

Introduction

The year 1978 was a milestone in the history of health care development. It was year of the Alma Ata Declaration, of which mention has been made in the opening chapter. As stated therein the declaration resolved to launch a global effort for attaining the goal of Health For All (HFA) the people of the world by the year 2000, that will permit them to lead a socially and economically productive life. The key approach for attaining this goal was identified as **Primary Health Care (PHC)** based on the principles of:

- Equity or care according to needs; universal coverage of defined populations.
- Health care which is culturally acceptable.
- At a cost that the community can afford.
- Active community participation.

Over the last decade experiences from different countries have highlighted the need of reliable information for decision making.

A 1987 World Health Organization Report on Evaluation of the strategy for Health for all by the year 2000 states: "the main constraint reported by practically all countries is inadequate information for managerial process to provide systematic and analytic information for continuous assessment of the situation, determination of priorities, improvement of management and evaluation – **the Health For All** strategy demands an integrated managerial approach – and also monitoring and evaluation with a view to modification or re-adjustment of the strategy as part of the continuous cycle."

Yet there has never been a greater need for robust health information. As the world community has turned its attention to meeting **Millennium Development Goal targets**, and ever increasing resources are going towards preventing and treating high burden diseases such as **HIV and AIDS, tuberculosis and malaria**, decision-makers need to be able to measure whether policies and programs are working, and whether progress is being made towards the goals that have been set. Donors are also placing more emphasis on performance, linking the release of funds to performance based measures.

Decisions need to be taken at all levels of care from policy making at the federal level to the basic health care facil-

ity at the periphery, to the home level by individual family members and to the donor agencies for funding. Decisions require some kind of information. Management information hence provides all the information needed by policy makers, clinicians, and health service users to improve and promote population health.

Definition of Management Information System

The system which provides an organized method of collecting data and assimilating it into information to be used for management decision making is called **Management Information System (MIS)**.

A few years back, in the health sector, this system was called **Health Information System**. However, with the understanding and realization that, the information processed through the system is used for management decision making, the term Management Information System has gained greater acceptability.

Definition of Health Management Information System (HMIS)

Health management information system (HMIS) being an integral part of national health system can be defined as

"a mechanism for the collection, processing, analysis, transmission of information required for organizing and providing health services, and also for research and training."

The information generated by HMIS on the status of ongoing health related activities facilitate the evidence based decision making and effective management of health system at all levels (central, local and international) to assist planners and policy makers in studying their functioning and trends in demand and work load.

Characteristics of information produced by HMIS: The basic idea behind effective and efficient HMIS is to generate information that must be **reliable, relevant, up to date, adequate, timely and reasonably adequate** so that it will be properly used by health managers and decision makers.

Data And Information

One of the basic building blocks of HMIS is **Data** which is later on processed into **information**. Both of them are vital components of HMIS. According to Russell Ackoff, a systems theorist and professor of organizational change, the content of the intelligence hierarchy can be classified into four categories:

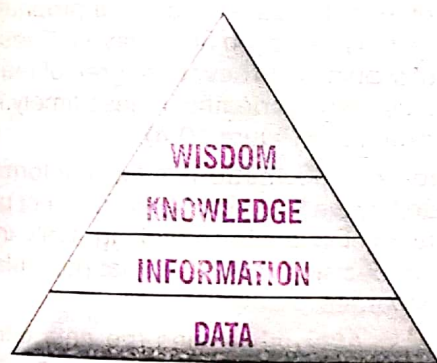
Data consist of discrete observations of attributes or events. These facts and figures can either be qualitative or quantitative

Information is the data that are processed to be useful. Data can be transformed into information by reducing, summarizing and adjusting them for variations in an attempt to communicate meaning.

Knowledge is typically defined with reference to information. Information that have been processed, organized or structured in some way, or else as being applied or put into action. Plato referenced it as "justified true belief."

Wisdom is the ability to increase effectiveness. The knowledge and experience needed to make sensible decisions and judgments. Wisdom adds value, which requires the mental function that we call judgment. The ethical and aesthetic values that this implies are inherent to the actor and are unique and personal.

The data that is not transformed into information and the information that is not utilized for decision making after application of knowledge and wisdom is of diminutive value.



Intelligence Hierarchy Pyramid

The Need for a Management Information System in PHC Programs

Effective Primary Health Care programs require constant overseeing of the activities of personnel, adequate provision of drugs and other supplies and effectiveness of intervention strategies employed for specific problems. MIS provides the necessary tools for establishing the infrastructure for management and supervision.

Information is needed at all levels, however, the purpose and uses of information differ at different levels. Let us take

the examples of Growth Monitoring and Promotion (GMP) component of a PHC program:

- Health care workers and parents are interested in the health of children. They use heights and weights of children to monitor the health status of individuals.
- A PHC program supervisor (a Lady Health Visitor or a Community Health Nurse) is interested in coverage and efficiency of the program. She needs to know how many of the total target population of under five children have been monitored for growth promotion in the last quarter and what proportion are malnourished.
- A PHC program manager along-with the supervisor monitors effectiveness of intervention. They need to know, of the children malnourished, what proportion showed improvement, deterioration or no change over a given period of time.
- Planners may use information from GMP component of the program to compare alternative methods of GMP and to assess program effectiveness and efficiency. Information at this level is also used for making decisions pertaining to optimal use of resources.

Essentials of a Health Management Information System

Essential elements of HMIS

Every information system has three essential elements - **an input, an output** and a **process** that links them in some functional way.

The inputs of a MIS are the data on selected activities or happenings that will produce the required information.

The processing component of a HMIS is the means by which data are transformed into information. Raw data are generally unusable except for individual case management. They have to be collated, aggregated, analyzed and presented on time, in legible and understandable formats.

The output of the information system consists of processed information to satisfy one or more user needs.

Steps in developing HMIS

- **Planning and Designing Phase** is the first phase of developing MIS that ensures the systemic development of information system that will generate valuable information required for particular program. The process of planning depends on the objectives of the program and comprises of situation analysis, budgeting and development of software.
- **Implementation Phase:** This is by far the most expensive and time consuming phase in the development process. Implementation phase consists of developing all of the system components -- data collection forms; data col-

lection, transfer and processing procedures; data entry procedures and screens; software; report forms; report distribution; quality control procedure and at the same time training of manpower

- **Monitoring and Evaluation Phase** is the phase of inquiry into the performance of a program includes periodic audits and maintenance to ensure that the system is functioning properly.
 - **Monitoring** is day to day overseeing of program working
 - **Evaluation** is the periodic check of impact or program results evaluation
 - **Formative**: -evaluation is the process that goes on all through the implementation phase of the program. It is very important as major changes might be made in the program during implementation based on results of formative evaluation
 - **Summative**: - this is the formal evaluation done at the end of program

Essential Requirements of HMIS

AWHO expert committee identified the following properties should be present in health information system:

- The system should be population based
- The system should avoid the unnecessary agglomeration of data
- The system should be problem oriented
- The system should employ functional and operational terms (e.g. episodes of illness, treatments regimens, laboratory tests)
- The system should express information briefly and imaginatively (e.g. tables, charts, percentages)
- The system should make provision for the feedback of data.

Components of HMIS

There are several subsystems within health information system. A comprehensive health information system requires information and indicators on the following subjects;

- Demography and vital events
- Environmental health statistics
- Health status; mortality, morbidity, disability and quality of life
- Utilization and non utilization of health services; attendance, admission, waiting lists
- Indices of outcome of medical care
- Financial statistics (cost, expenditure) related to the particular objective

Important Features for HMIS

A well designed HMIS should take into account the

following:

- **Relevance**: In designing the MIS every effort should be made to ensure that data collected is relevant. Data essential to the monitoring and evaluation process of the program should not be part of routine data collection.
- **Standardization**: Efforts should be made to ensure conformity in definitions of variables collected. It is essential to maintain uniformity otherwise inconsistency in the definition of variables would pose problems when comparing the impact of intervention. For example, if the definition of infant varies from time to time, then computation of Mortality Rate will carry no meaning. Quality control of data collection and processing should be part of the function of PHC team.
- **Data Collecting and Aggregating Instruments**: Instruments to record data should be simple and easily understood by the users, examples of which are the growth monitoring chart shown elsewhere and the MIS quarterly report shown in Table 10-1. Dais may be trained to use the monthly report chart shown in Figure 10-1.
- **Data Presentation**: It is important that processed data should be presented in appropriate format which is readily understood (See Figure 10-2 and 10-3).
- **Flow of Information**: The collection of data, the processing and flow of information should be on time, so that information needed to make decisions should be available when and where decisions are taken. For example, if the information on the number of malnourished children showing no change in their weights in the last 3 months does not reach the supervisor on appropriate time, important decisions for action are delayed. These children are at risk of slipping in to severe degree of malnourishment which may result in deaths, unless timely intervention is undertaken (See Figure 10-4).
- **Filtration of Information**: A lot of information may be generated by the MIS. All of these may not be of relevance at every level of decision making. Only information required for decision making at that particular level need to be forwarded.
- **Feedback**: After processing the data into information, feedback at all levels should be inbuilt in the system so that the people collecting data appreciate its uses. For example, at the family level, feedback on weight gain of a child, as demonstrated by the direction of the curve on the road to health card, could stimulate the interest of mother for action. The feedback of aggregated data on growth in the target population gives information to the health personnel on effectiveness of GMP strategy on the health status of all children in the community.

Informations Collected From HMIS

Though HMIS provide a wide range of information available at various levels to manage health system but, international data on following issues must be collected;

Table 10-1
Examples of MIS quarterly Report of Agha Khan University Urban PHC Program (Quarter July to September 1990)

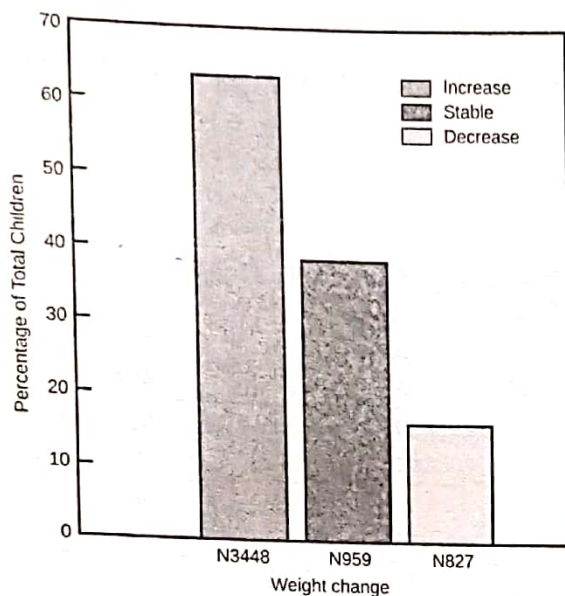
Sr. #	Name of PHC	Total Children	# of Child Weighed	Weight Change	Nutritional Status			I	II	III	
					INC.	STABLE	DEC.				
1	% OR #	10 906	6 598	76 1150	59 623	29 308	11 118	51 581	39 454	8 96	1.7 19
2	% CG #	10 1077	7 724	73 1322	67 862	16 210	17 224	55 728	34 452	8 112	2.5 30
3	% EN #	12 1284	7 751	91 1845	65 1180	19 338	17 308	53 986	38 708	7 127	1.3 24
4	% AB #	11 854	7 537	77 1076	74 783	10 103	17 177	61 658	34 366	4 43	0.8 9
TOTAL #		11 4121	7 2610	80 5393	66 3448	18 959	16 827	55 2953	37 1980	7 378	1.5 82
		(5234)	(5393)								

OR = Orangi, CG = Chanesar Goth, EN = Essa Nagri, AB = Azam Basti

The figure displays a 'Monthly Report Chart of a Dai'. It is a complex form with multiple sections:

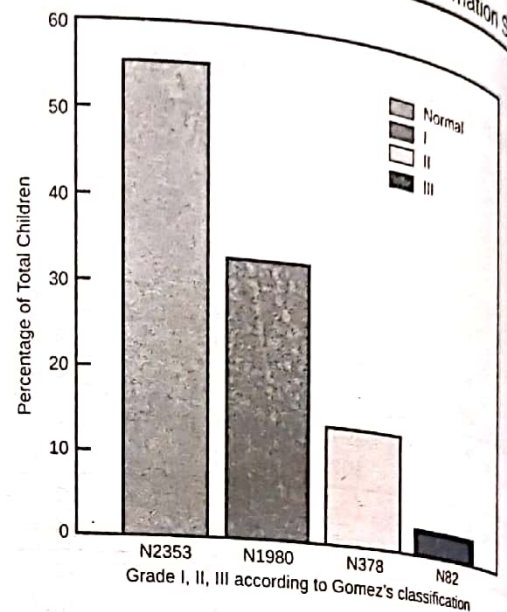
- Top Section:** Contains personal information of the Dai and the community, including name, address, and contact details.
- Grid Section:** A large table with columns for days of the month (1-31) and rows for different health indicators like fever, cough, diarrhea, etc.
- Child Health Section:** A section for recording the health of children, including names, ages, and nutritional status (weight change, INC, STABLE, DEC).
- Household Assessment Section:** A section for recording the health status of household members, including names, ages, and health conditions.
- Bottom Section:** Contains summary statistics and a section for the Dai's signature and date.

Figure 10-1
Monthly Report Chart of a Dai

**Figure 10-2**

Data presentation in a bar diagram. The figure depicts the percent number of children with reference to their weights.

Source: MIS Quarterly Report, GMP Component, The Aga Khan University PHC Program

**Figure 10-3**

Data regarding the nutritional status of children is presented in the form of a bar diagram.

Source: MIS Quarterly Report, GMP Component, The Aga Khan University PHC Program

1. Epidemic diseases
2. Drug supply and distribution position
3. Preventive care in children under 5 years
4. Preventive care for mothers
5. EPI
6. Malaria
7. Family Planning Services
8. Tuberculosis
9. ARI
10. CDD
11. Status of the instruments, equipments, drug, manpower, etc.
12. 18 priority health problems

18 Priority Health Problems

1. Diarrhea
2. Dysentery
3. ARI
4. Fever (clinical malaria)
5. Cough more than 2 weeks
6. Suspected cholera
7. Meningococcal meningitis
8. Poliomyelitis
9. Measles
10. Neonatal tetanus
11. Diphtheria
12. Whooping cough

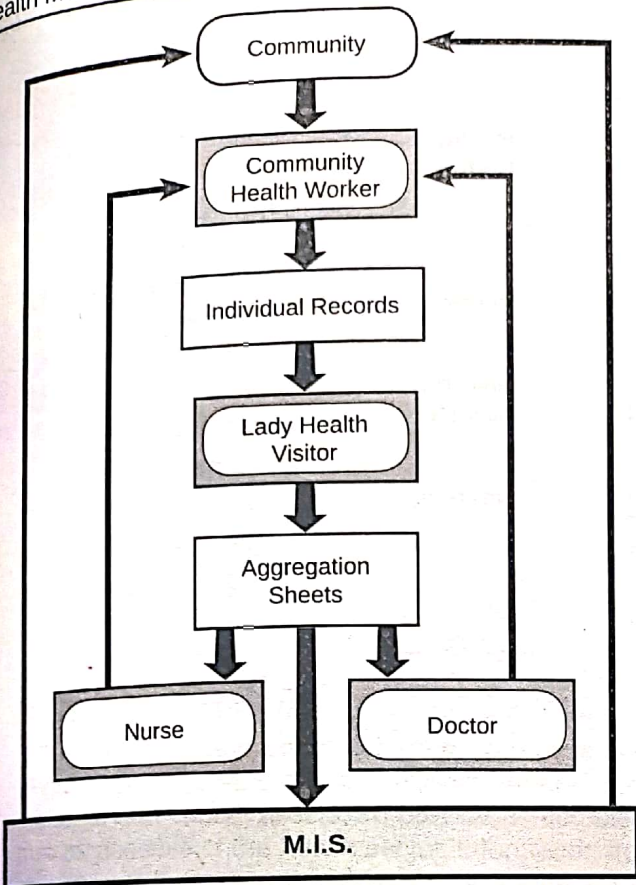
13. Goiter
14. Viral hepatitis
15. AIDS
16. Snake bite with signs of poisoning
17. Dog bite
18. Scabies

Indicators

Definition: The day to day measure of efficiency or a periodic assessment of impact require some variable which can help measure changes of effectiveness or degree of efficiency. Variables which aid in appraising these changes are called indicators. Ideal indicators should be **valid** i.e. they should be both accurate and reliable. **Accurate** that is, they should actually measure what they are supposed to measure and they should be **reliable** - the answer should be the same measured by different people in similar circumstances.

Indicators can be formulated **input indicator** that measure input in a program, for example, resource allocation in terms of manpower, finances, drugs etc. Indicators for gauging program efficiency are called **process indicators** for example the proportion of malnourished children having weight gain in the last quarter. **Output Indicators** measure the quantity of services utilized during the program. Indicators for measuring effectiveness of the program are called **impact indicators**. For example Infant Mortality Rate, Maternal Mortality Rate etc.

Selection of indicators should be based on the goals and objectives of the program listed subsequently under categories of indicators. Table 10-2 shows the various categories of indicators.



Bi-directional and regular flow of information is important to ensure availability of information at the appropriate levels of management decision-making

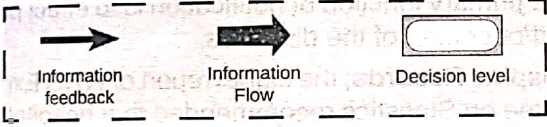


Figure 10-4 Simplified Schematic Diagram:

Source: The Aga Khan University Primary Health Care Management Information System

Strategic And Operational Issues

The data needed in a comprehensive health management information system ranges from birth, morbidity and mortality data, to type and location of health personnel, to type and quality of clinical services provided at national and sub-national level and finally to population indicators, such as demographics and socio-economic status. This information can be divided into five different domains, as shown in the figure Figure 10-5: health determinants, health system inputs, health system outputs, health system outcomes, and health status.

Diseases Notifiable To WHO

1. Cholera
2. Plague
3. Yellow fever

Table 10-2

Categories of Indicators with few examples

Availability of Health Care:
Ratio between population in various administrative units and health facilities and health manpower available.

Accessibility of Health Care:
Percentage of population within 5 kms or one hour walk of nearest trained health care provider.

Acceptability and Quality of Health Care:
Proportion of immunizable communicable disease cases for which patient history reveals past immunization for disease contracted.

Social and Economic Indicators Related to Health

- Rate of population increase
- Adult literacy rate

Indicators of Provision of Primary Health Care

- Percentage of homes with children under 5 years or with pregnant women visited by community Health Worker in a specified period of time
- Percentage of pregnant women who receive ante-natal care at least once.

$$\frac{\text{Number of Ante - natal contacts}}{\text{Number of expected births}} \times 100$$

- Percentage of children aged 12 through 23 months who are fully immunized.

Health Status Indicators

Percentage of children under 5 who are malnourished (according to Gomez's classification. Grade I, II, III).

$$\frac{\text{Number of children < 5 who are in Grade I, II, III}}{\text{Total number of < 5 children}} \times 100$$

Infant Mortality Rate (IMR)

$$\frac{\text{Number of deaths of children less than one year during past year}}{\text{Number of live births in that year}} \times 1000$$

Maternal Mortality Rate (MMR)

Number of pregnant women/or women within 42 days post partum who die from any cause related to aggravated by pregnancy or its management (but not accident) during past year

$$\frac{\text{Number of pregnant women/or women within 42 days post partum who die from any cause related to aggravated by pregnancy or its management (but not accident) during past year}}{\text{Total number of live births during past year}} \times 1000$$

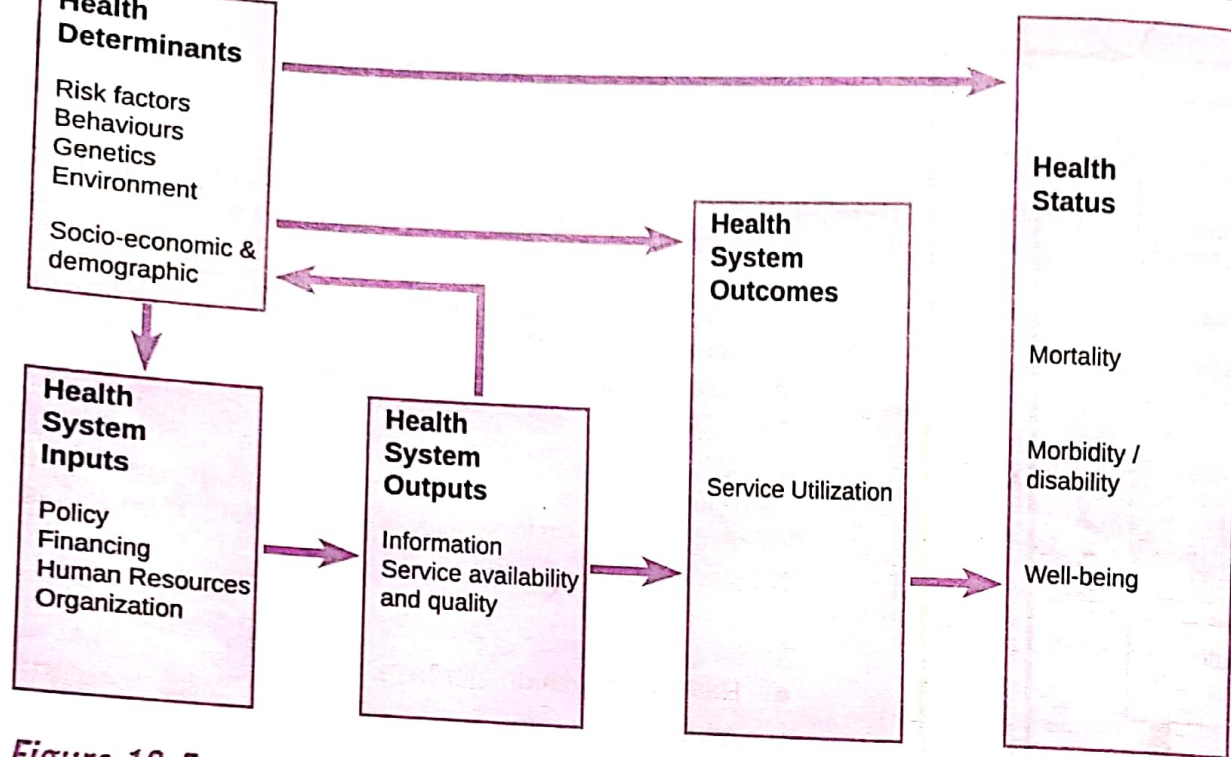


Figure 10-5
Health Information Domains

Diseases Subjected To International Surveillance

1. Louse borne typhus
2. Relapsing fever
3. Polio
4. Influenza
5. Malaria
6. Rabies
7. Salmonellosis

Sources Of Health Information

1. **Census:** a census is very important source of health information. It is carried out in most of the countries regularly after an interval of ten years. As defined by United Nations, "census is the total process of collecting, compiling, and publishing demographic, economic and social data pertaining at a specified time or times, to all persons in a country or delimited territory."
2. **Registration of Vital Statistics:** is very important as it the originator of health statistics. The United Nations defines a vital event registration system as including "legal registration, statistical recording and reporting of the occurrence of, and the collection, compilation, presentation, analysis and distribution of statistics pertaining to vital events, i.e. live births, deaths, fetal deaths, marriages, divorces, adaptations, legitimating, recognitions, annulments and legal separations.

3. **Notification of Diseases;** is historically important as it was the first health information system established ever. The primary function of notification is to effect prevention and/or control of the diseases.
4. **Hospital Records;** the eighth report of WHO Expert Committee on Statistics recommended that hospital statistics be regarded in all countries as an integral and basic part of the national statistical program.
5. **Diseases Registers;** the term registration implies something more than notification. A register required that a permanent record be established, that the cases be followed up, and that basic statistical tabulations be prepared both on frequency and on survival.
6. **Record Linkage;** is the process of bringing together records relating to one individual (or to one family), the record originating in different times or places. The term Medical Record Linkage implies the assembly and maintenance for each individual in a population, of a file of the more important records relating to his health.
7. **Epidemiological surveillance;** in many countries where particular diseases are endemic, special control/eradication programs have been instituted, as for example national diseases control program for malaria, tuberculosis, etc.
8. **Oral health services records;** a lot of information is also found in the records of hospital out patient departments, primary health centers, polyclinics, private practitioners, mother and child health centers, school health records, etc.

9. **Environmental health data;** health statistics are now sought to provide data on various aspects of air, water and noise pollution, harmful food additives, industrial toxicants, inadequate waste disposal and other aspects of the environment.
10. **Health personnel sources;** for example, number of physicians, dentists, pharmacists, veterinarians, hospital, nurses, etc.
11. **Population surveys;** the term Health Survey is used for surveys relating to any aspect of health, e.g. morbidity, mortality, nutritional status, etc.
12. **Non quantifiable information**
 - a) Information on health policies
 - b) Health legislations
 - c) Public attitudes
 - d) Program costs
 - e) Procedures
 - f) Technology

Linkage Between Information Sources

The HMIS relies on data collected from several sources (Figure 10-6): service delivery, finance, human resources, logistics, and capital assets. To provide as complete a picture as possible of the health sector, information from other governmental organizations and from the private for-profit and not-for-profit sectors should also be included. HMIS data

should also be harmonized with health-related and multi-sectoral data collected by other organizations, such as vital events registration, census, survey, etc. Providers of HMIS and other health-related information need to establish common data definitions and understanding on how to interpret the information.

Functions of Health Management Information System

HMIS, like drugs, skilled manpower, logistics, equipment, and so forth, is an essential ingredient of an effective and efficient health care system.

The HMIS is a tool which enables the program personnel, at various levels, to oversee the smooth running of the various components of PHC system, and to assess the program's effectiveness. In other words, the prime function of the information system is that of monitoring and evaluation. Without this process one is blind to the effectiveness and efficiency of the program.

Uses of Health Information

- To measure the health status and to quantify the health problems, medical and health care need
- For local, national and international comparisons of health status (for such comparisons, data need to be subjected and standardization and quality control)

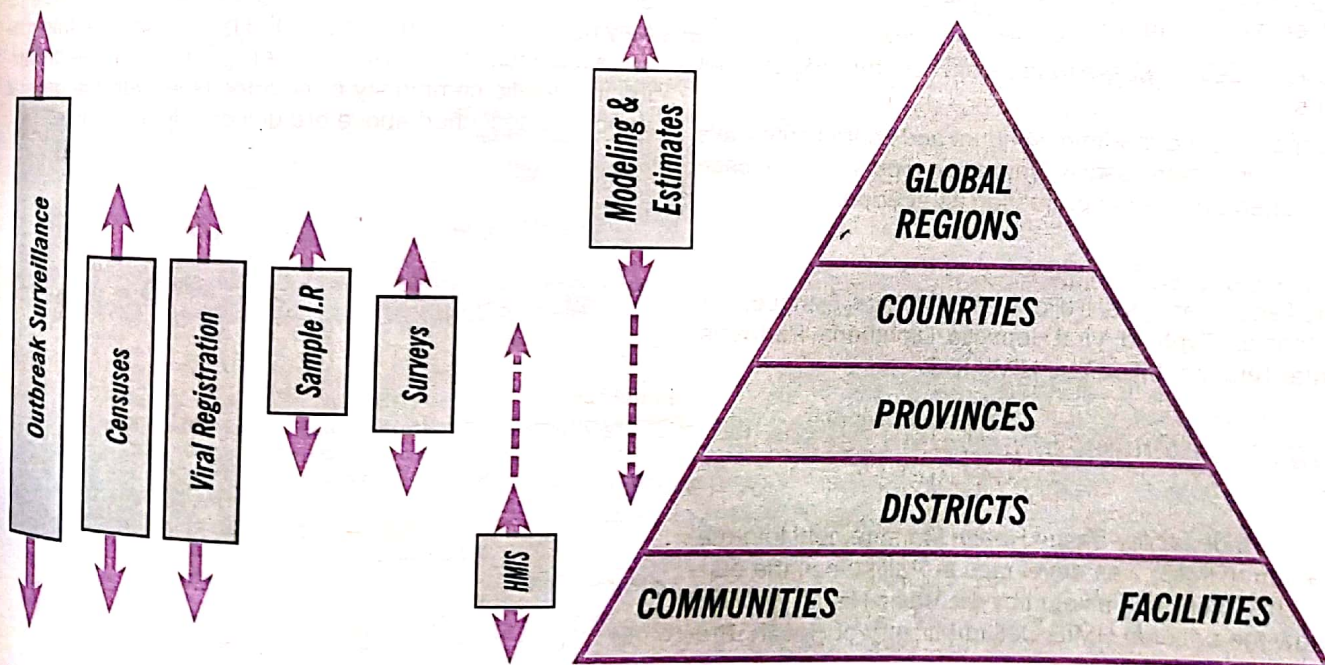


Figure 10-6
Relevant health information tools for different levels of the health system

- For planning, administration and effective management
- For assessing effectiveness and efficiency of the health services
- For assessing attitudes and degree of satisfaction of beneficiaries
- For research and training

Diseases Early Warning System (DEWS)

Communicable diseases remain the major public health concern and are the prime cause of morbidity and mortality throughout Pakistan. Pakistan is at high risk of epidemics because of over crowded cities, unsafe drinking water supply, inadequate sanitation, poor socio economic conditions, low health awareness and inadequate vaccination coverage. The risk of outbreaks due to infectious diseases increases many folds during disaster and resultant population movement which Pakistan has been experiencing recurrently during last few years.

Considering this scenario, the presence of a functional Diseases Early Warning System (DEWS) has been a priority within the health sector in Pakistan, to timely detect and predict potential outbreaks of these disasters for effective response. World Health Organization (WHO), in close collaboration with the Ministry of Health (MoH) Pakistan, designed and setup DEWS shortly after October 2005 earthquake with the following goals and objectives.

Goals and Objectives of DEWS

The goal of the DEWS is to reduce to morbidity and mortality by early detection and response to epidemic-prone diseases. The objectives are to:

- Report weekly disease trends from country-wide sentinel sites
- Respond to alerts within 24 hours and control outbreaks – including water quality, sanitation inputs; clinical case management; health promotion as needed.

Diseases selected for DEWS

Acute flaccid paralysis/ Poliomyelitis, Plague, Dengue, Malaria, Measles, Typhoid, Viral Hepatitis, Diphtheria, Pertussis, Neonatal Tetanus, Influenza, HIV/AIDS.

Health Management Information System In Pakistan

A countrywide facility-based Health Management Information System (HMIS) was developed in Pakistan in the early 1990s. This effort was initiated by the Basic Health Services Cell, now the national HMIS Cell of Ministry of Health. Provincial Health Departments also fully shared this participatory development process. International agencies like USAID, UNICEF and WHO extended both technical and financial support. This system has now been implemented in a phased

manner and more than 90% primary health care facilities report under this system.

Till June 2001, 117 districts (out of total of 120 districts) have sent their data to the National HMIS Cell. HMIS data flow directly from the peripheral health facilities to the District Computer Centers, then to the Provincial Computer Centers. Ultimately, the information reaches the National HMIS Cell on computer diskettes where it is analyzed through HMIS software and also through Statistical Package of Social Sciences (SPSS). The data is analyzed at the district level but seldom at the facility level. National consolidation, analysis and the feedback of this data is being delayed due to time and the distance involved between health facilities and the Provincial or the National HMIS Cell. District managers transmit information to the provincial level without establishing a feedback loop with the facilities.

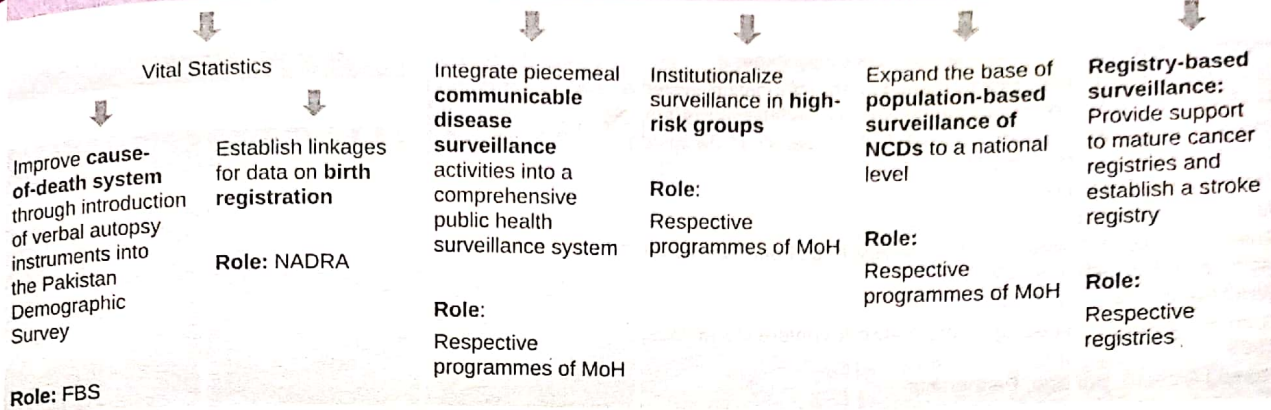
A parallel community based information system has also been developed in 1994, which is functioning under the National Program for Family Planning and Primary Health Care (NPF&PHC). In addition there are several other information systems specifically geared to the needs of vertical programs such as EPI, TB, AIDS, Malaria, etc., which are not fully integrated into HMIS. However, the software for NPF&PHC is based on the same parameters that of HMIS software. (Figure 10-7).

Conclusion

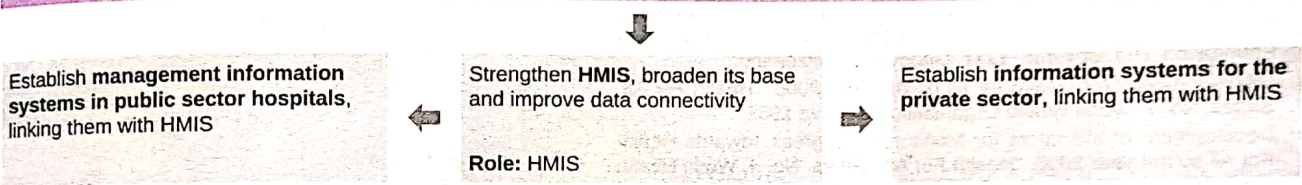
The field of HMIS is in the process of evolution and continually adopting and adapting to the trends suitable for given communities and countries. No single information system can be designed which could be adopted universally. Problems may be community specific or country specific. The Information system has to be tailored to serve circumstances prevailing in specific community or country. However, the general principles described above are universally applicable.

HEALTH INFORMATION IN PAKISTAN - BRIDGING GAPS

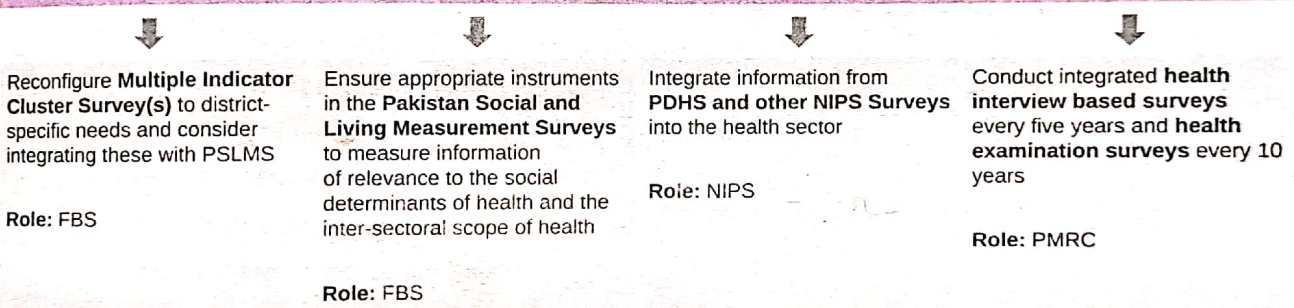
SURVEILLANCE



MANAGEMENT INFORMATION SYSTEMS



SURVEYS



RESEARCH

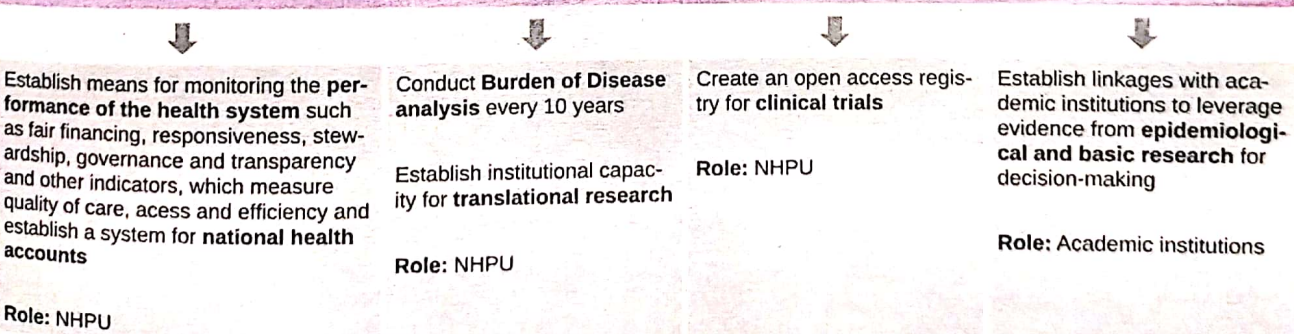


Figure 10-7

Health Information System in Pakistan