

# Developing Health Management Information Systems

A PRACTICAL GUIDE FOR  
DEVELOPING COUNTRIES



**WORLD HEALTH ORGANIZATION**  
REGIONAL OFFICE FOR THE WESTERN PACIFIC

## Acknowledgements

The WHO Regional Office for the Western Pacific acknowledges the contributions made by Dr Ophelia Mendoza, WHO Consultant, and Dr Y.C. Chong, Regional Adviser in Health Information.

WHO Library Cataloguing in Publication Data

### **Developing health management information systems: a practical guide for developing countries**

#### **1. Management information systems 2. Guidelines 3. Developing countries**

ISBN 92 9061 1650 (NLM Classification: **WA 26.5**)

© World Health Organization 2004  
All rights reserved.

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

The World Health Organization does not warrant that the information contained in this publication is complete and correct and shall not be liable for any damages incurred as a result of its use.

Publications of the World Health Organization can be obtained from Marketing and Dissemination, World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland (tel: +41 22 791 2476; fax: +41 22 791 4857; email: [bookorders@who.int](mailto:bookorders@who.int)). Requests for permission to reproduce WHO publications, in part or in whole, or to translate them – whether for sale or for noncommercial distribution – should be addressed to Publications, at the above address (fax: +41 22 791 4806; email: [permissions@who.int](mailto:permissions@who.int)). For WHO Western Pacific Regional Publications, request for permission to reproduce should be addressed to Publications Office, World Health Organization, Regional Office for the Western Pacific, P.O. Box 2932, 1000, Manila, Philippines, Fax. No. (632 521-1036, email: [publications@wpro.who.int](mailto:publications@wpro.who.int)).

The named author/s alone is/are responsible for the views expressed in this publication.



# Contents

Acknowledgements . . . . .	ii
Abbreviations . . . . .	v
1 Introduction . . . . .	1
2 The basic concepts . . . . .	3
3 Reviewing the existing system . . . . .	5
4 Defining data needs . . . . .	9
5 Determining the data flow . . . . .	13
6 Designing the data collection and reporting tools . . . . .	17
7 Developing procedures for data processing . . . . .	21
8 Developing the training programme . . . . .	25
9 Pre-testing the system . . . . .	29
10 Monitoring and evaluating the system . . . . .	33
11 Developing data dissemination and feedback mechanisms . . . . .	37
12 Enhancing the HMIS . . . . .	41
Examples . . . . .	45
References . . . . .	53



# Abbreviations

ARICP	Acute Respiratory Infection Control Programme
BCG	Bacille-Calmette Guérin
CDSS	Communicable Disease Surveillance System
CHC	Commune Health Centre
DHC	District Health Centre
DHS	Department of Hospital Services
DOF	Department of Finance
DMCH	Department of Maternal and Child Health
DP	Department of Planning
DPT	Diphtheria-Pertussis-Tetanus
DSS	Disease Surveillance System
EH	Environmental Health
EPI	Expanded Programme of Immunization
FPSF	Family Planning Service Facilities
H	Hospital
HACP	HIV/AIDS Control Programme
HMIS	Health Management Information Systems
MCH	Maternal and Child Health
MOE	Ministry of Education
MOH	Ministry of Health
NIN	National Institute of Nutrition
NMCP	National Malaria Control Programme
NSO	National Statistics Office
NTCP	National Tuberculosis Control Programme
OPV	Oral Polio Vaccine
ORS	Oral Rehydration Salts
PHC	Primary Health Centre
PHO	Provincial Health Office
PMC	Preventive Medical Centre
TT	Tetanus Toxoid



# 1 | Introduction

## Purpose of the Manual

This Manual is designed to be a quick-and-easy, user-friendly reference for the development of health management information systems (HMIS), with the focus on applications. It serves as a primer on HMIS development and provides a general overview of the basic principles, as well as the fundamental steps and issues involved in the different activities to be undertaken. The information is presented in a concise, direct-to-the point, easy-reading, and outline format. It aims simply to provide the basic elements on HMIS development for people who do not have the time or the need to read deeply on the subject. For those who wish to develop a more in-depth knowledge, the Manual can also serve as the springboard for further reading and research.

## Prospective Users of the Manual

This Manual was designed with the following persons in mind:

- Heads and staff of Statistics Units at the national, provincial, or even the district health service level who are actively involved in the development of their HMIS
- People who do not have the in-depth background on HMIS but need to have a general overview of its components because they are members of Multi-disciplinary Committees tasked with overseeing the development of the HMIS in their country
- Managers and staff of vertical programmes whose responsibilities include any component of the information system of their respective programmes

## Scope and Style of the Manual

Each chapter in this Manual has four parts:

- (a) Principles
- (b) Steps
- (c) Issues
- (d) Worksheets

The worksheets give the reader an idea of how to go through the different steps, or how to process the different issues in an organized and systematic manner. Sample entries for the worksheets are provided to demonstrate how they are filled out.

The last part of the Manual gives an example of a list of basic indicators that might be used in Ministry of Health programmes, together with the corresponding data sources, modes and frequency of data collection, as well as the lowest administrative level where the indicator is computed. While the reader can adopt some of these indicators for their use, the main objective of the example is to show how the set of indicators used by a country can be presented so that it will be easy for the staff of the Statistics Unit to monitor their status. Also provided at the end of the Manual is an example of a flow chart of the HMIS of hypothetical country X. As in the first example, the aim is to show not “ what” , but “ how” ; not to prescribe a model flowchart for the HMIS as such, but rather to demonstrate how the HMIS can be presented by means of a flow chart.



## 2 | The basic concepts

### Some Definitions

**System** A collection of components that work together to achieve a common objective<sup>1</sup>

**Information System** A system that provides information support to the decision-making process at each level of an organization<sup>2</sup>

**Health Information System** A system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services<sup>3</sup>

**Health Management Information System** An information system specially designed to assist in the management and planning of health programmes, as opposed to delivery of care<sup>4</sup>

### Steps in Developing a Health Management Information System

- (1) Review the existing system
- (2) Define the data needs of relevant units within the health system
- (3) Determine the most appropriate and effective data flow
- (4) Design the data collection and reporting tools
- (5) Develop the procedures and mechanisms for data processing
- (6) Develop and implement a training programme for data providers and data users
- (7) Pre-test, and if necessary, redesign the system for data collection, data flow, data processing and data utilization
- (8) Monitor and evaluate the system
- (9) Develop effective data dissemination and feedback mechanisms
- (10) Enhance the HMIS

---

<sup>1</sup> World Health Organization (2000)

<sup>2</sup> Hurtubise (1984)

<sup>3</sup> World Health Organization (2000)

<sup>4</sup> World Health Organization (1993)



# 3 | Reviewing the existing system

## P R I N C I P L E

**D**o not destroy existing systems; build on the strengths and learn from the weaknesses of what already exists.

## S T E P S

- (1) Make an inventory of the forms, log books and other tools used to record and summarize data at different levels.
- (2) Assess the quality of the data being collected using the existing forms at different levels. Among the aspects to be included in the assessment are:
  - Accuracy
  - Completeness
  - Adequacy
  - Timeliness
- (3) Determine the problems encountered with the current system of data collection at different levels, including the timing and flow of information.
- (4) Determine the current status of the other components of the HMIS like:
  - Data processing
  - Data analysis
  - Data dissemination
  - Supply and logistics
  - Staff development
  - Coordination, cooperation and communication within and between different units in the Ministry of Health, as well as with related agencies outside of the ministry

- (5) Identify the aspects of the system that need to be:
  - Retained
  - Modified
  - Abolished
- (6) Summarize the results of the assessment in a formal report.
- (7) Discuss results of the assessment with proper authorities.

---

## *I S S U E S*

---

- (1) Who has the authority to make the assessment?
- (2) Availability of technical expertise and resources to do the assessment.
- (3) Cooperation among the different units in the assessment process; involvement of end-users at all levels.
- (4) Formation of a body (ideally an inter-departmental committee) tasked with planning, monitoring and managing all phases of the development of the HMIS, from the baseline assessment to the evaluation phase.

# W O R K S H E E T S

**Worksheet 3.1: Checklist of Problems Encountered With the Existing HMIS, at Different Administrative Levels**

Type of Problems Encountered	Village	District	Province	National
Duplication of forms	✓			
Too many record books/forms being filled out at this level	✓			
Lack of constant supply of forms				
Reports not submitted on time				
Inadequate training of health workers on how to fill out forms	✓	✓		
High degree of inaccuracies in data collected	✓	✓		
Lack of technical expertise of staff to properly analyze the data collected	✓	✓	✓	✓
Lack of utilization of data being collected	✓	✓	✓	✓
Low level/no dissemination of and feedback about data collected				

### Worksheet 3.2: Checklist of Problems Encountered With the Existing Forms

Type of Problems Encountered	MCH Form	Form 2	-----	Form (n)
Entries in this form duplicate those of other forms	✓			
Too many data elements required to complete this form	✓			
Structure of the form is too complicated, making it difficult to fill out				
Difficult to collect the data required to fill out the form				
Written instructions on how to fill out the form are not available	✓			
Lack of constant supply of this form				
Completed form not submitted on time				
Inadequate training of health workers on how to fill out the form	✓			
High degree of inaccuracies in data collected	✓			
Not all items in the form are filled out or completed	✓			
There are difficulties in collecting data for this form from all geographic or service areas covered				
Lack of technical expertise of staff to properly analyze the data collected from this form	✓			
Lack of utilization of data being collected from this form	✓			
Low level/no dissemination of data collected from this form				

# 4 | Defining data needs

## P R I N C I P L E S

**D**ifferent administrative levels in the health system have different roles, and therefore have different data needs.

**N**ot all data needs should be generated through the routine system of data collection. Data that are not frequently needed or are required only for certain subsets of the population can be generated through special studies and sample surveys.

## S T E P S

- (1) Define the different roles/functions of each level, for each of the major programmes. A common set-up is as follows:

Administrative Level	Function
Village	Case finding; service delivery
District	Monitoring and supervision
Province	Programme planning; evaluation
National	Policy formulation

- (2) Identify the indicators needed by each level to perform its functions. Note that some levels, especially at higher administrative levels, need data coming from other ministries or departments related to the health sector.
- (3) Determine the formula and identify the variables or data elements needed in order to compute the indicators.



**Group discussion on selecting relevant health indicators.**

- (4) Determine the source of the different data elements needed for both the numerator and denominator of each indicator. The major sources can be:
  - Routine data generated from the health management information system of the Ministry of Health
  - Special studies and surveys conducted by the Ministry of Health, as the need arises
  - Other health-related information systems under the responsibility of other agencies or institutions (Examples of these are the vital registration system – usually under the Department of Justice or the National Statistics Office – and the nutrition data collected by the Ministry or Department of Agriculture)

## *I S S U E S*

- (1) Roles and functions of different units with respect to data generation and utilization are not well defined.
- (2) Defining minimum basic data needs.
- (3) Differentiating data that should be included in the routine data collection system, from data that are best generated through the conduct of special studies and sample surveys.
- (4) Inability of staff at different levels to identify their data needs; understanding of indicators often lacking.



Worksheet 4.1: Identification of Indicators Corresponding to Each Programme Objective and Strategy

Programme Objectives	Strategies	Indicators		
		Input	Output	
<p><b>Unit:</b> Maternal and Child Health (MCH) Division</p> <p>To increase the coverage of immunization by 20% at the end of the year</p>	<p>Implementation of a health education programme on immunization for mothers</p>	<p><b>Programme:</b> Immunization (EPI)<sup>1</sup></p> <ul style="list-style-type: none"> <li>• Number of health education classes on immunization conducted</li> <li>• Number of the following information, education and communication (IEC) materials developed and distributed:                             <ul style="list-style-type: none"> <li>– posters</li> <li>– leaflets</li> </ul> </li> </ul>	<p><b>Year:</b> 2003</p> <ul style="list-style-type: none"> <li>• Percentage of mothers who attended health education classes on immunization</li> <li>• Percentage of mothers who have seen/received each of the IEC materials on immunization developed</li> </ul>	<p><b>Effect/Impact</b></p> <ul style="list-style-type: none"> <li>• Change in the knowledge and attitudes of mothers on immunization</li> <li>• Change in the percentage of fully immunized children (FC) &lt;1 year between 2002 and 2003</li> </ul>
<p><b>Unit:</b> Department of Hospital Services</p> <p>To increase the utilization of hospital services by 20%</p>	<p>Strengthen the referral system</p>	<p><b>Programme:</b></p>	<p><b>Year:</b> 2003</p> <p>Bed-occupancy rate</p>	
<p>To decrease the incidence of nosocomial infections by 30%</p>	<p>Conduct seminars for hospital staff on the prevention and control of hospital-acquired infections</p>	<p>Number of seminars conducted Number of hospital staff trained</p>		<p>Incidence of nosocomial infections</p>

<sup>1</sup>EPI = Expanded Programme of Immunization

## Worksheet 4.2: Identification of Data Needs at Different Levels

Indicator	Formula	Data Source for		Frequency of Collection	Lowest Level of		Unit Requiring Indicator			
		Numerator	Denominator		Collection	Utilization	Dist. Hlth Serv.	Prov. Hlth Serv.	Natl. MCH Prog.	Natl. Plan/Stat. Ofc.
<b>Department of Maternal and Child Health</b>										
Number of health education classes on immunization conducted	None	MCH Form 1	Not Applicable	Quarterly	Village	Village	✓	✓		
Percentage of children <1 who are fully immunized (FIC)	$(\text{No. of FIC among 1 yr old children} / \text{Total no. of children} < 1) \times 100$	EPI Form 1	Target Client List for EPI	Biannual	Village	Village	✓	✓	✓	
<b>Department of Hospital Services</b>										
Bed Occupancy Rate	$(\text{No. of occupied bed-days} / \text{total available bed-days}) \times 100$	Daily Hospital Census Form	Medical Records Dept.	Monthly	District	District	✓	✓	✓	
Nosocomial Infection Rate	$(\text{No. of in-patients who develop hospital-acquired infections within the year} / \text{total number of hospital in-patient-days within the year}) \times 100$	Patient Medical Records	Medical Records Dept.	Annually	District	District	✓	✓	✓	

# 5 | Determining the data flow

## P R I N C I P L E

**N**ot all the data collected at a certain level need to be submitted to higher levels. The most detailed data should be kept at the source, and reporting requirements to higher levels should be kept at a minimum.

## S T E P S

- (1) Determine what data will be submitted to whom. This involves the:
  - Identification of variables/indicators that need to be submitted to higher levels
  - Identification of most appropriate unit and position of person to whom summaries will be submitted

A major determining factor for this step is the function of the office and/or the person to whom the data is submitted in relation to the generation and utilization of information.

- (2) Determine how frequently data should be submitted to each level, considering the following factors:
  - Needs of each level
  - How common phenomenon is observed

Reports on infrequent events, or ones that are not often needed (e.g., the number of immunization campaigns conducted in a village) can be submitted on a quarterly or on a semi-annual basis, instead of monthly.

- (3) Determine in what form data will be submitted to each level.
  - Raw data versus summaries
  - Hard copies versus electronic files

- (4) Make a flow chart that shows the flow of information from the peripheral to the highest level. An example of this flow chart is shown in Figure 5.1. Another example is shown in the Appendix.

## I S S U E S

- (1) Lack of understanding of use for which data is collected.
- (2) Inability to distinguish which data are needed for service delivery and which data are needed for programme management and monitoring.
- (3) Inability of lower administrative levels to generate summaries of raw data collected due to:
  - Lack of technical expertise of staff
  - Lack of data processing facilities (calculators, computers, etc.)
  - Lack of computer skills of staff
- (4) Lack of storage facilities for raw data at lower administrative levels.
- (5) Data retrieval issues; inability to generate any information because of computer breakdown.

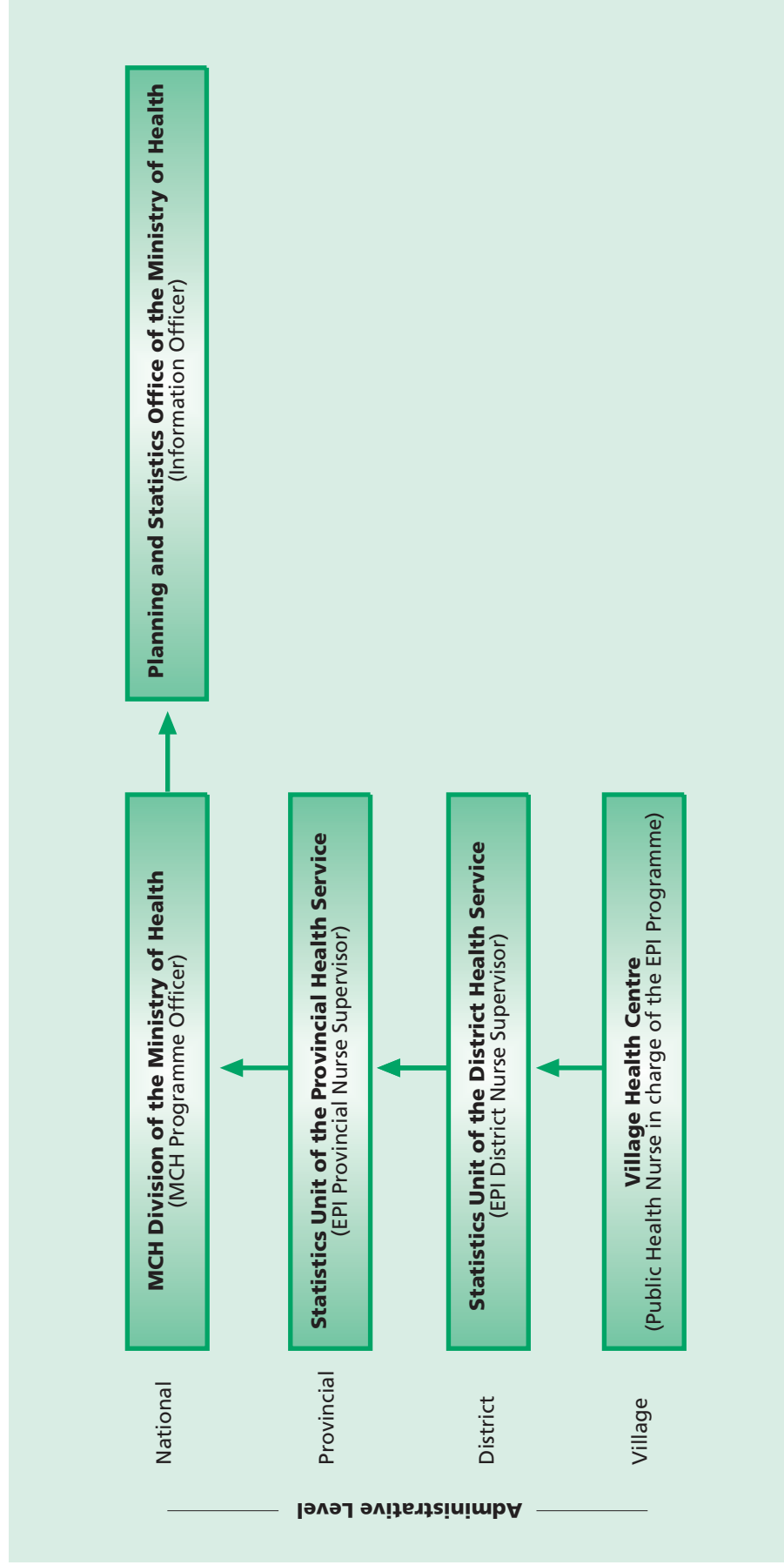


**Discussion on how to streamline morbidity/mortality reporting.**

**Worksheet 5.1: Summary of Data Flow of EPI Report at Each Administrative Level**

Administrative Level	Forms/Reports Accomplished at this Level	Position of Person in Charge of Accomplishing Form/Report	To Whom Completed Form/Report is Submitted Unit/Office	Position of Person in Charge	Frequency of Submission
Village	EPI Village Health Centre Form 1	Public Health Nurse in charge of EPI programme	Statistics Unit, District Health Service	EPI District Nurse Supervisor	Quarterly
District	EPI District Summary Form 1	EPI District Nurse Supervisor	Statistics Unit, Provincial Health Service	EPI Provincial Nurse Supervisor	Quarterly
Province	EPI Province Summary Form 1	EPI Provincial Nurse Supervisor	MCH Division, National Office	MCH Programme Manager	Quarterly
National	EPI National Summary Form 1	MCH Programme Information Officer	MOH Planning and Statistics Office	Information Officer	Quarterly

Figure 5.1 Flow Chart of EPI Data From the Village to the National Level



# 6 | Designing the data collection and reporting tools

## P R I N C I P L E S

**T**he capability of the staff who will be tasked with filling out the forms must be taken into consideration in designing them.

**T**he most effective data collection and reporting tools are simple and short.

## S T E P S

- (1) Develop the first draft of each form that is needed, using as a guide the list of indicators to be used for the programme. This step entails either the modification of existing forms, or the development of new ones.
- (2) Compare the first draft of the form that has been developed with the list of indicators to ensure that all the data needs can be generated from the form.
- (3) Present the first draft of the form to relevant staff members and discuss with them the following aspects of the new form:
  - How does it compare with the old forms?
  - What are the advantages and disadvantages of the new form?
  - What modifications need to be done to the new form to enhance its advantages and minimize the disadvantages?
  - For countries that have a number of dialects, is it necessary to translate the forms into the major dialects used in the different regions of the country?
- (4) Prepare a draft of the Instructions Manual on how to fill out the new forms.
- (5) Pre-test the use of the new forms as well as the Instructions Manual.
- (6) Assess the results of the pre-test.
- (7) Modify the forms and the Instructions Manual based on the results of the pre-test.

---

## I S S U E S

---

- (1) Technical expertise/capability of data providers at data source is not consistent with the level of complexity needed for data collection tools to meet the data needs of users.
- (2) Designing the pre-testing activity, ensuring the comparability of conditions with actual implementation.
  - Where?
  - Who will be involved?
  - How long?



**Worksheet 6.1: Identification of Entries for the Development of New Forms and the Preparation of an Instruction Manual**

Name of Form: EPI Form 1 Level Accomplishing This Form: <input checked="" type="checkbox"/> Village <input type="checkbox"/> District <input type="checkbox"/> Province <input type="checkbox"/> National			
Data Elements Needed	Categories (If Applicable)	Definition	Instructions for Data Collection and/or Report Generation
Number of 1-year-old children who are fully immunized	Fully immunized Not fully immunized	A fully immunized child is one who has already completed the following immunizations by the time he/she is 1 year old: BCG, OPV3, DPT3 and measles	Review all the immunization registers/cards for all 1-year-old children in the service area of the Village Health Centre. All children who have completed their BCG, OPV, DPT and measles immunizations will be counted as fully immunized



# 7 | Developing procedures for data processing

## P R I N C I P L E

The way the HMIS data is processed should be consistent with the objectives for data collection and the plans for data analysis and utilization.

## S T E P S

- (1) Assess the advantages and disadvantages of manually processing the data compared to using computers, considering the following factors:
  - Cost
  - Availability of personnel with the proper background/level of technical expertise to run a computerized system; in particular the software skills of the staff at the lowest level where computers can be provided should be looked into
  - Availability of technical support in case of hardware breakdown
- (2) If a computerized system is to be implemented, decide the lowest level where computers will be used to process data. Among the important considerations in choosing this level is the presence of staff trained in system maintenance.
- (3) Define the specifications for software development, in consultation with different levels of data users. Among the important aspects to be decided are:
  - Summary Reports to be routinely generated
  - Data quality control mechanisms/checks to be incorporated within the software
  - Data analysis requirements of the data users

- (4) Develop the software needed to process the data at each level where computers will be used, based on the required specifications. It may also be possible that the softwares designed to generate outputs similar to those of the HMIS have already been developed, requiring only minor modifications to customize it. In this situation, the resources needed to acquire and customize the software should be determined. A decision then needs to be made on whether to develop new software or acquire and modify an existing program.
- (5) Pre-test the software, paying attention to:
  - Identification of bugs
  - Ability of software to generate the expected data
  - Ability of staff to use it
- (6) Develop and pre-test the User's Manual for the software.
- (7) Design a training programme to train relevant staff on the use of the software.

---

## I S S U E S

---

- (1) Capability of existing hardware, especially at the lower levels, to accommodate the software, as well as its ability to store all the data.
- (2) Compatibility of the developed software with other existing software (both within and outside the Ministry of Health) that it might need to interface with in the future.
- (3) Basic system maintenance procedures.
- (4) Security system.

**Worksheet 7.1: Comparative Assessment of Software to be Used in the HMIS**

Criteria for Selection	Score		
	Software 1	Software 2	Software 3
Cost of acquiring/developing the software 1 – Very expensive 2 – Moderately expensive 3 – Nil/free	2		
Existence of staff within MOH who know how to use the software 1 – None 2 – Some 3 – Several	2		
Availability of local technical support in case of problems 1 – None 2 – Limited availability 3 – Highly available	3		
Compatibility with the operating systems of the computers used by other units within the MOH with whom the HMIS needs to interface 1 – Not compatible 2 – Compatible	2		
Compatibility with other software used in the MOH that HMIS needs to interface with 1 – Not compatible at all 2 – Software interface possible after additional processes 3 – No compatibility problems	3		
Availability of User's Manual for the software 1 – Not available at all 2 – Available, but cannot be acquired locally 3 – Available locally			
Level of computer skills needed to use the software 1 – High/advanced 2 – Moderate 3 – Low (very user-friendly)	2		
<b>Total</b>	<b>17</b>		



# 8 | Developing the training programme

## P R I N C I P L E

**T**raining programmes should be designed according to the needs and level of the target groups.

## S T E P S

(1) Conduct a training needs assessment for data providers and data users. Four types of training are usually conducted. These are:

- Training of trainers
- Training of data providers at the peripheral levels on how to fill out forms
- Training of computer operators on the use of the software and hardware
- Training of staff at different levels on data utilization

A separate training-needs assessment should be conducted for each type of training.

Among the variables to be collected for the training-needs assessment are as follows:

- Basic functions of each staff related to HMIS
- Extent of previous training received on the performance of such functions
- When training was received
- Adequacy of previous training to enable staff to perform expected functions
- Desired training areas

(2) Develop the curriculum for each type of training, based on the results of the training needs assessment. The following aspects should be covered:

- Target group (For Whom?)
- Content (What?)
- Strategies (How?)
- Duration (How long?) – This refers to the total duration of the training programme, as well as the time allocated for each topic included in the training

The output of this step is a course syllabus for each training programme to be conducted.

- (3) Develop the training materials. The following training materials are suggested:

Type of Training	Training Material	Contents
Training for Data Providers	Data Dictionary	List of indicators, formulas, definitions, data sources
	Manual for Data Providers (separate Manual for each level)	Instructions on how to fill out forms
Training for Data Users	Manual for Data Users (separate Manual for each level)	Data analysis, interpretation and utilization
Training for Computer Operators	Computer Software User's Manual	Detailed instructions (with examples) on how to use the software; troubleshooting
Training of Trainers	Trainer's Manual	Instructions on how to implement the training programme for data providers and data users; teaching strategies; guidelines on the use of the Manual for Data Users and Manual for Data Providers

The participants of the Training of Trainers should be provided with a copy of the Data Dictionary, the Manual for Data Providers and the Manual for Data Users.

- (4) Reproduce the training materials. Since there is a chance that some modifications in the format, structure and content of the training materials will be made based on the evaluation results, the number of copies to be reproduced at this point should be limited.
- (5) Formulate the evaluation design for the training programme. It is important to determine this prior to the conduct of the training activities, since most evaluation designs require the collection of a baseline or a pre-training level of knowledge among the participants.
- (6) Identify the most appropriate participants for each type of training, based on their duties and responsibilities related to data generation, management and utilization. An efficient strategy to use is to identify and train a core set of staff who can act as trainers for the neighbouring areas. If this strategy is adopted, it is important to consider the geographic distribution of participants for the Training of Trainers.
- (7) Conduct the training of data providers.
- (8) Conduct the training of data users. This is usually conducted after sufficient data from the HMIS has been collected for use as examples during the training.
- (9) Evaluate the training programme, including the training materials used.



- (10) Modify the training materials and the training programme itself based on the results of the evaluation. This should be done prior to the conduct of another series of training activities.

## I S S U E S

- (1) Selection of the appropriate participants for the different training programmes to be conducted.
- (2) Backgrounds of staff identified to enter data and generate reports using the software developed for the HMIS. Are they very different?
- (3) Language/dialects to be used for the training materials.
- (4) Extent of dissemination of training materials and manuals.
- (5) Preparation of adequate facilities to conduct training.



Training seminar on data use.

## Worksheet 8.1: Preparation of a Lesson Plan for the Training of Data Users and Data Providers

Type of Training: <input type="checkbox"/> Training for Data Providers <input checked="" type="checkbox"/> Training for Data Users <input type="checkbox"/> Training of Trainers <input type="checkbox"/> Training for Computer Operators	
Session No.: 1    Topic: Introduction to Health Statistics	
Duration of Lecture (in hrs): 2.0 hrs    Duration of Practical Exercises (in hrs): 1 hr    Total Time Allocated for this Session (in hrs): 3 hrs	
Learning Objectives	Outline of Lecture
By the end of the session, the participants should be able to: 1. Identify the different local and international sources of health data that are collected either on a routine or on an <i>ad hoc</i> basis 2. Know the types of data available from the different local and international sources 3. Be aware of the problems faced by the routine data collection systems for health and health-related data, particularly on the MOH health information system and the vital registration system 4. Know how to assess a given set of health data according to timeliness, completeness, adequacy, accuracy and reliability 5. Identify factors affecting the quality of health data	1. Health Statistics 1.1 Sources of health data a. The health information system of the Ministry of Health b. The vital registration system c. Other local sources of health data (including other sectors such as the police for accidents, etc.) d. International sources of health data (WHO, UNICEF, etc.) 1.2 Assessing the quality of health data a. Timeliness b. Completeness c. Adequacy d. Accuracy e. Reliability
Specific Topics to be Covered in the Lecture	Topics to be Covered/ Activities to be Undertaken for the Practical Exercises
<ul style="list-style-type: none"> <li>➤ Data sources</li> <li>➤ Routine data collection system</li> <li>➤ <i>Ad hoc</i> data collection system</li> <li>➤ MOH health information system</li> <li>➤ Vital registration system</li> <li>➤ Definitions and ways of detecting problems in the following aspects of data quality:                             <ul style="list-style-type: none"> <li>• Timeliness of data</li> <li>• Completeness of data                                     <ul style="list-style-type: none"> <li>– extent to which the whole form/data collection tool is filled out</li> <li>– geographic area covered by the report</li> <li>– time frame covered by the report</li> </ul> </li> <li>• Adequacy of data</li> <li>• Accuracy of data</li> <li>• Reliability of data</li> <li>• Factors affecting the quality of the data</li> </ul> </li> </ul>	Critique data published in the Annual Health Statistics Report

# 9 | Pre-testing the system

## P R I N C I P L E

The system should be pre-tested in conditions that reflect as much as possible the actual conditions prevailing during its implementation.

## S T E P S

- (1) Prepare the guidelines for pre-testing the system. This involves addressing the following questions:
  - (1.1) **Where?** Selection of the place(s) where the pre-testing will be conducted. There is a need to develop criteria for selecting the pre-testing sites. These can include technical factors like the level of expertise or qualifications of the staff in the area, or practical considerations like the proximity of the area, the provision/availability of infrastructure support, or how cooperative the staff are.
  - (1.2) **Who?** Who will participate in the pre-testing? It is important for the different types of data providers and data users to participate in the pre-testing.
  - (1.3) **What?** What are the specific objectives of the pre-testing? Specifically, what aspects of the HMIS will be pre-tested? What are the different activities to be undertaken to achieve these objectives?
  - (1.4) **How?** What modes and tools for data collection will be utilized to systematically collect the data required for an efficient pre-testing of the forms?
  - (1.5) **How long?** For how long will the pre-testing be conducted?
- (2) Orient the staff involved in the pre-testing.
  - (2.1) Inform them on the objectives of and procedures for the pre-testing.
  - (2.2) Train the data users and data providers in the pre-test areas on the new system.

- (3) Implement the pre-testing activities.
- (4) Write a report on the results of the pre-testing.
- (5) Formulate recommendations, based on the results of the pre-testing.

---

## *I S S U E S*

---

- (1) Implementation of a systematic and proactive monitoring mechanism during the pre-testing phase.
- (2) Systematic updating of the software in all units where it has been installed.
- (3) Ensuring that all elements and staff are ready for the pre-testing phase.

# W O R K S H E E T

**Worksheet 9.1: Logbook of Problems Identified During the Pre-testing Phase**

Province: _____		District: _____		Village Health Centre: _____		Month/Year: _____			
Date	How Problem Was Identified			Problem Area		Description of Problem	Action Taken	Result/Status of Problem	
	Phone Call	Field Visit	Others (Specify)	Forms	Computer <sup>1</sup>				Others
3/1/03	✓			✓			Ran out of supply of new forms	Additional supply of new forms sent the following day	Problem solved
3/3/03		✓			✓		Computer doubles the entries for some forms	Problem referred to software developer	Bug in the software identified; correction of software installed in all districts scheduled for next week
3/10/03		✓		✓			Confusion in definition of FIC – whether cut-off age is <1 or <2	Problem referred to EPI Unit	Age cut-off verified to be <1; written clarification of definition of FIC distributed to all health centres

<sup>1</sup>Includes both software and hardware-related problems



# 10 | Monitoring and evaluating the system

## P R I N C I P L E

The goal of monitoring and evaluation is not to focus on what is wrong and condemn it; rather, it is to highlight the positive aspects of the system that make it work, as well as to identify what went wrong as a basis for improving the system.

## S T E P S

- (1) Develop a plan for the systematic monitoring and evaluation of the system.
  - What will be monitored and evaluated?
  - How will it be done?
  - Who will do it?
  - How frequently will it be conducted?
  - How will the results be systematically disseminated?
  - How will action resulting from the evaluation results be generated?
- (2) Identify the resources needed to implement the monitoring and evaluation plan.
- (3) Prioritize the activities, based on availability of resources and need.
- (4) Implement the monitoring and evaluation plan.
- (5) Document and disseminate the results of monitoring and evaluation activities.
- (6) Make recommendations based on the results of monitoring and evaluation activities.



Checking data entry work at a health centre.

## *I S S U E S*

- (1) Institutionalization of monitoring and evaluation to ensure that it becomes a regular activity and will be allocated the corresponding resources.
- (2) Availability of technical expertise and other resources for monitoring and evaluation.



Worksheet 10.1: Data Collection Activities for the Evaluation of the HMIS

Area	Major Variables to be Covered	Mode of Data Collection	Data Collector
Data generation and report compilation	<ul style="list-style-type: none"> <li>➤ Data quality including timeliness, completeness, accuracy and reliability</li> <li>➤ Correct computing of indicators</li> <li>➤ Appropriateness of data sources</li> <li>➤ Extent and nature of problems met by village health centre staff on data entry and report generation</li> <li>➤ Adequacy of forms to meet the needs of the national, provincial, district and village levels</li> </ul>	Key informant interviews Focus group discussions	HMIS evaluation Consultant
Data utilization	<ul style="list-style-type: none"> <li>➤ Extent and nature of interaction among staff at different levels on the HMIS forms and reports</li> <li>➤ By whom and how data generated from the HMIS are utilized at the national, provincial, district, and village levels</li> </ul>	Key informant interviews Focus group discussions	HMIS evaluation Consultant
Computer software and hardware	<ul style="list-style-type: none"> <li>➤ Extent and nature of problems in data entry and report generation at the national, provincial, district and village levels</li> <li>➤ Adequacy of the software to meet the needs of the provinces and districts, as well as the national level</li> <li>➤ Problems met with the software</li> </ul>	Review of logbook of computer problems	IT specialist, National Office
Training	<ul style="list-style-type: none"> <li>➤ Assessment of the training for data users and data providers</li> <li>➤ Assessment of the training of trainers</li> <li>➤ Assessment of the training on the use of the software</li> <li>➤ Assessment of the User's Manual for the software</li> </ul>	Key informant interviews Focus group discussions	HMIS evaluation Consultant
Monitoring	<ul style="list-style-type: none"> <li>➤ Monitoring activities and strategies used at the national, provincial, and district levels. Of particular importance are monitoring activities for the following areas:                             <ul style="list-style-type: none"> <li>• data quality</li> <li>• data extraction from various sources</li> <li>• utilization of HMIS products</li> </ul> </li> <li>➤ Monitoring activities at the national and provincial level on the use of the software</li> </ul>	Key informant interviews Focus group discussions Review of records and logbooks	HMIS evaluation Consultant
General	<ul style="list-style-type: none"> <li>➤ Supply of forms, computer supplies, and other materials needed for the various components of the HMIS</li> <li>➤ Forms and sources of additional support needed at the national, provincial, district, and village levels</li> </ul>	Key informant interviews Focus group discussions	HMIS evaluation Consultant



# 11 | Developing data dissemination and feedback mechanisms

## P R I N C I P L E

**A**n effective way of motivating data producers is to constantly provide them with both positive and negative feedback on the status of the data they produce.

## S T E P S

- (1) Determine the most effective and efficient way of disseminating the data generated from the HMIS by considering the following factors:
  - (1.1) To whom should the data be disseminated? The needs of target groups have to be considered.
  - (1.2) What should be disseminated? This should include not only the outputs of the HMIS, but also feedback on who is using the information and what/how they are using it.
  - (1.3) How often should data be disseminated to the different target groups?
  - (1.4) In what form should the data be disseminated to each of the different target groups? The whole range of forms and venues for data dissemination should be considered.
- (2) Identify the human, financial and other resources needed to implement the data dissemination plan.
- (3) Prioritize the different modes of data dissemination to be adopted, based on need and availability of resources.
- (4) Implement the data dissemination activities.

- (5) Develop and implement a system for monitoring and evaluating the data dissemination and feedback activities conducted. Among the factors to be considered are:
- Coverage — to what extent is the material reaching the target audience?
  - Effect of the feedback system on the staff
  - Degree of utilization by the target audience — are they actually using the data presented in the different materials prepared?

---

## *I S S U E S*

---

- (1) Preparation of a Management Report.
- (2) Limited financial resources for dissemination.
- (3) Ensuring that dissemination activities reach the 'correct' audience.
- (4) Consistency between the data disseminated by the HMIS, and similar data published and disseminated by other units within the ministry, especially those of the vertical programmes.

Worksheet 11.1: Summary of Data Dissemination and Feedback Activities

Type of Report/Activity	To Whom It Needs to be Disseminated	Mode of Dissemination	Frequency of Dissemination/Conduct
Annual Health Statistics Report	<ul style="list-style-type: none"> <li>➤ Government Statistics Office</li> <li>➤ Secretary of Health</li> <li>➤ National Health Planner</li> <li>➤ All Programme Managers at the national level</li> <li>➤ All Provincial Health Offices</li> </ul>	Publication	Annual
Weekly Morbidity Report for Notifiable Diseases	<ul style="list-style-type: none"> <li>➤ District Health Offices</li> <li>➤ Provincial Health Offices</li> <li>➤ Programme Directors</li> <li>➤ National Disease Control Unit</li> </ul>	<ul style="list-style-type: none"> <li>➤ Radio</li> <li>➤ Telephone</li> <li>➤ Fax</li> <li>➤ Email</li> </ul>	Weekly
District Monthly HMIS Monitoring Meetings	<ul style="list-style-type: none"> <li>➤ Programme Managers at the district level</li> <li>➤ Village Health Centre staff</li> </ul>	Meeting	Monthly



# 12 | Enhancing the HMIS

## P R I N C I P L E

The development of the HMIS is always a work in progress. It is a dynamic endeavour where managers and workers strive for constant improvement.

## S T E P S

- (1) Review the results of monitoring and evaluation activities conducted on the HMIS in recent years.
- (2) Identify aspects of the HMIS that need to be developed further to facilitate the functioning of the core system. The basic question to be answered is, “Where do we go next?”. Among the possible aspects that need looking into:
  - Enhancement and institutionalization of procedures to assure data quality control
  - Developing capacity to conduct special studies and sample surveys
  - Defining coordinating mechanisms for the horizontal use of data generated from vertical programmes
  - Developing strategies to create and/or sustain the interest of staff at different levels to use the data for programme planning, management and evaluation
  - Establishing inter- and intra-sectoral linkages among units involved in different aspects of the HMIS
  - Unifying and coordinating initiatives of sectors and funding agencies involved in activities related to the HMIS
- (3) Identify resources needed to implement the different options for the enhancement of the HMIS. This should include specific types of resources for each planned expansion activity; the budgetary requirements (if any); and the desired source of support for each type of resource needed.

- (4) Prioritize the different options according to degree and urgency of need, and availability of resources for its proper implementation.
- (5) Prepare a timetable for the implementation of the different activities for the expansion of the HMIS.
- (6) Conduct the different activities needed to implement the desired enhancement of the HMIS.
- (7) Monitor and evaluate the effect of newly implemented aspect of the HMIS.

---

## *I S S U E S*

---

- (1) Sustaining interest among different stakeholders for the continuous development of the HMIS.
- (2) Generation of resources to support the different activities for system enhancement.
- (3) Coordinating the activities of the different donor agencies so as to minimize the proliferation of data collection forms and the duplication of efforts in areas related to HMIS development.
- (4) Ensuring the continued existence of a body/committee to oversee the HMIS after the pilot-testing phase.



**Worksheet 12.1: Two-year Plan of Activities for HMIS Expansion and Corresponding Resource Requirements**

Activity	Timetable for Implementation								Resource Requirements	Estimated Cost	Source of Support
	Year 1				Year 2						
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4			
Provision of computers to all the 10 districts of Prov. X									10 computers and printers	\$15 000	Donor agency
Development of training strategies ➤ Identification of participants ➤ Development of training materials									Communication costs Honorarium for local consultant	\$600	Regular budget
Training of district level Information Officers on the use of the software									Development and reproduction of training materials Per diem of participants Transportation, food and venue Honorarium for local consultant/trainer	\$1000 \$4000 \$300	Regular budget Donor agency Regular budget
Printing of new forms									Printing costs	\$2000	Donor agency
Monitoring and inspection									Transportation and daily subsistence allowance of monitoring team (1 visit/district/2 months) Communication costs (long distance calls, fax, etc.)	\$500	Regular budget



The background features a collage of documents and statistics. On the left, there's a photo of people in a natural setting. In the center, a document with a table is visible. On the right, there are two book covers: one for 'HEALTH SECTOR OF MONGOLIA years' and another for 'THỐNG KÊ NIÊN HEALTH STATISTICS 200'.

# Examples

Example 1 is a list of basic indicators that might be used in Ministry of Health programmes, together with the corresponding data sources, modes and frequency of data collection, as well as the lowest administrative level where the indicator is computed. While the reader can adopt some of these indicators for their use, the main objective of the example is to show how the set of indicators used by a country can be presented so that it will be easy for the staff of the Statistics Unit to monitor their status.

Example 2 is a flow chart of the HMIS of hypothetical country X. As in the first example, the aim is to show not “ what” , but “ how” ; not to prescribe a model flowchart for the HMIS as such, but rather to demonstrate how the HMIS can be presented by means of a flow chart.

**Example 1: List of Indicators Used by the Ministry of Health of Country X With Corresponding Data Sources and Mode of Data Collection**

Indicator	Source			Other Agencies (Please Specify)	Mode of Data Collection		Lowest Level Where Indicator is Computed
	Unit/Division	MOH Form/Register			Routine System	Special Survey	
<b>A. Population, Socio-economic and Environmental Indicators</b>							
1. Population growth rate			NSO	✓	✓	Annually	Village
2. Natural population growth rate			NSO	✓	✓	Annually	Village
3. Crude birth rate			NSO	✓		Annually	Village
4. Crude death rate			NSO	✓		Annually	Village
5. Total fertility rate			NSO	✓	✓	Annually	Village
6. Percentage of the population by age and sex			NSO		✓	Every 5 yrs	District
7. Gross domestic product per capita			NSO	✓		Annually	National
8. Literacy rate							
a. Overall							
b. Males							
c. Females			NSO; MOE		✓	Every 5 yrs	Province
9. Percentage of the population using safe water							
a. Overall							
b. Urban							
c. Rural	EH		NSO		✓	Every 5 yrs	Province
10. Percentage of the population using hygienic toilet							
a. Overall							
b. Urban							
c. Rural	EH		NSO		✓	Every 5 yrs	Province
<b>B. Resource Indicators</b>							
11. Percentage of government health budget in GDP	PHO DOF	MOH DOF	NSO	✓		Annually	National

12. Percentage of government health budget in expenditure of national budget	PHO DOF	MOH DOF	NSO	✓	✓	Annually	National
13. Health budget per capita	PHO DOF	MOH DOF	NSO	✓	✓	Annually	National
14. Proportion of health expenditure by programme (preventive, curative, training, management)	PHO DOF	MOH DOF	NSO	✓	✓	Annually	Province
15. Number of hospital beds per 1000 population	DHS; DP	DHS; DP		✓		Annually	Province
16. Number of physicians per 10 000 population	DHS; DP	DHS; DP		✓		Annually	Province
17. Number of pharmacists per 10 000 population	DP	DP		✓		Annually	Province
18. Number of nurses per 10 000 population	DP	DP		✓		Annually	Province
19. Number of dentists per 10 000 population	DP	DP		✓		Annually	Province
20. Percentage of villages with a trained health worker	DP	DP		✓		Annually	Commune
<b>C. Performance and Output Indicators</b>							
<b>C1. Nutrition Indicators</b>							
21. Weight malnutrition rate of children <5 years old	NIN		NSO	✓		Annually	Province
22. Height malnutrition rate of children <5 years old	NIN		NSO	✓		Annually	Province
23. Weight/height malnutrition rate of children <5 years old	NIN		NSO	✓		Annually	Province
24. Percentage of low birth weight	DMCH; CHC			✓		Quarterly	District
<b>C2. Curative Services</b>							
25. Number of in-patients per 1000 population	DHS			✓		Quarterly	Province
26. Percentage of insured in-patients among total in-patients	DHS			✓		Quarterly	Province

Continued next page ►

Example 1 (Cont'd)

Indicator	Source			Mode of Data Collection		Lowest Level Where Indicator is Computed
	Unit/Division	MOH	Other Agencies (Please Specify)	Routine System	Special Survey	
		Form/Register				
<b>C2. Curative Services (Cont'd)</b>						
27. Number of out-patients per 1000 population	DHS			✓	✓	Province
28. Average length of stay in the hospital	DHS			✓		District
29. Bed occupancy rate	DHS			✓		District
30. Bed turn-over rate	DHS			✓		District
<b>C3. Reproductive Health and Family Planning</b>						
31. Percentage of pregnant women vaccinated with Tetanus Toxoid ≥2	EPI; CHC; DMCH			✓		District
32. Percentage of women with ≥3 antenatal visits during pregnancy	CHC; DMCH			✓		Commune
33. Percentage of deliveries in health facilities	CHC; DMCH			✓		Commune
34. Percentage of deliveries attended by a health worker	CHC; DMCH			✓		Commune
35. Percentage of mothers who received postnatal care	CHC; DMCH			✓		Commune
36. Percentage of pregnant women among <19 years old	CHC; DMCH		NSO	✓	✓	District
37. Contraceptive prevalence rate	FPSF		NSO	✓	✓	District
38. Method-specific contraceptive rate (IUD, Pill, etc.)	FPSF		NSO	✓	✓	District
39. Spontaneous abortion ratio	H			✓		District
40. Morbidity and mortality ratio of obstetric complications	H			✓		Province

<b>C4. Child Health Care</b>										
41.	Percentage of children <1 year old fully immunized (FC)	EPI	✓					Quarterly	Commune	
42.	Percentage of children <1 year old vaccinated against TB	EPI	✓				✓	Quarterly	Commune	
43.	Percentage of children <1 year old vaccinated against pertussis, tetanus and diphtheria	EPI	✓				✓	Quarterly	Commune	
44.	Percentage of children <1 year old vaccinated against polio	EPI	✓				✓	Quarterly	Village	
45.	Percentage of children <1 year old vaccinated against measles	EPI	✓				✓	Quarterly	Village	
46.	Percentage of children <1 year old vaccinated against hepatitis	EPI	✓				✓	Quarterly	Village	
47.	Morbidity and mortality rate of 6 vaccine preventable diseases of children	EPI	✓				✓	Quarterly	Province	
48.	Morbidity and mortality rate of neonatal tetanus	H; DSS	✓				✓	Quarterly	District	
49.	Average number of diarrhea episodes among children <5 years old	H; DHC PHC	✓				✓	Quarterly	Village	
50.	Percentage of diarrhea cases among children treated with Oral Rehydration Salts	H; DHC PHC;CHC	✓				✓	Quarterly	Village	
51.	Mortality rate from diarrhea among children <5 years old	H; DHC PHC; CHC	✓				✓	Quarterly	Province	
52.	Average number of acute respiratory infection episodes among children <5 years old	ARICP	✓				✓	Quarterly	Village	
53.	Mortality rate from acute respiratory infection among children <5 years old	ARICP	✓				✓	Quarterly	Province	
54.	Percentage of severe pneumonia cases among children <5 years old referred to higher level	ARICP					✓	Quarterly	Village	

Continued next page ►

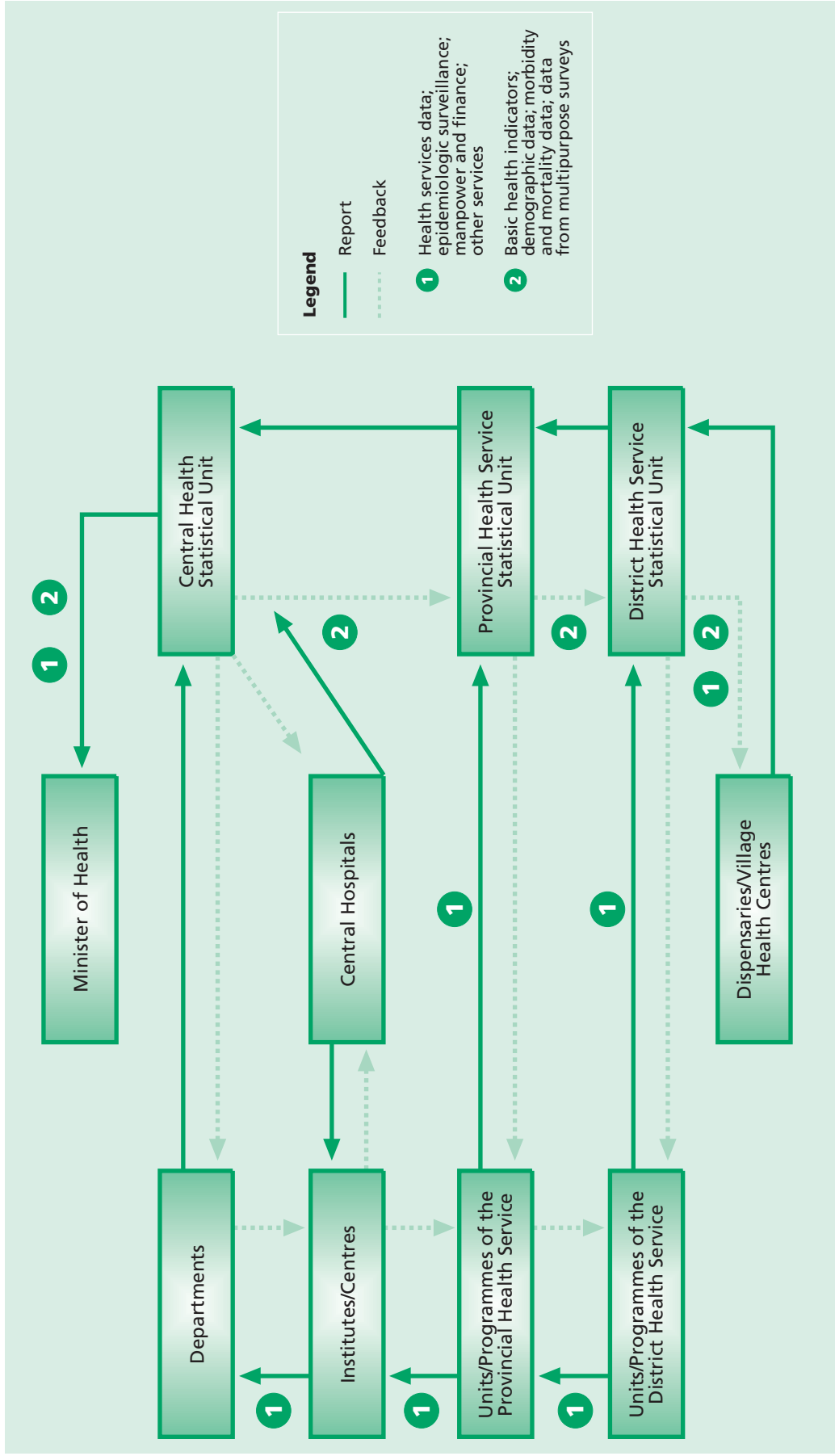
Example 1 (Cont'd)

Indicator	Source			Mode of Data Collection		Lowest Level Where Indicator is Computed
	MOH		Other Agencies (Please Specify)	Routine System	Special Survey	
	Unit/Division	Form/Register				
<b>C5. Selected Diseases</b>						
55. Prevalence of leprosy	DHC PMC			✓		Province
56. Percentage of new leprosy cases with disability degree 2 and over	DHC PMC			✓		Province
57. Morbidity and mortality rate of tuberculosis	NTCP			✓		Province
58. Notification rate (incidence) of tuberculosis	NTCP			✓		Province
59. Percentage of tuberculosis patients treated with DOTS	NTCP			✓		Province
60. Case fatality rate for tuberculosis (among treated cases)	NTCP			✓		Province
61. Morbidity and mortality rate for malaria	NMCP,CDSS			✓		District
62. Percentage of blood smears positive with parasite	NMCP			✓		District
63. Number of malaria outbreaks	NMCP,CDSS			✓		District
64. Percentage of households using iodized salt	NIN				✓	Province
65. Prevalence of goiter among school-age children	NIN				✓	Province
66. Number of new HIV-AIDS cases	HACP			✓	✓	Province
67. Cumulative number of HIV-AIDS cases	HACP			✓	✓	Province
68. Number of deaths due to AIDS	HACP			✓	✓	Province
69. Number of food poisoning outbreaks				✓		Commune



D. Impact Indicators		Annually						
70. Morbidity and mortality rate for selected communicable diseases	CDSS	Annually	✓					Village
71. Ten leading causes of morbidity and mortality in hospitals	H	Annually	✓					District
72. Percentage of hospital admissions according to different groups of diseases (based on ICD-10 categories)	H	Annually	✓					District
73. Under-five mortality rate	MOH	Annually	✓	NSO		✓		Province
74. Infant mortality rate	MOH	Annually	✓	NSO		✓		Province
75. Perinatal mortality rate	MOH	Annually	✓	NSO		✓		Province
76. Maternal mortality ratio	MOH	Annually	✓			✓		Province
77. Life expectancy at birth a. Males b. Females		Every 5 yrs				✓		Province
78. Human development index		Every 5 yrs		NSO		✓		National

Example 2: Data Flow for the HMIS of Country X



# References

- Hurtubise, R. *Managing information systems: concepts and tools*. West Hartford, CT, Kumarian Press, 1984.
- Lippeveld, T., et al, eds. *Design and implementation of health information systems*. Geneva. World Health Organization, 2000.
- World Health Organization Regional Office for the Western Pacific. *Workshops on the assessment and development of national Health Information Systems (HMIS) and epidemiological surveillance*. Manila, Philippines. World Health Organization, 1986 (Unpublished document, (WP)HIN/ICP/HST/005-E).
- World Health Organization Regional Office for the Western Pacific. *A selection of important health indicators*. Manila, Philippines. World Health Organization, 2000.
- World Health Organization Regional Office for the Western Pacific. *Guidelines for the development of Health Management Information Systems*. Manila, Philippines. World Health Organization, 1993.

