f. **Timeline for M&E activities***
    g. M&E unit organizational chart

There are various options for structuring this segment of the session. Below are some possibilities that may be tailored to the group's needs and dynamics:

A. All groups work on the same section of the M&E plan simultaneously, for a specified period of time. For example, from 1PM to 2PM everyone will work on their results framework. The facilitator circulates among the groups while they are working to provide assistance and feedback. At around 1:45PM, the facilitator may opt to regroup all participants into a plenary discussion to discuss any common issues. Then at 2PM, all groups resume work, but for the next 45–60 minutes they work on M&E staffing and organization; near the end of the time period, there is a plenary discussion for Q&A. This pattern repeats throughout the day. The advantage of this structure is that it forces participants to review all components of their M&E plan. Remember that during the previous segment, participants devoted substantial time to the M&E matrix/IPTT, so the remaining time should be used to work on other plan components.

B. Before the day begins (ideally the previous day), the facilitator asks participants which components they have not worked on yet or need the most help with; basically, it is the participants' decision how to prioritize the time. The schedule is designed to accommodate the needs and priorities of the group. The advantage of this structure is that participants focus their time on the areas where they feel they need the most support in a workshop setting. Again, it is recommended to protect about three hours for the M&E matrix alone, because this is such a critical piece of the plan and it is common for this to be one of the weaker components in M&E plans.

Regardless of how the session is structured, be sure to schedule formal 15–20 minute breaks!

Handout 1.9.1: M&E Matrix Worksheet

Note: The information needed for each indicator spans across two pages along a single row.

Indicator title *(cont'd next page)*	Description	Indicator type	Direction of change	Unit	Information need	Tabulation	Numerator/ denominator	Target group

Indicator title *(cont'd from previous page)*	Data source	Means of verification	Data collection method	Strata	Frequency of collection	Data analysis	Communication strategy	Primary responsibility

Module 2: Qualitative Tools and Analysis

Lesson 2.1: Introduction to Qualitative Methods

This lesson focuses on providing an overview of the purpose of qualitative research and its potential use in the monitoring and evaluation of development projects and/or programs.

This lesson is estimated to take **45 minutes**.

Learning Objectives

Lesson 2.1 will help participants:

- Understand the basis for qualitative research methods
- Identify the range of indicators that are viable candidates for qualitative methods

Companion Materials

The PowerPoint presentation **2.1 Introduction to Qualitative Methods.ppt** accompanies this lesson as a separate file.

Slides

Slides 1–4: What is qualitative data?

As opposed to the distinct quantifiable answers collected through household surveys, qualitative methods focus on collecting contextually-specific and detailed information on the **perceptions, judgments, opinions, beliefs and behaviors** of target populations. Through direct and dynamic interaction with respondents, qualitative research can identify cultural, societal and household factors that provide complementary contextual information gained through quantitative methods.

A greater understanding of an appreciation for qualitative methods can be gained by a comparison with quantitative methods.

Quantitative Methods	Qualitative Methods
• Answers the question "how many?" • Obtain precise, statistical answers to defined questions • Collect information on a large population giving precise estimates	• Answers questions such as "how?" and "why?" • Obtain rich information and under-standing of community life and people's attitudes, opinions, beliefs, behaviors

Quantitative Methods	Qualitative Methods
• Obtain quantifiable information which can be extrapolated, generalized • Provides information on the *extent* of particular problems in the community • Quantitative instruments must be used uniformly to ensure validity of data	• Helps to determine meanings, processes, and reasons • Provide insight to sensitive topics that cannot be captured in numbers • Iterative process allows flexibility in approach to qualitative data collection

Another important distinction between quantitative methods (e.g., household survey) and qualitative methods is that qualitative methods are iterative, meaning that they are continually refined during field work based on an evolving understanding of the target area and population. This is important because qualitative methods require direct and personal contact with target populations in their own environments, where the researcher becomes the central instrument of data collection. As such, qualitative methods require a willingness and capacity for exploration of inter-related topics based on inductive logic.

Compared with the broadly representative information collected through quantitative methods, the detailed and contextually-specific information gained through qualitative methods is typically derived from a relatively small number of interviews, group discussions and/or interactive activities. Rather than asking questions that have discrete, yes or no answers (closed-ended questions), qualitative studies are made more robust and useful by utilizing open-ended questions which require respondents to formulate their own answers. As such, qualitative methods are particularly appropriate for measuring the outcomes of projects that aim to achieve individualized outcomes (e.g., adoption of new practices, behavior change). Qualitative methods are also important for achieving deeper understanding of the underlying causes of vulnerability at the community, household and individual levels (e.g., gender disparities, sources of conflict, constraints to improved health or educational status).

Ideally, a mixture of both quantitative and qualitative methods can be used, as they provide different perspectives, have different advantages and allow cross-checking (triangulation) of information.

Slides 5–6: Use of qualitative information in monitoring and evaluation

Qualitative methods can also be used to effectively engage beneficiary participation in project and/or program implementation and monitoring and evaluations. For instance, qualitative tools can provide useful insight into beneficiary perceptions regarding the advantages or challenges to adopt certain behaviors or to try out any new techniques promoted by the project, gauge their level of participation in project implementation and capacity for sustaining activities, and identify key lessons learned for improved design, targeting and implementation of future projects.

When determining whether or not to utilize qualitative methods in monitoring the outputs and outcomes of development interventions, it's useful to consider a range of key questions:

- Are project managers interested in finding and understanding the internal dynamics of the project - lessons learned?
- Is detailed, in-depth information needed for certain target group cases or project sites?
- Are project managers and technical specialists interested in knowing why the adoption rate of certain techniques are higher in some communities compared to others?
- Are project managers and technical specialists interested in knowing why the adoption rate of certain activities is low?
- How is the intervention perceived by the community? Who is benefiting and who does not? Are there a certain segments of the community benefiting from the intervention and not others?
- How are resources allocated within a household? How the benefits of the project are shared between the different members of a household?
- How do the socioeconomic and cultural dynamics interplay within the community that may affect the project results?
- Is there a need to add depth, detail, and meaning to statistical findings or survey generalizations?
- How does the interdependence between different socioeconomic groups work and how is the project intervention influencing or affecting this social fabric?
- Has the collection of quantitative evaluation data become so limited and routine that no one pays much attention to the results anymore?

Slide 7: Commonly used qualitative tools

The tools used to generate qualitative information can be divided into two general categories: interview and interactive.

Interview methods include: in-depth, key informant, and focus group discussions. A general characteristic of these methods is that they are typically **semi-structured**, meaning that the interviewer follows a topical outline, however varies the questions to expand on points that might be interesting.

Interactive tools, sometimes called participatory tools, include: transect walks, community calendars, Venn diagrams, matrices, and ranking/scoring. These tools aim to stimulate interaction and make the interviews more inclusive.

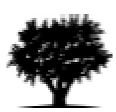
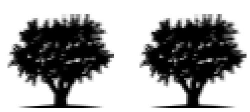
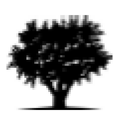
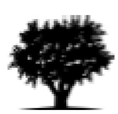
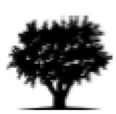
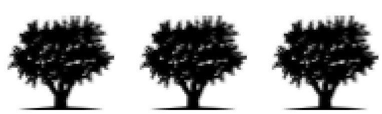
Slides 8–14: Examples of qualitative information relevant to FFP programs

While quantitative methods aim to answer questions related to "how many" or "what", qualitative methods are concerned with "how" or "why". For example, when evaluating trainings effect on improved agricultural practices, quantitative indicators might be concerned with results related to increases in yield (e.g. kg production/hectare) and/or reductions in cost (e.g. gross margins). A complementary qualitative study would likely focus on the reasons why yields increased or decreased, or could explore the factors contributing to reductions in cost for smallholder farmers.

Other examples of qualitative information that might be relevant to USAID Office of Food for Peace (FFP) programs include:

- Community perception of the quality of project services
- Challenges related to adoption of project promoted strategies
- Perceived benefits of project interventions

Ex. 1: Qualitative tool in monitoring: Yield

Community	Baseline	Annual	Reasons
# 1			• Improved soil quality • Less pest attack
# 2			• Pest attack
#3			• Improved soil quality • Adequate rain • Better crop management

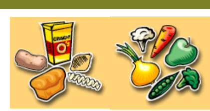
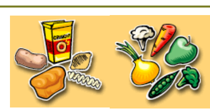
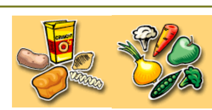
The above is an example of how qualitative methods might be used in monitoring to examine the factors contributing to increases in yield. As part of interviews, it is determined that community #1 experienced a modest increase in yields, community #2 experienced a significant increase in yields, and community #3 did not report any change in crop yields.

Ex. 2: Qualitative tool in monitoring: Cost

Community	Baseline	Annual	Reasons
# 1			• Use of composting reduced the requirement of chemical fertilizer • Intercropping and mulching reduced requirement of water
# 2			
#3			• Vermi-composting increased labor cost • Composting significantly reduced the requirement of chemical fertilizer

The above uses the example of how qualitative tools can be used to examine how improved agricultural practices led to reduced costs for farmers. Qualitative methods suggest that communities #1 and #2 experienced a modest reduction in farming costs, mainly through the substitution of expensive chemical fertilizer use with cheaper composting techniques. Reduction in cost were also reportedly realized though reductions in water expense achieved through mulching. The use of vermin-composting in community #3 led to even larger cost reductions by allowing farmers to drastically reduce chemical fertilizer use, offset only partially by increased labor costs.

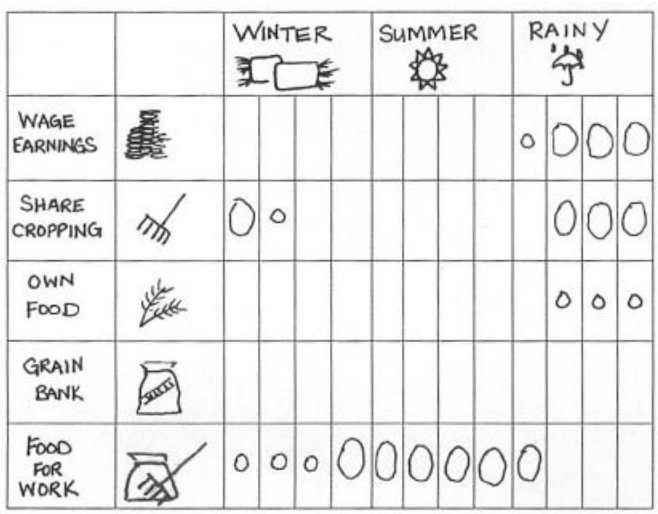
Ex. 3: Qualitative tool in monitoring: diet diversity

Community	Baseline	Annual	Reasons
# 1			• Started a vegetable garden • Reared poultry • Increased labor sells
# 2			• Had a bumper crop • Reduced postharvest loss • Increased income
#3			• Poor yield • Irrigation pump failed

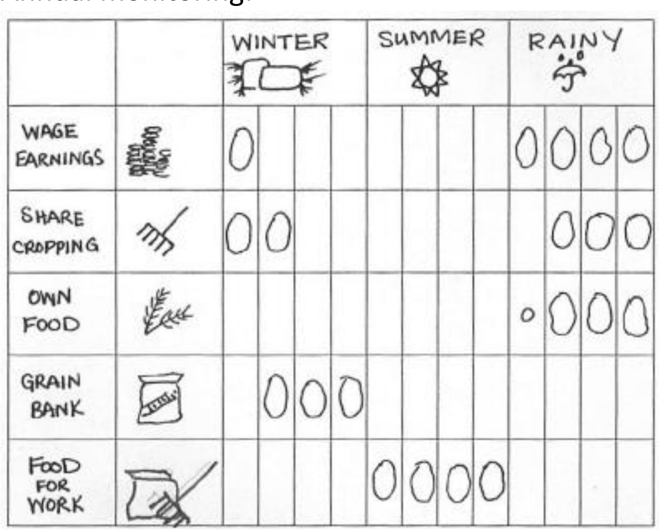
This final interviewing technique example demonstrates how qualitative tools can be used to evaluate the influence of agricultural practice improvement on dietary diversity. Qualitative methods suggest that community #1 had a significant increase in household dietary diversity, #2 experienced a modest increase, and #3 reported no change in dietary diversity. Increases in community #1 were driven through increased labor income, promotion and creation of vegetable gardens, and support for poultry raising. In community #2, increased dietary diversity was supported by a particularly strong harvest in the most recent season, reductions in post-harvest loss, and increases in income from other sources. Finally, in community #3, poor crop yields combined with a failed irrigation pump mitigated any potential gains in dietary diversity for households in that community.

Ex. 1: Participatory techniques – calendar to show seasonal variation in food security

Baseline:



Annual monitoring:

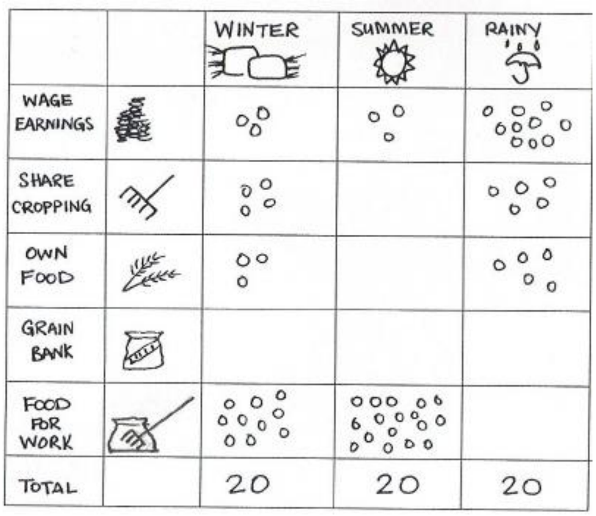


In the above example, seasonal calendars are used to show differences in food security and livelihoods over the winter, summer, and rainy seasons. The chart can be drawn on the paper or ground and community participants are invited to place stones to indicate which months have the highest incidence of the respective livelihood activities (e.g. wage earnings, share cropping, own food, etc.). By using the calendar method at project baseline and again as part of annual monitoring, participants can demonstrate changes in the frequency of livelihood activities across the seasons for the community. The example calendars above show:

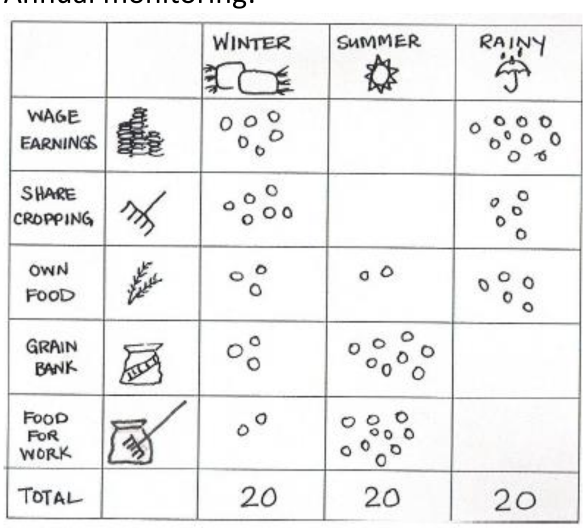
- Opportunities for agriculture labor increased and extended to dry season
- People are able to grow more food
- Able to store more food and reduce post-harvest loss
- Less dependent of food for work

Ex. 2: Participatory techniques – ranking matrix to show seasonal variation in food security

Baseline:



Annual monitoring:



In the above ranking matrix example, differences in food security and livelihoods over the winter, summer, and rainy seasons are demonstrated. Again, the chart can be drawn on the paper or ground and community participants place stones to indicate which seasons have the highest incidence of the respective livelihood activities (e.g. wage earnings, share cropping, own food, etc.). In this case, the participants start with 20 stones for each season and allocate the stones to indicate the relative frequency of livelihood activities within each season. The ranking matrix is used at project baseline and as part of annual monitoring to demonstrate seasonal changes in the frequency of livelihood activities for the community. The example matrices show:

- In winter and summer there is less dependence on Food for Work (FFW)
- Improved ag practices , larger farm size, and increased cropping intensity resulted greater employment opportunity and increased productivity of land.
- Increased productivity resulted greater access to food in summer and winter

Slide 15: Key activities when planning for a qualitative monitoring

- Identifying key questions
- Developing topical outline
- Identify tools and methods
- Decide a sampling strategy
- Forming a team
- Conducting field work
- Provide training to the team members
- Data compilation and synthesis
- Analysis
- Interpretation and integration
- Reporting

Summary of Key Concepts

- Qualitative methods are distinct from but complementary to quantitative research methods. Quantitative methods focus on collecting information on the **perceptions, judgments, opinions, beliefs and behaviors** of respondents.
- When properly applied, qualitative methods are **flexible, iterative and interactive**.
- Qualitative methods are well-suited for achieving **deeper understanding of the underlying causes of vulnerability** at the community, household and individual levels.

Lesson 2.2: Qualitative Tools

This lesson focuses on providing an overview of various tools and approaches used for collecting qualitative information. It incorporates classroom and field exercises for practicing two of the more common qualitative tools – focus group discussions and key informant interviews.

The estimated duration of this lesson is **30–45 minutes**. Also budget 2 hours 45 minutes for the classroom exercise and 1 day in the field for the extended practice session.

Learning Objectives

Lesson 2.2 will help participants:

- Identify a number of tools and/or approaches used for collecting qualitative information
- Select the proper qualitative tool(s) depending on their information needs
- Understand the proper application of individual tools
- Gain classroom and field experience practicing focus group discussions and key informant interviews

Companion Materials

The PowerPoint presentation **2.2 Qualitative Tools_revised.ppt** accompanies this lesson as a separate file.

The following handouts are provided at the end of this lesson. Be sure to provide copies to each participant.

- **Handout 2.2.1: Required Skills of Qualitative Team Members**
- **Handout 2.2.2: Guidance for Conducting Individual and Group Interviews**
- **Handout 2.2.3: Sample Topical Outline**

Slides

Slide 1: Commonly Used Qualitative Tools

Several different qualitative tools and approaches can be used to assess vulnerability and monitor or evaluate development activities. While each is capable of providing insight into the perceptions, judgments, opinions, or beliefs of individuals or groups, each has its own advantages in terms of the nature of the information gained. Decisions regarding which tool (or combination of tools) to use depend on qualitative information needs.

Interview tools include **focus group discussions** and **key informant interviews,** and are among the most commonly used qualitative methods in assessment, monitoring and evaluation. Interviews and group discussions are typically semi-structured (unlike structured interviews this approach allows for a lot of flexibility, where the interviewer is free to introduce new ideas to the discussion depending on what the respondent says) and are guided by a **topical outline also known as a check list**.

Interactive tools for data collection are typically less structured than interviews. They depend on the direct participation of community members, and are especially well-suited for analysis of agricultural, ecological and social systems within a particular community. Among the many interactive tools, the most common are:

- Mapping
- Community calendars
- Matrix ranking
- Venn diagrams
- Wealth ranking
- Transect walks
- Observation

This lesson and its related exercises cover focus group discussions and key informant interviews, but it is important to be aware of these other interactive qualitative tools.

Slide 2: Focus Group Discussions

Focus Group Discussions (FGDs) are conducted to obtain qualitative information on a range of selected topics from community members and/or beneficiaries. They usually involve a relatively large but manageable group of community members (10–15). Keep in mind the following important principles when conducting FGDs.

- In most situations, it is important to segregate FGDs according to gender to ensure that both men and women have an opportunity to openly share their often differing perspectives.

- The FGD facilitators should be aware that other uninvited community members, particularly community leaders, may attempt to participate in the FGDs. Facilitators should attempt, as much as possible, to conduct FGDs in isolated areas away from community foot traffic to mitigate curious community members attempts to join in. When these attempts occur, politely inform the uninvited community member that the FGD is a closed session.

- Focus group discussions should be guided by a **topical outline.** These outlines contain lists of topics that have been carefully defined in a manner that is complementary to (as opposed to redundant with) quantitative information collected by the project/program and that reflect priority outcome indicators. The facilitator uses this list of topics to guide the line of questioning and conversation in the focus group.

- Facilitators should encourage and allow sufficient time for free and open expression from all participants.

The table below summarizes the main characteristics of FGDs and the skills required to conduct them.

Tool	Types of Information Collected	Skills Required	Population Surveyed
Focus Group Discussions	Themes for discussion should be guided by topical outlines. Themes to gather information about may include: • predominant livelihood systems • most vulnerable groups • household perceptions about project interventions • household coping mechanisms • cultural/social dynamics • cultural/social institutions • community infrastructure • land tenure systems • population movements • climate/natural disasters • priority needs for external support • agricultural practices • how a specific intervention is viewed by the community • views on adopting specific project interventions (e.g., sustainable agricultural practices, health and hygiene practices promoted by the project) • resource allocation within the household	• Open-ended interview skills • Understan-ding of group dynamics	• Diverse members of the community • May be segregated by gender

Slide 3: Steps to Conduct Focus Group Discussions

The following steps should be included in planning and preparing for the focus group. They take place days or weeks before the FGD is held.

1. **Define the purpose of the focus group.**

   Defining the purpose of the focus group, i.e., having a clear idea of the questions you want answered (such as questions related to a specific indicator[s]), will help you determine who should be invited to participate. For example, if you want to know about the adoption of sustainable agricultural practices (e.g., why certain practices have been adopted and others not), you would invite farmers who have adopted these practices, as well as farmers who have not.

2. **Identify and invite the participants.**

   Develop a list of key attributes to seek in participants based on the purpose of the focus group. Determine how many participants you need and how many to invite. The optimal group size depends on the study, however in general the important factors are: the number of questions asked, the allotted time for each question, the format of the focus group session and the duration of the session. Above all, the size of a group should first be determined by the aims of the research study. A group larger than 10–12 gets to be unwieldy, and voices get lost. However, you should invite more, in anticipation of no-shows.

3. **Identify key questions related to the indicator and develop a topical outline.**

   To facilitate the discussion you need to develop a list of key questions so that you can generate discussion and probe for the information you are looking for. Do not ask questions that only require a “yes” or “no” answer; such questions usually do not stimulate discussion and thus miss out on important information that will help you to understand the “how” and “why.” However, sometimes yes/no questions are necessary to begin a discussion. The FGD should focus on gaining the qualitative information that *explains* an outcome or a situation. This is done by asking open-ended questions – or yes/no questions that are followed up by a probing question. For example:

   - Did any farmers here adopt sustainable practices [**Facilitator:** name the specific practice]? What is your experience in adopting this practice?
   - Those of you who did not adopt this practice – why not?

4. **Sharpen your facilitation skills.**

   The success of the FGD depends on the facilitator. A facilitator should be able to deal tactfully with outspoken group members, keep the discussion on track, and make sure every participant is heard. A good facilitator makes sure that the participants are comfortable and engaged in the discussion, that the discussion is not dominated or influenced by any particular person, that the discussion is not dominated by a particular gender, and that it is interesting to the participants.

Having a qualified, well-trained team of people to conduct focus groups and other qualitative data collection exercises is, of course, an important prerequisite to doing qualitative work. See **Handout 2.2.1: Required Skills of Qualitative Team Members**.

Slides 4–5: Conducting Focus Group Discussions

The following are practical steps for conducting the FGD once the preparatory work is complete. These take place the day of the FGD.

Materials needed:

- Notepad and pencils
- Flipchart or poster paper
- Topical outline
- List of participants
- Markers
- Masking tape
- Watch or clock
- Refreshments
- Voice recorder to record the session, if appropriate

Steps:

1. Arrive before the participants. Arrange the room so all participants can view one another. (U-shaped seating is commonly used.)
2. As participants arrive, set the tone for a comfortable, enjoyable discussion by welcoming them just as would any gracious host.
   - Welcome the group.
   - Introduce yourself and the co-facilitator.
   - Introduce the purpose and context of the focus group.
   - Let participants know how much time it will take.
   - Explain the means to record the session.
3. Carry out the focus group as per the plan and topical outline.
   - You should also be flexible, i.e., leave room for asking questions that arise spontaneously from the discussion, in order to probe more deeply into a topic.

4. Allow a few minutes to wrap up and close the focus group session. This includes thanking the participants, giving them an opportunity for further input (e.g., "Any last comments or questions?"), telling them how the data will be used, and explaining when the larger process will be completed.

Slide 6: Key Informant Interviews

Key Informant Interviews (KIIs) are qualitative in-depth interviews with people who know what is going on in the community. Their main purpose is to collect information from a wide range of people who have first-hand knowledge about the community. Interviews may aim to obtain the opinion of experts on selected topics, or to collect specific information that may not be available to the wider community. Key informant interviews are typically held with the community's civil society, political and/or traditional leaders and authorities. However, key informants may also include individuals noted for their unique perspective and/or high degree of vulnerability, such as widows, educated girls, ethnic minority leaders, elders, schoolteachers, and health post attendants.

Key informant interviews are also used to triangulate information gathered through focus group discussions. They should provide information useful for cross-checking information gained in other stages or components of the assessment or M&E exercise, including quantitative work.

Tool	Types of Information Collected	Skills Required	Population Surveyed
Key Informant Interviews	The result of these interviews should be a better understanding of specific issues (depending on the individuals interviewed) and a clearer definition of the community profile.	• Open-ended interview skills	• Community leaders, elders, educated professionals, and respected individuals

Slide 7: Key Informant Interview Steps

There are several key steps involved in planning and implementing key informant interviews. These are similar to the steps used to prepare for focus group discussions.

1. Determine what information is needed.
2. Identify possible key informants based on your topic.
3. Prioritize and finalize list of key informants.

4. Develop an interview tool/ topical outline. Note: you may have different outlines for different “categories” of informants, e.g., government ministry, local government staff/authorities, nongovernmental organization (NGO) management staff, NGO field staff, tribal leaders, etc.
5. Determine documentation method (e.g., note-taking, recording).
6. Select designated interviewer(s).
7. Schedule and conduct key informant interviews.
8. Compile and organize key informant interview data.

Small Group Work

Objective: Participants practice conducting focus groups and key informant interviews (classroom-based)

Time needed: 2 hours, 45 minutes

Instructions:

This small group exercise has two parts. Participants will plan and conduct, first, a mock FGD and, second, a KII. Both exercises will be based on a set of indicators from an actual IPTT. This exercise serves as preliminary work for the day-long extended practice session that concludes this lesson; this will save planning time and allow participants the opportunity for feedback and revision before they “field-test” the tools developed here.

Divide the participants so that there are no more than 5–6 people per group. Preferably, group members work for the same project and/or from the same Indicator Performance Tracking Table (IPTT). Each group should have both male and female members.

Each group should select 2–3 indicators from its IPTT to use as the basis for developing plans and topical outlines for the mock FGDs and KIIs they will conduct in this session.

Part One: Mock Focus Group Discussion

Steps apply to individual small groups.

1. Review the selected indicators.
2. According to the indicators chosen, identify an appropriate category of participants for a focus group (e.g., mothers with children under 2, beneficiary and/or non-beneficiary farmers, male youth).
3. Develop a topical outline to guide the FGD.

4. Select group members to play the roles of facilitator and co-facilitator/note taker. The other members will be focus group participants.
5. The facilitator conducts the FGD. Allow about 15–20 minutes for this. This is shorter than a “real” FGD; however, given time constraints of the workshop we want to be sure as many people as possible have a chance at playing the different roles.
6. After everyone has had chance to role play in the mock FGD, discuss (in the small group) the experience of being FGD facilitator, note taker, and focus group member. Did you feel comfortable in your role? Were there things that were difficult? If so, how, and how could these be changed for the better? What did facilitators do well and how they could they improve? Were the topical outlines followed? Were they helpful? How could the topical outlines be improved? Allow 10–15 minutes for this discussion.
7. Repeat the exercise, this time with different people playing the roles of facilitator and note-taker.

Toward the end of the time allotted for the FGD exercise, regroup for a plenary discussion. Compare experiences across groups. Allow about 15 minutes for this. Take a break, and return to small groups for the next part of the exercise.

Part Two: Key Informant Interviews

Steps apply to individual groups.

1. Review the selected indicators.
2. Review the notes and discussion from the FGDs in Part One. Identify topics that need or warrant further follow-up, detail, context, etc. According to the indicators chosen, and keeping in mind the topics that need follow-up, identify appropriate interviewees for KIIs (e.g., health center staff, NGO field manager, tribal leader, local government staff).
3. Select what KIIs will be held, and develop a topical outline to guide each KII. Depending on the number of people in each group, you may arrange mock KIIs with more than one category of informant.
4. Break into smaller groups of 2–3 people. Every group member should have the opportunity to play the role of interviewer. The other members will play the informants. It is also useful to designate one person as an observer; this role is specifically to provide feedback to the interviewer and on the use of the topical outline. The observer should take notes. (An observer is also useful in the FGD exercise; however, this only works well if there are enough group members to play focus group participants!)

5. The interviewer conducts the KII. Allow about 15–20 minutes for this. Again, this is shorter than a "real" KII. Fifteen-twenty minutes should be sufficient to practice the role and to practice applying the topical outline enough to generate discussion about interview skills and techniques.

6. Switch roles so that all group members play the role of interviewer. After each interview, group members should process the experience, e.g., the interviewer shares his/her experience of interviewing and using the topical outline, and group members provide feedback and observations.

Toward the end of the time allotted for the KII exercise, regroup for a plenary discussion. Compare experiences across groups. (The guiding questions in #6 for FGDs can be used again here.) Allow about 15 minutes for this.

Wrap up the session. Discuss preparations and logistics for the next day, which is the extended practice session on qualitative field work.

Summary of Key Concepts

- The most common qualitative tools used for M&E of development projects include focus group discussions, key informant interviews, mapping, community calendars, matrix ranking, Venn diagrams, and wealth ranking. Qualitative interviews should be guided by a topical outline.
- Selection and training of qualitative team members is particularly important because they must be able to consistently and independently conduct qualitative analysis and make necessary adjustments to topical outlines and other qualitative tools.
- In order to establish rapport with respondents and ensure collection of detailed and reliable qualitative information, qualitative team members must properly conduct themselves when preparing for and facilitating interviews.

Extended Practice Session: Qualitative Field Work

Objective: Participants practice conducting focus group discussions and key informant interviews (field-based)

Preparation: Both the facilitator and workshop participants need to do preparation for this field-based exercise. It is important to keep in mind that the facilitator tasks – some shared with the host NGO – start days (or even 1–2 weeks) *before* the workshop.

Time needed for actual field practice**:** Full day

Facilitator: (Starting several days prior to the workshop):

- **Plan the visit with the NGO and community contacts.** Work with the workshop's host NGO to identify communities/villages in their operational area that are suitable for conducting FGDs and KIIs for training purposes. The number of communities needed for the exercise will depend on the workshop size and how many FGDs/KIIs can be completed by any team in a day: participants should be divided into groups of no more than five people (e.g., if there are four five-member groups, at least four communities are needed, but more may be visited if time permits). The communities should be close to the workshop location and easily accessible. The facilitator should work with the host NGO to contact community representatives to explain the purpose of the field practice, seek permission to conduct FGDs and KIIs, and request the assistance of the community in assembling focus groups and identifying key informants. A day, time and location should be arranged that fit the workshop schedule and are also convenient for the community. Transportation and logistics need to be arranged ahead of time. This includes lunch/snacks and refreshments both for the workshop participants and for the community members who will assist in the exercise. This is an incentive for community members to participate and it also expresses appreciation for their time and assistance.
- **Invite community participants.** When inviting the community to participate in this exercise, it is important to specify the profile of the participants needed (e.g. youth, returnees, etc.). This will depend on the topic(s) of investigation. The number of people needed should also be specified. Remember also that FGDs should always be conducted separately with men and women. The facilitator should make sure that the topical outlines developed by the small workshop groups are appropriate to the community participants available for the exercise. This may require some adjustments, e.g., perhaps a group has developed questions for a FGD with male farmers but male farmers will not be able to attend on the scheduled day; in such a case the group will need to modify or re-do their topical outline to fit the community participants who will be present.

Facilitator:

During the workshop (at least 1 day before the field visit):

- **Designate small groups for field work.** While it is not strictly necessary to keep the same groups as in the classroom exercise, maintaining the same groups would allow participants to experience the process from start to finish and see, for example, how the qualitative instruments develop and evolve in practice, and to work through challenges as they arise. Regardless of whether the same or different groups are formed, it is still recommended that the groups contain both male and female members. In addition, preferably at least one person in each group has some experience conducting FGDs and/or KIIs in the field.

- **Provide community background information.** The facilitator and/or the host NGO should provide background information to the workshop participants about the particular village they will be visiting. This includes the history of the program in the community and information about the village's experience with M&E activities.
- **Provide supplies.** The facilitator should ensure that all groups have adequate supplies, as listed on Slides 4–5: Conducting Focus Group Discussions – notepads, pens, etc.

Workshop participants: During the workshop (at least 1 day before the field visit):

- Workshop participants should review the guidance in this lesson and especially the topical outlines developed in the classroom-based small group exercises. Before going into the field, they should finalize their topical outlines and make copies for all group members.
- Participants should select in advance who will facilitate and co-facilitate the first FGD (or KII), who will take notes on the discussion, who will interview, etc. It may be useful for purposes of the FGD practice, to designate more than one person as note taker, so that later during the analysis stage, the group is able to compare what information was recorded and how it was recorded, checking for similarities and differences in what information was captured and in note taker styles. This will help to generate discussion later about what kind of information is important and how to record it efficiently, correctly and completely.

Field Practice:

Each team should be asked to complete at least one FGD and at least one KII, two of each if possible. Female teams should be given explicit responsibility for carrying out female FGDs, and if the topic warrants, KIIs with female respondents.

Every member should arrive at the field site fully prepared – with adequate paper, pen/pencil, and a hard copy of the topical outline(s). When facilitating the FGD or KII, the note taker should always record the date, location, the number of individuals participating, and the start time of the interview. As a general rule, two-person teams should not take more than 45 minutes for an individual interview, or 90 minutes for a group discussion.

After conducting a FGD or KII, team members should switch roles and partners so that everyone has the opportunity to practice all roles and work alongside different people. Likewise, when conducting actual qualitative field work, team members should not work with the same partner every day. Rotating team members daily gives each person an opportunity to work with and learn from the other team members.

At the end of the qualitative field practice, and prior to beginning qualitative analysis, each team should meet to verify salient points and/or clarify any gaps in the notes, as these now become the sole source of qualitative data.

Handout 2.2.1: Required Skills of Qualitative Team Members

The selection and training of the qualitative team requires greater attention and consideration than for conventional survey enumerators. This is because the skills required for carrying out qualitative fieldwork are quite different than those required for quantitative surveys. The minimum skills every member of the qualitative team should have include the following.

1. Ability to establish rapport

Qualitative team members must have the ability to establish rapport with respondents in order to ask probing questions and collect detailed information.

2. Group facilitation skills

Since information will likely be collected through focus group discussions and/or other group activities, qualitative team members must have the ability to control dominant personalities and encourage the participation of a wide range of community members.

3. Analytical skills and the ability to apply contextual knowledge

Perhaps most importantly, qualitative studies differ from quantitative studies in that they require continual and independent analysis. In order to ensure the validity of qualitative data, the topical outlines must be continually reviewed to ensure that questions are appropriately stated and all relevant and emerging topics are being addressed. Each team member must have sufficient knowledge and understanding of the program context to enable him/her to adapt questions (when needed) without losing sight of the objectives of the monitoring or assessment activity. Accordingly, qualitative team members must be able to draw on their knowledge and experience to engage holistic analysis that is contextual and disaggregated.

Additional desired skills include:

- Previous experience facilitating interviews in individual and group settings
- Language and cultural competency skills appropriate to the individuals or groups that will be met with

Handout 2.2.2: Guidance for Conducting Individual and Group Interviews

While it is likely that qualitative team members have some experience in conducting community interviews, it is good practice to review the guidance presented here when preparing for project M&E. Failure to follow these basic principles may present challenges for establishing rapport with the respondent(s), and more importantly, negatively affect the quality and reliability of the qualitative information gained through the interview.

Resources and Preparation Required

- Arrange for appropriate interviewer (gender-specific, if necessary)
- Topical outline (checklist of topics to be covered)
- Recording materials (paper and pencil, survey form, etc.)
- Relatively private space to conduct interviews free from distraction

Methodology

How to start:

Always begin with a traditional greeting and explain:

- Who you are
- Who you work for
- Why you are there
- What your role is

If (as is likely) you are not a decision-maker, say so. Explain that by collecting good, accurate information from the community you will be able to inform decision makers more accurately about the community's situation.

Identify and record the characteristics of the individual or group (e.g., gender, age and socio-economic status).

How to conduct yourself and the discussion:

- Use your topical outline to ensure that all topics are covered, but be flexible. Allow new and unexpected issues to be brought up and pursued.
- Maintain an informal approach – don't interrogate. Mix questions with discussion.
- Be aware of non-verbal communication from your informants.

- Respect people's sensitivities and their right not to answer certain questions if they choose not to.
- In a group discussion, ensure that all participants contribute; don't allow more powerful individuals or groups in the community to dominate. (If an individual persists in dominating, politely bring the discussion to an end and form a new group.)
- Let informants and groups explain points fully; allow them to "wander" if it helps them to make their point. Understand their logic and concerns and, when appropriate, gently bring the discussion back to the topic about which you seek information.
- Don't be (or appear to be) in a hurry; allow sufficient time.
- Avoid passing value judgments (either verbally or through body language) on what an informant says.
- Don't take more than 45 minutes for an individual interview, or 90 minutes for a group discussion.

Whenever possible, and particularly in group discussions, use two interviewers (preferably a woman and a man):

- One interviewer leads the discussion while the other takes notes; exchange roles regularly.
- Don't interrupt each other: wait until your colleague has finished his/her line of inquiry before bringing up another topic.
- Sometimes it helps having a team member who is familiar with the local context. Certain words and expressions may contain subtleties or multiple meanings that would be difficult to interpret without experience with the local context.

Handout 2.2.3: Sample Topical Outline

End of Program (EOP) Evaluation

Topical Outline: Focus Group Discussions

Overall Food Security Context

1. Which **households** in this community are **most food insecure**? Are there any that are more food secure than most?
2. What are the **biggest challenges** to securing sufficient food for your family?
3. How do vulnerable households **cope with food shortages** during the hungry season (October-March)?
4. How has the **food security situation changed since the beginning of the project** in this community?
5. What types of **project interventions are most valued** by members of this community?

Agricultural Activities

1. What **impact** have agricultural interventions had on the ability of vulnerable households in this community to access adequate food?
2. Describe your level of satisfaction with the **quantity and quality of agricultural extension services**? Has agricultural extension support been sufficient for meeting farmer needs? If not, why not?
3. How have community members **participated in implementation of agricultural activities** (design, planning, targeting, monitoring)? Who participated?
4. Has **implementation of agricultural activities changed** since they first began in this community? If so, what changed? What was the reason for the change?
5. Were community members able to give their **ideas and feedback on implementation of agricultural activities**? If yes, how has the program responded to feedback (probe for specific examples)?
6. How might **agricultural activities** be **improved?** (registration, allocation of seeds/tools, mobilization, targeting, monitoring, verification, help desk)
7. What **impact (if any) have agricultural activities had on household nutrition** in this community?
8. What **impact (if any) have agricultural activities had on household income** in this community?

Food for Assets (FFA)

1. Have Food for Work (FFW) activities supported the **creation/rehabilitation of *community* assets** in this community? If so, what type(s) of asset(s) was/were created/rehabilitated?
2. What types of FFW **interventions** have been **most valued** by community members?
3. Which households **benefit most** from the assets created through FFW activities?
4. How were beneficiaries selected? Were **selection criteria** transparent and fair? Which household members participated most in FFW activities?
5. Has **implementation of FFW activities changed** since they first began in this community? If so, what changed? What was the reason for the change?
6. How have community members **participated in implementation of FFW activities** (design, planning, targeting, monitoring)? Who participated?
7. How did participation in FFW affect time spent on **other livelihood activities**?
8. Did the community develop and submit a **formal proposal** for the FFW activities to project managers?
9. Has this community received any **technical support** or training for rehabilitation or construction of assets through FFA? If so, describe.
10. Were community members able to give their **ideas and feedback on implementation of** FFW? If yes, how has the project responded to feedback (probe for specific examples)?
11. Has anyone in the community created ***household* assets** through project FFW activities? What type of asset was created?
12. What **impact** (if any) have **FFW activities** had on household food security in this community?
13. What arrangements (if any) have been made by the community for **maintaining assets** created through project FFW activities?
14. Has anyone in the group **participated in agricultural training modules facilitated by project**? What modules did they participate in? How have these training modules influenced their agricultural practices (give examples)?

Overall Effectiveness of Project Interventions

1. What is the **community's perception of the project**? How might the project be improved?
2. Have food rations been **distributed in a timely manner**? Were you satisfied with the **quantity and quality**? If not, what was the problem?
3. How has participation in the project affected the **capacity of households to cope with food security emergencies** in the future?
4. Have you been (or were you) **notified about the end date of project activities**? If the activity has ended, were you satisfied with how the project ended? If not, how could it have been improved?
5. What (if any) **other assistance is provided to vulnerable households** in this community? In terms of effectiveness, how do other nongovernmental organization (NGO) programs compare to the implementing agency for this project? How well did **project managers coordinate with other NGOs** in the community?
6. What types of assistance do people in this community **need most** to improve household food security?

Lesson 2.3: Qualitative Sampling and Fieldwork Logistics

This lesson focuses on providing an overview of non-probability sampling and the various steps involved in planning for qualitative field work.

The estimated duration for this lesson is **50–60 minutes for sampling** and **10–15 minutes for logistics**.

Learning Objectives

Lesson 2.3 will help participants:

- Understand various approaches to non-probability sampling, including purposive sampling
- Identify steps necessary to adequately plan and prepare for qualitative field work

Companion Materials

The PowerPoint presentation **2.3 Qualitative Sampling.ppt** accompanies this lesson as a separate file. **Handout 2.3.1: Purposive Sampling: An Overview** is provided at the end of this lesson. Be sure to provide copies to each participant.

Slides

Slides 1–3: Distinguishing between probability and non-probability sampling

Sampling occurs when a subset of the population (or other unit) under study is selected from the larger group (the total population under study).

Sampling (selecting respondents) for a qualitative study is different in important ways from sampling carried out for quantitative methods such as household surveys. A quantitative survey typically relies on "probability" sampling which utilizes some form of random selection. It's referred to as probability sampling since, in theory, every individual member of the population should have an equal probability of being selected for participation. Probability sampling is common for quantitative survey because such methods rely on precision of measurement, and replicability of statistical findings.

Sampling for a qualitative study on the other hand is not bound by the same requirements for statistical validity. Rather, it can, and often does involve more deliberate selection of research participants in order to ensure collection of rich (detailed) information and contextual analysis of the central research questions. The various approaches to non-probability sampling discussed in this lesson include: **convenience sampling, purposive sampling, snowball sampling, and quota sampling**. It is important to note that we cannot generalize the results to the population of interest using non-probability sampling. Remember that qualitative study (and by extension qualitative sampling) is not concerned with answering the question of how many, but is more focused on determining answers to deeper questions concerning how, why, and what now.

Slides 4–12: Various approaches to non-probability sampling

The following section focuses on various approaches to non-probability sampling, starting with the most general methods, convenience and purposive sampling, and following with descriptions of two commonly utilized purposive sampling methods.

Convenience sampling: This approach to sampling is what it suggests. It simply refers to carrying out qualitative research (interviews, interactive tools such as mapping, calendars, etc.) with individuals who are easiest to find and willing to participate. It is the least rigorous approach to non-probability sampling and is generally not recommended for qualitative research in support of development activities.

Purposive sampling: In purposive sampling, we sample with a *purpose* in mind. We usually would have one or more specific predefined groups we are seeking. For instance, if we want to understand the benefit of a road built by a project we may want to interview communities who live nearby the road and also interview communities who live far from the road. While we select the respondents one of the first things we need to do is verify that the respondent does in fact meet the criteria for being in the sample. Purposive sampling can be very useful for situations where you need to reach a targeted sample quickly and where sampling for proportionality is not the primary concern. With a purposive sample, you are likely to get the opinions of your target population, but you are also likely to overweight subgroups in your population that are more readily accessible.

Snowball sampling: Snowball sampling, a type of purposive sampling, involves a bit more reasoning than convenience sampling in that it begins with selection of one or more individuals that the research feels will have useful insight into the particular research topic(s). It gets its name through the process of accumulation whereby the initially selected participants are asked to refer the researchers to similar individuals or groups that he or she feels would be useful sources of qualitative information. Snowball sampling is typically used for key informant interviews (KIIs), but could be used for focus group discussions (FGDs) in certain circumstances. Those circumstances included cases where the subjects being evaluated belong to groups that are difficult to identify or locate (e.g., migrants, illegal immigrants, subjects engaging in high-risk behaviors).

Quota sampling: This approach, another form of purposive sampling, makes an attempt to reflect the overall characteristics of the community being studied. It begins with estimations of various strata within the community (e.g., proportion of male/female, youth, elderly, ethnic groups, wealthy, poor). Participants for qualitative research are then selected in a manner that approximates these same characteristics.

Slide 13: Steps for conducting purposive sampling

Purposive sampling entails a deliberate approach to constructing a sample that specifically addresses a qualitative research question (e.g., what are the constraints to household resilience), or a series of questions (e.g., what is the relationship between exposure to drought and household food security). As such, it is critical that research teams follow certain steps in constructing a purposive sample.

1. Define the target community/village/area

This step is analogous to determining the "sampling frame," the population of individuals from which study participants will be selected. A qualitative sampling frame is typically defined by a geographic area such as a community within the project's operational area.

2. Identify inclusion and exclusion criteria for sample

Identification of selection criteria for a purposive sample is essential. The criteria should explicitly reflect the research questions being investigated. For instance, investigating the impact of drought on food security would definitely benefit from establishing "small-scale farmers" as a selection criteria. Likewise, studies on household resilience may decide to use "female-headed households" as a selection criteria in order to inform analysis of constraints. Most often multiple, complementary selection criteria are used to ensure that the overall purposive sample corresponds to multiple research questions.

3. Determine the sample size

Having selected the criteria by which research participants will be selected, the team must now estimate the number of individuals needed to participate in various qualitative research activities. While the determination of sample size should be guided by the selection of qualitative tools (e.g., focus group discussions, key informant interviews), there is no need to select a number that is statistically representative of the entire population. Create a plan to recruit and select sampling units that satisfy the criteria

Once the team knows the criteria through which participants will be selected and the estimated number of participants needed, it must then formulate a plan for enlisting participants. This can often be facilitated through discussion with community leaders.

4. Select the targeted number of sampling units

The final step in purposive sampling entails actually selecting individuals (sampling units) for participation in qualitative study. When doing so, interviewers must do what they can to arrange sessions at the convenience of the participants, and be willing to exclude willing participants who do not meet their selection criteria.

Slide 14: Preparing for qualitative fieldwork

Once sampling for qualitative fieldwork has been completed, or while it is taking place, the research teams can begin preparing for and taking initial steps in conducting qualitative field work.

1. Compile, process and analyze secondary material on the program and beneficiary population

In order to make adequate preparations for fieldwork, the research team will need to compile information on village locations, population, key livelihood strategies, contributors to vulnerability, development agency activities, etc.

2. Recruit and train evaluation team members

Teams should have an adequate number of qualitative researchers, and be balanced with respect to gender, technical skills, language capabilities.

3. Field test and revise data collection instruments

Team members should field test topical outlines and other data collection instruments to ensure questions are clear, relevant, and appropriate to both the context and language capabilities of respondents.

4. Review data analysis plan

Prior to beginning fieldwork, all team members should be able to identify analysis topics, objectives of qualitative analysis, and how qualitative data will be linked to quantitative findings.

Slide 15: Initial steps in conducting field work

In order to ensure that qualitative field work proceeds efficiently and effectively, research teams should conduct the following initial steps prior to beginning data collection.

1. **Inform community and local authorities regarding the time and location of planned field activities, and explain the purpose of the study**

During initial interactions with the community, it is important to take care to avoid introducing bias to the research by not falsely raising expectations regarding follow-on programs or projects.

2. **Use initial interactions with community members to build rapport and obtain information on important trends**

Through casual conversation, researchers can gain valuable information from community members regarding food and livelihood security trends (most recent harvest, common sources of income, etc.), demographic trends (youth and elderly populations, outmigration, etc.), community infrastructure (schools, health posts, markets, etc.), previous and ongoing assistance efforts, key community institutions.

3. **Ask community leaders to accompany team on a walk around the community and make introduction to focus group participants**

While waiting for focus group members to gather, or on the way to the meeting venue, team members should take the opportunity to become familiar with the physical surroundings within the community and general characteristics of community members.

Summary of Key Concepts

- Qualitative sampling differs from quantitative sampling in that it is not bound to statistical tests of validity. Quantitative samples need not be representative of the entire population, rather, they should be deliberately selected to ensure the greatest amount of detailed information on the selected research topic(s). Various approaches to qualitative sampling include: **convenience sampling, snowball sampling, quota sampling and purposive sampling.**
- In order to conduct qualitative sampling and planning for field work in a timely and appropriate manner, research teams should **ensure that preparatory tasks are understood and completed by research team members**.

Handout 2.3.1: Purposive Sampling: An Overview

Purposive sampling, also known as **judgmental, selective or subjective sampling**, is a type of **non-probability sampling** technique. Non-probability sampling focuses on sampling techniques where the units that are investigated are based on the judgment of the researcher.[19] There are a number of different types of purposive sampling, each with different goals. This article explains (a) what purposive sampling is, (b) seven of the different types of purposive sampling, and (c) the broad advantages and disadvantages of purposive sampling.

Purposive Sampling Explained

Purposive sampling represents a *group* of different *non-probability sampling* techniques. Also known as *judgmental*, *selective* or *subjective* sampling, purposive sampling relies on the *judgment* of the researcher when it comes to selecting the *units* (e.g., people, cases/organizations, events, pieces of data) that are to be studied. Usually, the sample being investigated is quite small, especially when compared with *probability sampling* techniques.

Unlike the various sampling techniques that can be used under *probability sampling* (e.g., simple random sampling, stratified random sampling), the goal of purposive sampling is not to *randomly* select units from a *population* to create a *sample* with the intention of making *generalizations* (i.e., *statistical inferences*) from that sample to the population of interest.[20] This is the general intent of research that is guided by a *quantitative research design*.

The main goal of purposive sampling is to focus on particular characteristics of a population that are of interest, which will best enable you to answer your research questions. The sample being studied is not representative of the population, but for researchers pursuing *qualitative* or *mixed methods research designs*, this is not considered to be a weakness. Rather, it is a choice, the purpose of which varies depending on the *type* of purposive sampling technique that is used. For example, in *homogeneous sampling*, units are selected based on their having similar characteristics because such characteristics are of particular interested to the researcher. By contrast,

[19] See "Non-probability sampling" (http://dissertation.laerd.com/non-probability-sampling.php) to learn more about non-probability sampling, and "Sampling: The Basics" (http://dissertation.laerd.com/sampling-the-basics.php) for an introduction to terms such as units, cases, and sampling.

[20] See the article "Probability sampling" (http://dissertation.laerd.com/probability-sampling.php)

critical case sampling is frequently used in *exploratory*, *qualitative research* in order to assess whether the phenomenon of interest even exists (amongst other reasons).

During the course of a *qualitative* or *mixed methods research design*, more than one type of purposive sampling technique may be used. For example, *critical case sampling* may be used to investigate whether a phenomenon is worth investigating further, before adopting a *maximum variation sampling* technique to develop a wider picture of the phenomenon. We explain the different goals of these types of purposive sampling technique in the next section.

Types of Purposive Sample

There are a wide range of purposive sampling techniques that you can use.[21] These include:

- Maximum variation sampling
- Homogeneous sampling
- Typical case sampling
- Extreme (or deviant) case sampling
- Critical case sampling
- Total population sampling
- Expert sampling

Each of these types of purposive sampling technique is discussed in turn.

Maximum variation sampling:

Maximum variation sampling, also known as *heterogeneous sampling*, is a purposive sampling technique used to capture a wide range of perspectives relating to the phenomenon that you are interested in studying; that is, maximum variation sampling is a search for variation in perspectives, ranging from those *conditions* that are viewed to be *typical* through those that are more extreme in nature. By conditions, we mean the units (i.e., people, cases/organizations, events, pieces of data) that are of interest to the researcher. These units may exhibit a wide range of attributes, behaviors, experiences, incidents, qualities, situations, and so forth. The basic principle behind maximum variation sampling is to gain greater insights into a phenomenon by looking at it from all angles. This can often help the researcher to identify *common themes* that are evident across the sample.

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[21] See Patton 1990 (*Qualitative evaluation and research methods* (2nd ed.). Newbury Park) and Kuzel 1999 (Kuzel, AJ. (1999). "Sampling in qualitative inquiry." In BF Crabtree and WL Miller (Eds.) *Doing Qualitative Research* (second edition). Thousand Oaks, CA: Sage Publications) for a complete list.

Homogeneous sampling:

Homogeneous sampling is a purposive sampling technique that aims to achieve a homogeneous sample; that is, a sample whose *units* (e.g., people, cases) share the same (or very similar) *characteristics* or *traits* (e.g., a group of people that are similar in terms of age, gender, background, occupation). In this respect, homogeneous sampling is the opposite of *maximum variation sampling*. A homogeneous sample is often chosen when the *research question* that is being addressed is specific to the characteristics of the particular group of interest, which is subsequently examined in detail.

Typical case sampling:

Typical case sampling is a purposive sampling technique used when you are interested in the *normality*/*typicality* of the *units* (e.g., people, cases, events, settings/contexts, places/sites) you are interested in, because they are *normal*/*typical*. The word *typical* does not mean that the sample is *representative* in the sense of *probability sampling* (i.e., that the sample shares the same/similar characteristics of the population being studied). Rather, the word *typical* means that the researcher has the ability to compare the findings from a study using typical case sampling with other similar samples (i.e., comparing samples, not generalizing a sample to a population). Therefore, with typical case sampling, you cannot use the sample to make generalizations to a population, but the sample could be illustrative of other similar samples. Whilst typical case sampling can be used exclusively, it may also follow another type of purposive sampling technique, such as maximum variation sampling, which can help to act as an exploratory sampling strategy to identify the typical cases that are subsequently selected.

Extreme (or deviant) case sampling:

Extreme (or deviant) case sampling is a type of purposive sampling that is used to focus on cases that are *special* or *unusual*, typically in the sense that the cases highlight *notable outcomes*, *failures* or *successes*. These extreme (or deviant) cases are useful because they often provide significant insight into a particular phenomenon, which can act as lessons (or cases of best practice) that guide future research and practice. In some cases, extreme (or deviant) case sampling is thought to reflect the *purest* form of insight into the phenomenon being studied.

Critical case sampling:

Critical case sampling is a type of purposive sampling technique that is particularly useful in *exploratory* qualitative research, research with *limited resources*, as well as research where a single case (or small number of cases) can be *decisive* in explaining the phenomenon of interest. It is this decisive aspect of critical case sampling that is arguably the most important. To know if a case is decisive, think about the following statements: "If it happens there, it will happen anywhere;" or "if it doesn't happen there, it won't happen anywhere;" and "If that group is having problems, then we can be sure all the groups are having problems."[22] While such critical cases should not be used to make *statistical generalizations*, it can be argued that they can help in making *logical generalizations*. However, such logical generalizations should be made carefully.

Total population sampling:

Total population sampling is a type of purposive sampling technique where you choose to examine the *entire population* (i.e., the *total population*) that have a particular set of *characteristics* (e.g., specific experience, knowledge, skills, exposure to an event). In such cases, the entire population is often chosen because the size of the population that has the particular set of characteristics that you are interest in is very small. Therefore, if a small number of *units* (i.e., people, cases/organizations) were not included in the sample that is investigated, it may be felt that a significant piece of the puzzle was missing.

Expert sampling:

Expert sampling is a type of purposive sampling technique that is used when your research needs to glean knowledge from individuals that have *particular expertise*. This expertise may be required during the *exploratory* phase of qualitative research, highlighting potential new areas of interest or opening doors to other participants. Alternately, the particular expertise that is being investigated may form the basis of your research, requiring a focus only on individuals with such specific expertise. Expert sampling is particularly useful where there is a lack of empirical evidence in an area and high levels of uncertainty, as well as situations where it may take a long period of time before the findings from research can be uncovered. Therefore, expert sampling is a cornerstone of a *research design* known as *expert elicitation.*

Advantages and Disadvantages of Purposive Sampling

Whilst each of the different types of purposive sampling has its own advantages and disadvantages, there are some broad advantages and disadvantages to using purposive sampling, which are discussed below.

Advantages of purposive sampling:

There are a wide range of *qualitative research designs* that researchers can draw on. Achieving the goals of such qualitative research designs requires different types of *sampling strategy* and *sampling technique*. One of the major benefits of purposive sampling is the wide range of sampling techniques that can be used across such

[22] Patton. 2002. *Qualitative evaluation and research methods* (2nd ed.). Newbury Park. p. 237.

qualitative research designs; purposive sampling techniques that range from *homogeneous sampling* through to *critical case sampling*, *expert sampling*, and more.

Whilst the various purposive sampling techniques each have different goals, they can provide researchers with the justification to make *generalizations* from the sample that is being studied, whether such generalizations are *theoretical*, *analytic* and/or *logical* in nature. However, since each of these types of purposive sampling differs in terms of the nature and ability to make generalizations, you should read the articles on each of these purposive sampling techniques to understand their relative advantages.

Qualitative research designs can involve multiple phases, with each phase building on the previous one. In such instances, different types of sampling technique may be required at each phase. Purposive sampling is useful in these instances because it provides a wide range of non-probability sampling techniques for the researcher to draw on. For example, *critical case sampling* may be used to investigate whether a phenomenon is worth investigating further, before adopting an *expert sampling* approach to examine specific issues further.

Disadvantages of purposive sampling:

Purposive samples, irrespective of the type of purposive sampling used, *can be* highly prone to *researcher bias*. The idea that a purposive sample has been created based on the *judgment* of the researcher is not a good defense when it comes to alleviating possible researcher biases, especially when compared with *probability sampling* techniques that are designed to reduce such biases. However, this judgmental, subjective component of purpose sampling is only a major disadvantage when such judgments are *ill-conceived* or *poorly considered*; that is, where judgments have not been based on clear criteria, whether a theoretical framework, expert elicitation, or some other accepted criteria.

The subjectivity and non-probability based nature of *unit* selection (i.e., selecting people, cases/organizations) in purposive sampling means that it can be difficult to defend the representativeness of the sample. In other words, it can be difficult to convince the reader that the judgment you used to select units to study was appropriate. For this reason, it can also be difficult to convince the reader that research using purposive sampling achieved *theoretical*/*analytic*/*logical generalization*. After all, if different units had been selected, would the results and any generalizations have been the same?

Lesson 2.4: Qualitative Data Analysis

This lesson provides an overview of qualitative data analysis and interpretation within the context of M&E systems.

The estimated duration for the **extended practice session is 4–5 hours** and for the **lesson is 45–60 minutes**.

Learning Objectives

Lesson 2.4 will provide participants with:

- A basic understanding of the difference between data analysis and interpretation
- An introduction to basic qualitative analysis

Companion Materials

The PowerPoint presentation **2.4 Qualitative Data Analysis.ppt** accompanies this lesson as a separate file.

Extended Practice Session: Organizing and Analyzing Qualitative Data

Objective: Qualitative training participants organize and analyze data they have collected during extended practice session for Lesson 2.2 – Qualitative Research Tools

Part One: Review of the Field Work

Time needed: 15 minutes

Instructions:

- How did the qualitative field work go? Was it efficient? Did everyone understand and complete their roles?
- Did the field work begin on time?
- Did the community ensure adequate participation?
- Did the team encounter any logistical challenges? If so, how did they respond?
- What did they learn about facilitating focus group discussions (FGDs) and key informant interviews (KIIs)?
- Is there anything that could be done differently or better the next time?

Part Two: Analyzing the Field Data

Time needed: 1 hour 30 minutes to 2 hours

Ask the participants?

Please use the techniques that you learned this morning to analyze the data that you have collected from the field.

Please also ask the following questions while you analyze the data.

- What were the most significant findings?
- How did male and female FGDs respond differently to the same question?
- Which key informants were most informative? Why?
- Were there any answers that you felt were surprising or particularly noteworthy?
- How could findings from initial qualitative sessions inform, or lead to adaptation of subsequent interviews?

You may want to work in groups to discuss and enter notes from each of the three qualitative sessions that you have facilitated during the field practice.

Part Three: Conducting Qualitative Analysis

Time needed: 2–3 hours

Once two-person teams have completed entering their notes from each of the three qualitative sessions they've conducted, the supervisor should bring the entire group of qualitative trainees together to discuss findings. Each team should be given a chance to share their notes from each cell in the qualitative matrix and answer any questions from the larger group. After each issue/topic/indicator is discussed among the group, the qualitative supervisor can attempt to reach consensus among the entire group on qualitative findings, or alternatively he/she could simply collect and summarize individual matrices into a single "master" qualitative matrix. In order to facilitate analysis, the qualitative supervisor should practice his/her own qualitative interviewing skills by probing team members for clear, detailed qualitative information. In doing so, he/she may ask the team the following questions:

- How many have analyzed qualitative information before?
- What are some of the challenges to analyzing qualitative data?
- How are such challenges best dealt with?
- What are some of the overarching themes (or most common responses) revealed during qualitative data collection?

- Are there any noticeable patterns in the responses given? How have various populations (e.g. men, women, youth, elderly, farmers, fishermen, etc.) differed in their interpretation of, or responses to individual questions?
- Are there any interesting outliers (unusual responses) that may lead to further questions?
- Did teams capture any particularly illustrative quotes? If so, share them.
- How does the qualitative information gained answer to / inform the central topics of the evaluation or assessment?
- If there is a quantitative component to the research, how might the qualitative information complement individual quantitative indicators?

Slides

Slides 1–2: What is entailed in qualitative data analysis?

Whether quantitative or qualitative, **data analysis** refers to the process of bringing order to the data, organizing what is there into patterns, categories, and basic descriptive units. **Data interpretation** is a necessary complement to data analysis in that it involves attaching meaning and significance to the analysis, explaining descriptive patterns, and looking for relationships and linkages among descriptive units. Together, data analysis and interpretation enables one to draw conclusions about groups of people or things – gauging their status, how they may be different or alike, how they change over time, how factors might relate to each other, etc. Good analysis and interpretation is absolutely critical to sound decision-making, and directly influences the ability of M&E managers to assess progress and change.

Analysis and interpretation of qualitative data is a complex process that includes deductive reasoning and careful consideration of contextual information. Software packages enable statistically valid measurement of quantitative indicators for which information is typically collected through household interviews (e.g., dietary diversity, number of daily eating occasions, and asset ownership). Alternatively qualitative results are typically analyzed by organizing them into consolidated matrices that inform analysis of the specific indicators identified in the project logical framework or specific themes addressed in the topical outline.

Slides 3–26: Recommended steps for conducting qualitative data analysis

While it can be complex, analysis of *quantitative* information is relatively straightforward in that it is based on defined mathematical and statistical principles. Analysis of *qualitative* data, by comparison, is much less clear, and is inherently subjective. One approach to reducing the subjectivity of qualitative analysis is to focus on discerning **observable patterns in qualitative information** provided by respondents. The illustration below provides an example of how this might be done.

Community perceptions (from FGDs) regarding improvement of rural road infrastructure

Preliminary categorization of qualitative information on improvement of rural road infrastructure

	Positive	Negative	Total
Male	5	2	7
Female	6	4	10
Total	11	6	17

When utilizing this approach to analysis of qualitative data, it's important that the person conducting the analysis calculates percentages, rates, or frequencies without losing sight of diverse and detailed opinions, perceptions, and/or beliefs. Key tips for doing so include:

- Develop categories based on indicators or key question
- Assign qualitative data such as quotes, descriptions or summaries to the appropriate category
- Calculate values by counting, for example, how many people responded a certain way or behaved a certain way
- Use actual quotes or descriptions to support the values

For purposes of illustration, if our key question is: *Why don't some families of the project grow trees on their land?*

Then potential indicators may include:

- Percentage of farm families who say they don't have enough money to purchase cuttings
- Percentage of farm families who say they don't want to take the risk of growing trees
- Percentage of farm families who say they are afraid the government will take their trees once they are productive
- Percentage of farm families who give another reason

The next steps in conducting preliminary qualitative analysis, in proper sequence, would be to:

1. Construct a matrix for categorizing quotes and other information related to each indicator
2. Enter quotes and other notes from interviews and interactive qualitative data collection into the matrix
3. Count the number of similar responses in each of the categories. Based on the example above, the tabulation may look like this

Insufficient money for investment	=	55 respondents
Risk averse	=	22 respondents
Lack of trust in government	=	35 respondents
Other	=	9 respondents
TOTAL	=	121 respondents

After dividing the number of respondents in each category by the total respondents (121) and multiplying by 100, we could arrive at the following summary conclusions:

- 45.5% of FGD respondents said they don't have enough money to invest in trees
- 18.2% of FGD respondents said they don't want to take the risk of growing trees
- 28.9% of FGD respondents said they don't trust the government enough
- 7.4% of FGD respondents gave other reasons

Slides 26–30: Challenges in utilizing qualitative analysis as part of a 'mixed methods' approach

Years of collective experience in utilizing qualitative research methods to monitor and evaluate development programs have revealed several common challenges to conducting rigorous qualitative analysis. They include:

- Ensuring that information collected answers the key question(s)
- Ensuring that qualitative information collected from multiple individuals or teams is *sufficiently detailed and consistently categorized*
- Ensuring that qualitative information analyzed is limited to that which is important and useful

Each of these challenges can be addressed by constructing and utilizing matrices for data entry and analysis. By constructing qualitative matrices that directly correspond to key evaluation questions and individual qualitative indicators, research teams can:

- Ensure that qualitative teams are consistently collecting and recording their findings
- Encourage concise recording of detailed data according to important themes
- Allow comparison of qualitative data between men, women, children and between different geographic locations
- Enable consistent analysis of qualitative data from multiple groups

> Direct quotes from respondents can add a whole other dimension to qualitative information that enables insight into important perceptions and opinions.

Another common challenge when conducting qualitative analysis, especially when doing so as part of a 'mixed methods' approach that also involves analysis of quantitative data, is ensuring that qualitative and quantitative analysis are complementary, rather than parallel. All too often, qualitative and quantitative researchers adopt a 'silo mentality' thinking only of their own research findings and failing to consider ways in which they may complement findings arrived at through other methods. Overcoming the inherent challenges to integrating qualitative and quantitative analysis as part of a 'mixed methods' approach can be done by:

- Engaging in inclusive quantitative and qualitative team discussions about the particular project's Theory of Change
- Arriving at consensus regarding the causal chains that influence achievement of project objectives (intended domains of change)
- Drawing on the expertise of team members capable of bridging research methodologies (quantitative and qualitative)

An example of appropriately integrated quantitative and qualitative analysis is provided below.

Quantitative: Percentage of farmers reporting receiving business or technical training in last three years – Rwanda

	Catchment /B	Catchment /NB	Control	Total sample
Received business/ technical training	62.7	39.7*	19.8*	41.7
Type of training received:				
Milk quality	65.5	60.8	23.0*	56.8
Animal husbandry	50.5	50.8	35.4*	47.8
Feeds	33.8	31.7	20.4*	30.9
Artificial Insemination (AI)	31.4	21.7*	15.0	26.6
Other	8.5	11.7	36.3	14.2
Leadership	1.5	5.0	17.7	5.2
Business planning/management	1.8	4.2	8.8	3.5
Organizational development	0.8	1.7	5.3	1.8

* Distribution of responses different from Catchment/B at the 0.10 significance level.

Quantitative findings presented in the table above show that project beneficiaries were much more likely to have received business/technical training compared to their non-beneficiary counterparts within and outside of Chilling Plant catchment areas (63 percent versus 40 and 20 percent, respectively).

Qualitative

Qualitative feedback from focus groups indicates that training materials and post-training reference materials are not adequate for the needs of participants. Participants noted that information retention is difficult without reference materials to reinforce the main points of training sessions.

Summary of Key Concepts

- **Data analysis** is the process of bringing order to the data, organizing what is there into patterns, categories, and basic descriptive units. **Data interpretation** involves attaching meaning and significance to the analysis, explaining descriptive patterns, and looking for relationships and linkages among descriptive units.

- Analysis of quantitative data relies on established mathematical and statistical principles whereas in the **varied nature of qualitative data makes it much more difficult to discern relevant trends and/or patterns.**
- Relevant patterns in qualitative information can be identified by **categorizing similar responses to questions related to specific indicators.**
- Construction of **matrices** is a proven method of organizing both the entry and analysis of qualitative data.
- When using a 'mixed methods approach', it is important to ensure that quantitative and qualitative analysis are **complementary and integrated** rather than parallel.

Module 3: Statistical Concepts and Data Analysis Session 1

Lesson 3.1.1: Understanding Variables

This lesson provides an overview of variables. It describes the characteristics of several types of categorical and numeric variables, and it offers a brief introduction to how SPPS software classifies variables.

The estimated duration of this lesson is **25 minutes**.

Learning Objectives

Following Lesson 3.1.1 participants will be able to:

- Distinguish the difference between categorical and numeric variables.
- Organize different types of variables within these two main categories.
- Recognize the variable categories used in SPSS software (numeric and string).

Companion Materials

The PowerPoint presentation **3.1.1 Understanding Variables** accompanies this lesson as a separate file.

Slides

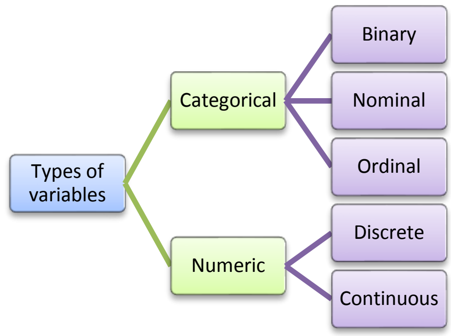
Slide 1: What is a variable?

A variable is any characteristic, number, or quantity that can be measured or counted. A variable may also be called a data item. Age, sex, education, height, weight, income, country of birth, and expenditures are examples of variables. These data items are called variables because the value may vary between data units in a population and may change in value over time. For example, "income" is a variable that can vary between data units in a population (e.g., the income of one household will vary from another). Income will also vary over time for each data unit (e.g., it can go up or down based on seasonal factors and changes in source).

Variables contain data or information that is used to explain or describe something. They can be manipulated in various ways to extract and use the data they contain. Some data base applications refer to variables as "fields."

Slide 2: Types of data/variables

The diagram offers an overview of all variable types. Slides 3–7 that follow define and describe each type.



Slides 3–5: Categorical variables

Categorical variables have values that describe a quality or characteristic of a data unit. Categorical variables may be mutually exclusive (fall within one category or another) or exhaustive (include all possible options). Therefore, categorical variables tend to be represented by a non-numeric value.

There are three types of categorical variables:

- Binary
- Nominal
- Ordinal

Nominal variables have two or more categories that can be “named” and are mutually exclusive, but the values cannot be ordered from highest to lowest. Examples of nominal categorical variables include marital status, occupation, sex, ethnicity, or religion.

Binary variables, also called dichotomous variables, are a type of nominal variable, where data are classified into only two groups or levels. For example, dead/alive, disease/no disease, exposed/unexposed, beneficiary/non-beneficiary, or male/female.

Ordinal variables have values that can be logically ranked (ordered) in two or more categories. Although ordinal variables can be ranked higher or lower than another, we can’t place a relative value to them. In other words, the ranking does not suggest a numeric difference between each category. Examples of ordinal variables include: attitudes (strongly agree, agree, disagree, strongly disagree), birth order (1^{st}, 2^{nd}, 3^{rd}), and severity of malnutrition or food insecurity (mild, moderate, severe). In the birth order example, we may know that John is the first born, Mark the second, and Pat the third-born, but we know nothing about the differences between the points (i.e., number of years between each birth).

Slides 6–7: Numeric variables

Numeric variables have values that describe a measurable quantity as a number, such as how many or how much. Sometimes they are called "quantitative variables." There are two types:

- Discrete
- Continuous

Discrete variables can only take on a finite number of values. A discrete variable cannot take a fractional value between one value and the next closest value. For example, a household cannot have 1.5 children. Examples of discrete variables include the number of food groups consumed, years of school completed, or children in a family, all of which are measured as whole units (i.e., 1, 2, 3 children in a family). Statistics computed from discrete variables can, however, have values that are not whole numbers, for example, the mean household dietary diversity score, or the mean number of children in a household.

Continuous variables can take on any value between two specified values. Examples of continuous variables include height or weight of children, # of minutes to walk to a water source, income, or area of land cultivated.

Slides 8–11: Types of data/variables

In these slides, there are some examples for audience participation. Discuss the examples given in the slides and ask participants to identify variable types. Note that some answers can be different variable types depending on how the data are collected (e.g., level of savings could collect a continuous numerical amount or ordinal ranges/levels from respondents; marital status could be binary as married: yes/no, or a categorical response: single, widowed, divorced, separated), and this discussion provides a transition to Slide 12.

Slide 12: String variables versus numeric variables in SPSS

SPSS and other statistical software categorizes variables as either "string" or "numeric". String variables can contain alpha-numeric characters (a, b, c, d, 1, 2, 30, etc.). In the types of surveys used for FFP programs, string variables are used to capture the name of a respondent, or brief open-ended responses such as specifying "other". Numeric variables only contain numbers (1, 10.5, 36, 45.7 etc.). Analysis options are greater for SPSS numeric variables, because string variables cannot directly be used in calculations without creating dummy variables to represent the string values.

It is important to note the distinction between numeric variables as a general statistical concept, and numeric variables as categorized by SPSS and other software. In SPSS, most variables described earlier (ordinal, binary, nominal, discrete, etc.) will be entered as numeric variables. The use of string variables is less common in baseline and endline surveys carried out for FFP programs.

Summary of Key Concepts

- A variable is an attribute that describes a person, place, or thing, by characteristic, number, or quantity that can vary between one unit of analysis and another.
- Mainly, there are two types of variables – categorical and numerical. There are three types of categorical variable: binary, nominal and ordinal. Numeric variables are of two types – discrete and continuous.
- The use of numeric variable as a general statistics term differs from the distinction "numeric variable" used in SPSS and other software. Most categorical variables will be captured as numeric variables in SPSS. Only variables that require alpha-numeric characters will be captured as "string variables."

Lesson 3.1.2: Introduction to SPSS

This lesson introduces the basic concepts of the SPSS software and database features.

The estimated duration of the lecture and exercise is **30 minutes each**.

Learning Objectives

Following Lesson 3.1.2 participants will be able to:

- Understand the basics of SPSS software
- Recognize key SPSS data windows.
- Apply knowledge to create SPSS variables and enter data in an SPSS database

Companion Materials

The PowerPoint presentation **3.1.2 Introduction to SPSS** accompanies this lesson as a separate file.

Print copies of **Exercise 3.1.2: Creating Variables and Data Entry** instructions for each participant.

Slides

Slide 1: Title slide "Introduction to SPSS"

Facilitator note: Insert date, location of training, and name of facilitators on title slide.

Slides 2: What is SPSS?

The acronym SPSS stands for Statistical Package for Social Science. It is a statistical package widely used by social scientists, nongovernmental organizations (NGOs), the United Nations, and research organizations. It runs on Microsoft Windows and Mac OS systems. The current version of SPSS (10 and above) is a comprehensive system for analyzing data. SPSS can be used to take data from almost any type of file to generate tabulated reports, charts, plots of distributions and trends, descriptive statistics, and complex statistical analyses. SPSS makes statistical analysis more accessible for the beginner and more convenient for the experienced user. Simple menus and dialog box selections make it possible to perform complex analyses without typing a single line of command syntax. The Data Editor function offers a simple and efficient spreadsheet-like facility for entering data and browsing the working data file.

Slides 3–7: Basic SPSS windows

The three SPSS windows most commonly used in our analyses, with saved file extensions are:

- Data Editor (.sav)
- Output Viewer (.spv)
- Syntax Editor (.sps)

There is also a Script Window (.sbs) that provides the opportunity to write full-blown programs, in a BASIC-like language. We do not use it in our analyses, and thus do not explain it in this training; however, the IBM SPSS guide provides clear guidance on Script.

Data Editor: (Slide 4)

The Data Editor provides a convenient, spreadsheet-like method for creating and editing data files. The Data Editor window opens automatically upon starting a session.

The Data Editor provides two views of your data:

- *Data view* that displays the actual data values or defined value labels.
- *Variable view* that displays variable definition information, including defined variable and value labels, data type (e.g., string, date, and numeric), measurement level (nominal, ordinal, or scale), and user-defined missing values.

In both views, it allows modifying or editing the variable properties. The file names of saved SPSS data editor files will have the extension ".sav".

Output Viewer: (Slide 5)

When a procedure is run, the results are displayed in a window called the Output Viewer. In this window the output can be easily navigated. The output can be manipulated and a document created that contains precisely the output that is required, arranged and formatted appropriately. The file names of saved SPSS Output Viewer files will have the extension ".spv".

Syntax Editor: (Slide 6)

The Syntax Editor window is used to write, store, and run SPSS commands. Syntax editor is simply a text file that contains commands. While it is possible to open a syntax window and type in commands, it is often easier to build syntax file using one of the following methods:

- Pasting command syntax from dialog boxes
- Copying syntax from the output log
- Copying syntax from the journal file

Syntax Editor allows the user to edit existing syntax in the file and to create new syntax. The file names of saved SPSS syntax files will have the extension ".sps".

Slides 7–17: Starting SPSS (Data and Variable View)

Slide 7: Data Editor is the default window when you first open SPSS. You can also open a blank Data Editor by going to **File** >> **New** >> **Data** in an open data file. There are two windows available in Data Editor—Data View and Variable View—both windows allow editing at any time.

Slide 8: The "Data View" sheet opens by default when you open Data Editor. This is where you will see all the data stored in columns by each variable. Every row represents a case and every column represents a variable.

Slide 9: To open "Variable View" click on the tab. Each rows represents a variable and each column defines variable properties. There are 11 attributes that can be assigned for a particular variable. Only seven of them are relevant to our analysis purposes: Name, Type, Width, Decimals, Label, Values, and Missing. The IBM SPSS guide provides additional information on the other variable attributes (Measure, Column, Align, Role).

Slide 10: Variable name: Each of the cells in the column "Name" represents a variable name. Insert variable names in cells of the name column in the desired order of the variables. The first character of the variable name must be alphabetic (exceptions are the characters @,#, $). Variable names must be unique, less than 64 characters, and with no spaces. Reserved keywords cannot be used as variable names. Reserved keywords are ALL, AND, BY, EQ, GE, GT, LE, LT, NE, NOT, OR, TO, WITH.

Slide 11: Variable type: Cells in the the column "Type" represent the variable types. There are nine variable types that can be selected from the list by clicking on a cell in the type column. Numeric, string, and date are three common variable types used in SPSS.

Slide 12: Width: Width allows the user to determine the number of characters SPSS will allow to be entered for the variable. The width for the column of a particular variable can be set in this column. By default the column width is 8.

Slide 13: Decimals: Decimals are allowed in SPSS only for the numeric variables. Each cell of this column determines the number of decimals allowed for a particular numeric variable. It could be zero for all variables other than continuous variables. The number of decimal points have to be less than or equal to 16.

Slide 14: Label: Variable labels provide space for a longer description than is allowed by "variable name." Variable names do not allow spaces and certain characters. They are kept short to faciliate coding efficiency. Variable labels, however, allow for full details of the variable, often in the form of the question on the survey. This helps the user clarify the details of the variable and link it to the questionnaire. Variable labels can be up to 256 characters.

Slides 15: Values: Value labels give more description than the integer values of a variable and can make it more user-friendly. It provides a method for mapping variable values to a descriptive label. In the case of this example, there are five allowed values for the marital status variable “q20”. A value of 1 means that the subject is single, and a value of 2 means that he or she has been married 2 years or less, a value of 3 means he or she has been married more than two years, etc. Variable labels allows the descriptions to be linked to the corresponding numeric value. These labels are used in output to identify different values of the variable.

Slide 16: Missing: Missing values are values identified as representing missing data. Missing Values defines specified data values as user-missing. It is often useful to know why information is missing. For example, it might need to distinguish between data missing because a respondent refused to answer and data missing because the question didn’t apply to that respondent (e.g., 98 for “Do not know” and 99 for “Not applicable”). This column allows the user to flag data for special conditions, such as exclusion from the analysis for that variable. Missing values can be assigned in the “Missing Values” box that can be obtained by clicking on a cell in the “Missing” column.

Exercise 3.1.2: Creating Variables and Data Entry in SPSS (Slides 20–22)

Exercise 3.1.2 provides hands-on SPSS practice,creating variables and entering mock data, as covered in this lesson. Before the exercise, provide participants with a hard copy of **Instructions for Exercise 3.1.2: Creating Variables and Data Entry in SPSS**.

Summary of Key Concepts

- Three of the SPSS windows are most relevant to our analyses: Data Editor, Syntax Editor, and Ouput Viewer. They each have a distinct file extention.
- In SPSS, database variable properties and specifications are defined in the “Variable View” window and variable values can be entered in the “Data View” window.
- Both Data and Variable View windows allow editing at any time.

Instructions for Exercise 3.1.2: Creating Variables and Data Entry in SPSS

Open a new SPSS data editor

Create an "ID" variable with width of 8

Create a **string** variable "name" with width of 20 where you can enter the name of the respondents.

Create a variable "sex" with variable value labels of 1 for "male" and 2 for "female"

Create a variable "age" to enter the age of a respondents in years

Create a variable "exp_food" to enter household monthly expenditure for "food"

Create a variable "exp_treat" to enter household monthly expenditures for "treatment"

Create a variable "exp_others" to enter household monthly expenditure for "food"

Create a variable "exp_total" to enter dtotal household monthly expenditure

Create a variable "status" to rank the household (HH): 1 = "rich" if HH expenditure is US$>5,000; 2 = "medium" if HH expenditure is US$3000 to 5000; and 3 = "poor" if HH expenditure is US$<3000

Create a variable "incom_cat" as household income category where categories are professional=1, skilled worker=2, day labor=3, agriculture=4, farming=5, business=6, others=7

Create variable labels and value labels for each variable in the database. Assign user-missing values

Enter data for 20 respondents in your database

Save the SPSS file as "Creating variables and data entry.sav"

Lesson 3.1.3: Importing, Exporting, Merging, and Restructuring Data in SPSS

This lesson introduces step-by-step guidance on basic data management systems in SPSS and database connectivity to other databases.

The estimated duration for this lesion, including exercises, is **2 hours**.

Learning Objectives

Following Lesson 3.1.3 participants will be able to:

- Import other types of data files (Excel, dBase, etc.) into an SPSS database
- Export SPSS data files into other databases
- Merge two SPSS data files
- Restructure a SPSS data file – long to wide, wide to long, or transpose entire data matrix

Companion Materials

The PowerPoint presentation **3.1.3 Importing, Exporting, Merging, and Restructuring Data in SPSS** accompanies this lesson as a separate file.

Print copies of the following handouts for each participant:

- **Instructions for Exercise 3.1.3a: Import and Export Data Files**
- **Instructions for Exercise 3.1.3b: Data Merging**
- **Instructions for Exercise 3.1.3c: Restructuring Data Files and Review of Exporting**

The following data sets are provided as separate files:

- Excel files: **1.3 wide_long.xls** and **1.3_long_wide.xls**
- SPSS files: **merge_1.sav** and **merge_2.sav**

Slides

Slide 1: Title Slide: Import, Export, Merge and Restructuring in SPSS

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slides 2–6: Importing data from common database files

This set of slides walks participants through the process of importing data to SPSS, step-by-step.

Most of the common database files can be imported to SPSS directly using the file open option in the file menu. Data files come in a wide variety of formats, and SPSS software is designed to handle many of them, including:

- Spreadsheets created with Lotus 1-2-3 and Excel
- Database files created with dBASE and various SQL formats
- Tab-delimited and other types of ASCII text files
- Data files in SPSS format created on other operating systems
- SYSTAT data files
- SAS data files

Slide 7: Exporting Data to Excel/CSV/dbase

SPSS data files can be exported to other data file formats using simply the "Save as" or "Export to database" options in the file menu. SPSS data file can be exported to the following data formats using the "Save as" option:

- Spreadsheets created with Lotus 1-2-3 and Excel
- Database files created with dBASE and various SQL formats
- Tab-delimited and other types of ASCII text files
- Data files in SPSS format created on other operating systems
- SYSTAT data files
- SAS data files

"Export to database" option is another way to export SPSS dataset into other database system using a wizard. The Export to Database Wizard helps to export data from the active SPSS statistics dataset to a database. But this sometimes complicated. An Open Database Connectivity (ODBC) need to be established before going start using this process. Make sure that the two drives - SPSS Data Access Pack and Microsoft Data Access Pack are installed to use the Export to Database Wizard.

Slide 8: Introduction to Exercise 3.1.3a

If you have not already distributed the paper handout with Exercise 3.1.3a instructions, do so now.

Slide 9: Exercise 3.1.3a Import and Export Data Files

Ask the group to follow the instructions on the screen. Give them 10–15 minutes to perform the following tasks. Afterwards, project your laptop and work through the same tasks, answering questions as they arise.

- You have two Excel data files: “3.1.3 wide_long.xls” and “3.1.3_long_wide.xls”
- Import the two data files into SPSS and save them as “wide_long.sav” and “long_wide.sav”
- Export “wide_long.sav” and “long_wide.sav” to Excel as “wide_long_excel.xls” and “long_wide_excel.xls”

Slides 10–17: Merging Two Data Files in SPSS

This set of slides walks participants through the process of merging SPSS files, step-by-step.

Two SPSS data files can be merged in one data file if a unique identification variable exists in both of the file. In case of large data record, sometimes, different modules are entered by different data entry clerk creating a unique identifier variable for every modules. The modules are then merged into one data file. Another example, in an Excel file, modules can be entered in different tabs of the excel worksheet. Every worksheet of the Excel data tabs are converted to SPSS in separate data files and then can be merged into one SPSS data file. Two SPSS data files can be merged in two different ways that are:

- Merge files containing the same variables but different cases.
- Merge files containing the same cases but different variables.

Add Cases merges the working data file with a second data file that contains the same variables but different cases. For example, recording the same information for commodity distribution and endues monitoring in two different commodity distribution points and maintain the data for each distribution points in separate files. In this case, variables are same but cases are different. Now the central commodity management team needs a single data file for all cases from different distribution points. Individual distribution data point data files then merged into one data file by using the command in SPSS: Data >> Merged files >> Add cases.

Add Variables merges the working data file with an external data file that contains the same cases but different variables. For example, it might need to merge a data file that contains household socio-economic data with one that contains household diet diversity and health and nutrition related information for the same households. In this case, households (cases) are same but variables are different in two data files. Both of the files have an ID variable of unique household identification numbers. Hence, the two data files can be merged using the SPSS command: Data >> Merged files >> Add variables with following instances:

- Cases (household ID) must be sorted in the same order in both data files.
- If one or more key variables are used to match cases, the two data files must be sorted by ascending order of the key variable(s).
- Variable names in the second data file that duplicate variable names in the working data file are excluded by default because Add Variables assumes that these variables contain duplicate information.

Slide 18: Introduction to Exercise 3.1.3b Data Merging

If you have not already distributed the paper handout with Exercise 3.1.3b instructions, do so now.

Slide 19: Exercise 3.1.3b Data Merging

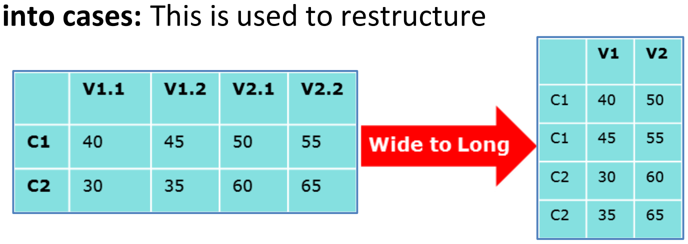
Ask the group to follow the instructions on the screen. Give them 10–15 minutes to perform the following tasks. Afterwards, project your laptop and work through the same tasks, answering questions as they arise.

- You have two data files "merge_1.sav" and "merge_2.sav" on your USB drive
- Sort both of the data files based on "ID"
- Merge the two data files and save as "merged.sav"

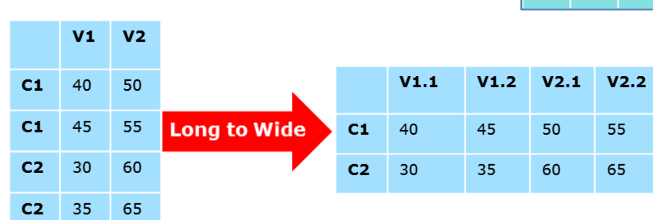
Slides 20–35: Data restructuring in SPSS

Restructuring an SPSS data file is a process that helps to reorganize data from multiple variables (columns) in a single case to groups of related cases (rows) vice versa, or transpose the entire data matrix. There are three forms of restructuring in SPSS:

1. **Restructure selected variables into cases:** This is used to restructure current dataset where each case has some variables that we would like to rearrange into groups of related cases in the new dataset.



2. **Restructure selected cases into variables:** This is used to restructure current dataset where groups of related cases that we would like to



rearrange so that data from each group are represented as a single case in the new dataset.

3. **Transpose all data:** This is used to restructure current dataset where all cases will become variables and selected variables will become cases in new dataset.

In SPSS, the command: Data >> Restructure is used for data restructuring.

Slide 36: Introduction to Exercise 3.1.3c Restructuring a SPSS Data File

If you have not already distributed the paper handout with Exercise 3.1.3c instructions, do so now.

Slide 37: Exercise 3.1.3c Restructuring a SPSS Data File

Ask the group to follow the instructions on the screen. Give them 10–15 minutes to perform the following tasks. Afterwards, project your laptop and work through the same tasks, answering questions as they arise.

- You have two Excel data files: “wide_long.xls” and “long_wide.xls”
- Import the two data files into SPSS and save them as “wide_long.sav” and “long_wide.sav”
- Restructure the data file “wide_long.sav” from wide to long and save as “wide_long_restructure.sav”
- Restructure the data file “long_wide.sav” from long to wide and save as “long_wide_restructure.sav”
- Export “wide_long_restructure.sav” and “long_wide_restructure.sav” to Excel as “wide_long_restructure_excel.xls” and “long_wide_restructure_excel.xls”

Summary of Key Concepts

- SPSS data export and import is possible with most of the common analysis data formats, such as, Excel worksheet, dBase, ASCII text, STATA, SAS etc. by using the “Save as” and “Open” command in the File menu.

- Two SPSS data files can be merged into one data file for both adding cases and variables if the two files have a unique ID variable.

- Cases to variables (wide-to-long), variables to cases (long-to-wide) and transpose (cases to variable and variable to case) are the three data restructuring processes in SPSS.

Instructions for Exercise 3.1.3a: Import and Export Data Files

There are two Excel data files you will work with: "3.1.3 wide_long.xls" and "3.1.3_long_wide.xls"

Import the two data files into SPSS and save them as "wide_long.sav" and "long_wide.sav"

Export "wide_long.sav" and "long_wide.sav" to Excel as "wide_long_excel.xls" and "long_wide_excel.xls"

Instructions for Exercise 3.1.3b: Data Merging

There are two data files "merge_1.sav" and "merge_2.sav" on your USB drive

Sort both of the data files in ascending order based on "ID"

Merge the two data files and save as "merged.sav"

Instructions for Exercise 3.1.3c: Restructing Data Files and Review of Exporting

Open the SPSS files you created in the Import/Export exercise "wide_long.sav" and "long_wide.sav"

Restructure the data file "wide_long.sav" wide to long and save as "wide_long_restructure.sav"

Restructure the data file "long_wide.sav" long to wide and save as "long_wide_restructure.sav"

Export "wide_long_restructure.sav" and "long_wide_restructure.sav" to Excel as "wide_long_restructure_excel.xls" and "long_wide_restructure_excel.xls"

Module 3: Statistical Concepts and Data Analysis Session 2

Lesson 3.2.1: An Introduction to SPSS Syntax

This lesson introduces the use of syntax for SPSS data management, manipulation, editing, and analysis. This offers a basic idea of how to create SPSS syntax by writing simple programs and using menus.

The estimated duration for this lesson is **35 minutes for the lecture** and **60 minutes for the exercise**.

Facilitator's note: All **red bolded and shaded text** in the presentation and the guide denotes either a menu or syntax command.

Learning Objectives

Following Lesson 3.2.1 participants will be able to:

- Explain the basics of SPSS syntax
- Identify basic rules used to write syntax commands
- Compute simple frequencies using the SPPS menu and by manually writing syntax in the SPSS Syntax Editor window
- Compare the differences between writing syntax using menu functions and writing syntax manually
- Recognize several useful syntax for development analyses

Companion Materials

The PowerPoint presentation **3.2.1 An Introduction to SPSS Syntax** accompanies this lesson.

During this lesson, the facilitator will demonstrate how to use SPSS syntax. Participants may follow along using the SPSS data set **Session2_practice_dataset.sav**.

Slides

Slide 1: Title slide "Introduction to SPSS Syntax"

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: What is SPSS syntax?

Syntax is an easy and powerful SPSS program language where a user does not need to be an advanced programmer. It utilizes simple logic and some specific words to run SPSS data files. Saving a syntax file allows you or anyone else to repeat the same analysis at a later date. Many commands are accessible from SPSS menus and dialog boxes, however, manually writing command syntax provides some functionality not found in the menus and dialog boxes.

While it is possible to open a syntax window and type in commands, it is often easier to build syntax file using one of the following methods:

- Pasting command syntax from dialog boxes
- Copying syntax from the output log
- Copying syntax from the journal file

Slide 3: SPSS syntax rules

There are simple rules that should be kept in mind when editing and writing command syntax, including:

- Each command must begin on a new line and end with a period.
- Most subcommands are separated by slashes (**/**). The slash before the first subcommand on a command is usually optional.
- Variable names must be an exact match to what is in the dataset.
- Text included within apostrophes or quotation marks must be contained on a single line.
- Each command syntax cannot exceed 80 characters.
- A period (**.**) must be used to indicate decimals, regardless of your Windows regional settings.
- Variable names ending in a period (**.**) can cause errors in commands created by the dialog box.

Slide 4: Creating a SPSS syntax file

Facilitator's note: The following slides (4–13) are animated so that a corresponding screenshot from SPSS appears as the facilitator talks through the steps in the slide. At the discretion of the facilitator, there are two alternatives that can be used to encourage participation as part of this lesson. The first is to encourage participants to emulate the steps on their own laptops as the facilitator talks through the examples in the slides. The second is to have the facilitator present the slides, talking through the steps, and then afterwards project the facilitator's laptop and actually run through the steps at which point the participants are encouraged to follow along emulating on their own laptops. In either case, by actually completing the steps on their own laptops, this will help familiarize participants with the program and orient them to the layout of the syntax window. Have participants follow the instructions on each slide:

- Open data file, "Session2_practice_dataset.sav"
- Click on **File** menu → **New** → **Syntax**
- Blank SPSS Syntax Editor will appear
- There are two part of the syntax window – Command Pane and Syntax Writing Page
- If you write syntax in the right side, the name of the command will show in the command pane
- Save the syntax file as "Practice Syntax.sps"

Slides 5–8: Creating and running syntax using menu, frequency table

Facilitator's note: There are two ways of writing syntax: using the menu functions or writing it manually. In this first set of slides participants will learn step-by-step how to create and run syntax using the menu to produce frequency tables. Participants should follow along with the facilitator as he/she demonstrates using SPSS with the data file "Session2_Practice_dataset and the SPSS syntax file "Practice Syntax.sps". Instructions are listed in the presentation and in this guide, as follows.

- Use the syntax file "Practice Syntax.sps" that you just created.
- To get a frequency table of the variable "district" using the SPSS menu: Click on Analyze >> Descriptive Statistics >> Frequencies.
- Select "district" variable and keep in the "Variable (s)" box.
- After adding the "district" variable in box the "Paste" button in bottom will be activated and then click on the "Paste" button.
- Syntax will be pasted in the Syntax Editor.
- "**FREQUENCIES**" indicates the command.
- "**district**" indicates the variable name.
- " **/** " indicates continuation of previous line.
- " **.** " indicates end of the command.
- Select the Syntax and click on  button in the menu to run the syntax.
- Create a frequency table by running the syntax.

Syntax:

```
DATASET ACTIVATE DataSet1
FREQUENCIES VARIABLES=district
  /ORDER=ANALYSIS.
```

If you want to get mean, median, and mode with the Frequency table:

- Click on "**Statistics**" in the "**Frequency**" box
- Select "**Mean**", "**Median**" and "**Mode**" from the "**Frequencies: Statistics**" Window
- Click on "**Continue**"
- Click on "**Paste**" button
- Syntax editor will appear with a new set of syntax
- In the syntax one additional line to get the selected statistics
- Select the new set of Syntax and click on the Run button ( ) in the menu to run the syntax
- After clicking the Run button ( ) the output viewer will appear
- The same frequency table will be obtained
- The selected statistics – Mean, Median and Mode are appeared In the table "**Statistics**"

Syntax:

```
FREQUENCIES VARIABLES=district
 /STATISTICS=MEAN MEDIAN MODE
 /ORDER=ANALYSIS.
```

Slide 10: Writing and running syntax

Sometimes it is easier to manually write syntax in the editor than to build it from the menu and dialog boxes. For example, to get the same frequency table for the variable "district":

- Just write "**freq district.**"
- Run the syntax by clicking the button and you will get the same frequency table
- If want to include any statistics just add one more line "**/statistics = mean median mode.** "
- Run the syntax by clicking the button and get the output with Mean, Median and Mode
- You can copy the syntax and get a frequency table for any other variable just changing the variable name

Slides 11–13: Syntax crosstabs using the menu

If we want to create a crosstab with variable "m1.5" in row and "cluster" in column:

- Go to **Analyze** → **Descriptive** → **Crosstabs**
- Select variable "**m1.5**" and keep in "**Row**" box and "**cluster**" in the "**Column**" box
- Click on the **Paste** button and run ( )the syntax
- Output will show the cell counts

To get row and column percent:

- Go to **Analyze** → **Descriptive** → **Crosstabs**
- Click on **Cells**
- Select **Row** → **Select Column** → **Continue**
- Click on **Paste** and Run () the syntax
- Output table will appear with row and column percentages

To do chi-square test:

- Go to **Analyze** → **Descriptive** → **Crosstabs**
- Click on "**Statistics**"
- Select "**Chi-Square**" → **Continue**
- Click on "**Paste**" and run () the syntax
- Output viewer will appear with another table for **chi-square test**

Slides 13–16: Some useful SPSS syntax

Facilitator's note: The next set of slides covers commonly used syntax.

Variable label:

For example, if we wanted to change the variable label from "id" to "Unique Identification Number", use the following syntax:

Single Quotation

Syntax:

```
var label id 'Unique Identification Number'.
```

"**Var**" means variable "**label**" means we want to label variable

"**id**" the variable we want to label

We want to label this for the variable "**id**"

Full stop to end the command

Variable Value Label:

For example, if we wanted to use the variable "cluster" to label the variable value 1 as "South, 2 as North", and 3 as "West", use the following syntax:

Syntax:

Single Quotation

var label cluster 1 'South' 2 'North' 3 'West'.

"**var label**" means we want to label the values for a variable

Full stop to end the command

The value **1** of variable "cluster" will be labeled as "**South**"

"**cluster** is the variable with values to be labeled

The value **2** of variable "cluster" will be labeled as "**North**"

The value **3** of variable "cluster" will be labeled as "**West**"

Screen 16: Recode:

- The variable "e1.2" is the average monthly HH food expenditure in local currency, we want to recode the values of this variable into three categories, "Lowest", "Medium", and "Highest", and rename the categorized set of values as new variable "food_exp".

- We need to write two syntax sentences – one to recode the values and rename the variable and the other to label the recoded value.

  recode e1.2 (lowest thru 50000=1) (50001 thru 200000=2) (200001 thru highest=3) into food_exp.

  value label food_exp 1 'Lowest' 2 'Medium' 3 'Highest

Facilitator's note: Refer to screen shot for detailed explanation of syntax.

Screen 17: Compute:

For example, for the variables from e1.1 to e1.9, there are 9 categories of HH average monthly expenditures. We want to compute a new variable "month_exp" which will be the total average monthly HH expenditure.

```
compute month_exp = sum(e1.1,e1.2,e1.3,e1.4,e1.5,e1.6,e1.7,e1.8,e1.9).
execute.
```

Facilitator's note: Refer to screen shot for detailed explanation of syntax.

Slide 17: Syntax in the SPSS syntax editor

Facilitator's note: This slide displays what the syntax in the previous example looks like in the SPSS Syntax Editor.

Slide 18: Advantages of Syntax Files

Syntax works with all versions of SPSS, not just with SPSS for Windows. Well-documented syntax files form a valuable record. They allow others to understand the exact processes and steps that contributed to your analysis.

There are some advantages of manually writing syntax as opposed to using the point-and-click method. These include:

- Writing syntax commands is often quicker and less cumbersome compared to using a complicated sequence of mouse clicks. There is a wider range of analysis options than offered by the point-and-click menu
- Once you've written a set of commands once, it is very easy to repeat them, either during the same session, or at a later time from the saved contents of the Syntax Editor.

Summary of Key Concepts

- Documenting your analysis steps is a critical element of data management and recordkeeping. Syntax files are the means of saving these valuable records.
- Syntax commands can be created using menu or dialog boxes and pasting the command into Syntax Editor or can be written manually directly in the Syntax Editor. Both methods were demonstrated in this lesson.
- Syntax for SPSS is especially useful for data management, manipulation, editing, and analysis; commands reviewed in this lesson include making frequency tables, relabeling and recoding variables, simple statistics using chi2, computing the sum of a set of variables.

Lesson 3.2.2: Introduction to Data Management

This lesson introduces the use of data management for monitoring and evaluation and provides a framework for participants to think about how data is collected, recorded, collated, analyzed and disseminated within their projects.

The estimated duration for this lesson is **20 minutes**.

Learning Objectives

Following Lesson 3.2.2 participants will be able to:

- Explain data management as it pertains to the data life cycle or journey
- Identify key elements of developing a data management plan

Companion Materials

The PowerPoint presentation **3.2.2 An Introduction to Data Management** accompanies this lesson.

Slides

Slide 1: Title slide "Introduction to Data Management"

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: What is data management?

Data management is a critical aspect of project monitoring and evaluation. Developing a data management plan is particularly important for coordinating the use of data given the long path that data typically travels along the **data life cycle**. Data life cycle, for our purposes, refers to the journey data takes from the time of when it is conceptualized in the design stage of a project to when it is used.

Slide 3: Immediate thoughts on data management

When think about project data, many questions come to mind, such as:

- What information do we need for this Project?
- How will we collect the data?
- How will we use this information?
- Where will get the money for this?

Slides 4–5: Data journey

As mentioned before, the data life cycle is the journey data takes from when it is conceptualized to when it is used. The earliest stages of data are in the design phase of a project, where they are used to help develop the log frame and design the M&E matrix. From there, data are collected using data tools, are collated and entered into a data base. Data are then analyzed and further synthesized in order to present or communicate finding to internal and external stakeholders. Data, at this stage, are transformed to information and knowledge that can be used to reach conclusion and/or make informed decisions.

Slide 5: To prepare the journey for your data, key questions need to be addressed for data to be used more effectively. These questions fall under tasks undertaken during the data journey, ranging from determining sample section to providing feedback and disseminating information from the data collected and analyzed.

Task	Key Questions to Answer
Sample selection	Is it necessary to draw a sample? If yes, how do we ensure it's a representative sample? Think of sample size, sampling frame, sample selection approach.
Data collection	What method will be used? Interview, observation, measurement, key informant or group discussion? Important: Pre-test, do spot checks
Data recording	Who will use what formats to write, visualize, photograph or video record data? Carefully select the interviewers and facilitators, train them thoroughly.
Data storage	Where will data be stored, how and by whom? Who will have access to the data? (lock and key/password). How often will you do data back up?
Data collation	Who will use what methods to group data into logically ordered overview? Aggregation when done well can greatly aid data analysis
Data analysis	Who will examine the data using what method to give them meaning and synthesize them into a coherent explanation of what happened and what needs to now be undertaken?
Information feedback and dissemination	At what stages and using what means will information be shared with project and partner staff, primary stakeholders, steering committees and funding agencies?

Slide 6: Why data management?

You may be asking yourself, "Why is data management so important?" For starters, it increases the use of your data, saves time, increases efficiency, and simplifies your life. It is also a way to perverse and document your data so that may be used in future analysis. Donors, likewise, require projects to manage their data so that it is accessible and provide insight into the project's progress.

Slide 7: Data management plan

When developing a data management plan, it is necessary to consider these questions:

- What type of data will be produced? (routine monitoring/ annual survey/ baseline – endline)
- How often new data to be added?
- Is there a data protocols and codebook?
- Who will use it?
- Who can access data?
- Who controls data?
- How long should it be retained? (project life? beyond?)
- Which tools or software needed to create/ process/visualize the data?

Slide 8: Data management checklist

A data management checklist can help identify what to put in place for good data practices and which actions to take to optimize data sharing. Included in this checklist are these key questions:

- What file formats to be used?
- Any special privacy or security requirements?
- Any sharing requirements?
- Any other donor requirements?
- What directory and file naming convention will be used?
- What project and data identifiers will be assigned?
- Is there a storage and backup strategy?
- Who is responsible for data management?

Summary of Key Concepts

- Understanding the journey data will take is vital to management the data both efficiently and effectively. The journey begins at the time the log frame and M&E

matrix is designed. From there, it is collected, recorded, stored, collated, and analyzed. The data is then presented in a format that allows stakeholders to draw conclusions and make future decisions.

- Data management is important because not only is it a requirement of donors, but can increase the use of your data, save you time, and is a way to document your progress.
- Consider many key questions when developing a data management plan that will help optimize how the data is collected, produced, and analyzed. Likewise, having a data management checklist ensures that data is appropriately being disseminated and shared.

Lesson 3.2.3: Manipulating SPSS Variables

This lesson demonstrates how to manipulate variables in SPSS using the menu functions.

The estimated duration for this lesson is **30 minutes for the lecture** and **45–60 minutes for the exercise**.

Facilitator's note: All **red bolded and shaded text** in the presentation and the guide denotes that it is either a menu or syntax command.

Learning Objectives

Following Lesson 3.2.3 participants will be able to:

- Give examples of when and why new variables may be needed
- Create a new variable in SPSS
- Categorize a continuous variable in SPSS
- Recode a variable in SPSS

Companion Materials

The PowerPoint presentation **3.2.3 Manipulation of Variables** accompanies this lesson as a separate file.

During this lesson, the facilitator will demonstrate for participants how to use syntax in SPSS. Participants may follow along using the data set **Practice Dataset2.sav**.

Slides

Slide 1: Title slide "Manipulation of Variables"

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2–3: Defining new variables

There are several reasons why we would want to define new variables and occasions when it is needed; for example:

- Categorizing continuous variables
- Re-categorizing categorical or ordinal variables
- Changing variables on continuous variables
- Performing mathematical function on existing variables to calculate new variables.

The primary goal of defining new variables will be to extract information from the data in a revised or refined format that will allow users to analyze indicators. But beforehand, it is good practice to label new variables in a way that indicates which variables were added to the analysis (i.e.,"age groups" for "age_group").

Slide 4–5: Categorizing a continuous variable

For convenience and descriptive purposes, it is sometimes necessary to present data in a categorized form.

For example, we may want to know:

- What is the mean age of married women?
- What percentage of girls below the age of 18 who are married?

It is important to emphasize that either of these statistics can be determined by collecting these data as a quantitative variable.

If-then statements:

If-then statements are a key element in a programmer's toolbox, the general pattern used is pattern used is:

- Define [New Variable]
- IF [existing variable] {1st condition} THEN [1st Value of New Variable]
- IF [existing variable] {2nd condition} THEN [2nd Value of New Variable]

For example:

- Define age_group
- If (AGE >= 0) and (AGE < 18) then age_group = 1
- If (AGE >= 18) then age_group = 2

Slide 6–7: Creating a new categorical variable

Facilitator's note: The facilitator will demonstrate how to categorize a quantitative variable (using the example posed in the previous slide) through menu functions in SPSS.

Instruction to participants:

- Open dataset, "Practice Dataset2.sav".
- Click on **Transform** → **Compute**
- Name the new variable as "age_group" in **Target Variable** window
- Insert the value in **Numeric Expression** window

- Click on **If** to create the condition.
- To define the condition, highlight the age variable and move it to the right-hand side box.
- Set up the condition ("age >=0 &age <18")

Slides 8–10: Re-categorizing or recoding a variable

Facilitator's note: In this set of slides, the facilitator demonstrates how to re-categorize or recode a variable.

Instruction to participants:

- Click on **Transform** → **Recode** → **Into Same Variable**
- Highlight the variable you want to recode ("age_group") and move it to the right-hand side box.
- Click on **If** to set up the condition.
- Set us the condition using the variable using "Age" and click on **Continue**.
- Click on **Old and New Values** button to recode the variable.
- Insert the "old value" and the "new value".
- Click on **Add**.
- Click on **Continue**.

Slide 11: Creating a new variable

Facilitator's note: The facilitator demonstrates how to create a new variable.

- Create a new variable called "Individual" that has a value of 1.
- Create a variable label, and value label for age_group.

Slide 12–14: Computing a new variable

Facilitator's note: The facilitator will demonstrate how to compute a new variable.

We can compute a new variable from an existing variable. In this demonstration, let's add a number of variables to create a new variable. There are two ways to do this:

- Click **Transform** → **Compute**.
- Insert name of your new variable in the top left window.
- Bring variables that you want to add to the right window. Add them with a "+" sign.

Note: This approach will not work if you have missing values. If you are adding variables with missing values, use the "Statistical Sum" function.

- Click **Transform** → **Compute**.
- Insert name of your new variable in the top left window.
- Click **Statistical** in "Function Group".
- Double click **Sum** in "Functions and Special Values".
- Notice that the sum is copied in to the "Numeric Expressions" window.
- Bring the variables that you want to add within the parenthesis and separate them with a comma.
- Click **Ok**.

Exercise 3.2.3: Manipulation of Variables

Objective: Use SPSS to create a new variable

Time needed: 45–60 minutes

Materials: SPSS data set on USB drive **3.2.3_exercise_Dataset**

Instructions: Open the SPSS data file **3.2.3_Exercise_Dataset**. The exercise can be conducted individually or in small groups at the discretion of the facilitator. If the general level of SPSS experience among participants is low, small groups are preferred, allowing the participants to self-organize with at least one person who is comfortable with SPSS, per group. The exercise is split into discrete tasks on a PowerPoint slide (slide 16) – the facilitator should give the groups time (20 minutes) to run through all the tasks, walking around the room and helping groups on an individual basis as necessary. At the end of the predetermined time, the facilitator can project his/her laptop screen and show the collective group how to perform all the tasks and answer any questions.

Exercise tasks: Display slide 23, ask the group to open the file **3.2.3_Exercise_Dataset** and give them 20 minutes to perform the following tasks. Afterwards, project your laptop and work through the tasks answering any questions the participants may have.

- Open the SPSS data file **3.2.3_Exercise_Dataset**.
- Categorize "age" variable to "age_group" where <30 years old are categorized as "1", 30-40 year categorized as "2" and 40+ year categorized as "3"

- Recode the “income_cat” variable to new values of 1=1, 2&3=2, 4&5=3, 6=6 and 7=7 and change the value labels to reflect the recode.
- Compute three new expenditure variables by changing units from $USD to local currency.
  - “exp_food to exp_food1”
  - “exp_treat to exp_treat1”
  - “exp_others to exp_others1”
- Compute a new variable by summing “exp_food1”, “exp_treat1” and “exp_others1”

Summary of Key Concepts

- There are several reasons to define new variables and occasions when it is needed including when categorizing continuous variables, re-categorizing categorical or ordinal variables, changing variables on continuous variables, and performing mathematical functions on existing variables to calculate new variables.
- The primary goal of defining new variables will be to extract information from the data in a revised or refined format that will allow users to analyze indicators.

Instructions for Exercise 3.2.3: Manipulation of Variables

Open the SPSS data file **3.2.3_Exercise_Dataset**.

Categorize "age" variable to "age_group" where <30 years old are categorized as "1", 30–40 year categorized as "2" and 40+ year categorized as "3"

Recode the "income_cat" variable to new values of 1=1, 2&3=2, 4&5=3, 6=6 and 7=7 and change the value labels to reflect the recode.

Compute three new expenditure variables by changing units from $USD to local currency.

- "exp_food to exp_food1"
- "exp_treat to exp_treat1"
- "exp_others to exp_others1"

Compute a new variable by summing "exp_food1", "exp_treat1" and "exp_others1"

Lesson 3.2.4: Manipulating SPSS Data Files

In this lesson, participants will learn how to manipulate data files including how to sort data, aggregate files, select cases, and split files.

The estimated duration of this lesson is **60 minutes**.

Facilitator's note: All **red bolded and shaded text** in the presentation and the guide denotes that it is either a menu or syntax command.

Learning Objectives

Following Lesson 3.2.4 participants will be able to:

- Sort data in an SPSS file
- Aggregate or collapse an SPSS file
- Select one part of the data set (specific cases) for further analysis
- Split SPSS data files into separate groups

Companion Materials

The PowerPoint presentation **3.2.4 Manipulating SPSS Data Files** accompanies this lesson as a separate file.

During this lesson, the facilitator will demonstrate for participants how to use syntax in SPSS; participants may follow along using the following data sets:

- **3.2.4_Merge1.sav**
- **3.2.4_Merge2.sav**
- **3.2.4_Dataset.sav**
- **3.2.4_Dataset2.sav**

Slides

Slide 1: Title slide "Manipulation of data files"

Facilitator's note: Title page with introduction of the presentation and facilitators.

Slide 2: Manipulation of data files

In this session we will learn how to:

- Sort data in a file
- Aggregate or collapse a file
- Select cases
- Split a file

Slides 3–5: Sorting data file

The records in a data file are sorted based on the values of one (or more) variable (s). Sorting is required before certain commands such as file merge can be run. Normally, data can be sorted by ascending or descending order. Sorting is useful to determine whether records have been entered more than once and to look for odd values when cleaning data.

One of the more common variables to sort a data file is by household id.

Facilitator's note: Demonstrate how to sort data by household id in SPSS using the datasets, "3.2.4_Merge1.sav" and "3.2.4_Merge2.sav". Participants are encouraged to follow along with SPSS. Note the "id" variable is labeled as "Unique Identification Number."

Sorting Data:

- Open data file "3.2.4_Merge1.sav" and click on **Data** → **Sort Case**.
- Highlight the variable for ID and move it to the **Sort by** box.
- Highlight the order of sorting.
- Click **OK**.
- Repeat the same procedure for "3.2.4_Merge2.sav"
- Now save the sorted files.
- The files will now be sorted by ID in ascending order.

Slides 6–8: Aggregating data

Facilitator's note: Demonstrate how to aggregate data in SPSS using the dataset, **3.2.4_Dataset2.sav**. Participants are encouraged to follow along with SPSS.

Aggregating Data:

Open the data file “3.2.4_Exercise_Dataset.sav” Notice there are more than one case for each “id”. Each case is a HH member. We want to create a household size variable (hh size) that contains all cases with the same HH id. Follow these steps.

- Click **Data** → **Aggregate**
- To aggregate variable “**hh_mem_n**” by “**id**”:
  - Highlight “**id**” and move it to the **Break Variable**
  - Select the variable “**hh_mem_n**” and move it to the **Summaries of Variables**
  - Click on **Name & Label** and write Name as “**hh_size**” and Label as “**Household Size**”
  - Click on **Continue**
- Now we need to tell SPSS how we want to aggregate the variable.
  - We can calculate mean, median, sum…
  - For “hh_size” we will add the individuals
  - Click **Function** → **Sum** → **Continue**
  - This will sum the values in “hh_mem_n” by “id”
  - Click on **OK**

Slides 8–10: Select cases

Facilitator’s note: Demonstrate how to select cases in SPSS using the dataset, “Practice Dataset2”. Participants are encouraged to follow along with SPSS.

Select Cases:

- Use the same data file used in the previous slide, under “Aggregated Data”
- Notice we still have multiple cases with same “**id**” – each for one HH member
- We want to keep only one case for each “**id**”
- We will use **Select Cases** to keep only the cases belong to the household head
- Code “1” in the variable “relation” indicates the HH head
- Click **Data** → **Select Cases**
- This window allows us to set up conditions to select cases
- Click **Data** → **Select Cases** → **If condition is selected** → **If**

- We want to select household heads. Select and bring the "relation" variable to the right box
- Then write "relation=1" in the right box and click on **Continue**
- We have two output options: We can delete the unselected cases or we can filter them
- Let us select **Filtered**
- Click on **OK**
- Sort the data file by ID and save it as "household_head_filtered.sav"

Notice that the HH Head filtered as "1" and row number is not crossed:

Slides 12–14: Split SPSS data file

Split File splits the data file into separate groups for analysis based on the values of one or more grouping variables. You can also select multiple grouping variables. Cases should be sorted by values of the grouping variables and in the same order that variables are listed in the Groups Based On list. This way you can compare different groups and sub-groups.

Split Files:

- Open data file **3.2.4_Exercise_Dataset2.sav**
- Click **Data** → **Split File**
- The "Split File" window will open up
- Select **Compare groups**
- Select the variable "cluster" that you want to use to group the variable and send it to the **Groups Based on** box by clicking the arrow
- Click **OK**
- After doing this every output will appear in the table grouped by the clusters (Cluster-1, Cluster-2, Cluster-3)

Average Monthly Expenditure for House rent by cluster

Cluster Code	N	Mean
Cluster-1	414	103176
Cluster-2	283	15070
Cluster-3	488	13625

- Now the data are grouped by the variable "cluster".

- When you are done, make sure to go back to the split file window to uncheck **Compare groups** and select **Analyze all cases, do not create groups**
- Run a Descriptive statistics of the variable expenditure "e1.1"

What do you see?

- The output table does not show grouped by cluster

Descriptive Statistics		
	N	Mean
Average Monthly Expenditure: House rent - Amount (sh)	1185	45256

- Select **Compare groups** if you wish to split the data file again

Slide 15: Summary

In this session, we have covered:

- Sorting data
- Aggregate (collapse) a file
- Split File
- Select Cases

Summary of Key Concepts

- A number of forms of data file manipulation are useful in analysis.
- Sorting data is necessary before merging data files and is helpful in data cleaning.
- Aggregating data allows you group single cases to create a new variable.
- The Select Cases function allows you select one part of the data set for further analysis
- And finally, the Split File function allows you to compute descriptive statistics for different groups and sub-groups.

Module 3: Statistical Concepts and Data Analysis Session 3

Lesson 3.3.1: Introduction to Measures of Central Tendency

This lesson introduces the three common measures of central tendency used as part of descriptive statistics: the mean, median, and mode. The calculation method for each measure is presented, compared and contrasted, followed by a discussion of when it is appropriate to use each respective measure.

The estimated duration of this module is **30 minutes**.

Learning Objectives

Following Lesson 3.3.1 participants will be able to:

- Summarize measures of central tendency: mean, median, mode
- Calculate the mean, median, and mode of a variable
- Assess which measure of central tendency will be most representative of the population being measured in a given situation

Companion Materials

The PowerPoint presentation **3.3.1 An Introduction to Measures of Central Tendency** accompanies this lesson as a separate file.

Slides

Slide 1: Title Slide: Measures of Central Tendency

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: Statistical process?

The statistical process follows a series of steps beginning with data collection, followed by data cleaning, and ending with data analysis. When conducting data analysis, a researcher is typically interested in generating:

- Inferential statistics
- Descriptive statistics: Measures of central tendency are an important, frequently used set of descriptive statistics used to describe data

Slide 3: Descriptive Statistics

Descriptive statistics are used to organize and describe the data that have been collected as part of a sample. Descriptive statistics can be used to determine:

- The underlying patterns existing in data – e.g., measures of central tendency, frequencies
- The "shape" of the data – e.g., measures of dispersion

Slide 4: Data properties

Data is typically described in terms of two general properties:

- Values related to central tendency
- The spread, or dispersion, around the central values

The three most common methods to describe the centrality of data are: mean, median, and mode which are described in detail in the following slides.

Slide 5: Central tendency

- Mean: is the arithmetic average of a set of values
- Median: is the "middle" value taken from a set of values
- Mode: is the most frequently occurring value of a set of values

It is possible that all three measures are equal; however, in practice this is rarely true. The three measures have different sensitivities to "outlier" values (i.e., extremely high values and/or extremely low values).

Ranking the measures with respect to their sensitivity to outliers:

1. Mean: is the most sensitive – extremely high or low values will shift the mean up or down in the general direction of the outliers
2. Median: less sensitive than the mean – just a few (or even one) extremely high or low value will not affect the median so much
3. Mode: not sensitive at all to just a few extremely high or low values

Differences in the calculated values of the three measures can provide clues to any "abnormalities" that might exist in the data. It is also important to recognize that when there are stark differences, particularly between the mean and median, it is important to gauge which measure is a more accurate representation of the central tendency of whatever data you are trying to analyze.

Slide 6: The mean

Mean is typically used interchangeably with the terms "average" and "arithmetic average." All reference the following calculation:

Example data, the age of 20 participants in a training session

28	29	43	27	31	25	26	35	38	27
34	35	30	29	27	45	36	32	31	65

The steps to calculate the mean:

1. Sum the values: adding the 20 values together = 673
2. Divide the sum in step 1. by the total number of values (in this case, 20 values): 673 / 20 = 33.65
3. The mean age of the training session participants = 33.65!

Slides 7–9: The median

Median is used interchangeably with the term "midpoint." As the midpoint of a set of values, 50% of the values will fall above the median, and 50% of the values fall below the median. The median is a fairly straight forward computation when there is an odd number of values (e.g., if there are 11 values, the median is the value that falls between the greatest five values and the lowest five values).

There is a general rule followed if the median is being calculated from an even number of values: take the average (mean!) of the *two* middle values (e.g., if there are 10 values, the median is the average of the 5th greatest value and the 6th greatest value – leaving 4 values higher and 4 values lower than the median).

Following is an example of how to calculate a median.

Using the data from the previous mean calculation example, find the ages of 20 training participants.

Step 1: Sort the numbers from the lowest to highest.

Step 2: Identify the middle values, in this case since there are an even number of values, we need to identify the two "middle-most" values.

Note: If there were only 19 participants, excluding the oldest aged 65, then the median value would fall between the highest 9 and lowest 9 values: 31; no need for additional steps.

Step 3 *(only necessary if calculating a median from an even number of values):* Take the average of the two middle values, in this case the 10th and 11th highest values. The median is the average of 31 and 31 = 31.

25	26	27	27	27	28	29	29	30	31	31	32	34	35	35	36	38	43	45	65

Below is an alternative example using the same data except excluding the oldest participant, aged 65; now there are only 19 (i.e., an odd number of) participants:

- Step 1: Sort the numbers from the lowest to highest.
- Step 2: Identify the middle value, in this case the median value would fall between the highest nine and lowest nine values: 31

25	26	27	27	27	28	29	29	30	31	31	32	34	35	35	36	38	43	45	65

Slides 10–12: Mean versus median

Slide 10: When there are observed differences between the mean and median (meaning they are very different), this gives us valuable clues about how the data might be shaped or of possible outlier values existing in the data.

Mean vs. Median example 1:

Seven farmers are asked to give the number of hectares of land they have farmed in the previous year. Their responses are:

1.5 3.0 2.5 1.0 2.5 2.0 4.0

To calculate the mean:

1. Sum the values: 16.5
2. Divide the sum by the total number of values (7): 16.5 / 7 = 2.36

To calculate the median:

1. Sort the values from lowest to highest

   1.0 1.5 2.0 2.5 2.5 3.0 4.0

2. Locate the middle value: 2.5

In this case, the mean and median values are very similar: 2.36 and 2.5, respectively. When the mean and median values are similar this suggests that the values are more tightly clustered around these central values, 2.36–2.5.

Slide 11: Let's look at another example that includes an outlier value:

In the new example the seventh farmer happens to be a rich landowner that has planted 25.0 hectares, a value much higher than the mean or median calculated in the previous example:

1.5 3.0 2.5 1.0 2.5 2.0 25.0

To calculate the mean:

1. Sum the values: 37.5
2. Divide the sum by the total number of values (7): 37.5 / 7 = $\boxed{5.36}$

To calculate the median:

1. Sort the values from lowest to highest

1.0 1.5 2.0 2.5 2.5 3.0 25.0

2. Locate the middle value: $\boxed{2.5}$

Slide 12: We can see that the addition of just one extreme value has shifted the mean much higher than it was without the extreme value: 5.36 vs. 2.36. However, the median remained unchanged at 2.5 despite the extreme value in this sample of farmers.

Once we've determined that the mean and median differ due to the extreme value of 25.0, we have to decide which value – the mean or median – is more representative of the sample we are trying to measure. Ask the group which measure (i.e., mean or median) they think is more representative in this case. As they respond you can give them relevant questions to consider:

- How likely is it that a farmer in the population could own that much arable land?
- Could the value of 25.0 be a recording error?
- Even if the value is correct, does the farmer with 25.0 hectares accurately represent the population we are trying to measure?
- Etc. …?

Slide 13: The mode

The mode is a common measure of central tendency; however, mode is perhaps used less frequently than the mean or median. The mode refers to the most frequent occurring value in a set of values.

Example, again using the ages of 20 training participants:

25	26	27	27	27	28	29	29	30	31	31	32	34	35	35	36	38	43	45	65

There are several values that occur more than once (e.g., 27, 29, 31, and 35); however, 27 occurs the most frequently, three times, and therefore it is the mode.

Slide 14: Mean versus median versus mode

In our three examples, we calculated the following values for our measures of central tendency:

- Mean: 33.65
- Median: 31.0
- Mode: 27.0

Facilitator's note: Pose the question: Which one is the most appropriate? Why?

Summary of Key Concepts

- The three principal measures of central tendency are the mean, median, and mode.
- The mean is the arithmetic average, the median is the midpoint, and the mode is the most frequently occurring of a set of values.
- The three different measures of central tendency have differing sensitivities to extreme values and/or the "shape" of the data. When the values of the measures differ, as they often do, it is at the discretion of the person conducting analysis to determine which value is the most representative of the population being measured.

Lesson 3.3.2: Introduction to Measures of Dispersion

This lesson gives an introduction to commonly used measures of dispersion used as part of descriptive statistics. The variance, standard deviation, and coefficient of variation measures are presented along with the steps necessary to calculate the measures, illustrated with examples.

The estimated duration for this lesson is **30 minutes**.

Learning Objectives

Following Lesson 3.3.2 participants will be able to:

- Understand how measures of dispersion aid an analysis
- Calculate standard deviation, variance, and coefficient variation
- Compare and contrast measures of dispersion to assess which is most appropriate for the analysis at hand

Companion Materials

The PowerPoint presentation **3.3.2 An Introduction to Measures of Dispersion** accompanies this lesson as a separate file.

Slides

Slide 1: Title Slide: Measures of Dispersion

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: What is a measure of dispersion?

Measures of dispersion are used to help understand the spread around the central points of tendency (e.g., mean, median, and mode) of a set of values. The measures explicitly quantify the variability in data being analyzed. The most commonly used measures of dispersion are the variance and the standard deviation, which is the square of the standard deviation.

Ask participants: why would one be interested in a measure of dispersion?

In the case there are limited ideas:

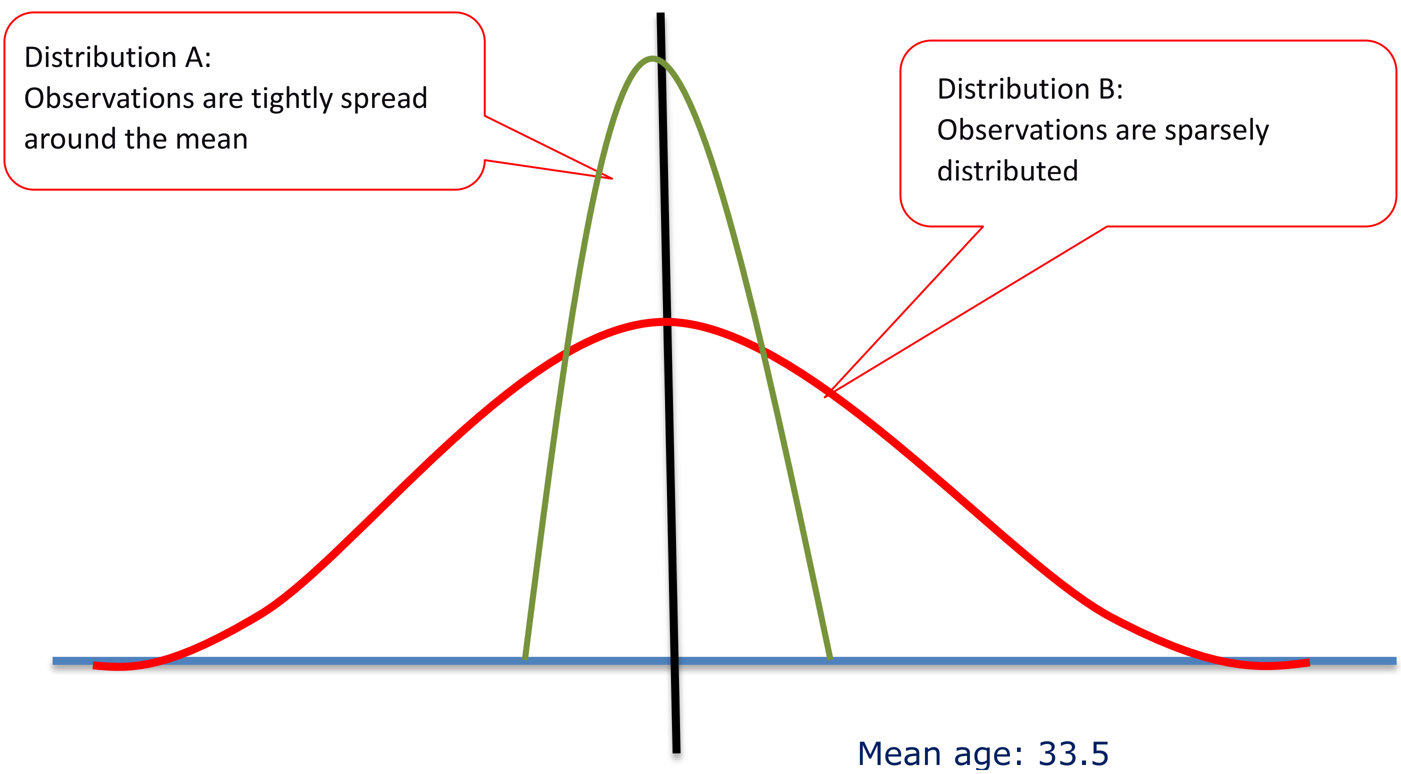
- Using income or expenditures as an example: the disparity of wealth is a common topic and is a measure of dispersion (i.e. dispersion measures can be an important stand-alone piece of information)
- Sometimes means of two different samples can be similar, but the variability around the means can be wildly different. Perhaps, give an example.

Slides 3–9: Variance and standard deviation

Variance and standard deviation are intimately related. (**Facilitator's note:** You can reiterate that the variance is the standard deviation squared, or vice versa, the standard deviation is the square root of the variance.) Both of the measures give an indication of how tightly a set of values one is analyzing is clustered around the mean.

A rough definition of the variance/standard deviation is the average amount by which observations/ values in a distribution differ from the mean ignoring the sign, or direction, of the difference (i.e., the variance and standard deviation are always positive, even if on balance the values tend to skew lower than the mean).

Slide 4: Example: Two distributions of age data



Steps to calculate the variance and standard deviation:

1. Calculate the mean.
2. Subtract the value of each data point from the mean.
3. Square each of the results from step 2.
4. Sum all the squared values calculated in step 3.
5. Divide the sum calculated in step 4 by the number of observations, minus 1 (n-1): **This gives the variance.**
6. Take the square root of the variance calculated in step 5: **This gives the standard deviation.**

Slide 6: Example standard deviation calculation:

Age	Mean	Deviation	Squared Deviation
25	34.33	-9.33	87.05
26	34.33	-8.33	69.39
35	34.33	0.67	0.45
38	34.33	3.67	13.47
27	34.33	-7.33	53.73
34	34.33	-0.33	0.11
35	34.33	0.67	0.45
30	34.33	-4.33	18.75
29	34.33	-5.33	28.41
27	34.33	-7.33	53.73
45	34.33	10.67	113.85
36	34.33	1.67	2.79
32	34.33	-2.33	5.43
31	34.33	-3.33	11.09
65	34.33	30.67	940.65
Sum of squared deviation			**1399.33**

In the example above, the second column (Mean) is calculated by taking the sum of all the values in column one (Age) and dividing by the number of observations, in this case 15. The resulting mean is 34.33.

The third column (Deviation) calculates the deviation from the mean for each age observation. For example, the mean subtracted from the first age observation (25 – 34.33) results in a deviation of -9.33. The mean subtracted from the second observation (26 – 34.33) results in a deviation of -8.33, and so forth…

The final column takes the square of the deviations calculated in column three. For instance, the first deviation squared (-9.33^2) results in a squared deviation of 87.05. The second deviation squared (-8.33^2) results in a squared deviation of 69.39, and so forth….

Finally, the sum of all the squared deviations is computed: 1,399.

Slide 7: Facilitator's note: A review of calculations. Alert participants that there is an Excel template provided as a separate file (variance and sd_template) that will help with these calculations.

To calculate the variance: take the sum of the squared deviations and divide by (n-1)

1399 / (15-1) = 100

To calculate the standard deviation: take the square root of the variance

$$\sqrt{100} = 10.0$$

Slide 8: Reiterate: both the variance and standard deviation measure the variability of the observation values in the distribution (around a mean, or central value). As was illustrated in the example, the variance and standard deviation can be thought of as the "average" deviation of all of the observations in the distribution from the mean of that distribution.

Facilitator's note: Could ask participants: why average?? (the squared deviations are summed and then divided by the total observations – 1: this is very similar to a mean calculation).

Slide 9: Facilitator's note: Ask participants: Which measure would you generally use? In what circumstance would you use the standard deviation? Variance? Why?

Slides 10–11: Coefficient of variation

The coefficient of variation "normalizes" the standard deviation or variability of a set of data by taking the ratio of the standard deviation to the mean. The coefficient of variation can be particularly useful when one wants to compare variability across different sets of data that have different units of measurement or means that differ greatly. It should be noted that the coefficient of variation can only be reliably computed for data that are measured on a ratio scale (vs. interval).

Coefficient of Variation calculation example:

	Sample-1	Sample-2	Sample-3
A	50	100	45
B	40	150	30
C	55	0	50
D	75	0	69
E	45	0	40
F	39	50	40
G	35	100	40
H	50	0	50
I	55	0	50
J	49	50	30
K	56	55	45
L	52	150	50
M	54	0	40
Mean	**50.4**	**50.4**	**44.5**
Median	**50.0**	**50.0**	**10.1**
Mode	**50.0**	**0.0**	**50.0**
STDEV	**10.0**	**57.8**	10.1
Min	35	0	30
Max	75	150	69
CV	**19.9%**	**114.7%**	**22.7%**

Facilitator's note: The defining feature of ratio scale data is that "zero" is meaningful (i.e., equals zero, null, nothing). This allows for ratio-type comparisons of values (e.g., 20 is twice as much as 10). Alternatively, temperature is measured on an interval scale: 0 degrees Celsius does not mean the absence of temperature. So while 20 degrees Celsius is warmer than 10 degrees Celsius, it does not imply that 20 degrees is twice as hot as 10 degrees.

As can be seen in the example, Sample 1 and Sample 2 have identical means (50.4) but widely different standard deviations (10.0 and 57.8). The coefficient of variation (CV) of Sample 1 that has the lower deviation of 10.0 is 19.9% (10.0 / 50.4), while the CV of Sample 2 with the higher standard deviation of 57.8 is five times greater than that of Sample 1: 114.7% (57.8 / 50.4). So, while Sample 2 and Sample 1 appear similar when only looking at the mean and median, when looking at the variability of the two samples, it is clear that the data are distinctly different. Note: the difference in mode gives us a clue (50 vs. 0). Can ask: Why might a mode of "zero" be a signal that there is high variability?

Facilitator's note: Discuss: How does Sample 3 relate to Sample 2 and Sample 1?

While 1 and 2 have identical means, Sample 3 and Sample 1 are more similar. They have a similar proportion of variation around their mean values.

Summary of Key Concepts

- The variance, standard deviation, and coefficient of variation are measures of dispersion used to describe the variability of sample data around a mean or central point.
- The variance and standard deviation can be thought of as the average deviation from the sample mean, not taking into consideration the “direction” (positive or negative) of the deviation.
- The coefficient of variation is the ratio of the standard deviation to the mean and is useful for comparing the variability of data across multiple samples.

Lesson 3.3.3: Generating Descriptive Statistics in SPSS

This lesson introduces various techniques for organizing and presenting descriptive statistics, including: frequencies, histograms, bar charts, and cross-tables. Participants will learn how to generate descriptive statistics in these forms using SPSS and will apply them as part of a group exercise in the second half of the lesson.

The estimated duration for this lesson is **45 minutes for the lecture** and **45–60 minutes for the exercise**.

Learning Objectives

Following Lesson 3.3.3 participants will be able to:

- Discuss the basics of univariate descriptive statistics, specifically frequencies.
- Identify different ways to create visual representations of frequency statistics: histograms, bar charts, and cross-tables
- Generate descriptive statistics in an SPSS dataset.

Companion Materials

The PowerPoint presentation **3.3.3 Generating Descriptive Statistics in SPSS** accompanies this lesson as a separate file.

Printed copies of Instructions for Exercises 3.3.3a and 3.3.3b, found at the end of this lesson, should be provided to each participant.

The following data sets also accompany this lesson as separate files:

- SPSS Data Editor document **3.3.3_Descriptive Statistics.sav**
- SPSS Syntax file **3.3.3_syntax_Descriptive_Statistics.sps**

Slides

Slide 1: Title Slide: Generating Descriptive Statistics

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: Descriptive statistics

Descriptive statistics are a means by which a large amount of data can be summarized concisely by a few standard measures. We already are familiar with two common types of descriptive statistics: measures of central tendency and measures of dispersion. We've already learned how to generate these measures manually – later in the presentation we will learn how to generate these statistics, step-by-step, using SPSS statistical software. A third type of descriptive statistic will be introduced in this lesson, frequency tables.

Slides 3–9: Univariate descriptive statistics – Frequency distribution

All modern statistical software packages have some form of frequency function that allows for the following:

- Generation of frequency tables
- Summary of data in a bar chart(s)
- Summary of data in a histogram(s)

Provide visual representations of the data.

- The calculation of summary descriptive statistics: mean, median, mode, standard deviation (*all of these already covered*); as well as skewness and kurtosis (c*overed later in the presentation*)
- Functions that assist with data "cleaning"

Slide 4: It should be noted that frequencies are most appropriate for categorical or discrete variables, not so much for continuous variables.

- Categorical variables: e.g., ranking of satisfaction on a scale of 1–5 (Likert scale)
- Discrete variables: e.g., number of cattle owned (possible responses: 5 cattle, 18 cattle, etc.)
- Continuous variables: e.g., amount of income earned last month (possible responses: $436.78, $2,509.93, etc.)

Continuous variables can be problematic if it is difficult to group observations into distinct categories.

Slides 5 and 6: Example frequency tables:

Sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	23	40.4	40.4	40.4
	Female	34	59.6	59.6	100.0
	Total	57	100.0	100.0	

Discuss: How do we read this table?

- Total number of observations = 57
- Total number of males = 23; Total number of females = 34 (23 males + 34 females = 57 total)
- Percent males in total sample = 40.4% (23/57)
- Percent females in total sample = 59.6% (34/57)

Discuss: What is the difference between percent and valid percent?

- The inclusion or exclusion of missing observations
- Slide 5 provides an example with no missing observations; Slide 6 has many missing observations.

Slide 7: What can we do with the Frequencies command?

- Estimate measures of central tendency: mean, median, mode, and sum
- Measures of dispersion: std. deviation, variance, range, min, max, and standard error
- Compute quartile and percentile values

These are new measures that won't be covered in detail in the presentation.

Slide 8: Using the Frequencies command in SPSS:

Note: a screenshot of the SPSS menus used to generate descriptive statistics is shown. The order of menu selection is as follows:

> Analyze → Descriptive Statistics → Frequencies → {select a variable that you want to analyze from a list of variables} → click the 'Statistics' button

Following that order of commands will generate the following example SPSS output:

Statistics

Age

N	Valid	57
	Missing	0
Mean		20.35
Std. Error of Mean		2.174
Median		15.00
Mode		2[a]
Std. Deviation		16.416
Variance		269.482
Range		55
Minimum		2
Maximum		57
Sum		1160

a. Multiple modes exist. The smallest value is shown

The Mean, Median, Mode, Std. Deviation, and Variance have all been covered in previous presentations.

New statistics in this table:

- N: total number of observations
  - Valid: number of observations with non-missing values
  - Missing: number of observations with missing data
- Std. Error of Mean: the sample standard deviation divided by the square root of the number of observations (std. deviation / √n)
- Range: the difference between the highest and lowest value (maximum – minimum)
- Minimum: the lowest value
- Maximum: the highest value
- Sum: the sum of the values of all observations

Slides 10–15: Shape of distribution

Alternative measures (i.e., in technical terms, *moments)* of the shape of the distribution can be measured by calculating the skewness and kurtosis of the distribution.

Facilitator's note: These slides, 10–15, can be covered in less detail if the session is running short on time; these concepts aren't essential, but they are being covered because they are among the options available in the SPSS descriptive statistics menu.

Slide 12: Skewness measures any asymmetry that may exist in the distribution. On one end of the spectrum, a perfectly 'normal' distribution is perfectly symmetric and has a skewness value of 0. As a rule of thumb, a skewness value that is twice (2x) the standard error of the mean gives a rough indication that the distribution is asymmetric.

Slide 13 contains graphic examples: reiterate the differences between positively, negatively, and not skewed data using the graphics.

The relationship between mean, median, and mode gives an indication of the skewness of a distribution. A skewness value that is positive indicates that the mode is greater than the median which is greater than the mean. A positively skewed distribution indicates that the "right-tail" of the distribution is longer, fatter, or both.

The opposite is true for a negative skewness value. A negative value indicates that the mode is less than the median which is less than the mean. A negatively skewed distribution has more observations in the "left-tail".

A normal distribution has a skewness value of 0, and as can be seen in the graphic, is perfectly symmetric.

Kurtosis measures the extent to which observations cluster around a certain point. Positive or negative kurtosis values indicate that a distribution is "narrower/tighter" or "flatter" than a normal distribution, which has a kurtosis value of 0. Positive kurtosis indicates that the distribution is clustered more tightly around some value resulting in fatter tails while negative kurtosis implies a broader, flatter distribution with more observations distributed in the tails.

Slide 15 contains graphic examples: reiterate the differences between positive, negative, and no kurtosis using the graphics.

Slide 16: Generating graphs and charts

The recently covered frequencies command includes an option (see screenshot on slide 16) to generate charts and graphs. Available options include:

- Bar charts: each column represents a group defined by a categorical variable
- Pie charts: each 'slice' of the pie represents a group defined by a categorical variable
- Histograms: each column represents a group defined by a quantitative variable

Facilitator's note: Discussion: when might you use any of these respective charts or graphs?

Slides 17–18: Generating descriptive statistics using Explore command in SPSS

The "Explore" command in the descriptive statistics menu produces summary statistics for all cases (observations, data points) or for groups of cases. The Explore function is useful for data screening, outlier identification, assumption checking, and characterizing differences among subpopulations (e.g., groups of cases).

Explore can be accessed through: Analyze → Descriptive Statistics → Explore

Slide 18: Example explore output:

Descriptives

	Sex			Statistic	Std. Error
Age	Male	Mean		23.04	3.556
		95% Confidence Interval for Mean	Lower Bound	15.67	
			Upper Bound	30.42	
		5% Trimmed Mean		22.40	
		Median		15.00	
		Variance		290.862	
		Std. Deviation		17.055	
		Minimum		2	
		Maximum		57	
		Range		55	
		Interquartile Range		34	
		Skewness		.528	.481
		Kurtosis		-1.161	.935
	Female	Mean		18.53	2.738
		95% Confidence Interval for Mean	Lower Bound	12.96	
			Upper Bound	24.10	
		5% Trimmed Mean		17.83	
		Median		10.50	
		Variance		254.923	
		Std. Deviation		15.966	
		Minimum		2	
		Maximum		48	
		Range		46	
		Interquartile Range		32	
		Skewness		.529	.403
		Kurtosis		-1.387	.788

The example output shows the summary statistics generated by explore split between two subgroups: male and female. One particularly useful statistic, the 5% trimmed mean, gives the mean value of the sample after trimming the highest and lowest 2.5% of values (for a total excluded 5%) of the sample. In this example, the 5% trimmed mean values are not much different than the mean values. In cases, where these values differ, it implies that there are outliers.

Slides 19–21: Cross-tabulation

We generate-cross tabulations when we want to analyze joint frequencies between different variables. Typically, there is an implicit assumption that one variable influences the other (e.g., a geographical region will influence a household's dietary diversity; the sex of the household head may influence the level of decision-making for women. Like other frequency distributions, crosstabs are primarily for categorical variables, as continuous variables (income, age, weight) will have too many distinct values.

Access the Crosstabs function by this path: Analyze → Descriptive Statistics → Crosstabs

Slide 20: The Crosstabs function can generate two-way and multi-way tables. It provides a variety of statistical tests and measures of association for two-way tables. The structure of the table and ordering of categories determine what tests and/or measures might be appropriate.

Example Crosstabs output:

B7.1 Highest level of education achieved * Sex of HH HEAD Crosstabulation					
			Sex of HH HEAD		Total
			Male	Female	
B7.1 Highest level of education achieved	**No education**	Count	109	58	167
		% within Sex of HH HEAD	19.2%	31.9%	22.3%
	JP (1-4)	Count	161	61	222
		% within Sex of HH HEAD	28.3%	33.5%	29.6%
	SP (5-8)	Count	229	53	282
		% within Sex of HH HEAD	40.3%	29.1%	37.6%
	JS (1-2)	Count	26	6	32
		% within Sex of HH HEAD	4.6%	3.3%	4.3%
	SS (3-4)	Count	39	4	43
		% within Sex of HH HEAD	6.9%	2.2%	5.7%
	Tertiary	Count	4	0	4
		% within Sex of HH HEAD	.7%	0.0%	.5%
Total		Count	568	182	750
		% within Sex of HH HEAD	100.0%	100.0%	100.0%

In this example table, we can see the frequencies for various levels of education (rows) as they relate to the sex of the head of household (columns). The total column on the right shows frequencies for the entire sample. This allows us to see trends between the sexes that would then be tested for statistical significance.

Slide 22: Descriptive statistics using Means command in SPSS

The Means function calculates means, as well as a range of other univariate statistics for one or multiple variables. It also is able to calculate means across subgroups by selecting the variable of interest as the dependent variable and then selecting the variable by which one wishes to disaggregate as the independent variable.

Slide 22 contains a screenshot of the means menu graphic.

Access the Means function by this path: Analyze → Compare Means → Means

Exercise 3.3.3: Descriptive Statistics (Slides 23 and 24)

Objective: Use SPSS to generate descriptive statistics for a sample dataset

Time needed: 45–60 minutes

Instructions: The exercise can be conducted individually or in small groups at the discretion of the facilitator. If the general level of SPSS experience among participants is low, small groups are preferred, allowing the participants to self-organize with at least one person who is comfortable with SPSS, per group. The exercise is split into discrete tasks that are listed on two separate PowerPoint slides (slide 24 and slide 26). The facilitator should give the groups 15–20 minutes to complete all the tasks on one slide, walking around the room and helping groups on an individual basis as necessary. At the end of the predetermined time, the facilitator can project his/her laptop screen and show the collective group how to perform all the tasks and answer any questions.

Part 1 (Slide 24)

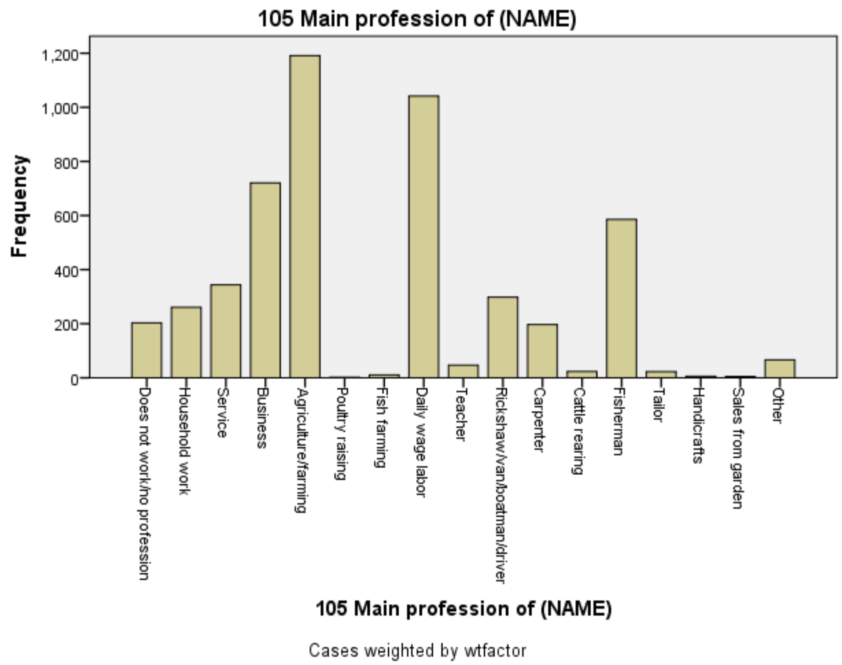
Ask the participants to open the SPSS files **3.3.3 Descriptive Statistics.sav** and syntax file **3.3.3 syntax.sps**. Explain that the majority of the practice exercises on the screen and on their printed handout of instructions will be executed using the menu functions reviewed in this presentation. The will execute the task on bullet 3 (create age group variable) by opening and running syntax in the SPSS file **3.3.3 syntax**.

- Make frequency table of the variable "profession". Output should look like this:

105 Main profession of (NAME)

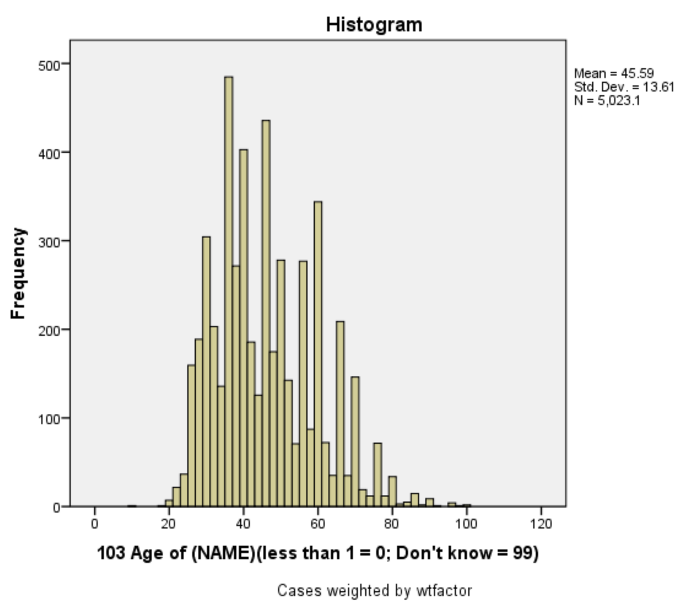
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Does not work/no profession	203	4.0	4.0	4.0
	Household work	261	5.2	5.2	9.2
	Service	344	6.8	6.8	16.1
	Business	720	14.3	14.3	30.4
	Agriculture/farming	1191	23.7	23.7	54.1
	Poultry raising	2	.0	.0	54.2
	Fish farming	11	.2	.2	54.4
	Daily wage labor	1041	20.7	20.7	75.1
	Teacher	47	.9	.9	76.0
	Rickshaw/van/boatman/driver	298	5.9	5.9	82.0
	Carpenter	197	3.9	3.9	85.9
	Cattle rearing	23	.5	.5	86.3
	Fisherman	586	11.7	11.7	98.0
	Tailor	23	.5	.5	98.5
	Handicrafts	6	.1	.1	98.6
	Sales from garden	5	.1	.1	98.7
	Other	67	1.3	1.3	100.0
	Total	5024	100.0	100.0	
Missing	System	1	.0		
Total		5025	100.0		

- Make a bar chart of the variable "profession". Output should look like this:



- Use syntax file on USB drive to categorize "age" variable to "age_group" and categories are "<30 = 1", "30-40 = 2", "40-50 = 3", "50-60 = 4" and ">60 = 5"

- Make a histogram of "age" variable (useful for continuous variables). Output:



- Calculate descriptive statistics (Mean, Median, Mode, standard deviation, skewness, kurtosis of "age" variable. Output:

Descriptive Statistics

		103 Age of (NAME)(less than 1 = 0; Don't know = 99)	Valid N (listwise)
N	Statistic	5023	5023
Range	Statistic	89	
Minimum	Statistic	10	
Maximum	Statistic	99	
Sum	Statistic	229021	
Mean	Statistic	45.59	
	Std. Error	.192	
Std. Deviation	Statistic	13.610	
Variance	Statistic	185.228	
Skewness	Statistic	.589	
	Std. Error	.035	
Kurtosis	Statistic	-.138	
	Std. Error	.069	

- Explore for "age" variable. Output:

Descriptives

			Statistic	Std. Error
103 Age of (NAME)(less than 1 = 0; Don't know = 99)	Mean		45.59	.192
	95% Confidence Interval for Mean	Lower Bound	45.22	
		Upper Bound	45.97	
	5% Trimmed Mean		45.04	
	Median		44.00	
	Variance		185.228	
	Std. Deviation		13.610	
	Minimum		10	
	Maximum		99	
	Range		89	
	Interquartile Range		20	
	Skewness		.589	.035
	Kurtosis		-.138	.069

- Create cross-table for “sex” and “age_group” variables

102 Sex of (NAME) * age_group Crosstabulation

			age_group					Total
			<30	30-39	40-49	50-59	60+	
102 Sex of (NAME)	male	Count	433	1343	1224	774	942	4716
		% within 102 Sex of (NAME)	9.2%	28.5%	26.0%	16.4%	20.0%	100.0%
	female	Count	17	83	68	62	74	304
		% within 102 Sex of (NAME)	5.6%	27.3%	22.4%	20.4%	24.3%	100.0%
Total		Count	450	1426	1292	836	1016	5020
		% within 102 Sex of (NAME)	9.0%	28.4%	25.7%	16.7%	20.2%	100.0%

Note: To generate the percentages it is necessary to select: cells → percentages (check ‘rows’ box).

Exercise 3.3.3b (Slide 25)

Facilitator’s note: Give the group 15–20 minutes to complete the following tasks. Participants who are moving ahead more quickly than others can create bar charts to display the output if they wish (in Excel or SPSS). Afterwards, project your laptop and work through the tasks answering any questions participants may have.

- Calculate means of q143 (value of sales of ag crops) by age_cat. Output:

Report

308 What was the value of sales of agricultural crops last year

age_group	Mean	N	Std. Deviation
<30	25475.01	42	31733.827
30-39	21049.94	242	32493.176
40-49	24454.95	305	26676.381
50-59	25140.68	259	36577.576
60+	26903.65	340	42950.491
Total	24648.35	1187	35400.458

- Calculate means of q137 (land owned in decimals) by age_cat. Output:

Report

302 How much land does your household own (including homestead land)? (Decimals)

age_group	Mean	N	Std. Deviation
<30	53.13	181	73.866
30-39	70.37	693	96.497
40-49	79.84	764	96.699
50-59	103.43	592	110.517
60+	109.47	738	108.594
Total	88.08	2968	102.937

- Use the SPSS syntax file **3.3.3_syntax** to compute new variable land_cat, quartiles of q137.

Statistics

302 How much land does your household own (including homestead land)? (Decimals)

N	Valid	2969
	Missing	2056
Percentiles	25	20.00
	50	48.00
	75	120.00

- Calculate means of land_cat by age_cat. Output:

Report

land_cat

age_group	Mean	N	Std. Deviation
<30	2.0906	181	1.04113
30-39	2.2650	693	1.09829
40-49	2.4412	764	1.11892
50-59	2.6992	592	1.12449
60+	2.8321	738	1.06185
Total	2.5274	2968	1.12233

- Calculate q143 by land_cat. Output:

Report

308 What was the value of sales of agricultural crops last year

land_cat	Mean	N	Std. Deviation
<20	8933.64	100	16598.325
20-47	14521.39	222	18023.001
48-119	26270.54	387	42207.668
120+	31398.47	477	36353.577
Total	24669.01	1186	35408.063

- Use SPSS syntax file **3.3.3 syntax** to compute new variable sales_decimal = q143/q137 and calculate means of sales_decimal by age_cat. Output:

Report

sales_decimal

land_cat	Mean	N	Std. Deviation
<20	1536.1543	100	4665.29732
20-47	455.1157	222	562.24348
48-119	448.5861	387	862.33326
120+	139.9143	477	160.42773
Total	417.4700	1186	1506.42763

Summary of Key Concepts

- Frequency tables, cross-tables, histograms, and bar charts are a convenient way of presenting descriptive statistics to describe data being analyzed.
- Frequencies tables are generally used for categorical variables. For continuous variables, a new variable should be computed separating the continuous variable values into categories. A histogram can then be generated for the new categorical variable.
- Various other useful commands are available in SPSS to present descriptive statistics: means, explore, and crosstabs.

Instructions for Exercise 3.3.3a: Descriptive Statistics

Open the SPSS files **3.3.3 Descriptive_statistics.sav** and **3.3.3_syntax.sps**

Using menu functions:

- Make frequency table of the variable "profession"
- Make a bar chart of the variable "profession"

Using the syntax file **3.3.3_syntax.sps**, categorize "age" variable to "age_group" and categories are "<30 = 1", "30-40 = 2", "40-50 = 3", "50-60 = 4" and ">60 = 5"

Using menu functions:

- Make a histogram of "age" variable (useful for continuous variables)
- Calculate descriptive statistics (Mean, Median, Mode, standard deviation, skewness, kurtosis of "age" variable
- Explore for "age" variable
- Create cross-table for "sex" and "age_group" variables.
- Note: to generate the percentages you must select: cells → percentages (check 'rows' box).

Instructions for Exercise 3.3.3b: Descriptive Statistics-Means

Use the SPSS data file **3.3.3 Descriptive statistics.sav** and syntax file **3.3.3_syntax**.

Use menu functions to:

- Calculate means of “q143” (value of sales of ag crops) by “age_cat” (make bar graph)
- Calculate means of “q137” (land owned in decimals) by “age_cat” (make bar graph)
- Use SPSS file **3.3.3_syntax** to compute new variable “land_cat”

Use menu functions to:

- Calculate means of land_cat by age_cat (make bar graph)
- Calculate means of sales_decimal by age_cat (make bar graph)

Use SPSS file **3.3.3 syntax** to compute new variable “sales_decimal” (calculation = q143/q137).

Use menu functions to calculate means of q143 by “land_cat” (make bar graph).

Module 3: Statistical Concepts and Data Analysis Session 4

Lesson 3.4.1: Introduction to Statistical Sampling

This lesson introduces the statistical concepts which underscore study design and sampling design.

The estimated duration of this lesson is **90 minutes**.

Learning Objectives

Following Lesson 3.4.1 participants will be able to:

- Summarize the rationale for statistical sampling.
- List the key characteristics of a statistically representative sample.
- Recognize common errors in sample design.

Companion Materials

The PowerPoint presentation **3.4.1 An Introduction to Statistical Sampling** accompanies this lesson as a separate file.

Slides

Slide 1: Title Slide "An Introduction to Statistical Sampling"

Facilitator note: Insert date, location of training, and name of facilitators on title slide.

Slides 2–3: Need for statistical sampling

Facilitator note: These two slides promote a general discussion between the facilitator and participants of why a project must draw conclusions about project efforts, and how to go about drawing conclusions.

Slide 2: What do we want?

In order to provide policy makers, program and project managers, and other stakeholders with the information they need to make critical programming and resource-allocation decisions, we must be able to draw conclusions about the *needs of target populations* or *project outcomes on target populations.*

Slide 3: How do we draw conclusions?

Ask the participants to answer the questions on the screen before the animations "census" (3rd click) and "sampling" (5th click) drop down.

We can draw conclusions by conducting a **census**, where we collect information from all members of a population under study, or we can select a sample from the population. **Sampling** occurs when we select a subset of the population (or other unit) under study from the larger group (the total population under study).

Slide 4: Study design – sampling method

It is very important that the sample accurately represents the population. Thus, a solid study design must articulate the specific method that will be used to select a **sample** of people, households, communities, or other units of a population, so that the conclusions conform to rules of statistical validity. A number of sampling methods exist—it will be important to logically match the sample design to the type of analysis needed.

After the "Why sample?" animation, ask the group to share their ideas about why we sample.

- Efficient – data can be collected more quickly from a sample than a census
- Cost-effective – reliable information at far less cost than a census
- Results can be more precise than a census: more attention can be given to data quality due to smaller operation (training personnel, following up on non-response, etc.)
- Errors can be calculated

Slide 5: Sample design for a statistically representative sample

Ask the group what we mean by a "statistically representative sample."

- The results (mean/proportion) from our sample are "representative" of the true population mean or proportion
- The estimated mean/proportion from our sample is:
  - Unbiased
  - Precise (*efficient*)

Slide 6: Steps in sampling design

Four key steps comprise a proper sampling design. Discuss with participants after each animation.

1. **Define a target population** – Who do you want to learn about and what are the characteristics of this population? Specification may include geographical area covered by the population, age group, sex, participation in a program, etc. The specification of the target population must be as complete as possible to ensure representation of all elements.

2. **Develop a sampling frame** – A *complete* listing of all sampling units in the target population.

3. **Choose a sampling method** – What method will you use to select sampled units?

4. **Calculate a sample size** – The sample design affects the sample size. Generally, the more precision required and the more complex the design, the larger the sample size.

Slide 7: Errors in sampling design

Facilitator's note: This slide introduces the steps of sampling one-by-one in animation and introduces potential error related to each step. You can ask participants to predict the next step prior to animation.

Sampling error: There is a margin of error that exists from taking a sample of a population instead of studying the entire population. This affects the precision of the results. Sampling errors are related to the sample size and variability among sampled units. You can reduce sampling error by increasing the sample size, but you can never eliminate it.

Non-sampling error: Typically happens during survey implementation and includes a number of ways in which estimates may deviate from their true values. The most common types of non-sampling error are:

- **Non-response** is when a survey team fails to interview a sampled unit, because they cannot be located or the household/individual refuses to be interviewed. If a large amount of people do not respond to a survey, the results may be biased and/or the confidence level of the results may be reduced.

- **Coverage errors:** Occurs when the sample frame is not complete. For example, a segment of the population (e.g., migrants, homeless) is excluded from the listing. The result is that the sample frame is not representative of the target population.

  They occur when a sampled unit (community, household, or individual) is excluded from the sample, or a non-sampled unit is included in the sample. Inclusion or exclusion of units may be by mistake, or may be deliberate (e.g., access to a household is very difficult and the interviewer decides not to make the effort; the interviewer misinterprets the household listing and visits a house not sampled).

- **Measurement or response errors** include poor questionnaire design, poor implementation of actual wording, poor respondent recall, bias: an interviewer influencing a how a respondent answers a question, and misunderstanding of wording in questionnaire.

Slide 8: Three general scenarios in sampling

- Respondents are selected from a more or less complete list of individuals in the target population.
- Respondents are selected from a set of people who go somewhere or do something that enables them to be sampled (exit polls, clinics).
- Sampling is done in two or more stages.

Slides 9–12: Characteristics to evaluate when defining a sample

Facilitator's note: The next group of slides provides details on three principal characteristics to consider when designing a quantitative sample. The first slide is simply an overview list.

Comprehensiveness: The percentage of the population that has a chance of being selected AND the extent to which those excluded are distinct from those included. Ideally, all of the target population should have a chance of being selected. Also, there should not be any systematic differences (i.e. demographically).

Before the animation of "examples," ask participants to relate their own experiences of situations that may compromise the comprehensiveness of a sample.

Examples:

- A list that does not include recent migrants is not up-to-date.
- A list compiled in 2005 for a 2014 survey is likely out of date.
- Examples of biased samples include those that do not contain:
  - Households not easily reached
  - Squatter populations

Probability of selection: A key attribute of a well-designed sample is that every unit of the sampling frame has an equal chance of being selected. If some units have a lower probability of selection this results in *sampling bias*.

Example: If a sample is drawn from clinic visit records over a six month period, it will give individuals who visited the doctor numerous times a higher chance of selection compared to those who only saw the doctor once.

Ask the group to share other examples.

Efficiency: What is the level of effort required to reach all units (e.g., households) that have been selected in the sample? In some cases, it is simply not efficient to directly draw a sample from the intended population because of logistical, temporal, or budgetary constraints. More efficient samples, reduce the time and cost of travel between sample units.

Before the animation of “example,” ask participants to relate their own experiences of situations that may compromise efficiency in sampling.

Example: Suppose the sample frame is an entire region or province. A simple random sample of households from such a large area could be widely dispersed, and the costs of traveling to interviews could be prohibitively expensive.

Slide 13: Sample size

Required sample size is NOT a function of the size of the total population. The size of a population from which a sample is selected has virtually no impact on how well a sample is likely to describe the population.

Sample size depends on the “variability” (standard deviation) of the population being measured

Slide 14: Central limit theorem

Facilitator’s note: This slide is presented in steps. Each animation helps to explain how increased sample size reduces the standard deviation of the population of means and increases the “precision” of the estimate of the population mean.

The central limit theorem refers to the “population of means.” This is the means of all possible samples of size N selected from an underlying population.

Animation: We see that the “population of means” from the small sample (N3) has large standard deviation and a maximum error of 10% (± 5% of the mean).

Animation: The green line illustrates how increasing the sample size to 15 slightly reduces the standard deviation and as a result also reduces the maximum error to 6% (±3% of the mean).

Animation: By doubling the sample to 30, we get closer to normal distribution of the population of means and reach a maximum level of error of only 4% (±2% of the mean).

Regardless of the distribution of the underlying population:

1. Mean of the population of means = population mean
2. SD of population of means = SD of population / $\sqrt{N}$
3. Distribution of the population of means approaches normal distribution as N increases

Because the population of means approaches a normal distribution, formal hypotheses tests can be conducted based on normal distribution.

Summary of Key Concepts

- We must be able to draw statistically representative conclusions about the *needs of target populations* or *project outcomes on target populations* in order to provide policy makers, program and project managers and other stakeholders with the information they need to make critical programming and resource-allocation decisions.
- If properly executed, sampling a sub-set of a population is an efficient, cost-effective, and precise way to draw these conclusions.
- Sampling can contribute to a rigorous, valid, and defensible methodology if the proper steps are taken to ensure statistical representativeness and to reduce common sampling design errors.

Lesson 3.4.2: Sampling Techniques

This lesson introduces various methods of *probability* sampling, along with a few popular *non-probability* sampling methods that may be used when it is not feasible or practical to conduct probability sampling.

The estimated duration of this lesson is **90 minutes**.

Learning Objectives

Following Lesson 3.4.2 participants will be able to:

- Describe the various methods used for probability sampling
- Compare and contrast the merits, demerits, and varieties of non-probability sampling methods
- Determine the appropriate sampling method for various types of study

Companion Materials

The PowerPoint presentation **3.4.2 Sampling Techniques** accompanies this lesson as a separate file.

Slides

Slide 1: Title Slide-Sampling Techniques

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: Type of sampling

Sampling methods fall into two main categories:

- **Probability sampling:** A probability sample is defined as one in which every unit (household, individual, etc.) has a known, non-zero chance of being selected, and chance methods are used to select the sampled units.
- **Non-probability sampling** includes uncontrolled sampling methods that do not provide the level of precision and/ or confidence offered by probability samples.

Slide 3: Probability sampling

The most common probability sampling methods are:

- Simple random sampling (SRS)
- Random walk (a type of systematic random sampling)
- Stratified random
- Multi-stage sampling (cluster sampling)
- Multi-phase sampling

Facilitator's note: Ask participants about their level of familiarity with the methods listed on the screen.

Slides 4–5: Simple random sampling

Facilitator's note: The next two slides provide an overview of SRS, situations in which it may be the most appropriate method and an illustrative example of sampled units using SRS.

Slide 4: Sampling theory was developed based on Simple Random Sampling (SRS). It is the underlying principle for all other probability methods. SRS is important, but in practice is rarely used as a "stand-alone" method; rather it is used in conjunction with other sampling methods.

Animation: Before using SRS, ask yourself the following key questions:

1. Is there a sample frame for the entire population?
2. Is the sample frame complete and up-to-date?
3. Is the target population widely-dispersed?

Animation: SRS must have a *complete* and up-to-date sampling frame. SRS is most feasible (logistics, time, cost, etc.) if the population is not widely dispersed. Therefore, if the answer to questions 1 and 2 is yes, and the answer to question 3 is no, then SRS may be an appropriate sampling method for your study.

Critical criteria for SRS: Each unit of the target population must have an equal chance of being selected. A complete listing must be developed before sampling.

If there is time, share the basic steps for conducting simple random sampling:

1. Determine the sample size (n).
2. List all sampling units in the target population. (This is the hard part! It cannot systematically exclude anyone.)
3. Assign a unique number to each sampling unit, beginning with 1.

4. Generate n (sample size) random numbers.
5. Select the units that correspond to the random numbers. This is your sample.

Slide 5 illustrates simple random sampling used in the SHOUHARDO II Food Security Program. Blue stars represent households. The thick lines represent district boundaries and the thin green lines represent community boundaries.

We see that the total target population across the three districts is 1,000 (N=1000) and the sample size is calculated as 50 (n=50). The equation on the screen shows that every household has an *equal* (5%) chance of being selected.

Animation: Red stars highlight the households selected using the SRS method. We see that many households are selected in some communities, while some communities have no households selected. We also see that the size of the village had no bearing on how many households were selected.

Slides 6–7: Random walk sampling

A random walk is a form of systematic random sampling. Similar to SRS, it is most useful when:

- You don't have a list of the population.
- The target population has defined and countable limits.
- You have a map of all the households in a program area.
- You know how many people are targeted for program enrollment, but don't know who they are at the time of sampling.

Random walk sampling requires a sample interval of (K = N/n). Where N is the total population and n is the required sample size.

The basic steps for conducting a systematic random sampling are:

1. Randomly select the first sampled unit from the population.
2. Select remaining sampled units using the defined sample interval from the target population.

Slide 7 illustrates random walk sample for the PROSHAR Food Security Program. In this example, the target population is known (N=300). The required sample size is determined to be 50. Thus, per the sampling interval equation, every 6th household will be selected.

Animation: The red star represents the first randomly selected household.

Subsequent animations: The enumerator walks through the village and based on the sample interval of six, selects the 6th household. This process continues until the enumerator obtains the required sample of 50 households.

Slide 8: When is random walk sampling appropriate?

Random walks are appropriate if an NGO wants to conduct a diagnostic survey to inform project proposals or when a project wants to carry out annual internal project monitoring.

However, per new Food for Peace requirements, random walk samples are not considered valid for performance monitoring. Instead, projects must create household listings when they do not exist. The listing operation consists of visiting every village in the target population and recording on listing forms a description of every structure and the names of the heads of the households for each structure. A map is made for each community that includes detailed sketches of all structures residing in the community.

The USAID publication “Demographic and Health Survey Sampling and Household Listing Manual” provides ample detail on this process.

Household mapping exercises are very costly, sometimes as much as one-third the cost of implementing the survey itself. As such, projects much factor in this cost to their proposals, at baseline and again at endline. At times existing lists can be used, for example if a DHS or census was conducted in the project area within a year, but the quality and accuracy of such lists must be determined before using it in place of the household listing process. Even if such lists are used at baseline, they will be out of date by endline, and a project should budget for at least one household listing activity.

Slide 9: Complex sampling

Facilitator’s note: This slide presents two main methods of complex sampling. Each is discussed in detail in subsequent slides.

Cluster sampling is the random selection of naturally occurring groupings, referred to as clusters, from which all members are chosen for the sample. The total target population is divided into clusters (non-overlapping subgroups of the population) and all elements of the population fall into one and only one cluster.

Stratification is essentially the classification of a survey population into sub-groups, or strata, on the basis of selected characteristics for comparison purposes. Stratified random sampling can be applied to all the forms of probability sampling we’ve already discussed.

Slides 10–11: Cluster sampling

Cluster sampling is the most widely used method of complex probability sampling, particularly in development settings. There are two selection stages:

1. Randomly select clusters from the overall population.
2. Within the selected clusters randomly select primary sampling units (households).

Slide 11: Facilitator: Ask participants why a project may want to conduct a two-stage cluster sample.

Cluster sampling is a cost-effective approach when the program area is large and site visits are necessary for data collection. Cluster sampling is useful when no sampling frame or list of the population is available before the survey begins, but listings of clusters (villages, towns, camps) are available.

A drawback of cluster sampling is that the standard error increases as independent selections in the sample decrease, with consequent loss of precision. Each cluster is randomly selected (and, therefore, independent), but the selection of each sampling unit is not independent. The more that clusters differ, the less precise the estimates become. This differs from SRS, where each sampling unit is randomly selected. In stage one, clusters may be selected using "probability proportional to size" (PPS), which means that a cluster with more households is more likely to be included than one with fewer households.

Slides 12–14: Probability proportional to size

Facilitator's note: A common misperception of PPS is that when larger clusters are more likely to be selected, it will affect a household's chance of being selected. This set of slides demonstrates that PPS does indeed ensure that every household has an equal chance of being selected.

Begin by asking participants to respond to the question on the screen. "Does PPS ensure that each household within the sample has the same chance of being selected?"

Animation: Even though a cluster with more households is more likely to be included than one with fewer households when PPS is used in the first-stage of selection, **each household within the sample has the same chance of being selected.** This is because within larger villages, each individual household has a smaller chance of being selected than individuals in smaller villages.

The greater chance of a larger village being selected and the smaller chance of a household in that larger village being selected cancel each other out.

Slide 13 illustrates this principle.

Slide 14 illustrates two-stage cluster sampling.

Animation: In the first stage, sampled villages (clusters) are selected (green dots). In the second stage, the same number of households is selected from each sampled village (red stars).

Slides 15–16: Stratified random sampling

Facilitator's note: The next two slides provide an overview of stratified sampling, explain why it may be the preferred method of a study, and offers an illustrative example of how units are sampled using this method.

Stratified sampling is used when the study population is grouped into strata where patterns of differences (variation) are expected a priori (e.g., ethnic or age groups; zero-grazing or pastoralist households). It is important that there are no overlaps of sampling units between any of the strata (i.e., each subject or sampling unit belongs to only one stratum).

A random sample is selected from within each stratum. This sampling technique is used to ensure proportional representation for each stratum, to decrease the sampling variability, or to yield sufficient numbers of a sub-population in the sample for reliable analysis, specifically for comparison.

Slide 16 illustrates a sample that is stratified by districts in Bangladesh. Stratifying will provide the project with data of known precision for each district, allowing for statistical comparisons between districts.

Multiple Animations: First we see five clusters selected in Barisal (green dots), followed by the selection of five households in each cluster. This process is repeated for the other two strata: Patuakhali and Barghuna.

Note that the total population in Barisal (N=550) is much smaller than that of Patuakhali and Barguna (n=2000); however, the total number of sampled households is constant across the three districts (n=25).

Facilitator: Ask participants why the sample size (n) is the same in each stratum even though there are large differences in population size (2000 vs. 550). What is the effect of this on a household's chance of being selected?

Total population size does not affect the size of the overall sample. However, the probability of a household being selected in Barisal is much higher. We will need to weight the data during analysis to compensate for the unequal probability that households will be included in the sample.

It is possible to conduct balanced, stratified sampling before the survey, such that each household has an equal chance of being selected, however there are reasons that most surveys elect to weight after data collection. *(Weighting is discussed in depth in the next lesson).*

- Logistically it is more efficient to distribute survey teams equally across strata.
- In balanced stratification, while population size does not affect the overall sample size, the proportion of a sample will be smaller for a stratum with a smaller population. In this case, there is a risk that the sample size for that stratum may be too small to be representative.

Slides 17–18: Non-probability sampling

Non-probability sampling includes uncontrolled sampling methods that are not entirely based on chance.

There are several challenges to non-probability samples:

- They do not provide the level of precision and/or confidence offered by probability samples.
- It is impossible to estimate sampling variability.
- Thus, results cannot always be generalized to an entire population and it is difficult to determine the extent to which results are or are not representative.
- They contain unknown bias.

There may be circumstances, however, when it is not feasible or practical to conduct probability sampling, and non-probability sampling is the best choice. Non-probability sampling may be used for exploratory research to find out whether a problem or issue exists. Benefits of non-probability sampling include:

- Sampling is less expensive and quicker than probability sampling.
- It may be the only option for sampling hard-to-reach or “hidden” populations (HIV-positive; migrants, prostitutes, battered women).

Slide 18: Facilitator: Briefly discuss the common types of non-probability sampling displayed on the screen.

- Convenience sampling: whoever is available
- Snowball sampling (identify someone who meets criteria, ask them to recommend others who also meet criteria)

- Facility-based sampling (recruiting sample from specific facility [i.e., health, correctional, HIV clinic])
- Time-location sampling (assumption that hidden populations will congregate at certain types of locations
- Case study
- Respondent-driven sampling: similar to snowball sampling because it involves chain referral, yet different in that people are limited in the number of referrals they can recruit to the study. Sampling frame is constructed during the sampling process.

Slides 19–22: Examples on sampling techniques

Facilitator: Ask participants to review each of the next four slides and determine which is the most appropriate sampling method, and why. In some cases, there is not enough information to determine the best method. Have them identify what other information is needed to determine the best method. Key considerations are:

- What types of comparisons need to be made in analysis?
- Does a household listing exist?
- What are the logistical considerations?
- What does the budget allow?

Slide 19: You want to assess the uptake of antenatal services in two large regions of your country. You do not have a list of all members of the community.

Possible answer: Random sampling; perhaps stratified by region.

Slide 20: You want to assess the baseline knowledge of beneficiaries on malaria, and you have a complete list of all of them.

Possible answer: Simple random sample or cluster sampling.

Slide 21: You are enrolling children in a program and would like to assess the nutritional status of a sub-sample of them at enrollment. You are interested in examining the difference between age groups.

Possible answer: Sample stratified by age group

Slide 22: You want to examine the effect of stigma on refugee families in a certain city, but you are unable to get a list of refugees in the area.

Possible answer: Non-probability sampling (snowball or respondent driven sampling).

Summary of Key Concepts

- The two main types of sampling are probability and non-probability. In most cases, a probability sample is the preferred sampling method to use in surveys that must draw conclusions about target population needs and project impact.
- The sampling method you select for your study must be based on the types of comparisons you need to be made in analysis, whether you have a complete sample frame (household listing), logistical considerations, donor requirements, and the available budget.

Lesson 3.4.3: Understanding Data Weighting

Weighting is a common adjustment technique that is applied when there is an unequal chance to be selected as a sampled unit across a target population. This lesson shares examples of when it is appropriate to weight data and when it is not. Participants are guided through a hands-on exercise in SPSS to weight data.

The estimated duration for this lesson is **60 minutes for the lecture** and **60 minutes for the exercise**.

Learning Objectives

Following Lesson 3.4.3 participants will be able to:

- Describe when and why weighting is needed
- Outline the process for calculating normalized weights
- Calculate the design weight for the three sample districts in Excel
- Construct a variable for weighting and generate descriptive statistics with the weight factor on and off

Companion Materials

The PowerPoint presentation **3.4.3 Understanding Data Weighting** accompanies this lesson as a separate file.

At the end of this lesson the participants will practice computing weights using SPSS data file **3.4.3_exercise_weighting**.

Slide 1: Title Slide – Understanding Data Weighting

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slides 2–3: When weighting is needed?

Facilitator's note: This set of slides explains situations where we do not need to weight our data (when every unit has an equal chance of being selected), and situations where we must weight the data (if the chance of being selected in a sample is not equal for all sampled units.)

Sometimes we purposively over-sample or under-sample a specific sub-group of population. This results in an unequal sampling probability. We might over-sample to make sure that we can precisely measure changes in key populations. Over- or under-sampling might occur when we stratify by geographic location. Recall the example from Lesson 3.4.2.

If sampled beneficiaries have unequal probabilities of selection we must compensate for this at the data analysis stage. If we don't compensate for this we run the risk of an estimation bias.

Slides 4–6: Scenario — The Midterm Evaluation Survey

Facilitator's notes: The next three slides present a scenario in which weighting is and is not needed based on the differing types of required analysis and reporting. The final slide in this set (#6) demonstrates the differing analytical needs of the survey: 1) to report at the district-level 2) and to report overall average of the three districts.

Slides 7–8: To weight or not to weight?

Facilitator's note: The next two slides use the scenario to demonstrate when it is and is not necessary to weight the data.

In the midterm evaluation scenario, you would sample 130 beneficiary households from each district.

Slide 7 screen shows that:

- Every beneficiary from Barisal has 15% chance of being selected compared to any other beneficiary in Barisal
- Every beneficiary house from Barguna has an 18% chance of being selected compared to any other beneficiary in Barguna
- Every beneficiary from Patuakhali has a 5% chance of being selected, compared to any other beneficiary in Patuakhali

Of key importance is that the probability of each beneficiary to be selected in your total sample is unequal across districts. Beneficiaries from Barisal have a 15% chance of being selected compared to those in Patuakhali, who only have a 5% chance of being selected, and those in Barguna, who have an 18% chance of being selected.

Slide 8: Whether we weight the data depends on how we want to present results.

Screen displays: When presenting results by district, there is no need for weighting.

Animation: Ask participants for their opinions to the question "Why?" before clicking forward.

If we're presenting by district, there is no need to weight the data because every beneficiary has an equal chance of being selected within a district.

Screen displays: If we want to present data at the project level (all districts) or by any other stratifying variable besides district, we must weight the data or estimates will be biased.

Animation: Ask participants for their opinions to the question "Why?" before clicking forward.

We must compensate for the unequal probability that a beneficiary will be selected across the three districts.

Slide 9: Unequal probability sampling

Facilitator's note: This slide repeats the earlier equations to help you demonstrate why the probability is unequal across districts.

Slide 10: We want equal probability

Facilitator's note: This slide explains how to compensate for unequal probability by weighting data to ensure equal probability.

The standard method to compensate for unequal probability is carried out during data analysis. We will apply design weights to the data by multiplying indicator value by a weight assigned to each strata (in our example, each district). The inverse, or reciprocal, of the probability that a beneficiary will be selected.

Slide 11: Calculating design weights

Facilitator's note: This slide demonstrates how to calculate the inverse of the probability that a beneficiary will be selected.

The calculated design weights for each strata are as follows:

- Barisal = 6.6
- Barguna = 5.4
- Patuakhali = 18.5

Recall that we apply design weights to the data by multiplying indicator value by a weight assigned to each strata (in our example, each district). However, in SPSS when we apply the design weight, the software inflates the total number of cases in the sample (N). In analysis and reporting we must ensure that the total sample size remains the same – in our example 390 (130 beneficiaries per each of the three districts). To address this problem we use *normalized weights*.

Slides 12–14: Calculating normalized weights

Facilitator's note: This set of slides takes participants through the calculation of normalized weights in a step-by-step process.

Slide 12: Facilitator: After explaining how the design weight is a function of the equation on the screen, ask participants if they can determine the values for the following elements in the equation (using information from the midterm evaluation sample). Explain that (N_s) will be different for each stratum.

$$w_s = \frac{N_s / N}{n_s / n} = \frac{N_s / n_s}{N / n} = \frac{N_s}{n_s} \cdot \frac{n}{N}$$

Answers:

- N_s = Barisal (N_s =860); Barguna (N_s =700); Patchuakhali (N_s =2400); Number of households/ individuals in sampling stratums
- N = (3960) Total number of households/individuals in the entire sampling universe
- n_s = (130) Sample size of sampling stratums
- n = (390) Total sample size of all sampling stratums

Slide 14 displays the results of the equation. The pink column on the right side of the slide presents the N values that will be displayed for each stratum when we present the results. Note that they now tally up to our calculated sample of 390 beneficiaries.

After we calculate the design weights, we will create a new variable in SPSS.

Slides 15–16: Weighting data in SPSS

Facilitator's note: This set of slides allows participants to practice creating a weight variable and turning weighting on and off. Lead participants through the steps on the screen 15. Explain the points on Screen 16 after all have created a weight variable.

Once we create a weight variable we can turn it on and off as needed.

Facilitator's note: Before activating the animation on Slide 16, ask participants for their opinions on the type of analysis when the weight factor will be turned on? When will the weight factor be turned off?

Weight the data when you are running statistics for the overall sample.

Un-weight the data when you are running statistics for individual stratum (district).

Facilitator's note: Before next animation, ask participants what will be the N in the weighted sample when we use normalized weights?

When using normalized weights, the weighted total number of all cases should be equal to the original un-weighted number of cases.

Slide 17: Introduction to Exercise 6: Computing Weights

Facilitator's note: If you have not already distributed the paper handout with Exercise 3.4.3 instructions, do so now.

Exercise 3.4.3 (Slide 18)

Allow the participants 45–60 minutes to calculate the design weight for the three districts in Excel, construct a **wtfactor** variable, and then generate and compare descriptive outputs with the weight factor on and off.

Summary of Key Concepts

- Weighting is a common adjustment technique that is applied when there is an unequal chance to be selected as a sampled unit across a target population.
- We do not need to weight data when every unit has an equal chance of being selected.
- We do need to weight data if the chance of being selected in a sample is not equal for all sampled units.

Instructions for Exercise 3.4.3: Computing Weights

The table below shows total number of HHs and sample size for each of three districts

District	Total HH in the Sampling frame	Sample size
Barisal	104,785	1,665
Barguna	99,461	1,671
Patuakhali	115,102	1,689
Total	319,348	5,025

Calculate the design weight in Excel

Use the SPSS data file **3.4.3_Exercise _weighting.sav**, where three districts in the variable “q1” are coded as “Barisal=1”, “Barguna=2” and “Patuakhali=3”

Create a new variable “wtfactor” which shows the corresponding calculated weight factors for the districts Barisal, Barguna and Patuakhali

Generate descriptive outputs using the “wtfactor” “on” and “off” mode

Lesson 3.4.4: Introduction to Complex Sample Analysis in SPSS

This lesson demonstrates how to conduct a complex sample analysis in SPSS using menu functions.

The estimated duration of this lesson is **60 minutes**.

All **red bolded and shaded text** in the presentation and the guide denotes that it is either a menu or syntax command.

Learning Objectives

Following Lesson 3.4.4 participants will be able to:

- Understand the utility of complex sample analysis
- Create a Plan file for conducting a complex sample analysis
- Conduct statistics using complex sample analysis

Companion Materials

The PowerPoint presentation **3.4.4 Introduction to Complex Sample Analysis in SPSS** accompanies this lesson as a separate file.

During this lesson, the facilitator will demonstrate for participants how to use menu functions in SPSS. Participants may follow along using the data set **Complex analysis.sav**, provided as a separate file.

Slides

Slide 1: Title Slide-Introduction to Complex Sample Analysis in SPSS

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slide 2: Implications of Complex Samples: Design Effect

What are complex samples?

The data that we work with are typically NOT simple random samples from the population of interest. It is increasingly more cost-effective and convenient to obtain samples in a more structured way, such as stratification or clustering. However, in order to make statistically valid population inferences from sample data, standard errors must be computed using procedures that take into account the complex nature of the sample design. Otherwise, the standard errors produced, as for a simple random sample, would generally underestimate the true population value. The SPSS Complex Samples module adjusts for the design effect (strata/cluster) to correctly calculate confidence intervals and standard errors using weighted data.

Before conducting a complex analysis, you will need to prepare a **Plan File**. A Plan File contains information on your sampling procedures, including a weight variable.

Slide 3–6: Impacts of Clustering on Design Effect

These slides describe how the selection of clusters tends to increase the standard errors of sample estimates, and how clustering affects the design effect.

Slide 7–8: Impacts of Stratification on Design Effect

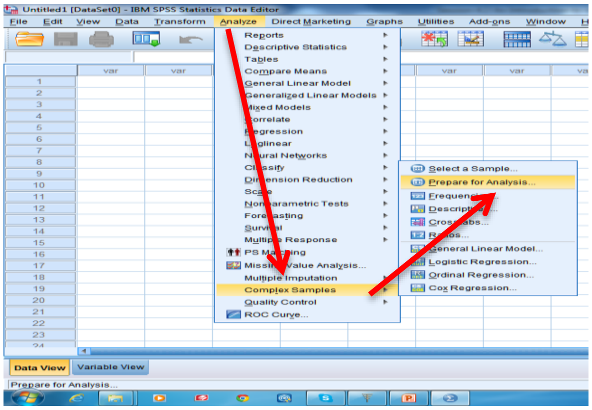
The complex samples analysis procedures require sampling weights in order to generate valid estimates. In order to create weights, we need to have information on the total number of households in the sampling frame and the number of households within each frame. Weights are derived by dividing the total number of households in the sampling frame within a district by the sample size (n). The sample weight for Barisal is 62.933 (104,785/1665), which means one sample household represents 62.933 households in the sample frame.

Slide 9–20: Preparation of Plan file

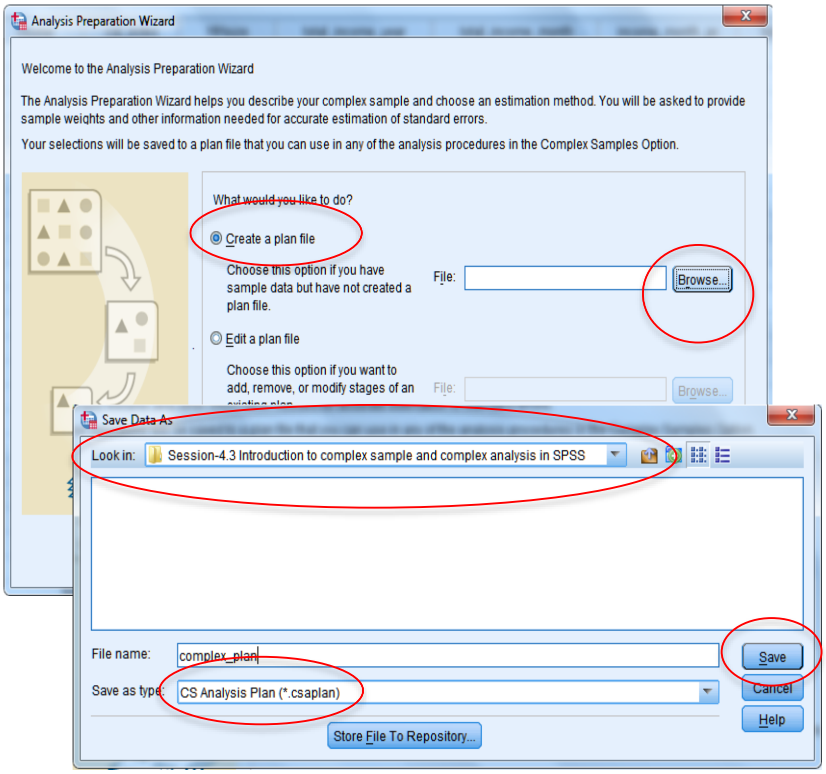
The next series of slides will demonstrate how to create a **Plan File** through menu functions in SPSS; participants are encouraged to follow along using SPSS.

Instructions to participants:

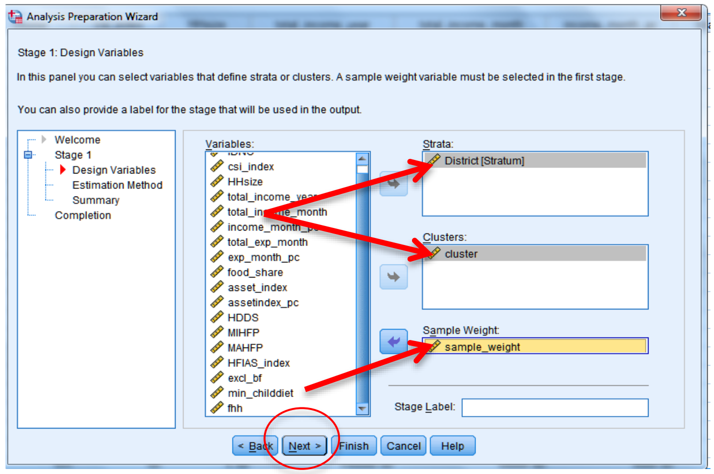
- Open data file, **Complex analysis.sav**.
- Type the recode syntax: **recode stratum (1 = 62.93) (2 = 59.49) (3=68.15) into sample_weight**
- Click on **Analyze** → **Complex Samples** → **Prepare for Analysis**



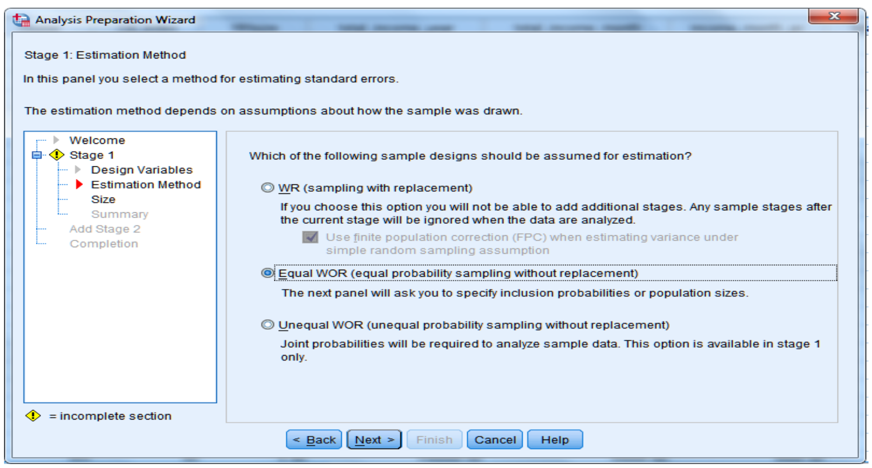
- Select "Create a plan file" and click on **Browse** to locate "Session-4.4 Introduction to complex sample analysis in SPSS"
- Type the file name "complex_plan" and click on **Save**
- Click on **Next** to go to the "Stage 1: Design Variables" window



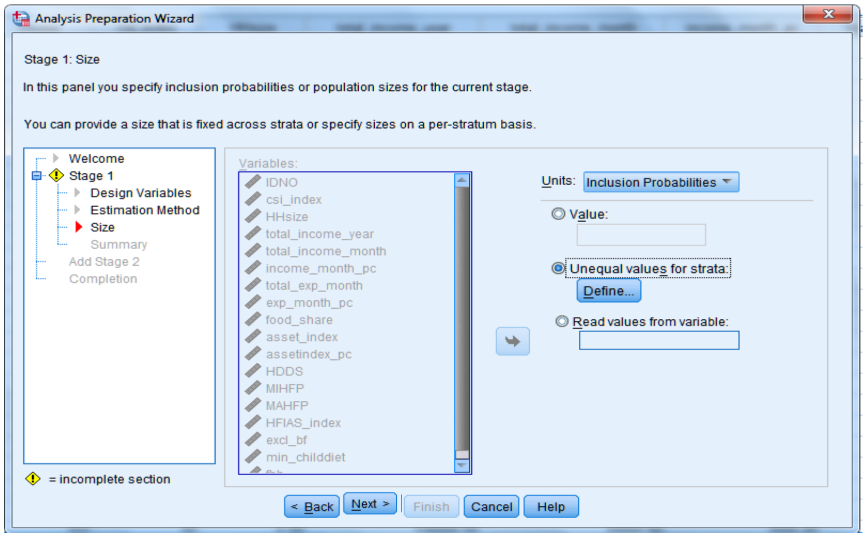
- Select the variable "Stratum" and move to the **Strata** box
- Select "cluster" and move to the **Clusters** box
- Select the variable "sample_weight" and move to the **Sample Weight** box
- Click **Next** to go to the "Stage 1: Estimation Method" window



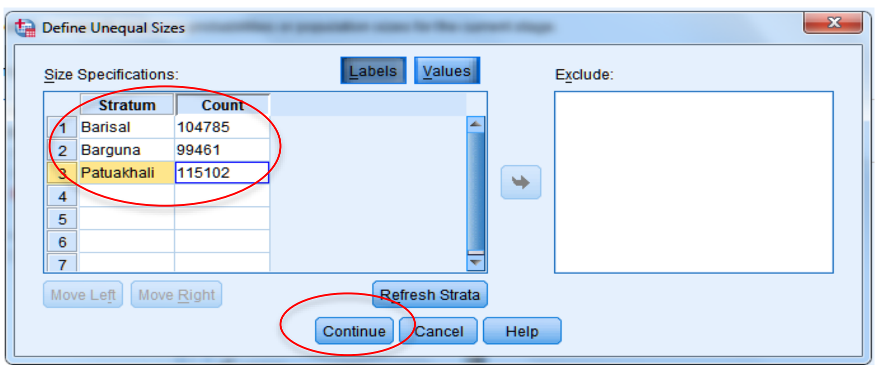
- Select “Equal NOR”
- Click on **Next** to go to the “Stage 1: Size” window



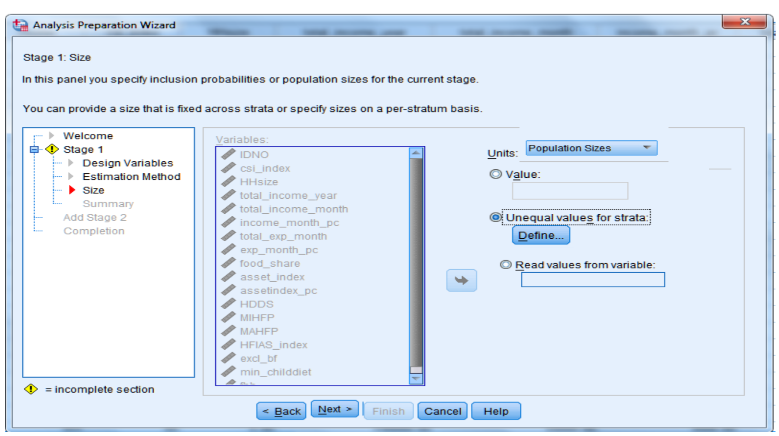
- From the **Units** pull-down tab, select “Population sizes”
- Select “Unequal values for strata”
- Click on **Define**

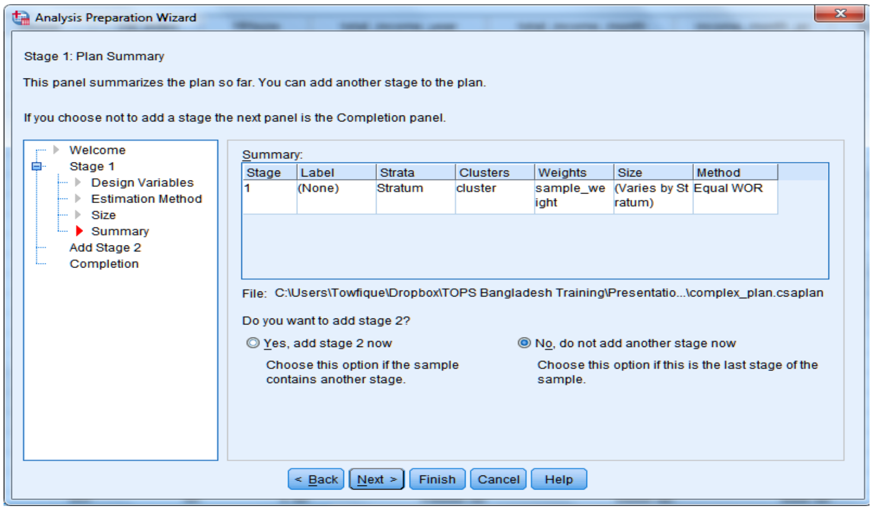


- Insert population values for Barisal, Barguna, and Patuakhali
- Click on **Continue** to return to "Stage 1: Size" window

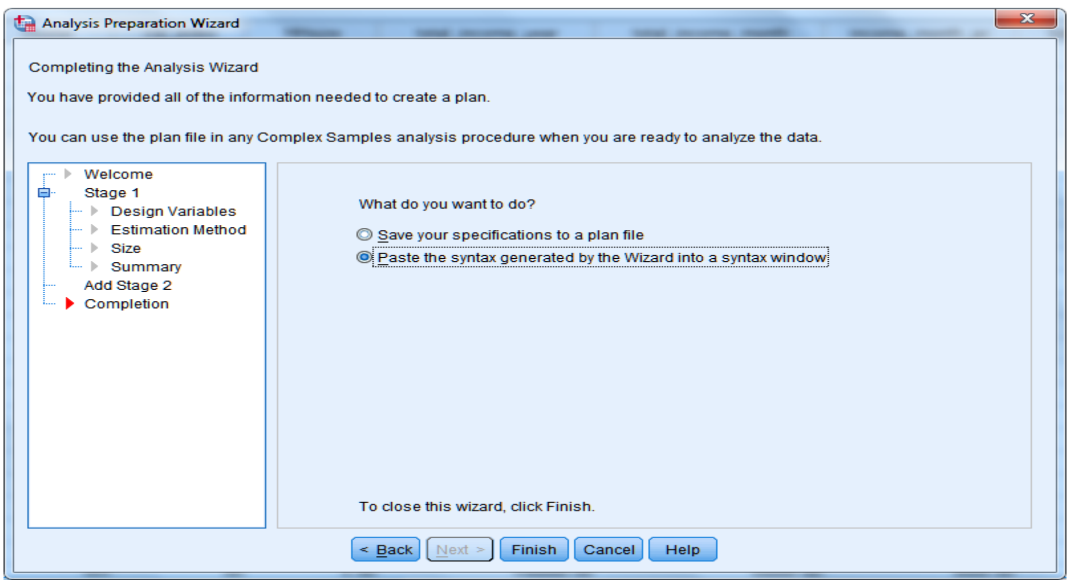


- Click on **Next** to go to the "Stage 1: Plan Summary" window
- Click on **Next**

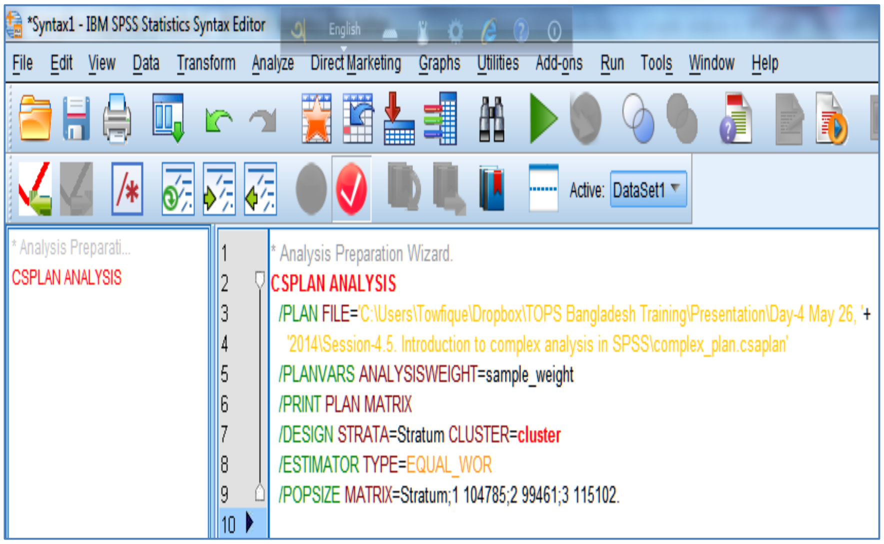




- Select “Paste the syntax generated by the wizard into a syntax window”
- Click on **Finish**



- Click on **Run** → **All**
- A plan variable will be created in the specified location

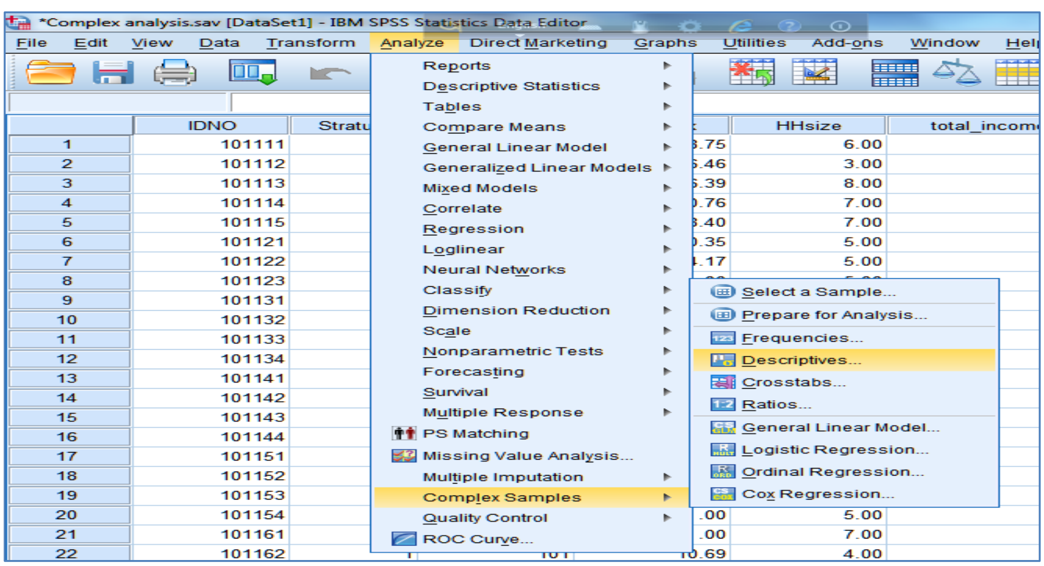


Slides 21–23: Complex Analysis

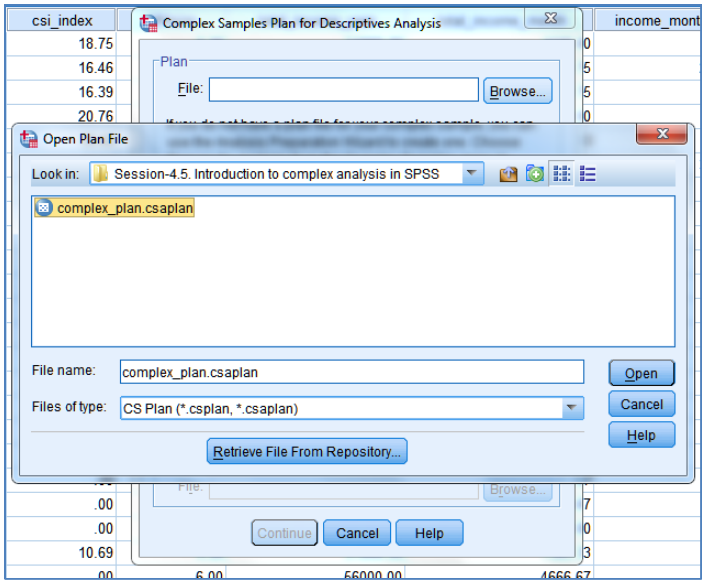
Facilitator's note: The next three slides provide an example of generating descriptive statistics with the Complex Samples module.

Instruction to participants:

- Click on **Analyze** → **Complex Samples** → **Descriptives**



- Click on **Browse** and select "complex_plan.csaplan" file
- Click on **Open**



- Select "An open dataset" and Click **Continue**
- Select "HDDS" from the **Variables** box and move to the **Measures** box
- Select "District [Stratum]" from the **Variables** box and move to the **Subpopulations** box
- Click on **Statistics** to go to "Complex Samples Descriptives: Statistics" window
- Check the "Mean, "Standard error", "Confidence interval", "Coefficient of variation" and "Design effect" boxes
- Click **Continue** to go back to "Complex Samples Descriptives" window

Facilitator's note: Be sure to indicate the different estimates produced by the Standard Direct Calculations versus the Complex Analysis, particularly for the Standard Errors and the Coefficient of Variation.

Mean Household Dietary Diversity Score

Stratum	Direct Calculation					Complex Analysis					
	Mean	SE	95% CI		CV	Mean	SE	95% CI		CV	Design effect
			Lower	Upper				Lower	Upper		
Barisal	4.96	.039	4.88	5.03	.324	4.96	.068	4.82	5.08	.014	2.97
Barguna	4.45	.036	4.38	4.53	.332	4.45	.060	4.33	4.57	.013	2.60
Patuakhali	4.75	.035	4.61	4.75	.301	4.68	.059	4.57	4.80	.013	3.14
All	4.70	.021	4.66	4.74	.323	4.70	.036	4.62	4.77	.008	2.87

Summary of Key Concepts

- SPSS Complex Samples Analysis module accounts for complex (stratified/clustered) sampling designs that correctly calculates standard errors with weighted data.
- Survey designs that call for complex sampling require different methods to calculate standard errors and confidence intervals.

Module 3: Statistical Concepts and Data Analysis Session 5

Lesson 3.5: Inferential Statistics

This lesson provides an overview of making inferences about populations from samples; statistical hypothesis tests, Type-I and Type-II errors; confidence level (alpha); P-values/significance levels of statistical tests; and various forms of testing such as chi-square, t-tests (Independent samples), and one-way ANOVA.

The estimated duration of this lesson is **120 minutes**.

Learning Objectives

Following Lesson 3.5 participants will be able to:

- Recognize multiple statistical analysis tests, understand their use and differences, and choose the appropriate test for a given data set
- Set up hypotheses that can be tested statistically (null hypothesis and alternative hypothesis)
- Interpret the results of statistical tests and effectively identify common errors
- Understand the standard error and confidence interval of a sample estimate of an indicator
- Run these statistical tests in SPSS

Companion Materials

A PowerPoint presentation **3.5_Introduction to Inferential Statistics** and the data sets **3.5 Practice dataset** and **3.5 Exercise_inferentials** accompany this lesson as separate files.

Instructions for Exercise 3.5: Introduction to Inferential Statistics is provided at the end of this lesson. Be sure to provide hard copies to each participant.

Slides

Slides 2–4: Inferential Statistics

These slides introduce the general concept that, if properly selected, the estimate of an indicator (measured as either a proportion or a mean) can be a "good" estimate of the population value of the indicator. In other words, we can make inferences about the population value of the indicator based on the estimate of the indicator computed from a sample drawn from the population.

Slide 3 explains that inferences can also be made on the basis of comparing estimates of an indicator drawn from two (or more) samples. In particular, we can draw inferences based on whether two samples are drawn from the same underlying population, or if they have been drawn from different underlying populations. As an example, based on samples drawn from "treatment" and "control" groups, we can infer whether the two groups are really different (are two different populations) or not (are from the same underlying population).

The way we make statistical inferences is by formulating "hypotheses" about a parameter (such as mean, median, standard deviation, or proportion of the sample with a given characteristic) estimated from a sample or the differences in measured parameters across two or more samples.

Slide 4 describes how we make inferences based on tests of statistical hypotheses

Slides 5–6: Hypothesis Tests

These two slides describe the procedures for defining statistical hypotheses in order to conduct statistical tests on the hypotheses. Following the usual hypothesis testing methodology, two opposing hypotheses tests are defined, the null hypothesis and the alternative hypothesis. Normal convention is the null hypothesis specifies that there is no difference between the sample parameter and the population parameter or between parameters from two samples. The alternative hypothesis is that there is a difference between sample and population parameters or between the parameters estimated from two different samples. Note that when the hypothesis is comparing the sample parameter with the population parameter, the null hypothesis is the desired result, namely that there is no difference between the sample estimate and the true parameter of the population. When comparing results across populations, the desired result is that the alternative hypothesis is true, e.g. that there is a difference in the estimated parameters between control and treatment groups.

The example at the bottom of **Slide 5** gives an example of the alternative hypothesis (what the researcher wants to prove) that stunting rate is lower (by at least 15%) in the end-line survey compared with the baseline survey.

Slide 6 gives the corresponding null hypothesis, that there is no difference in the stunting rate between the two survey rounds.

Slides 7–8: Important Statistical Terms: Type-I Error & Type-II Error

These two slides show in tables the definitions of Type-I and Type-II errors.

Slide 7 shows the table in relation to the null hypothesis (H_0), and **Slide 8** shows the same errors in relation to the alternative hypothesis (H_1). The point of these two slides is to show that the Type-I and Type-II errors are the same for either the null or the alternative hypothesis.

Slide 9: Explained with an Example

This example is based on a common indicator that is measured in FFP projects.

Slides 10–11: Test of Significance

These two slides describe the general application of statistical tests of significance to apply in hypothesis tests.

The researcher sets the desired level of significance for a test, referred to as alpha (α). The significance level can be interpreted as the probability of having a Type I error, namely that the null hypothesis is true, but we reject the null hypothesis. Naturally, we want the probability of having a Type I error to be low, so the desired significance level for the test should be low, 0.05 or lower.

We accept a result as significant (that is, we reject the null hypothesis) if the likelihood of observing the computed test statistic from our sample is less than our threshold value, alpha.

Slides 12–13: P Value (Probability Value)

The P-value is the likelihood that we will reject the null hypothesis when it is true. P-values are a common and convenient way of reporting the results for statistical significance testing. Common cut-off points include:

P value	Interpretation
> 0.05	Little evidence of a significant finding
0.01 to 0.05	Moderate evidence of a significant finding
0.001 to 0.01	Strong evidence of a significant finding
< 0.001	Very strong evidence of a significant finding

Slides 14–16: Standard Error (SE)

The standard error of a sample estimate is a statistic that quantifies the variability existing between a sample estimate compared to the population parameter the sample statistic attempts to approximate. As part of evaluation, we engage in data collection in an attempt to measure beneficiary characteristics, livelihood outcomes, etc. Evaluation, and in particular data collection, is costly. So instead of interviewing all households in a beneficiary population, we draw a sample, or a smaller set of households, that we expect to be representative of the population as a whole.

For the variables we are interested in measuring, any parameter we may calculate, such as the mean of a particular variable, is a sample mean – an approximation of the mean of the overall population. The standard error is a means of measuring how close the sample mean is to the overall population mean.

Imagine if one were to draw multiple samples from one population. The means of any given characteristic one wants to measure, across these samples, will naturally be different. The standard error represents the variability of this distribution of sample means around the true population mean. It is a measure of the "average" difference between our sample estimate of a parameter and the true value of the parameter in the population. The lower the standard error, the higher the probability that the sample mean is an accurate estimate of the sample mean, and vice-versa when the standard error is high.

The formula for calculating standard error is as follows:

SE = standard deviation / $\sqrt{n}$

An important implication of this formula is that as the sample size increases the standard error will decrease in a non-linear fashion. That is, the standard error decreases rapidly as the sample size increases.

Slides 17–18: Confidence Interval

The confidence interval is closely related to the standard estimate of the estimate of a parameter from a sample. It is an interval above and below our estimate of the parameter from our sample in which we are 95 percent confident that the true sample parameter will lie. Note that the 95% confidence interval is the most commonly reported, but we can also have confidence intervals with different significant levels, such as 90% (a narrower interval than the 95% interval) or 99% (a wider interval than the 95% interval).

The smaller the standard error of a parameter estimate, the narrower the confidence interval.

Slide 18: Facilitator: Ask the participants, can we conclude that the project target was achieved in the two cases presented in the table? First row: yes, because we are 95% confident that the actual stunting rate is less than 19.8. Second row: not so sure because we are 95% confident that the actual stunting rate is less than 20.9, so there is a greater than 5% chance that the actual stunting rate is greater than 20%.

Slide 19–21: Chi-Square Test

This is a statistical test to compare parameters of a sample that are measured as frequencies, or percentages, such as the total number of women, or the proportion of the sample that are women. This statistic is to test whether the number or proportion of women is different across sub-groups, for example if the proportion of women in the sample is the same or different across regions.

The null hypothesis is that the distribution (proportion) of the observed characteristic is the same across different sub-groups.

If the P-value for the Chi-square test is significant (i.e., it is less than our threshold level, alpha), then we reject the null hypothesis that the proportions are the same across the sub-groups.

In the example in **Slide 21**, the reported P-value for the Chi-square statistic is 0.005. Because this is a very small value, we should reject the null hypothesis that the rate of stunting is the same between boys and girls, even at the 0.01 significance level.

Slide 22–23: H_0: There is no difference in meat/beef/chicken consumption by cluster?

Slide 22: Animation: Shows the steps of how to perform a Chi-square test in SPSS, using the Crosstabs operation.

Slide 23 presents the results from a crosstab operation in SPSS, showing the results from the Chi-squared test and the asymptotic estimate of the significance level (the P-value).

Slide 24–26: T-test

While the Chi-squared test is used to test whether proportions (or totals) across sub-samples are different, the T-test is used to test whether means are different across different sub-samples.

Three types of T-tests:

1. One sample T-test – Test whether a sample mean is different from a specific value (e.g., whether a computed mean of 5.3 is different from 5.0).
2. Independent sample T-test – Test whether means from two sub-samples are different.
3. Paired samples T-test – Test whether means of related observations are different (e.g., tracking height of a panel sample of children over time).

Slide 25: The independent sample T-Test is the most commonly used test in reporting results from surveys done in FFP projects. This T-test is to test the null hypothesis that the means of two sub-groups are the same. If the P-value of the T-test is small, we reject the null hypothesis and conclude that the means of the two sub-groups are significantly different.

Slide 26: Comparing two groups within the project population. In this example the P-value is very high. That is there is a 40.6% chance of obtaining a T value of -0.832 if the mean area under paddy per household are the same in the two groups. Therefore, we do not reject the null hypothesis that the two sub-groups (Barisal and Barguna) have the same mean area under paddy per household.

Slide 27–28: Comparing two groups within the project population using SPSS

Slide 27: Animation: Shows how to conduct an independent sample t-test using the compare means option in SPSS.

Slide 28 shows the results from the independent samples T-test.

In the SPSS output, results are given for two alternative assumptions a) that the variances of the variable being measured are the same between the two sub-groups, and b) the variances are different between the two sub-groups. The results from the Levene's Test for Equality of Variances are used to decide which of these two alternative measures to use. If the P-value for the Levene's test (second column in the table) is below our alpha cutoff level, we reject the null hypothesis and assume that the variances between the two groups are not equal. If the P-value of the Levene's test is above our alpha threshold, we accept the null hypothesis that variances are equal. In the example, the P-value (sig.) is 0.000, so we conclude that the variances are not equal across the two groups, and we use the results from the second row in the table.

Slide 29: Analysis of Variance or ANOVA

The T-test can only be used to compare means across two sub-samples. If we have more than two sub-samples (e.g., we want to compare across four regions that are included in our sample), we can use Analysis of Variance (ANOVA). The One-Way ANOVA option of the Compare Means command in SPSS provides an F-statistic and corresponding significance level (P-value) for the statistic, for the test of whether the means are the same across all the groups in the analysis.

Slide 30–32: ANOVA Test in SPSS

In SPSS, the first step is to run ANOVA get the F-test to see if there are any differences in means across the sub-groups.

If the P-value of the F-test is "high" (above the alpha value set by the analyst), then accept the null hypothesis that the means across the subgroups are not different.

If the P-value is low (0.00 in the example shown in **Slide 31**) then we conclude the means are different across the subgroups. In this case we want to run the ANOVA and select "post-hoc" tests for differences across the subgroups. The most comment tests are the Sheffe and Bonferoni tests. If the variances across the subgroups are likely to be unequal, then you can use the Tamhane's T2, Dunnett's T3, Games-Howell, and Dunnett's C are other tests you can select. Note that in most cases the results from all these tests are quite similar.

Exercise 3.5: Inferential Statistics (Slides 33–34)

Ask the group to follow the instructions on the screen. Give them 60 minutes to perform the tasks. Afterwards, project your laptop and work through the same tasks, answering questions as they arise.

Summary of Key Concepts

- Using samples to make inferences about populations
- Statistical hypothesis tests, Type-I and Type-II errors
- Confidence level (alpha)
- P-values /significance levels of statistical tests
- Chi-square test
- T-test (Independent samples)
- One-way ANOVA

Instructions for Exercise 3.5: Introduction to Inferential Statistics

Use the SPSS data file **Exercise 8 inferential statistics_1**

Calculate the confidence interval for mean age by district

Want to see the difference in profession by districts; Create a crosstab for the variables "district" in the column and "profession" in the row; Interpret the chi-square test results

Test the mean age difference for districts Barisal and Barguna using the variables "age" and "district" (compare two groups); Interpret the test results

Test the mean age difference for all three districts using the variables "age" and "district" (one-way ANOVA); Interpret the test results

Module 3:
Statistical Concepts and Data Analysis
Session 6

Lesson 3.6.1: Data Cleaning

This lesson introduces sources of error that can occur in a dataset and the visual and statistical techniques that can be used to identify and address them.

The estimated duration of this lesson is **60 minutes**.

Learning Objectives

Following Lesson 3.6.1 participants will be able to:

- Recognize common sources of errors in data sets
- Apply the appropriate techniques to identify and address errors
- Develop processes for documenting errors

Companion Materials

The PowerPoint presentation **3.6.1_Data Cleaning** accompanies this lesson as a separate file.

Be sure to provide hard copies of the slides to each participant at the beginning of the session.

Slides

Slide 1: Title Slide-Data Cleaning

Facilitator's note: Insert date, location of training, and name of facilitators on title slide.

Slides 2–3: Dataset Cleaning Overview

Cleaning data is a necessary step that takes place after data has been entered and before conducting any analysis. Nearly every dataset will contain some errors or values that are not valid. Most importantly, if the errors are not identified and addressed or corrected, the results from our analyses will be misleading. A good data analysis plan allocates at least 25–30% of the time devoted entirely to cleaning the data.

In addition, some errors may be more common when using a paper-based questionnaire, which is becoming less common. On the other hand, electronic data collection tools such as tablets are not necessarily error-free.

The first step is **detecting** errors in our data. We do this by:

1. Checking for outlier values within quantitative variables.
2. Checking for logical inconsistencies between variables.
3. Checking for missing values and out of range values in categorical variable.

The next step entails **correcting** the errors, which will be discussed later.

Slide 4: Outliers

An **outlier** is a data point that is outside the expected range and is either extremely small or extremely large when compared to the rest of the dataset. Outliers do not follow the pattern that the rest of the dataset does.

An outlier, or data point that unduly influences the results, is influential. However, not all outliers are influential.

Slide 5: Sources of Error

The most common sources of errors in our data stem from:

- Errors in coding data
- Errors in data collection (interviewer errors)
- Errors in data entry

Slide 6: Coding Errors

A common source of error occurs when coding the variable response categories. This happens while the data file is being constructed for data entry. For example:

- Missing data coded as 999, 99 or other value
- "Not applicable" or "blank" coded as "0" (zero)

Facilitator: Ask participants to identify the error in the table. A valid response category for health status is "good", which could have a numeric value of "1" associated with it. Examining the frequency of response categories endorsed can reveal that "good" was also mistakenly coded as a "2".

Slide 7: Data Collection Errors

Another common source of error can occur during the data collection process, such as mismarking or skipping questions. The example provided illustrates that a respondent indicated that he or she participates in a program in question e, but the following question of why he or she does not participate in the program does not match the first response.

Slides 8–9: Data Entry Errors and Examples of Error

Personnel are another source of error. Examples include:

1. Age of Household Head: __5__
2. Sex: **_3_** (Male = 1; Female = 2)
3. Value of a bicycle **450,000 Taka**
4. How many water pumps do you own? **1000**
5. Column Shift – data was entered into the wrong column

Slides 10–11: Missing Data

Every survey is at risk of missing data for various reasons. Data may be missing at random, but a distinct pattern of too many missing data values may indicate a problem with the question. These might include:

- Misunderstanding by respondents
- Invalid questionnaire logic (or not understood by some enumerators), or
- Because it is a poorly written question

Thoughtful consideration of viable response options is required during the questionnaire design phase. For example, 0 has a different meaning from Not Applicable, which is different from Missing, which would be no answer. Emphasis should be placed on how to deal with these types of possible responses.

Detecting missing data is part of the data cleaning step that occurs before any analysis can be done.

Slide 12: Detecting Errors

To begin cleaning the data, we first need to detect whether there are any errors. This is typically done by taking a look visually at the actual data and then statistically determining any errors.

Slide 13: Visual Techniques for Detecting Errors

Taking a preliminary look at key variables in the dataset in the SPSS Data View window can help to identify missing values or errors in the data. Direct the participant to look at the “Missing” column in the Variable View window to make sure that any discrete codes (e.g., 99, 999) are not used in place of “not applicable.”

Slide 14: Statistical Techniques for Detecting Errors

The three main procedures available in SPSS to detect errors include:

1. Descriptive Statistics
2. Histograms
3. Scatter plots

Slides 15–17: Using Explore Feature

The Explore feature in SPSS produces multiple statistics for the data cleaning process.

Begin by clicking: **Analyze → Descriptive Statistics → Explore → Statistics.**

M-estimators provide robust alternatives to the sample mean and median for estimating the center of the distribution. Outliers will greatly affect these statistics.

Clicking the option for Outliers will display the five largest and smallest values, including which cases they are associated with.

The Descriptives option allows you to look at the mean, median, and standard deviation of your variable of interest. It is useful to inspect the range of expected values, as well as the 5% Trimmed Mean.

Compare the robust alternatives provided in the M-Estimators output to the Descriptives. Again, outliers will perturb these values. The Extreme Values table output provides the largest and smallest 5 extreme values, as well as the case number.

Slide 18: Histogram

Histograms are a useful visual tool to explore the distribution of the expected range of variable values.

Facilitator: Prompt students to identify potential outlier value associated with area of rice cultivated.

Slide 19: Scatter plots

Scatter plots are another useful visual tool to inspect for outlier values.

Facilitator: Prompt students to identify outlier values.

Slides 20–21: What to do when mistakes and/or inconsistencies are found

1. Never change the data set unless it is clearly just an error in data entry.
2. Determine first whether it is an error on the questionnaire or a data entry error.

3. If it is a data entry error, it can be changed.
4. If other errors are found, refer back to the original questionnaires, and talk to the enumerators or the enumerator supervisors to gain insight into the error.
5. For values considered to be outliers, the design team should decide how to include the case in the analysis but should have clear documentation of which values, if any, were excluded from analysis, and why.
6. Values for missing data should be assigned during the survey design stage.

Slides 22–27: Dealing with the Errors

Slide 23:

- For datasets that have very few errors, it is useful to set them to "missing" using the recoding scheme.
- To define missing values, go to Variable View window and click the Missing Values box for the variable of interest.
- Insert the values that you want to set to missing.

Slide 24:

Use Household ID (HHID) to identify where in the questionnaire the errors are occurring and make corrections. If the questionnaire is not available, you can set the error values equal to the median value of the variable or by strata. Household size could be such an example.

Slide 25:

- You can separately estimate the median and replace using the technique that we discussed in the last slide.
- You can use SPSS to replace missing values with the mean of nearby points. You can set the span of nearby points. The span of nearby points is the number of valid values above and below the missing value used to compute the mean.
- You can use SPSS to replace missing values with the median of valid surrounding values. You can set the span of nearby points.

Slide 26:

To replace the missing values with the mean and median of nearby points, you first need to set the values to missing:

- Click **Transform → Replace Missing Values**
- Next, identify the variable and move it to the right window labeled "New Variable(s)"
- Define the method
- Set the value of nearby points

Slide 27:

- Linear interpolation. Replaces missing values using a linear interpolation. The last valid value before the missing value and the first valid value after the missing value are used for the interpolation.
- Linear trend at point. Using a liner regression, it replaces missing values with the predicted values.

Slides 28–29: Documentation

Documenting is a vital component of the data cleaning process. Ideally, you want to be able to replicate the original data set without questions of how or why something is not correct. Questions to keep in mind while documenting include, but are not limited, to:

- What percent of data has errors?
- If you have left some data out from the analysis, explain what percent.
- If you have replaced the errors, explain why and how.

Facilitator: Engage participants in other kinds of issues to document.

Summary of Key Concepts

- Data cleaning is a necessary step before conducting any analysis.
- Detecting and correcting errors will ensure the results are valid.
- Keeping a log of what was changed, why it was changed, and how it was changed keeps the integrity of the data analysis intact.

Lesson 3.6.2: Making Data Meaningful

This lesson introduces effective means of communicating data visually.

The estimated duration of this lesson is **60 minutes**.

Learning Objectives

Following Lesson 3.6.2 participants will be able to:

- Select the best format to effectively display data visually
- Analyze different forms of presentation and discuss the pros and cons of the data presentation
- Create visuals that properly communicate data and are easily understood by the target audience

Companion Materials

The PowerPoint presentation **3.6.2 Making data meaningful** accompanies this lesson as a separate file.

Slides

Slide 1: Title Slide – Making Data Meaningful

Facilitator: Insert date, location of training, and name of facilitators on title slide.

Slide 2: Communicating Results

Visually displaying your data is a key way to understand, interpret, and communicate what they mean and how they relate to your research questions.

There are many ways, including:

- Tables
- Charts/Graphs
- Maps
- Pictures

Slides 3–5: Context Matters

Facilitator: Slides 3 and 4 illustrate how easy it is to misrepresent what is being communicated based on how things are put into context.

Slide 3: In this example, the reader visually perceives that the top part of the vertical bar is darker; however, the bar is the same shade of gray all the way across. It is not clear to the reader that there is no distinction. Thus, the context influences what we perceive.

Slide 4: In this example, both circles A and B are the same size, but the reader may perceive one is bigger than the other. What does this say about context?

Slide 5: The human mind automatically sees objects in the context of their surroundings. Because of this, it is important to be careful when producing visual displays of your data. It is easy to distort the user's interpretation, even with the best of intentions. In the two examples, the objects are perceived in the context of their surroundings. Likewise, the use of graphs, charts, and other visual illustrations of data in our reports can have the same effect when the context in which they are presented distort the way the reader perceives the information. In this lesson, we will learn how to clearly communicate our data so that it is meaningful to the reader.

Slide 6: Checklists for developing good data visualizations

It is useful to have a checklist to ensure that important and relevant questions are being adequately addressed. Questions to include:

- Who is the intended audience or target group?
- What is the role of the graphic in the overall presentation?
- How and where will the message be presented?
- What are contextual issues to consider that may distort understanding?
- Would a textual analysis or a data table would be a better solution?
- What accessibility issues need to be considered?
- Is there consistency across data visualizations?
- Keep in mind the size, duration, and complexity
- Have you considered possible misinterpretations?

Slide 7: Presenting Data in Tables

Tables can be an effective way to display data and results. Although SPSS offers a variety of options, many analysts export results to an Excel file to generate bar charts and other graphical displays.

Most importantly, the analysis will only be as useful as the ability to interpret the results.

Slides 8–9: Components of a Table

Tables are composed of four essential elements including a title, column headers, row stubs, and the table body. Footnotes and data sources should be included when indicated.

Slide 8: A **table title** is placed above the body of the table. It should be descriptive but remain short and concise; explanation or interpretation of the data should take place in the text. It also addresses the "what", "where", and "when" of the data. Avoid using verbs; titles are not complete sentences but rather a way to help inform the reader of the table's content and organization.

Column headers allow the reader to quickly identify the data that is presented in each column of the table, thus should remain both brief and descriptive. Units of measurement, time period, or geographic area should also be included.

Slide 9: Row stubs are located in the first column of the table and should identify the data presented in each row of the table.

The **table body** is where the data, both numerical and textual, is displayed in the table. **Footnotes** and **data sources** are located at the bottom of the table as references. Footnotes provide additional information needed to understand and use the data correctly. The data source cites where the data was obtained and is especially important when using secondary data.

Slides 10–15: Tips for a good table

Slide 10: Emphasis should be placed on 'less is more' when displaying information through tables, particularly for presentations. Use only a subset of the data and limit the number of rows and columns so that your audience is not distracted by irrelevant numbers.

Slide 11: Other useful issues to consider include:

- Data values should be set out so key information can be extracted easily.
- Columns should be evenly spaced and not too far apart.
- Lines or subtle shading can also be used to encourage users to read horizontally.
- Avoid unnecessary text.
- Use a minimum of decimal places.

Slide 12: Align values; consider a space to separate 1,000 to avoid translation issues; avoid centering

Slide 13: Avoid empty cells, but include an indicator of why it was not presented (e.g., not available or not applicable)

Slide 14: What could be improved on the table?

Facilitator: before moving to Slide 15, ask participants to list how the table could be improved?

Slide 15: How was table improved?

Slide 16: Presenting Data in Charts/Graphs

Graphs and Charts can oftentimes be a more effective way to communicate data than in table format. Key questions to consider are:

- Comparison: How much? Which item is bigger or smaller?
- Changes over time: How does a variable evolve?
- Frequency distribution: How are the items distributed? What are the differences?
- Correlation: Are two variables linked?
- Relative share of a whole: How does one item compare to the total?

Slide 17: Checklist for designing a good chart

Designing an effective chart begins by considering the following:

1. Define your target audience: What do they know about the issue?
2. Determine the message you want to communicate: What do the data show? Is there more than one message?
3. Determine the nature of your message: Do you want to compare items, show time trends, or analyze relationships in your data?

Slide 18: Criteria of a good chart

An effective chart:

- Grabs the reader's attention
- Presents the information simply, clearly and accurately
- Does not mislead
- Displays the data in a concentrated way (e.g. one line chart instead of many pie charts)
- Facilitates data comparison and highlights trends and differences
- Illustrates messages, themes or storylines in the accompanying text

Slide 19: When it may not be appropriate to use charts

Situations when it is a good idea NOT to use a chart include when your data:

- are widely dispersed
- have too few values
- have too many values
- show little or no variation

Slide 20: Incorporating Standard Deviation in Bar Charts

Standard Deviations are useful statistics to include in bar charts in order to illustrate the degree of variation in your data. Males might own more land than females, but there is considerably more variation in their ownership than among females.

Slide 21: Bad example of a Line Chart

Facilitator: Ask participants to identify why this is not a good Line chart. Consider the long title, too many lines, different colors, etc.

Slide 22: Good example of a Line Chart

Facilitator: Ask participants to identify why this is a better Line chart. Consider the title, number of lines, etc.

Slide 23: Good example of a Bar Chart

Facilitator: Ask participants to identify why this is a good Bar chart. Consider the title, the horizontal display, etc.

Slide 24: Good example of a Pie Chart

An effective Pie chart can display percentage distribution of one variable with up to a reasonable number of categories (usually no more than six).

Notice that the same colors are used across categories and were labeled with their category names and data values for each pie segment. Doing this allows the reader to easily compare and glean the information across the two pie charts.

Slide 25: Good example of a Scatter Plot

Scatter plots are a useful way to illustrate the relationship between two variables. It is important to keep in mind the metric of each variable (continuous, ordinal, or dichotomous).

Facilitator: Ask participants to interpret this slide.

Slides 26–29: Examples of good and bad charts

Slide 26: Using multiple colors in bar charts can be difficult to discern when printed in black and white. It is better to use different textures. Presenting data in alphabetical order is discouraged. Rather, present the data in order of magnitude.

Slide 27: It is better to minimize the use of gridlines, especially if the data values are being displayed. Colors, again, do not always transfer when documents are printed in black and white.

Slide 28: One of the biggest misleading elements in a chart is the scale along the vertical, or y-axis. The y-axis should begin at zero to avoid the illusion that a difference is bigger than in reality.

Slide 29: Avoid displaying data in 3D format as it detracts from the perspective of proportions.

Slide 30: Determining what chart to use

When deciding which chart is best to use to communicate your data, ask yourself the following questions:

- Is the data nominal, where you can count but not order or measure the data? *If so, consider using a bar chart.*
- Does the data have an independent variable such as time? Does the data have one value for each independent variable? Do you want to see trends in the data? *If so, consider using a line chart.*
- Is the data ordinal, where the data has arbitrary values based on a scale? *If so, consider using either a bar or line chart.*
- Are there many categories with one variable you can illustrate using percentages? *If so, consider using a pie chart.*
- Do you wish to establish a relationship between two variables? Are there several data points to compare that does not easily demonstrate a trend using line segments between each point? *If so, consider using a scatter plot.*

Slide 31: Using maps in statistics

Maps are the most efficient way to communicate spatial patterns and geographic information. They also lend themselves to be able to:

- Compare different areas
- Summarize a large volume of data and reduce their complexity
- Communicate your message clearly

- Attract people's attention
- Store spatial information in a geographical information system

Slide 32: Characteristics of a good map

Several characteristics to consider when using maps are:

- Is it simple and easily understood?
- Does it have a clear and objective message?
- Does it give an accurate representation of the data? Is it misleading in any way?
- Does it attract the reader's attention to the most important information?
- Is it presented well? Is it attractive?
- Does it fit the output format and your audience?
- Can it stand by itself without further explanation?
- Is it accessible to color-blind persons?

Slide 33: Good examples of maps

Facilitator: Ask participants why these make good maps?

Slide 34: Example of a bad map

Facilitator: Ask participants why this a bad map?

Notice how this map lacks a title, a legend, and overuses both labels and colors.

Slide 35–36: Components of a map

Several components need to be considered when making an effective map. These include:

Slide 35:

- Informative title
- Clearly identified legends
- Geographic units are identified, either in the title (or subtitle) or in a legend
- Text labels help identify important or relevant places or other information

Slide 36:

- Scale helps the user measure distances and compare different maps
- Footnotes provide definitions or other methodological information
- Data source identified at the bottom of the map
- Copyright information identifies the author responsible for its content

Summary of Key Concepts

- **Visual displays** of data (tables, charts/graphs, maps) can be efficient and effective ways to communicate information.
- Data that have little variation, too few values or too many values are not good candidates for visual displays.
- The context in which data are displayed can either clarify information or dilute it. Different types of data will be more conducive to some forms of display and not others.

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