The United Republic of Tanzania
Ministry of Health, Community Development, Gender, Elderly and Children

DHIS 2 Functions and Data Use for Health Information System Strengthening

Training Manual

Facilitators' Guide

September 2017

The United Republic of Tanzania,
Ministry of Health, Community Development,
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Abbreviations

ANC	antenatal care
ART	antiretroviral therapy
CBI	community-based information system
CHMT	council health management team
DHS	Demographic and Health Survey(s)
DHIS	district health information system
eIDS	electronic integrated disease surveillance and response
eLMIS	electronic logistic management information system
FMIS	financial management information system(s)
GIS	geographic information system(s)
HIS	health information system(s)
HMIS	health management information system(s)
HRH	human resources for health
HRHIS	human resources for health information system(s)
HRIS	human resource information system(s)
IDSR	integrated disease surveillance and response
IPD	inpatient department
LMIS	logistic management information system
MFL	master facility list
MOHCDGEC	Ministry of Health, Community Development, Gender, Elderly and Children
NHA	National Health Accounts
OPD	outpatient department
RCH	reproductive and child health
RHMT	regional health management team
RITA	Registration Insolvency and Trusteeship Agency
TDHS	Tanzania Demographic and Health Surveys
THMIS	Tanzania HIV and Malaria Indicator Surveys
TSPA	Tanzania Service Provision Assesment Survey
VIA	visual inspection with ascetic acid (vinegar)

Contents

MODULE 1: OVERVIEW OF HEALTH SECTOR DATA SOURCES **1**

Introduction 1

Session 1: Health Information System Data Sources 2

Session 2: Major Health Surveys in Tanzania 3

MODULE 2: OVERVIEW OF TANZANIA'S HMIS **5**

Introduction 5

Session 1: HMIS Structure, Data Flow, and Staff Roles and Responsibilities 5

Session 2: Overview of HMIS Data Collection and Reporting Tools 6

Session 3: Overview of Indicators 8

Session 4: Frameworks for Understanding a Well-Functioning HMIS 12

MODULE 3: HIS DATA MANAGEMENT SYSTEMS **14**

Introduction 14

Session 1: Overview of the Major HIS Data Management Systems in Tanzania 14

Session 2: DHIS 2 Data Capture and Management 15

MODULE 4: MANAGING HEALTH DATA QUALITY **17**

Introduction 17

Session 1: Introduction to Data Quality 17

Session 2: HMIS Data Management and Data Quality 21

Session 3: Data Quality Assurance in DHIS 2 23

MODULE 5: ANALYSIS AND USE OF HEALTH DATA **25**

Introduction 25

Session 1: Fundamentals of Data Analysis 25

Session 2: Data Analysis Using DHIS 2 26

2a. Pivot Tables 26

2b. Data Visualizer 28

2c. Geographical Information System (GIS) 31

Session 3: Data Use Overview 33

Session 4: Data Interpretation and Communication 34

Session 5: Sustaining Data Use 36

MODULE 1: **OVERVIEW OF HEALTH SECTOR DATA SOURCES**

DURATION
2 HOURS

Introduction

Healthcare delivery occurs in a complex environment that is influenced by factors both within the healthcare system (e.g., health facilities, healthcare providers, healthcare management, and healthcare resources) and outside the system (social, political, cultural, and geographic factors). Therefore, healthcare system managers need a wide range of information to make sound decisions. Here are some examples of the information they need:

- Health service accessibility by the community
- Quality of the provided service
- Health outcomes in the community—for example, a decrease in morbidity and mortality
- Human resources for health management
- Logistics and drug supplies

Given the vastness of these information requirements, a variety of data sources are needed for healthcare and health system management. Different methods are employed to extract such data for use in management decision making in Tanzania.

This module introduces the health information system (HIS) and discusses different HIS data sources (both routine and nonroutine), the HIS subsystems used to collect and manage those data, and how the data can be used to set benchmarks for health service performance.

Module **Objectives**

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

1. **Identify the basic health information system data sources used to track the status and progress of health in the country**
2. **Explain the interdependence of health sector data sources**
3. **Distinguish routine and nonroutine health sector data sources**
4. **Describe essential data elements of common health surveys conducted in Tanzania**

Session 1: Health Information System Data Sources

DURATION
1 HOUR
30 MINUTES

SESSION OBJECTIVES

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

- Classify and distinguish different HIS data sources
- Distinguish routine and nonroutine data sources
- Explain the interdependence of different HIS data sources

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Exercise instructions
- Flip charts and markers

SESSION PLAN

Time	Title and Description	Methods/Activities
40 min	**Health Information System Data Sources** Present and explain: **The different health information system data sources and their interdependence**	Lecture
10 minutes	Exercise 1. Group Work: **Information needs at different levels of the health system**	Small Group Discussion
20 min	Exercise 2. Group Work: **Data and data sources**	Group Presentation and Plenary Discussion

EXERCISE 1. Group Work: **Information Needs at Different Levels of the Health System**

- Organize participants in groups of two.
- Ask participants to discuss the information needs of different levels of the health system. Encourage participants to relate the information needs to the functions of the health system levels.

- Give groups 10 minutes to discuss.
- Time permitting, groups can report back group by group or the facilitator can solicit responses in plenary.

EXERCISE 2. Group Work: **Data and Data Sources**

- Divide participants in groups of no more than five
- Ask each group to:
    - Identify data that can be obtained only through a single source. Identify the source.
    - Identify data that can be obtained through multiple sources.
- Give groups 10 minutes to discuss.
- Discuss in plenary and record and present responses on flip charts.

Session 2: Major Health Surveys in Tanzania

SESSION OBJECTIVES

DURATION
30 MINUTES

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

- Identify health surveys that are conducted in Tanzania and the types of data they collect
- Explain how data from health surveys can inform health programs
- Describe how data from health surveys can be used with health management information system (HMIS) data

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Exercise instructions
- Flip charts and markers
- Sample copies of survey reports—e.g., Tanzania Demographic and Health Survey (TDHS), Tanzania Health Management Information System (THMIS), and Tanzania Service Provision Assessment Survey (TSPA)

SESSION PLAN

Time	Title and Description	Methods/Activities
20 min	**Major Health Surveys in Tanzania** Present and explain: **Common health surveys conducted in the country—their methods, content, and frequency**	Lecture
10 min	Exercise. Group Discussion: Participants to discuss as a group and identify the types of surveys that respond to the following aspects of healthcare delivery: ○ **Healthcare coverage (e.g., are services reaching those in need?)** ○ **Healthcare quality (e.g., are clients satisfied with services? Are healthcare providers satisfied with the environment for health service delivery? Which factors affect client satisfaction with healthcare services?)** ○ **Patient-level outcomes (e.g., do the patients achieve improved health through the services provided?)** ○ **Population-level outcomes (e.g., are the health services provided having an impact on a community or population?)**	Plenary Discussion

SUGGESTED REFERENCES

1. Tanzania National Bureau of Statistics. (2016). Retrieved from http://www.nbs.go.tz/.
2. Tanzania National Bureau of Statistics. (2011). Tanzania HIV and malaria indicator survey 2011–2012. Retrieved from http://www.nbs.go.tz/tnada/index.php/catalog/23.

EXERCISES

Participants will discuss as a group and identify the types of surveys that respond to the following aspects of healthcare delivery:

- Healthcare coverage (e.g., are services reaching those in need?)
- Healthcare quality (e.g., are clients satisfied with services? Are healthcare providers satisfied with the environment for health service delivery? Which factors affect client satisfaction with healthcare services?)
- Patient-level outcomes (e.g., do the patients achieve improved health through the services provided?)
- Population-level outcomes (e.g., are the health services provided having an impact on a community or population?)

MODULE 2: **OVERVIEW OF TANZANIA'S HMIS**

Introduction

This module provides an overview of Tanzania's HMIS: the data flow, data management processes, and staff roles and responsibilities at each level of the HMIS. It also provides an introduction to the data collected by the HMIS, the data collection and reporting tools that are used to capture and report these data, and the national core indicators that are constructed using these data. The module offers two conceptual frameworks to help define HMIS performance and highlight the factors that influence HMIS performance.

Module **Objectives**

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

1. **Describe the structure and functions of Tanzania's HMIS**
2. **Identify HMIS roles and responsibilities for different health management levels in Tanzania**
3. **Identify sources of HMIS data**
4. **Identify and describe different registers and tools used to collect HMIS data**
5. **Differentiate types of indicators**
6. **Define the core HMIS indicators**
7. **Define HMIS performance and explain the role of a well-functioning HMIS in the production and use of high-quality data**
8. **Explain the differences among the technical, organizational, and behavioural factors influencing HMIS performance**

Session 1: HMIS Structure, Data Flow, and Staff Roles and Responsibilities

DURATION
30 MINUTES

SESSION OBJECTIVES

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

- Describe the flow of data across levels of health management in Tanzania
- Explain HMIS roles and responsibilities at different health management levels in Tanzania

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Exercise instructions
- Flip charts and markers

SESSION PLAN

Time	Title and Description	Methods/Activities
20 min	**HMIS Structure, Data Flow, and Staff Roles and Responsibilities** Present and explain: • **HMIS data flow across the system's levels**	Lecture
10 min	Exercise. Plenary Discussion: • **What HMIS-related challenges do you face in your work?**	Plenary Discussion

EXERCISE Plenary Discussion: **What HMIS-Related Challenges Do You Face?**

In plenary, encourage participants to discuss the challenges they have faced, pertaining to the HMIS, in their various roles. As participants offer their experiences, organize their responses in categories. This can be done by creating a matrix of different types of bottlenecks and proposed solutions on a flip chart (see Table 1).

Table 1. HMIS Bottlenecks and Solutions

	Data Quality (incl. timeliness and completeness)	Logistics Materials	Others
Facilities			
District			
Regional/National			

Session 2: Overview of HMIS Data Collection and Reporting Tools

SESSION OBJECTIVES

DURATION
1 HOUR, 10 MINUTES

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

- Explain the purpose of the HMIS in Tanzania
- Identify sources of HMIS data

- Identify and describe different registers and tools used to collect HMIS data
- Explain the importance of the registers in ensuring that high-quality HMIS data are collected

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Exercise instructions
- Flip charts and markers
- Sample registers, tally sheets, and summary forms

SESSION PLAN

Time	Title and Description	Methods/Activities
15 min	**Overview of HMIS** Present and explain: • **What an HMIS is** • **Purpose of an HMIS** • **Where HMIS data are generated**	Lecture Q/A (Plenary Discussion)
15 min	**Data Collection Tools** Present and explain: • **Different primary data collection tools (e.g., patients cards, registers, tally sheets, and monthly forms)** • **Data collection, aggregation, and reporting process** • **Data management with DHIS 2** • **Types of HMIS books used in Tanzania** • **Importance of HMIS registers**	Lecture Q/A (Plenary Discussion)
40 min	Exercise. Group Work: • **Data collection tools and individual roles in data collection**	Exercise/Group Presentation and Plenary Discussion

SUGGESTED REFERENCES

1. Ministry of Health and Social Welfare. (2013). Health management information system (HMIS) training manual, 2013.

2. MEASURE Evaluation, University of North Carolina at Chapel Hill. (2013). HMIS information use training manual. Retrieved from https://www.cpc.unc.edu/measure/resources/publications/ms-13-71.

EXERCISE. Group Work: **Sharing Participants' Experiences with Data Collection**

- Divide participants in small groups, depending on size of the class
- Give groups 15 minutes to brainstorm the following questions:
    - What types of data collection tools do facilities use to collect routine data?
    - What is your individual role in data collection? How does your performance affect how data are collected and used?
    - What best practices/recommendations can you share in terms of data collection tools?
- Choose one representative from each group to present what the group discussed to the class. Give each group five minutes or more, depending on how much time you have, for feedback and discussion.

Session 3: Overview of Indicators

SESSION OBJECTIVES

DURATION
2 HOURS

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

- Define indicators and explain their importance
- Describe different types of indicators
- Identify and define core indicators

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Flip chart and markers
- Exercise instructions
- List of Health Sector Strategic Plan (HSSP) IV indicators

SESSION PLAN

Time	Title and Description	Methods/Activities
40 min	**Introduction to Indicators** Present and explain: • **What a goal, a target, and an indicator are and how they are linked** • **Indicator structure** • **Types of indicators (count, rate, ratio, proportion, and percentage) and examples**	
25 min	Exercise 1. Group Work: **Understanding Indicators**	Exercise/Group Presentation Q/A (Plenary Discussion)
20 min	**National Priority indicators from HSSP IV** Present and explain: • **Five categories of health sector performance indicators** • **How many indicators are in each subcategory** • **Health status and service delivery indicators**	Lecture
35 min	Exercise 2. Group Work: **National Priority Indicators**	Exercise/Group Presentation Discussion

SUGGESTED REFERENCES

1. Ministry of Health and Social Welfare. (2015). Health Sector Strategic Plan, July 2015–June 2020 (HSSP IV). Retrieved from http://www.tzdpg.or.tz/fileadmin/documents/dpg_internal/dpg_working_groups_clusters/cluster_2/health/Key_Sector_Documents/Induction_Pack/Final_HSSP_IV_Vs1.0_260815.pdf.

EXERCISE 1. Group Work: **Understanding Indicators**

- Divide participants into four or five groups for a 10-minute discussion.
- Select two indicators from the following list:
  - Confirmed malaria cases
  - Antenatal care (ANC) coverage: before 12 weeks gestational age
  - ANC coverage: four visits
  - Antiretroviral therapy (ART) coverage
  - Cervical cancer screening
  - Outpatient attendance
  - Completeness: expected reports submitted in a given period
- For the selected indicators:
  - What is each indicator's type?
  - What are the numerator and denominator?
  - Where can we get the data for the numerators and denominators of these indicators?
- After the groups brainstorm, depending on how much time you have, you can ask each group to present its responses to all three questions to the larger group. If time is too short for that, ask Group 1 to present its response to the first question, Group 2 to present its response to the second question, and Group 3 to present its response to the third question.

EXERCISE 2. Group Work: **National Priority Indicators**

- Divide participants into four or five groups for a 10-minute discussion.
- Each group chooses two indicators from the reference sheet provided.
- Each group should discuss what each indicator means and how it can help to measure the performance of a health service or program.
- Each group should take up to five minutes (depending on the time available) to present its discussion.

National Prioirty Indicators

Indicator	Type	Numerator	Denominator	Data Sources
Confirmed malaria cases	Proportion or percentage	Number of confirmed malaria cases x 100	Total number of malaria cases (clinical + confirmed)	Registers
ANC coverage: before 12 weeks gestational age	Proportion or percentage	Number of pregnant women who start ANC before 12 weeks of gestation age	Estimated number of pregnant women	ANC register Census (Denominator)
ANC coverage: 4 visits	Proportion	Number of pregnant women who received antenatal care four or more times x 100	Estimated number of pregnant women	ANC register Census (Denominator)
ART coverage	Proportion or percentage	Number of adults and children eligible for ART receiving ART (disaggregated by under 5 and over 5 and sex)	Estimated number of eligible adults and children	Registers Census (Denominator)
Cervical cancer screening	Proportion or percentage	Total number of women between 30 and 50 years of age who were screened with visual inspection with acetic acid/vinegar (VIA)	Number of women ages 30–50 years	Registers
Outpatient attendance	Proportion	Total number of outpatients presenting for a new condition	Total population	Register
Completeness: share of expected reports submitted in a given period	Proportion	Number of reports received in a given year or other period	Number of reports expected in a given year or other period.	Monthly reports

Session 4: Frameworks for Understanding a Well-Functioning HMIS

SECESSION OBJECTIVES

DURATION
1 HOUR

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

- Define HMIS performance
- Explain the role of a well-functioning HMIS in the production and use of high-quality data
- Explain differences among the technical, organizational, and behavioural factors influencing HMIS performance

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Flip chart and markers
- Exercise instructions

SESSION PLAN

Time	Title and Description	Methods/Activities
15 min	**Defining HMIS Performance** Present and explain: • **Purpose of an HMIS** • **HMIS performance** Exercise 1. Group Work: **Defining a Functional HMIS**	Small-Group Discussion Lecture Presentation Q/A (Plenary Discussion)
45 min	**Frameworks for Understanding HMIS Performance** Exercise 2. Group Work: **Factor Analysis** Present and explain: • **The PRISM Framework** • **The 12 Components Framework** Exercise 3. Group Work: **Describe the status of the HMIS using the PRISM Framework**	Small-Group Discussion Lecture Presentation Q/A (Plenary Discussion)

SUGGESTED REFERENCES

Aqil, A., Lippeveld, T., & Hozumi, D. (2009). PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy Planning*, 24(3): 217–228.

Joint United Nations Programme on HIV/AIDS & Monitoring & Evaluation Reference Group. (2008). Organizing framework for a functional national HIV monitoring and evaluation system. Retrieved from http://www.unaids.org/sites/default/files/sub_landing/files/20080430_JC1769_Organizing_Framework_Functional_v2_en.pdf.

EXERCISE 1. Group Work: **Defining a Functional HMIS**

Get into small groups of five to six people and answer the following questions:

- What is the purpose of a well-functioning HMIS?
- List five things you need in order to have a well-functioning HMIS.

Give groups 10 minutes to discuss.

EXERCISE 2. Group Work: **Factor Analysis**

Get into small groups. Choose three bottlenecks that you are currently facing with the HMIS. For each problem, list the factors contributing to the problem. Be as specific as possible when listing the causes. For example:

Problem: Data are not being transmitted on schedule

Factors: Lack of materials/forms; staff not trained to fill out the forms; no incentive to submit on time

Give the groups 15 minutes to discuss.

EXERCISE 3. Group Work: **Describe the Status of the HMIS Using the PRISM Framework**

Using the PRISM framework, discuss the current status of the HMIS in your district.

How well is your district handling:

- Technical determinants
- Organizational determinants
- Behavioural determinants

Give the groups 15 minutes to discuss.

MODULE 3: **HIS DATA MANAGEMENT SYSTEMS**

Introduction

This module introduces the main HIS data management systems used by the Ministry of Health and Social Welfare to manage the types of data that Tanzania's health sector generates. It discusses the types of data contained by the systems and how these systems relate to one another for interoperability and information sharing. The module goes on to describe in detail DHIS 2: the main data warehouse in Tanzania and the system that is used to manage HMIS data. The module presents the main concepts and terminologies used by the DHIS 2 and the major functional areas of the system, including how data entry and validation are done. Other functional areas of DHIS 2 will be covered in detail in subsequent modules: for example, data quality (Module 4) and data analysis (Module 5).

Module **Objectives**

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

- **Identify and describe the main HIS data management systems used by the Ministry of Health, Community Development, Gender, Elderly and Children and the types of data they contain**
- **Practice basic data capture and data management functionalities of DHIS 2**

Session 1: Overview of the Major HIS Data Management Systems in Tanzania

DURATION
1 HOUR

SESSION OBJECTIVES

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

- Identify and describe the main HIS data management systems used in Tanzania
- Describe the data sets managed by the HIS data management systems in Tanzania
- Explain how the HIS data management systems are useful to council health management teams (CHMTs) and regional health management teams (RHMTs)

RESOURCES NEEDED

- Presentation
- PowerPoint projector
- Flip chart and markers
- Exercise instructions

SESSION PLAN

Time	Title and Description	Methods/Activities
35 min	**Introduction to the Major HIS Data Management Systems** Present and explain: • **Overview of the six main HIS data management systems used by the Ministry of Health and Social Welfare: DHIS 2, HRHIS, eIDSR, PLANREP, MFL, AND eLMIS**	Lecture
25 min	Exercise. Group Work: **Participant experience using HIS data management systems**	Plenary Discussion

EXERCISE. Group Work: **Using HIS Data Management Systems**

- Divide participants into groups of five. Try to place participants who have similar job functions and responsibilities in the same group.
- Ask each group to respond to the following questions:
    - Which of these systems for managing health sector data do you use and for what purpose?
    - How do these systems help you do your work?
    - What are some challenges related to using these systems in your respective places of work?
- Give the groups 15 minutes to discuss.
- Ask each group to present back in plenary. Capture their responses on a flip chart.

Session 2: DHIS 2 Data Capture and Management

SESSION OBJECTIVES

DURATION
1 HOUR, 25 MINUTES

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

- Explain key DHIS 2 terminologies and concepts
- Demonstrate competence in DHIS 2 data entry and validation

RESOURCES NEEDED

- Presentation
- PowerPoint projector

- Flip chart and markers
- Exercise instructions
- A computer with access to DHIS 2

SESSION PLAN

Time	Title and Description	Methods/Activities
30 min	**Data Capture and Management in DHIS 2** Present and explain: **Key DHIS 2 terms and concepts** **Core dimensions that describe DHIS 2 data** **User accounts and privileges** **Data entry, validation, and management in DHIS 2**	Lecture
45 min	Exercise. **DHIS 2 Demonstration/Group Exercise** Demonstrate the functionalities of the DHIS 2 Data Entry Module	Demonstration and Group Exercise

SUGGESTED REFERENCES

1. Health Information Systems Programme (HISP). (2015). DHIS 2 user manual. Retrieved from http://dhis2.github.io/dhis2-docs/2.21/en/user/html/dhis2_user_manual_en.html.
2. United Republic of Tanzania Prime Minister's Office. (2013). Local government planning and reporting database (PlanRep2). [Online]. Retrieved from http://www.pmoralg.go.tz/quick-menu/mis/planrep2.php.
3. Ministry of Health and Social Welfare, United Republic of Tanzania. (2016). Health facility register. [Online]. Retrieved from http://hfrportal.ehealth.go.tz.

EXERCISE. **DHIS 2 Demonstration and Group Exercise**

The facilitator should demonstrate the functionalities of the DHIS 2 Data Entry Module.

Participants will practice data entry as designed by the facilitator.

Sample exercises:

Enter ANC data for a selected facility for a given month.

Enter data on the prevention of mother-to-child transmission of HIV for the past quarter for a selected hospital.

MODULE 4: **MANAGING HEALTH DATA QUALITY**

Introduction

This module defines data quality and explains why data quality assurance for HMIS data is critical for monitoring program performance and improving service delivery. The module describes the main data management functions that are carried out at different levels of the health system and links data management practices and data flow to data quality. It also discusses practices and procedures that should be adopted at each level of the health system to ensure that high-quality data are collected and reported at all levels. Finally, the module describes and demonstrates the types of data quality assurance checks that are programmed into DHIS 2. These can be run during and after data entry, to ensure that high-quality data are entered and stored in the system.

Module **Objectives**

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

1. **Define data quality and explain the importance of data quality in monitoring program performance**
2. **Describe the key dimensions of data quality**
3. **Identify factors that affect the quality of data entered into the DHIS 2**
4. **Describe the methods and procedures that can be employed to assess and improve data quality at each level of the health system**
5. **Identify data quality checks that are built into DHIS 2 and explain how and when to use them**

Session 1: Introduction to Data Quality

SESSION OBJECTIVES

DURATION
1 HOUR, 15 MINUTES

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

- Explain the importance of data quality for HMIS data
- Describe the data quality conceptual framework
- Describe the key dimensions of data quality

RESOURCES NEEDED

- Presentation
- Laptop and projector
- Instructions for the group exercises
- Flip chart or poster board
- Markers

SESSION PLAN

Time	Title and Description	Methods/Activities
10 min	**Introduction to Data Quality** Present and explain: • **What data quality is** • **The importance of data quality** • **Symptoms of a data quality problem**	Lecture Q/A (Plenary Discussion)
20 min	**The Cost of Collecting Quality Data** Group work: **Group brainstorm to identify/discuss the costs associated with HMIS data collection and the costs associated with collecting high-quality data** Present and explain: • **The cost of data collection** • **The cost of poor data quality** • **Midpoint between high cost and poor quality**	Lecture Exercise/Group Presentation and Plenary Discussion
45 min	**Data Quality Conceptual Framework** Present and explain: • **Components of the data quality conceptual framework** • **Dimensions of data quality** Group work: **An exercise to become familiar with the dimensions of data quality**	Lecture Exercise/Group Presentation and Plenary Discussion Q/A (Plenary Discussion)

SUGGESTED REFERENCES

1. MEASURE Evaluation, University of North Carolina at Chapel Hill. "Data Quality Assurance" suite of tools: the Data Quality Audit Tool (DQA) and the Routine Data Quality Assessment Tool (RDQA). Retrieved from http://www.cpc.unc.edu/measure/tools/monitoring-evaluation-systems/data-quality-assurance-tools.

2. World Health Organization (WHO). (2015). *Data quality review (DQR): monitoring health facility data quality technical guide, Version 1.0.* Geneva, Switzerland: WHO. (This document should be online soon at www.who.org.)

EXERCISE 1. Group Brainstorm: **The Cost of HMIS Data Collection and Data Quality**

- Divide participants into small groups.
- Give groups 15 minutes to brainstorm the following questions:
    - What costs are associated with collecting the core national indicators in the HMIS?
    - What are the consequences of collecting data that are not of good quality?
    - What costs are associated with ensuring that the collected data are high quality?
- Clarify that the objective of the exercise is to categorize and describe the types of costs and not to come up with a monetary value. Two examples of costs associated with collecting indicators through the national HMIS are the cost of producing registers and reporting forms and the cost of training staff to use these tools.
- After the groups brainstorm, depending on how much time you have, you can ask each of the groups to present to the larger group their responses to all three questions. Or, if time is short, ask Group 1 to present on the first question, Group 2 to present on the second question, and Group 3 to present on the third question.
- Record the groups' responses on a flip chart. Alternatively, pass out flip chart paper and markers to each of the groups and ask them to record their responses while they brainstorm.

EXERCISE 2. **Dimensions of Data Quality**

- Divide participants into seven groups.
- Assign each group a dimension of data quality:
    - Group 1: Validity/accuracy
    - Group 2: Timeliness
    - Group 3: Completeness
    - Group 4: Reliability
    - Group 5: Confidentiality
    - Group 6: Precision
    - Group 7: Integrity
- Ask all groups to read the list of questions below. Each group will then pick out the questions that are relevant to their assigned dimension and discuss why they think so.
- Allow 15–20 minutes for this work. Then give each group a few minutes to list the questions that they have selected and explain why each question is relevant to their assigned dimension.

QUESTIONS AND ANSWERS

1. What is the relationship between the activity/program and what you are measuring?
   ACCURACY/VALIDITY
2. Is the same data collection instrument used from year to year, site to site?
   RELIABILITY
3. What is the data transcription process? Is there potential for error?
   ACCURACY/VALIDITY
4. Are steps being taken to limit transcription error (e.g., double-keying of data, built-in validation checks, random checks)?
   ACCURACY/VALIDITY
5. If there are data errors, what do you do with that information?
   ACCURACY/VALIDITY, INTEGRITY
6. Is the appropriate level of detail reported to higher levels?
   PRECISION
7. If raw data need to be manipulated, are the correct formulas being applied and applied consistently (e.g., from site to site, over time)?
   RELIABILITY
8. Is there a written protocol regarding which staff have access to personal data?
   CONFIDENTIALITY
9. Do staff sign confidentiality agreements?
   CONFIDENTIALITY
10. Are clients assured that their data will be recorded and stored according to national and/or international standards?
    CONFIDENTIALITY
11. Are final numbers reported accurately (e.g., does the total add up)?
    ACCURACY/VALIDITY
12. What steps are taken to ensure completeness of data?
    COMPLETENESS
13. What systems are in place to maintain data security (e.g., locked cabinets, password-protected databases)?
    INTEGRITY
14. What percentage of all fields on the data collection form are filled in?
    COMPLETENESS
15. Are procedures in place to ensure that data are free of significant error and that bias is not introduced (e.g., instructions, indicator information sheets, training, etc.)?
    ACCURACY/VALIDITY, INTEGRITY
16. Is the same data collection process used from year to year, site to site?
    RELIABILITY

17. What percentage of all expected reports are actually received?
    COMPLETENESS

18. Has there been an independent review of data?
    ALL DIMENSIONS, DEPENDS ON WHAT THE REVIEW IS LOOKING AT

19. Are the data from all sites that are to report included in aggregate data? If not, which sites are missing?
    COMPLETENESS

20. Do data collected have sufficient detail (e.g., collected by age, sex?)
    PRECISION

21. Are the data reported as soon as possible after collection?
    TIMELINESS

22. Are data available frequently enough to inform program management decisions?
    TIMELINESS

23. Are the data from all sites that are to report included in the aggregate data? If not, which sites are missing?
    COMPLETENESS

24. Are data collection forms designed to collect exactly what needs to be collected and reported?
    PRECISION

25. Is a regular schedule of data collection in place to meet program management needs?
    TIMELINESS

26. Do program staff know and understand the reporting deadline? Is it consistent across all reporting sites?
    TIMELINESS

27. Are the data reported as soon as possible after collection?
    TIMELINESS

28. Are data at risk of being manipulated for personal or political reasons? What systems are in place to minimize such risks?
    INTEGRITY

Session 2: HMIS Data Management and Data Quality

SESSION OBJECTIVES

DURATION
1 HOUR, 30 MINUTES

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

- Identify main data management functions at each level of the HMIS
- Explain how data management and information flow affect data quality
- Outline the main data quality challenges at each level of the HMIS
- Explain what each level of the system can do to improve data quality

RESOURCES NEEDED

- Presentation
- Laptop and projector
- Instructions for the group exercises
- Flip chart
- Markers

SESSION PLAN

Time	Title and Description	Methods/Activities
30 min	**Introduction to Data Management** Present and explain: • **What is data management?** Group Work: **An exercise to identify/discuss the HMIS data management functions that take place at each level of the health system** Present and explain: • **HMIS data management functions by level** • **Information flow and data quality**	Lecture Exercise/Group Presentation and Plenary Discussion Q/A (Plenary Discussion)
30 min	**HMIS Data Quality Challenges** Group Work: **An exercise to identify/discuss the main data quality challenges at each level of the health system. For each challenge, groups are to suggest solutions.** Present and explain: • **The common types of data errors** • **Potential reasons for poor data quality**	Lecture Exercise/Group Presentation and Plenary Discussion Q/A (Plenary Discussion)
30 min	**Data Quality Assurance** Present and explain: • **What is data quality assurance?** • **Data quality assurance at the service delivery level** • **Data quality assurance at the CHMT and RHMT levels** • **Data quality assurance at the national level** • **General principles for improving data quality**	Lecture Q/A (Plenary Discussion)

SUGGESTED REFERENCES

Heywood, Arthur; Boone, David. (2015). Guidelines for data management standards in routine health information systems. Chapel Hill, NC: MEASURE Evaluation, University of North Carolina.

Session 3: Data Quality Assurance in DHIS 2

SESSION OBJECTIVES

DURATION
1 HOUR, 45 MINUTES

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

- Show how to use DHIS 2's built-in data quality assurance checks, which can be run during data entry (e.g., data element history, minimum and maximum limits)
- Show how to use DHIS 2's built-in data quality assurance checks, which can be run after data entry (e.g., reporting rate summary and validation rules)
- Apply other advanced data quality analysis tools in DHIS 2 (e.g., standard deviation outlier analysis, follow-up analysis, "min-max" outlier analysis, and gap analysis)

RESOURCES NEEDED

- Presentation
- A computer capable of accessing DHIS 2
- Laptop and projector
- Instructions for the group exercises

SESSION PLAN

Time	Title and Description	Methods/Activities
30 min	**Data Quality in DHIS 2** Present and demonstrate: **The built-in DHIS 2 data quality assurance checks done during and after data entry**	Lecture
75 min	Exercise. **Using Built-In DHIS 2 Data Quality Checks**	Demonstration

SUGGESTED REFERENCES

1. HISP. (2015). DHIS 2 user manual. Retrieved from http://dhis2.github.io/dhis2-docs/2.21/en/user/html/dhis2_user_manual_en.html.

EXERCISE. **Using Built-In DHIS 2 Data Quality Checks**

Part 1:

In this part of the exercise, participants will identify and describe data quality flaws in given sets of data using different organisation units and periods. The facilitator should provide participants with sample paper-based and electronic forms with filled/entered data to perform the data quality checks.

Data collection/entry forms that are used at different levels involved in health data capture and processing will be reviewed and assessed during the session.

Part 2:

In this part of the exercise, participants will use the DHIS 2 to generate the following quality-related reports:

- Reporting rate summary, to establish data completeness and timeliness
- Validation rule analysis, to uncover violations of different validation rules by data already in the DHIS 2
- Data set reports, to establish data correctness, by making comparisons with data in the corresponding paper forms
- Consistency analysis using the DHIS 2-based WHO Data Quality Tool and tracking of data element history through selected data entry forms
- Outlier analysis using the Data Quality Tool and "min/max" values using selected data entry forms
- Gap analysis using the Data Quality Tool

MODULE 5: **ANALYSIS AND USE OF HEALTH DATA**

Introduction

Just as having high-quality data to inform health systems and their programs is important, ensuring that decision makers have the necessary skills to use and analyse these data is important, too. This includes building capacity for data analysis, interpretation, visualization, and use, as well as understanding how to communicate the findings of data and collaborate with stakeholders who are involved with the programs.

This module provides an overview of the concept of data use; provides information on the fundamentals of data analysis; teaches participants how to use the pivot table, data visualizer, and GIS modules in DHIS 2; teaches participants how to interpret and communicate data; and discusses the importance of sustaining a data use culture and developing data use plans.

Module **Objectives**

At the end of this module, participants should be able to:

1. **Explain the basic concepts and importance of data use**
2. **Describe fundamental concepts of data analysis**
3. **Demonstrate how to use the pivot table, data visualization tools, and GIS modules of DHIS 2**
4. **Show how to interpret and communicate data**
5. **Create a plan to sustain a culture of data use in their organizations**

Session 1: Fundamentals of Data Analysis

SESSION OBJECTIVES

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

- Identify and explain key concepts and terms relevant to data analysis
- Describe the process and key steps to analyse facility and district-level data
- Show how to present data for maximum impact

DURATION
3 HOURS

RESOURCES NEEDED

- Presentations
- Computer with access to DHIS 2
- Laptop and projector
- Flip chart
- Markers

SESSION PLAN

Time	Title and Description	Methods/Activities
1 hour	**Data Analysis: Key Concepts and Terms** Present and explain: • **Counts, ratios, proportion, percentages, rate, mean, median, range, etc.**	Lecture
1 hour	**Key Steps for Data Analysis** Present and explain: • **Seven steps for the analysis of district and facility-level data**	Lecture
1 hour	**Data Presentation and Visualization** Present and explain: • **Narratives** • **Tables** • **Charts** • **Maps**	Lecture

Session 2: Data Analysis Using DHIS 2

Session 2a: Pivot Tables

SESSION OBJECTIVES

DURATION
1 HOUR, 30 MINUTES

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

- Use the features of the pivot table module in DHIS 2
- Demonstrate how to analyse data using the pivot table module in DHIS 2

RESOURCES NEEDED

- Presentation
- A computer capable of accessing DHIS 2
- Laptop and projector
- Instructions for the group exercises

SESSION PLAN

Time	Title and Description	Methods/Activities
20 min	**Data Analysis and Presentation Using DHIS 2 Pivot Tables** **Present and demonstrate how to use the pivot table module in DHIS 2. Explain and show how data can be analysed using the pivot table module.**	Lecture and Demonstration
30 min	Demo **Using the analysis functionalities: pivot tables**	Demonstration
40 min	Exercise. **Using Pivot Tables to Analyse Data** **Use the pivot table module to analyse programmatic data and describe trends (whether positive or negative). Prior to the exercise, the facilitator should select the programmatic area(s) the exercise will focus on, which will depend on the profile of the training workshop participants, and customize the sample questions provided. Programmatic areas of interest may include:** **• Vaccination coverage** **• Institutional delivery** **• Postnatal attendance** **• Antenatal attendance**	Exercise

SUGGESTED REFERENCES

HISP. (2015). DHIS 2 user manual. Retrieved from http://dhis2.github.io/dhis2-docs/2.21/en/user/html/dhis2_user_manual_en.html.

EXERCISE. **Using Pivot Tables to Analyse Data**

Use the pivot table module to analyse programmatic data and describe both positive and negative trends. Prior to the exercise, the facilitator should select the programmatic area(s) the exercise will focus on (which will depend on the profile of the training workshop participants) and customize the sample questions below. Programmatic areas of interest may include:

- Vaccination coverage
- Institutional delivery rate
- Postnatal attendance
- Antenatal attendance

INSTRUCTIONS

1. Create a pivot table showing the reporting rate for the postnatal form for the districts in a region of your choice for the year 2015. Your table should display districts in rows and the postnatal reporting rate in columns. Once you have created the table, save it as a favourite.
2. Create a pivot table showing the ANC first and fourth visits for the past financial year for a district of your choice. Save it as a favourite.
3. Using the pivot table developed in Question 1, drill down to the facility level.

    a. Display the table with facilities as rows and their hierarchy.
    b. Save this pivot table as a favourite.
    c. Download the table as a plain data source (spreadsheet) and save it.

Session 2b: Data Visualizer

SESSION OBJECTIVES

DURATION
1 HOUR, 30 MINUTES

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

- Use the features of the data visualizer module in DHIS 2
- Demonstrate how to analyse data using the data visualizer module in DHIS 2

RESOURCES NEEDED

- Presentation
- A computer capable of accessing DHIS 2
- Laptop and projector
- Instructions for the group exercises

SESSION PLAN

Time	Title and Description	Methods/Activities
20 min	**Data Analysis and Presentation Using the DHIS 2 Data Visualizer** **Present and demonstrate how to use the data visualizer module in DHIS 2. Explain and show how data can be analysed using the data visualizer.**	Lecture and Demonstration
30 min	Demo **Using the analysis functionalities: data visualizer**	Demonstration
40 min	Exercise. **Using the Data Visualizer to Analyse Data** **Use the data visualizer to create charts/graphs, analyse programmatic data, and describe trends (whether positive or negative). Prior to the exercise, the facilitator should select the programmatic area(s) the exercise will focus on, which will depend on the profile of training workshop participants, and customize the sample questions provided.** **Programmatic areas of interest may include:** • **Family planning** • **Antenatal attendance** • **Vaccination coverage** • **Immunisation**	Exercise

SUGGESTED REFERENCES

1. HISP. (2015). DHIS 2 user manual. Retrieved from http://dhis2.github.io/dhis2-docs/2.21/en/user/html/dhis2_user_manual_en.html.

EXERCISE 1. **Using the Data Visualizer to Analyse Data**

Use the data visualizer to create charts/graphs, analyse programmatic data, and describe trends (whether positive or negative). Prior to the exercise, the facilitator should select the programmatic area(s) the exercise will focus on, which will depend on the profile of training workshop participants, and customize the sample questions provided. Programmatic areas of interest may include:

- Family planning
- Antenatal attendance
- Vaccination
- Immunization

INSTRUCTIONS:

1. Create a visualizer using a bar chart, for the following:

    a. Family planning: HIV

        (i). "Wenza katika FP waliopimwa VVU"
        (ii)."Wenza katika FP waliogundulika kuwa na VVU"
        (iii). For 3 months of 2014 (January, May, September)
        (iv). All public facilities in a Municipal Council

    b. Show values on the chart.
    c. Show the trend line.
    d. Show base value (10) and target value (100).
    e. Label your axes accordingly.
    f. Give the bar chart a heading of your choice.
    g. Save it as a favourite.
    h. Download the chart as a PDF with name format and save it.

2. Create a visualizer using a line graph for the following:

    a. ANC

        (i). "Hudhurio la kwanza chini ya wiki 12"
        (ii). "Hudhurio la kwanza ANC Ujauzito wiki 12 au zaidi"
        (iii).For all quarters of 2014
        (iv).For all hospitals under a municipal council

    b. Label your axes accordingly.
    c. Give the line graph a heading of your choice.
    d. Save it as a favourite.
    e. Download the graph as an image and save it.

Session 2c: Geographic Information System (GIS)

DURATION
1 HOUR, 30 MINUTES

SESSION OBJECTIVES

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

- Use the features of the GIS module in DHIS 2
- Demonstrate how to analyse data using the GIS module in DHIS 2

RESOURCES NEEDED

- Presentation
- A computer capable of accessing DHIS 2
- Laptop and projector
- Instructions for the group exercises

SESSION PLAN

Time	Title and Description	Methods/Activities
20 min	**Data Analysis and Presentation Using DHIS 2 GIS** **Present and demonstrate how to use the GIS module in DHIS 2. Explain and show how data can be analysed using the GIS module.**	Lecture and Demonstration
30 min	Demonstration **Show how to use the analysis functionalities of GIS**.	Demonstration
40 min	Exercise. **Using the GIS Module to Analyse Data** **Use the GIS module to create maps, analyse programmatic data, and describe positive or negative trends. Prior to the exercise, the facilitator should select the programmatic area(s) the exercise will focus on (depending on the profile of the training workshop participants) and customize the sample questions provided. Programmatic areas of interest may include:** • **Family planning** • **Antenatal attendance** • **Vaccination coverage** • **Immunisation**	Exercise

SUGGESTED REFERENCE

HISP. (2015). DHIS 2 user manual. Retrieved from http://dhis2.github.io/dhis2-docs/2.21/en/user/html/dhis2_user_manual_en.html.

EXERCISE: **Using the GIS Module to Analyse Data**

Use the GIS module to create maps, analyse programmatic data, and describe positive or negative trends. Prior to the exercise, the facilitator should select the programmatic area(s) the exercise will focus on, which will depend on the profile of training workshop participants, and customize the sample questions provided. Programmatic areas of interest may include:

- Immunisation
- Family planning
- Antenatal attendance
- Vaccination coverage

INSTRUCTIONS

This assignment covers the following:

- Use of all GIS layers in presenting data
- Use of labels on maps
- Presenting data through thematic mapping
- Use of intervals and classification of presented data

Part 1:

Create a map of a region (the facilitator can propose a region) showing the following:

1. Immunisation: measles vaccination coverage of children under one year of age (Use the default legend to show the coverage per district for the region for the year 2014.)
2. Display labels for the district and indicator values.
3. Save as a favourite.
4. Download the file as pdf.

Part 2:

1. Using the facility layer, present a list of all facilities by organization, unit, type, group, and set for the entire region (the facilitator can propose a region).
2. Assuming the catchment area for each facility is 1000 meters, show the circular area with radius in meters.
3. Using the boundaries layer, display boundaries of districts in the region so the facilities can clearly be seen where they belong in districts.
4. Save as a favourite.
5. Download it as a PNG.

Part 3:

Mention one reason for the use of each of the layers below in GIS:

1. Facility layer
2. Boundary layer
3. Thematic layers 1, 2, 3, and 4

Session 3: Data Use Overview

SESSION OBJECTIVES

DURATION
1 HOUR, 30 MINUTES

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

- Explain the value of data-informed decision making
- Describe the context of decision making
- Explain the importance of sharing information and providing feedback

RESOURCES NEEDED

- Presentation
- Laptop and projector
- Instructions for the group exercises

SESSION PLAN

Time	Title and Description	Methods/Activities
10 min	**Introduction to Data Demand and Use** Present and explain: • **What data demand is** • **What data use is** • **The data-informed decision making process**	Lecture
60 min	**The Context of Decision Making** Present and explain: • **The interactions among stakeholders, decisions, and data** Group Discussion: **Who are your stakeholders?** Exercise: **Action Plan for Addressing Barriers to Data Use**	Lecture Group Discussion Exercise
20 min	**Sharing Information and Providing Feedback** Present and explain: • **The importance of providing feedback** • **Developing a feedback mechanism** Group Discussion: **Potential barriers to providing feedback and the benefits of providing and receiving feedback**	Lecture Group Discussion

SUGGESTED REFERENCES

MEASURE Evaluation, University of North Carolina at Chapel Hill. (n.d.) Data demand and use guidance documents. Retrieved from http://www.cpc.unc.edu/measure/our-work/data-demand-and-use/data-demand-and-use-publications.

EXERCISES

Appendix: **Action Plan for Addressing Barriers to Data Use**

Barriers	Steps Involved	Person Responsible	Other Stakeholders	General Timeline

Session 4: Data Interpretation and Communication

SESSION OBJECTIVES

DURATION
3 HOURS

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

- Interpret data
- Use results to develop and improve programs
- Develop a communication strategy
- Develop communication products

RESOURCES NEEDED

- Presentation
- Laptop and projector
- Instructions for the group exercises

SESSION PLAN

Time	Title and Description	Methods/Activities
30 min	**Data Interpretation** Present and explain: • **The three stages of data interpretation** • **The process of data interpretation**	Lecture
60 min	Group work: **RMNCH scorecards**	Exercise
1 hour 30 min	**Developing a Communication Strategy** Present and explain: • **The six elements of an effective communication strategy** • **Types of communication products** Group work: **Developing an elevator speech**	Lecture Exercise

SUGGESTED REFERENCES

1. MEASURE Evaluation, University of North Carolina at Chapel Hill. (2009). Making research findings actionable: a quick reference to communicating health information for decision-making. Retrieved from http://www.cpc.unc.edu/measure/resources/publications/ms-09-39/.

2. MEASURE Evaluation, University of North Carolina at Chapel Hill. (2011). Introduction to basic data analysis and interpretation: a training toolkit. Retrieved from http://www.cpc.unc.edu/measure/resources/training/materials/basic-data-analysis-for-health-programs.

Session 5: Sustaining Data Use

DURATION
2 HOURS

SESSION OBJECTIVES

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

- Define culture and culture of information use
- Describe key elements of data use culture
- Describe the factors affecting culture of information use
- Develop an action plan to sustain a culture of information use

RESOURCES NEEDED

- Presentation
- Laptops for group work

SESSION PLAN

Time	Title and Description	Methods/Activities
15 minutes	**Definition of Culture and Culture of Information Use** Present and explain: • **What culture is** • **What a culture of information use is**	Lecture Q/A (Plenary Discussion)
15 minutes	**Description of Key Elements of Data Use Culture** Present and explain: • **What the key elements of data use culture are** • **How each factor is related to the others**	Lecture Q/A (Plenary Discussion)
30 minutes	**Description of Factors Influencing a Culture of Information Use** Present and explain: • **Individual and team actions affecting a culture of information use**	Lecture Q/A (Plenary Discussion)
30 minutes	**Creation of a Data Demand and Use Action Plan** • Group work: **Brainstorm to identify data demand and use challenges, actions to be taken to address the challenges, responsible person, time frame, action to be taken, and resources needed** Present and explain: • **The importance of tracking the results on a monthly basis**	Lecture Exercise and Group Presentation, Q/A Session (Plenary Discussion)

SUGGESTED REFERENCES

1. MEASURE Evaluation, University of North Carolina at Chapel Hill. Tools for data demand and use in the health sector: quick guide. Retrieved from http://www.cpc.unc.edu/measure/resources/publications/ms-11-47.

2. Zimmermann, K. A. (2015, February 19). What is culture? Definition of culture [Blog post]. Retrieved from http://www.livescience.com/21478-what-is-culture-definition-of-culture.html.

An Example of a District Action Plan Addressing Data Demand and Use Challenges

DISTRICT ACTION PLANNING: District Name: District A

SN	CHALLENGE	ACTION TO BE TAKEN	RESPONSIBLE	TIME FRAME	RESOURCES
1	Inadequate internet access	-Purchase of modems and airtime bundles - Flexibility of time and place for access of internet	MTUHAco and DMO	08/06/2015 on going.	HRH(CHMTs) Funds
2	Geographical position of some health facilities which make delay of report submission especially during rain season	Improve communication through phones.	MTUHAco	08/06/2015 on going	HRH(CHMTs) Funds
3	Inadequate working tools e.g laptop computers	Purchase of 2 laptops	DMO	01/07/2015	Funds
4	Inadequate reporting forms	Printing and photocopying	MTUHAco and DMO	01/07/2015	Funds
5	Few CHMTs who conduct data entry	To add 3 CHMT members with DHIS2 Passwords	DMO and National DHIS2 facilitators	03/06/2015	HRH (CHMT)