A District Health System Managers Guide to

Using Data to Measure Health Program Performance

FACILITATOR'S MANUAL



IPSI

India Primary Health Care Support Initiative

About the Document

This document serves as the **Facilitator's Manual** for conducting training for district- and block-level health system managers on the effective use of data to measure health care program performance. The complete training package comprises three components: (i) the Facilitator's Manual, (ii) Module slides, and (iii) Exercise instruction sheets. The complete training package is available at https://jhu-ipsi.com/

The manual is intended to serve as a resource for program managers at the district and state health departments. Program officers at the district level are exposed to vast amounts of data related to availability of inputs and processes that is generated by the health system. Some of this data is used by these managers to understand how well programs under them are performing. Yet, the level of analytics that program managers apply to this data is quite basic and limited in the insights it generates. A bit more sophisticated analytical techniques can generate greater actionable insights into how programs perform. This is the goal of this manual. It can be used by government and other public health institutions to conduct capacity-building programs for district- health system managers, as well as, a ready reference for health system managers seeking to improve their analytical skills.

The manual has been developed under the India Primary Health Care Support Initiative (IPSI), a consortium of schools of public health and public health institutions working to strengthen primary health care systems in India. The IPSI consortium is led by Johns Hopkins University, USA and its partners include – All India Institute of Medical Sciences-Delhi; Indian Institute of Public Health-Gandhinagar, Gujarat; Indian Institute of Public Health-Shillong, Meghalaya; All India Institute of Medical Sciences-Bhubaneshwar, Odisha; State Health Systems Resource Centre, Gujarat; and JHPIEGO- India.

An innovative feature of this training is that it is focused on the application of data analytics to data generated by the health system. This manual has been used to train district health system managers. The experiences and feedback from these training programs have informed the training content, facilitation approaches, exercises, and this manual. The manual therefore is a 'field' tested guide, and it is intended to support future adaptation and scale-up. We hope that this manual will serve as a **practical and useful resource for state health departments and public health institutions** in strengthening the capacity of district health system managers to use data effectively for better program monitoring, decision-making, and health system performance.

Acknowledgments

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Abbreviations

AAMs	Ayushman Arogya Mandirs
AIIMS	All India Institute of Medical Sciences
ANC	Antenatal Care
ASHA	Accredited Social Health Activist
CHOs	Community Health Officers
DQR	Data Quality Review
DVDMS	Drug and Vaccine Distribution Management System
HBNC	Home-Based Newborn Care
HMIS	Health Management Information System
IQR	Interquartile Range
JHU	Johns Hopkins University
LWB	Low Birthweight
M&E	Monitoring and Evaluation
MUAC	Mid-Upper Arm Circumference
NCDs	Non-Communicable Diseases
NFHS	National Family Health Survey
NHM	National Health Mission
NQAS	National Quality Assurance Standards
OPD	Outpatient Department
RCH	Reproductive and Child Health
RKSK	Rashtriya Kishor Swasthya Karyakram
SBAR	Situation, Background, Assessment, and Recommendation
SD	Standard Deviation
SMART	Specific, Measurable, Achievable, Relevant, and Time-bound
SRS	Sample Registration System
TB	Tuberculosis
UNICEF	United Nations Children's Fund
VHSNC	Village Health, Sanitation, and Nutrition Committee
WHO	World Health Organization

CONTENTS

About the Document *i*
Acknowledgments *ii*
List of Contributors *ii*
Abbreviations *iii*

Introduction **1**

Organizing the Training **4**

Section 1: Measuring Program Performance **7**
Module 1.1: Monitoring Health Program Performance 7
Module 1.2: Indicator Construction and Data Sources 13

Section 2: Analyzing and Communicating Data **21**
Module 2.1: Describing Data Effectively 21
Module 2.2: Describing and Communicating Data Effectively – Numerical Data 30
Module 2.3: Describing and Communicating Data Effectively – Categorical Data 37

Section 3: Measuring Population Health **43**
Module 3.1: Estimating Service Coverage 43

Section 4: Assessing Data Quality **52**
Module: 4.1: Right Data – Right Decisions: Approach to Data Quality 52

Reading Resources *63*

Introduction

Why was this training developed?

The district (or similar administrative area) is an important unit in any country's health system. The district health office is tasked with the critical role of maintaining health of people in the district. Among the many functions of the district health office, it is responsible for providing health services to the district's population, ensuring that services are of good quality and coverage, and collecting information and monitoring health of the district population. The ability of the district health office to perform these functions effectively depends, in part, on the knowledge and skills of these health system managers. One of the key competencies required for these roles is the ability to **use data effectively for decision-making**.

Program managers at the district level use data for program planning, and monitoring. To do this effectively they need to possess several competencies – skills related to compiling and managing data across various data platforms in line with data policies; knowledge of assessing and addressing quality issues with data; ability to analyze and interpret data using appropriate methods; identifying implementation gaps, and strategies to address the gaps; and, presenting these findings through clear, and persuasive reports.

Evidence from different parts of India has highlighted challenges in the use of administrative data, as well as gaps in the analytical skills required by health managers to generate meaningful learnings from this data[1,2]. Findings from a training needs assessment conducted by IPSI in three states further corroborated these observations. The assessment identified a need to strengthen the capacity of district- and block-level health managers to assess data quality and understand and analyze routine health system data[3]. These findings highlighted the need for a **practical, competency-focused training that enables health system managers to use the data they routinely collect to understand program performance and guide action**.

How was the training content developed?

The training content was developed through an iterative and consultative process, drawing on existing training resources, and the experiences and needs of district health system managers.

First, a review of the literature on competencies related to data use was undertaken. This was complemented with a review of courses and workshops on data use for program managers developed by government organizations and academic institutions. This helped define the scope and key areas to be covered by the training. Next, we conducted

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[1] *Nongkynrih, Baridalyne, Harshal Ramesh Salve, and Anand Krishnan. "Training needs assessment of national non-communicable disease program managers in India." Journal of Public Health and Emergency 5 (2021).*

[2] *Nongrum, Melari Shisha, et al. "Disconnected data: mHealth data systems and challenges for primary health care workers in India." SSM-Health Systems (2025): 100124.*

[3] *Malhotra Sumit et al, "Training needs in Comprehensive Primary Health Care for health care providers in three districts of India" Primary Healthcare Matters. India Primary Healthcare Support Initiative (June 2024).*

structured consultations with district program managers to identify priority areas for capacity building and to contextualize the training content and learning modalities. Based on these inputs, draft training content was developed collaboratively by IPSI partner organizations.

The draft content was subsequently reviewed by experts from AIIMS, New Delhi, and Johns Hopkins University, and their feedback was incorporated. The revised content was then shared with the state and district health departments in the pilot districts. A second round of consultations with district managers was undertaken to further refine and finalize the training content.

The design and materials in this training have been **co-developed with health system managers and informed by their experiences and learning needs**. An innovative feature of this training is that it is focused on the application of data analytics to data generated by the health system. The training content and exercises are designed to be relevant to the routine responsibilities of district and block managers and to support the application of learning to their own program data and work contexts.

What this training aims to achieve?

Training objective: **This training aims to strengthen knowledge and skills related to the use of data to measure program performance of district health system managers.**

In this training, participants will learn to:

1. Frame questions that can be answered using routine administrative data sources.
2. Apply basic data analysis and data visualization techniques to routine data.
3. Identify issues with data quality and ways to address them.
4. Estimate service coverage indicators.
5. Develop a framework for measuring program performance.

Training modalities and content

The training is grounded in adult learning principles, with an emphasis on reflective and experiential learning. District health system managers work with data as part of their routine responsibilities and bring substantial contextual knowledge about their programs, health systems, and the challenges associated with data use. The training therefore builds on participants' existing knowledge and experiences and provides them with practical approaches and tools that can be applied to their day-to-day work.

The training does not seek to replicate routine training programs on health information systems, reporting formats, or data-entry processes. It focuses on strengthening the competencies required to analyze, visualize, interpret, and present routine data in a meaningful way to understand program performance and inform action.

- Modality: In-person

This training is designed as an in-person training program. In our experience, this is effective for teaching skills and sharing learnings through group work and discussion-based exercises. The trainers, however, can join in-person or virtually. A team of facilitators to facilitate the group work and discussions (one facilitator per group) is required for effective delivery of the training.

- Duration: 20 hours

Training content requires 16-17 hours, followed by 3 hours of final project presentations by the participants. The content is designed to be delivered through in-person sessions over 3 to 4 days. However, because the training content is in modules, it can be delivered in flexible ways i.e., shorter sessions of 2-3 hours each day to be completed within a month. The modular structure of the training allows for such adaptations.

- Training structure

The training has been divided in four sections corresponding to the four key learning objectives. Each section has one to three modules, and there are seven such modules. The following table describes the training structure in brief.

Section and modules	
Section 1: Measuring Program Performance	
Module 1.1	Monitoring health program performance
Module 1.2	Indicator construction and data sources
Section 2: Analyzing and Communicating Data	
Module 2.1	Describing data effectively
Module 2.2	Describing and communicating data effectively: Numerical data
Module 2.3	Describing and communicating data effectively: Categorical data
Section 3: Measuring Population Health	
Module 3.1	Estimating service coverage
Section 4: Assessing Data Quality	
Module 4.1	Right data – Right decisions: Approach to data quality
Final presentation of the group project work	

Each module is 2-3 hours long and is structured so that the first half is a didactic session containing lectures and reflection activities. During the second half of the session, participants will work on group exercises and apply the module lessons to their own district data. They will work on a group project over the course of training using their own district data to assess the performance of a health program and prepare a presentation for a review meeting. At the end of the training, the groups will present the project to their colleagues and the trainers.

- Target audience

The training is intended for health system managers working at the district levels. There are no specific educational qualifications or pre-service training requirements for participation. However, participants should have a basic working knowledge of Microsoft Excel and access to a laptop for participating in practical exercises and data analysis activities.

- Trainers/facilitators and coordinators

Coordinators supporting the training should be familiar with the training content and have experience in facilitating group-based learning, practical exercises, and discussions. A combination of trainers with technical expertise in data analysis and coordinators with practical experience in health program implementation can help ensure that the training remains both technically sound and relevant to participants' day-to-day work.

Organizing the Training

Guidelines, Norms, Group Arrangements, and Logistics

This section provides practical guidance for preparing and facilitating the training workshop. It covers the facilitator's role, learning environment, workshop norms, group arrangements, and key logistical requirements.

Facilitator Guidelines

The facilitator sets the tone for the workshop and is responsible for both effective content delivery and a positive learning process. Before the workshop, facilitators should familiarize themselves with the session objectives, presentation slides, facilitator notes, activities, and expected timings, and ensure that all required materials and equipment are ready.

During the workshop, facilitators should:

- **Create an inclusive and respectful learning environment:** Encourage participation from all participants, value different perspectives, and manage dominant or less vocal participants appropriately.
- **Keep the learning participatory and practical:** Use discussions, group work, case studies, problem-solving, and participants' own experiences rather than relying primarily on presentations.
- **Connect learning to practice:** Help participants relate concepts and exercises to their own programs and work contexts. Examples and scenarios may be adapted to reflect local needs.
- **Manage time, flow, and energy:** Keep sessions on schedule while allowing space for meaningful discussion. Provide clear instructions, make smooth transitions between activities, and use breaks or energizers when appropriate.
- **Facilitate objectively and constructively:** Remain neutral when discussing differing views, handle disagreements respectfully, and keep discussions focused on the learning objectives.
- **Observe and adapt:** Pay attention to participants' engagement, questions, and areas of confusion, and adjust the pace, examples, or facilitation approach as needed. Summarize key messages and encourage participants to reflect on how they can apply the learning. Use the breaks to check in informally with participants and gauge if any individual/group requires extra attention.

Workshop Norms and Ground Rules

At the beginning of the workshop, invite participants to agree on a few simple norms that will support a productive learning environment. These should include:

- Being punctual and returning from breaks on time.
- Participating actively and sharing relevant experiences and perspectives.

- Listening respectfully and allowing others to speak without interruption.
- Respecting different opinions and maintaining confidentiality where required.
- Keeping discussions focused and solution oriented.
- Asking questions freely and seek clarification when needed.
- Minimizing distractions, including unnecessary phone use and side conversations.

Tip for Facilitators

Rather than simply reading the norms aloud, invite participants to suggest any additional ground rules that would help them learn effectively. Once agreed, display the norms where they remain visible throughout the workshop.

Group Assignments

Groups should be formed at the beginning of the workshop and remain unchanged throughout all three days. Participants will complete the exercises in their respective groups, allowing them to build on their learning and experience throughout the workshop. Groups should have 5–6 participants each, mixing district- and block-level officers so each group has varied program exposure. For all the group exercises across the modules, participants will work in the same group. The matrix below suggests the groupings. This is a suggestive list and states/districts can change these groups as per their requirement.

Group 1	Non-Communicable Diseases (NCD) Services
Group 2	Pregnancy Care
Group 3	Leprosy Services
Group 4	Tuberculosis (TB) Services
Group 5	Malaria Services

Standard Group Exercise Protocol

Each module contains exercises based on the lesson covered in the module. Some standard protocols for facilitating the group exercises are mentioned below.

1. Announce the group assignments. Confirm each group has the required material.
2. Read the session-specific instructions aloud. Ask if there are questions before groups begin—avoid over-explaining; let groups discover through the exercise.
3. Groups work independently. All coordinators circulate—spending approximately 4–5 minutes per group per round.
4. Give a time warning when 10 minutes are left.
5. Short debrief—refer to debrief guidance corresponding to each exercise.

Materials and Logistics

Adequate preparation of the venue, materials, and equipment is essential for smooth delivery of the workshop. Before participants arrive, confirm that the following are in place:

- **Venue and seating:** Sufficient space for approximately 25–30 participants, with classroom-style seating for presentations and cluster seating for group work. Ensure clear visibility of the presenter and screen, as well as space for informal interaction.
- **Registration and participant materials:** Registration and attendance arrangements, participant folders with required printouts, and copies of the workshop agenda.
- **Presentation and group-work materials:** Projector and screen, microphone and sound system as required, and slide changer/pointer, flipcharts or white boards with markers, pens, notepads, and Post-it notes.
- **Facilitator and technical support:** Facilitators and speakers should receive the relevant facilitator notes and presentation materials in advance. Test all audiovisual equipment, power connections, and internet connectivity before the workshop.
- **Participant prerequisites:** Participants should have basic knowledge of Microsoft Excel and access to a laptop for activities that require it.

MODULE 1.1

Monitoring Health Program Performance

Module Overview

Module	1.1—Monitoring Health Program Performance
Total Duration	2 hours
Sessions	> Sessions 1 & 2: Introduction to Program Performance Measurement and Logic Model Framework (70 mins) > Break (10 mins) > Group Exercise (40 mins)
Format	Facilitator-led presentation and discussion + Group work

Module Objectives

By the end of this module, participants will be able to:

1. Appreciate the importance of measuring district health system and program performance.
2. Learn about the different types of indicators that can be used to inform system/program performance.
3. Develop a logic model for an existing district level health care program.

Materials Required

- Module 1.1 presentation slides
- Whiteboard or flipchart and markers—for capturing participant responses during discussions
- Any polling platform—set up before the session. Polls are embedded in Slides 15 and 16
- Flipchart paper and markers for each group (group exercise)

Session at a Glance

Section	Activity	Materials	Time
Part A	**What is Primary Health Care?**	**Slides 5–16**	**20 mins**
Part B	**Why and How to Measure PHC Performance?**	**Slides 17–29**	**20 mins**
	Why measure?	Slide 17	5 mins
	Key questions and frameworks	Slides 18–28	12 mins
	Summary	Slide 29	3 mins
—	Break		10 mins
Part C	**Logic Model Framework**	**Slides 31–45**	**30 mins**
	What is a logic model?	Slide 32	5 mins
	Logic models in programs	Slides 33–36	10 mins
	Five components	Slides 37–41	10 mins
	Discussion based exercise + takeaways	Slides 42–45	5 mins
Exercise	Group exercise: Developing a logic model	Flipcharts	40 mins

Part A—What is Primary Health Care? (Slides 5-16, approx. 20 minutes)

0:00–0:03 | **Opening (Slide 6)**

Opening question—pose before showing any slides

"Before we begin—think about your own work. What do you think is included under PHC?"

Expected participant responses

Common responses: First contact with the health system; Outpatient Department (OPD) care at PHCs; national health programs; Accredited Social Health Activist (ASHA) home visits; vaccinations; maternal and child health services. Participants may also mention NCDs, mental health, or intersectoral action—affirm and build on these.

TIP: Leave the list on the board throughout Part A. Refer back to it when the formal definition is introduced—most responses will be right, just in different language.

SLIDES

Slide 8: Content for this section—PHC definition, Bhore Committee, National Health Mission (NHM), Ayushman Bharat—is in the slide speaker notes. Present each milestone briefly.

Draw the connection explicitly: The Bhore Committee's vision of a publicly financed, three-tier, community-centered health system is remarkably close to what Ayushman Arogya Mandirs (AAMs) are trying to achieve today. This helps participants see that current reforms are rooted in a long-standing vision, not a new idea imposed from outside.

Discussion prompt—after the timeline

"Given this history—who do you think pays for health care in India today?"

Expected participant responses

Participants typically say the government, or both. Guide towards out-of-pocket expenditure—when households pay out of pocket and fall into poverty, healthcare becomes inequitable. Financial protection is a core reason PHC performance must be measured.

TIP: Keep Slides 9-10 (public sector health system pyramid) brief—participants work within this system daily. One to two minutes is sufficient.

0:18–0:20 | **Polling Activity (Slides 14–16)**

Use any polling platform to ask participants to classify district health programs (Reproductive and Child Health [RCH], NCD, TB, Leprosy, Vector-borne diseases, Rashtriya Kishor Swasthya Karyakram [RBSK], National Quality Assurance Standards [NQAS]) under three PHC components – primary care, empowered people and communities, or intersectoral policy and action.

TIP: After the poll, focus on programs where participants disagreed or where results were mixed—these are the most instructive. Use them to reinforce that PHC is comprehensive and integrated, not siloed by disease or program.

Part B—Why and how to Measure PHC Performance (Slides 17-29, approx. 20 minutes)

0:20–0:25	Why Measure? (Slide 17)

Discussion prompt—pose before the slide

"Why do you think it is important to measure health system performance? What would we lose if we didn't?"

Expected participant responses

Common responses: To identify gaps and trends; to understand whether programs are working; to compare performance across blocks or facilities; to justify budget allocations. Build on these to present the four formal reasons on the slide.

Key message to reinforce

"Governments typically measure inputs—money spent, workers trained, facilities built. We also measure outcomes such as service coverage. These are important. But inputs alone cannot tell us whether the system is working, and what led to these outcomes. That shift—to understanding what drives performance—is what this training is about."

0:25–0:40	Key Questions and Frameworks (Slides 18-29)

SLIDES

Slides 18–23: Cover current monitoring mechanisms by level using NHM conditionalities as a concrete example, as per speaker notes; ask participants which mechanisms they use most in their daily work.

Discussion prompt (Slide 19)

Before posing this question, briefly explain the three categories:

Personal medical services—*direct clinical care provided to individuals (e.g., consultations, treatment).*

Non-personal health services—*population-level interventions not directed at specific individuals (e.g., screening campaigns, health education, surveillance).*

Intersectoral action—*activities outside the health sector that influence health outcomes (e.g., taxation, education, water supply, housing).*

Then ask: "How would you classify the following activities in your district?" Use locally relevant examples: Outpatient visits to PHCs; hypertension screening by Community Health Officers (CHOs); tobacco control messaging; health education in schools; Village Health, Sanitation, and Nutrition Committee (VHSNC) meetings; taxes on sugary drinks.

Bridge to Part C—use this before the break

"We have now established why we measure PHC performance, and we have seen that existing monitoring mechanisms give us only a partial picture. After the break, we will look at a tool—the logic model—that helps us structure a more complete picture. The framework you build in the group exercise today will directly inform your end-of-workshop presentation."

Break—10 minutes

Part C—Logic Model Framework (Slides 31-45, approx. 30 minutes)

0:00–0:05 What is a Logic Model? (Slide 32)

Opening question

"Has anyone come across the term 'logic model' in their work—in program planning, Monitoring and Evaluation (M&E) frameworks, or funding proposals?"

Expected participant responses

Responses will vary. Build towards the formal definition on the Slide 32 (see speaker notes) and simplify it: 'A logic model is a map of your program—what you put in, what you do, what you produce, and what changes as a result.'

0:05–0:10 Logic Models in Programs You Already Use (Slides 33–35)

SLIDES

Key points for each example—NHM Key Deliverables, NQAS Guidelines, AAM Operational Guidelines—are in the slide speaker notes.

The goal of this section is recognition, not explanation. Ask: 'Have you seen something like this in your work?' Do not spend more than 1–2 minutes on each example.

0:10–0:15 WHO-UNICEF PHC Framework (Slide 36)

TIP: Take more time to explain the World Health Organization (WHO)-United Nations Children's Fund (UNICEF) PHC Framework. Link it to the previous session on definition of PHC and 3 components of PHC and walk through the 6 domains of the framework.

0:15–0:23 The Five Components (Slides 37–41)

For each component, pose the guiding question before advancing to the slide examples. The slide content covers the sub-domains—add only what the slides do not show.

TIP: Participants sometimes confuse inputs with processes. Clarify that inputs are what you bring before the program starts; processes are what you do with them.

TIP: Outputs are often confused with outcomes. An output is what the program produces (e.g., number of ANC sessions conducted); an outcome is what changes in people as a result (e.g., increase in women receiving 4 or more Antenatal Care (ANC) visits). Impact is population-level change over time—hardest to measure and most influenced by factors outside the health program.'

TIP: This section covers 5 components in 10 minutes—about 2 minutes per component. Keep the pace brisk. The group exercise will consolidate understanding. Do not overload this section with explanations.

Discussion prompt—to illustrate the distinction

"Can you give an example from your own program of an output, an outcome, and an impact? How do they relate to each other?"

0:23–0:25 Quick Classification Exercise (Slide 43)

Read each indicator aloud one at a time and ask participants to call out the category simultaneously on the count of three. This surfaces disagreement quickly and makes for a livelier discussion than asking individuals one by one.

- Proportion of PHCs compliant to Indian Public Health Standards → Inputs
- Percentage of health facilities implementing the Drug and Vaccine Distribution Management System (DVDMS) → Processes
- Percentage of pregnant women registered for ANC in 1st trimester → Output
- Number of maternal deaths per 100,000 live births → Impact
- Proportion of infants vaccinated with BCG, DPT, OPV, and measles → Outcome

TIP: Accept all answers and gently correct. If disagreement arises—especially on outputs vs outcomes—use it as a teaching moment. Validate it and acknowledge that these categories can be difficult to separate at first.

0:25–0:30 Strengths, Limitations, Key Takeaways (Slides 44–45)

SLIDES

Key points on strengths and limitations are in the slide speaker notes. Cover briefly or incorporate into a verbal summary.

Transition to group exercise

"Now you will apply this to a real health program in your district. Work in your groups. You have 40 minutes. The framework you develop today will be the foundation of your end-of-workshop presentation. You do not need all the data or all the answers right now."

Group Exercise: Developing a Logic Model for an Existing Health Program

Duration	40 minutes
Format	Group work + short debrief
Materials	Flipchart paper and markers per group

Session-specific Instructions

Read out the instructions provided on Slides 48 and 49. Participants are expected to develop a conceptual model for program at the district level, using the learnings from Module 1.1. Follow the facilitation process as described in Section II.

What a strong group output looks like at this stage

A good logic model at the end of this exercise identifies 3–4 sub-domains under each of the five categories, with at least one assumption or contextual factor noted. Do not expect precision or completeness—the goal is coverage and structure. Encourage groups that are overthinking or trying to fill in data values to step back. The framework is the deliverable today, not the data.

Debrief Guidance

- Invite each group: "Group [X]—which program did you work on and what was your main logic model structure?"
- After each group, ask one probe: "Which domain was hardest to define, and why?" Or "Did any assumptions come up that surprised you?"
- Close with: "Across very different programs, the structure is the same—what differs is the content within each category. That is the point of the framework: a common language for measuring different programs."

TIP: Don't correct or rank groups at this stage. Save detailed feedback for end-of-workshop presentations.

Module 1.1 Summary and Link to Module 1.2

Key takeaways to reinforce at close of module

- Measuring health program performance is essential—it helps us understand gaps, compare performance, and link system activities to population-level outcomes.
- The logic model (inputs → processes → outputs → outcomes → impact) provides a common, structured framework adaptable to any program.
- Existing monitoring mechanisms provide a partial picture—focused on inputs and outputs. This training builds towards the full chain, including outcomes and impact.
- The logic model you have started today is the foundation for all remaining modules and the end-of-workshop presentation.

Transition to Module 1.2

"You have now built the structure of your logic model. What it does not yet have is content, which includes the specific indicators for each sub-domain and the data sources to measure them. That is what we do after lunch in Module 1.2."

MODULE 1.2

Indicator Construction and Data Sources

Module Overview

Module	1.2 – Indicator Construction and Data Sources
Duration	2 hours
Sessions	> Session 1: Indicator Construction (50 mins) > Session 2: Health Data Sources (20 mins) > Break (10 mins) > Group Exercise (40 mins)
Format	Facilitator-led presentation, discussion and group work

Module Objectives

By the end of the module, participants will be able to:

1. Understand the importance of using appropriate denominators
2. Construct Specific, Measurable, Achievable, Relevant, and Time-bound (SMART) indicators using data from routine sources to populate a PHC performance measurement framework
3. Identify sources of data to measure PHC performance in the district

Materials Required

- Module 1.2 presentation slides
- Whiteboard (or flipchart and markers) for capturing participant responses during discussions
- Any polling platform—set up before the session, for the indicator construction activity (Slide 13)
- Sticky notes for each of the participants
- Flipchart paper and markers for each group (group exercise)
- Logic model templates prepared during Module 1.1

Session at a Glance

Section	Activity	Materials	Time
Part A	**Constructing Indicators**	**Slides 5–20**	**50 mins**
	Participant reflection and basic concepts	Slides 5–8	15 mins
	Importance of denominators	Slides 9–12	15 mins
	SMART indicators and indicator construction	Slides 13–20	20 mins
Part B	**Health Data Sources in India**	**Slides 21–28**	**20 mins**
	Activity: Commonly used data sources	Slide 22	
	Data sources	Slide 23–28	
—	Break		10 mins
Part C	**Group Exercise: Develop Indicators for Monitoring an Existing PHC Program in the District**	**Slides 31–35**	**40 mins**
	Key takeaways – Indicator construction	Slide 34	
	Key takeaways: Commonly used health data sources	Slide 35	

Before you begin

Remind participants that in Module 1.1, they developed a logic model for their selected health program by identifying inputs, processes, outputs, outcomes and impact. Clarify that while the logic model provides the overall structure for monitoring program performance, it is not yet complete.

Explain that Module 1.2 focuses on populating this framework with measurable indicators and identifying reliable data sources for each component. These indicators and data sources will form the basis of the group work that continues throughout the training and culminates in presentations at the end.

Encourage participants to keep their logic model templates from Module 1.1 readily available, as they will build directly on them during the group exercise later in the session.

Part A—Constructing Indicators (Slides 5-20, approx. 50 minutes)

0:00–0:05	Participant Reflection – What is an Indicator? (Slide 5)

Opening question (ask before displaying the definition on the next slide)

"When you hear the term indicator, what comes to mind? In your day-to-day work, what indicators do you regularly monitor?"

Expected participant responses

Likely participant responses: Immunization coverage; ANC registration; institutional deliveries; malaria cases; TB notification; NCD screening; Health Management Information System (HMIS) indicators; performance targets.

TIP: Avoid introducing the formal definition immediately. Encourage participants to think from their own experience first. A few participants may describe indicators simply as "numbers" or "data." Accept these responses and explain that the session will distinguish between data, information, and indicators.

0:05–0:10	From Data to Information to Knowledge (Slides 6–7)

SLIDES

Slides 6 and 7: Walk participants through concepts of data, information, and knowledge using the Home-Based Newborn Care (HBNC) example.

Emphasize that data are individual facts collected through routine systems; information is created when these data are summarized into indicators; and knowledge emerges when indicators are interpreted and used for program improvement.

Discussion prompt

"Can you think of an example where the same data were interpreted differently by different people?"

OR

"Have you ever identified a program issue only after reviewing trends rather than individual numbers?"

Key message to reinforce

"Collecting more data does not automatically improve decision-making. The value lies in converting data into meaningful indicators and then using those indicators to guide action."

0:10–0:15 Constructing an Indicator (Slide 8)

Display Slide 8 and invite participants to name the elements of the indicator listed on the slide – numerator, denominator, time period and any other elements that they may think of.

0:15–0:25 Importance of Denominators (Slides 9–11)

SLIDES

Use the illustrations on Slides 9–11 to demonstrate why absolute numbers can be misleading. Walk participants through the three malaria examples (Slides 10 and 11). The figures reveal different interpretations with respect to block-wise malaria burden in the district (reported numbers, test positivity and incidence). Use Trainer Notes in Slide 10 and 11 to explain the concept further.

Discussion prompt

Guide the discussion towards understanding that:

- Positive cases indicate case load
- Test positivity indicates program performance among those tested
- Incidence reflects population disease burden

Expected participant responses

Participants would recognize that areas with more reported cases may also have tested more people; percentages provide a more meaningful comparison than absolute numbers; different denominators answer different public health questions.

Key message to reinforce

Indicators are meaningful only when appropriate elements are used to construct it such as numerator, and denominator. Using no denominator—or an inappropriate denominator—can lead to incorrect conclusions and inappropriate program decisions.

TIP: This is one of the most important concepts in the module. Allow participants sufficient time to discuss the malaria example before moving to the formal explanation. Many participants instinctively interpret absolute numbers as higher burden; the comparison provides a valuable learning opportunity.

0:25–0:30	Challenges with Denominators (Slide 12)

Discussion prompt

Ask participants: "In your district, which denominators are difficult to obtain?"

Expected responses may include: Population aged 30 years and above; high-risk populations; migrant populations; urban slum populations; updated population estimates.

Acknowledge these challenges before explaining that program managers often rely on proxy estimates or projected populations where exact denominators are unavailable.

Reassure participants that: "Not knowing the exact denominator is common. The challenge is selecting the most appropriate denominator available and interpreting findings accordingly."

Key message to reinforce

- Lack of denominator data should not prevent analysis; use appropriate proxy estimates where required.
- Common challenges include missing or outdated population data, poor data quality, integration gaps, and capacity constraints.
- A reasonable estimate is preferable to having no denominator, provided the assumptions are documented.

0:30–0:35	Polling Activity (Slides 13–14)

Use the polling platform to create a short assignment for the participants and ask them to make their own indicator for a financial year quarterly progress report on the hypertension screening activity in the district. Instruct them to write down the definition of indicator that they will use for this report in the polling link. Divide the participants into five groups as before and record one response per group.

Discussion prompt

After consolidating the polling response, discuss them with the participants. Bring focus on the elements that are not reflected (e.g., time duration, denominator) and connect with the SMART indicators to lead to the next slides.

0:35–0:40 SMART Indicators (Slides 15–16)

SLIDES

Use Slide 15 to explain the meaning of each letter in the acronym SMART.

Introduce the SMART framework by stating that well-constructed indicators are not only measurable, but also meaningful. Explain that the SMART criteria provide a simple way to assess whether an indicator is suitable for monitoring program performance.

Use the Mid-Upper Arm Circumference (MUAC) example (Slide 16) to illustrate how each element of SMART is reflected within a single indicator.

0:40–0:45 Activity: Identify the SMART Indicators (Slide 17)

Discussion prompt

Ask participants to work through each of the four ANC indicators shown on the slide. For each indicator, ask:

"Which SMART criteria are satisfied by this indicator?"

Allow participants to discuss briefly before inviting responses. Encourage them to justify their reasoning rather than simply answering "yes" or "no."

Ask participants:

"When you prepare district review presentations, have you ever found that an indicator was difficult to interpret? What made it difficult?"

Likely responses include: Unclear definitions; changing denominators; combining multiple services into one indicator; lack of recent denominator estimates; inconsistent reporting across facilities.

Key message to reinforce

"A SMART indicator reduces ambiguity. It ensures that everyone interprets program performance in the same way and enables meaningful comparisons across time and across geographic areas."

TIP: There is often more than one acceptable interpretation during such exercises. Encourage discussion rather than immediately confirming the "correct" answer. The objective is to help participants think critically about indicator construction rather than memorize the SMART criteria.

0:45–0:50 Activity: Constructing an Indicator (Slides 18–20)

Explain that participants will now apply the concepts covered so far by constructing an indicator themselves.

Discussion prompt

Introduce the activity by explaining a scenario where they have been asked to construct an indicator to report on the hypertension screening in their respective blocks for the first quarter of the year (Slide 18). Convey to the participants that this is a discussion-based activity for the whole group. Ask them to develop indicators in discussion as a group.

Use Slide 19 (Reflections on the activity)

Before revealing the discussion points, ask: "Does this single indicator tell us everything we need to know about the performance of the NCD program?"

Allow participants to respond.

Expected participant responses: Participants may suggest additional aspects that should be monitored, including: availability of medicines; availability of BP apparatus and diagnostics; training of frontline workers; treatment initiation; treatment adherence; and follow-up of diagnosed cases.

Acknowledge all responses before reinforcing that program performance cannot be assessed using a single indicator.

Key message to reinforce

Every indicator provides only one perspective of program performance. Effective monitoring requires a balanced set of indicators measuring different dimensions of the program.

Link this discussion back to the logic model introduced in Module 1.1. Explain that different indicators are needed to measure Inputs; Processes; Outputs; Outcomes; and Impact.

Collectively, these provide a comprehensive picture of program performance.

Transition to Part B

"We now know how to construct meaningful indicators. The next question is equally important: Where do these data come from? Every indicator depends on reliable data, and selecting the right data source is just as important as selecting the indicator itself. In the next session, we will explore the different health information systems and data sources available for measuring district PHC performance."

Part B—Health Data Sources in India (Slides 21–28, approx. 20 minutes)

0:50–0:55	**Activity (Slide 22)**

Discussion prompt (Slide 22)

Introduce the activity by explaining a scenario where they have been asked "What data do you usually use to monitor program performance in your district?"

Ask the participants to list down common data sources to measure PHC performance in their district. Ask them to use sticky notes and write the name of one data source on each sticky note.

Expected participant responses

Participants will mention HMIS, National Family Health Survey (NFHS), RCH portal, program reports, review meetings etc.

Explain that data sources are of different kinds: Some are at the national level and some at the regional/state/district level. Key point to surface: These mechanisms focus heavily on inputs and outputs—rarely on outcomes or impact.

0:55–1:10	Health Information Data Sources (Slides 23–28)

SLIDES

Using Slides 23-27 explain the health information data sources; the difference between population-based and institution-based data sources; their uses and limitations; and the other data sources that can be used.

Key messages to reinforce

- Data sources are population and institution based. Population-based data sources provide the denominator.
- Each data source has strengths and limitations that need to be considered while referring to them.

Discussion prompt

Ask the participants about the challenges that they face with respect to data. Most common responses include: network issues; use of too many apps, duplication of data; lack of ability to visualize data.

Come back to the sticky notes where the participants have written data sources. Ask them if they have written any sources other than the ones explained on the slides.

Ask the participants what they use the different data sources for. If need be, reiterate and explain the difference between the different surveys such as NFHS and Sample Registration System (SRS). Use Slide 28 and trainer notes to reflect upon the data sources and how they are used by the participants in the course of their work.

Break—10 minutes

Part C—Group Exercise: Develop Indicators for Monitoring an Existing PHC Program in the District (Slides 31–35; approx. 40 minutes)

Group Exercise: Developing Indicators for Monitoring an Existing PHC Program in the District

Duration	40 minutes
Format	Group work + short debrief
Materials	Flipchart paper and markers per group

Session-specific Instructions

Read out the instructions provided on Slide 32. Participants are expected to identify key sub-domains and indicators for the conceptual model of the program developed at the end of module 1.1. Follow the facilitation process as described in Section II.

Debrief Guidance

- **Invite each group:** "Group [X]—which domain and sub-domain did you work on and what are the indicators that you developed?"
- **After each group's response, ask one probe:** "Among these domains, which according to you is the domain for which it is hardest to develop indicators, and why?" Or "Which domain do you feel is the simplest or easiest with respect to indicators?"
- **Close with:** "Across very different programs, the structure is the same—what differs is the content within each category. That is the point of the framework—a common language for measuring different programs."

Module 1.2 Summary and Link to Module 2.1

Key takeaways to reinforce at close of Module 1.2

Indicator construction

- An indicator converts raw data into information that can be interpreted and used for decision-making.
- Not using a denominator or using an incorrect denominator will misrepresent the findings.
- Make indicator clear and meaningful and help in effective monitoring of the program.

Commonly used health data sources

- There are different types of data sources that report information: At varying frequencies; at different levels of health system, and on different parameters such as service delivery, infrastructure, human resources, and population health.
- Appropriate data sources should be identified based on the purpose—routine monitoring, planning and resource allocation, etc.
- Each data source has certain strengths and limitations that need to be taken in to account while using the data.

Transition to Module 2.1

You have now developed a comprehensive understanding of logic model framework, SMART indicators and their construction and health data sources in India. Moving forward we will discuss and understand data analysis and data communication in the next session.

MODULE 2.1

Describing Data Effectively

Module Overview

Module	2.1 – Describing Data Effectively
Duration	2 hours
Sessions	> Session 1: Introduction to data types and data analysis (25 mins) > Session 2: Descriptive statistics (35 mins) > Break (10 mins) > Group exercise and conclusion (50 mins)
Format	Facilitator-led presentation, discussion + Group work

Module Objectives

By the end of the module, participants will be able to:

1. Understand types of data and variables
2. Describe district health system data using measures of frequency, central tendency and variation
3. Frame questions that can be answered by available district health systems data

Materials Required

- Module 2.1 presentation slides
- Whiteboard (or flipchart and markers) for capturing participant responses during discussions
- Any polling platform—set up before the session
- Exercise Instructions Booklet for group exercise

Session at a Glance

Section	Activity	Materials	Time
Part A	**Introduction to Data Types**	**Slides 4–10**	**15 mins**
	Participant reflection on data and data types	Slides 6–9	8 mins
	Activity: Identifying the type of variable	Slide 10	7 mins
Part B	**Data and Data Analysis**	**Slides 11–16**	**10 mins**
	Data Analysis – Types; What data represents; Key questions to ask	Slides 12–16	10 mins
—	Break		10 mins
Part C	**Describing Different Types of Data and Group Exercises**	**Slides 17–33**	**85 min**
	Data types and descriptive statistics and exploratory analysis	Slides 18–19	5 mins
	Measures of frequency	Slides 20–21	5 mins
	Measures of central tendency	Slides 22–23	5 mins
	Describing a dataset – Measure of central tendency	Slides 24–25	20 mins
	Measures of variation	Slides 26–28	10 mins
	Describing a dataset – Measures of frequency and variation	Slide 29	30 mins
	Summary: Data types and descriptive statistics and Key takeaways	Slides 32–33	10 mins

Before you begin

Remind participants that indicators convert raw data into meaningful information for decision-making. Reinforce that accurate interpretation depends on using the correct numerator and denominator and selecting the appropriate data source.

Explain that in Module 2.1, they will learn how to analyze and interpret district health system data. They will understand different types of data and variables, use simple statistical measures to describe data, and frame questions that can be answered using routinely available health data.

Part A—Introduction to Data Types (Slides 4–10, approx. 15 minutes)

0:00–0:03 | **Participant Reflection – Introduction to Data (Slide 6)**

Opening questions for participants

"What do you understand by the word 'data'? "What are the different types of data?"

Allow participants to respond freely. Encourage examples from their own work rather than formal definitions. Record key responses on a white board or flipchart.

Expected participant responses

Participants may mention: HMIS reports; Number of OPD visits; ANC registrations; Immunization coverage; Maternal deaths; Population figures; NCD screening data; Facility performance reports

TIP: Acknowledge all responses before introducing the definition provided on the slide. Explain that data are simply raw observations, numbers or categories collected through routine program activities. By themselves, data do not answer program questions. Their value lies in how they are analyzed and interpreted.

0:03–0:08 | **Data Variables and its Types (Slide 7–9)**

Introduce the concept of a variable by explaining that every piece of data collected describes a particular characteristic or attribute.

Key message to reinforce

Different variables require different approaches to analysis. Understanding the variable type is the first step in selecting appropriate descriptive statistics and visualizations.

0:05–0:08	Types of Variables (Slides 8–9)

Taking the concept of variables further, explain that they are classified into two categories – numerical and categorical.

SLIDES

Use Slides 8 and 9 to explain numerical and categorical variables.

TIP: Avoid spending too much time on statistical terminology. The objective is not for participants to memorize definitions but to recognize the different types of variables encountered in routine health data.

0:08–0:15	Activity: Identify the Type of Variable (Slide 10)

Using a polling platform, ask participants to classify each variable shown on the slide.

Review each example one by one. After each response, ask participants to explain why they selected that option before revealing the correct answer. Where participants disagree, encourage discussion rather than immediately providing the correct answer.

Key message to reinforce

- Data are the raw material for program monitoring and decision-making.
- Variables describe the characteristics that are measured or recorded.
- Variables are broadly classified as numerical or categorical.
- Identifying the type of variable/data is essential for selecting appropriate methods of analysis and data visualization. .

Transition to Session 2

Conclude the session by stating:
"Now that we understand the different types of data and variables, the next question is how these data are analyzed to generate meaningful information. In the next session, we will explore the purpose of data analysis and how clearly framed questions guide the choice of analytical methods."

Part B—Data and Data Analysis (Slides 11-16, approx. 10 minutes)

0:15–0:20	Understanding the Purpose of Data Analysis (Slides 12–14)

Opening questions

"When you receive a monthly HMIS report, what do you usually do with the data?"

Allow participants to share their experiences. Follow this by asking:

"Do you simply review the numbers, or do you try to understand what the numbers are telling you?"

TIP: Use the discussion to introduce the two broad purposes of data analysis:

- Exploratory analysis, which helps us examine data to identify patterns, trends and unusual observations (e.g., identifying blocks with low hypertension screening coverage)
- Explanatory analysis, which helps us identify causes and communicate the findings in a way that supports program decisions (e.g., focuses on communicating why these differences exist in block performances and what actions are needed).

Key message to reinforce

Data analysis is not only about generating statistics. Its purpose is to understand program performance and communicate findings that support informed decision-making.

SLIDES

Walk participants through the sequence illustrated in Slide 13: Real-world events; collection of data; analysis of data; presentation through tables, charts and graphs; interpretation for program action.

Emphasize that the quality of analysis depends not only on the data available but also on understanding the context in which those data were collected.

Walk through the four key questions listed on Slide 14. Mention that the current module focuses on the first two questions and the next two questions will be addressed in upcoming modules.

0:20–0:25 Asking the Right Questions (Slides 15–16)

Explain that meaningful analysis begins with a clearly defined question.

SLIDES

Display the examples provided on Slides 15-16 and compare a broad question such as:

“How are health facilities performing in terms of OPD?” with more specific questions, as illustrated on slide 15.

Slide 16: Explain that as questions become more specific, it becomes easier to identify the variables required; the appropriate analysis; the most suitable method of presenting results.

Relate this discussion to the SMART indicators introduced in Module 1.2, emphasizing that clear program questions and well-defined indicators complement one another.

Key message to reinforce

- Effective analysis begins with a clearly defined question.
- Specific questions guide the selection of variables, analytical methods and visualizations.
- Before beginning any analysis, program managers should ask:
  - What data are available?
  - What question do I want the data to answer?
  - Does the available data allow me to answer that question?
- Good analysis should always lead to program action, not simply the production of reports.

Break—10 minutes

Part C—Describing Different Types of Data (Slides 17–33, approx. 85 minutes)

Before you begin

Remind participants that clearly framed questions guide data analysis and explain that the next step is to understand how different types of data can be appropriately summarized and described. Emphasize that the choice of descriptive statistics depends on the variable type and the question being asked, enabling accurate interpretation, and effective communication of findings. Explain that the session combines facilitator-led discussion with a practical group exercise using a district health dataset to apply these concepts to routine health data and identify priority areas for improvement.

0:35–0:40 | **Matching Data Types with Descriptive Statistics (Slides 18–19)**

Discussion prompt

Begin by displaying the classification of variables shown on Slide 18. Ask participants:

"Now that we know the different types of variables, how do we describe them? Would we use the same statistical measures for all types of data?"

Allow participants to respond before introducing descriptive statistics.

Explain that descriptive statistics summarize large amounts of data into meaningful information that supports program monitoring and decision-making.



SLIDES

Use Slide 19 to explain that each measure serves a different purpose and is selected according to the type of variable and the question being answered.

Discussion prompt

Ask participants:

"When you prepare monthly program reports, which summary measures do you most commonly use?"

Participants are likely to mention percentages, averages, coverage rates or proportions. Use these responses to transition into the detailed discussion.

Key message to reinforce

The type of data determines the most appropriate statistical summary. Choosing an inappropriate measure may lead to misleading conclusions.

0:40–0:45 Measures of Frequency (Slides 20–21)

SLIDES

Explain that measures of frequency describe how often something occurs. Introduce each measure using routine public health examples as given in Slides 20 and 21.

- Discuss: Frequency (absolute counts); ratio; rate; proportion; and percentage.
- Use simple numerical examples to describe the measures using a white board.
- Encourage participants to think about which question each measure answers.

Discussion prompt

Ask participants:

"Can you think of examples from your own programs where ratios, rates or percentages are commonly used?"

Probe for examples such as doctor-population ratio; ANC coverage; institutional delivery rate; hypertension screening coverage; immunization coverage

TIP: Many participants confuse proportions, percentages and rates. Encourage them to focus on the denominator and what it represents rather than memorizing definitions.

0:45–0:50 Measures of Central Tendency (Slides 22–23)

Explain that measures of central tendency describe the "typical" value within a dataset. Introduce mean, median and mode.

SLIDES

Using the examples provided in the Slides 22–23, discuss when each measure is appropriate. Use simple numerical examples to describe the measures using a white board. Explain that:

- Mean is suitable when data are approximately normally distributed.
- Median is preferable when data contain extreme values or are skewed.
- Mode is useful for identifying the most frequently occurring category.

Avoid lengthy statistical explanations. Instead, relate each measure to routine district health data.

Discussion prompt to illustrate the distinction

Ask participants:

"If one health facility reports exceptionally high OPD attendance while all others report much lower values, which measure would better represent the district performance—mean or median? Why?"

Allow participants to discuss before summarizing. Use this discussion to introduce the concept of outliers and their influence on averages.

Group Exercise: Describing a Dataset – Measure of Central Tendency

Duration	20 minutes
Format	Group work + discussion + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.1_Exercise 1 > Exercise dataset: Dataset_Module 2.1_Exercise 1

Read out the instructions provided on Slides 24 and 25. Participants are expected to calculate the average number of OPD per 1000 population at sub-health centers in each block. Follow the facilitation process as described in Section II.

Discussion prompts

"What measure of central tendency would you use to describe OPD performance across the two blocks?"

"Why is OPD per 1,000 population more useful for comparison than the absolute number of OPD visits?"



TIP: Emphasize that standardization using an appropriate denominator or benchmark is important when comparing facilities with different population sizes.



1:10–1:20 **Measures of Variation (Slides 26–28)**

Explain that measures of central tendency tell us what is typical, but they do not indicate how much the values differ from one another. Two blocks may have the same average OPD attendance while showing very different levels of variation across facilities. Measures of variation help us understand this spread and identify unusually high or low values that may require further investigation.



SLIDES

Using Slides 26–28:

- Introduce Range as the difference between the highest and lowest values in a dataset.
- Explain that range provides a quick indication of how widely values are spread but does not describe how observations are distributed between the extremes.
- Introduce Standard Deviation (SD) as a measure of how closely individual observations cluster around the mean.
- Emphasize that a small SD indicates that observations are relatively similar, whereas a large SD suggests greater variation between facilities or observations.
- Avoid detailed statistical derivations—the emphasis should remain on interpretation.

Key message to reinforce

Measures of variation complement averages. They help identify inconsistencies, outliers and variability across units that averages alone cannot reveal.

1:20–1:50	Describing a Dataset – Putting It All Together (Slides 29–30)

SLIDES

Use the example to bring together the measures of central tendency, variation and frequency introduced in the session.

Discussion prompt

"What additional information does the range and SD provide?"

"What does the proportion of facilities meeting the benchmark tell us?"

Group Exercise: Describing and Interpreting a Dataset

Duration	30 minutes
Format	Group work + discussion + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.1_Exercise 1 > Exercise dataset: Dataset_Module 2.1_Exercise 1

Session-specific Instructions

Read out the instructions provided on Slides 29–30. Participants are expected to calculate and interpret appropriate measures of variation and frequency for the same dataset as in the previous exercise. Follow the facilitation process as described in Section II.

Discussion/Debrief

- After groups complete the exercise, invite two or three groups to share their findings. Use the following questions to guide the discussion:
  - "How does the variability in the two blocks compare? Would you describe it as high or low?"
  - "Both blocks have similar average OPD per 1,000 population. What does the variation tell us that the average alone does not?"
  - "What might explain why some facilities have OPD below the benchmark?"
  - "Is this information sufficient for planning? What additional information would you need to understand and improve service utilization?"
- The expected results show that the average performance is similar in the two blocks, but variation is higher in Block A. Block A also has facilities with particularly high and low values, which may be important for planning. The proportion of facilities meeting the benchmark is low in both blocks.

Key message to reinforce

The average alone does not provide a complete picture of program performance. Measures of variation and the proportion of facilities meeting a relevant benchmark help identify differences that can inform program planning and action.

Key takeaways to reinforce at close of module (Slides 32 and 33) (10 minutes)

- Data are the raw material for decision-making and need to be converted into meaningful information.
- The type of variable determines the appropriate statistical measure and data visualization approach.
- Before analyzing data, ask: What data do I have? What question do I want the data to answer?
- The choice of analysis should be guided by both the data available and the question being asked.

Transition to Module 2.2

"We have now seen how selecting appropriate descriptive statistics allows us to move beyond simply reporting numbers. Now that we know the basis of choosing a specific statistics method, we will learn in the next modules about how visualizations can help in describing these measures."

MODULE 2.2

Describing and Communicating Data Effectively – Numerical Data

Module Overview

Module	2.2 – Describing and Communicating Data Effectively – Numerical Data
Duration	2 hours
Sessions	> Session 1: Analyzing and visualizing numerical data: Data analysis and visualizing techniques – Histograms (30 mins) > Session 2: Box Plots (40 mins) > Break (10 mins) > Session 3: Line Graphs/Scatter Plots (40 mins)
Format	Facilitator-led presentation, discussion and group work

Module Objectives

By the end of this module participants will be able to:

1. Describe numerical data using measures of frequency, central tendency and variation.
2. Frame questions that can be answered using available district health systems data.
3. Apply appropriate data visualization techniques to answer questions about district health system performance.

Materials Required

- Module 2.2 presentation
- Microsoft Excel installed on participant laptops
- Flipchart/white board and markers
- Exercise Instructions Booklet for Module 2.2 – Exercises 1, 2, 3, 4

Session at a Glance

Section	Activity	Materials	Time
Part A	**Analyzing and Visualizing Numerical Data Histograms**	**Slides 5–13**	**30 mins**
	Understanding data analysis and visualization	Slides 5–10	8 mins
	Understanding histograms	Slides 11–12	7 mins
	Exercise: Constructing a histogram	Slide 13	15 mins
Part B	**Box Plots**	**Slides 15–26**	**40 mins**
	Measure of variation: Interquartile range	Slides 15–17	10 mins
	Box plots	Slides 18–24	10 mins
	Exercise 2: Constructing a box plot	Slides 25–26	20 mins
Part C	**Line Graphs and Scatter Plots**	**Slides 28–39**	**40 mins**
	Time trends	Slides 28–31	7 mins
	Scatter plots	Slides 32–35	8 mins
	Exercise 3: Line graph	Slide 36	10 mins
	Exercise 4: Scatter plot	Slide 37	10 mins
	Key takeaways	Slide 38–39	5 mins

Before you begin

Remind participants that in Module 2.1 they learnt how numerical data can be summarized using measures such as the mean, median, range and SD. Explain that while these measures help describe the data, program managers also need to interpret what the data reveal and communicate those findings clearly.

Part A—Analyzing and Visualizing Numerical Data: Data Analysis and Visualizing Techniques - Histograms (Slides 5–13, approx. 30 minutes)

0:00–0:08 | **Understanding Data Analysis and Visualization (Slides 5–10)**

Opening questions for participants

"When you review program data in your district, what questions are you usually trying to answer? Which of these questions would require different types of visualization methods?"

SLIDES

Use Slide 5 for revising the process of analyzing data introduced in the previous module. Mention that having discussed the first two questions, the next two modules focus on visualization methods to describe the data.

Review the figure on Slide 8 showing different variable types and the descriptive statistics commonly used for each. Reinforce that today's session focuses on numerical variables, which are generally described using mean, SD, range, and Interquartile Range (IQR), and are commonly presented using histograms, box plots and line charts.

Use Slides 9 and 10 to further explain analysis of numerical continuous data.

Key message to reinforce

Selecting the appropriate graph is the first step towards meaningful interpretation.

0:08–0:15 | **Understanding Histograms (Slides 11–12)**

SLIDES

Introduce the example of hypertension screening data in Slide 10 and ask participants to review the descriptive statistics and consider what they reveal about program performance. Use the trainer notes to reinforce that descriptive statistics help identify overall patterns but do not show how observations are distributed.

Next, display the histogram in Slide 11 and ask participants to observe it silently before beginning the discussion. Guide them to identify where most facilities are clustered, whether the data are symmetrical or skewed, and whether any facilities appear unusual.

Discussion prompt

"Looking at this histogram, what concerns or questions would you raise if this represented data from your district?"

TIP: Allow participants to interpret the histogram before introducing concepts such as skewness and outliers. This helps them understand the graph through observation rather than memorization.

Group Exercise 1: Distributions – Constructing a Histogram

Duration	15 minutes
Format	Group work + discussion + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.2_Exercise 1 > Exercise dataset: Dataset_Module 2.2_Exercise 1

Session-specific Instructions

Read out the instructions provided on Slide 13. Participants are expected to construct a histogram using the given dataset. Follow the facilitation process as described in Section II.

During the debrief, invite two or three groups to present their interpretations. Reinforce that histograms are valuable because they provide a quick visual summary of the distribution of numerical data and help identify unusual observations that may require further investigation.

Part B—Box Plots (Slides 15–26, approx. 40 minutes)

0:30–0:40 **Understanding Variation through the IQR (Slides 15–17)**

SLIDES

Begin with Slide 15 by briefly recapping that descriptive statistics include measures of frequency, central tendency and variation. Reinforce that while mean and median describe the centre of a dataset, measures of variation show how widely observations are spread, which helps explain differences in performance despite similar averages. Using Slides 16 and 17, introduce quartiles and the IQR through illustration and simple mathematical calculations.

Discussion prompt

Ask participants:

"Why might program managers be interested in understanding variation rather than relying only on averages?"

Guide the discussion towards consistency of program implementation and identification of facilities requiring supportive supervision.

TIP: Avoid spending time on the formula. The objective is for participants to understand what the IQR tells them about program performance, not to memorize the calculation.

0:40–0:50	Interpreting Box Plots (Slides 18–24)

SLIDES

Introduce the box plot as a graphical summary of the same hypertension screening dataset used in Session 1. Explain that unlike the histogram, the box plot summarizes the distribution using the median, quartiles, range and outliers in a single figure.

Using Slides 18–21, build participants' understanding step by step.

Use Slides 22 and 23 to ask participants to interpret the box plot using the questions provided in Slide 22.

Finally, use Slide 24 to demonstrate how box plots can be used to compare performance across groups.

Discussion prompt

Ask participants:

- Which blocks appear to be performing better?
- Which blocks show greater variability between facilities?
- If these were your district data, which block would you prioritize for further review and why?

TIP: Encourage participants to interpret the box plot as evidence for decision-making. Rather than asking whether a block is "good" or "bad", ask what additional information they would seek before deciding on a program action.

Group Exercise 2: Constructing and Interpreting a Box Plot (Slides 25–26)

Duration	20 minutes
Format	Group work + discussion + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.2_Exercise 2 > Exercise dataset: Dataset_Module 2.2_Exercise 2-4

Session-specific Instructions

Read out the instructions provided on Slide 25. Explain that each group will prepare the five-number summary, calculate the IQR, identify any outliers and construct a box plot using the supplied data.

During the debrief, ask groups to use the reflection questions provided on Slide 26 to interpret their findings.

Conclude by reinforcing that box plots are particularly useful for comparing performance across facilities or blocks and for identifying observations that require further investigation before program decisions are made.

Break—10 minutes

Part C—Line Graphs and Scatter Plots (Slides 28–39, approx. 40 minutes)

Before you begin

Start by reminding participants that histograms and box plots help describe the distribution and variation of numerical data at a particular point in time. Explain that program managers also need to answer questions such as: Is program performance improving over time? Are facilities showing consistent performance? Is there a relationship between two indicators? These questions require different visualization methods.

1:20–1:27	Time Trends (Slides 28–31)

SLIDES

Introduce the line graph using the example provided in the presentation, which tracks the percentage of adults aged 30 years and above screened for hypertension across five consecutive quarters in selected facilities. Before interpreting the graph, ask participants to identify the variables represented on each axis. Explain that connecting the observations with a line helps visualize changes in program performance over time rather than isolated values.

Discussion prompts

Ask participants:

- "What is the overall trend in hypertension screening across the five quarters?"
- "Which facility would you prioritize for further review and why?"
- "What program or operational factors might explain the decline in screening during some quarters?"

Summarize by reinforcing that line graphs help managers monitor program performance over time, identify unusual changes and assess whether interventions are producing sustained improvements.

1:27–1:35	Understanding Scatter Plots (Slides 32–35)

SLIDES

Use Slides 32–35 to introduce scatter plots. Explain that unlike line graphs which examine trends over time, scatter plots explore whether two numerical variables appear to be

related. Ask participants to observe the distribution of points and describe the overall pattern before discussing any interpretation.

Explain that scatter plots are useful when program managers wish to examine whether changes in one indicator appear to be associated with changes in another.

Discussion prompts

Ask participants:

- What pattern do you observe in the scatter plot?
- Are there facilities that do not follow the overall trend?
- What additional information would you require before concluding that one variable influences the other?

Group Exercise 3 and 4: Line Graph and Scatter Plots

Duration	20 minutes
Format	Group work + discussion + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.2_ Exercise 3 and 4 > Exercise dataset: Dataset_Module 2.2_Exercise 2–4

Session-specific Instructions

Read out the instructions provided on Slides 36 and 37. Follow the facilitation process as described in Section II.

Exercise 3: Explain that each group will construct a line graph comparing total live births and low birthweight (LBW) cases across blocks/facilities and answer the interpretation questions provided in the presentation.

During the debrief, invite two or three groups to share their observations. Reinforce that line graphs help compare patterns across units and make differences or notable observations easier to identify and interpret.

Exercise 4: Explain that each group will construct a scatter plot showing the relationship between total live births and LBW cases by block/facility, and label at least five points.

During the debrief, invite two or three groups to share their interpretations. Reinforce that scatter plots help examine relationships between two numerical variables and can highlight patterns, outliers and areas that may require further investigation.



TIP: Participants often assume that two variables moving together indicate cause and effect. Reinforce that scatter plots generate hypotheses for further investigation rather than proving causal relationships.

Invite participants to reflect on all four visualization methods discussed during the module. Ask them to consider which graph they would choose in the following situations:

- understanding the distribution of service coverage across facilities;
- comparing variation in performance between blocks;
- monitoring program performance over time; and
- examining whether two indicators appear to be related.

1:55–2:00	Key Takeaways (Slides 38–39)

Module summary and transition to next module

Before closing the module, reinforce the key messages of the module. Conclude by reminding participants that they have now learnt how to summarize, visualize and interpret numerical data using different graphical methods. Explain that the next module will focus on categorical data type. Participants will learn how to move beyond describing data to identifying program gaps, prioritizing actions and using evidence to improve district health system performance.

MODULE 2.3

Describing and Communicating Data Effectively – Categorical Data

Module Overview

Module	2.3 – Describing and Communicating Data Effectively: Categorical Data
Duration	80 minutes
Sessions	> Session 1: Analyzing and Visualizing Categorical Data – Tables (40 mins) Session 2: Bar Charts and Pie Charts (35 mins) > Key Takeaways (5 mins)
Format	Facilitator-led presentation, discussion and group exercises

Module Objectives

By the end of this module, participants will be able to:

1. Describe categorical data using measures of frequency, central tendency and variation.
2. Frame questions that can be answered using available district health systems data.
3. Apply appropriate data visualization techniques to answer questions about district health system performance.

Materials Required

- Module 2.3 presentation slides
- Laptop and projector
- Microsoft Excel installed on participant laptops
- Exercise Instructions Booklet (Module 2.3 - Exercise Dataset 1 and 2)
- Whiteboard or flipchart and markers

Session at a Glance

Section	Activity	Materials	Time
Part A	**Analyzing and Visualizing Categorical Data** **Data Analysis and Visualization Techniques; Tables**	**Slides 2–13**	**25 mins**
Exercise	Exercise 1 – Working with Tables	Slide 14	15 mins
Part B	**Bar Charts**	**Slides 15–19**	**10 mins**
Part C	**Pie Charts**	**Slides 20–21**	**10 mins**
Exercise	Exercise 2: Categorical data: Block-wise performance on LBW babies	Slide 22	15 mins
	Key takeaways	Slides 23–24	5 mins

Before you begin

Remind participants that the previous module introduced different types of variables, descriptive statistics, and visualization methods for numerical data. Explain that this session builds on that foundation by focusing on categorical data and how it can be presented effectively to support program monitoring and decision-making.

Part A—Analyzing and Visualizing Categorical Data – Tables (Slides 4–13, approx. 25 minutes)

0:00–0:05	Visualizing according to Data Variable Type (Slide 5)

SLIDES

Use Slide 5 for revising the different variable types and the descriptive statistics commonly used for each. Reinforce that today's session focuses on categorical variables, which are generally described using frequencies, percentages and mode, and are commonly presented using tables, bar charts and pie charts.

Use the program examples on the slide to link the concepts to routine district health data.

0:05–0:25	Tables (Slides 6–13)

Opening question

"Suppose you wanted to present ANC registrations for every block in your district. How would you normally present this information?"

Allow participants to respond before displaying the table.

SLIDES

Walk participants through the example tables in Slides 6–13 showing ANC registrations by block. Ask them to identify the highest and lowest performing blocks and discuss whether this can be done quickly.

Explain how colour coding and heat maps make the tables more informative. Use the example to demonstrate that while tables provide precise information, they do not always communicate patterns effectively.

Discussion prompt

"What makes tables difficult to interpret during a review meeting?"

Expected participant responses

Participants may mention: too many numbers; difficult to compare blocks; highest and lowest values are not immediately obvious; everyone has to read each row individually.

Summarize by reinforcing that tables are useful for presenting exact values but often need to be organized to improve interpretation.

Exercise 1: Working with Tables

Duration	15 minutes
Format	Group work + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.3_Exercise 1 > Exercise dataset: Dataset_Module 2.3_Exercise 1–2

Session-specific Instructions

Read out the instructions provided on Slide 14. Participants are expected to construct tables for describing the given data and identify the best and worst performing blocks in terms of LBW babies. Follow the facilitation process as described in Section II.

Encourage participants to explain why they selected a particular presentation method rather than focusing only on Excel steps. Conduct a short debrief.

Debrief Guidance

- Invite one or two groups to present their outputs.
- Ask: "Which version of the table made it easiest to identify priority blocks?"
- Conclude by reinforcing that organizing data effectively improves interpretation without changing the underlying information.

Bridge to Session 2

"So far we have improved the way tables communicate information. However, managers often need to communicate findings quickly during review meetings and presentations. In the next session we will look at graphical methods that make comparisons even easier."

Part B—Bar Charts (Slides 15-19, approx. 10 minutes)

0:40–0:45	**Bar Charts for Comparing Categories (Slide 16); Stacked Bar Charts and 100% Stacked Bar Charts (Slide 17–18)**

SLIDES

Use the examples used in Slide 16 to demonstrate how bar charts make it easier to compare categorical data such as block-wise ANC registrations. Highlight how the highest and lowest values can be identified much more quickly than in a table.

Emphasize that bar charts are most useful when the objective is to compare categories rather than present exact numbers.

Summarize by reinforcing that bar charts communicate comparisons more effectively than tables.

SLIDES

The examples on Slides 17 and 18 demonstrate how stacked and 100% stacked bar charts answer different program questions.

Explain that stacked bar charts are useful when managers need to compare both overall totals and the contribution of sub-categories.

Explain that 100% stacked bar chart standardizes each bar to the same height, making it easier to compare proportions across categories.

TIP: Remind participants that graphs often generate questions rather than provide answers. Additional information is usually needed before drawing conclusions.

TIP: Reinforce that the choice of graph should always be guided by the management question rather than familiarity with a particular chart type.

0:45–0:50	**Recognizing Poor Visualization Practices (Slide 19)**

SLIDES

Review the example of the three-dimensional bar chart (Slide 19). Discuss how unnecessary visual effects, background elements and clutter can distract from the message and make comparisons more difficult.

Highlight the recommended improvements shown on the slide.

> **Opening question**
>
> "What problems do you notice with this graph?"

Allow participants to identify the issues before discussing the slide. Summarize by emphasizing that effective visualizations should communicate information clearly with as little unnecessary detail as possible.

Part C—Categorical Data - Pie Charts (Slides 20–21, approx. 10 minutes)

0:50–1:00	**Categorical Data: Pie Charts and Spotting Poor Visualization Practices (Slides 20–21)**

SLIDES

With the help of Slides 20–21 explain that pie charts are useful for showing the relative contribution of each category to the whole. Also discuss the example of poor pie chart design (Slide 21) and highlight why too many categories, similar colours and poor ordering make interpretation difficult.

Discussion prompt

"Would you use a pie chart to compare performance across 15 blocks? Why or why not?"

Expected participant responses

Participants are likely to observe that pie charts become difficult to interpret when there are many categories; comparing slice sizes is more difficult than comparing bar lengths; bar charts are usually better for comparing multiple categories.

Summarize by reinforcing that pie charts should be reserved for situations where the objective is to show relative contribution and the number of categories is limited.



TIP: Encourage participants to avoid using pie charts simply because they are familiar. Always consider whether another graph would communicate the message more effectively.

Group Exercise 2 – Categorical Data

Duration	15 minutes
Format	Group work + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 2.3_Exercise 2 > Exercise dataset: Dataset_Module 2.3_Exercise 1-2

Session-specific Instructions

Read out the instructions provided on Slide 22. Participants are expected to use different types of bar charts and pie chart to examine block performance. Follow the facilitation process as described in Section II.

Conduct a short debrief.

Debrief Guidance

- Invite one or two groups to present their graphs.
- Ask: "Which graph would you use during a district review meeting, and why?"
- Follow with: "Did different graphs answer different management questions?"
- Conclude by reinforcing that selecting the right visualization is an important analytical skill and that different graphs are appropriate for different purposes.

Closing Discussion

Before summarizing the module, ask participants:

"Thinking back over today's session, which visualization do you think would improve the way program data are presented in your district review meetings?"

Invite two or three participants to share examples from their own programs. Use the discussion to reinforce that effective visualization is not about producing attractive graphs—it is about helping managers identify priorities, communicate findings clearly and support evidence-based decision-making.

Key takeaways to reinforce

- The choice of visualization should always be guided by the question and type of variable.
- Tables are useful for presenting detailed information but should be organized to improve interpretation.
- Bar charts are generally the most effective way of comparing categories.
- Pie charts are best used to show relative contribution when there are only a few categories.
- Good visualizations communicate information clearly and support evidence-based decision-making.

Transition to Module 3.1

"In this module we explored how categorical data can be organized and presented to answer program management questions. In the next module, we will build on these principles by examining additional methods for analyzing and communicating health systems data. As you move forward, continue to ask three questions: What data do I have? What question am I trying to answer? Which visualization will communicate that answer most effectively?"

MODULE 3.1

Estimating Service Coverage

Module Overview

Module	3.1 – Estimating Service Coverage
Duration	2.5 hours
Sessions	Session 1: The Health Service Coverage Cascade (40 mins) Break (10 mins) Session 2: Measuring Service Coverage (15 mins) Session 3: Estimating Service Coverage using Routine Data (50 mins) Group Exercise (35 mins)
Format	Facilitator-led presentation, discussion and group exercise

Module Objectives

By the end of this module, participants will be able to:

1. Describe the stages of the health service coverage cascade.
2. Distinguish between concepts of service utilization, service coverage and effective coverage.
3. Identify appropriate data sources for estimating service coverage measures and understand the associated pros and cons, and challenges in using certain data sources.
4. Estimate population denominators required for calculating service coverage indicators.

Materials Required

- Module 3.1 presentation slides
- Microsoft Excel installed on participant laptops
- Whiteboard or flipchart with markers
- Exercise Instructions Booklet (Module 3.1 – Exercise Dataset 1)
- Calculator

Session at a Glance

Section	Activity	Materials	Time
PART A	**Health Service Coverage Cascade**	**Slides 5–18**	**40 mins**
	Why measure service coverage?	Slides 5–10	15 mins
	Standardized health service cascade	Slide 11	5 mins
	Stages of health service coverage cascade	Slides 12–16	15 mins
	Applying the coverage cascade	Slides 17–18	5 mins
—	Break		**10 mins**

Section	Activity	Materials	Time
PART B	**Measuring Service Coverage**	**Slides 19–28**	**15 mins**
	Service coverage vs. utilization	Slides 19–21	5 mins
	Service coverage in practice	Slides 22–27	5 mins
	Session summary	Slide 28	5 mins
PART C	**Estimating Service Coverage using Routine Data**	**Slides 29–52**	**50 mins**
	Data sources for service coverage	Slides 30–34	10 mins
	Estimating denominators	Slides 35–40	30 mins
	Other considerations in estimating service coverage	Slides 41–47	10 mins
	Group exercise: Estimating service coverage from routine data	**Slides 49–51**	**35 mins**

Before you begin

Explain to the participants that this module focuses on a key aspect of program performance – whether health services reach the population in need. Emphasize that service coverage helps managers identify gaps, assess performance and prioritize corrective action.

TIP: Throughout the session, encourage participants to relate each concept to programs they currently manage, such as immunization, NCD screening, maternal health or TB.

Part A—Introducing the Health Service Coverage Cascade (Slides 5–18, approx. 40 minutes)

0:00–0:15	Why Measure Service Coverage? (Slides 5–10)

Opening questions for participants

"When we say a program is performing well, what information do we usually look at?"

Allow participants to respond before displaying the slides.

SLIDES

Slides 5–9: Re-introduce the WHO–UNICEF Primary Health Care Performance Measurement Framework and explain the distinction between program outputs and outcomes.

Next, discuss the three conditions necessary for people to use health services:

- Services must be available.
- Services must be physically accessible.
- Services must be acceptable and affordable.

Discussion prompt

"Can you think of examples from your district where services are available, but people still do not use them?"

Encourage participants to share examples related to their own programs.

Expected participant responses

Participants may mention: Distance to health facilities; lack of awareness; cultural beliefs; cost of travel; poor quality of services; inconvenient service timings.

Summarize the responses by reinforcing that availability alone does not guarantee utilization.

0:15–0:20	Standardized Health Service Coverage Cascade (Slide 10–11)

Opening question—pose before showing any slides

"What steps do you think occur between identifying a person who needs a health service and achieving the desired health outcome?"

Allow participants to suggest a few steps before displaying the cascade.



SLIDES

Using Slide 11, introduce the standardized health service coverage cascade and explain that it describes the sequence from identifying the population in need through service contact, quality-adjusted coverage and ultimately health outcomes.

Discussion prompt

"How might this framework help program managers identify bottlenecks in service delivery?"

Guide participants to recognize that different gaps in the cascade require different corrective actions.

0:20–0:40	The Seven Stages of the Coverage Cascade (Slides 12–18)



SLIDES

Using Slides 11–16, introduce each stage of the cascade:

- Target Population
- Service Contact Coverage
- Input-adjusted Coverage
- Intervention Coverage
- Quality-adjusted Coverage

- User Adherence-adjusted Coverage
- Outcome-adjusted Coverage

For each stage:
- Briefly explain what it represents,
- Use the program examples provided on Slide 17 for application of cascade in practice.
- Reinforce how each stage narrows the population moving through the cascade.

Emphasize that in routine program monitoring, service contact coverage and quality-adjusted (effective) coverage are the indicators most commonly estimated.

TIP: Avoid asking participants to memorize all seven stages. Instead, focus on helping them understand how each stage builds on the previous one.

Discussion prompt—after Slide 18

"Which stages of this cascade could you estimate using the routine data systems available in your district?"

Allow a brief discussion before concluding the session.

Part B—Measuring Service Coverage (Slides 19–28, approx. 15 minutes)

Discussion prompt

"How might this framework help program managers identify bottlenecks in service delivery?"

Guide participants to recognize that different gaps in the cascade require different corrective actions.

Before you begin

Explain to the participants that this session focuses on the practical aspects of measuring service coverage—understanding the difference between utilization and coverage, identifying appropriate data sources, estimating denominators and recognizing the limitations of routine data.

0:40–0:45	**Service Coverage vs. Utilization (Slides 19–21)**

Opening question—pose before showing any slides

"If a facility reports that 2,000 adults were screened for hypertension last quarter, does that tell us whether the program has achieved good population coverage?"

Allow participants to discuss briefly before displaying the slides.

SLIDES

Use the examples provided in Slides 20–21 to distinguish between:

- Service utilization, which measures the number or frequency of contacts with health services from the provider or patient perspective.
- Service coverage, which measures the proportion of the target population that has received the service.

Walk participants through the hypertension screening example presented in the slides to demonstrate why utilization alone may provide an incomplete picture of program performance. Highlight the role of the denominator in estimating coverage.

TIP: Draw participants' attention back to Module 1.2 on denominators. Reinforce that without an appropriate denominator, program performance can easily be misinterpreted.

0:45–0:50 Service Coverage in Practice (Slides 22–27)

SLIDES

Walk through the example of the ANC coverage cascade (Slides 22–27) and ask participants to calculate the key aspects of service coverage cascade. Use the speaker notes to explain the quality score and the interpretation of the effective coverage estimate.

Emphasize that effective coverage combines both access and quality.

0:50–0:55 Session Summary (Slide 28)

SLIDES

Briefly summarize the key messages from the first part of the session.

Reinforce that:

- Service utilization and service coverage are different concepts.
- Service coverage requires both a numerator and an appropriate denominator.
- Effective coverage incorporates quality of care.
- The coverage cascade helps identify where improvements are needed.

Bridge to Part C

"Having understood what service coverage measures, let us now examine where the information comes from and how routine data can be used to estimate service coverage."

PART C—Estimating Service Coverage using Routine Data (Slides 29–47, approx. 50 minutes)

0:55–1:05	Data Sources for Service Coverage (Slides 30–34)

Opening question

"What routine data sources do you currently use to monitor program performance in your district?"

Allow participants to list the systems they use before displaying the slides.

SLIDES

Review the common sources of numerator and denominator data used for estimating service coverage.

Highlight the distinction between:

- Population-based surveys (e.g., NFHS)
- Routine health information systems (e.g., HMIS, RCH Portal, NCD App, AAM Portal)

Discuss the advantages of routine data for program monitoring and decision-making before introducing the steps involved in estimating service coverage.

Discussion prompt

"Why are routine data systems particularly useful for district program managers?"

Expected participant responses

Participants may mention timely availability; continuous reporting; supports program monitoring; helps identify gaps; supports resource allocation.

Summarize by reinforcing that routine data are essential for program management but should always be interpreted with an understanding of their limitations.

1:05–1:35	Estimating Denominators (Slides 35–40)

SLIDES

Introduce the four examples (Slides 36) used to estimate denominators for common service coverage indicators:

- Hypertension screening
- DPT-3 immunization
- Four ANC visits
- OPD utilization

Walk participants through each example one by one using the speaker notes. Ask the participants to estimate the denominator using given information. After each example, explain the arithmetic on a white board and facilitate the discussion questions provided after each exercise.

Emphasize that different indicators require different methods for estimating denominators and that each method has its own strengths and limitations.

1:35–1:45	Other Considerations in Estimating Service Coverage (Slides 41–47)

SLIDES

Slides 42–47: Discuss the limitations of routine data, approaches for validating service coverage estimates and common reasons why service coverage may be underestimated or overestimated.

Conclude by highlighting the ethical considerations associated with interpreting service coverage measures and the importance of disaggregated estimates for monitoring equity.

Use the summary slide to reinforce the major learning points before moving to the group exercise.

Discussion prompt

Ask:

"Have you encountered service coverage estimates greater than 100%? What could explain such findings?"

Allow participants to discuss practical examples before summarizing the key reasons presented on the slides.

Bridge to Group Exercise

"We have now discussed the concepts, data sources and methods used to estimate service coverage. In the final session, you will apply these principles using a routine dataset to estimate and interpret service coverage indicators."

Group Exercise: Estimating Service Coverage using Routine Data

Duration	35 minutes
Slides	49–50
Materials	> Laptops with Microsoft excel installed > Exercise Instructions Booklet: Instruction Sheet_Module 3.1_Exercise 1 > Exercise dataset: Dataset_Module 3.1_Exercise 1

Session-specific Instructions

Read out the instructions provided in the instruction booklet. Participants are expected to estimate the service coverage for key services in a district based on the given data and interpret the findings. Follow the facilitation process as described in Section II.

TIP: If participants focus only on obtaining the correct numerical answer, redirect the discussion towards interpretation by asking, "What does this estimate tell you about program performance?"

Debrief Guidance

- Invite two or three groups to present their responses.
- For each question, encourage participants to explain:
  - how they identified the numerator;
  - how they estimated the denominator;
  - the assumptions they made;
  - the limitations of their estimate.

TIP: Don't correct or rank groups at this stage. Save detailed feedback for end-of-workshop presentations.

Discussion prompt

Ask participants:

"If you were presenting these findings during a district program review meeting, what additional information would you want before making management decisions?"

Encourage participants to think beyond the calculations and consider data quality, completeness and program context.

2:25–2:30	Module Summary (Slides 50–51)

Key messages to reinforce

- Health service coverage measures the proportion of the target population that receives a health intervention.
- Service utilization and service coverage are related but distinct concepts.
- Estimating service coverage requires an appropriate numerator and denominator.
- Routine health information systems provide valuable data for monitoring service coverage but have important limitations that should always be considered.
- Service coverage estimates should support program improvement by identifying gaps in access, utilization and quality of care.

Closing Reflection

Before closing the session, ask:

“How could the concepts discussed today improve the way service coverage is monitored in your district?”

Allow two or three participants to share examples from their own program areas.

Use the discussion to reinforce that service coverage estimates are most valuable when they are used to identify bottlenecks, prioritize action and strengthen program performance rather than simply report numbers.

Transition to Module 4.1

“In this module, we examined how service coverage can be estimated using routine health information systems and why appropriate denominators are essential for meaningful program monitoring. In the next module, we will build on these concepts by exploring data quality assessment methods and approaches.”

MODULE 4.1

Right Data – Right Decisions: Approach to Data Quality

Module Overview

Module	4.1 – Right Data – Right Decisions: Approach to Data Quality
Duration	2.5 hours
Sessions	> Session 1: Data Quality Concepts and their Importance (20 mins) Break (10 mins) > Session 2: Data Quality Assessment and Improvement (120 mins)
Format	Facilitator-led presentation, interactive discussion and group exercises

Module Objectives

By the end of this module, participants will be able to:

1. Identify types of data errors that affect the quality of health data.
2. Define data quality and identify the key dimensions of data quality assessment.
3. Apply techniques to improve the quality of health data.

Materials Required

- Module 4.1 presentation slides
- White board or flipchart with markers
- Mentimeter (or alternative polling platform)
- Exercise Instructions Booklet (Module 4.1 – Exercise Dataset 1, 2, 3)
- Microsoft Excel

Session at a Glance

Section	Activity	Materials	Time
Part A	**Why Data Quality Matters and Common Data Quality Issues**	**Slides 4–5**	**10 mins**
	Introducing data quality	Slide 4	5 mins
	Interactive activity	Slide 5	5 mins
Part B	**Common Data Quality Issues**	**Slide 6**	**5 mins**
Part C	**Data Quality Assessment and Improvement**	**Slides 7–41**	**120 mins**
	Data quality issue: Missing data	Slides 7–12	10 mins
	Group exercise 1: Identifying missing values and zeros	Slide 14	10 mins
	Data quality issue: Inconsistency	Slide 15	5 mins
	Inconsistency: Outlier	Slides 16-20	10 mins
	Group exercise 2: Identifying outliers	Slide 22	10 mins
	Other inconsistencies: Inconsistency over time, Inconsistency between related indicators, Inconsistency with original records	Slides 23–29	25 mins

Section	Activity	Materials	Time
	Group exercise 3: Identifying inconsistencies	Slide 30	10 mins
	Data quality issues: Accuracy	Slides 31–35	20 mins
	Situation, Background, Assessment, and Recommendation (SBAR) framework and its application	Slides 36–37	10 mins
	Poor data quality: Real world impact	Slide 38	5 mins
	Key takeaways	Slide 41	5 mins

Before you begin

Remind participants that previous modules focused on understanding indicators, estimating service coverage and interpreting program performance. Explain that all these activities depend on one fundamental requirement—high-quality data.

Emphasize that inaccurate, incomplete or inconsistent data can result in inappropriate planning, incorrect program decisions and poor health outcomes. Throughout this module, participants will explore practical approaches for identifying common data quality issues and improving the quality of routine health information.



TIP: Encourage participants to relate the discussion to their own reporting systems. Most participants will already have encountered data quality challenges during routine program implementation.

Part A—Why Data Quality Matters and Common Data Quality Issues



0:00–0:05 | **Introducing Data Quality (Slide 4)**

Begin by asking

"Can you recall a situation where poor-quality data created confusion, delayed action or affected program decisions?"

Invite one or two participants to briefly share their experiences before displaying the slide.



SLIDES

Use Slide 4 and introduce the concept of data quality using the examples and discussion points provided in the speaker notes. Use the program cycle illustrated on the slide to explain how poor-quality data affect planning, implementation, monitoring and evaluation.

Discussion prompt

Ask participants:

"Why do program managers need to care about data quality?"

Allow participants to respond before summarizing the discussion.

Expected participant responses

Participants may mention: better program planning; more reliable monitoring; improved resource allocation; greater confidence in reported results; better decision-making.

Conclude by reinforcing the central message:
Good decisions depend on good-quality data.

0:05–0:10	Interactive Activity – Poll (Slide 5)

SLIDES

Conduct the polling activity using the questions provided on Slide 5. Use the poll primarily as an icebreaker to encourage participants to reflect on their own experiences with data quality rather than as a formal assessment.

PART B—Common Data Quality Issues (Slide 6, approx. 50 minutes)

0:10–0:15	Types of Data Quality Issues (Slide 6)

Opening question

"What kinds of data quality problems do you encounter most frequently in routine program reports?"

SLIDES

Slide 6: Introduce the major categories of data quality issues presented in the module:

- Missing data
- Inconsistency
- Measurement and data entry errors
- Indicator definition issues
- Manipulation and reporting bias

Before you begin Part C

Remind participants that the previous session introduced the importance of data quality and key data quality issues. Explain that this session focuses on practical methods for assessing these five categories of issues and introduces tools that program managers can use routinely to identify and address data quality issues.

Emphasize that the purpose of data quality assessment is not to identify mistakes or assign blame, but to strengthen routine health information systems and improve program performance.

0:15–0:25	Completeness and Timeliness (Slides 7–12)

SLIDES

Use Slides 7-8 to describe common reasons for blank values, delayed reporting and partial reporting. Reinforce that missing or zero values should always be interpreted carefully before assuming that no services were provided.

Explain the indicative WHO Data Quality Review (DQR) metrics for completeness and timeliness.

Conclude by introducing the operational approaches used to improve completeness, including supportive supervision, automated reminders and routine review meetings.

Discussion prompts

"Does a value of zero always mean that no services were delivered?"

"Which of these operational methods could be implemented most easily within your district?"

Encourage participants to identify practical actions that could strengthen reporting completeness.

Group Exercise 1: Identifying Missing Values and Zeros

Duration	10 minutes
Format	Group work + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 4.1_Exercise 1 > Exercise dataset: Dataset_Module 4.1_Exercise 1

Session-specific Instructions

Participants are expected to calculate the percentage of zeros and missing values in the ANC services data and interpret what the findings may indicate.

Debrief Guidance

- Invite two or three groups to share their findings. Ask: "What would you want to check before concluding that a zero represents an actual absence of service?"
- Reinforce that missing and zero values need to be examined carefully before they are interpreted as program performance.

0:35–0:40	Understanding Inconsistency (Slide 15)

SLIDES

Explain that data may be complete but still have quality problems if values are inconsistent with expected patterns. Introduce the main types of inconsistencies covered in the session: outliers, inconsistency over time, inconsistency between related indicators, inconsistency with original records, and external comparison.

Discussion prompt

"If a value looks very different from what we normally see, what would you want to check before using it?"

Key message to reinforce

Consistency checks help identify data that require further investigation.

0:40–0:43	Inconsistency: Outliers (Slides 16–17)

SLIDES

Explain that an outlier is a value that is unusually high or low compared with the expected pattern of the data. Use the ANC coverage example to illustrate how an unusual value can be identified visually.

Discussion prompt

"If one block reports ANC coverage that is much higher than all the others, what could explain this?"

Expected participant responses

Data-entry or calculation errors, a change in the population denominator, reporting problems, genuine differences in service delivery, or over-reporting.

Key message to reinforce

An outlier is a signal for investigation—not automatically an error.

TIP: Link this briefly to the data visualization techniques covered in earlier modules. Participants should recognize that graphs can help identify unusual observations quickly.

0:43–0:47	Outlier Detection using SD and Box Plot Methods (Slide 18–19)

SLIDES

Use the example on Slide 18 to demonstrate how the SD method can be used to identify a potential outlier.

Use the example on Slide 19 to identify the median, quartiles, IQR, whiskers and potential outliers.

Mention that a box plot provides a quick visual way to identify unusually high or low observations.

Key message to reinforce

Statistical methods help identify unusual values; verification is needed to determine whether they are errors.

TIP: Participants have already been introduced to these methods. Avoid reteaching the concept and focus on its application to data quality assessment.

0:47–0:50 | **Operational Methods to Address Outliers (Slide 20)**

SLIDES

Explain that once an outlier is identified, the next step is verification. Discuss the possible actions shown on the slide: Correct confirmed errors, retain genuine outliers and flag values that cannot yet be verified.

Discussion prompt

"Should an unusual value always be corrected or removed?"

Key message to reinforce

Never remove or change an outlier simply because it looks unusual. Verify it first.

Group Exercise 2: Identifying Outliers

Duration	10 minutes (0:50-1:05)
Format	Group work + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 4.1_Exercise 2 > Exercise dataset: Dataset_Module 4.1_Exercise 2

Session-specific Instructions

Ask participants to remain in their existing groups. Direct them to identify:

- outlier facilities for ANC registration using the SD method;
- outliers for TB screening using box plots; and
- appropriate interpretation of the findings.

Discussion prompt

"What would you check before concluding that an identified outlier represents a data quality problem?"

Key message to reinforce

Outlier detection is a screening step. The flagged value must be verified before action is taken.

1:05–1:10	Inconsistency Over Time (Slides 23–24)

SLIDES

Explain that inconsistency over time examines whether reported values follow a logical or expected pattern, using the ANC report example.

Walk participants through the basic process:

- Calculate the recent average.
- Compare the current value with the average.
- Compare the facility trend with the district trend.
- Flag substantial deviations for review.

Discussion prompt

"Does a large change from the previous months automatically mean that the data are wrong?"

Key message to reinforce

A deviation is a signal to investigate, not proof of a data quality problem. It could reflect genuine changes in service delivery, seasonal variation, staff availability or other program factors. It should be investigated before a conclusion is made.

TIP: Remind participants to consider genuine program or seasonal changes before classifying a deviation as an error.

1:10–1:15	Inconsistency/Consistency Between Related Indicators (Slides 25–26)

SLIDES

Explain that some indicators have an expected relationship and can therefore be compared to identify potential inconsistencies.

Discussion prompt

"If ANC1 and TT1 are expected to be similar, what could explain a large difference between them?"

Encourage participants to consider both data quality and genuine service-delivery explanations.

Key message to reinforce

Comparing logically related indicators is a useful way to identify possible inconsistencies within routine data.

1:15–1:23 Comparing Reported Data with Original Records (Slides 27)

SLIDES

Explain that reported data can be checked against the original source documents from which the data were compiled.

Walk participants through the process:

- Select facilities → review source documents → compare reported and recorded values → measure agreement → follow up discrepancies.
- Emphasize that this method requires review of original facility records and therefore involves primary data collection.

Key message to reinforce

Source-data verification checks whether reported figures match the original records.

1:23–1:25 External Comparison and Inconsistency (Slide 28)

SLIDES

Explain that routine program data can be compared with other sources, such as NFHS and HMIS, to identify substantial differences.

Emphasize that differences between sources do not automatically mean that one source is incorrect; they indicate the need for further review.

Discussion prompt

“What could explain a difference between routine program data and survey data?”

Expected participant responses

Differences in definitions, population coverage, reporting periods, denominators or reporting practices.

Key message to reinforce

External comparison helps identify substantial differences that warrant investigation; it does not, by itself, establish which source is correct..

1:25–1:30 Operational Methods to Address Inconsistency (Slide 29)

SLIDES

Briefly discuss the practical actions shown on the slide: Cross-verification with facility records, correction of confirmed errors, documentation and feedback, follow-up logs, training, clear indicator definitions and validation rules.

Key message to reinforce

Data quality improvement requires both correcting existing problems and preventing them from recurring.

Group Exercise 3: Identifying Inconsistencies

Duration	10 minutes (1:30–1:40)
Format	Group work + short debrief
Materials	> Laptops with Microsoft Excel installed > Exercise Instructions Booklet: Instruction sheet_Module 4.1_Exercise 3 > Exercise dataset: Dataset_Module 4.1_Exercise 3

Session-specific Instructions

- Ask participants to remain in their existing groups. Direct them to identify:
  - inconsistencies between OPV-0 and Hepatitis-B0 birth-dose indicators; and
  - inconsistencies over time using facility-wise monthly data on new ANC registrations.
- Ask groups to interpret the results.

Discussion prompt

"What could explain this inconsistency, and what would you check before concluding that there is a data quality problem?"

Key message to reinforce

Consistency checks identify signals for investigation; they do not, by themselves, establish the cause of a discrepancy.

1:40–1:50 **Data Quality Issues Related to Accuracy (Slides 31–33)**

SLIDES

Explain that accuracy refers to the correctness of the data reported.

Use the examples on Slide 32 to discuss measurement and data-entry errors, including typing errors, and wrong-field entries.

Use example on Slide 33 to explain the calculation errors.

Discussion prompt

"Why might this type of error occur during reporting?"

Expected participant responses

Unclear indicator definitions, misunderstanding of the compilation process, inadequate training or communication gaps.

Key message to reinforce

Accurate reporting depends on a clear and shared understanding of indicator definitions.

1:50–1:55	Accuracy: Indicative Metric (Slide 34)

SLIDES

Briefly introduce the WHO indicative metric shown on the slide and explain that reported values can be compared with values verified from source documents to assess accuracy.

TIP: Keep this brief. The important point is understanding the purpose of source verification, rather than memorizing the threshold.

1:55–2:00	Operational Methods to Address Accuracy Issues (Slide 35)

SLIDES

Discuss the practical measures shown on the slide: Standardized protocols and definitions, routine training and proactive data quality monitoring.

Key message to reinforce

Preventing errors at the point of measurement, recording and entry is more effective than correcting them later.

2:00–2:10	SBAR Framework (Slides 36–37)

SLIDES

Explain that participants have now learned how to identify different types of data quality problems. Introduce SBAR as a structured way of communicating these problems and agreeing on appropriate action.

Use the example of incorrect computation of fully immunized children to briefly illustrate each component.

Key message to reinforce

SBAR provides a simple structure for moving from identifying a data problem to understanding it and recommending action. Applying a structured approach consistently can help move data quality management from one-off corrections towards a culture of continuous improvement.

TIP: Keep the discussion practical. Participants do not need to learn SBAR as a separate technical tool; they need to understand how it can strengthen routine communication and follow-up.

2:10–2:15	Poor Data Quality—Real-World Impact (Slide 38)

SLIDES

Use the diagram to connect the data quality issues discussed in the session with their consequences for health programs.

Discussion prompt

"What can happen when poor-quality data are used to make program decisions?"

Build on responses to highlight effects on resource allocation, performance assessment, planning and monitoring, patient safety, public health decisions and trust.

Key message to reinforce

Poor data quality is not simply a reporting problem—it can directly affect program decisions and health outcomes.

2:15–2:20	Key Takeaways—Assessing Data Quality (Slide 41)

SLIDES

Briefly recap the key messages from the session. Reinforce that health data quality can be affected by missing data, outliers, inconsistencies and inaccuracies. Highlight the key dimensions of quality assessment covered.

Emphasize that different techniques can be used to identify and address each type of data quality problem, but that improving data quality at source remains critical.

Key message to reinforce

Good decisions depend on good-quality data. Data quality needs to be protected throughout the data cycle—from collection and entry to analysis, review and feedback.

Closing Remarks

"Today we have looked at how to identify problems in routine health data, understand what may be causing them and determine what needs to be checked or corrected. The key is not simply to find errors, but to build systems and practices that prevent them and continuously improve data quality."

Reading Resources

- World Health Organization and the United Nations Children's Fund (2022). Primary health care measurement framework and indicators: monitoring health systems through a primary health care lens.
- National Health Systems Resource Centre (2018). Operational guidelines for comprehensive primary health care through health and wellness centres.
- M&E Division MoHFW and HMIS Division NHSRC (2011). Understanding health management information systems- Service provider's manual.
- National Health Systems Resource Centre (2011), Principles of rationalization of data collection & the process of crafting and validating indicators
- World Health Organization, Health Metrics Network. (2012). Framework and standards for country health information systems. Second edition.
- Mishra, A., Mokashi, T., Nair, A., & Chokshi, M. (2022). Mapping healthcare data sources in India. Journal of Health Management, 24(1), 146–159.
- Ministry of Health and Family Welfare, Govt. of India. (2020). An e-Booklet on IT initiatives of National Health Mission
- Shukla, D. (2023). A narrative review on types of data and scales of measurement: An initial step in the statistical analysis of medical data. Cancer Research, Statistics, and Treatment, 6(2), 279–283.
- Hoeks, S., Kardys, I., Lenzen, M., Van Domburg, R., & Boersma, E. (2013). Tools and techniques–Statistics: Descriptive statistics. EuroIntervention, 9(08), 1001–1003.
- Knaflic, C. N. (2019). Storytelling with data: let's practice!. John Wiley & Sons.
- Tufte, E. R., & Graves-Morris, P. R. (1983). The visual display of quantitative information (Vol. 2, No. 9). Cheshire, CT: Graphics press.
- Tufte, E. R. (2006). Beautiful evidence. Graphis Pr.
- World Health Organization, Principles for Effective Communications. Available at *https://www.who.int/about/communications/principles*
- Tanahashi, T. (1978). Health service coverage and its evaluation. Bulletin of the World Health organization, 56(2), 295.
- Marsh, A. D., Muzigaba, M., Diaz, T., Requejo, J., Jackson, D., Chou, D., ... & Soucat, A. (2020). Effective coverage measurement in maternal, newborn, child, and adolescent health and nutrition: progress, future prospects, and implications for quality health systems. The Lancet Global Health, 8(5), e730–e736.
- World Health Organization and International Bank for Reconstruction and Development/The World Bank (2017). Tracking universal health coverage: 2017 global monitoring report. Licence: CC BY-NC-SA 3.0 IGO.

- Khatri, R.B., Durham, J., Karkee, R. et al. High coverage but low quality of maternal and newborn health services in the coverage cascade: who is benefitted and left behind in accessing better quality health services in Nepal?. Reprod Health 19, 163 (2022). *https://doi.org/10.1186/s12978-022-01465-z*
- World Health Organization (2023). Toolkit for analysis and use of routine health facility data: general principles. Licence: CC BY-NC-SA 3.0 IGO.
- World Health Organization (2017). Data quality review: a toolkit for facility data quality assessment. Module 1. Framework and metrics. Licence: CC BY-NC-SA 3.0 IGO.
- World Health Organization (2017). Data quality review: a toolkit for facility data quality assessment. Module 2. Desk review of data quality. Licence: CC BY-NC-SA 3.0 IGO.
- National Health Systems Resource Centre (2011). Health program manager's manual on data quality. Available from: *https://nhsrcindia.org/sites/default/files/2021-04/Session%203%20Presentation%20for%20Volume%202%20Health%20Program%20Managers%20Manual%20Data%20Quality_0.pdf*

