The RHINO Workshop on Issues and Innovation in Routine Health Information in Developing Countries

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Acknowledgements

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Executive Summary

Proceedings of the Workshop on Issues and Innovation in Routine Health Information in Developing Countries

Summary

In the past few years, the role of information in supporting the development and performance of heath systems in developing countries has come under intense scrutiny. In every country, health providers, managers, and planners regularly collect information about many aspects of health care delivery, management and financing and policy. These types of routine information systems and their role in health systems were the focus of a recent *Workshop on Issues and Innovation in Routine Health Information Systems in Developing Countries* held in Potomac, Maryland from March 14 to 16, 2001. Workshop sessions were organized around three themes:

- The rationale for investing in routine health information in developing countries
- The role of routine health information in facilitating and monitoring health sector reform
- Restructuring and strengthening routine health information systems

Presenters and participants included 83 professionals from 26 countries representing ministries of health, multilateral and bilateral aid organizations, and technical assistance groups based in academic, non-governmental, and consulting organizations.

This document begins with a synthesis of workshop papers, presentations, and working group products presented as **lessons of experience** and proposed **guidelines for investment** in routine health information in developing country settings. Following the synthesis are the complete proceedings of the workshop including: facilitators' opening remarks, overview and workshop papers, presentations, and working group reports. Readers are also referred to a companion document, *The Potomac Statement on Investment in Routine Health Information in Developing Countries*, which discusses the role of routine information in securing adequate health system performance and presents an Agenda for Investment in this field. Both the proceedings and statement are available on the website of the Routine Health Information Network (RHINO) located at: **http://www.cpc.unc.edu/measure/rhino/ rhino.html.**

Lessons of Experience and Guidelines for Investment in the Collection and Use of Routine Health Information in Developing Countries

This section presents the lessons of past investment derived from workshop papers, working groups reports, and discussions. Lessons were culled by working groups and later formatted into guidelines. These guidelines focus on investment norms and practical approaches for ensuring consistent and effective collection and use of routine information at all levels of the health system. Neither the lessons of experience nor the practical guidelines is intended to be comprehensive. Rather, they represent the experience and views of workshop participants based many years of research and field-based practice. It is hoped that they will be useful for guiding future investment.

The lessons and guidelines (or recommended practices) are grouped around three main axes. The first *is the development of sustainable routine health information systems*, involving design choices, resource allocation, human resource capacity building, and use of appropriate technology. The second is *the shaping of the culture of the organization or health system that intends to benefit from the information system*. This "culture of information" relates to the policy and management environment, particularly the incentives for information use within it, and the experience and attitudes of managers and planners with respect to the role information plays in securing adequate performance in the health sector. The third is related to *coordination* of the partners, resources and knowledge that are needed to ensure successful outcomes from investment in routine health information.

Section 1 Building or Restructuring Sustainable Routine Health Information Systems

While there is no ideal model for restructuring national or local methods for the collection and use of a routine health information, workshop presentations yielded a number of insights related to investment approaches and external conditions that contribute to success.

General Lessons

The restructuring of a routine health information systems works best when three conditions are met.

1. Routine health information collection and use should be integrated or linked to overall health system development. In this context, routine health information should support improvements in health system performance and may even serve as a catalyst for change or reform in the health sector.

2. The restructuring of approaches to routine health information collection and use benefits from a well-defined framework for national information needs and identification of data sources to meet those needs. In this context, routine health information methods should complement other data collection methods such as sentinel surveillance and surveys.

3. The restructuring of routine health information systems should involve all key stakeholders in the design process. Experience suggests that systems that are designed by a team of "information experts" without adequate involvement of key stakeholders usually fails to reflect the needs and practical reality of service providers and managers, and does not encourage ownership of the system.

General Guidelines

1. Reform or strengthening of a national routine health information systems should support and facilitate the achievement of three goals: improved health system performance; innovation in health services management, and sustainable improvement in the use of information for decision making in the health system.
2. Every country should have a health information policy that is compatible with national health policies.
3. A national routine health information system should have clearly defined objectives, data standards, routines, and procedures for data collection, analysis, reporting, and use.
4. The main objective of a routine health information system should be to meet the needs of regular data users, particularly those at service delivery levels;
5. Every national routine health information system should include incentives for promoting information use;
6. Countries must invest in improving the quality of routine health information to encourage investor confidence and the use of routine information in performance improvement;
7. Countries should define a national policy on building and sustaining human resource capacity for managing routine health information systems, and for guiding data use.

Reforming routine health information collection

Lessons

1. Many restructuring efforts have failed because future users of the system were not involved in the design process. Failure to work effectively with information collectors and users results in poorly defined information needs, overly complex data collection instruments, and a lack of ownership among information users. While time-consuming, broad-based consensus building during the design phase leads to greater sustainability of information systems.
2. Major overhauls of existing routine health information systems are rarely successful or sustainable. It is preferable to focus on improving information subsystems or prioritizing specific components of the information system components (defining information needs, improving data collection and data processing, strengthening use of information).
3. Many routine information systems focus on data collection at the expense of data analysis, interpretation, and use. A balance should be struck between defining the key technical components of the system (indicator definitions, forms, and information technology) and promoting information use.
4. Health information system restructuring tends to be more successful in countries with an existing "information culture."

Guidelines

1. Assessment and design of routine health information approaches should involve a broad range of stakeholders, including representatives of all management levels of the health system.
2. A multidisciplinary team should be formed to manage the restructuring process, including "data technicians" (statisticians, system analysts, health planners) and "data collectors and users" (program and line managers);
3. Planners should conduct an in-depth assessment of the existing routine health information system, focusing on technical content, institutional capacity, and stakeholder interests;
4. Restructuring of routine information systems should always focus on improving management of health care delivery (including planning, implementation, financing, monitoring and evaluation) not simply information generation.
5. Restructuring of routine information systems should follow and support ongoing efforts of health system reform;
6. Leadership is an important element of restructuring to direct the effort and forge the relationships among stakeholders.

Design of routine health information systems and approaches

Lessons

1. Many routine information systems collect excessive quantities of data that are not relevant to the health professionals responsible for data recording. Thus, data quality often suffers and data use at collection level is minimal. Stakeholder involvement is critical in defining a minimum data set that reflects the management needs of the service delivery units.
2. It is necessary to build quality control into all routine health information development strategies. Poor quality systems are not used or supported by local or external program managers.
3. Incentives for maintaining data quality and improving data use are critical elements in the design of routine information systems.

Guidelines

1. The design of routine information systems should facilitate the definition of a minimum set of indicators focused mainly on priority health problems and service delivery needs. This minimum set of indicators should be defined using a consensus building process to reduce overall data requirements and build ownership of the information system.
2. Planners should choose data sources (routine, non-routine) for a comprehensive information system based on costs and benefits. Data collected by care providers should at least support service delivery.
3. A fundamental element of data quality in a routine information system is the validity of population estimates drawn from vital registries, the census, and/or surveys. National information systems offices should establish and enforce minimum standards for defining and updating population estimates and regularly communicate them to data users at all levels of the health system.
4. Routine health information system design should enable improvements in data flow and ensure timely feedback to the periphery. However, it should also encourage data use by health workers and managers at the point of collection.

Routine information and the private sector

Lessons

1. Public sector routine information systems could benefit from links to private sector providers. Various NGOs and private providers collect population- and facility-based information, and support community-managed information systems. These information systems can supplement routine facility based service statistics in the public sector and give a more complete picture of health system performance.
2. The absence of well-established regulatory systems for the private sector in most developing countries hampers involvement of the private sector in public sector routine information systems.
3. Incentives for increasing private sector collection and use of routine information differ from those found in the public sector.

Guidelines

1. Governments are responsible for defining and facilitating useful links between the public and private sectors with respect to routine health information collection and use.
2. The public sector should aim to improve its overall capacity to manage data and integrate private sector data in the public sector routine information systems.

Routine health information and information technology

Lessons

1. In general, health sectors in developing countries have lagged behind in the development of technology and communication infrastructure and tools.
2. The experience of computerization of routine information in developing countries has been mixed. It is easy to overestimate the usefulness of information technology. Local capacity to use technology effectively at different levels should dictate the introduction of computers in routine information systems. Careful consideration of the costs and benefits of computerization is warranted.
3. It is often difficult to retain health information technology specialists in the public sector. The public sector cannot compete with the private sector in terms of salaries, and cannot provide incentives for maintaining technical competency among its staff.
4. Information technology devices are currently available in a wide variety of forms and functions, and at an array of prices. Many developing countries can afford computerization of routine information to a certain level. However, ministries of health and other health organizations often lack sufficient understanding of information technology to make appropriate investment decisions.
5. New information technology concepts such as data warehousing, data mining, data visualization, and interactive communications could become major tools to improve data transmission and presentation in information systems in developing countries. The cost effectiveness of using these technologies in developing country settings should be studied, since investment costs can be high.

Guidelines

1. Following a careful assessment of the institutional environment, governments should clearly define the parameters for use of information technology in routine information collection and use at each level of the health system.
2. It is essential to build local capacity to maintain and upgrade software and other aspects of information technology to ensure sustainability. All information technology interventions should include support for maintaining and upgrading system components.
3. Public domain software applications, supported by technical assistance (preferably local), may facilitate the sharing of effective applications among countries.
4. It is necessary to train health professionals in the use of information technology for data analysis and provide adequate incentives to ensure job satisfaction and retention of professionals working in the public sector.
5. Donor organizations are critical advocates for securing discounted prices for technology, promoting joint development of Information Technology, and expanding training in this area.

Sustaining routine health information systems

Lessons

1. Sustainability of routine health information reform depends on the participation of stakeholders in the design phase.
2. It is often necessary to demonstrate tangible results from improved routine health information collection and use to ensure sustained interest and investment in the restructuring process.
3. Introduction of incentives that tie data collection, quality control and use to the control of resources has been found to improve the effectiveness and sustainability of routine information systems.
4. Donor control over investment in routine health information has often resulted in vertically organized and unsustainable systems.
5. External technical assistance can be particularly effective in promoting sustainability when assessment, design, and capacity building activities are performed in close collaboration with national partners.

Guidelines

1. The best warranty for sustainability of a routine health information systems is to ensure that they are useful to various clients (health managers, providers, communities, and policy-makers).
2. Routine health information system development should provide tangible benefits to clients in the early stages of implementation in order to gain the confidence of health planners and managers.
3. Externally funded health interventions should provide a portion of recurrent and development costs of the national information systems. In turn, governments should provide timely information to its partners, using transparent approaches to quality control.

Structure and resources to support routine information

Guidelines

1. Where central health information units exist, countries should define their role clearly, and strengthen their ability to coordinate investment and practices.
2. Health information units at intermediate and district levels, and in major hospitals, can be useful for supporting the public sector information system, and ensuring adequate human resources for information management.
3. Job descriptions for medical staff and curricula for pre-service training should clearly state related data management responsibilities.
4. Countries should provide adequate investment and recurrent budgets for development and maintenance of routine information systems.

Section 2 Creating a Culture of Information

The basic argument for establishing an information culture is to maximize the benefits of strengthening the collection and analysis of routine data. Experience suggests that even well designed routine information systems fail to change information management practices where the culture within the health system does not support evidence-based decision-making. Nevertheless, establishing a “culture of information” is often the greatest obstacle to overcome in improving the use of routine health information. It requires behavioral change in individuals and organizations, and a long-term perspective.

Information culture relates to the policy and management environment and the incentives to use information for decision making, as well as to the experience and attitudes of managers and planners with respect to the role of information in improving health system performance.

Understanding decision making in the health sector

Lessons

There is a general lack of understanding of way that policy, planning, and management decisions are made in public sector health systems in developing countries. Few studies have addressed the decision making process in the health sector or the role of information in decision making. It is often assumed that decisions are made based on knowledge, while socio-cultural and political factors are obviously critical motivators.

Information culture and design of routine information systems

Lessons

1. Most existing data collection systems are overly complex and not geared towards the use of information for action.
2. Existing routine information methods often fail to address the commonalties and differences of local, national and global information needs. A large portion of the data collected at the local level is not relevant to local management needs, and is therefore not used effectively.
3. Key reasons for the low frequency of routine information use include poor data quality and lack of timeliness. Data quality can improve with training and the introduction of standardized instructions in data collection methods. More importantly, however, is the need to consult local managers and providers in the choice of data collected.
4. Community level information needs and data are often neglected in the design of routine information approaches. Mechanisms to assist health managers and communities to identify community level information needs are lacking.

Guidelines

1. The definition of essential information needs should reflect a well-conceived health services structure and clear management functions at each level of the health system.
2. Each data element must be reviewed for practical use in decision making.
3. The majority of data collected at the periphery should contribute to essential management and planning decisions at that level.

Information culture and information use

Lessons

1. Supportive supervision can be effective in improving and sustaining information use.
2. Information use is linked with decision making power. The greater the authority to take action the more likely that data will be analyzed and used.
3. Computers have shown their potential to contribute to improved use of information through rapid processing, improved data presentation, and improved communication and dissemination of information

Information culture and capacity building

Guidelines

1. Basic training of health professionals should develop their skills in basic data analysis (statistics, epidemiology, etc.).
2. Curricula for training health professionals to manage routine information should include practical or competency-based methods, and reinforce skills in information interpretation and use.
3. Countries should involve local governments and communities in routine health information use through improving their understanding of the benefits of health information.

Information culture and communication of information

Lessons

Designers should develop information presentation formats that are appropriate to specific audiences or decision-makers (e.g. community health workers versus policy makers).

Guidelines

1. Mechanisms for presenting information should allow for comparative analysis over time with respect to geographic areas and performance elements.
2. Self-assessment and peer review are key methods for promoting information use.
3. Countries should establish mechanisms for sharing, exchange and review of information between health and related sectors

Information culture and the policy and management environment

Guidelines

1. Decentralized planning and management environments are effective in promoting greater appreciation and use of information for improving service performance.
2. Senior policy makers and managers should nurture a non-punitive environment of information analysis and discussion, and encourage regular data analysis and use in decision-making.
3. Health managers should establish mechanisms to motivate staff to use data to improve service performance through supportive feedback, supervision, meetings, and regular performance review workshops.
4. Explicit communication channels must be set up between information producers (statisticians and demographers) and users (policy makers, planners, managers, care providers, and communities) to promote the practice of regular information use, and guide improvements in the routine information systems.

Section 3 Coordination of Investment in Routine Health Information Development

Lessons

Coordination of investment in the collection and use of health information has three major objectives:

1. to channel effectively the resources invested in routine information development and sustainability;
2. to increase access to information on best practices and innovation in the collection and use of routine information; and
3. to promote further analysis of technical and organizational experience in collection and use of routine information, and explore the effect of improved capacity in this area on performance in the health system

At country level:

the establishment of a broad-based health information coordination committee (including Ministry of Health, care providers, funding agencies) is an important element of overall national information coordination.

At international level:

1. there are few, if any, existing mechanisms to coordinate investment (financial or technical) efforts in routine health information system development. Existing networks focus on information sharing (HELENA) or a subsystem of routine information collection (EPIET);
2. there is limited evidence or collective analysis of the lessons from past investment in routine information in developing countries. Few lessons have been formally and systematically shared at national or international levels;
3. coordination networks in other fields have succeeded because they have been well- financed and have secured commitment from key individual and institutional (national and international) stakeholders. Experience suggests that focused leadership, feasible objectives, and a clearly defined mandate are key elements of success.

Guidelines

At national level:

Every country should establish a national information coordination committee to address the planning, regulation, implementation, and monitoring and evaluation of the routine health information system, including essential areas such as indicator choice, technical assistance needs and the introduction of information technology. The committee should include representatives of national health institutions and external assistance organizations.

At international level:

1. Health information professionals and organizations interested the development of routine health information should establish an international group or network to coordinate investment, knowledge development, and dissemination related to routine health information. This group or network should be adequately financed and its members (institutions/individuals) should be committed to its success. The mandate/role of this network should be feasible and well defined, as should its leadership structure.
2. International donors should avoid imposing special data requirements on countries.
3. Donors should provide financial and technical assistance to improve existing approaches to the collection and use of routine information rather than creating parallel or duplicate information systems. This support should come through direct intervention in system or method development, or as part of a contribution to other health service improvement interventions.
4. Technical assistance (TA) should be of the highest quality and tailored to the needs and capacity of specific countries (i.e., human resource capacity, training needs, and capacity for technology use). Collaboration with national information professionals at all steps of the technical assistance process is essential for promoting sustainability.
5. External assistance organizations should regularly share experience of working on routine information in the same country and internationally.

Introduction

In the past few years, the role of information in supporting the development and performance of heath systems in developing countries has come under intense scrutiny. In every country, health providers, managers, and planners regularly collect information about many aspects of health care delivery, management and financing and policy. These types of routine information systems and their role in health systems were the focus of a recent *Workshop on Issues and Innovation in Routine Health Information Systems in Developing Countries* held in Potomac, Maryland from March 14 to 16, 2001. This document reports the proceedings and outcomes of the workshop.

The aims of the workshop were:

- Reach a common understanding on a rationale for increasing investment in routine health information system development;
- Identify future areas for investment in routine health information systems that reflect the demands of health sector reform in developing countries;
- Document common barriers to establishing and sustaining effective routine health information systems, and strategies to minimize their effects;
- Disseminate state-of-the-art practices in routine health information system design, management and data use;
- Define an Agenda for Action and Research that includes guidelines for sound investment and specific activities to be pursued by members of the Routine Health Information Network (RHINO)

Participants included 83 professionals from 26 countries representing ministries of health (21%), multilateral and bilateral aid organizations (34%), and technical assistance groups based in academic, non-governmental, and consulting organizations (45%).

The Potomac workshop represented one of few opportunities for health information professionals and information users to exchange views on the technical, social and political role of routine health information in developing countries. During the workshop participants were asked to present lessons of experience in the development and management of routine information in developing countries. They were also requested to recommend investment norms and practical approaches for ensuring consistent and effective investment in this field. These lessons and guidelines are presented in the executive summary above.

Structure of the document

Workshop papers are presented according to three themes:

- The rationale for investing in routine health information in developing countries
- The role of routine health information in facilitating and monitoring health sector reform
- Restructuring and strengthening existing routine health information systems

Each theme includes, where available, facilitators' remarks, an overview paper, and a series of related papers. Where complete papers were not available, we have included presentation slides. The annexes contain information on working group reports and contact information for all presenters and facilitators.

In this document, "routine health information" is defined as information that is derived *at regular intervals of a year or less* through mechanisms designed to meet predictable information needs. Examples of routine health information systems include systems for collecting and using:

- health services statistics for routine service reporting and special program reporting (malaria, TB, and HIV/AIDS);
- administrative data (revenue and costs, drugs, personnel, training, research, and documentation);
- epidemiological and surveillance data;
- data on community-based health actions; and
- vital events data (births, deaths and migrations).

Readers are also referred to a companion document, *The Potomac Statement on Investment in Routine Health Information in Developing Countries*, which discusses the role of routine information in securing adequate health system performance, and presents an Agenda for Investment in this field. Both the proceedings and statement are available on the website of the Routine Health Information Network (RHINO) located at: http://www.cpc.unc.edu/measure/rhino/ rhino.html.

Routine Health Information Systems: The Glue of a Unified Health System

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Abstract

Individual health interventions and public health interventions are complementary and interdependent in improving the health status of individuals and populations. While this principle is well documented and widely disseminated, fragmentation of the health system is a common phenomenon worldwide, and is even worsening due to the growing competition for decreasing health resources.

Routine health information systems have the potential to play a major role in facilitating integration between individual health and public health interventions. Since both individual health care services and public health functions are being carried out within the health services system, the routine health unit-based health information system is the main information source for both type of interventions. While performing their daily health care activities, care providers within the health unit record data for patient/client and health unit management. Routine health unit-based data can also be aggregated to generate information on services provided to the population, for disease surveillance, and for other public health functions.

Yet most experts agree that routine health information systems in most countries, industrialized as well as third world countries, are woefully inadequate to provide the necessary information support to individual care and public health activities. In fact, poor use of information for evidence-based decision making is probably one of the main causes of the current lack of linkages between individual care and public health systems. At least four reasons are reported consistently in the literature:

1. Data on individual health care activities are irrelevant and of poor quality.
2. Information on health care interventions is not linked to a reference population.
3. Information system management is often heavily centralized.
4. Health information system infrastructure is inadequate in most developing countries.

The transformation of existing routine health information systems into effective and efficient management tools, facilitating integration of individual care and public health functions into a unified health services system, will require a multipronged approach and the involvement of all main stakeholders. Recent experiences have shown that *decentralization of information management toward the district level* is an effective strategy to improve the use of routine information. The district level is also the most appropriate level to link routine and nonroutine data collection methods.

A second strategy is *to carefully manage the routine health information system restructuring process.* The guiding principles for effective health information system restructuring are:

1. to adapt information needs to well-defined management functions at all levels of the health system;
2. to improve data collection procedures, data transmission, data analysis, and data presentation to generate quality and timely information;
3. to provide sufficient and appropriate physical and human resources for HIS management; and
4. to create an “information culture” geared toward use of information for decision making, by using a participatory and consensus-building process.

Finally, for the long term, we propose involving communities directly in health services planning and information system management. Communities can provide most of the information for management of essential public health functions. Examples include reporting births and deaths; notification of cases of infectious diseases and outbreaks; identification of high-risk children, pregnant women, and families; coverage and defaulters of critical services; coverage of households with safe water supply and sanitation; and monitoring air, water, land, and noise pollution.

Although these are clearly ambitious and long-term efforts, district-managed, and at least partially community-managed HIS could provide the glue to bind together individual and community health interventions. Further research and experience is required to expand and scale up existing projects. First, a comprehensive review study should be set up to gather existing scientific evidence that decentralized routine HISs contribute to more effective and efficient integration of individual and community health interventions.

Some other important questions need to be answered to establish information systems responsive to the health needs of individuals and populations:

- How can service providers and, particularly communities, as key information users, be more actively involved in HIS development efforts?
- What is the ideal process and level for development of interdisciplinary social information systems, through which interaction among health, education, and economic development can be identified in an action-oriented manner?
- Given the benefits of a population-based community health information system, how can it be linked effectively to a routine health unit-based HIS?
- What structural interventions could better link routine service statistics with nonroutine data collection systems (surveys, vital events registration, rapid assessments methods, etc.)?
- What is the relationship between the format in which information is displayed (maps, action oriented graphs, etc.) and its use in management?
- How can training in information use effectively improve the actual use of information for health services planning and management?
- What is an efficient strategy for designing and testing computer support for integrated management of individual health and public health?

Introduction

One of the main objectives of this unique and important workshop on routine health information systems in developing countries is to reach a common understanding among decision makers and health professionals on the rationale for increasing investment in routine health information system development. While routine health unit-generated information is obviously essential for evidence-based decision making related to both individual health care interventions and public health interventions, routine health information systems potentially have a broader mission: to glue them together into a unified health system.

The ultimate goal of the health system is to improve the health status of individuals in a population. Health status is determined by at least four main factors: (1) biological assets, (2) personal lifestyle, (3) the environment, and (4) the health care system. Obviously, interrelations exist among these groups of factors. Biological and environmental factors can influence personal behavior. The potential impact of interventions within each of these groups can be debated, but several authors have stressed that the contribution of the individual health care system alone is marginal, compared to the potential impact of interventions on personal lifestyle and the environment[1]. While public health interventions to affect the first three groups of factors mainly prevent ill health, individual health care interventions are often the last stage in a chain of events leading to disease and, therefore, mainly restorative in nature. Clearly, individual and public health interventions are complementary and interdependent.

While these principles are well documented and widely disseminated, fragmentation of the health system is a common phenomenon worldwide, and is worsening due to the growing competition for decreasing health resources. As Boelen states: "Significant divisions exist and sometimes widen between individual health and community health services, between economic and social aspects of health, biomedical and psychosocial models, curative and preventive care, services provided by generalists and by specialists, public and private sectors, health services providers and consumers."[2] Recently, a group of health professionals and advocates, coordinated by the World Health Organization, developed a project called "Towards Unity for Health" (TUFH) to study and promote efforts to integrate individual health and public health interventions. Five principal partners or stakeholders ("the pentagon") have been identified that are essential in creating this movement toward unity for health: (1) policymakers, (2) health managers, (3) health professionals, (4) academic institutions, and (5) communities. For health services to facilitate the integration between medicine and public health, three essential features should be present: a focus on a reference population and a defined geographical area in the context of a decentralized health system; an attempt to develop organizational models for supporting coordination and integration processes; and use of a comprehensive health information system.[3]

The thesis of my presentation is that routine health information systems, in particular, can play a major role in facilitating integration between individual and public health interventions. First, I clarify the conceptual linkage between routine health information systems and the health system. Following this conceptual model, various problems and constraints in existing routine health information systems are presented that could explain why information is often not used for evidence-based decision making, in both individual care and public health information systems. Finally, mechanisms are proposed to improve routine health information systems as a means to ensure better integration between individual health and public health.

The relationship between routine health information systems and the health system at large

A health information system (HIS) cannot exist by itself, but is a functional entity within the framework of a comprehensive health system to improve the health of individuals and the population. As such it is a *management information system*. Although many definitions of a management information system have been proposed, we propose the one by Hurtubise: "a system that provides specific information support to the decision-making process at each level of an organization".[4]

The HIS structure should permit generation of the necessary information for rational decision making at each level of the health system, from local all the way up to national. Each of these levels has specific functions that require specific decisions to be made, to ultimately improve the health status of the population. From a management perspective, functions can be grouped into three types of *management functions* related to (1) individual care management, (2) health unit management, and (3) health system management (see figure 1).

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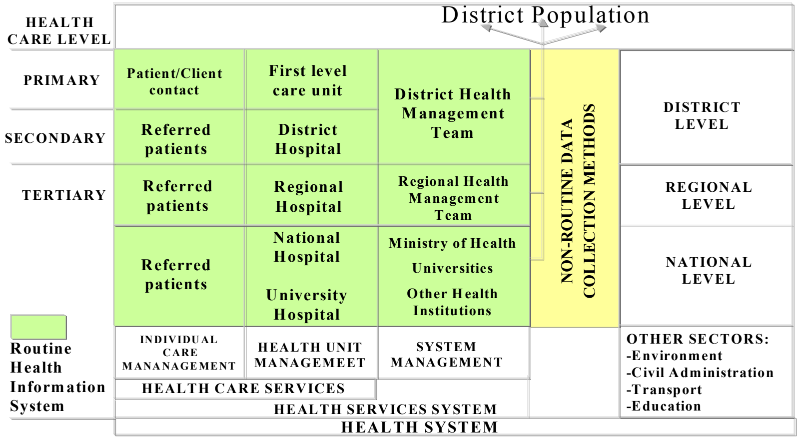
[1] Pineault R and Daveluy C *La Planification de la Santé; Concepts, Méthodes et Stratégies*. Agence d'ARC Inc. Montréal: Canada, 1986.

[2] Boelen C *Towards Unity for Health: Challenges and Opportunities for Partnership in Health Development*. Geneva: World Health Organization, 2000.

[3] Ibid.

[4] Hurtubise R *Managing Information Systems: Concepts and Tools*. West Hartford, CT: Kumarian Press, 1984.

Figure 1
Relationship between the Routine Health
Information System and the Health System



Individual care management functions are directly related to the delivery of quality care to individuals consulting with the health services system. Services to individuals can be curative, preventive, or health promotional in nature, at the first level and at the referral level.

The general management objective of a health unit is to provide health care to a defined population in the catchment area surrounding the health unit with a given amount of resources. Health units can be classified according to the level of concentration of resources: first-level care units and referral-level care units. Management functions are specific for each type of health unit. They can be subdivided further into service delivery functions and administrative functions. First-level care units provide a package of general health care services. Based on the strategy of primary health care, a minimum package of essential health care, including curative, preventive, and promotional activities, should be provided to as large a segment of the population as possible.

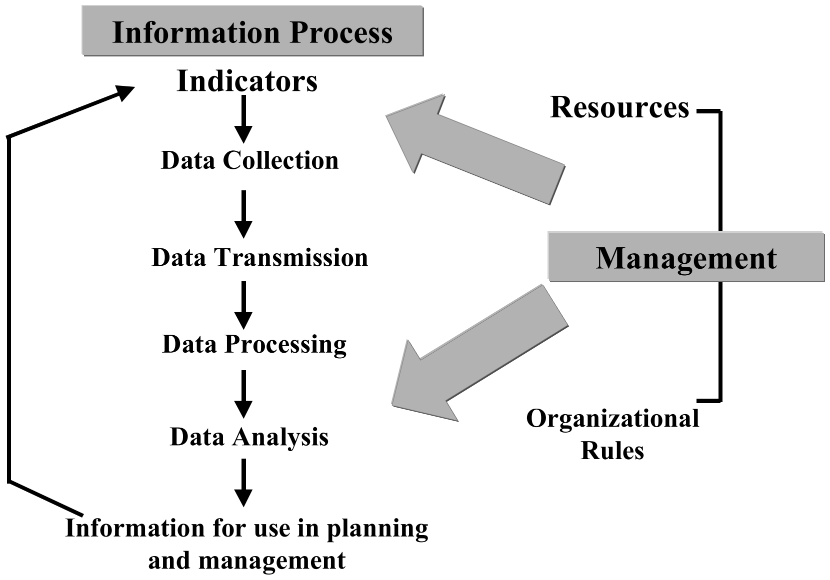
In addition to coordination and management support for delivery of health care delivery services, health system management functions include a set of public health functions for a particular reference population, such as protection of the environment; prevention and control of disease; health promotion and education; health legislation and regulation; and specific public health services, such as school health, occupational health, veterinary health services, and public health laboratories.

To be relevant, a health information system must fit into the organization of the health system for which it generates information. Based on clearly defined management functions, identifying the information needed to make appropriate decisions at each management level is relatively easy. The next question is how to obtain this information in the most effective, efficient way.

To answer this question, it is important to understand the health information system structure. HIS, like every system, has an organized set of interrelating components that can be grouped under two entities: *information process*, and *HIS management structure* (see figure 2**).** Through the *information process,* raw data (inputs) are transformed into information in a "usable" form for management decision making (outputs). The information process can be broken down in the following components: (1) data collection, (2) data transmission, (3) data processing, (4) data analysis, and (5) presentation of information for use in patient care and health services management decisions.

Figure 2

Components of a Health Information System



To make the information process efficient, a *HIS management structure* is required to ensure that resources are used in such a way that high-quality information is produced in a timely fashion. This structure can be broken down further into two components: (1) HIS resources and (2) a set of organizational rules. HIS resources include persons (e.g., planners, managers, statisticians, epidemiologists, and data collectors); hardware (e.g., registers, communication technology, and computers); software (e.g., carbon paper, report forms, data processing programs); and financial resources. Organizational rules (e.g., the use of diagnostic and treatment standards, definition of staff responsibilities, supply management procedures, and computer maintenance procedures) ensure efficient use of health information system resources.

Monitoring and evaluation of the process ensures that the right mixture of inputs produces the right type of outputs in a timely fashion. For example, the information needed changes continuously with changing planning and management needs. This, in turn, affects the data collection and other components of the information process. A health information system can generate adequate and relevant information only insofar as each of the components of the information process has been adequately structured.

Data collection is the first step of the information process, so health information systems are often classified according to data collection method. We have found it useful to classify these methods into two groups: *routine and nonroutine data collection methods*. Routine health unit-managed data collection is the classic form of routine data collection. Data are collected based on patient/client encounters in the health facility or through outreach. Routine data collection, as we mention later, can also be managed directly by the community. Vital events registration is another form of routine data collection. Nonroutine methods of health data collection include surveys, quantitative and qualitative rapid assessment methods, and other special studies.

No single data source can provide all of the information required for planning and management of health services. A national health information system in support of health services always uses a combination of data collection methods, depending on the nature and the use of the information for which data need to be collected. Routine health unit data collection is particularly geared toward provision of health care to individuals and, therefore, provides information on the health of those individuals who use the regular health services. This can be a problem in countries where access to or use of health services is low. For a more comprehensive understanding of health problems in low-access communities, other methods of data collection are needed, such as population-based sample surveys or, as we discuss below, health unit data collection needs to be expanded to include community data. Mortality data can be obtained from hospitals and civil registration systems, but often must be generated through other methods, such as prospective studies of communities or retrospective demographic surveys.

Available routine or survey-based data sets are often not sufficient to understand underlying causes of problems, particularly at the district and local levels. Informal investigations[5] and "soft" information obtained through meetings with individuals and groups[6] can be important sources of information to answer such questions. Also, information from other sectors such as education, agriculture, and economics can contribute in major ways to improved decision making, particularly for health policy formulation and planning of primary health care-based health services.[7] In this presentation we focus more particularly on use of routine versus nonroutine data collection methods, and how this influences the relevance, effectiveness, and efficiency of the current health information systems.

What is wrong with existing routine health information systems?

Since both individual health care services and public health functions are being carried out within the health services system, it seems obvious that the main information source for integration of both types of intervention should be the routine health unit-based health information system. This is the most obvious mechanism of collecting data for patient/client and health unit management. Care providers within the health unit record data while performing their daily health care activities. Routine health unit-based data can also be aggregated to generate information on services provided to the population, for disease surveillance, and for other public health functions.

Yet most experts agree that routine health information systems in most countries, industrialized as well as third world countries, are woefully inadequate to provide this integrated management support between individual care and public health activities. In fact, poor use of information for evidence-based decision making is probably one of the main causes of the current lack of linkages between individual care and public health systems. According to Neame and Boelen: "The health care environment is bursting with information, but the sector lacks the capacity to find, communicate or use it effectively."[8]. Or as Chambers notes rather sarcastically: "[Most data] remains unprocessed, or, if processed, unanalyzed, or, if analyzed, not read, or, if read, not used or acted upon."[9] Literature review provides us with several explanations, which I have tentatively grouped under four headings:

Irrelevancy and poor quality of the data on individual health care activities

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[5] Rodriguez RJ and Israel K *Conceptual Framework and Guidelines for the Establishment of District-Based Information Systems*. Barbados: Pan American Health Organization, Office of the Caribbean Program, 1995.

[6] Green A *An Introduction to Health Planning in Developing Countries*. Oxford, UK: Oxford University Press, 1992.

[7] de Kadt E Making health policy management intersectorial: Issues of information analysis and use in developing countries. *Social Science and Medicine 29*, 1989.

[8] Neame R and Boelen C *Information Management for Improving Relevance and Efficiency in the Health Sector: A Framework for the Development of Health Information Systems*. Geneva: World Health Organization, 1993.

[9] Chambers, R *Rural Development: Putting the Last First.* New York: Longman, 1994.

According to a WHO Expert Committee, "many of the data recorded and reported by the health service staff are not needed for the tasks the staff perform."[10] Data collection tends to focus on disease reporting and only partially addresses management objectives at the health unit or individual care level. Yet data that are needed frequently are not collected. For example, indicators to monitor continuity of care to patients or clients are rarely included in HIS. The common characteristic of these two observations is a lack of a consensus between producers and users of data at each level of the health care system regarding the information needed.

Data quality is low for several reasons. Care providers receive little if any training in data collection methods, and they rarely are given standardized instructions on how to collect the data. They are poorly motivated to produce quality data, because most data collected are irrelevant to their own information needs. They rarely receive feedback on the data reported to higher levels, so they have little incentive to ensure quality of the collected data and comply with reporting requirements.

The main problem obviously is low use of the data, specifically by health care providers. If the main function of individual health care is provision of comprehensive, integrated, and continuous care, providers do not use easily available information to make their daily treatment decisions. A child is treated for chronic diarrhea, without taking into account his malnutrition problem as evidenced by a low weight-for-height measure. Tuberculosis patients abandon treatment, although a simple message or home visit could have brought them back into treatment. Specialists ask for a full set of laboratory tests and provide expensive treatments without knowing what kind of assessment and treatment was provided at the first level.

Individual health care is not linked to a reference population

One of the main criticisms of routine health unit-based information systems has been that the aggregated information is not representative of the population at large. This is certainly the case in countries with low utilization rates of the health services, or, in general, for those segments of the population known to underuse health services: periurban slum areas, geographically isolated populations, and marginal high-risk groups in the community. This problem is not necessarily inherent to health unit-based systems; it lies more in the organization of the system and in the motivation of its users.

Most health care providers do not know their catchment area population, either in numeric terms, or in terms of its members' health status, sociocultural norms, and environmental threats. This is especially the case for hospital-based staff. Health care institutions generally are not aware of those who do not visit the facility and certainly do not try to reach them. Also, at higher levels of the health system, aggregated service utilization data are rarely linked to a population denominator, or, if they are, they are not used to identify underserved populations in the community and focus public health interventions on those most in need.

Centralization of information management

Routine health information systems in most countries are centrally planned and managed. Indicators, data collection instruments, and reporting forms usually have been designed by centrally located epidemiologists, statisticians, and administrators (called *data people*), with minimal involvement of lower-level line managers and providers of the health services (called *action people*). The cultural differences between the two groups are often so huge that Dunn speaks of the "two communities metaphor."[11]

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[10] World Health Organization *Information Support for New Public Health Action at the District Level.* Report of a WHO Expert Committee. WHO Technical Report Series No. 845,1–31. Geneva: World Health Organization, 1994.

[11] Dunn WN The Two-communities Metaphor and Models of Knowledge Use: an Exploratory Case Study. *Knowledge 1*, 1980.

Data processing and analysis are mainly the responsibility of a centrally located office. Complex data transmission and compiling systems slow down the production of feedback in such a way that, by the time a feedback report is received at lower levels, the information is frequently obsolete for decision making. Planners and managers face deadlines and time constraints in their daily decision making. Outdated information, even of high quality, is of low value to them.

The main result of this centralization is that information use is weakest at the district level, where the main public health interventions are planned, implemented, and monitored, and at the health unit level, where individual health decisions are made.

Poor and inadequately used health information system infrastructure
Finally, as was pointed out before, no HIS can function effectively without adequate human, physical, and financial resources. Yet most developing countries have an environment in which the most essential resources are lacking. Health units are staffed by poorly trained clinical staff, have no water or electricity supply, and lack the most essential HIS supplies such as printed forms or registers. Many countries have introduced computer equipment at the district level, but have no qualified staff to maintain software and hardware. Basic supplies such as printer cartridges and paper are often out of stock. Often the most essential communication technology is lacking, such as a telephone line between the health unit and the district headquarters.

This resource problem is not as acute in developed countries; although all the information and communications technology is readily available, it is used poorly by decision makers at all levels of the health services system. Provision of computer equipment is determined more often by vendors than by health services managers, resulting in an enormous waste of resources that could have been used for the health care activities the HIS was intended to support.

These shortcomings in routine health unit-based health information systems result in a real block between individual care and public health information systems. Irrelevant and poor-quality routine data limit use of the data by health unit managers and planning and management staff at the district level who rely primarily on gut feelings to formulate ad hoc decisions. At higher levels, many government agencies and donors tend to organize costly general and special-purpose surveys to capture data that should be part of routine reporting. Survey results are not linked to the individual health information system. In addition, lack of information exchange between first-level care staff and the community creates a major communication problem between health services and the community. It completes the total isolation of the individual health care system from any form of community health intervention.

A second result of deficient and centralized information management has been fragmentation of the health information system. National programs in many countries have created separate *program information systems* that tended to focus on one specific disease (e.g., diarrheal diseases), a specialized service (e.g., family planning information systems), or a management subsystem (e.g., drug management information system) instead of addressing management functions in a comprehensive way. These program information systems have existed side by side with the general routine health information system that is considered to be insufficient and incapable of delivering the data needed for program management. While these separate systems could provide real information support for programmatic decisions, and the quality of information they generate tends to be better than that of the general information system[12], the net result has been that routine health information systems became even more chaotic and bothersome, due to redundant data collection, multiple report forms, and data transmission problems. Most of all, these systems, by their disease-oriented approach, have endangered further the holistic perspective of individual and community health care.

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[12] World Health Organization, 1994.

Proposed actions to improve information management within a health services system, integrating individual and community health interventions

It is obvious from this situational analysis that the transformation of existing routine health information systems into effective and efficient management tools to facilitate integration of individual care and public health functions into a unified health services system will require a multipronged approach and the involvement of all major stakeholders. Fortunately, many national policymakers in developed and developing countries have decided to attack the information problem at the roots and have planned for a more integrated approach to improving health information systems. Bolivia, Cameroon, Eritrea, Morocco, New Zealand, Niger, Pakistan, Philippines, and South Africa are examples where comprehensive HIS restructuring efforts have taken place recently or are still underway.

One of the more consistent findings of these experiences is that *decentralization of information management toward the district level is an effective strategy to improve routine information systems*. According to the now classical WHO definition,

> a district health system based on primary health care is a more or less self-contained segment of the national health system. It comprises first and foremost a well-defined population living within a clearly delineated administrative and geographical area. It includes all the relevant health care activities in the area, whether governmental or otherwise. It therefore consists of a large variety of interrelated elements that contribute to health in homes, schools, workplaces, communities, the health sector and related social and economic sectors. It includes self-care and all health care personnel and facilities, up to and including the hospital at the first referral level..."[13]

Also, in this decentralized health system, most public health functions can be carried out by the health district management team, in collaboration with and with the active involvement of the community. Therefore, delegation of information system management responsibilities to the district level is a major step toward integrating individual and community health information systems.

The district level seems to be the most appropriate level to link routine and nonroutine information systems.

Even the best-functioning routine system cannot provide all the information necessary for individual and community health, but it can become the starting point for additional data collection, using surveys or other nonroutine methods. Nonroutine methods can help managers to address questions that the routine system cannot answer; mortality levels, health beliefs, and client satisfaction are some examples. These questions do not all need to be answered through expensive national surveys. In the last two decades, more and more managers have started using "rapid assessment procedures" (RAP). These rapid assessment procedures comprise a variety of methods used primarily in social research, such as formal and informal interviews, focus group discussions, and document analysis. In addition to being less costly, these methods are particularly suitable at the district level because they use simple methodologies, have a short timeframe between data collection and presentation of results, and are action-oriented. They permit involvement of the clients in analysis of the data, so they are well suited for community health information.

Within the limited time of this presentation, I can put forward only general principles on how to implement health information system restructuring toward decentralized health services management. These principles are based on the three premises of an effective management information system: (1)

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[13] Tamiro E *Towards a Health District: Organizing and Managing District Health Systems Based on Primary Health Care*. Geneva: World Health Organization, 1991.

information needs are based on the management functions at each level of the health services; (2) each of the components of the information-generating process has been adequately structured; and (3) sufficient HIS resources are available and are used in such a way that high-quality information is produced in a timely fashion. I will add a fourth principle that is inherent to the reform process: HIS reform, a complex organizational intervention, requires a carefully managed change process resulting in the creation of a *new information culture.*

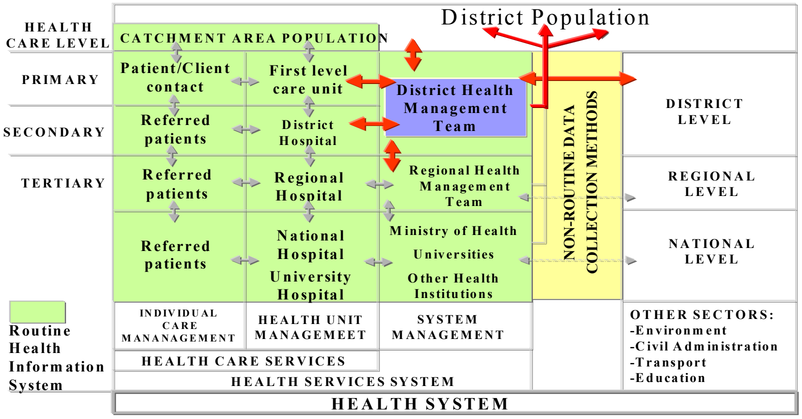
Defining information needs and indicators

If the final outcome of HIS restructuring is to ensure better information support to the health services system, then the first requirement for any HIS designer is to have a clear understanding of how a health services system is structured and which management functions are involved. According to the proposed framework, management functions of the health services can be categorized into three groups: individual care, health unit, and system management. Management functions vary further, according to the health system level: from periphery to center. They address curative, preventive, promotional, personal care, and public health services. Based on a conceptually sound health system model, information support can be translated more easily into relevant and appropriate indicators.

The main focus of redefining information needs and indicators should be on individual care and health unit management at the first level of the health services system. First-level care by definition is holistic and should take into account the sociocultural context of an individual visiting the health unit. A first-level care unit can be made responsible for a well-defined geographical or functional catchment area population, so it is the ideal locus for integration between individual and public health activities (see figure 3). Once a denominator is defined (the catchment area population), the quantity of health services offered by the health care unit can be transformed more meaningfully into coverage rates, measuring services provided (or not provided) to the catchment area population. As a simple example, a first-level care unit responsible for a population of 6,000, with an estimated birthrate of 25 per thousand, has as an objective to vaccinate the approximately 150 expected births every year. If, at the end of a given year, immunization services were provided to 100 children, the coverage rate for vaccination services is calculated to be 67 percent. It also shows that about one-third of all children did not receive immunization. Such denominator-based analysis, therefore, permits combining individual health and public health action.

Figure 3

District Managed
Routine Health Information Systems



The information-generating process

Once information needs have been defined according to management objectives, a well-structured information-generating process can help in using the data for decision making at various levels in the health services system and the community.

Data collection

One should never forget that the main data collectors in a routine health unit-based system are the care providers themselves. Data collection instruments, therefore, should be adapted and restricted to the daily decisions the providers have to make to provide quality care to their patients and clients. Since poor-quality data are not useful, all efforts should be made to improve the quality of data at the data collection level. Golden rules include keeping data collection instruments as simple as possible; involving users in the design; standardizing definitions and procedures and including them in a user's manual; developing an appropriate incentive structure; and—most important—training care providers as data collectors.

Data transmission

Streamlining data transmission should address the two main flows of information within the health services system:

> *(1) within the individual health care system*
> Data transmission should promote continuity of care and permit easy follow-up by individual patients and clients. Special attention should be given to the communication between first-level and referral-level care.
>
> *(2) from health unit to system management levels*
> Effective data flows between health unit and system management levels are crucial for integration of individual care and public health action. The most obvious example is reporting on epidemic diseases. The main principle is to keep reporting requirements by the care provider at a minimum.

Data transmission increasingly uses newer communication technology, such as computer diskettes, e-mail, and Internet connections. It is hoped that in the near future this technology can eliminate the reams of paper required to operate health services systems. The most advanced form is a *wide area network* in which health units are connected to a central data bank through modems. These networks are very attractive because of the speed of data transmission and the possibility of making processed information available instantaneously to all decision makers connected to the database. Wide area networks can also become major tools for integration of individual health and public health information. The central databank can be linked further to databases from other sectors such as education, water and sanitation, and agriculture, and to community databases. However, because of technical and cost constraints, this technology will not be available to most developing countries for some years to come.

Data processing and analysis

Data processing and analysis range from simple manual computations to sophisticated computerized processing and analysis that transforms the data into useful variables. The challenge in the coming years will be to achieve the right mix of computer and manual systems, and to ensure that they are integrated fully. The large amount of health data, combined with time constraints, make computerized data processing generally the preferred option. Recent developments in computer technology have greatly facilitated data processing and analysis. High-level programming environments permit the creation of user friendly data entry and processing applications. Fortunately, powerful computer equipment has become increasingly affordable, so that these data processing systems can be used even in low-income countries.

Data presentation and use of the information

Anecdotal evidence shows that health managers and care providers do not use information for most of their decisions. Assuming that use of appropriate information does improve decision making, how can we improve information use? At least five mechanisms are suggested[14]:

1. Ownership and relevance of the information must be felt among all potential users of the information, through active participation in the system design.
2. Data need to be of appropriate quality, aggregated at the right level, and produced in a timely manner.
3. Performance-based management systems tend to increase use of information for decision making (easier to achieve in private health services).
4. Cultural differences between data people and action people can be decreased through consensus building, teamwork, and training.
5. Data presentation and communication (feedback) should be customized for users at all levels. Good feedback is based on meaningful comparisons: time comparisons. geographical comparisons, or comparison of actual versus mean or planned performance.

As Neame and Boelen rightly state, "it is only when those providing the data begin to receive meaningful and useful feedback that they will begin to appreciate the value of data and will therefore take appropriate steps to improve the quality, timeliness and quantity of the data they provide."[15]

Information system resources

HIS resource problems, including the lack of such basic infrastructure as reliable electricity, will remain a serious constraint in low-income countries for some time to come. It is often difficult for governments to put scarce resources into paper, pencils, registers, and computer equipment. Cost-effectiveness studies on the potential benefits of routine information systems eventually might convince decision makers to invest more resources in the generation of useful information.

Another important resource management question concerns appropriateness of computerization and at what level. While most health units in industrialized countries now have access to computer equipment, in many developing countries computers are still not available at the district level. Yet rapidly developing computer technology will make health information systems increasingly effective and powerful management tools for the health services. Computer equipment is becoming more affordable. Database management and geographical information system software applications can improve the use of information for decision making in both individual and community health matters.

However, introducing computer technology is not necessarily the silver bullet that creates effectiveness and efficiency in health services. On the contrary, lack of appropriately trained staff and hardware and software problems sometimes result in the decay and obsolescence of expensive computer equipment, without any gains in decision making.

Changing information culture

Even if a perfectly relevant, well–organized, and technologically sound routine health information system were readily available, it would not be possible to introduce it immediately. The main issue is that information systems are managed and used by people who have certain beliefs, attitudes, and practices, and changing them will take time. Most care providers feel threatened by a system that leads to objective decision making and are suspicious of automation; health care consumers feel that more accessible information systems are threats to confidentiality; and there is a lack of mutual understanding between data people and action people.

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[14] Dunn 1980.

[15] Neame and Boelen 1993.

Based on our experience, and confirmed by other researchers, the task of health information system reform is both formidable and complex, particularly in the context of government bureaucracies in developing countries. As Helfenbein et al. put it: "Changing the way information is gathered, processed, and used for decision-making implies changes in the way an organization operates. Producing and utilizing information more effectively will affect the behavior and motivation of all personnel. It is therefore important for those in charge of HIS restructuring to have a full understanding of what is at stake for each of the actors involved in the projected changes."[16]

In their analysis of information systems for primary health care, Sandiford et al. identify at least three groups of actors strongly in favor of improved health information systems: health services managers, public health specialists, and information technology experts.[17] However, each group has different expectations. Health services managers expect increased efficiency; public health specialists are interested in both improved effectiveness and equity; and information technology experts hope that computerized systems will eliminate "the drudgery of form-filling." But these objectives of improved effectiveness, efficiency, and equity are not necessarily supported by other influential groups: vertical program managers may oppose efforts to integrate information systems; the introduction of computers can mean loss of jobs for certain employees; and care providers often show little interest in improved information simply because it is not part of their professional culture.

To implement health information system reform in these complex and potentially resistant environments, at least two conditions have repeatedly been shown to be crucial: leadership and consensus building. Peterson, in their analysis of the implementation of a computerized personnel information system in an African bureaucracy, describes *leadership* as a "saint" who manages the "demons."[18] The "saint" is a progressive senior government official, who is willing to shoulder the reform effort, while the "demons" are government staff or other concerned actors resisting the reform. As for *consensus building*, it is clearly impossible to involve everyone in the health sector in all aspects of the health information system reform effort, but active participation of key actors early on in the design process will foster their understanding and their ultimate support during the implementation.

Future perspectives and research agenda

While the development of *population-based district managed health information systems* will definitely contribute to the integration of individual health and community health interventions, we would like to finish this presentation with an even more ambitious and long-term perspective of health information system management: *community health and information systems*.

As pointed out by Marsh in his excellent article on this topic, population-based community health systems and the information systems that support them stress local participation in responding to the health needs of all in the defined population, through household and neighborhood level services, including health promotion and disease prevention activities.[19] Community members, often volunteers, complement health personnel. Such community health systems are necessarily linked to referral services for curative and rehabilitative care. Thus, the district health model is an integral part of the population-based community health system. The focus shifts, however, from the peripheral facility to the catchment areas, the

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[16] Helfenbein, S et al. *Technologies for Management Information Systems in Primary Health Care*. Geneva: World Federation of Public Health Associations, 1987.

[17] Sandiford P et al. What can information systems do for primary health care; an international perspective. *Social Science and Medicine. 34* (10), 1992.

[18] Peterson S et al. Computerizing Personnel Information Systems in African Bureaucracies: Lessons from Kenya. Development Discussion Paper No. 246. Harvard Institute of International Development, 1994.

[19] Marsh D Population-based Community Health Information Systems. In Lippeveld T, Sauerborn R and Bodart C (eds.). *Design and Implementation of Health Information Systems*. Geneva: World Health Organization, 2000.

communities they serve. The community adds another management level to the system, with its own information needs**.**

The community level can provide most of the information for management of essential public health functions. Examples include reporting births and deaths; notification of cases of infectious diseases and outbreaks; identification of high-risk children, pregnant women, and families; coverage and defaulters of critical services; coverage of households with safe water supply and sanitation; monitoring air, water, land, and noise pollution; coverage of disadvantaged populations with health and social services; availability of functioning service facilities and staff; and availability of essential drugs.

The population-based community approach is common in research settings (for example, Matlab [Bangladesh], Kasongo [Zaire], and Aga Khan University [Pakistan]), and in development programs (for example, private voluntary or nongovernmental organizations in numerous developing countries). But some developed countries have initiatives as well. Goldfield proposes community-oriented health status management (COHSM) as a means to integrate community planning with the individual planning characteristic of the traditional doctor-patient relationship.[20] COHSM requires the identification and involvement of community elites. It focuses on vulnerable populations, such as low-income households or chronically ill patients, who often are excluded from participation in traditionally managed care organizations. Only a few large-scale examples exist linking communities to the health services system, such as the Health and Management Information System in the Philippines, and the Vital Horoscope in Iran.

Although they are clearly ambitious and long-term efforts, district-managed and at least partially community-managed HIS could provide the glue needed to bind together individual and community health interventions. Further research and experience is required to expand and scale up existing projects.

First, a comprehensive review study should be set up to gather existing scientific evidence that decentralized routine HISs contribute to more effective and efficient integration of individual and community health interventions. We also invite the research community to help answer the following list of questions, which is certainly not exhaustive, but, we hope, will contribute further to the establishment of information systems responsive to the health needs of both individuals and populations:

- How can service providers and communities in particular, as key information users, be involved more actively in HIS development efforts?
- What is the ideal process and level for development of interdisciplinary social information systems, through which interactions among health, education, and economic development can be identified in an action-oriented manner?
- Given the benefits of a population-based community health information system, how can it be linked effectively to a routine health unit-based HIS?
- How can qualitative information be tracked in a routine health information system (for example, the quality of interpersonal relations between the care providers and the patients)?
- What structural interventions could better link routine service statistics with other data collection systems (surveys, vital events registration, rapid assessments methods, etc.)?

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[20] Goldfield N The Hubris of Health Status Measurement: A Clarification of its Role in the Assessment of Medical Care. *International Journal for Quality in Health Care 8* (2), 1996.

- What is the feasibility of involving communities directly in vital events registration?

- What is the relationship between the format in which information is displayed (maps, action-oriented graphs, etc.) and its use in management?

- How can training in information use improve the actual use of information for health services planning and management?

- Is there an approach for determining when computerization is likely to pay the greatest dividends?

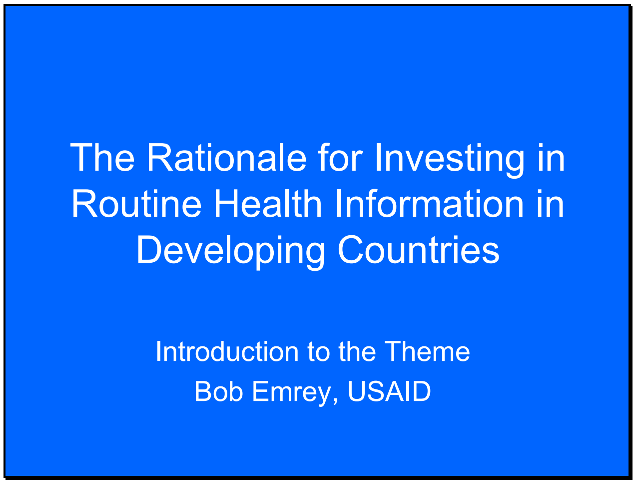
- What is an efficient strategy for designing and testing computer support for integrated management of individual and public health?

Theme 1

The rationale for investing in routine health information in developing countries

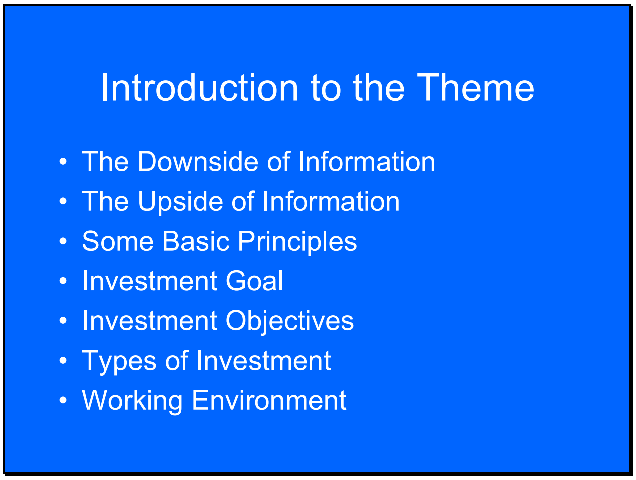
Introduction to the Theme

Bob Emery, USAID



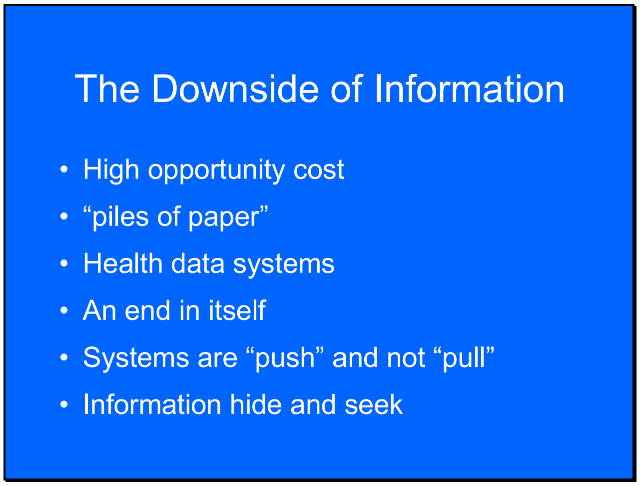
The Rationale for Investing in Routine Health Information in Developing Countries

Introduction to the Theme
Bob Emrey, USAID



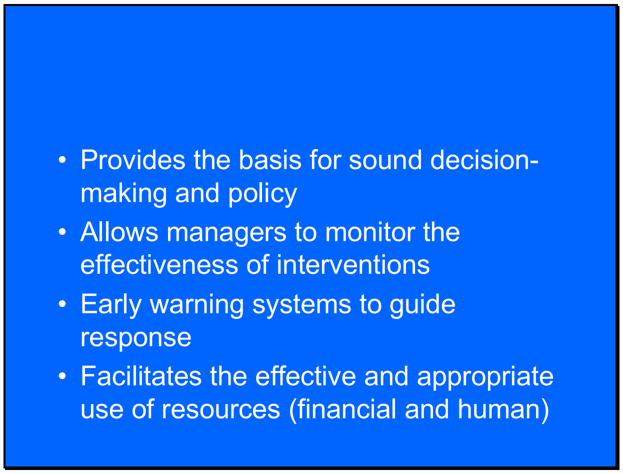
Introduction to the Theme

- The Downside of Information
- The Upside of Information
- Some Basic Principles
- Investment Goal
- Investment Objectives
- Types of Investment
- Working Environment

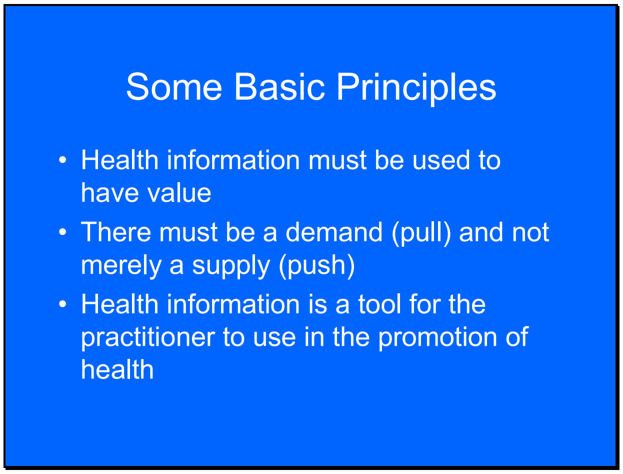


The Downside of Information

- High opportunity cost
- “piles of paper”
- Health data systems
- An end in itself
- Systems are “push” and not “pull”
- Information hide and seek

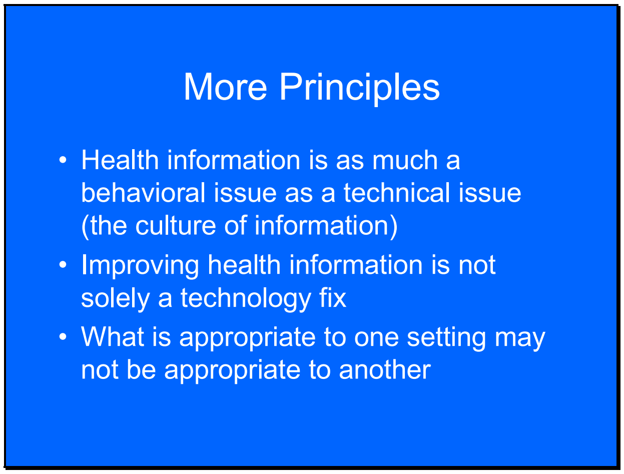


- Provides the basis for sound decision-making and policy
- Allows managers to monitor the effectiveness of interventions
- Early warning systems to guide response
- Facilitates the effective and appropriate use of resources (financial and human)



Some Basic Principles

- Health information must be used to have value
- There must be a demand (pull) and not merely a supply (push)
- Health information is a tool for the practitioner to use in the promotion of health



More Principles

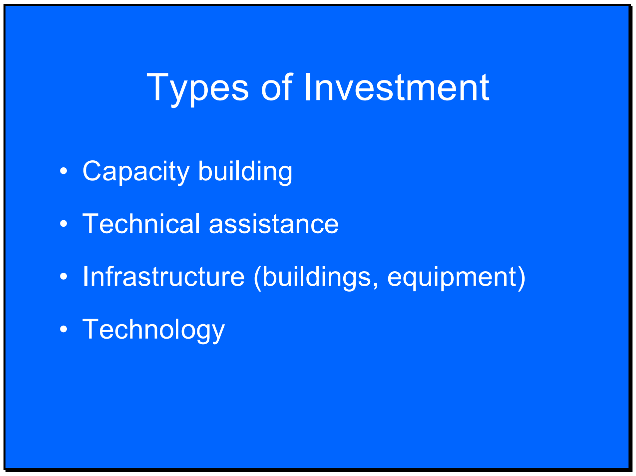
- Health information is as much a behavioral issue as a technical issue (the culture of information)
- Improving health information is not solely a technology fix
- What is appropriate to one setting may not be appropriate to another

Investment Goal

The improvement in the population's health status

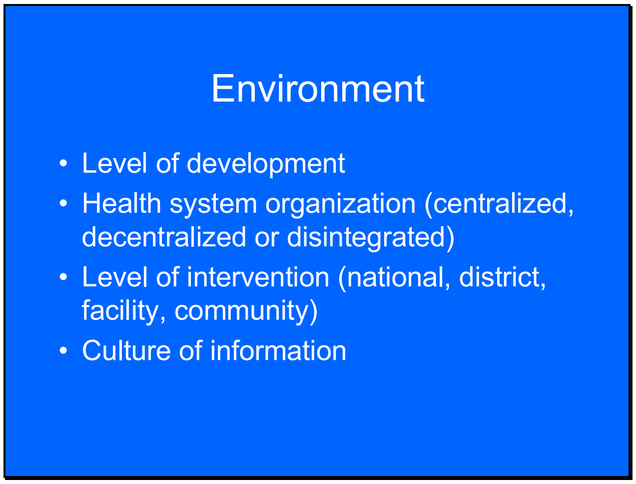
Investment Objectives

- More efficient use of resources
- Informed decision making
- More effective policies
- Increased intervention effectiveness
- Improved safety and quality
- More timely response



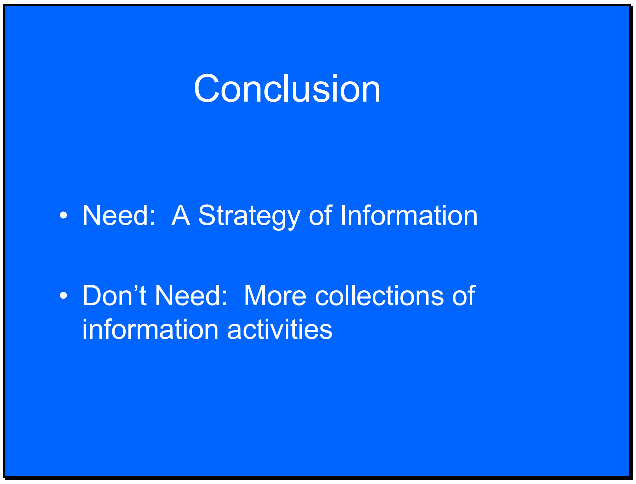
Types of Investment

- Capacity building
- Technical assistance
- Infrastructure (buildings, equipment)
- Technology



Environment

- Level of development
- Health system organization (centralized, decentralized or disintegrated)
- Level of intervention (national, district, facility, community)
- Culture of information



Conclusion

- Need: A Strategy of Information
- Don't Need: More collections of information activities

Overview: The Interface between Routine Health Information, Rapid Assessment and Survey-based Information

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Routine health information is a resource of tremendous value that in recent years has been neglected in developing countries in favor of survey-based information. The reasons are obvious: routine health information is often incomplete, poorly recorded, difficult to access, and unable to represent the experiences of whole populations. Service-based routine information suffers from the additional problem that the more it is used for managerial purposes, the greater the incentive to 'cook the figures'. Survey data on the other hand tends to be more carefully gathered, more representative of entire populations, less vulnerable to manipulation, more widely available in summarized and raw formats, and is generally designed with specific management and evaluation purposes in mind. In developed countries however, routine health information sources are widely used. This paper presents some of the uses that routine data have been put to in developed countries.

The paper argues that routinely collected data can provide useful inputs for service management, and health policy formulation in developing countries. It also suggests that some of the greatest potential benefits of routinely collected health information could accrue if it is made available to the general public in a format that enables citizens to make more informed choices with regard to their utilization of health services.

For routine health information to yield its potential there are a number of organizational issues that need to be addressed. Of tremendous importance is the need to acknowledge that in most developing countries the private sector provides a significant proportion, sometimes even the majority, of health services, particularly for ambulatory care. Effective strategies have yet to be developed for involving and integrating the private sector in the collection of health information. In recognizing the plurality of modern health systems, responsibility for gathering, analyzing and disseminating health information may need to be devolved to an independent, non-governmental authority, particularly in countries where the Ministry of Health retains a major role in service provision. Health information also needs to become more freely available to all stakeholders, but in particular to the general public.

To date, there has been a tendency for those concerned with the improvement of routine health information systems in developing countries to be excessively focussed on technological 'fixes'. Whilst the advantages offered by developments in computing and network technology should continue to be exploited, the real challenge that lies ahead will be a different one. It will be to skillfully secure the support of key stakeholders for a radical change in the 'ownership' of health information, independently of whether is derived from routine, survey, or rapid assessment sources, to one which views all such information as being at the service of citizens and users of health services rather than a jealously guarded possession of specific institution or political interests.

Power Point presentation follows.

Why has there been so much investment in survey-based health information in developing countries?

- It is generally more carefully gathered
- It can be designed to be representative of entire populations
- It is less vulnerable to manipulation
- It is more widely available in both summarised and raw formats
- It is generally produced to meet specific management and evaluation purposes, particularly those of donors

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Why has investment in routine health information systems been neglected in developing countries?

- It is often incomplete, with there being little scope for attain full coverage
- The data tends to be poorly recorded
- It is difficult for users to access, sometimes deliberately so
- Service-based data do not usually represent the experience of entire populations
- If used for managerial purposes there can be incentives to 'cook the figures' thus reducing its credibility

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The Interface Between Routine Health Information, Rapid Assessment and Survey-based Information

Peter Sandiford MD PhD
Institute for Health Sector Development

Reasons why routine health information systems might merit more investment

- Their marginal cost is relatively low and therefore they are more sustainable for developing countries than periodic large surveys
- They can provide a synergistic complement to survey-based data, and identify issues requiring further investigation through, for example, *ad hoc* enquiries
- Their potential to influence policy and improve service management has been demonstrated in developed countries
- Technological advances have made it possible to provide access to these sources, and therefore use of them, to a much wider population.

Why invest more in routinely collected health information systems?

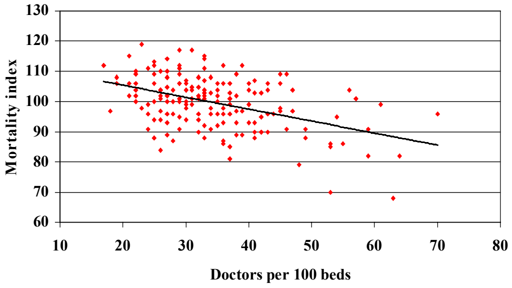
'Good' reasons

- To assist policy formulation
- To monitor service and system performance
- For health surveillance
- To empower citizens
- To create incentives for better performance
- To meet international reporting obligations

'Bad' reasons

- To keep up with advances in other countries
- To make use of the opportunities provided by technological advances
- Because existing systems are weak

Hospital mortality vs doctors in England



Information system developments: the present and the future

‘Modern’ Information System Developments

- Conducting regular health and demographic population surveys
- Redesigning forms
- Establishing minimum datasets
- Computerising data storage
- Improving data analysis and reporting
- Web-site publication of results
- Orientation to (and ownership by) public sector providers
- Focussing on service production and productivity

‘Post-modern’ Information System Developments

- Tailoring to the needs of reformed health systems
- Redefining ownership and responsibilities
- Orienting to needs of patients, purchasers and regulators
- Concern with monitoring multiple dimensions of overall system performance
- Integrating routine information with surveys & *ad hoc* studies

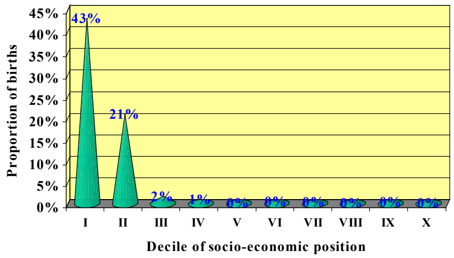
Health Sector Reform and Information System Development

- Recognition and encouragement of plurality in health service provision 🕐 need to integrate public, private and social security data, particularly for disease surveillance and system-wide performance monitoring
- Strengthening the ‘stewardship’ role of ministries of health 🕐 developing their capacity to assess performance of the health system as a whole
- Separation of functions of purchasing and provision for health services 🕐 need for independence of the institution responsible for generating performance indicators

Poverty Reduction and Information System Development

- Incorporating measures of socio-economic status in data collection forms to generate indicators of equity
- Monitoring socio-economic inequalities in access to services, utilization, and health outcomes
- Developing capacity to assess system performance in terms of how well they protect families against catastrophic health care costs

Proportion of children born outside hospitals or health centres by decile of socio-economic status



Source: National birth register, 1996

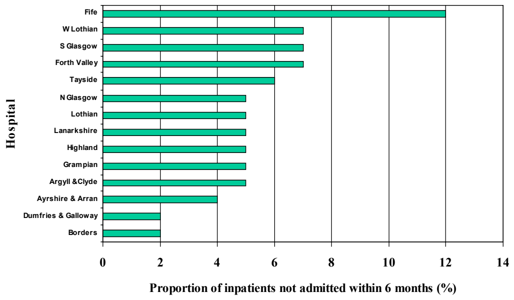
Improving Health System Performance through Information System Development

- WHR 2000 and the focus on health system performance
- Acknowledgement that health systems have a range of social functions beyond mere health gain
- Need for information systems to be able to evaluate and monitor the various dimensions of overall health system performance including:
  - (1) Health gain
  - (2) Equity
  - (3) Social security against catastrophic costs
  - (4) Process utility (client-perceived service quality)
  - (5) Value for money

Empowering Citizens through Information System Development

- Increasingly citizens are being asked to assess and purchase health services, either through facility co-payments, selection of insurance plans, use of vouchers, or by choosing doctors
- Citizens need information to effectively purchase and choose service providers
- Patient perceptions of quality are now acknowledged to be important and valid indicators of performance (particularly for patients). Purchasers and users of services therefore need to routinely monitor these.
- Publication of service performance indicators can have a powerful influence on health policy and on service management.

Waiting times for admission in Scottish hospitals



Areas for Investment in Developing Country Routine Health Information (I)

- Developing surveillance systems in collaboration with private sector clinical and laboratory service providers
- Establishing systems and dissemination modalities that help citizens to choose quality health services (health insurance) at reasonable prices
- Separating roles of data analysis and publication from health service provision
- Creating and strengthening capacity to flag adverse health events (eg maternal deaths) and conduct *ad hoc* enquiries

Areas for Investment in Developing Country Routine Health Information (II)

- Introducing record linkage between survey, census and routine health information (whilst maintaining privacy)
- Introducing socio-economic indicators into routine information sources for monitoring health and health service equity
- Improving routine data on service costs to enable efficiency to be monitored and value for money to be determined
- Increasing the availability of electronic sources of routinely collected data to public health specialists, journalists and researchers

Potential Modalities of Investment

- Lobbying for organisational change in the ownership of information and in responsibilities for dissemination with a view to establishing new independent structures holding a remit to provide service performance information to purchasers of health services (including specifically the general public).
- Demonstration projects of collaboration with private sector service providers, particularly for improving reporting and management of notifiable diseases
- International comparison studies making use of existing routine information to compare health system performance (in equity, avoidable mortality etc).

Potential Modalities of Investment

- Redesign of existing systems to incorporate more cost and socio-economic information on users, and to extend scope for record linkage between data sources (whilst protecting privacy).
- Pilot projects in the use of routine mortality and morbidity data as triggers for adverse health event enquiries

A Decentralized Information System for the Monitoring and Evaluation of Maternal and Child Health/Family Planning Program Performance

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Introduction

Aware of the lack of relevant, timely, and reliable information for the planning, management, and evaluation of health programs, since 1986, the Morocco Ministry of Health (MOH), with the assistance of numerous international donors (USAID, WHO, UNFPA, UNICEF, European Union), has made efforts to restructure the National Health Information System. The Ministry of Health was strongly committed to the development of a health information system that serves as a tool for decision makers at all levels of the health service system to effectively plan, manage, and evaluate health programs. This effort was part of a broader health system reform effort to decentralize health services management, after the creation in 1996 of 16 regions, to an intermediate level between national and provincial levels.

Within the restructuring process of the National Health Information System, the Family Planning/Maternal and Child Health (MCH/FP) information subsystem, which is the focus of this paper, received special attention, and serves as a model tool for decentralized decision making and monitoring and evaluation of MCH/FP health programs. The MOH charged the Studies and Health Information Service (SEIS), in collaboration with the Directorate of Population (DP), the Directorate of Epidemiology and Disease Control (DELM), and the Division of Informatics and Methods (DIM), with restructuring the National Health Information System.

In the 1980s, there was an early attempt at computerized data collection for the National Health Information System that was centralized at the national level. In this system, the health facilities submitted monthly summary reports to each provincial manager, and the provinces aggregated these summary reports manually and submitted them for data entry at the national level (dBASE data entry program, SPSS-PC for analysis). Despite these early efforts, by the mid-1990s the maternal and child health information system was affected by four sets of problems: (1) the poor quality and incomplete nature of data produced by the routine collection system; (2) the fragmentation of data collection systems, too often organized vertically rather than by priority programs; (3) delay in the availability of information at all levels; and (4) insufficient use of available data for planning, management, and evaluation of services. The Ministry of Health (MOH) planned to tackle each of these issues, emphasizing integration of the routine health information system and information management capacity building at the peripheral level. The MOH's effort has been supported by USAID and its contractor, John Snow, Inc., as well as by other international donors, who provided financial and technical assistance.

Restructuring the Health Information System

Three concerns of the MOH guided the restructuring of the information system: (1) to promote use of information to improve service quality; (2) to integrate data collection from different MCH/FP programs by facilitating a holistic approach to child and reproductive health; and (3) to introduce new programmatic focuses, such as integrated management of childhood illnesses (IMCI) and management of obstetric emergencies.

Restructuring activities were implemented in three phases, which occurred mostly in parallel: (1) revision of data collection instruments; (2) development of a computerized MCH/FP data entry and analysis system; and (3) training of managers at regional and provincial levels in the use of data for decision making.

Concurrently, a study was undertaken in 1998 on the quality of MCH/FP data collected in health facilities to identify critical weaknesses in the production and use of routine data. The study was conducted by a multidisciplinary MOH team, composed of representatives of the DP, SEIS, and the Inspector General of the Health Ministry, in collaboration with a WHO/ Geneva consultant and JSI. The study confirmed the persistence of several problems identified at the beginning of the Project, such as imprecise data collection and the lack of use of information at local level.

Revision of data collection instruments

One of the features of the MCH/FP data collection system in first-level health facilities was a multiplicity of registers, daily forms, and reports. This situation was the result of developing vertical data collection systems for each program in the 1970s and '80s. Consequently, the immunization program (PNI), diarrheal disease program (PLMD), acute respiratory infection program (PIRA), nutrition program, (PNT), maternal health (PSGA), and family planning program (FPP) each had its own set of instruments. Transmission procedures were also very confused. In addition to transmission of data to the SEIS, the service for centralizing all of the health information, reports were conveying data directly to the national programs through parallel transmission channels. Although at the beginning of the 1990s, program managers, in collaboration with the SEIS, agreed on a list of essential program indicators, the multitude of data collection instruments continued and constituted a demotivating workload for service providers in health facilities.

In 1997, several working groups were set up to adapt the data collection instruments (DCS, including forms and registers) to the needs generated by the integration of reproductive and child health programs and new approaches to child health and maternal health: Emergency Obstetric Care (EOC), and Integrated Management of Childhood Diseases (IMCI). These working groups were composed of key staff representing the relevant programs, SEIS, and JSI resource persons. Following a series of meetings, the following decisions were made:

- Maintain the DCS of family planning services.

- Restructure DCS linked to child health to better respond to the needs of the IMCI approach.
- Restructure the DCS of obstetrical services.
- Simplifying MCH/FP data transmission procedures by creating a monthly report in booklet form that would contain all the MCH/FP data of a health facility.
- Conduct operations research on the decentralization of epidemiological surveillance.

Child health data collection

The IMCI approach, which was introduced in Morocco in 1996, promotes integrated care to each child entering an MCH unit, through evaluation of all potential health issues and exploiting preventive care opportunities. The multiplicity of existing data collection instruments was an impediment to this approach. Indeed, a survey of data collection instruments for the four child health programs showed that there were 13 information instruments: five registers, three daily forms, and five monthly reports. After several months of consultation between managers of the different child health programs and managers of these programs at SEIS, an integrated information system was developed for child health. This made it possible to record in a single document all the curative and preventive care provided to any child under age 5. The 13 original information forms were reduced to four:

- integrated daily child health activity register,
- register for the national vaccination program,
- daily PNI activity form, and
- integrated monthly child health activity report.

Maternal health data collection

The maternal health data collection system was revised to address the information needs of the new emergency obstetric care strategy. The following registers and tools were revised: (1) the delivery register, which was transformed into an obstetric register, permitting recording of obstetrical complications during pregnancy, childbirth, and postpartum; (2) the monthly obstetric activity report; and (3) the monthly pre- and postnatal report.

All the monthly reports of the MCH/FP programs were grouped into an integrated MCH/FP report, in the form of a booklet, to be sent out monthly. A user's guide, or instruction manual, for the new registers and a new monthly report were also developed that explained how to fill out each form and register, and provided standard definitions for each variable and indicator.

After developing the new instruments, a pretest was initiated in the Souss-Massa-Drâa and Méknes-Tafilalet regions for the integrated child health data collection system, and in the Taza-Al Hoceima-Taounate and Fez-Boulemane regions for the maternal health data collection system. The MCH personnel of the health facilities and the Provincial Ambulatory Health Care (PAHC) staff of these regions were trained to use the new system. Following field visits by Ministry of Health and JSI staff, the different reports were revised several times until a final version was obtained that responded to the needs of the majority of information users at different levels of the system.
The new DCS were approved for generalized use throughout the country at the beginning of 1999, and a first stock was printed by the MOH's Division of Information, Education and Communication (DIEC). Later, cascaded training of the personnel of all of the health facilities was organized, first in the USAID-funded provinces and later in the other provinces funded either by other international donors or the Ministry of Health. Following a memo from the Secretary General in January 2000, all the Moroccan provinces officially began using the new forms and registers..

Development of a computerized MCH/FP data entry and analysis system

One of the explanations for the poor use of information by peripheral managers was the centralized processing and analysis of routine data. The central level was not able to provide feedback to the periphery within acceptable timeframes. As a result, health service providers and managers limited data transmission to the central level, without much regard for quality. The trend toward decentralized management of health services in recent years opened the door to a change in management of the health information system and gradually prepared managers at regional and provincial levels to begin processing and analyzing data themselves.

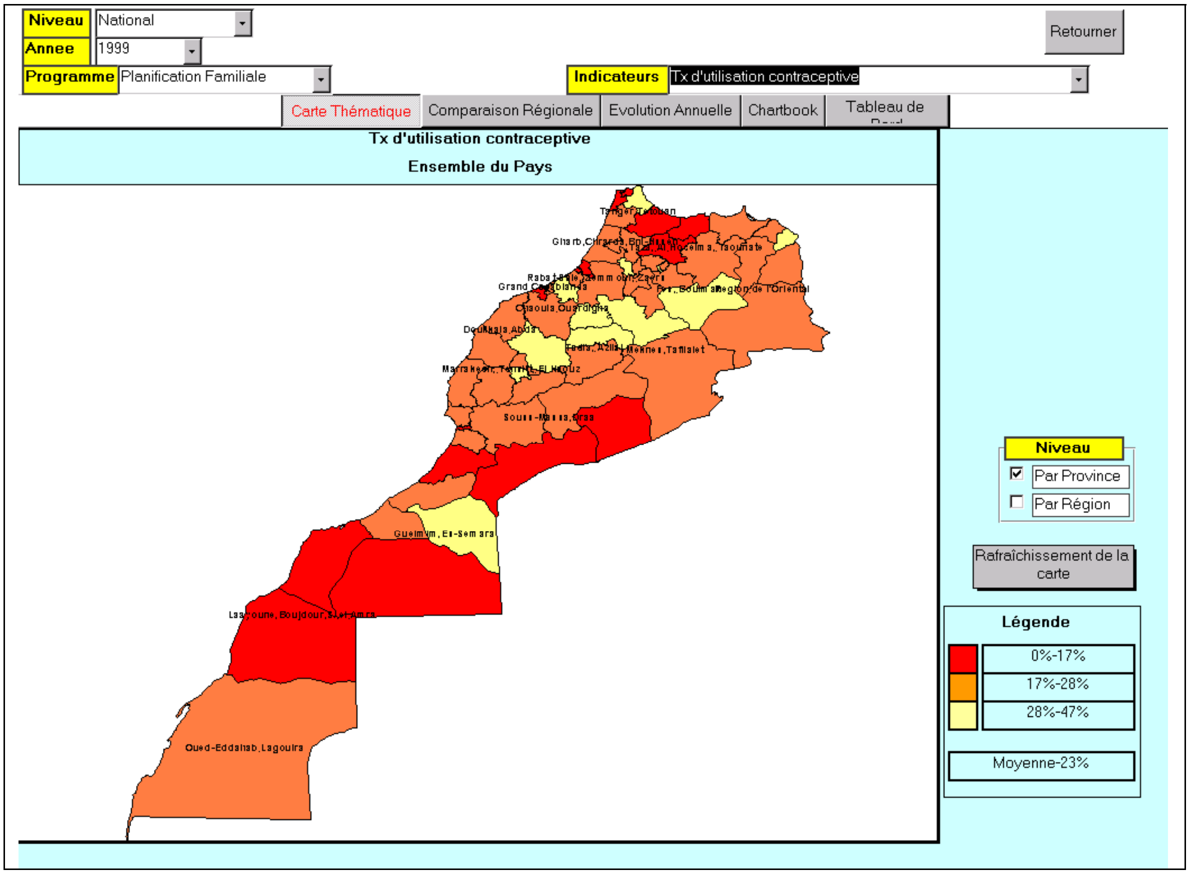
In the first phase, therefore, it was decided to implement a computerized and interactive system that provided peripheral managers with easy access to 20 MCH/FP performance indicators. This application ("SNISSTAT"), developed with technical assistance from Tulane University under the USAID EVALUATION Project, was DOS-based (Clipper) and used provincial-level data entered at the SEIS, as well as 1994 census figures, and certain indicators from DHS surveys. This made it possible to produce tables, multiple graphs, and maps for each indicator over a period of five years (1992 to 1996) and for the different levels (national, regional, and provincial). The system could also be linked to an Internet-based interface, called the *Electronic Chartbook*. However, data produced by this application were often criticized by peripheral managers, who alleged that the data were obsolete, incomplete, or did not reflect how provinces actually performed.

Designers decided to decentralize data entry to the provincial level based on the following objectives: (1) improving the quality of MCH/FP data collected at the peripheral level; (2) encouraging the use of data at regional and provincial levels; and (3) reducing delays in data availability at central and regional levels. A computerized entry and processing system for MCH/FP and curative data at the provincial level were developed between 1998 and 2000. This application, called *système SMIPF,* was developed using Microsoft Access and VBA (Visual Basic for Applications), with technical assistance from John Snow, Inc., in close collaboration with future users from central and peripheral levels. It permits central program managers and peripheral health services managers to monitor MCH/FP service performances on an immediate basis.

A preliminary version of the application was installed experimentally in 1999 in all of the provincial ambulatory care offices of the Méknes-Tafilalet and Souss-Massa-Drâa regions. During the testing period, the users made several comments on the application to the developer. These suggestions were eventually incorporated into the different modules.
In addition to the data entry module, the application has several feedback or decision support modules.

One of these is the graphics module. This module, using an active-X control, Graphics Server (http://www.graphicsserver.com), allows decision makers at the peripheral and the central level to interpret numerous MCH/FP variables and indicators visually, through a series of line graphs, pie charts, and histograms. The system functions at the peripheral and the central level so that indicators can be graphed for a health center, province, region, or national level. The system also allows automatic generation of numerous graphs and is linked with a Microsoft Word document that explains the source and method of calculation of each of the indicators.

The application also has a geographic module that was developed using another Active-X control, Map Object LT (http://www.esri.com). This allows decision makers to visualize any indicator geographically by region, province, or commune/Health Center catchment area.



Niveau National

Annee 1999

Programme Planification Familiale

Indicateurs Tx d'utilisation contraceptive

The final version of the *système SMIPF* was handed over to the MOH in June 2000 and is now installed nationwide. At the end of 2000, more than 90 percent of all provincial offices were entering MCH/FP data using the new application. Data processing and analysis possibilties of this system are noted in the box below.

Système SMIPF Application*:* Data Processing and Analysis Possibilities

- Define the list of Health Centers and the target populations in each province.
- Enter the data for MCH/FP program and curative services by CS based on monthly reports.
- Produce summary reports on program performance.
- Transmit data by e-mail to SEIS and/or regional managers.
- Calculate the major MCH/FP program indicators, and present them in tabular, graphic, or geographic form.
- Make a detailed analysis of the MCH/FP data by health center, province, region, and national level.
- Develop a chartbook by province, region, or national level.

Selected MOH central computer managers have been trained to troubleshoot the *système SMIPF* application. All central and peripheral statistical technicians and program facilitators were trained in using the data entry module of the application with the help of training modules that were developed and validated by MOH and JSI managers. A core group of trainers was created and trained to address future in-service training needs of provincial technicians, and to solve potential installation/upgrading problems of the application and data transmission.

Training in data use

While changes were taking place in data collection computerized data processing and analysis tools, the project team made a sustained effort to strengthen the capacity of managers at the central and peripheral levels to use information for better management and delivery of MCH/FP services.

Between 1995 and 1997, the EVALUATION project organized several training sessions in program evaluation techniques and the use of indicators for program management at the central and provincial levels. This training was targeted mainly at provincial-level statisticians and program facilitators.

With the creation of the new regions and the new approach to regionalized management of health services, central MOH staff, with technical assistance from JSI and Tulane University, organized workshops for provincial health managers on the use of MCH/FP routine data in program planning and management in four regions. During each workshop, participants were asked to prepare a regional chartbook, thus practicing the techniques they learned during the workshop. These chartbooks enabled health service managers to identify major problems and proceed with problem-solving actions. A problem identified in this way often required an in-depth, more qualitative investigation to find operational solutions. With Tulane University assistance, training in qualitative research was organized for the Souss-Massa-Drâa region.

Last, in the context of the decentralization of MCH/FP services and in collaboration with DELM, the project supported the pilot-testing of a Regional Epidemiological Observatory (ORE) in the Souss-Massa-Drâa region. Its objective was to strengthen provincial and regional capacity to manage epidemiological information for decision making and action at local and regional levels. Training in epidemiological surveillance of provincial managers was organized, a computerized early warning system was developed in collaboration with local managers, and dissemination of epidemiological surveillance data was initiated through a printed newsletter.

Strengths and weaknesses

The information system restructuring has been a beneficial but operationally complicated process.

The effort to restructure the routine MCH/FP information system has doubtless contributed greatly to the sustainability of programmatic achievements and the institutionalization of the decentralized management of MCH/FP services. The integration and simplification of several data collection instruments and monthly reports will decrease the workload of service providers and help them to use a holistic approach to case management.

The *système SMIPF* application, which allows provincial and regional managers to enter, process, and analyze MCH/FP data themselves, will have a doubly beneficial impact on the decentralized management of MCH/FP services. By enabling peripheral levels to proceed with a rapid and targeted analysis of the major performance indicators, increased use of information for MCH/FP management decisions is expected. In addition, the improved use of information will motivate managers and service providers to collect better-quality data and transmit them within adequate timeframes. The availability of timely, quality information at the central level, in turn, will improve use of information by national program managers. The feedback modules were finalized only recently. Thus, further training efforts are required to ensure a better understanding of the enormous potential of the *système SMIPF* application.

It is worthwhile to note that information system restructuring is a complex endeavor. While a consensus-building process ensures ownership and sustainability, it makes restructuring time-consuming, which can lead to other problems. In this case, during the long field-testing period, the SEIS received monthly report in two different formats (old and new). Coexistence of these two different monthly report formats generated data entry problems with the new application and caused confusion related to the data available to national-level program planners and managers. Another issue that has caused major problems during the pilot phase of restructuring is the stock-out of DCS. All future users should be warned that the large-scale restructuring of the routine information system is very complex and can seriously disrupt, at least temporarily, the smooth running of health information system.

Creating an information culture is a long-term behavioral intervention.
From the very beginning, the major objective of the health information system was to improve the use of MCH/FP data generated by the system for decision making at all the levels. Although health information system restructuring did transform the system into a more relevant, reliable, and rapid information production tool, it did not lead automatically to better use of the information.

For five years, several activities had been undertaken to convince the managers of programs and peripheral health services, and, through them, the service providers, that information can lead to action. To achieve this, training was designed in the form of exercises in MCH/FP data analysis that would help participants identify problems and propose solutions. The planning and implementation of small projects, based on an in-depth analysis of the regional situation of MCH/FP services, was particularly revealing for most of the participating managers, and even engendered enthusiasm in some of them. However, these exercises also revealed managers' lack of confidence in the existing routine information system, over which they never had control. Also, most managers believed that it was useless to undertake actions based on information, as long as they did not have sufficient control over the use of resources. It is hoped, therefore, that the creation of decentralized management structures at the regional level, including control over the new decentralized data processing and analysis system, will motivate peripheral managers to make better use of the information and will gradually establish a genuine "information culture."

Computerized data processing requires both capital and recurrent investments.
The Ministry of Health, with donor assistance, has made major investments in the acquisition of high-performance computer equipment and the training of managers from all levels in its use. Despite these efforts, most MOH key staff and decision makers, at both the central and peripheral level, do not use this information tool well. In effect, few use the available software daily for planning and management tasks, and few use e-mail as a communication medium to plan meetings or transmit data or reports. All too often the computer sitting on the desk remains a mysterious object, a status symbol, and an end in itself. Again, this observation reflects a problem of attitude and behavior. To achieve a positive result, the MOH should invest in preservice and in-service computer training for all MOH senior staff, both medical and administrative.

Another danger threatening the computer pool is its rapid decline into dysfunction without continued maintenance of both hardware and software. The amount of equipment to be maintained has increased enormously, and the needs expressed by the different users at the central and peripheral levels have become so vast that they exceed the capacity of the DIM, especially when they requires going to the four corners of the country. The maintenance function of the computer pool should be rapidly decentralized, therefore, by outsourcing if necessary.

Recommendations and future perspectives

On the basis of this analysis, we would like to finish by proposing a few recommendations and future perspectives on the sustainability and institutionalization of the health information system as a management tool for MCH/FP services:

- Consolidate the restructured information system.

Many efforts are still required to ensure that the MCH/FP data produced by the new information system are reliable, complete, and timely, and that MCH/FP information is used for decision making at all levels. There must be a continuous supply of data collection forms and registers, and especially of an integrated monthly report form. Ultimately, the regions themselves could become responsible for the production of registers and forms. All the relevant central departments should provide continued support to the regions and provinces to resolve problems that might arise with the use of the *système SMIPF* and to motivate and raise the awareness of managers about the importance of information for MCH/FP service management.

- Proceed with further integration and decentralization of routine health information system management.

The process initiated to integrate and decentralize management of the routine health information system must continue. For example, the effort to decentralize the management of epidemiological data undertaken on a pilot basis by the project through the Souss-Massa-Drâa regional epidemiological observatory, should be extended throughout the country. Both MCH/FP and epidemiological data should become part of an integrated health services database at provincial and regional levels. Operations research is required to identify the most appropriate mechanism to achieve this result.

- Strengthen the capacity to use computer technology as an information management tool.

To optimize MOH and international donor investments in computerization of health services management, sustainable mechanisms must be created to ensure maintenance of the computer pool and to train health personnel in its use.

Registration of Births, Deaths, and Causes of Death to Inform Public Health Policies

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Abstract

The paper briefly reviews the history of vital registration in Europe and in some other countries before the 20th century. It analyses in particular the use of death registration for monitoring epidemics and to inform public health practitioners. Vital statistics have also been the key to documenting and understanding the demographic transition during the 20th century, both for fertility and for mortality trends. Further information on causes of death has been fundamental to analyze mortality decline in developed countries.

In developing countries, the completeness of vital registration systems (VRS) remains low in many instances. Despite low coverage of death registration, VRS data can still be used to document demographic trends. This paper describes a few case studies showing the use of VRS to document a major mortality decline (such as Sri Lanka) and major mortality crises (HIV/AIDS in Abidjan, famine in Antananarivo). Information on births can also be used to document the effect of family planning programs.

In addition to classic vital registration, other systems have been developed to improve the quality of estimates when VRS were deficient, such as sample registration systems (SRSs), as in India, and demographic surveillance systems (DSSs), as in many population observatories in Africa and South Asia. When causes of death data are not available, verbal autopsies can also produce useful information, both at local (population observatories) and national levels (as in Morocco).

This paper advocates for improving current health information systems in developing countries, particularly to improve the completeness of birth and death registration, and to develop appropriate alternative methodologies in case of deficient data, especially for causes of death. Analyzing currently available data and publishing the results might be an additional incentive for improving current reporting systems, and could be very valuable for research.

Introduction

A civil registration system (CRS) is an administrative system that systematically records changes in civil status in the population, primarily births, deaths, and marriages. Modern registrations system typically record nine types of vital events: birth, death, marriage, divorce, annulment, separation, adoption, legitimation, and recognition.[1] A CRS is central to modern legal systems, because it is the basis for defining legal existence of individuals and unions, ancestry, age, nationality, and, therefore, many individual rights. Closely linked to regular CRS is the registration of causes of death by the medical system. Registration of causes of death is an important part of modern health systems because it is the basis for understanding where the most important challenges lie (leading causes of deaths), and where progress has been achieved (declining mortality).

Vital registration statistics (VRS) and cause of death statistics (CDS), together with other demographic, social and economic statistics are now part of basic statistics in developed countries. VRS and CDS are

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[1] Jamison E, Baum S (eds.). *Civil Registration and Vital Statistics: A Collection of Papers*. Bethesda, MD: IIVRS and UNFPA, April, 1996.

central to health information systems (HISs) and the basis for analyzing changes in population and health parameters. Birth and death statistics are necessary for estimating population flows and making population projections. Together with the census, which provides a count of the population, they are the sources of data necessary for computing life tables and fertility tables—the statistical tools that produce critical demographic indicators such as life expectancy, total fertility rates, and net reproduction rates. Although demographic surveys have been used to supply estimates of demographic indicators in case VRS were not available, no other method can replace a precise measure of age-specific birth and death rates, and no other method can provide a precise measure of yearly, monthly, and daily fluctuations of birth and death rates, which are crucial to understanding the processes of birth and death. Similarly, a precise account of causes of death by age, sex, and time are invaluable to understanding health problems, and no other method can replace proper CDS. As early as 1824, Chadwick advocated the use of vital statistics to identify health problems an inequalities.[2]

Various international agencies have devoted numerous meetings and publications to recommend improving civil registration systems, vital registration statistics, and cause of death statistics. The first international meetings of public health statisticians were already concerned with controlling infectious diseases and with vital registration, starting with the 1851 First International Sanitary Conference in Paris and the 1853 First International Statistical Congress in Brussels. International cause of death classifications started in 1893 (Bertillon) and were revised 10 times in the 20th century, following the early attempts by British and French statisticians in the 19th century.[3] The 10th revision of the International Classification of Diseases and Causes of Deaths (ICD-10) was published in 1993, under the authority of the World Health Organization.[4] The United Nations Population Division (UNPD), the United Nation Statistics Division (UNSD), the United Nations Fund for Population Activities (UNFPA), and the International Statistical Institute (ISI) have devoted critical publications to various issues of vital registration statistics since the 1950s. More recently, the International Institute for Vital Registration and Statistics (IIVRS), founded in 1974, has monitored the progress and challenge of CRS and VRS throughout the world, and publishes information regularly in a series of technical papers.

Although much progress has been accomplished over the past 50 years, much remains to be done in developing countries. This point is crucial, since the most salient demographic and health problems lie in these countries. The aim of this paper is to describe the potential and limits of VRS and CDS in developing countries, with special focus on Africa, where the gaps are the widest. More than a criticism of the failures of VRS in developing countries, which has been done many times by various international agencies, we want to emphasize what can be done with what is currently available and affordable, and how the results can be used to inform health policies.

Brief history of civil registration

When complex societies developed an administration to monitor, protect, and regulate economic flow, they felt the need to have an account of population size and flows. For instance, in China, the first attempts at a systematic household registration system (HRS) were conducted by the Western Zhou Dynasty (1100–771 B.C.). This system was rediscovered in the 14th century, improved in 1741 by the Qing dynasty, and known as the *Baojia* family registration system (FRS). The current Chinese system, modernized in 1958 and known as the NHRS (national household registration system), is just an extension of earlier versions. Other Far Eastern societies developed their system based on the Chinese model, such as the *Koseki* system in Japan, modernized in 1872, and the Korean system, modernized in

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[2] Rosen G. *A History of Public Health*. Baltimore, MD.: Johns Hopkins University Press, 1993.

[3] Moriyama IM *Historical Development of Cause of Death Statistics*. IIVRS Technical Papers No. 65, September, 1993.

[4] World Health Organization. *International Statistical Classification of Diseases and Related Health Problems. Tenth Revision*. Geneva, 1992 (volumes 1, 2, 3).

1910. On the other side of the world, the Inca empire also had a basic civil registration system, known as the *Quipus* system.[5]

In the Western world, some early attempts were conducted by the Roman Republic and the Roman Empire. For instance, as early as 443 B.C., births and deaths occurring during the previous five years of censuses were recorded among Roman citizens. In the first century BC., Roman families officially recorded births, deaths, marriages, and divorces with two copies, in front of seven witnesses.[6] With the Roman Empire, birth registration became compulsory for citizens within 30 days after the naming ceremony (4 AD.). Roman insurance companies also had some kind of death registration because they were able to compute life expectancies at various ages.[7] Birth and death registration was later forgotten for several centuries, despite local attempts by Oriental churches in the sixth century.

Systematic civil registration in Europe started in the Middle Ages. In France, in 1406, the Archbishop of Nantes required the parish priests to record births systematically. He was soon imitated by many of his peers, and, by the 16th century, births, deaths, and marriages were registered in many French provinces. In 1539, the French king wanted to reorganize the administration and made compulsory the registration of births, deaths, and marriages by the priests in the French language, and no longer in Latin in the édit de Villers-Cotterêts.

These early laws were revised several times, in particular in 1667, 1736, and 1787. During the French revolution, the modern system of civil registration was installed independent of the church (1792, 1803). In Spain, civil registration was also started in the 15th century and extended to the newly conquered Peru, replacing the old Inca system.

In England, civil registration started in 1538. The Bills of Mortality were probably the first death registration statistics (1532), and were used to monitor the impact of plague epidemics in the 16th and 17th century. They were analyzed by John Graunt in 1662, who computed the first known life table. Civil registration and vital statistics became systematic in 1837 in England and Wales, and compulsory and complete after 1874.

Northern European countries started civil registration in the 17th century: Sweden (1608, compulsory after 1686), Finland (1628), Denmark (1639, compulsory after 1646), and Norway (1685). In the United States, a first attempt at gathering such statistics took place in 1639 in Massachusetts, but became systematic only in the 19th century (1841 in Massachusetts), compulsory in 1909, and complete for all states in 1930. In Canada, VRS started in 1919, and much earlier in Australia and in New Zealand.

In addition to registration of births, deaths, and marriages, attempts to record causes of death began also early in Europe, in the 17th century. Of course, causes of death were recorded as perceived by the family, with only local knowledge, quite removed from our modern systems. But they were useful to monitor major epidemics, such as the plague, smallpox, measles, and, later, cholera. As early as 1630 in London there were death searchers, usually women, who made inquiries to families about causes of death of recently deceased persons. They reported their findings every week.[8]

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[5] Jamison et al. 1996.

[6] Dugas de la Boissonny *L'état civil*. Paris: PUF, 1988.

[7] Smith D, Keyfitz N *Mathematical Demography: selected papers*. Springer-Verlag, New York, 1977: 1-7.

[8] Biraben JN. Essai sur la statistique des causes de décès en France sous la Révolution et l'Empire. In*: Hommage à Marcel Reinhard sur la population française au XVIII^e^ et au XIX^e^ siècles*. Paris, Société de Démographie Historique, 1973: 59-70.

In non-Western countries, there were several attempts to gather vital statistics in the 19th century. For instance, in Egypt, the Sultan, who was concerned with cholera epidemics, started civil registration in 1839, which became compulsory after 1912. In Indonesia, a system was put in place in 1849 and modernized in 1933. Also with the aim of monitoring epidemics, India instituted civil registration in 1850, then modernized it in 1950 and 1969. In the Philippines, a system was put in place in 1889. Table 1 summarizes the earliest dates of publication of vital registration statistics in a number of countries, often 50 to 100 years after registration was organized. This table shows the lag between the date recording started and the date statistics became available to analysts.

Table 1 Dates when vital registration statistics became available in Europe[9]

Country	Date annual statistics available	Earliest date with estimation	Country	Date annual statistics available	Earliest date with estimation
Europe			*Outside Europe*		
Norway	1735		Japan	1875	
Sweden	1736		Mexico	1900	
Finland	1751		Argentina	1900	
France	1800	1740	Chile	1900	
Denmark	1800		Uruguay	1900	
Germany	1817		New Zealand	1900	
Austria	1820		Singapore	1900	
Belgium	1830		Sri Lanka	1900	
England & Wales	1838	1735	Australia	1901	
Netherlands	1840		Philippines	1903	
Scotland	1855		Taiwan	1906	
Spain	1858		Mauritius	1910	
Rumania	1859		Egypt	1912	
Greece	1860		Canada	1921	
Hungary	1861		USA	1930	1900
Russia	1861		Fiji	1930	
Italy	1862		India	1932	
Serbia	1862		Malaysia	1932	
Ireland	1864		Tunisia	1946	
Portugal	1866				
Switzerland	1870				

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[9] Chesnais, JC. *La transition démographique*. Paris, PUF,1986 (Cahier de l'INED n° 113).

Bulgaria	1881	
Iceland	1900	
Cyprus	1901	
Bohemia, Czech R.	1919	1750
Poland	1921	
Ireland	1922	
Albania	1938	

With a few exceptions, CRSs were instituted in Africa during the colonial period, but only a few African countries publish routine vital statistics today (table 2).

Table 2 Date when vital registration systems were established in Francophone Africa[10]

Country	Date of first VRS law	Last update
Benin	1939	1950
Burkina Faso	1939	1950
Cameroon	1917	1965
Cape Verde	1803	
Central African Rep.	1894	1969
Congo	1889	1958
Côte d’Ivoire	1950	1964
Gabon	1912	1963
Mauritius	1667	1830
Madagascar	1878	1961
Niger	1939	1950
Rwanda	1963	1969
Senegal	1916	1972
Chad	1939	1961
Togo	1909	1962
Zaire (Rep. Congo)	1939	1958

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[10] François M. L’état civil. In *De l’homme au chiffre. Réflexions sur l’observation démographique en Afrique*. Paris, Etudes du CEPED 1, 1988. 91-112.

Use of vital statistics in demographic research

Vital registration statistics have been the source of critical demographic research. For example, the theory of demographic transition was developed after analyzing birth and death statistics of the 19th and early 20th century.[11] [12] By analyzing detailed data at the provincial level in most of Western Europe, Coale and his colleagues at Princeton were able to describe precisely the spread of the fertility transition in Europe.[13] If demographic surveys and censuses were used later as a primary source of data in developing countries to document the fertility transition, vital registration statistics were still used in many situations, particularly in Latin America and in some Asian countries, such as Taiwan.

Similarly, critical work on mortality transition by cause of death was conducted by analyzing cause of death data. For instance, the seminal work conducted by McKeown was based on causes of death registered and published in England and Wales since 1837.[14] It is remarkable to note that these early statistics were produced long before the germ theory of diseases was developed by Pasteur, Koch, and others in the 1880s. Still, they could be used to understand mortality decline for such critical diseases as smallpox, measles, whooping cough, tuberculosis, scarlet fever, diphtheria, pneumonia, diarrheal diseases, and so on. This fact has implications for today's research, because it shows that a simple typology based on clinical signs and symptoms can be sufficient to identify the most important diseases and to permit major conclusions about mortality decline by cause of death.

Similarly, Preston's fundamental work on mortality patterns and causes of death was also based on vital registration and causes of deaths in various countries of the world, primarily among European populations.[15] This study documented the role of main disease categories in mortality decline. A large number of studies have used vital registration data and causes of death to document and analyze mortality changes throughout the world.

Vital registration in developing countries: Problems and limits

Vital registration in developed countries has been invaluable because birth and death registration have been virtually complete for more than a century, and causes of death have become standardized at least since World War II, and in some countries since the mid- or late 19th century. This is not the case, however, in many developing countries, although some have now reached the level of Western countries, despite the fact that virtually all countries have passed a law making birth, death, and marriage registration compulsory.

Several issues are at stake in developing countries:

- *Geographical coverage:* Although many large cities now have a reasonable CRS, many rural areas lag far behind, and sometimes lack even the basic infrastructure for registration.
- *Demographic completeness*: Even when civil registration is compulsory, and when the proper infrastructure exists, registration is often not complete, especially for the deaths of young children. Completeness is defined as the proportion of cases formally registered. Completeness is often high for birth registration, because in many instances a birth certificate is required for entering school. It is often much lower for deaths, however, especially for young children, and remains very low for marriages in traditional societies.
- *Timing and errors:* Even when events are registered, they are often deficient because of late declaration, and sometimes are falsified (age and date in particular).

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[11] Landry A *La révolution démographique*. Paris, Sirey, 1934.

[12] Notestein F Population: the long view. In Schultz T (ed.) *Food for the world*. Chicago, Chicago University Press, 1945: 36-57.

[13] Coale AJ, Cotts-Watkins S *The Decline of Fertility in Europe*. Princeton: Princeton University Press, 1986.

[14] McKeown T *The Modern Rise of Population*. New York: Academic Press, 1976.

[15] Preston SH *Mortality Patterns in National Populations*. New York: Academic Press, 1976.

Completeness of vital registration

Several methods have been devised to estimate the completeness of birth and death registration. These are:

- *Comparison case by case*: One starts by sampling births or deaths in the population, asks the family whether the event has been notified and where, and goes on to verify the declaration in the corresponding office. This is often difficult to do, because dates stated by the family might be erroneous or unknown, and names may be spelled quite differently on the register. This has been tried, for example, in Dakar and Abidjan.[16]
- *Comparison of estimates with surveys*: If a survey provides birth and death rates with a good degree of confidence and a small sampling interval of confidence, one can compare these estimates to those of vital registration. This method is probably the most accurate for estimating completeness of birth and death registration. It has been tried in various instances, such as Saint Louis (Senegal), Brazzaville (Congo), Yaoundé (Cameroon), Libreville (Gabon), and Madagascar.[17]
- *Indirect methods*: These methods have been derived by demographers to estimate death registration among adults. They are based on models and depend on certain hypotheses, such as population stability (constant birth and death rates and no migration for a long time) and constant underregistration by age. They have been used with some success in Latin America and are described in the UN Manual X.[18]

Table 3 gives estimates of completeness of birth and death registration in the world, according to IIVRS. Among the 213 countries surveyed, only 92 (43 percent) had complete registration for births, and 90 (42 percent) for deaths. An additional 29 had a high registration rate (>= 90 percent) for births, and 23 had a high registration rate for deaths (>= 90 percent).

Table 3 Completeness of birth and death registration in the world[19]

Country	Completeness (percent) Births	Completeness (percent) Deaths	Country	Completeness (percent) Births	Completeness (percent) Deaths
C= Complete U= Unknown					
AFRICA					
Algeria	C	U	Mali	U	U
Angola	U	U	Mauritania	U	U
Benin	U	U	Mauritius	100	100
Botswana	U	U	Morocco	82	20
Burkina Faso	U	U	Mozambique	U	U
Burundi	U	U	Namibia	…	…
Cameroon	85	30	Niger	U	U
Cape Verde	C	C	Nigeria	U	U

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[16] Garenne M, Zanou B. L'état civil en Afrique: Que peut-on en tirer? In *Clins d'oeil de démographes à l'Afrique et à Michel François*. Paris, Documents et Manuels du CEPED No. 2, 1995.

[17] Ibid.

[18] United Nations. Manual 10. Techniques indirectes d'estimation démographique. Département des Affaires Economique at Sociales Internationals. *Etude Démographique* no. 81. New York: United Nations, 1984.

[19] IIVRS. Civil registration and vital statistics: a collection of papers. Bethesda, MD, 1996.

Central African Rep.	11	6
Chad	U	U
Comoros	U	U
Congo	74	41
Djibouti	U	U
Egypt	100	100
Equatorial Guinea	53	58
Ethiopia	U	U
Gabon	...	...
Gambia, The	50	10
Ghana	45	20
Guineau	U	U
Guinea-Bissau	U	U
Ivory Coast	...	...
Kenya	U	U
Lesotho	45	20
Liberia	35	12
Libya	90	62
Madagascar	U	U
Malawi	1	1
Réunion	C	C
Rwanda	51	51
Saint Helena	C	C
Sao Tomé and Principe	C	C
Senegal	54	39
Seychelles	100	100
Sierra Leone	U	U
Somalia	0	0
South Africa	64	60
Sudan	25	5
Swaziland	23	26
Tanzania	U	U
Togo	80	15
Tunisia	C	U
Uganda	35	25
Western Sahara	U	U
Zaire	U	U
Zambia	15	10
Zimbabwe	U	20

NORTH AMERICA

Anguilla	C	C
Antigua and Barbuda	C	C
Bahamas, The	72	97
Barbados	85	80
Belize	U	U
Bermuda	100	99
British Virgin Islands	C	C
Canada	100	100
Cayman Islands	100	100
Costa Rica	97	95
Cuba	100	100
Dominica	C	C
Dominican Rep.	35	5
EI Salvador	C	C
Greenland	C	C
Grenada	94	90
Guadeloupe	C	C
Guatemala	95	90
Haiti	...	...
Honduras	U	U
Jamaica	90	90
Martinique	C	C
Mexico	96	89
Montserrat	100	100
Netherlands Antilles	C	C
Nicaragua	80	40
Panama	95	75
Saint Kitts and Nevis	100	100
Saint Lucia	100	100
Saint Pierre and Miquelon	C	C
Saint Vincent and the Grenadines	99	97
Trinidad and Tobago	98	100
Turks and Caicos Islands	C	C
United States	99	99
Virgin Islands	C	C

SOUTH AMERICA

Argentina	98	100
Bolivia	U	U
Brazil	75	75
Chile	100	100
Guyana	81	86
Paraguay	27	48
Peru	88	80
Suriname	95	95

Colombia	90	98	Uruguay	95	100
Ecuador	15	22	Venezuela	100	100
French Guyana	...	...			

ASIA

Afghanistan		...	Jordan	95	60
Armenia	100	100	Kampuchea (Cambodia)	...	...
Azerbaijan	99	28	Kazakhstan	C	C
Bahrain	87	U	Korea, North	…	…
Bangladesh	U	U	Kuwait	C	C
Bhutan	70	70	Kyrgyzstan	C	C
Brunei	C	C	Laos	...	...
China	90	90	Lebanon	U	U
Cyprus	85	85	Macau	100	100
Georgia	C	C	Malaysia	93	74
Hong Kong	100	100	Maldives	C	C
India	47	54	Mongolia	100	100
Indonesia	...	...	Myanmar (Burma)	90	90
Iran	U	U	Nepal	24	9
Iraq	U	U	Oman	...	...
Israel	100	100	Pakistan	35	35
Japan	100	100	Philippines	85	73
Qatar	95	95	Thailand	70	60
Saudi Arabia	...	...	Turkey	80	95
Singapore	100	100	Turkmenistan	C	C
South Korea	95	95	United Arab Emirates	...	...
Sri Lanka	99	94	Uzbekistan	C	C
Syria	88	54	Vietnam	...	...
Tajikistan	98	84	Yemen	...	...

EUROPE

Albania	C	C	Italy	100	100
Andorra	...	...	Latvia	C	C
Austria	100	100	Liechtenstein`	C	U
Belarus	100	100	Lithuania	100	100
Belgium	100	100	Luxembourg	100	100
Bosnia-Herzegovina	C	C	Macedonia	C	C
Bulgaria	C	C	Malta	100	100
Channel Islands	C	C	Moldova	...	...
Croatia	C	C	Monaco	C	U
Czech Republic	100	100	Netherlands	100	100
Denmark	100	100	Norway	100	100
England and Wales	100	100	Poland	100	100
Estonia	C	C	Portugal	85	99
Faroe Islands	100	100	Romania	100	100
Finland	100	100	Russia	C	C
France	100	100	San Marino	C	C

Germany	100	100	Scotland	C	C
Gibraltar	100	100	Slovakia	100	100
Greece	99	99	Slovenia	100	100
Hungary	100	100	Spain	C	C
Iceland	100	100	Sweden	100	100
Ireland	100	100	Switzerland	100	100
Isle of Man	100	100	Yugoslavia	100	100
OCEANIA					
American Samoa	C	C	New Zealand	100	100
Australia	99	99	Niue	100	100
Cook Islands	94	98	Papua New Guinea	...	...
Fiji	95	97	Solomon Islands	75	75
French Polynesia	U	U	Tonga	95	90
Guam	98	98	Tuvalu	26	9
Kiribati	70	60	Vanuatu	40	30
Marshall Islands	C	C	Wallis and Futuna	...	...
Nauru	C	C	Western Samoa	30	36
New Caledonia	C	C			

In other countries, civil registration was very deficient. In particular, among the 55 African countries, only seven had complete registration systems, none of which from continental sub-Saharan Africa (Egypt, Cape Verde, Mauritius, Réunion, São Tomé and Principe, Saint Helen, and the Seychelles). In addition two North-African countries, Tunisia and Algeria, had complete birth registration, despite incomplete death registration. A few African cities were analyzed earlier by various authors (table 4).

Table 4 Coverage of vital registration data in selected African countries and cities[20] [21] [22]

National	%	Urban	%	Rural	%
Cameroon		Yaounde, 1986–1987	32	Ngaoundere, 1965	16
Congo, 1969	29				
Côte d'Ivoire		Abidjan, 1975	50	Rural, 1970	21
		Abidjan, 1980	63		
		Abidjan, 1973–1983	66		
Gabon, 1970	19				
Ghana, 1974	22				
Kenya, 1970	34				
Kenya, 1979–1980	22				
Madagascar, 1970	51			Ambinanitelo, 1967	74
Madagascar, 1972	54	Antananarivo	99		
Mali, 1987	15				
Niger, 1985, 1989	40				
Rwanda, 1971	26				
Rwanda, 1973	65				
Sénégal, 1973	23	Saint Louis 1987-–88	95	Niakhar, 1961-–1965	5
Zaïre		Urban, 1970	26		

Results show that VRS were often deficient in these African cities, although some had virtually complete coverage, such as Saint Louis in Senegal and Antananarivo in Madagascar.

Using vital registration statistics in developing countries: Three case studies

Perhaps more important than formal estimates of coverage, completeness, and accuracy is the fact that VRS can be used to inform health professionals in developing countries. Three case studies were selected to illustrate this point, one from Asia and two from Africa, the continents where VRS deficiency is the most striking. As for England and Wales of the mid-19th century, when death registration was neither complete nor accurate for causes of death, but still useful to understand the health transition, the cases presented below show, through examples, what can be drawn from VRS in lesser developed countries (LDCs).

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[20] Podlewski A. Un essai d'observation permanente des faites d'état civil dans l'Adamaoua. Recherche méthodologique. *Travaux et Documents de l'ORSTOM* n° 5, Paris, 1970 (p. 169-178).

[21] Garenne et al., 1995 (*opus citat*).

[22] Gendreau F. *La population de l'Afrique : manuel de démographie*. Paris, Karthala - CEPED, 1993 (Chapitre 4: L'état civil : pp. 61-74).

Sri Lanka and the impact of malaria control
Sri Lanka (formerly Ceylon) has had a good system of vital registration since the beginning of the 20th century, although not complete before 1950. This country is one of the most famous success stories of the malaria eradication effort undertaken just after the end of World War II. Sri Lanka had a complex profile for malaria before 1945, with some highly endemic areas and some areas with lower prevalence. Malaria was eradicated within about a year following a comprehensive program of home spraying of insecticide drugs. Several models were developed to estimate the demographic impact of malaria eradication. Some took a linear approach to additive causes of death, others a multiplicative approach, such as for risk factors.[23][24] In both cases, they used vital registration data by causes of death and detailed geographical locations to estimate the net impact of malaria eradication. Without entering into academic debates about the optimal approach, it was clear from all studies that malaria eradication had a major impact on mortality, and accounted for about 30 to 40 percent of the observed sharp mortality decline in the years following eradication. Without vital registration and causes of death data, none of these studies would have been possible.

Abidjan and the impact of HIV/AIDS
Another good example of use of vital registration data, despite some deficiencies, is that of Abidjan. The capital city of Côte d'Ivoire has maintained a relatively good system of vital registration since the turn of the 20th century. Although quite deficient for children, completeness remained relatively high for adults of both sexes. Statistics were not published, so a team from the Ivoirian Statistical Office (INS) undertook to code the deaths for 20 years, from 1973 to 1992—that is, 10 years before and 10 years after the onset of the HIV/AIDS epidemics in that country.[25]

Using various methods, the study estimated completeness to be about 97 percent for male adults and about 81 percent for female adults in 1975. This was high enough coverage to make an estimate of the demographic impact of HIV/AIDS. By comparing death rates after 1986 to previous trends, the authors estimated that HIV/AIDS was responsible for at least 25,000 deaths in the city by 1992, a much higher figure than estimated earlier. The demographic estimates were supplemented with cause of death data recorded in Abidjan hospitals, which confirmed that most of the mortality increase was due to HIV/AIDS and opportunistic infections. The pattern of mortality increase in the city identified from the VRS further allowed researchers to reconstruct the dynamics of the HIV epidemic and document the sex differentials of AIDS mortality. Despite deficient data, these estimates of AIDS mortality were far more accurate and useful than those made earlier from confirmed cases in hospitals and from non-representative seroprevalence surveys. This indicates once more that VRSs can be useful, even when they are incomplete.

Antananarivo and the impact of urban famines
A study in Antananarivo, the capital city of Madagascar, is another case of using vital registration data for health information purposes. The death registration data revealed a mortality crisis that had been totally overlooked before. Madagascar has a long history of civil registration, beginning in 1878, when Malagasy queen Ranavalona II decided to make registration of births and deaths compulsory. The main purpose of this law was to monitor plague epidemics, as in London in the 16th century. In 1996, a team from the Ministry of Health in Madagascar undertook the coding of registered deaths for the period 1976–1995.[26]

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[23] Newman P. Malaria control and population growth. *Journal of Development Studies*, 1970; 6(2): 133-158.

[24] Gray RH. The decline of mortality in Ceylon, and the demographic effect of malaria control. *Population Studies*, 1977; 28(2): 205-209.

[25] Garenne M, Madison M, Tarantola D, *et al*. Conséquences démographique du SIDA en Abidjan. *Etudes du CEPED No 10*. Paris, CEPED, 1995.

[26] Waltisperger D, Cantrelle P, Ralijaona O. La mortalité à Antananarivo de 1984 à 1995. *Documents et Manuels du CEPED* No. 7, Paris, 1998.

This period was crucial for the country, since it was the end of the Malagasy communist period and the beginning of the new more liberal period after structural adjustment programs were implemented. The analysis revealed a severe mortality crisis during the years of the transition (1984–1986), after several years of steady mortality increase (1976–1983). The crisis, which could be analyzed with the help of causes of death recorded in the hospitals, was due primarily to a famine during the 24 months of the transition.[27] As in South Asia, the famine was due primarily to poor state management and speculation by the main economic actors controlling the rice market. This famine had never been documented before or discussed in the newspapers. It was revealed only by the detailed analysis of death rates and causes of deaths that were found in various registers of the VRS and hospitals.

Sample Registration System (SRS)

When vital registration statistics were inadequate and could not be used, other systems have been developed. The most famous is probably the Indian Sample Registration System, where births and deaths are recorded routinely from a representative sample of the population. This system is supposed to be relatively cheap and more accurate than formal VRS. It has been working in India since 1964. The system is sophisticated, with routine recording of events over time and an independent check every six months. This independent check is in fact a dual record system, and is assumed to be very accurate.

Local Registration: Demographic Surveillance Systems (DSS)

When national systems are not available, people have devised local schemes, usually with the explicit aim of conducting in-depth research. These schemes are called demographic surveillance systems (DSSs). They have been working for some 50 years in many areas throughout the world, primarily in South Asia and in Africa. Das Gupta *et al*. have summarized the experience with population observatories before 1990,[28] and a network (called In-Depth network) is currently federating the some 40 sites currently functioning in the world. These are small populations, accounting for roughly 20,000 to 200,000 people, that are followed carefully over time. Births and deaths are recorded routinely, together with in and out migrations, through regular visits to households. Visits can be as often as every week or as rare as every year, and typically are every three or four months. These sites allow demographic and health research and are well suited for evaluating interventions. Most are focused on health topics, and many have been the sites for vaccine trials, disease control, and nutritional or therapeutic interventions. With a few exceptions, these sites are rural and have relied on verbal autopsies to assess causes of death.

Verbal autopsies at national level: Example of Morocco

Verbal autopsies using standardized questionnaires have been developed in population observatories to compensate for the lack of cause of death statistics in rural areas of developing countries, where most deaths occur outside health facilities.[29] [30] [31] When conducted properly, such verbal autopsies can provide reliable estimates of causes of death for a limited number of conditions: major infectious and parasitic diseases, accident and violence, and some non-communicable diseases. Validation studies have shown that sensitivity and specificity can be reasonable for these conditions, compared to hospital diagnoses.

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[27] Ibid.

[28] Das Gupta M, Garenne M (eds.). *Prospective Community Studies in Developing Countries*. Oxford, UK: Oxford University Press, 1997.

[29] Garenne M, Fontaine, O. Assessing probable causes of death using a standardized questionnaire. A study in rural Senegal. In J. Vallin, S. D'Souza, and A. Palloni (eds.). *Measurement and Analysis of Mortality*. Proceedings of IUSSP seminar, Sienna, Italy, 7–10 July, 1986. Oxford, UK: Clarendon Press, 1986.

[30] Zimicki, Susan. L'enregistrement des causes de décès par des non médecins: Deux expériences an Bangladesh. In Jacques Vallin, Stan D'Souza, and Alberto Palloni (eds.). *Mesure et analyse de la mortalité: Nouvelles Approaches*. Cahier de l'INED No. 119. Paris: PUF, 1986.

[31] Fortney JA, Susanti I, Gadalla S, *et al*. Reproductive mortality in two developing countries. *American Journal of Public Health*, 1986; 76(2): 134-138.

Verbal autopsies can also be used at the national level when cause of death registration is poor. This has been done in Morocco in two studies conducted in 1987 and 1997, at ten-year intervals, on a representative sample of deaths of under-five children.[32] [33] Results not only provided estimates of cause specific mortality, but also allowed evaluation of the demographic impact of a series of health interventions conducted during the 1987–1996 period. Results showed the major impact of vaccinations (measles, whooping cough, tetanus) and oral rehydration therapies, whereas mortality from pneumonia and neonatal mortality from birth trauma and prematurity did not change over the period, suggesting a failure of current strategies against these conditions.

Conclusions

Civil registration, vital registration, and cause of death statistics remain a necessity for all countries that desire efficient population and health policies and want to be able to monitor the outcomes of these policies. CRSs and VRS are critical both for administrative and for statistical purposes. Both require merely more than political will and organization, and all of the countries that have made the necessary efforts seem to have succeeded. Installation and proper functioning of a CRS and a VRS take about a generation, if proper steps are taken, so there is no excuse for any country in the world not to have an efficient system by now, since most passed a law more than 25 years ago making CRS compulsory. Even if international agencies help, nothing can replace the state's political will to make CRS and VRS work.

Cause of death registration, coding, and statistics are more difficult to achieve. First, they require that almost all people die in health facilities, or that deaths are certified by a physician. Many developing countries simply do not have the necessary infrastructure and personnel to accomplish this. A proper CDS also requires standardization in coding causes of death and an efficient statistical system to publish the information. Many countries fall far short of this ideal state.

When data are deficient, alternative ways of producing vital statistics and cause of death statistics can be devised. In particular, verbal autopsies could provide valuable information for a number of important diseases, even at a national level.

Perhaps the most important message at this point is to show how VRS and CDS can be used in order to convince policymakers and health professionals to produce them. Even imperfect data, such as in England and Wales in the 19th century, or in Africa in the late 20th century, can be very informative for health planning purposes and research. Therefore, more efforts should be devoted to analyzing the currently available data.

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[32] *Etude Nationale sur les Causes et Circonstances de la Mortalité infanto-juvénile* (ECCD, 1988–1989). Rabat, Maroc: Ministère de la Santé Publique, 1989.

[33] *Causes et Circonstances de Décès Infanto-juveniles: Enquête Nationale*, *1998*. Rabat, Maroc: Royaume du Maroc, Ministère de la Santé, Direction de la Planification et des Ressources Financières, 2000.

Surveillance: What Is It? How Does It Relate to Routine Information Gathering and Use?

Do We Need It?

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Centers for Disease Control and Prevention (CDC)

Abstract

It is a truism that “all politics is local." Those who have worked in District Health Offices know that limitations of staff and logistics means that “all health information is integrated at the district level and below," because the same few staff members gather and analyze data (and do everything else). Recognizing this reality allows planners to build on the potential benefits of integration (training, shared logistics, etc.) and to minimize potential pitfalls (health workers spending all their time on one system, etc.).

Surveillance systems are the part of the health information system that provides rapid information to support public health responses that must often be made on short notice. Because surveillance systems may generate information of political interest, there are opportunities to increase the amount of resources that can be shared at the local level. Surveillance has many definitions, all of which imply collection of information for rapid action. Information from the surveillance system is one source of data for the routine health information system. The type of action and when the action would need to be taken should determine the objectives and the method of collection of health information.

The U.S. Centers for Disease Control and Prevention (CDC) has worked with WHO (headquarters and African Regional Office [WHO-AFRO]) to define a strategy to improve infectious disease surveillance, epidemic preparedness and response (EPR) called the Integrated Disease Surveillance (IDS) strategy. The IDS strategy focuses on 19 priority infectious diseases and is implemented through phases of assessment, prioritized action planning, implementation, monitoring and evaluation. To date, 19 countries in the 46 country WHO-AFRO have initiated IDS. Data from 10 countries’ assessments will be presented.

In the IDS strategy, improvements are based on a definition of the core activities of surveillance and EPR (i.e., detection, confirmation, registration, reporting, analyses, response, and feedback), support functions which include training, supervision, coordination, communication, and resource-provision, and the levels at which they occur (i.e., community, health facility, district, national, international). CDC, WHO-AFRO and partners have developed technical guidelines to help countries with implementation of IDS, based on the core activities and support functions of surveillance and EPR, focusing on the district level.

Challenges in the way forward include how the current health information systems can be used as a vehicle for improved surveillance and EPR and the utilization of disease specific programs against HIV/AIDS, TB, malaria and polio. Efforts are also underway to develop indicators that would measure the impact of improved surveillance and EPR.

Power Point presentation follows.

Surveillance: What, How, Do We Need It, What's New?

Peter Nsubuga MD, MPH

Centers for Disease Control and Prevention

Overview

- Definitions
- Objectives of surveillance systems
- Core activities and support functions of surveillance and response
- Surveillance and Response matrix
- Current status of surveillance in Africa
- Challenges

Definitions

Public Health Surveillance

"ongoing systematic collection, analysis, and interpretation of data on specific health outcomes, closely integrated with the timely dissemination of these data to those responsible for prevention and control"

Thacker SB, Berkelman RL. Public health surveillance in the United States. Epidemiol Rev 1988;10:164-90."

Definitions

[Health] Information System

"a combination of vital and health statistical data from multiple sources, used to derive information about the health needs, health resources, costs, use of health services, and outcomes of use by the population of a specified jurisdiction"

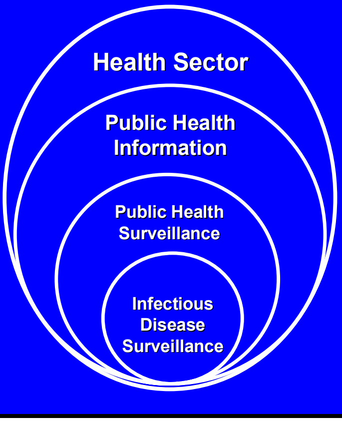
Last JM. A dictionary of epidemiology. second edition. New York: Oxford University Press, 1988.

Objectives of Surveillance Systems

Determined by

- What action can be taken
- When (how often) the action needs to be taken
- What information is needed to take/monitor the action
-

Information Components of the Health Sector



Initiatives in Surveillance and Response

Core Activities of Surveillance and Response

- Detection
- Confirmation (epidemiologic and laboratory)
- Registration
- Reporting and Feedback
- Analyses
- Response (acute and programmatic)

Support Functions

- Training
- Supervision
- Communication
- Coordination
- Resource-provision
- Monitoring and evaluation

Levels of the Health System

- Community
- Health facility
- <u>District</u>
- (Regional or other intermediate level)
- National
- International (e.g., WHO)

Surveillance and Response Matrix

	Identify	Report	Analyze	Investigate	Respond	Feedback	Evaluate
Community							
Health facility							
District							
National							
International							

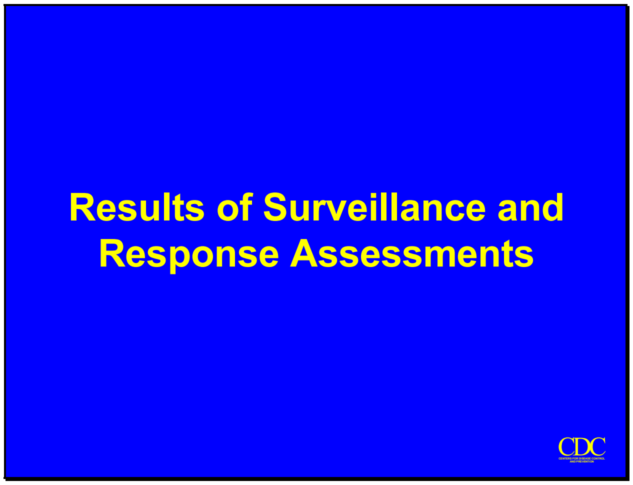
Integrated Disease Surveillance and Response (IDS) Strategy

- Partners: WHO (HQ, AFRO), CDC, USAID, UNF
- Started in 46 country WHO-AFRO in 1998
- Aim: Improve surveillance, epidemic preparedness and response
- Focus: 19 communicable diseases
- Phases: Assessments, prioritized plans of action, implementation, monitoring and evaluation

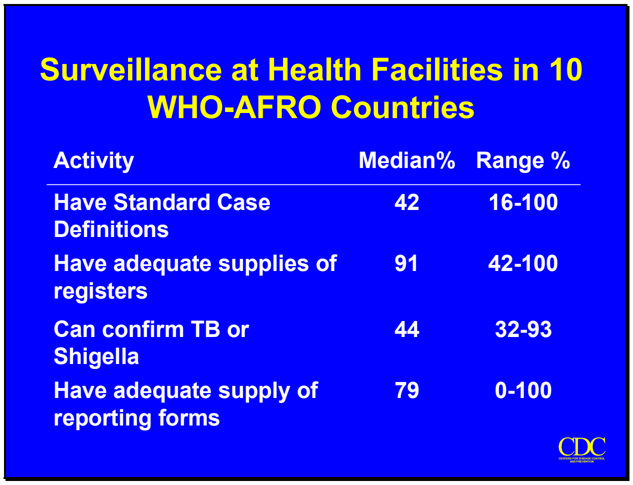
IDS Progress

- Regional activities
  - Tools for assessments and planning
  - Technical guidelines for implementation
  - Regional training in laboratory methods

- Country activities
  - 19 country assessments
  - 10 plans of action
  - Targeted implementation in 4 countries

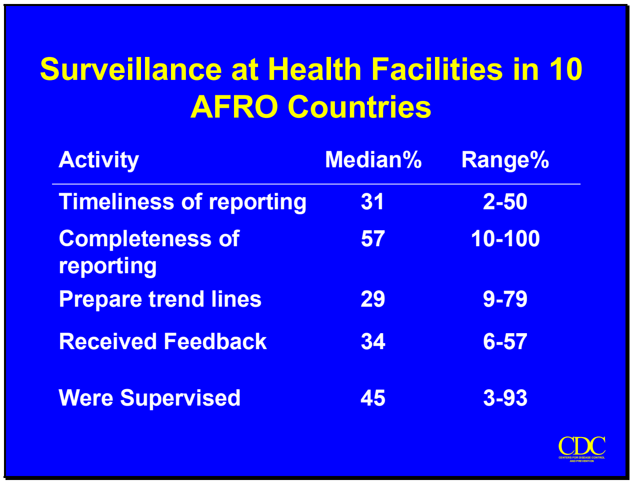


Results of Surveillance and Response Assessments



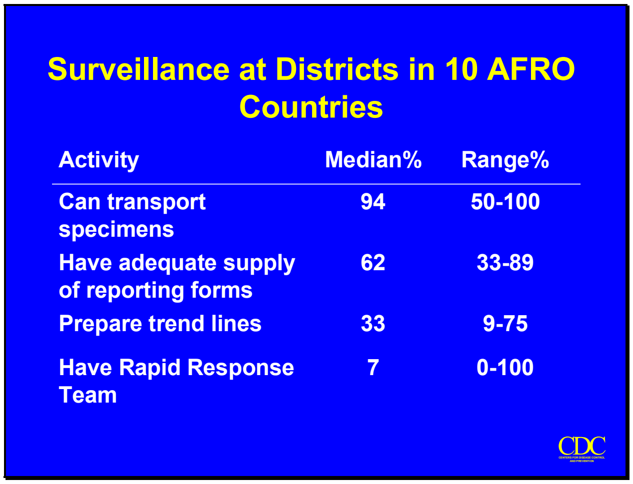
Surveillance at Health Facilities in 10 WHO-AFRO Countries

Activity	Median%	Range %
Have Standard Case Definitions	42	16-100
Have adequate supplies of registers	91	42-100
Can confirm TB or Shigella	44	32-93
Have adequate supply of reporting forms	79	0-100



Surveillance at Health Facilities in 10 AFRO Countries

Activity	Median%	Range%
Timeliness of reporting	31	2-50
Completeness of reporting	57	10-100
Prepare trend lines	29	9-79
Received Feedback	34	6-57
Were Supervised	45	3-93



Surveillance at Districts in 10 AFRO Countries

Activity	Median%	Range%
Can transport specimens	94	50-100
Have adequate supply of reporting forms	62	33-89
Prepare trend lines	33	9-75
Have Rapid Response Team	7	0-100

Surveillance at Districts in 10 AFRO Countries

Activity	Median %	Range%
Responded within 48 hours	33	25-75
Received Feedback	25	0-82
Trained in Surveillance	54	0-100
Have telephone	80	50-100
Have vehicle	94	17-100

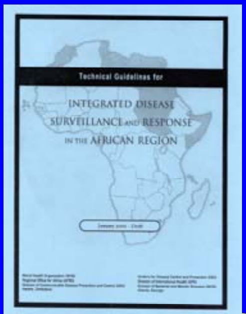
Summary of Results

- Major weaknesses
  - Case definitions
  - Lab confirmation
  - Timely reporting
  - Data analysis
  - Rapid response
  - Feedback
  - Supervision
- Strengths
  - Forms (Registers, reporting forms)

IDS Generic Technical Guidelines

Lutte contre les Maladies transmissibles dans la Région Africaine

Guide Technique
de
Surveillance Intégrée et de Riposte



Technical Guidelines for

INTEGRATED DISEASE
SURVEILLANCE AND RESPONSE
IN THE AFRICAN REGION

The Matrix at the IDS Field Test in Tanzania, 2000

Challenges

- Many countries have health (management) information systems: how can they be improved for surveillance?
- How can we use targeted disease-specific programs (e.g., TB, HIV, Malaria, Polio) to strengthen surveillance?
- How will we know when we have succeeded?

Integration of Polio in 32 African Countries, 2000

Attribute	N	(%)
Use AFP resources for surveillance for other diseases	26	(81)
Combine detection for other diseases with AFP	28	(90)
Inform clinicians about other diseases when informing them about AFP	27	(87)
Use AFP laboratory transportation system for other diseases	14	(44)
Total	32	

Theme 2

The role of routine health information in facilitating and monitoring health sector reform

ion and Health Sector Reform:
g Through Better Information

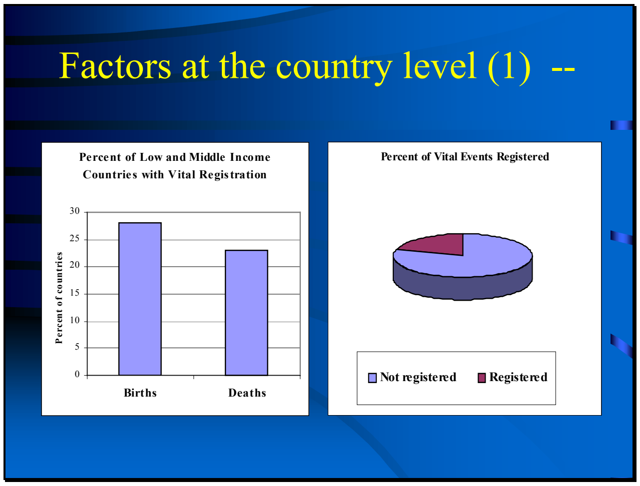
, World Bank

Why does this happen ?

- At the Bank*, **Not*** because of lack of knowledge/policy -- 30 years of exhortation , multiple 'performance indicator' guidelines
- Weak incentive structure **within** the Bank:
  - focus on appraisal, new commitments
  - decline in allocations for supervision over time'
  - focus on 'fiduciary supervision' -- crowds out technical review and monitoring
  - lack of mechanisms for review of M and E results internally
- Lack of resources, skills -- especially combination of managerial and technical skills

At donor level:

- Donor agencies are under pressure to report on results to to their immediate ‘authorizers’ -- e.g. Congress, Parliamentarians…
- Short time horizons --
- Reinforces tendency to ‘report up’ , ‘extractive’ approach to design and operation of health information systems
- Competition for resources inhibits willingness to work toward ‘common denominators’



Factors at the country level (1) --

Percent of Low and Middle Income Countries with Vital Registration

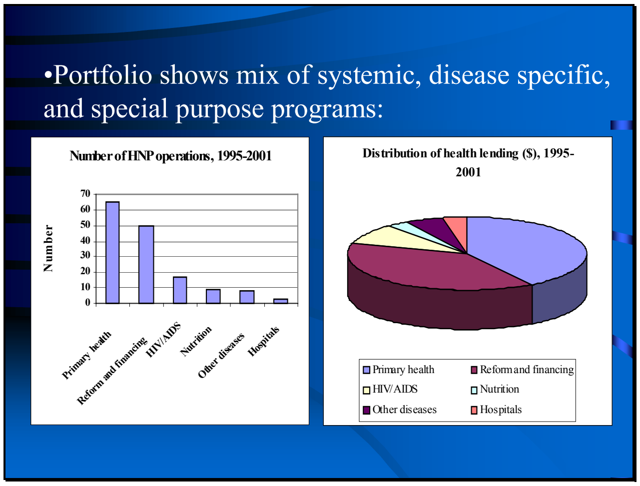
Percent of Vital Events Registered

Factors at the country level (2)

- Gaps in basic‘information infrastructure’ : (e.g. registration of deaths, births not existent or incomplete in most countries)
- Planning and budgeting systems not performance based.
- Donor dominance of measurement capacity that does exist (e.g. DHS, MICS, LSMS not useful for district level decision-making)

Current Trends, cont

- Forms and mechanics of assistance are changing to recognize:
  - – that country and local **ownership** is key to success
  - – need to reduce complexity, **maximize** coordination
  - – that ‘fungibility’ negates traditional approaches to accountability
- SWAps a response in HNP, PRSPs and the Comprehensive Development Framework more general



•Portfolio shows mix of systemic, disease specific, and special purpose programs:

Number of HNP operations, 1995-2001

Distribution of health lending ($), 1995-2001

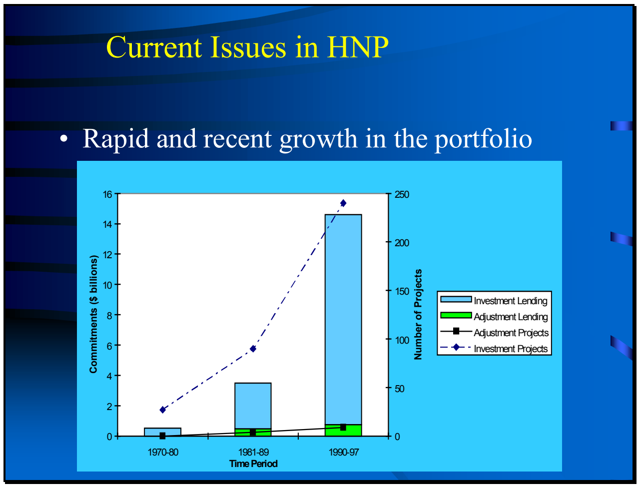
Current Trends, cont

Both traditional, disease-specific and newer Sector reform efforts can not succeed without:

better, and better use of, local information for decision making

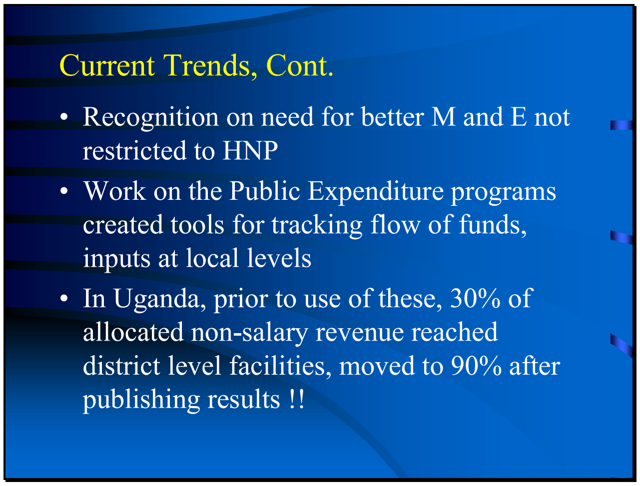
Current Trends, cont

- Sector reform aims to:
  - – improve health outcomes
  - – attain sustainable and equitable financing: economic access
  - – provide stewardship: quality, standards
- Sector reform focuses on **quality and responsiveness of decision making**
  - – better use of cost/financial information
  - – decentralization



Current Issues in HNP

- Rapid and recent growth in the portfolio

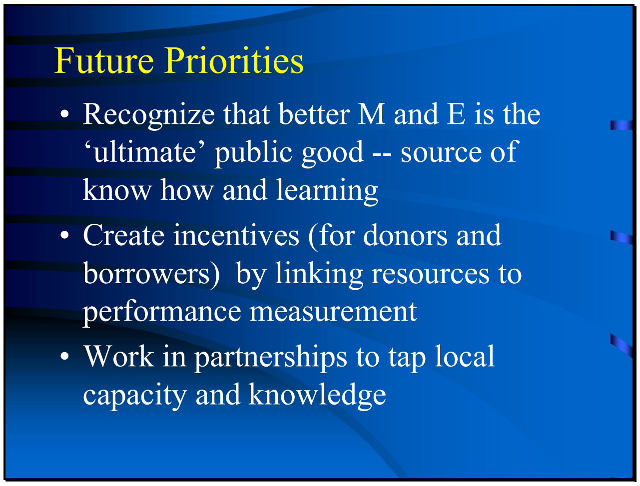


Current Trends, Cont.

- Recognition on need for better M and E not restricted to HNP
- Work on the Public Expenditure programs created tools for tracking flow of funds, inputs at local levels
- In Uganda, prior to use of these, 30% of allocated non-salary revenue reached district level facilities, moved to 90% after publishing results !!

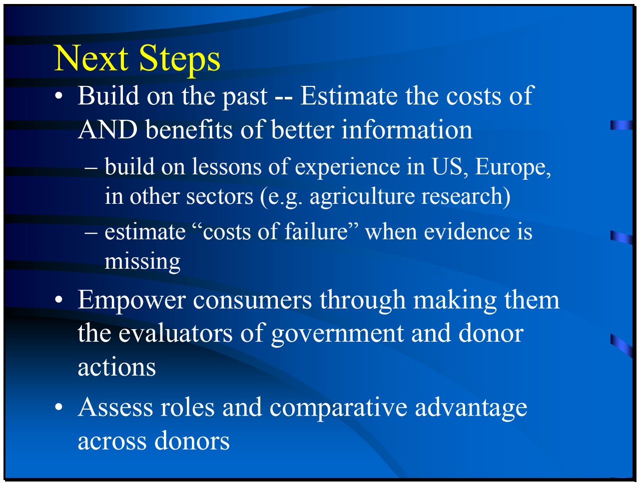
Implications for the Future

- Health is not improved by good intentions, *evidence matters*
- Accountability for results *more* not less important in future
- Providers and donors aren’t the only game in town -- consumers must have voice!
- We can no longer afford to ignore the need for investment and action to improve information infrastructure



Future Priorities

- Recognize that better M and E is the ‘ultimate’ public good -- source of know how and learning
- Create incentives (for donors and borrowers) by linking resources to performance measurement
- Work in partnerships to tap local capacity and knowledge



Next Steps

- Build on the past -- Estimate the costs of AND benefits of better information
  - – build on lessons of experience in US, Europe, in other sectors (e.g. agriculture research)
  - – estimate “costs of failure” when evidence is missing
- Empower consumers through making them the evaluators of government and donor actions
- Assess roles and comparative advantage across donors

Using Health Information to Sustain Support for Health Reform in Africa

Julie McLaughlin
Senior Health Specialist
Africa Region
The World Bank

This presentation aims to cover three things. First, I share some experiences of the Health Reform Program in Zambia that I think exemplify the critical role of health information within reform programs. These experiences also suggest that reform efforts must specify the model against which they are operating.

Second, I share some examples of how development partners are helping other countries in the region to avoid similar pitfalls that were found in Zambia. Their main approach is to introduce incentives that encourages countries to 1) define a model that depicts the ways in which reform initiatives are expected to impact the health system, and 2) monitor progress toward stated aims and targets.

Last, I briefly describe Bank instruments and initiatives that can create incentives for tracking progress and for getting the health reform model right.

Many may be familiar with the Zambian Health Sector Reform Program. It is worth highlighting that the program was developed before the terms "sector investment program" and "sector-wide approach" (SIP and SWAP) were formulated. However, the Zambian program helped to propel the main tenets of sectoral investment approach, that is of a long-term, comprehensive development program jointly supported by multiple partners. The Zambian program also initiated the now fairly common mechanism of joint annual reviews.

The widely cited intention of reform in Zambia was to achieve "equity of access to cost-effective, quality health care as close to the family as possible." However, a strategy monitoring progress toward achieving this aim was not defined. Reformers also did not make explicit the intended results expected from reform strategies or how these initiatives would result in equity of access to cost-effective care (the model).

Therefore, during the Annual Joint Reviews, existing health programs (which had indicators and recognized input-output-outcome models) continued to present their data and information. Financial indictors also were increasingly available. However, the approach used to measure overall progress of health reform was more akin to a common perception of progress among colleagues. People *felt* things were going well. The health information provided flavor, but was not used to explain the impact of policies and strategies included under the title of "reform."

When these mutually satisfactory perceptions were tested due to changes in leadership, donor representation, and increased external scrutiny, some detractors began using existing health information (i.e., from priority/vertical programs) to publicize the "failure" of reform initiatives. For example, the model by which reform should lead to higher immunization coverage, although intuitively correct, was not found to be effective in the short term. Thus, these standard measures served a tool for some stakeholders who were not served well by reform initiatives such as decentralization, integration of vertical programs (including loss of power), and donor coordination. The reformers were not in a position to counter criticism with data. They could not explain how the initial reform initiatives were intended to improve achieve results (i.e., service standards, resource allocation, accountability, deployment of staff, and systems) and *thus* lead to *sustainable* coverage, quality, and access because they had not specified a particular model or conceptual framework. Nor had they defined measures of success against which their work could be assessed.

Using indicators to diagnose and inform strategies, and direct and evaluate progress, implies use of a model that depicts causal relationships between variables. For example, we monitor oral rehydration salts (ORS) use rates because we accept that use of ORS decreases diarrhea deaths, and that decreasing deaths from diarrhea is a valid aim for a diarrheal disease control program.

We can define discrete models fairly readily, and we have the efficacy tests and can understand how behavior affects outcome in the case of ORS use. However, models of the impact of health reform are much more complex. We have far less understanding of how to model and assess the impact of decentralization, new financing mechanisms, staff satisfaction, improved logistics. When we do not understand the complex model, it is easy to interpret and diagnose wrongly. In the case of Zambia, one new Minister of Health—who did not see advantages of donor coordination, decentralization of authority, or staff empowerment—was able to build support for a simple message:
"specific reform strategies and policies were not yet resulting in improvements based on commonly used measures of service coverage. Thus, reform strategies and policies must be inappropriate and should be revised." The reformers were unable to counter such a message because they had no data to back up their strategies or progress expected as a result of reform. The result was significant backpedaling on certain reform initiatives, and criticism from outsiders about the "overemphasis on process."

However, we all are learning from experience. A quick review of documentation of new health sector reform operations that receive World Bank financing suggests an increased recognition and clarity surrounding the kinds of results that might be attributed more reasonably to common reform policies.

Traditionally HIS efforts have been couched within project components for building health systems (efforts that have produced notorious white elephants and countless reams of paper forms that were never used to inform decision making). Alternatively, HIS were established solely to respond to donor requirements. Some recent efforts have been more enlightened and have sought to foster demand for health information.

Increasingly, within reform and within sector-wide programs, there have been efforts to define an agreed list of "core indicators" against which all parties will track progress. I am not suggesting that these are the right indicators, but rather that the process of agreeing on a limited list of indicators— to be reported on annually—creates the impetus define impact models, the intentions of policy reform, and to collect, analyze, and use routine health information to monitor progress.

The mechanism of a "core list of indicators" also helps Ministries of Health, which often lack the capacity to respond to heavy demands for data, to streamline demands for reporting and consider how such indicators will be interpreted by various stakeholders (donors, MOF, health professionals, and constituents).

We also see increasing efforts to link performance to the achievement of specific targets. In some settings (e.g., Ghana, Zambia, Indonesia), there are initiatives that tie decentralized financing to certain targets. Adaptable program loans (APLs) and tranched financing can also create powerful incentives to define the right models and measure progress toward achievable targets.

The Bank recently developed a lending instrument that can reduce the effort needed to acquire subsequent financing for the same program, through setting explicit, objectively verifiable targets that will trigger new financing. APLs can foster increased emphasis on tracking progress toward targets, an improvement over the more traditional insistence on adhering to predefined lists of activities and inputs to be financed over a stated period of time. The greatest challenge to developing an APL is getting the targets right.

Adjustment lending from the Bank (i.e., balance of payments support) and more recently HIPC (i.e., debt relief) is commonly *tranched*, whereby the release of portions of funding is contingent on meeting defined targets. Poverty reduction strategy credits* (PRSCs) provide budget support for a comprehensive development program and a total expenditure program that seeks to reduce poverty. They often require that predefined targets be met related to reduction in private support to determine the rate of fund disbursement.

Debt relief programs and poverty reduction strategies are required to prioritize health interventions and improvement, and thus provide a real opportunity to focus attention on health information. Predicating national budget financing on health sector targets results in much greater support for tracking health indicators and defining the right indicators. Setting EPI or contraceptive coverage targets for HIPC money is a sure way to create internal government demand for tracking this information.

Let me conclude by making two points. First, defining indicators and investing in the development of health information systems is only a part of what must be accomplished within a reform program. We also need to know how to monitor and evaluate reforms, and we cannot do so without some common understanding of how reform strategies and policies are expected to have an impact (a model). Second, external financiers can and should help create the necessary demand for information.

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* "Credits" are provided, rather than loans, to countries that have GDP per capita below a specific amount, currently $925. These countries account for the large portion of the developing world. Credits are interest free, allow a 30- to 40-year repayment plan, and have a 10-year grace period. Given the decreasing value of money over time, only an estimated 20 percent of the value of the loans is repaid.

Health Information and Decision Making at the Community Level: Building and Using Simple Systems

Karima Saleh
Health Economist
The World Bank

A community-based primary health care system in urban slums of Karachi, Pakistan involved a simple health management information system (HMIS). Data were collected by community health workers for efficient management of the service delivery area. Supervisors monitored the workers more effectively due to the timely availability of action-oriented data, and prompt feedback and support that was provided to community workers. Program managers and policy makers monitored the coverage of the program, evaluated the targets achieved, and provided quick program support and budgetary response.

Part of the success of the HMIS could be attributed to the following: the primary reason for routine data collection was for “ program use”, and not for recording or to meet someone else’s data needs. The collector of routine data was trained in the purpose of the data being collected, and was therefore able to use the data in the job. “Minimal” data was collected, and the HMIS avoided overwhelming the workers with data, and relieved the workers from spending too much time on data recording. Data played a support role for the work, as data not only flowed from bottom-to-top, but from the top-to-bottom to provide feedback as designed. The key message was that routine data were to be collected for “decision making” and for “decision support”.

Some of the shortfalls of the program highlighted the importance of workers’ training, workers’ motivation, and supervisory support. A cost-effectiveness analysis expected in the evaluation of the program.

Power Point presentation follows.

Health Information
and Decision Making
at the Community Level:
Building and Using Simple Systems

Karima Saleh, World Bank

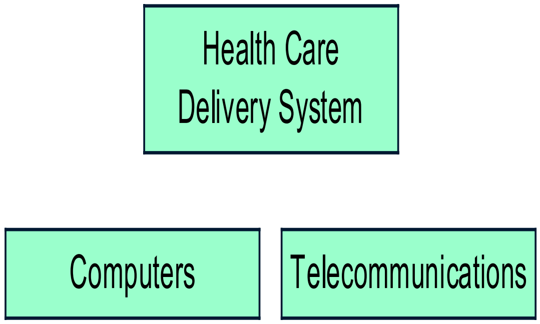
RHINO Workshop
March 14, 2001

Key Message-
Minimal information should be gathered:

- for the purpose of "*decision making*" and for "*decision support*"

- Modern health care sector management, including health care services provision, public health management and health insurance are information-driven businesses. They depend heavily on the reliable and efficient acquisitions, storage, retrieval, transmission and analysis of information.

HMIS are institutional capacity building projects, and should be seen in the big picture


Health Care Delivery System

Computers

Telecommunications

HMIS is necessary:

- for achieving operational efficiency gains, and
- for a more decentralized management structure

What have been some past mistakes in the HMIS at the community level?

- Information gathering was just an activity, with little understanding of its functions and use.
- Data collection was tedious and time consuming, and could take as much as half of the workers time.

- Data was recorded, but implementers did not know how to use this data in their job (or its relevance), as workers had not received training on purpose of data collection, and use of the data recorded in their jobs.
- Data needs were identified from top-down. Mostly data was collected to fulfill donor needs.

CASE STUDY: Community-based PHC Project in Urban Slums of Karachi, Pakistan

- Population Covered = 10,000
- Children Under-5 years = 2,000
- Community Health Workers = 10
- Supervisors = 2
- Project Manager = 1
- Primary health concern: communicable disease among children
- Provision: continuing primary health care and referral (health centers, hospitals)

HMIS had 2 critical functions in the project:

- To gather information required for oversight of the functions and performance of the health care system as a whole, and
- for the production of statistics on morbidity and mortality

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Regular tracking is a key characteristic of performance measurement

- Each Child had a health registration card, with name, age, vaccination status & due dates, nutrition/growth chart, morbidity history & action taken, and CHW visits.
- Each CHW had two registers: (i) child visit register to monitor children during visits and update register from child health card, and (ii) target population register to assess condition overall, and make decisions on an informed basis

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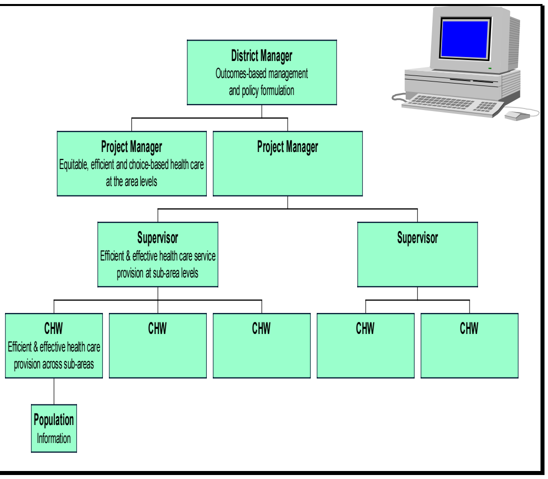


District Manager
Outcomes-based management and policy formulation

Project Manager
Equitable, efficient and choice-based health care at the area levels

Project Manager

Supervisor
Efficient & effective health care service provision at sub-area levels

Supervisor

CHW
Efficient & effective health care provision across sub-areas

CHW

CHW

CHW

CHW

Population
Information

For example:

- At the community level, workers use data to assess which children are to receive vaccination today, what is the outcome of today's visit, and who needs to be targeted tomorrow.
- At the supervisory level, data is used to assess how many children are fully immunized in a particular area, and which workers need special attention.

- At the program managers' level, data is used to assess what strategies should be adopted to improve immunization status in a particular area.
- At the policy makers level, data is used to assess equity consideration, such as where should resource be allocated to improve immunization status.
- Data is also flowing from top-down through *timely and appropriate decision, feedback and support*

What are some innovations that are taking place in the HMIS at the community level?

- Information needs are being identified at the *community level*. The community is involved in the development of the key output & outcome indicators and data needs.
- Workers are receiving training on the purpose of the data being collected, and how they can *use* the data in their jobs.

- The need to *minimize* data collection/ recordings are being emphasized, and therefore data collection/recording time is being replaced with data analysis time.
- Data collection at the community level is part of the Health Management Information *System*, and a support for the Health Delivery System.
- Data is flowing from *bottom-up*, with decision making at each level on informed-basis.
- Data is also flowing from top-down, through support and decision on informed-basis.

What are some benefits to the project from HMIS:

- needed information is readily available
- information is standards-based
- decision is made on informed-basis
- information is integrated throughout the project 's health delivery system
- local decision making capacity

What are some challenges facing the project?

- Broaden use of computer systems in health sector
- make information more accessible to providers
- integrate information for wider network of providers
- confidentiality of patient information

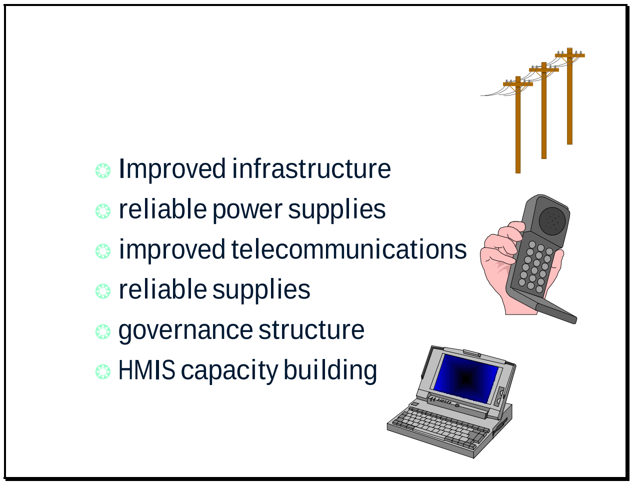
What are some lessons for future investment in HMIS at community level?

- Community level needs to be involved from the very beginning of the Health Management Information <u>System</u> development (bottom-up approach), within the Health Delivery System.
- Key <u>output and outcome indicators</u> and standards need to be identified from the start.
- "<u>Minimal</u>" data-need to be emphasized.

- Data are for decision making and for decision support.
- Capacity needs to be built and to be sustained at the community level.
- Resources need to be mobilized for HMIS at the community level for manpower training, supervision, technical tools (e.g.computer), etc.

Investment Agenda - *HMIS is an increasingly important component of health reform in the developing world*

- It is essential to make sure that the capacity to build, and to sustain, such systems is in place
- It is essential to develop the technical and organizational capacity in the developing countries to design, develop and implement appropriate and affordable HMIS.



- Improved infrastructure
- reliable power supplies
- improved telecommunications
- reliable supplies
- governance structure
- HMIS capacity building

South Africa's District Health Information System: Case Study from Eastern Cape Province

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This case study describes efforts to support improvements to health services in South Africa's Eastern Cape province through the enhancement of the province's Health Information System. It describes the context of health systems reform in which these enhancements were made, key characteristics of the information system, the process undertaken by many players at different levels of the health systems, and identifies a variety of lessons learned that should prove useful for similar efforts in other countries.

One of the most interesting aspects of the work highlighted in this case study is the fact that the system was introduced into a rapidly changing health care system – and the system's implementation has helped both to monitor that change and to shape the change process. During discussions to gather information for this case study many examples of this inter-relationship were discovered. To cite just a few: district health workers have been using the system to help monitor priority health problem trends and the coverage of services such a EPI, TB and STD contact tracing in specific geographic areas. This has allowed allocation of increased resources to those facilities lagging behind. Analyses of certain indicators, such as workload, have assisted in the reallocation of staff and the determination of new locales for introduction of health services. Tracking selected supplies/drug stock-outs monthly has resulted in dramatic improvement in essential drug availability at clinics, with the average percentage out of stock dropping from 13.2% in 1998 to 8.0% in 2000. At the same time, the introduction of the system has led to the determination of new functions and staffing requirements to support data management at the district and regional levels.

For public health professionals and multi-disciplinary teams involved in developing health management information systems, the Eastern Cape experience is rich in lessons learned and innovation.

Background

HIS in South Africa since the Apartheid era

South Africa (SA) has seen significant change in its health system since the end of apartheid. During the apartheid era, there were stark inequities in access to public health services. Health services were fragmented and there was a multi-tiered system for whites and three other 'racial' groups as well as a large private sector. The SA health sector was, and to some extent still is, very hospital- and curative-care oriented. Whereas this systematic discrimination based on skin colour has been abolished, there are still significant differences in public health services between historically advantaged and historically disadvantaged areas, both within and between provinces. Similar inequities in access to health services remain in the large and technically advanced private health sector, which continues to account for around 60% of overall health expenditure. The private sector only caters for the 20% most affluent with medical insurance, a group still predominantly white.

Eastern Cape province was typical of this pattern, with much of the land being part of the Republic of South Africa, but with a large proportion of the population living in two homelands (Transkei and Ciskei). Without a uniform national health service, health information systems varied greatly depending upon the local initiative of the health authority providing the services. These systems generally focussed on hospital/practice management and to a lesser extent epidemiological surveillance.

> *"The economical and political focus on hospitals and hospital information systems, as opposed to primary health care, has made it difficult to (re)-direct funds and resources to district-based information system development. [It is estimated that], 90-95% of all development expenditure for new health care information systems today are spent on Hospital Information Systems (this excludes the cost of stationary, transport, and staff time used for existing data collection mechanisms)."*[1]

There were limited guidelines as to what information should be collected and reported to the central level. Each province and homeland (14 such areas) and most vertical programs (including TB, EPI, STDs, FP, MCH, nutrition, chronic illness), had developed and deployed their own systems independently. Health workers at all levels were faced with multiple reporting formats in which massive amounts of data were recorded.

With the end of apartheid in 1994, this pattern began to change. The National Health Bill provided for the development of a district health system covering defined populations and responsible for all public health services in those areas. At the same time, the Ministry of Health became more conscious of the need to monitor health status and health service performance. This led to the publication of a document entitled "Year 2000 Health Indicators: Definitions and Data Sources". This mandated the collection of a limited set of standardised data elements.

Definition of HIS

A health information system[2] is a set of tools and procedures that a health program uses to collect, process, transmit, and use data for monitoring, evaluation and control. The DHIS in South Africa is the acronym used to describe both the District Health Information System in the broad sense, and the District Health Information Software (used to manage the data collected by this system). It includes the

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[1] Developing District-based Health Care Information Systems: The South African Experience; Jørn Braa, University of Oslo (jbraa@ifi.uio.no); Calle Hedberg, University of the Western Cape & University of Cape Town (chedberg@mweb.co.za).

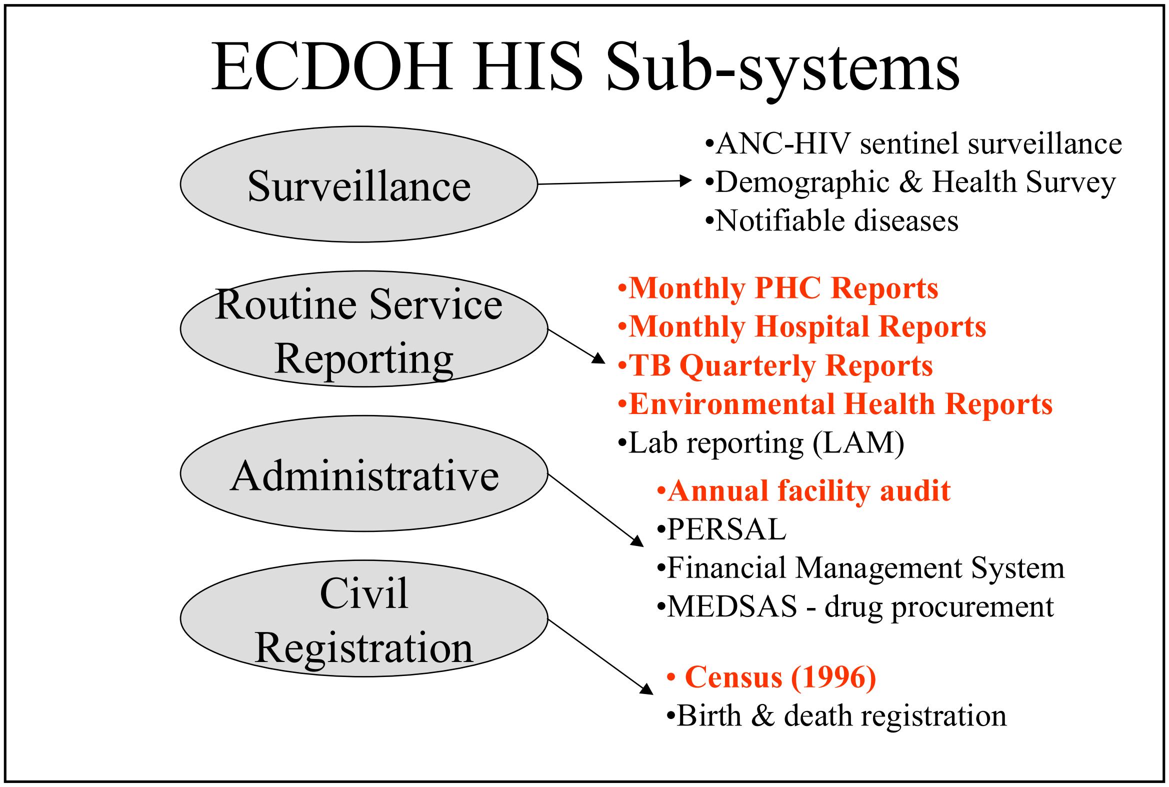
[2] Note: this is also often referred to as a Health Management Information System (HMIS) when data is collected and used to improve health system management in addition to meeting conventional disease surveillance objectives.

procedures and formats used in all health facilities to collect and report the data, as well as the roles and authority enabling health workers to use their data to improve health service performance.

Initiatives to enhance health information systems typically deal with several or all of the following data management steps:

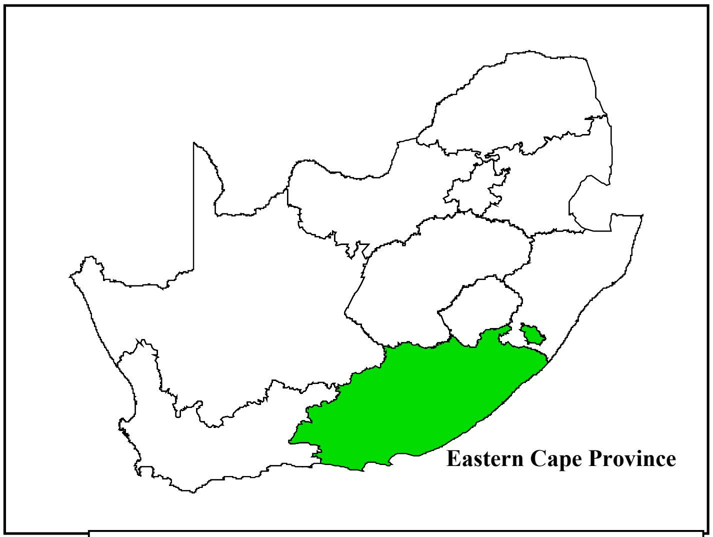
1. Collection: This typically includes rationalising the amount and types of data that is collected, improving formats and procedures for data recording and reporting.
2. Processing: Among the improvements in this area are: computerisation of data capture, analysis, and feedback reporting.
3. Use: This step is often the most difficult to influence because it requires a change in attitudes as well as just the availability of new information and procedures. Efforts to introduce a 'data culture' (in which people base their decision-making on evidence rather than intuition or habit) typically focus on:
   - Establishing standard procedures for use of data and information at the level at which it is collected,
   - training staff in data analysis and interpretation, and
   - incorporating data/information use into routine activities such as supervision and planning.

A health information system typically includes a variety of sub-systems. The illustration in figure 1, below, provides an overview of the various components of the Health Information System in Eastern Cape Province. The elements highlighted in bold are currently included in the DHIS.



HIS Evolution in Eastern Cape Province

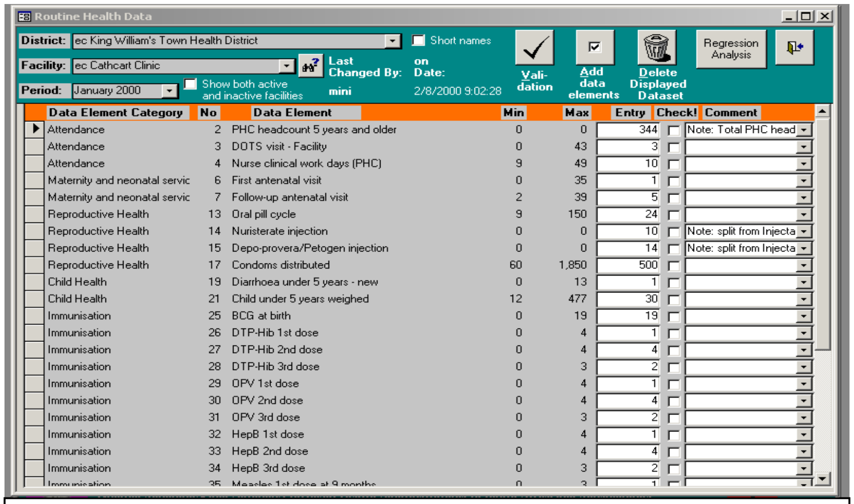
Eastern Cape Province, one of South Africa's 9 provinces, has a population of around 7 million, currently organised administratively into 5 Health Regions and 21 Health Districts. The province has a network of 700 clinics, 130 mobile routes, and 64 district/community hospitals that also provide some primary health care services.



Since 1994, a number of initiatives were undertaken, mostly on a pilot basis in certain areas, such as the Drakensburg area, to improve primary health care related information systems. These efforts included several noteworthy innovations, including the introduction of standardised tick registers that simplified the recording and tallying of data on different types of patient visits. A major push to enhance the health information systems in Eastern Cape province began in 1997 with support from the USAID-funded EQUITY project. Initial steps during that year included detailed discussion with all programme managers to select a very small set of indicators that would be valid and sensitive to change in relation to key elements of each health service area. These indicators helped to define a minimum data set of 20 items (later increased to 25) with precise definitions to be captured at each of the more than 900 or so PHC facilities. Computers with 16MB of RAM were purchased in 1996/97 and installed in all 21 health district offices. A computer program was initially designed using Clipper (a DOS-based dBase compiler), to enable data capture of this data set, but this system lacked the flexibility desired for reporting and for enabling districts, and even individual health facilities, to capture additional data elements of their own choosing.

Initial PHC Minimum data set indicators:

- Workload (1)
- Tracer drug availability (1)
- Maternal Health/Family Planning (7)
- Child Health (3)
- STD (2)
- Mental Health/Chronic Care (3)
- Referrals (1)
- Information system (2)



District: ec King William's Town Health District
☐ Short names
Facility: ec Cathcart Clinic
Last Changed By: mini
on Date: 2/8/2000 9:02:28
Period: January 2000
☐ Show both active and inactive facilities

Data Element Category	No	Data Element	Min	Max	Entry	Check!	Comment
Attendance	2	PHC headcount 5 years and older	0	0	344	☐	Note: Total PHC head
Attendance	3	DOTS visit - Facility	0	43	3	☐	
Attendance	4	Nurse clinical work days (PHC)	9	49	10	☐	
Maternity and neonatal servic	6	First antenatal visit	0	35	1	☐	
Maternity and neonatal servic	7	Follow-up antenatal visit	2	39	5	☐	
Reproductive Health	13	Oral pill cycle	9	150	24	☐	
Reproductive Health	14	Nuristerate injection	0	0	10	☐	Note: split from Injecta
Reproductive Health	15	Depo-provera/Petogen injection	0	0	14	☐	Note: split from Injecta
Reproductive Health	17	Condoms distributed	60	1,850	500	☐	
Child Health	19	Diarrhoea under 5 years - new	0	13	1	☐	
Child Health	21	Child under 5 years weighed	12	477	30	☐	
Immunisation	25	BCG at birth	0	19	19	☐	
Immunisation	26	DTP-Hib 1st dose	0	4	1	☐	
Immunisation	27	DTP-Hib 2nd dose	0	4	4	☐	
Immunisation	28	DTP-Hib 3rd dose	0	3	2	☐	
Immunisation	29	OPV 1st dose	0	4	1	☐	
Immunisation	30	OPV 2nd dose	0	4	4	☐	
Immunisation	31	OPV 3rd dose	0	3	2	☐	
Immunisation	32	HepB 1st dose	0	4	1	☐	
Immunisation	33	HepB 2nd dose	0	4	4	☐	
Immunisation	34	HepB 3rd dose	0	3	2	☐	
Immunisation	35	Measles 1st dose at 9 months	0	3	1	☐	

Figure 2 Sample data entry screen from DHIS Monthly Data

Furthermore, as the provincial health team planned the system's roll out, it became clear that human resources available locally were not adequate to support both software development and to meet the training needs of staff throughout all 21 districts. . In October 1998, after 9 months of data collection and capture but negligible output and feedback from the existing system, the team sought support from the Health Information Systems Programme (HISP) team based in Western Cape. This team had already developed a District Health Information Software (DHIS) application for use in Western Cape province (see box), and their ties to the University of Western Cape provided a convenient environment for organising many of the training activities required. The HISP team was also contracted to modify and further develop their software (developed in Microsoft Access), convert the existing data for use in the new software, install the system in all districts and train staff in its use.

During 1998 and 1999, the EQUITY project also worked on human resource issues at the district & regional level: helping to develop a new cadre of personnel called information officers and assisting with their recruitment and training.

In addition to providing on-going training and support to operational staff responsible for data capture and data management at the district level, the major focus in 1999 was on enhancing the computer system: adding new hardware in the districts, creating a more user friendly report generator, and developing a more systematic mechanism for feedback reporting. Members of the HISP team made repeated visits to each of the regions and most of the district offices to provide continuing training and to support efforts to enhance the use of data from the DHIS.

Efforts in the year 2000 focused on managers and improving their access to and use of information for decision-making. This proved to be a far larger job than expected because health workers were not used to having reliable and timely data, let alone using such information as the basis for resource allocation.

The evolution of the system has not always been without a hitch. There were at times heated debates with national and provincial health authorities concerning the development approach, the purpose of the system, and even the software development environment. Staff at the central level were had traditionally relied on their own rather simple EPI Info 6 (MS-DOS) applications, whereas the DHIS software had been developed using Microsoft Access and Excel pivot tables. There was a strong tendency to demand huge amounts of data, little of which was ever analysed or used, but which reflected the exhaustive statistics previously collected by vertical programs. EPI collected 44 data items monthly – DHIS proposed only 5 – they compromised 13 items enabling calculation of six useful immunisation indicators. By contrast, the World Health Organisation's (WHO) requirements for TB data have been a major obstacle to smooth development of the TB module. The Eastern Cape Department of Health developed a 12 item data list for TB to replace the 130 items that "WHO required," but no one would accept it due to the WHO requirements. While much of this data may be useful for international comparisons, it clusters and confuses the important, WHO does not clearly distinguish between that data that is recorded for local use and that which it requires for its own needs.

Similarly, different provinces had different priorities for investing their information systems budgets – most preferring to focus on hospital information systems of far greater complexity and cost while others began by emphasising district level primary health care services. Ironically, , the Health Information Systems Programme was considering winding up its activities in late 1998 due to limited funding, when the Equity project stepped in to support the extension of the system to Eastern Cape province. The Western Cape province had adopted the software, but its entire health information system budget had been allocated to a large Hospital Information System for three academic hospitals – a system that is still non-functional and now on the verge of being abandoned.

In spite of these obstacles, others bought into the approach. The British NGO TransAID, working with health transport managers in 8 provinces, has developed software and made it available using the open source approach. That software is currently distributed together with the DHIS, and the HISP team are working to ensure full compatibility (e.g. by use of the same facility coding system). Other similar linkages have begun to take shape, including: (a) the National Health Laboratory Services is very positive towards interfacing their laboratory information system, DISLAB, (used in 8 of the 9 provinces) to the DHIS; (b) staff from the Cape Metropolitan Council developed a geographic information system (GIS) interface between the DHIS and the free desktop GIS viewer ArcExplorer, and (c) the HISP team has established contact with the EpiInfo 2000 development team at CDC/Atlanta to explore interfacing the DHIS with EpiInfo 2000.

The DHIS software was successfully piloted in Mozambique during 2000, and is currently being rolled out in that country. Other countries, including Mozambique Malawi, Nigeria, and India, are currently piloting and/or adapting the software for their own use.

District Health Information Software:

The software, as implemented in the Eastern Cape Province, consists of the following modules (see the technical schematic diagram in Annex 1 for more details):

- Monthly Data – data entry for PHC monthly reports (with 25 required data items) and annual audit (far more detailed information on services provided, quality measures, infrastructure & staff) and production of standard reports
- TB – Quarterly TB data entry and standard reports
- Report Generator – This module uses temporary tables, referred to as a 'data mart', that take raw data entered into the other modules, calculates the indicators required and makes the results simpler to use for ad hoc reporting. This enables reports from any time period and any raw data or indicators to be tailored to the user requirements. Data can be selected for a cluster of facilities (used by the supervisor), for one district or several, by one program area, or across different programme areas for managers with a variety of interests. Figures can be averaged over periods, aggregated for a given time period and compared to a previous year. The data mart helps put together "exception reports" for any indicator. These reports list outliers – values above or below a given value that users can easily change according to their own assumptions. This is a very powerful tool for managers to see who is "out of line" - for example which facilities have immunisation coverage above or below a certain value, or whose workload is above or below local norms.

In addition, the system features links to other tools, including:

- a very user friendly set of Excel pivot tables that make it easy for users to cross tabulate, filter and graph data
- Maps displayed using ArcExplorer map display software.
- A web-browser based data dictionary that stores official names and precise definitions for all Data Elements included in national and provincial Minimum Data Sets. This Data Dictionary, as well as the Web Shell and other HTML/XML/Java tools under development, is running on the HISP Application Server (a local web-server).

During the course of its development a variety of interesting and unusual features have been added to the system - usually based on requests from users. For example, there are options to print out the monthly reporting forms and even the tick registers used to record the data manually in health centres. Similarly, tally sheets can be printed out with the size of cells automatically adjusted based upon data reported historically.

On the analysis side, the system has made innovative use of 1996 census data for calculating population denominators. This has included the development of an algorithm to impute catchment area populations based on the proportion of headcounts to the entire headcount per census district. This gives a reasonable estimate of the population actually served from which denominators can be calculated for coverage of services for any age group.

A key principle of the software development approach was that it should be 'Open Source' and gratis. This means that the software is distributed free of charge and that the source code (programming) and database structure are open to modification by anyone. While this does involve an element of risk – in that users could make modifications to the system that could have unanticipated consequences – this philosophy has also made it extremely easy to promote the use of the software. Not only do potential users incur no financial risk in trying out the software, but there is the potential for them to adapt it as they see fit and copy it onto as many computers as they wish. This had certainly not been the experience with most commercially marketed software that provincial health authorities have dealt with at the hospital level.

Current Status

Within Eastern Cape Province, the DHIS (including the software) has now been implemented in all 21 districts – a process that took about 36 months – although most districts were up an running with basic functionality (data capture, partial validation, and transmittal upwards) within 3 to 4 months. The software is also installed in a number of individual health facilities and is used at the Department of Health office in the provincial capital Bisho (as well as by EQUITY project).

As the amount of data captured into the DHIS kept growing, it soon became clear that the 16 MB PCs in the district offices were inadequate. The EQUITY project financed the purchase of computer equipment for all district and regional offices, as well as some equipment for the Department of Health (approximately US$ 140,000). Because of the demanding computer specifications required to run the DHIS (many due to MS-Excel pivot table memory requirements), each district received a "small business" PC (Pentium III 450, 128MB RAM), an A4 scanner and an A3 inkjet printer. The five regional offices and the provincial office received a "workstation" PC (512MB RAM) in order to handle much larger amounts of data. Two notebooks and two digital projectors were included for training purposes.

US government procurement regulations required that this equipment be purchased in the United States, with disastrous consequences. Firstly, whereas competitive bidding for this relatively standard equipment would have taken 2-4 weeks in South Africa, it took nearly 8 months from specification of the tender to its distribution to the recipients. Secondly, the people drawing up the tender specifications were told – rightly or wrongly – that the tender could not be limited to global suppliers that would be able to provide local support. The cheapest supplier that seemed to fulfil the specs would have to be chosen. Thirdly, various other factors resulted in several changes in the actual components used after the tender was awarded, with final PCs that proved highly prone to e.g. hard disk crashes.

Today, one year later, nearly all the 28 PCs have or are broken down. EQUITY project staff had to handle repairs and try to squeeze spares under warranty out of the US supplier, resulting in turn-around times of as long as 4-7 months. Some equipment, like a monitor defect on arrival, has never been repaired/replaced at all. Most districts have been forced to look for other PCs or parts to be able to cope.

Most districts are nevertheless using the system without major problems, and many understand and use the software more effectively than staff at the provincial level. Feedback reporting remains somewhat ad hoc and district information offices report that managers are not uniformly interested in requesting or using information from the system. More effort is obviously needed to create the information culture around the DHIS.

The HISP team continues to provide significant support, since local capacity for software development and design of specialised analytical reports is still not in place in at the provincial level. This support has focused on general computer troubleshooting and maintenance, configuration and use of the DHIS software, and use of data. In addition, the EQUITY project has provided support through the Department of Health for the training of district health supervisors in use of data for planning and service performance monitoring and evaluation. Eight training courses that have been organised by HISP team members at the University of Western Cape include:

- Certificate in District Information
- Introductory, Intermediate and Advanced level DHIS
- Using GIS for Health Data analysis and display
- Use of information for management
- Using DHIS for management
- Using information for hospital management

While this case study has largely focussed on experience in the Eastern Cape Province it should be noted the DHIS has been introduced, at least on a pilot basis, in all the 9 Provinces of South Africa. Initially, interested information mangers have attended courses at UWC lasting 1 to 2 weeks and offered once every 6 months. For those Provinces with a larger number of interested staff the UWC HISP team conducts tailored training on site including the installation of DHIS software on local computers and its initialisation for the chosen data set of the specific Province. Individual HISP facilitators have taken responsibility for 1 or 2 Provinces and return periodically to help troubleshoot problems and extend the training to new users. It has been difficult however, to rapidly introduce the system everywhere because of the large number of staff in need of training as well as requirements for computer hardware. In addition transfer of data electronically to the national capital in Pretoria has been irregular and especially from these Provinces only partial in its coverage. Hence the real power of DHIS to capture monthly primary health care activities throughout the country and make meaningful nationwide reports has yet to be realised. During 2000, Provincial and National authorities made the decision to extend DHIS to all health facilities in the country. This places heavy demands on the system especially the HISP trainers.

The HISP team is now fielding around 15 people to roll the system out and a MS Project workplan is being used to track responsibility of HISP, EQUITY and government staff. Nearly 100 people are involved in the roll-out that should be essentially complete by the end of 2001. A big challenge is to see how the system will continue to evolve and be maintained after EQUITY funding ends – but most of the actual roll-out is done by the provinces themselves without external funding which is reserved for consultant trainers and training courses.

During the visit to prepare this case study, plenty of anecdotal information was gathered about innovative uses of the system by health workers and managers alike. Some of the highlights are included in the box below. Such experiences need to be shared widely so that they become part of standard practice throughout South Africa.

Info to action: Innovative uses of DHIS data

Nurses Warden and Hendry are health workers from different health facilities in Southern Peninsula municipality, just outside of Cape Town. They have been given the difficult task of agreeing upon which of their two PHC centres should be closed – and how their patients and staff can be merged to provide services more efficiently – perhaps in a completely new location. In the past, Department of Health managers would have just made the decision at a high level and the health workers would have had to live with it. Now they are gathered around the computer at the municipal office, pouring over various types of data they have printed out from the DHIS. They are comparing staffing patterns with headcounts at each facility over time to determine workload and examining data on the catchment population for different services. This helps them see the case-mix of patients that each facility is seeing and helps them determine which facility is already seeing a larger part of the combined population. The sisters decide that this is still not enough information to make a recommendation. They live in a semi-urban area, and they believe there is considerable crossover of patients who live in one catchment area to the other – perhaps because they work in the other area. They have decided to request a large scale map of the two zones and conduct a brief survey of patients for a week or so to confirm their belief – plotting the residences of the patients with different colored dots on the map. This should help them decide on the best location for the combined facility.

Kevin is the district information officer for Aliwal North Health District, north of Queenstown. He has been trained to use the DHIS software to enter and analyze data coming from all the health facilities in his district. For the past several months he has printed out many pages of feedback reports covering all of the indicators in minimum data set and handed it out to each of the health programme managers and supervisors during district meetings. This has seemed like a waste of paper. There is too much paper to wade through, and the programme managers have many of other logistics and resource related issues that they feel are more important to discuss. This month he decided to use another approach, the works with the district health officer to identify one important them, and produces a comprehensive analysis of recent DHIS data related to that theme alone. Instead of just handing out the print-outs, he prepares PowerPoint slides on the topic and works with the responsible programme officer to presents the tables, graphs and key observations to the rest of the team. This takes a lot less time and results in much more animated discussion. Members of the team decide on a list of themes they would like the information officer to research for future meetings.

Virginia is the Community Health Coordinator for Southern Peninsula Municipal Office. She is faced with a major dilemma about how to allocate reduced funding for tuberculosis services among the 18 clinics in the municipality. In the past fund were allocate strictly on the basis of the number of cases treated (around 4000 Rand per patient per year). This approach is no longer possible, because there are more cases than there is money to go around. During a meeting of all TB programme nurses, the group decides to see if the data from the DHIS can help them. They ask Sylvia, the data entry clerk, to prepare **a** graph of the TB cure rates from the each facility. To their surprise they discover that these rates differ sharply between facilities. Most are quite high – around 80 or 90% -- but there are 4 or 5 health centres with low cure rates. Because of the risk of developing more resistant strains of TB when the cure rate is low, everyone agrees that proportionally more funds should be directed to those facilities. Interestingly, data gathered the following year supports the effectiveness of their approach. Nearly all the facilities lagging behind have closed the gap and most of the other facilities have maintained their cure rates. How much of the change is due to more resources and how much due to the heightened concern of the nurses who saw for the first time that they were lagging behind, is a matter of speculation.

Ivan is the Director of PHC for the City of Cape Town. The availability of data from the DHIS has helped him to revolutionise the process of developing the provincial business plan for health services. The new planning process results in a work plan that includes quantified outcomes and outputs anticipated for each activity – in addition to the resources required. Not only do the DHIS tools empower staff – who must agree together with their managers on reasonable targets for key indicators, but mid-level managers get a clear message that they must use the DHIS data to monitor the performance of their health facilities on more than just financial terms. To add further incentive, a new post of clinic manager has been created at the facility level. This individual is paid extra for being accountable for performance. Not everything works as well as Ivan would like, though. There is still no easy way to link the performance data generated in the DHIS – which is built around health facilities - with cost centres used in the financial management system, since these cost centres sometimes cover many facilities (e.g. drug supplies to clinics) and sometimes only part of a facility (e.g. staff salary per ward in larger hospitals). Also, the city needs to establish a more effective procedure to ‘unpack’ the provincial business plan for each level of the health system. New challenges to use of data have also emerged with the transition of decision-making authority from health managers to municipal councils with limited health or medical training. The data and information will have to be presented in simpler ways that are understandable and convincing to this broader audience.

Lessons learned

Implementing a system of this size and scope provides a wonderful natural laboratory for testing different approaches and, hopefully, learning about what works and what doesn’t. Below are some of the most significant lessons learned from the Eastern Cape experience.

a) **District-level involvement in HIS development is not only possible, but it is critical for the success of information systems** aimed at enhancing health services at the district level. There are many examples of how input from district and health facility level staff led to new features and functionality in the system. The success of this participatory approach in Eastern Cape province is reflected by a genuine feeling of ownership expressed by many district health staff while this case study was being prepared.

b) Whatever level is the primary focus of HIS enhancement activities even with a bottom-up development approach, **it is crucial to identify and involve all stakeholders or 'actors' in the process**. This includes individuals at all levels of the health system (potential users) as well as significant events and changes that are likely to influence the development of the system. It was important to focus on high level staff as well. Only when the information officers started making reports and putting them on managers' desks did anyone pay much attention to what the data were telling them.

c) It is important to **'walk before you try to run with information systems.'** Considerable effort was focused on helping staff use paper and pencil to master analytical skills before the system was computerised. This required a minimum data set, that health workers could easily understand and analyse on the spot – without the need of a computer. Similarly, the use of hand-drawn, catchment area maps and graphs was strongly encouraged as a key step in getting people to understand the populations they serve and to trust the data they collect. Later the computer can help them do it faster and better.

d) Several lessons were learned on the software development front:

   i) **A system of this complexity requires good linkages between users and a professional software development team**. To this end, the prototyping approach has worked well in South Africa. It is also clear that the presence of extremely motivated and, in their own words "workaholic", champions for the system within the department of health, the HISP team and the EQUITY project have played a crucial role in the rapid extension of the system. The excellent cellular telephone infrastructure in South Africa has also been an asset. Telephone support from HISP team members and Provincial DOH staff is available to users of the system almost any time of day.

   ii) **Efficient communication between the partners is crucial.** The good fixed and cellular telephone infrastructure in South Africa has been an asset. Telephone support from HISP team members and Provincial DOH staff is available to users of the system almost any time of day. Bureaucratic rules and regulations and lack of infrastructure have actually been the major impediment to smooth communication – a manager in the provincial administration might wait months to get an email account or Internet connection, despite having a physical contact point one meter from his/her PC... The information officer in one Health District in the Western Cape was initially only permitted to receive emails and not to send, since it would save around USD 1 per month. Getting permission to also send took nearly six months and much paperwork.

   iii) **Maximise data use by building links to off the shelf software** for analysis and reporting such as Excel pivot tables. This lets managers use the analysis tools they are most comfortable with and reduces the software development work that would otherwise be required to reproduce this functionality in their application.

   iv) **Don't underestimate the potential appeal of a specialised software application**. Design database structures that can accommodate more records than you would have ever imagined. If database design is internally complex, establish mechanisms to provide users with simpler views of the data for their own ad hoc analysis. Many users expressed frustration at not being able to understand the manner in which data were stored in the system.

   v) **Look to find a balance between precision and approximation.** This needs to take into account the expected quality of the data collected (including secondary data from census or other data sources, in addition to that controlled by the health sector itself) as well as the degree of precision required for decision-making. This was expressed several times using the adage: 'It is better to be approximately correct than precisely wrong.' In a similar vein, indicators that are too complicated to calculate are often also too difficult for mere mortals to interpret and use.

   vi) Open source software that is distributed for free is easy to 'sell', but don't underestimate the amount of training and technical support it requires. The database structure and many of the algorithms used for calculating indicators and generating reports are quite complex – even though they are well documented and, in theory, user-modifiable. In fact, it has been much more effective for users to request most modifications from HISP team members, rather than trying to implement them alone. About 70% of overall HISP effort has been spent on training, support, and institutional development in general – only 10-15% on software development. In addition, open source software may be somewhat more expensive to support over the long term, since different versions may evolve making it much more complicated to introduce and test upgrades.

e) The **implementation of new software can become a vehicle for change**, including: standardisation, integration, and more widespread dissemination of health data/information. This experience once again underlines the chicken/egg nature of technical innovation in a health system. Although this is somewhat the corollary of the 'walk don't run' principle cited above, in this case it was also true that the process of computerisation served as a catalyst for change. By requiring managers to prioritise what information was really necessary and to question standard operating procedures for data collection and use.

f) The **indicator-based approach** to determining information **needs is an effective way to reduce the number of data elements collected** and to ensure that data collected is relevant. A simplified indicator framework such as WHO's health problem, service and critical resource indicator categories, would have been useful to ensure a more even distribution of indicator types and to clarify the linkages between them.

g) **Improvements in data recording procedures deserve as much attention as reporting and data processing**. In the Eastern Cape, focus on this aspect came very late in the process. Problems of time spent recording data, poor data quality and limited use of the data at local level are likely to continue unless more emphasis is placed on this area.

h) It has been very **hard to get people to make timely reports** – they prefer annual reporting – which some feel is HISTORY!! The system is most useful if it can provide fast and up to date indicators of what the problems are and where they are localised.

Future Directions

In spite of the great progress already made, there are a variety of areas where the DHIS can be further improved. Below are some of the key areas that are being worked on or explored at this time:

a) **Using more sophisticated tools to manage the implementation process**: The DHIS is currently being rolled-out to the entire country, that means 9 provinces, some 180 health districts and 6000 health facilities in South Africa. The implementation team has recently developed a Microsoft Project work plan that is guiding the roll-out for this complex process, with a huge number of modifications to fit local needs. Remarkably it is all working and getting the standard numbers into Pretoria regularly now.

b) **Focus more attention on data interpretation and use**. This has begun with the development of some standard curricula for data-for decision-making training of supervisors. In addition, certain Provincial and Municipal authorities are linking DHIS data to specific procedures such as work planning. District health workers are required to project how much change they expect in key indicators when they put together their work plans – and are then held accountable for the results.

c) **Further develop the capacity of Provincial Department of Health and National health authorities to maintain the system**, including: receiving and aggregating data from all districts/provinces, providing systematic feedback, adapting the software as information needs change and providing timely support for end-user software trouble-shooting support.

d) **Proceed with the development of a new version of the software.** Version 1.2 of the DHIS software is at a crossroads. Its current database structure, originally designed to provide maximum transparency for district users with limited knowledge of MS Access, is not efficient for the large data sets gradually emerging at provincial and national levels. The Eastern Cape data file, covering three years of PHC data, is for instance around 200 MB in size and with individual tables reaching towards a million records or more. Even if Access formally has a maximum size of 2 GB, the practical limit is probably around 20% of that. Network installations are also on the increase, but it is not advisable to run the DHIS on Access (a thick client) with more than around 10-15 concurrent users. Pivot tables, fully stored in memory when used, are also very RAM hungry with such large data sets.. The new features of the software may include:

- The development of a 'DHIS light', client-server or web-browser based system, that will not have the same high computer resource requirements for end-users.
- Replace the current DAO[3] interface between the application modules and the data files with OLE DB and ADO[4], thereby allowing users to store their DHIS data on any SQL compliant Data Base Management System with an OLE DB driver (e.g. Oracle, DB2, SQL Server, Sybase, etc).
- Further improvements to the Report Generator and its temporary Data Mart tables, to make it easier for end users to understand the file structure and to use the data with other analysis tools and report writing tools (ArcExplorer, Crystal Reports, EpiInfo 2000, Excel, etc…).
- Bring the user interface more in line with common graphics interface or internet browser standards. This includes, revising the placement and use of menus and control buttons, changing the layout of data entry screens so that paper reporting formats can be organised in a more user-friendly manner.
- Introducing multi-language support, so that the system can be easily translated into different languages (Portuguese and French are likely requirements right now).
- Implement a common coding system for health facilities and geographic areas that will enable linking of many more of the computerised sub-systems – lab results, finance, personnel and drug management, for example.

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[3] Data Access Objects – the "linked tables" in MS Access is using this technology, which is being phased out and replaced by OLE DB and ADO.

[4] ActiveX Data Objects (ADO) enables you to write a client application to access and manipulate data in a data source through a provider like OLE DB. ADO's primary benefits are ease of use, high speed, low memory overhead, and a small disk footprint.

HEALTH INFORMATION SYSTEM IN CAMBODIA

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Introduction

The redefinition of a national health information system (HIS) in Cambodia was a critical task of the Ministry of Health. The Ministry started reviewing the system in 1992, and it took about two years to design a new health information system. The HIS was officially approved in December 1993, and implementation began in March 1994.

Objectives and Principles

Originally, the HIS was a service-based reporting system that encompassed the routine service reporting system and a disease surveillance subsystem (the alert system). In Cambodia, HIS does not include logistics or administrative information specific program information, or vital registration systems. The responsibility for different aspects of health information management in Cambodia is presented in the table below.

Table 1 National Health Information Systems

	Logistics/ Administration Information System	**Health Information System**	**Disease Surveillance System**	**Specific Program**	**Vital Registration System**
Areas	Finance Drugs Personnel Training General Administration				
Responsibility	Line Department--e.g., Finance is under the Department of Finance	Department of Planning and Health Information	Department of Communicable Disease Control	Line program	Not under the Ministry of Health
Frequency of reporting	Monthly, Quarterly, and Annually	Monthly, Annually	Weekly, Monthly, Quarterly, and Annually	Monthly, Quarterly, and Annually	

The general objective of the HIS is to provide the Ministry of Health and different levels of the health system with reliable information on health problems and health service activities for planning and management of health services.

Principles for the development of HIS include:

- Reflecting the reality of Cambodia's health system and existing policies;
- Using existing technical and material resources at each level of the health care system;

- Use models developed by national programs and nongovernmental organizations (NGOs) working in Cambodia;
- Achieve consensus with the central Ministry of Health managers and national programs managers;
- Select indicators that are useful for practical decisions in the Cambodian context, focusing on a minimum data set; and
- Gradually introducing the system to provinces with training on in recording, and the utility of health information.

Design steps

The following steps were taken in designing the HIS:

1. Formed a unit to take charge of the HIS and a Subcommittee for the Health Information System;
2. Evaluated existing information systems, including systems created by national programs;
3. Identified needs with main stakeholders;
4. Defined an indicator list;
5. Select information to be included in the reports, and developed supporting tools for information collection and transmission;
6. Develop instructions for filling out forms, and defined terms/cases in the reports;
7. Developed forms for field testing in three provinces and nine districts;
8. Before introducing the new HIS, designed workshops for national, provincial, and district levels;
9. Developed software that includes systems for entry and retrieval of data;
10. Install a computerized system.

Main Characteristics of New HIS

- Integration
- Standardization
- Simplicity
- Reliability
- Computerization

Components of HIS

The new HIS consists of five main components:

- *Monthly routine reports:* forms for first-line health facility, hospitals, district health office, and for provincial health department;
- *Alert system (zero reporting)* is a weekly surveillance system to report on four main health problems: cholera, dengue haemorragic fever, measles, and acute flaccid paralysis;
- *Annual inventory reports* for facilities at all levels: forms for first-line health facility, hospitals, district health office, and provincial health directorate;
- *Quarterly reports* for two national programs: tuberculosis and leprosy;
- *Register forms* to support data collection containing all daily registers for all areas, such as general consultation, hospitalization, birth delivery, and immunization.

Implementation, Monitoring, and Evaluation

The new HIS was implemented in March 1994. The computerized system was also set up with HIS software using an application called Episurv. Supervision has been carefully planned and conducted.

The first HIS evaluation conducted in 1995 reported positive results. However it also noted some constraints:

- software problems;
- slow process of capacity building;
- irregularity of funding support; and

- limited use of information, especially at peripheral levels.

The HIS was revised and was expected to be in place by 1996. This was not achieved for several reasons, two of which are irregularity of financial support from donors and partial implementation of the national health system reform. In late 1996, the HIS was revised again to reflect the new health system and reached nationwide coverage in January 1997.

To adapt to the new structure and service packages of the health system reform, reporting formats and their contents were changed. A computerized system was also developed using MS Access software. In late 1999, the HIS was revised again, and the revised system has been in use since 2000. There has been a delay in developing the new software due to technical and financial constraints. Development of new software is underway, and completion is planned for the second quarter of 2001.

Flow of information

- Data are collected through daily registers.
- Monthly report from health centers (HC) and hospitals (RH) are sent to operational district health offices (OD) between the 1st and the 5th of the following month.
- The OD prepares OD report by consolidating data, then sends it to the provincial health directorate (PHD) between the 5th and the 10th of the following month.
- The PHD prepares its report and sends it to the Ministry of Health, Department Planning and Health Information by 20th of following month.
- At the central level, the data have been computerized and analyzed. After that, the central level provides feedback to national programs, other MOH departments, and the provincial level.

Use of Health Information

Health information is used in the following ways:

- to control epidemics;
- to plan and manage the health care system at all levels, including allocating the budget, allocating drugs, and consumables;
- to formulate the workplan, and monitor and evaluate health facilities performance; and
- to monitor and evaluate health system performance.

Tools for the information use include:

- *Tableau de Bord*
- National-Level Indicators for Monitoring and Evaluating Health Sector Performance.

Health Information from Private Sector and NGOs

There is no effective mechanism to gather health information from the private sector and NGOs. Plans were made, however, to introduce the revised reporting forms to these organizations in 2001.

Constraints

Overall, the health information system has been functioning well. However, there have been a number of problems that have slowed down the development of the system. Constraints include:

- lack of a data culture;
- limited use of information, especially at provincial and district levels;
- lack of timeliness, especially of the alert system;
- limited staff capacity to analyze and interpret information;

- slow process of capacity building (formal training in HIS);
- irregularity of funding and technical supports from donors;
- lack of a long-term commitment from donors;
- unreliability of data;
- irregularity of and insufficient feedback; and
- lack of information from the private sectors and NGOs.

Future challenges and recommendations

- Three or five-year comprehensive strategic and budget plans should be developed.
- The uncertainty of future funding and technical assistance from donor agencies. The major funding is not required, one of the main obstacles to development of the system since 1997 has been insufficient financial support.
- Communication problems, especially for the alert system.
- Inadequate supervision at all levels.
- Training staff at all levels with skills related to information analysis, interpretation, and use.
- Staff motivation related to working conditions and professional development.
- Lack of material support to central, provincial, and district levels, such as computers and office supplies.
- Orientation toward information technology.
- Hospital information systems.
- Adequate information from the private sector and NGOs.

Conclusions

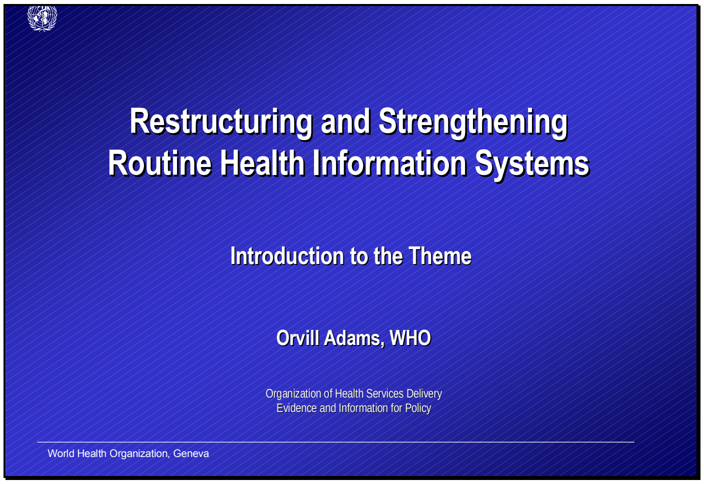
In conclusion, although the system is functioning, and capacity has been built at central level, the HIS staff at both the central and provincial levels do not have the full capacity to manage the system, particularly with respect to data analysis, interpretation, and use of information. Therefore, additional assistance is needed for addressing capacity building, capital costs, and running costs of the project, including training and supervision. This assistance will contribute to the sustainability of the HIS and its ability to support the development of the national health care system.

Theme 3

Restructuring and strengthening routine health information systems

Introduction to the Theme

Orvill Adams, WHO

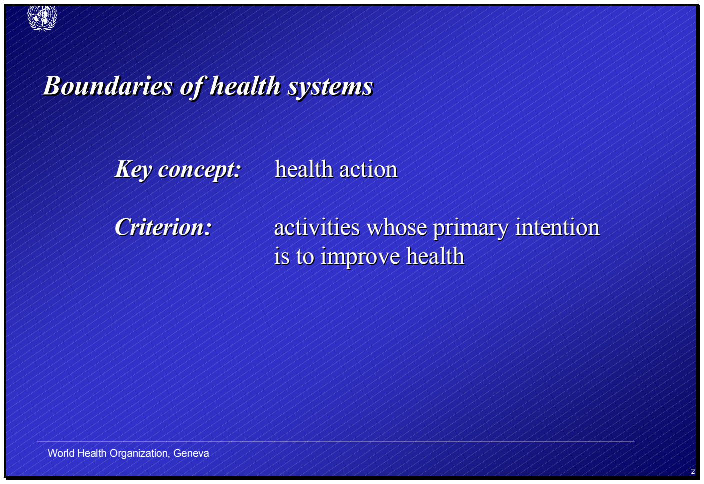


Restructuring and Strengthening Routine Health Information Systems

Introduction to the Theme

Orvill Adams, WHO

Organization of Health Services Delivery
Evidence and Information for Policy

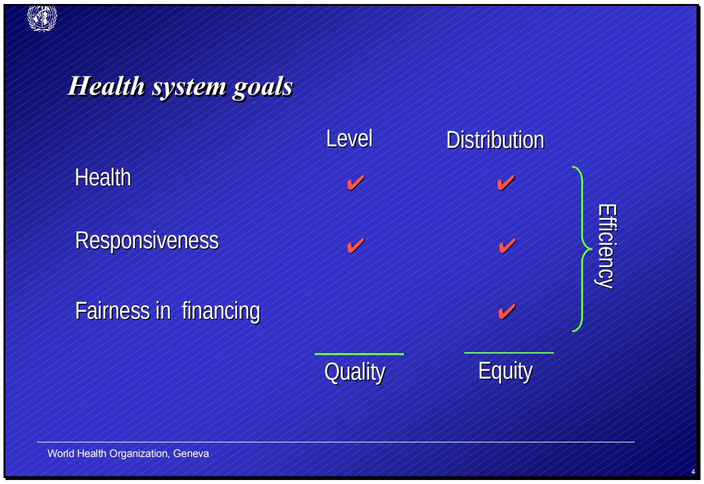


Boundaries of health systems

Key concept:	health action
Criterion:	activities whose primary intention is to improve health

Goals of the health system

- Improving health
- Enhancing responsiveness to the legitimate expectations of the population
- Assuring fairness of financial contribution

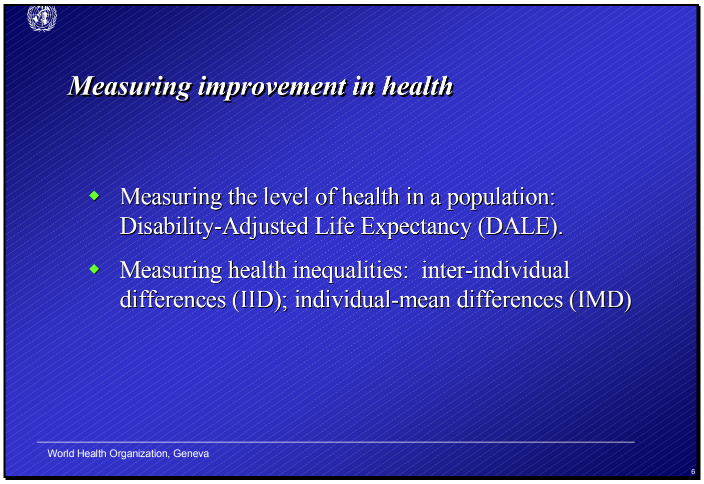


Health system goals

	Level	Distribution	
Health	✓	✓	Efficiency
Responsiveness	✓	✓	
Fairness in financing		✓	
	Quality	Equity	

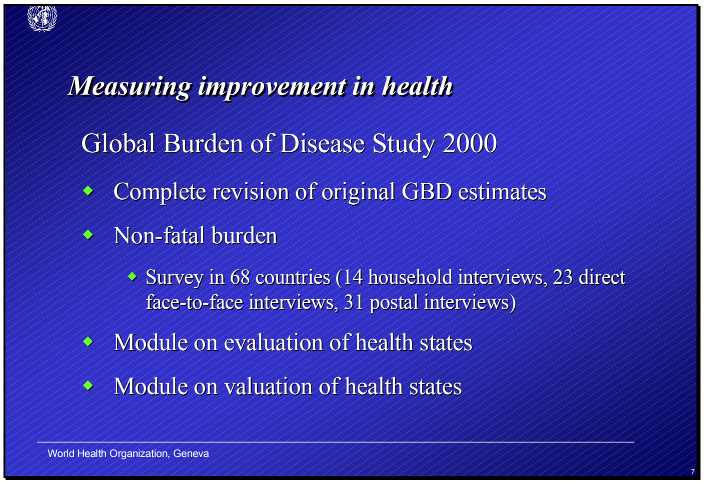
Improving health

- Improving the average level of population health (including fatal and non-fatal components)
- Reducing health inequalities or improving the distribution of health



Measuring improvement in health

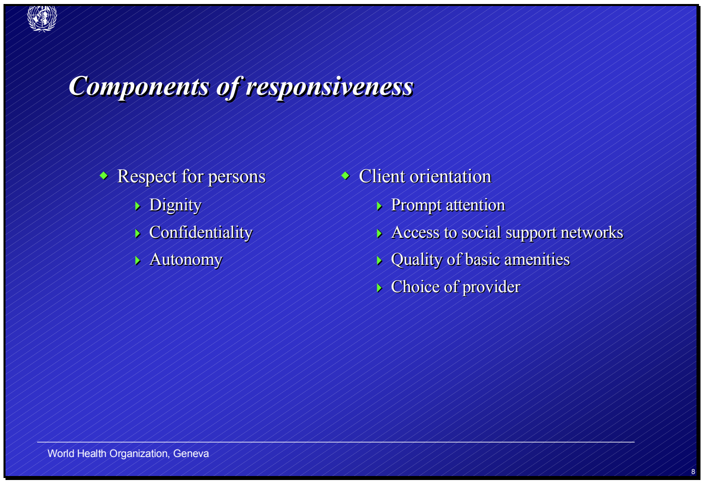
- Measuring the level of health in a population: Disability-Adjusted Life Expectancy (DALE).
- Measuring health inequalities: inter-individual differences (IID); individual-mean differences (IMD)



Measuring improvement in health

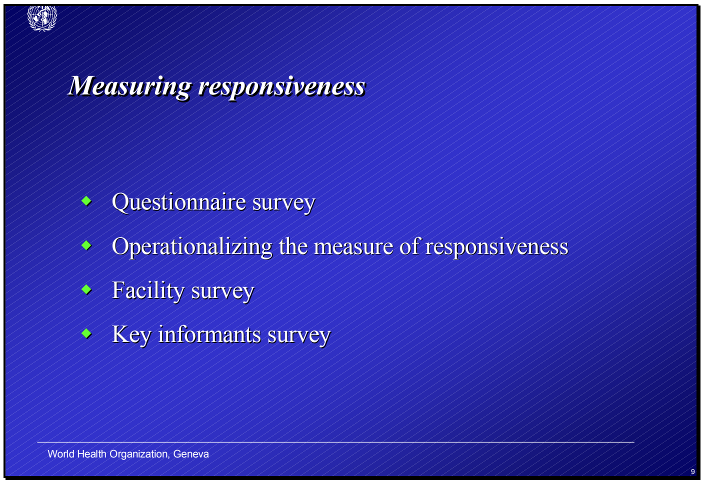
Global Burden of Disease Study 2000

- Complete revision of original GBD estimates
- Non-fatal burden
  - Survey in 68 countries (14 household interviews, 23 direct face-to-face interviews, 31 postal interviews)
- Module on evaluation of health states
- Module on valuation of health states



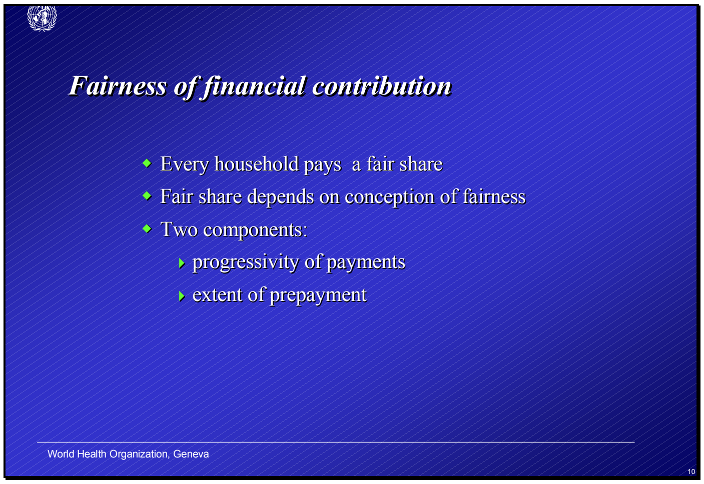
Components of responsiveness

- Respect for persons
  - Dignity
  - Confidentiality
  - Autonomy
- Client orientation
  - Prompt attention
  - Access to social support networks
  - Quality of basic amenities
  - Choice of provider



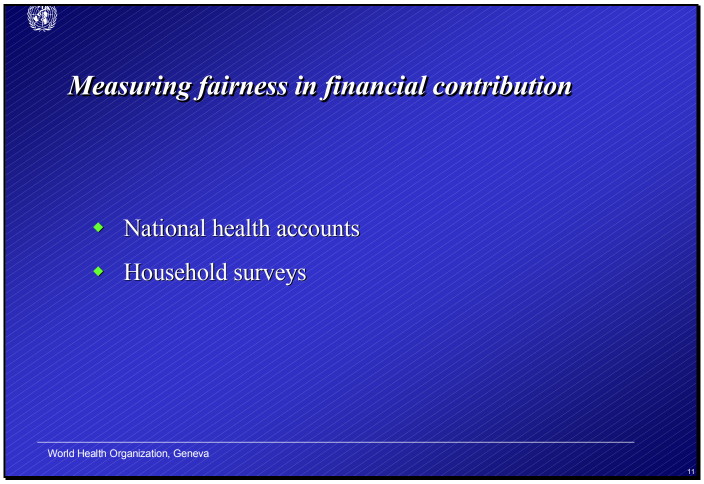
Measuring responsiveness

- Questionnaire survey
- Operationalizing the measure of responsiveness
- Facility survey
- Key informants survey



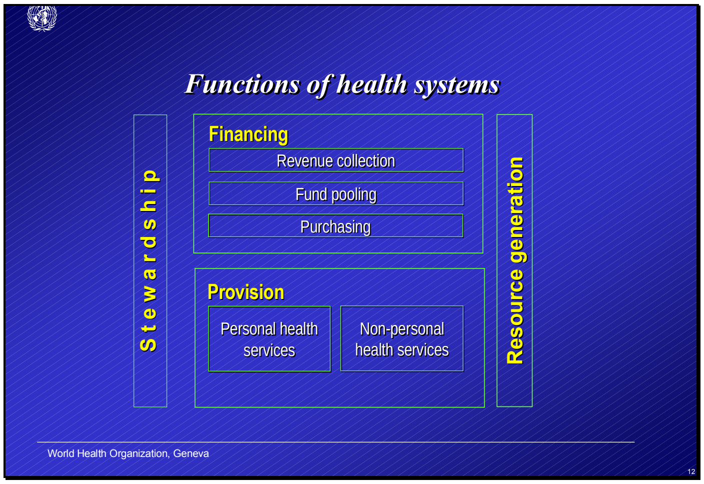
Fairness of financial contribution

- Every household pays a fair share
- Fair share depends on conception of fairness
- Two components:
  - progressivity of payments
  - extent of prepayment



Measuring fairness in financial contribution

- National health accounts
- Household surveys



Functions of health systems

Stewardship

Financing

Revenue collection

Fund pooling

Purchasing

Provision

Personal health services

Non-personal health services

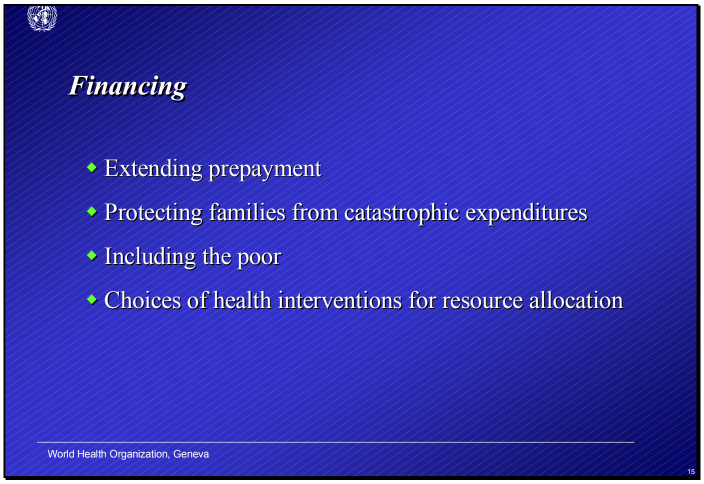
Resource generation

Components of stewardship

- *Health policy formulation* – defining the vision and direction for the health system
- *Regulation* – setting fair rules of the game with a level playing field
- *Intelligence* – assessing performance and sharing information

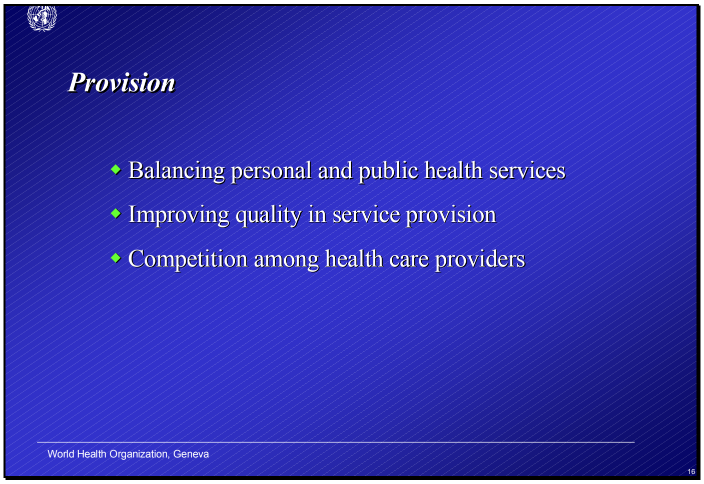
Stewardship

- Main technical and political barriers
- How can crucial regulatory and steering activities be made effective?



Financing

- Extending prepayment
- Protecting families from catastrophic expenditures
- Including the poor
- Choices of health interventions for resource allocation

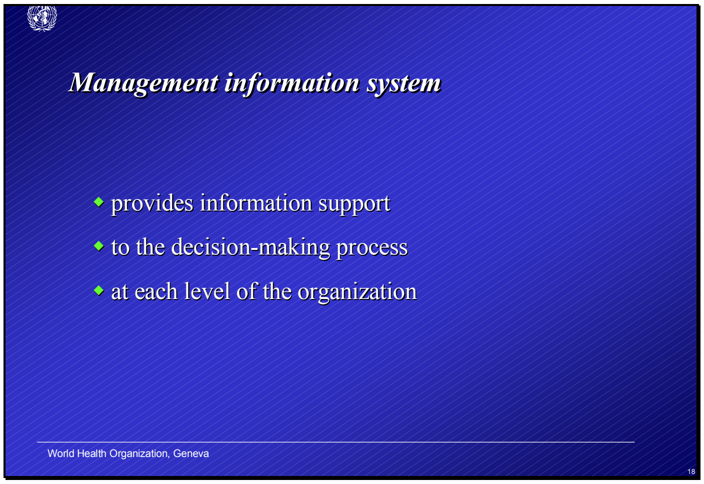


Provision

- Balancing personal and public health services
- Improving quality in service provision
- Competition among health care providers

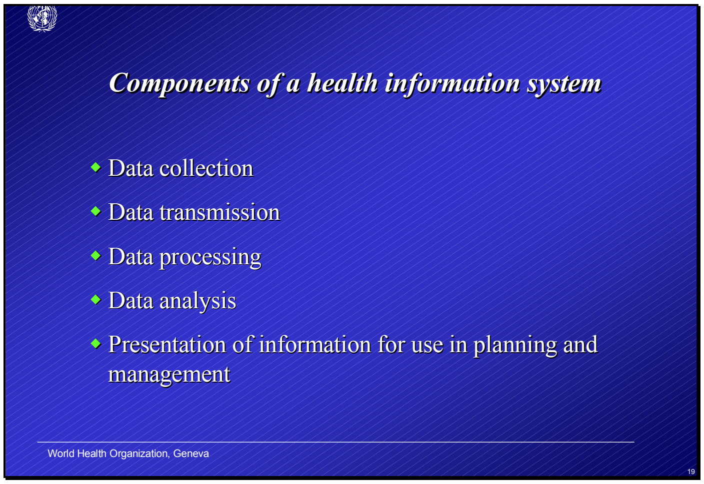
Resource generation

- Supply/demand of human resources
- Investment decisions concerning technology and its acquisition and use
- Investment in knowledge



Management information system

- provides information support
- to the decision-making process
- at each level of the organization



Components of a health information system

- Data collection
- Data transmission
- Data processing
- Data analysis
- Presentation of information for use in planning and management

World Health Organization, Geneva

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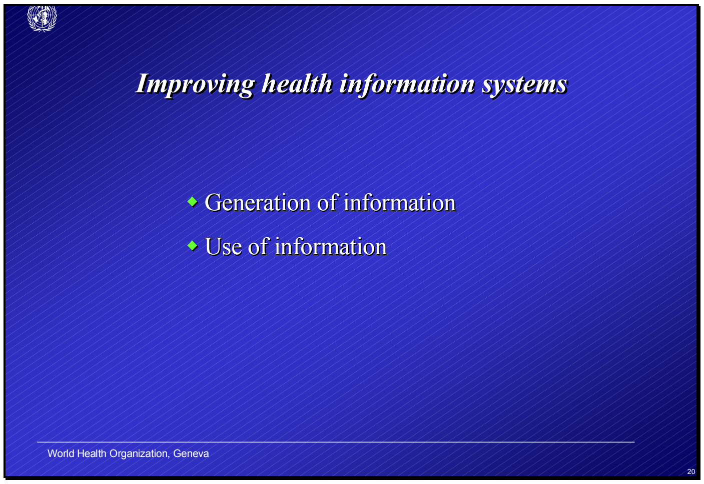

Improving health information systems

- Generation of information
- Use of information

World Health Organization, Geneva

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Improving health information systems

- Goal: to facilitate a more reasoned and informed debate on the interaction of system architecture and intervention mix
- clear measurement of health system goal attainment and performance,
- key aspects of the organization of health system functions and
- the technical content of health service provision

World Health Organization, Geneva

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Taking action

- Global strategy for health information systems development
- Mechanisms for global knowledge bases
- Common platform for data collection
- Modules for adaptation and use
- Use existing data collection mechanisms

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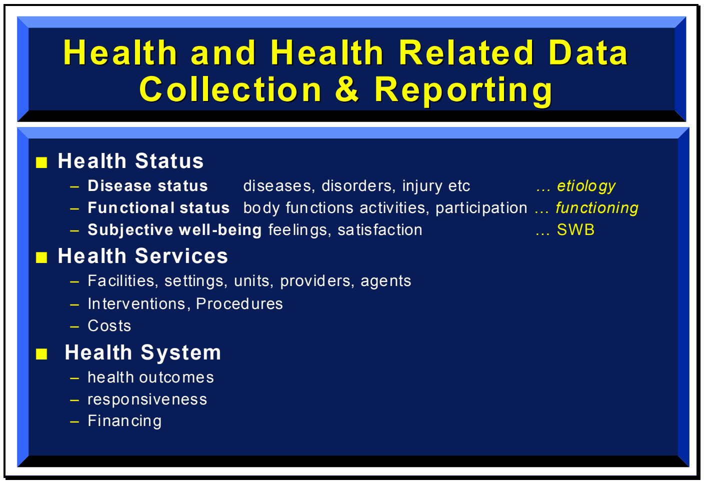

Health and Health Related Data Collection & Reporting

- **Health Status**
  - **Disease status** diseases, disorders, injury etc ... *etiology*
  - **Functional status** body functions activities, participation ... *functioning*
  - **Subjective well-being** feelings, satisfaction ... SWB
- **Health Services**
  - Facilities, settings, units, providers, agents
  - Interventions, Procedures
  - Costs
- **Health System**
  - health outcomes
  - responsiveness
  - Financing

Overview: Restructuring and Strengthening Existing Routine Health Information Systems (RHIS): Issues and Ideas

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Purpose of the Presentation

The purpose of this presentation is to challenge the participants of the meeting with one view of a number of key issues pertaining to national and international efforts to foster the practical and sustainable development of routine health information systems. These issues include improvement of data use for case, facility, and community health management. It is hoped that this presentation will generate debate and further ideas for improving national RHIS development and international cooperation, during the meeting and later, within the Routine Health Information Network.

Premise

It is suggested that examples of successful, sustainable routine health information systems (RHISs) development efforts are rare. Some measures of success and sustainability could include:

1) two years after the major system improvements are implemented, 80 percent of service units are recording and reporting according to the new system formats and procedures;
2) service staff are better able to perform their service and management functions with the use of the new system';
3) policy makers and program managers are asking for data for evaluation and planning purposes; and
4) any new computer applications are being maintained and improved by permanent staff in the services or in local service bureaus.

In addition, it is suggested that the increasing amount of international cooperation and funding being devoted to health information system improvement in developing and transition countries is largely ineffective, sometimes even disruptive and counterproductive. That being said, such aid is rarely refused because of the "benefits" that accrue to participating national staff, both financial and professional.

Issues

The writer has had the opportunity to participate in health management and health information system development activities in developing and transition countries for more than 30 years. Much of that experience focused on the evaluation of service and information system performance in a wide variety of settings. Along with such evaluations came efforts to develop and apply methodologies and processes for improving the subject health services and their management procedures, and systems of information support. In the last 10 years of this writer's, career much effort was devoted specifically to assessing and strengthening national health information systems. These numerous assessments have led to an all-too-familiar list of problems and underlying causes, such as those provided as an attachment to this paper.

The following is an attempt to generalize and discuss these issues in a manner that helps to identify some of the key factors that contribute to the difficulty of enhancing health information systems and using the resulting data.

Despite the rapid growth of requirements for data recording and reporting in national health services, the effective use of routine data is not increasing.

No phenomenon has been cited more often than the increase in recording and reporting data of many types from government health facilities. In many cases, these data are reasonably reliable and complete, at least at the outset, following the implementation of a new or revised information system. Despite the availability of data, there is not much evidence that the data are used. Why not?

There are many reasons, and they vary to some extent among countries. This observer supports the following explanations.

- Much of the content of registers and records in health facilities is placed there by managers and statisticians from higher levels of the system who think they need these data for monitoring and supervision purposes. Many of these registers are designed by staff who have never worked in the reporting facilities. The choice of data for collection is well intended, but it often does not support the tasks that the service provider must perform, first for the care of individual patients, or for efficient management of the facility.

- A related problem is that the tasks and functions assigned to service providers and managers are not specified adequately and procedures are not adequately defined. This lack of clarity of tasks and procedures is worsening as health reforms progressively decentralize management responsibility and authority for decision making to the facility and district levels. Additionally, many health administrations devote most of their training and supervisory attention to clinical tasks. The important functions of monitoring community health situations, events, and trends are not adequately supported with procedures and formats, and local-level decisions and actions are not spelled out adequately.

- Extensive emphasis is placed on the importance of correct and complete recording and reporting. Considerable inservice training is provided in the proper completion and submission of reports, and service units are monitored for timely and complete reports. The result is that considerable reporting takes place, but since little of the information results from or is fed into managerial processes and "action-taking", the data remain largely unused.

- A more recent phenomenon results from the devolution of health service units from the government health system as seen under health reform. In such situations, staff function primarily through payments from client fees and neither the government not the staff are clear about the requirements related to standard recording and reporting. If the government still pays for certain services to be performed, such as detection of infectious diseases and vaccination, then it has the right and responsibility to require reports on these activities, at least to enable payments to be made.

The dilemma of the denominator

Under-registration of births and deaths, particularly maternal and infant deaths, persists in many countries. There are various causative factors, both cultural and economic. These include: dysfunctional civil registration systems and the fact that clients use private care or no care. The result is a scarcity of good information on the size and distribution of the population being served, particularly critical target groups such as newborn infants and pregnant women.

A common response is to undertake periodic or continuous household and population enumeration for planning and monitoring purposes. This, of course, results in different (and, one hopes, improved) population data. But censuses invariably lead to inconsistency in reported population growth rates and service coverage figures. While these efforts seem to make sense for health service management purposes, they may undercut the civil registration system, unless a means by which births, deaths, and migration as measured by the health services can be communicated to the Civil Registration Office.

Record and register revision and inservice training are overused and ineffective
As we review past and ongoing health information development efforts, we always see two types of development activities. The first is a review and revision of basic records, registers, and report formats at the various health facilities. The second is inservice training of staff to encourage the use of new recording formats. Sometimes the format revision results from nothing more than the visit of an international expert who fails to find what he or she is looking for in the basic records and, therefore recommends a revision. National information system working groups also induce format changes to demonstrate the results of their efforts. However, these efforts normally take place in the capital, and fail to reflect the context of service delivery and operating conditions. Most often, revisions are made because the central health information unit wants to implement certain summaries and annual statistical reports, whether or not there is a need or demand for these statistics. Sometimes new records and registers are introduced purely because a donor agency asks for them to monitor the use and effectiveness of its resources. These requests often duplicate existing records.

Inservice training is an attractive activity from various points of view. It seems logical to system designers as an approach to change and improve recording and reporting practices. Staff members appreciate the opportunity to take a break from their routine tasks, visit another site, and receive a per diem. Normally, such training is delivered in a very traditional style, with lectures and individual exercises. Participants are impressed with the need to produce an information product with some accuracy and timeliness. Less often are they engaged in actually using the data they generate for patient care and facility management. External assistance organizations are fond of these types of training activities because they can use their budgets for "direct technical cooperation" and enumerate resulting products and "beneficiaries."

Comprehensive, integrated health information systems never seem to work for long.
We have participated in and observed many RHIS development projects that attempted to address all or most health service data requirements and deficiencies. While these types of projects were more common some years ago, they persist to this day, often encouraged by ambitious donors wishing to support major system improvements. Incentives for designing integrated information systems may also include the desire to foster integrated health services.

Increasingly, services that were the administered by specialized programs are being integrated into a comprehensive package of services, particularly at the periphery. The extent to which the data for these services can and should be integrated into comprehensive recording and reporting formats depends on how service and program management is to be carried out. Sometimes the desire to demonstrate integration, or the central health information units' desire to consolidate information into multipurpose databases produces problems for program and data management. Too often we find infectious disease data recorded and reported through multiple channels: to the central program manager and to a central information unit. The data invariably differ, requiring extensive staff time to correct reports. The timeliness and accuracy of reporting suffers as a result.

Additionally, the integration of data from different types of services into a database intended to serve many different managers, often fails to serve any. Such systems frequently use selected indicators when program managers need case-based data to analyze trends and make projections. Some progress is being made in consolidating indicators from various programs into summary presentations for senior management. However, it is not clear how useful such presentations really are except that they give an impression that a "data culture" exists.

There are risks to placing the responsibility for directing RHIS development and maintenance, including reporting systems and computer applications in the hands of statisticians, epidemiologists, and computer specialists located in a centralized health management information unit
Who should manage the design, implementation, and maintenance of routine health information systems? It is not uncommon for Ministries of to create centralized HIS units staffed with statisticians, epidemiologists, and computer specialists. While this seems a good way to get on with the difficult task of developing improved health information systems, it often contributes to many of the problems noted above.

Central information units are usually responsible for maintaining the databases required for producing the annual health statistics and other routine reports that the Administration often equates with information for decision making. Such data systems and their units tend to be self-perpetuating, as well-intended staff members strive to improve the completeness and timeliness of the data, whether or not they are useful for health services and programs. These units are also given responsibility for preparing the many reports requested by international agencies complete with an increasing large array of standard health indicators.

The creation of centralized health information units often results in:

- Records and reports designed to provide data to the central level, with less concern about the data needed for case and community management.
- A system is designed primarily for completing annual reports and statistical series.
- Failure to facilitate the collection of data required at service facilities for planning, budgeting, supply management, surveillance, quality control, and other critica; routine functions.
- The design of registers and records by HIS unit staff that may preclude the opportunity to reinforce standard clinical performance through the use of patient records and registers.

One benefit of the centralized health information unit is its potential to reduce duplication in recording and reporting. There is a tendency to invent new reports without checking what already exists. But even with a central HIS unit, preventing new and duplicate reports is difficult and many and at the district and facility level where staff members are already overburdened with recording and reporting. Perhaps the underlying cause of such spurious reporting requirements is the failure of the central HIS unit to adequately coordinate and share the data they are receiving with various offices and programs.

Focusing on "decisions" as the object and purpose of routine health information is not always possible or helpful.

Traditionally, information systems analysts approach the design of HIS by asking managers what decisions they make and what information they need to make them. While this sounds logical, it was not a useful approach for business and industry. It also does not work well in the health sector. First, "health managers" find it difficult to identify the explicit decisions they make, along with the data needed to make them. Second, in the health sector, practically everyone is a manager of something, and to enumerate all of these managers' decisions and corresponding data requirements is difficult, to say the least. The work of public health services may be defined better in terms of processes and functions related to systems and procedures. Many systems and procedures generate and require data for their effective performance.

Thus, rather than discreet decisions, health service delivery and management normally requires continuous processing that generates data initially for the tasks at hand, and additionally, as needed for arranging the support required for service delivery. These support processes include: laboratory diagnosis, drugs and other supplies, actions required by the community, and by higher levels in the system and in other sectors, such as food safety, water, and sanitation. This said, it is obvious that certain events or trends must be triggers for taking action such as an upward trend in enteric or sexually transmitted diseases in a certain locality, or an avoidable maternal death.

The more important routine health service and public health functions are often underemphasized in RHIS developments
Three of the more important public health functions are monitoring population dynamics through birth and death registration, monitoring infectious disease trends and outbreaks through disease surveillance systems, and monitoring environmental factors affecting health. Rarely are these information subsystems given priority for development.

Similar to other interventions in public health, the development of routine health information systems is not blessed with unlimited resources. As a result, the choice of data collected should reflect needs that are most critical for enabling the national health Administration to carry out its defined functions. Rarely is such priority setting done in a manner that defines the more essential public health responsibilities. Further, most countries are engaged in health sector reform that often includes decentralization of authority and management responsibility to regional and local levels. Staff at these levels must plan, manage, and control functions that were formerly performed at higher levels. All of these functions require information. However, defining essential information requires clear definition of the tasks and procedures for performing these functions. Unfortunately, it is often information systems designers who propose the data required for the new functions to be carried effectively without the clarity of defined administrative tasks and procedures.

The advent of the health indicator movement
In recent years, no health management concept has received more promotion and support than the health indicator. While "indicators" are an important element of RHIS development, they have often been misused, and implementing them is often problematic. One would like to believe that health status and system performance can be monitored effectively at all levels, community, facility, district, national, regional, and global, with a selection of carefully defined indicators, most of which must derive their data from routine recording and reporting. Many of the issues listed here would seem to be resolvable through the use of indicators. Recording and reporting should be reduced, and managers should be able to monitor and control without having to look at very much data or perform further analysis.

International agencies also saw great potential usefulness in health indicators. These agencies can deliver apparently sound technical advice for improving health information and its use, while simultaneously promoting their own policies, programs, and strategies, and creating a basis for comparing countries' progress toward "global goals.".. This indicator promotion has no doubt served the purpose of global monitoring to some extent (if the country data can be believed). Whether international indicator promotion has benefited national health information systems varies with the source and method of introducing recommended indicators. When global strategies, programs, and technologies are widely accepted by countries as being a high priority, technically correct, and cost-effective, the proposed indicators are likely to benefit the national monitoring and management of these programs' performance. But there have been many examples of indicators being defined by agencies for promoting aspirations and analytical approaches that have not been proven cost-effective. While countries may attempt to satisfy such international reporting requirements, their submission often results from central-level estimation exercises, with the resulting data not taken seriously and not used to influence national health policies, strategies, and services. Production of this indicator data becomes the price to be paid for membership in the international organization. Perhaps the worst sin of all is the continuing tendency by some agencies to promote the generation of composite indexes, those magic numbers through which a whole host of factors can be boiled down to one index and then used to rank countries from best to worst or vice versa.

Inside countries, the choice and definition of national health indicators has become a common exercise, often supported by external agencies. The amount of national self-determination in the choice and definition of health indicators varies, as does the flexibility and usefulness of the resulting indicators. Even when indicators are determined locally, technically sound, useful and feasible for routine reporting, much effort is often required to implement them. In the push for indicator-driven RHIS design, it should not be forgotten that many services continue to require case-based data management and transaction processing of services and support systems. Sound indicators and their monitoring do not serve all information needs, and unsound indicators create a huge waste of time at all levels.

The charm and the curse of the computer

Computerization has its own set of challenges to remain relevant, useful, and sustainable. About the only thing that can be said with certainty about computerization, and its contribution to the management, is that it will increase. The tremendous potential benefit of computerization in the public health sector, while beginning to be achieved, remains largely unfulfilled. Text and graphics processing, database management, data presentation, routine and ad hoc analysis, and data communications are the principal uses of the computer in the health field. But access to the Internet and the vast information it offers is fast overtaking all other uses.

One thing is certain, national health administrations in developing and transition countries need no inducement to computerize. How many times have we visited health institutions that are using newer hardware and software than we have back in our home offices? Staff skills, at least for individual applications, have expanded rapidly within health programs and services. Spreadsheet, database, project planning, and flowcharting expertise abounds. The question is whether these uses of the computer enhance health program performance through improved program management.

Much of their hardware and software have been received as part of cooperative projects, so most developing countries have a difficult time maintaining any kind of standardization. Most donors must procure from vendors in their own country or cope with restrictions on country of equipment origin. Often the cooperative project includes technical assistance for application development and training, which takes the choice of software out of the hands of the recipient. It may also deny the ultimate user much participation in design and development of the computer applications. In many cases, the computer applications are imported from other countries or from the collaborating organizations in the belief that economies can be realized by using existing software applications that just need to be adjusted for local use. How many times have we seen such efforts to apply existing computer applications fail? How many times have we seen new applications development that is designed and carried out by foreigners fall into disuse shortly after the foreign partners leave, usually because national staff have not participated enough in the design of the package and its programming to (1) believe in the approach, and (2) be able to maintain and develop the system further?

Another common constraint on computer program and system sustainability is the high turnover of computer-literate staff, because of their marketability in the private sector, for much higher salaries, once they gain computer skills in the public sector.

Still another problem is the inexperience of both foreign and native computer system developers in data systems management. Developers often blithely develop databases with far more content than is needed, and certainly more than can be maintained routinely with the data entry staff available. We seem to forget that routine data entry requires data entry clerks who either don't exist or are too few in number to handle the rapidly expanding workload. Even when data entry is decentralized to regions, districts, or local institutions, database maintenance and data communications are always a challenge.

Despite these difficulties, computerization in the health field will expand and become increasingly useful, aided by the type of experience sharing that this network can provide.

The international development community seems unable to learn what works and that doesn't for facilitating effective technical cooperation in support of sustainable routine health information system development

Many of the issues mentioned here involve technical cooperation. The group assembled here for this meeting should be able to cite examples of more and less effective external technical cooperation, especially those who represent national health administrations. We hope the group discussions that follow can elicit both the positive and less positive results of technical assistance in routine health information systems.

To help get that discussion started, we will share a few observations from recent experience.

- RHIS technical assistance (experts) fail to acknowledge the complexity and difficulty of RHIS development and the time it takes to design, test, and implement major systems.
- TA projects must produce "deliverables" within limited periods of time, which forces too much foreign involvement, thereby reducing sustainability.
- There is a failure to realize that every task performed by a foreigner, no matter how expert she or he may be, is a task not performed by a national and, therefore, not likely to be learned, accepted, and sustained.
- Ensuring national involvement and control is particularly difficult in HIS and computerization efforts because specialists in this field tend to have "do-it-yourself" personalities (for a variety of good and bad reasons).
- Most TA projects in health have some sort of requirements for, or impact on, routine health information systems. As the degree of external specifications and design of the reporting system increases, their compatibility with what already exists decreases. This fragmentation of approach is exacerbated by the common practice of having TA projects of the various development partners dispersed across the country, each with its unique reporting system.
- Not unexpectedly, programs with the most resources tend to attract more national support, which may push smaller, yet technically sound, projects aside. Collaboration and cooperation among cooperating agencies (CAs) in the HIS field is not better, and is often worse than in other types of health projects. This may be due to the absence of international strategies that sometimes exist in other health program subjects such as TB control, safe motherhood, and child health.
- As with other types of projects, national health administrations and program managers will accept just about any type of cooperation offered that includes financial, travel, material, training, or employment possibilities, even if the technical approach is inappropriate.

Some proposals for addressing these issues

The themes and presentations of this workshop should provide us with a wealth of examples of how to overcome some of these issues. We have heard some already, and more will follow in this session. I would like to share a few ideas that address some of the issues above. Some of these ideas have been tried out with success; others are still untried, but their potential is intriguing.

Addressing the problem that little effective use is being made of routine data

Can we do more to engage clinical specialists and community and public health experts in the process of record, register, and report design, with the purpose of increasing the relevance of the recorded data for the management of the patient and the community health situation? Such registers, records, and reports can thereby reinforce proper clinical and management procedures.

Improving the data on the population being served

Household enumeration of the population being served is becoming more common as a way to keep abreast of births and deaths occurring in the community, to update the size of target groups such as newborns and pregnant women, and to monitor their coverage with targeted services such as immunization. Such birth and death information can be shared with the civil registration authority.

Innovative approaches for strengthening routine health information systems and increasing staff capabilities to use data

Most projects would benefit from engaging service staff and managers in actual data analysis, service strategy design, and problem-solving activities, using existing data. Examples of such activities that we have supported for this purpose include:

- clinic performance and data assessments;
- assessments and design of disease surveillance systems;
- practical service and program evaluations;
- program and service performance monitoring, and profile construction;
- implementing "health watch" functions;
- constructing and maintaining geographic displays of the health situation, service performance, and resource distribution;
- analyzing and presenting indicators of health service access, quality, and equity;
- developing and applying community, household, and target group enumeration techniques; and
- undertaking team problem-solving efforts.

Increasing data functionality and the effectiveness of centralized HIS units

It should be possible to design improved -finding and case management, at the expense of having to maintain a few more forms and consolidate indicator data at levels above service delivery. This implies leaving much data system design with the responsible service programs, and developing basic reporting requirements with the involvement and guidance of clinical and public health specialists.

HIS units' focus should be on networking program and service data to enable more sharing and less duplication, assembling indicator data from the one source that is most likely to have them right, and preparing useful, management-oriented statistical and indicator presentations for monitoring implementation of national health policy, programs, and services.

Data for routine functions

Instead of seeking to define "decisions" and the data they require, why not try to define and describe the functions, procedures, and tasks to be carried out at the various service levels? These service processes generate and require the data that make up our RHIS. The problem lies in the difficulty of defining such functions and processes when the clinical managers and administrators have failed to do so during the process of health system reform. This type of systems and procedures design should be carried out by clinical and administrative system experts, supported by information systems people. We need improved tools and methods to help procedures description efforts. This process approach to data system design should use "signals for taking action" that embraces the concept of data for decision making, particularly in the nea-term, and unplanned actions in response to unexpected health situations.

Address health functions that are currently underserved with information support

Can we begin to foster the identification of essential functions for protecting the health of the population? It should be possible to begin to invest in data systems for monitoring those conditions and functions, such as monitoring population target groups and coverage with essential services; monitoring critical environmental conditions such as safe water, sanitation, and food safety; and providing effective surveillance of risk factors and infectious diseases.

The increasing tendency to decentralize health services management demands that we develop methodologies to facilitate the definition of processes and tasks that are being decentralized to district and facility levels. As service units become devolved from government health services, it is necessary to clarify the continuing recording and reporting requirements that must be continued to fulfill the government's responsibility for monitoring the health and service situation.

Living with the health indicator movement

We should strive to identify and maintain a modest list of nationally relevant health and service indicators that are drawn from important facility-based data that, when summarized, deliver additional information of value at the facility and district level, and that are useful at the policy level to enable managers to monitor health trends and service performance more easily.

How to ensure relevancy, utility, and sustainability from by computerizing routine health information systems

Can we revert to a tried and true maxim: don't touch the computer until the recording, reporting, and data use are proved effective within a manual system?

Further, can we insure that all systems design and development, including applications programming, is done by nationals, either staff in the health administration or from domestic consulting firms?

In addition, we must plan for the data entry workload expected from implementing the fully computerized system.

Finally, it is useful to begin to provide the products of computerization to service managers early in the development process and to seek their guidance for subsequent applications development.

How to enhance the value and effectiveness of international cooperation in RHIS development

Can we use this network to begin sharing the positive experiences from international support in RHIS development, as identified by the national managers of these developments? Can this network begin to devise and promote a "code of ethics" in RHIS cooperation, designed to prevent problems of nonsustainability?

Conclusion

Can we move toward some general principles in national RHIS development and cooperation?
In the past, we may have been tempted to come too quickly to the formulation of general principles of national health information system development. Yet, it would be helpful if we could agree on some basic principles that we all could support, because we feel that their application will help others avoid the problems and difficulties we have encountered.

Perhaps a short list of possible principles of RHIS development would not be inappropriate at the end of this paper.

- Place the design and enhancement of patient and facility registers and records in the hands of national clinical and public health experts.

- Use action learning-by-doing processes to enhance the use of existing data by service staff and managers at all levels, rather than traditional training workshops aimed at satisfying reporting requirement.

- Increase use of central health information units more to foster the sharing of health information received from the various national health programs, and less to design service registers, records, and reports to be processed through comprehensive, integrated reporting systems.

- Foster the definition of national essential health functions, processes, and tasks as the basis for health system management, as well as the national health information system.

- Ensure that any health indicators for national and international monitoring draw on routine data known to be necessary for facility and community management.

- Recognize that any task performed by a foreign expert is one that is not performed or learned by national staff, and reduce the direct technical involvement of such experts in RHIS development in favor of national management of the design and implementation processes.

- Build RHIS improvement efforts into health service and support system projects, and avoid health information system projects.

- Enable the sharing of RHIS design and implementation tools, methods, and practices through the RHINO network.

Attachment 1

Common RHIS Problems (Generalized from Actual HIS Assessments)

1. Requirements for data recording and reporting by service staff are excessive.
2. Much of the required data are not used in case management and public health tasks.
3. Excessive recording and reporting burden decreases attention to service tasks.
4. Large amounts of data accumulate at all levels of the health system, few of which are analyzed and used.
5. Service staff and health policymakers and program managers are not aware of the practical usefulness and strategic importance of the data currently being recorded and reported, or the procedures for data use have not been established.
6. Indicators have not been defined clearly for use by service staff. Often they are a response to international reporting requirements.
7. Demographic data are frequently wrong or unknown, making it difficult to develop rates, ratios, and proportions.
8. Data routinely reported by health services are considered of dubious quality (with regard to timeliness, validity, and completeness), so they are not relied on.
9. Problems of data quality often relate to the lack of consistent case definitions and other standards.
10. Data on the health of those without access to services or on those who use private sector services are not routinely available.
11. There is increasing use of general and special purpose surveys, often supported through international cooperation. Such surveys collect data that should be available through routine reporting systems, and as such, should further lessen reliance on the routine data.
12. In many countries, the birth and death registration and disease surveillance systems do not function adequately, which adversely affects many planning, monitoring, and action-taking functions for which the national health administration is responsible.
13. Despite considerable investment in computers and data processing, inadequate use is made of computers for better management and communication of health data.
14. That being said, efforts to enhance computerization often are undertaken by external agencies and staff, which makes it difficult for the resulting applications to be maintained in the recipient country.
15. There is often a lack of coordination in data collection, data maintenance, and reporting, which results in inconsistency, gaps, and duplication in data and the resulting information.
16. Analysis and reporting of and feedback on health data and information from the central level to service levels are rare and not well prepared.
17. The organization of health information systems development and management is often affected adversely by frequent change of leadership, few and frequent loss of qualified staff (to the private sector), and varying styles and types of international cooperation.

Health Management Information System in Malawi: Issues and Innovations

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Abstract

The main problem in the current health information systems is not a lack of information, but insufficient use of available information. Therefore, Malawi is establishing a health management information system (HMIS), beginning with institutionalizing a very simple health system monitoring process. In this process, districts convert existing facility-specific data to relevant indicators, monitor the trend, compare against targets or expected values, compare among facilities, discuss the reason for deviating from expected value, and incorporate corrective measures in their next monthly and quarterly plans. The same procedures are being followed at the national level. It has been recognized that this process is essential for developing a better understanding of the value of information in management, and that this will lead to establishing an information culture throughout the health delivery system. Within the new HMIS, a client-held health booklet system has been introduced, aimed at improving the quality of health care to individual clients. Though these booklets are sold in a cost-recovery scheme, they are in great demand and have been shown to have positive effects on quality and access of care.

Background

In 1999, the Ministry of Health and Population (MOHP) published the document, *To the Year 2020: A Vision for the Health Sector in Malawi*, that is intended to guide the development of the health sector for the next two decades. Establishing a flexible, accessible, comprehensive health management information system (HMIS) that integrates existing information systems was an important target of the long-term policy. This paper presents an overview of the process and the content of HMIS in Malawi and highlights major observations and lessons learned from implementing it.

The fourth National Health Plan 1999–2004, developed as part of the Ministry's long-term policies, aims to expand the range and quality of health services; improve the general health status of the population; increase access to health care facilities and basic health care services; develop human resources; improve efficiency and equity in resource allocation; strengthen collaboration and partnership; and increase overall resources in the health sector.

Some of the major strategic approaches to achieve the planned objectives are a sector-wide approach, decentralization, hospital autonomy, and diversification of the resource base, including cost sharing.

To ensure that the planned health targets are achieved, a systematic monitoring system was imperative. However, the existing health information system was unable to ensure timely data entry, analysis, and feedback to the facilities. The data quality was also questionable. At the district level, data collection to monitor and evaluate performance was not a priority. Information related to disease surveillance, vital statistics, maternal child and reproductive health indicators, and tracking of financing and expenditures was neither systematized nor easily accessible for proactive analysis and planning purposes. Thus, the MOHP's ability to track progress toward the planned objectives and targets was severely limited. Such absence of an information culture posed a major challenge to the development of HMIS in Malawi.

Strategies for design development and establishment of HMIS

Participation, consensus building, and collaboration

Collaboration among different stakeholders has been the main strategy behind the development of HMIS in Malawi. The HMIS has been designed through a systematic process of consensus building. Different stakeholders have agreed to basket funding to strengthen and sustain the system. Christian Health Association of Malawi (CHAM), the second-largest health service provider in the country, is participating fully in HMIS. Private facilities are also encouraged to become involved in the system.

National Capacity Building

A national team has led the effort to design, test, implement, and strengthen the system. Everyone involved in the delivery of health services underwent orientation training on purposes, tools, and techniques of the system. Facilitators of the process are exposed to different kinds of training, seminars, conferences, workshops, and higher studies based on the their specific job needs. At least three people have obtained M.P.H. degrees in HMIS-related subjects, and others have had short-term training in HMIS abroad. All health workers currently in the system receive training in HMIS, and the HMIS is included in the curriculum of health training institutions in Malawi. Because of these efforts, all those already in the system, as well as newcomers, will have basic knowledge about and skills in HMIS.

Step-by-Step Development

The HMIS development process includes the following major steps:

- building consensus on development of integrated HMIS;
- defining and endorsing indicators for routine monitoring;
- designing HMIS instruments, including user's manual and training materials;
- testing instruments in series;
- launching the HMIS nation-wide in phases; and,
- developing an appropriate "information culture."

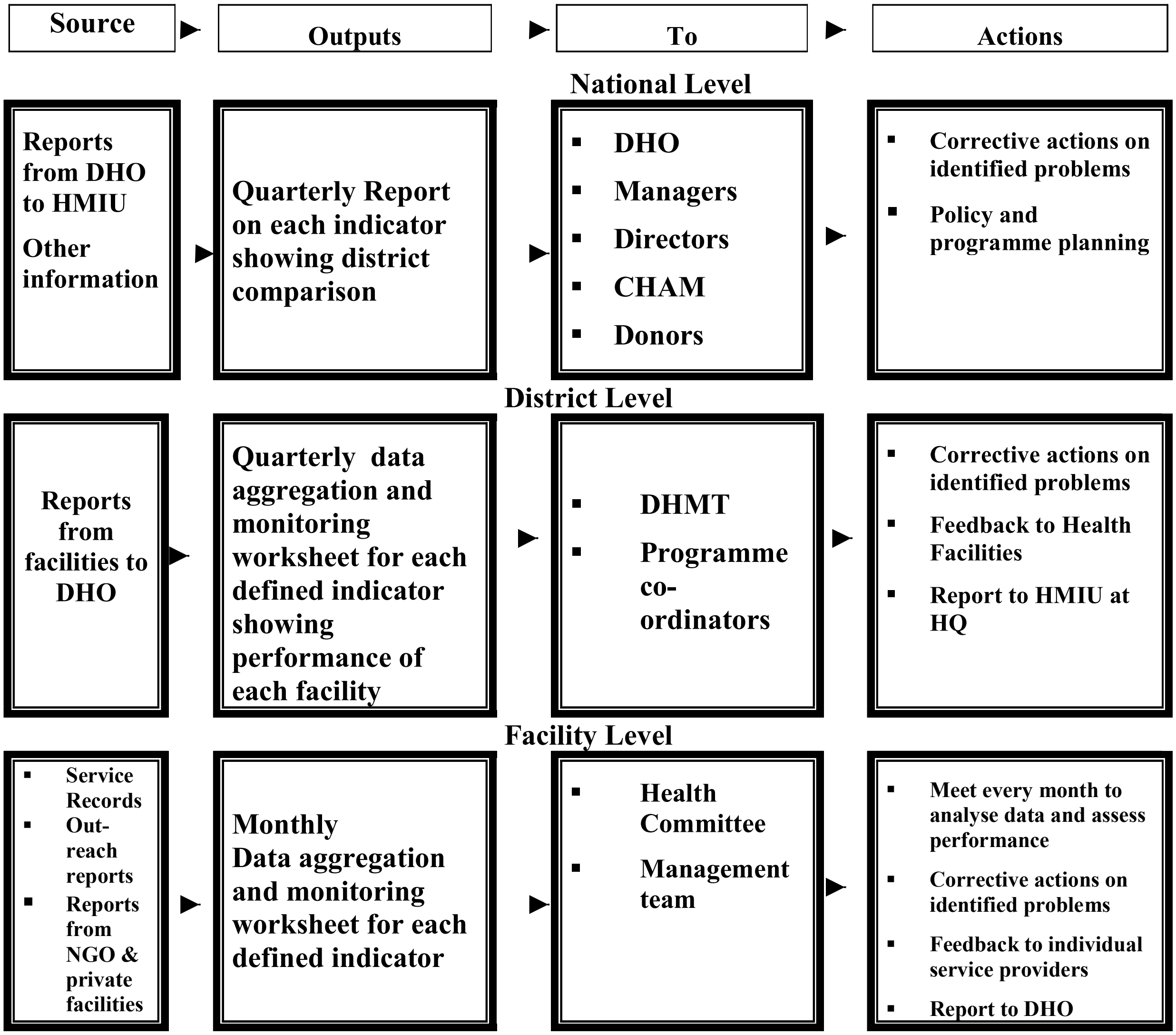
Conceptual design of the system

Principals

All stakeholders agreed on the following four principles to guide the design of the system:

- *Integration:* Program-specific vertical information systems are integrated into one health service information system. Five independent routine management information systems—health services; finance; drugs and supplies; physical assets, including buildings, equipment, and vehicles; and human resources, including staffing and inservice training—are gradually strengthened as subcomponents
- *Decentralization*: Analysis of data takes place at the level where it is generated. Simple analytic tools are introduced for this purpose. As part of health sector and the civil service reforms, the districts and the district health management teams play a pivotal role in health service delivery. Districts formulate their local policies, plan their activities annually, and are solely responsible for the delivery of health services.
- *Simple*: Manual operation of the procedures remains crucial. Health workers are able to draw registers and forms manually, and a simple calculator is sufficient to aggregate and analyze data. The system does not stop functioning simply because of a shortage of printed stationery or breakdowns of computers. However, it does benefit fully from modern technology at higher levels to facilitate data aggregation, analysis, and report generation.
- *Action Orientation*: There is a direct link among data collection, analysis, and decision making at all levels of the health pyramid. The HMIS provides information for policy development, program

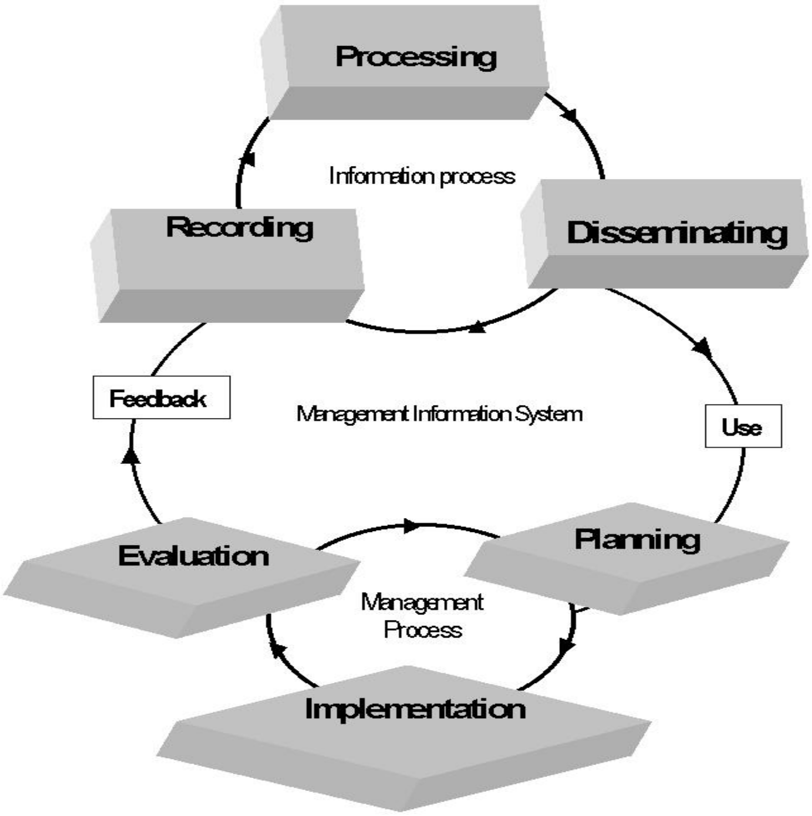
planning, and operational management. The system collects only the information needed for decision making, sends reports only to those managers who use the information for decision making, and send the reports only when they are needed for decision making. Routine actions at each level are depicted in the following diagram.

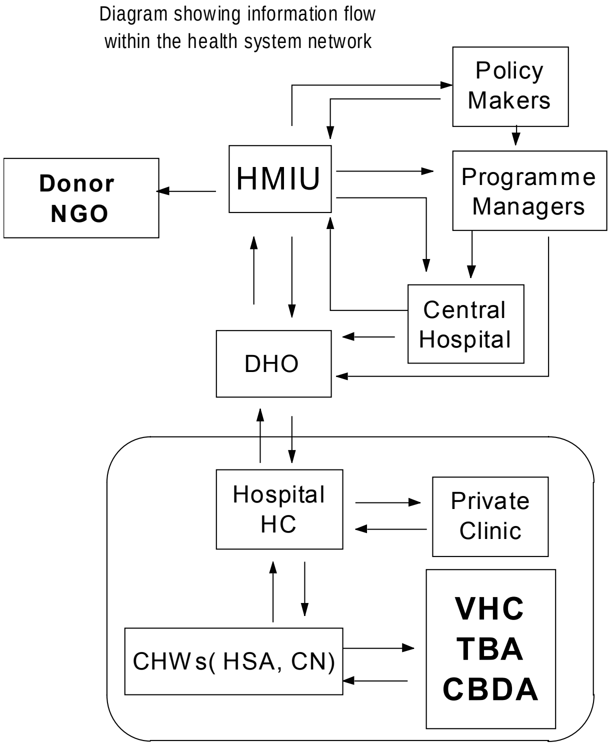


Source	Outputs	To	Actions
National Level			
Reports from DHO to HMIU Other information	Quarterly Report on each indicator showing district comparison	▪ DHO ▪ Managers ▪ Directors ▪ CHAM ▪ Donors	▪ Corrective actions on identified problems ▪ Policy and programme planning
District Level			
Reports from facilities to DHO	Quarterly data aggregation and monitoring worksheet for each defined indicator showing performance of each facility	▪ DHMT ▪ Programme co-ordinators	▪ Corrective actions on identified problems ▪ Feedback to Health Facilities ▪ Report to HMIU at HQ
Facility Level			
▪ Service Records ▪ Out-reach reports ▪ Reports from NGO & private facilities	Monthly Data aggregation and monitoring worksheet for each defined indicator	▪ Health Committee ▪ Management team	▪ Meet every month to analyse data and assess performance ▪ Corrective actions on identified problems ▪ Feedback to individual service providers ▪ Report to DHO

Meaning of HMIS

To understand the meaning and concept of HMIS is crucial for successful establishment of HMIS. The literature reflects confusion about the HMIS's scope of work. In Malawi, the MOHP has defined HMIS as a process of collecting, processing, and disseminating information on management, health services, and health status, and using the process to improve the management (planning, monitoring, evaluation) of programs and services. According to this definition, the information has to be used in the management process. The diagram below depicts this working definition.

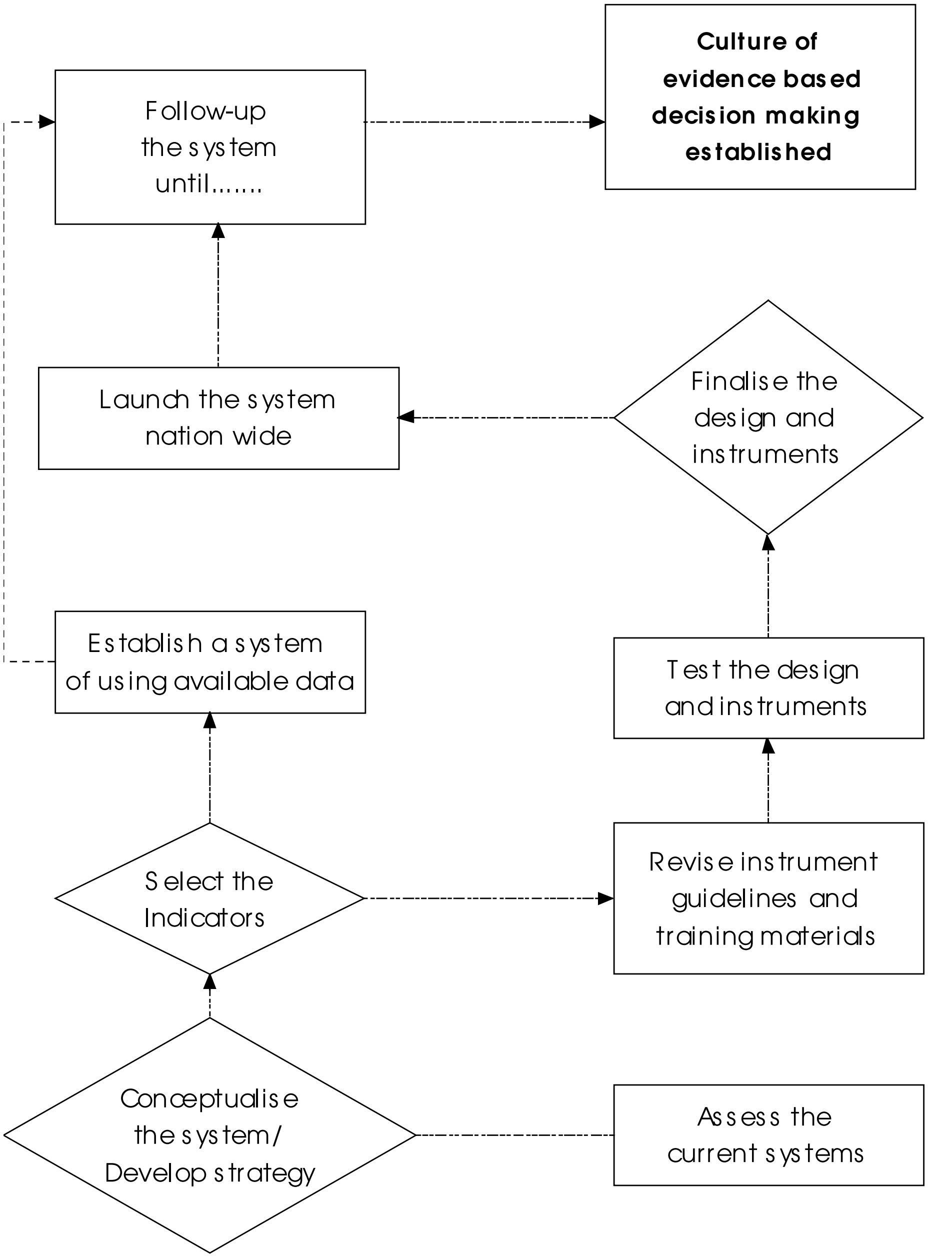




Upward, downward, and lateral communication
Community health workers (CHWs) discuss community health indicators at their monthly Village Health Committee (VHC) meetings.

Facility staff meets monthly to review their progress and to discuss ways to improve their work and prepare next month's workplan. The extended DHMT meets monthly to review the last quarter's progress, prepare workplans for the next quarter, and oversee their implementation.
At headquarters level, the health management information unit (HMIU) provides quarterly district comparative reports to all stakeholders, including the DHO. Each technical program provides feedback to the district on matters arising from quarterly HMIS reports. The diagram below depicts how the information flows within the health pyramid.

Diagram showing the 10 steps of HMIS design, development and establishment



Immediately after the end of each fiscal year, all of those in charge of facilities meet with the extended DHMT to review the annual performance of facilities and of the district as a whole. Similarly, all DHOs meet with headquarters to review district and program-specific performances. All stakeholders take part in this national annual performance review.

Process of designing, launching, establishing, and sustaining the system

The following diagram shows the overall picture of how the system is conceptualized, designed, tested, launched, and established.

Assessing the strengths and weaknesses of current systems

The process of evolving program-specific information systems into integrated and comprehensive HMISs started with an assessment of the strengths and weaknesses of the current systems in use. The findings of the assessment were disseminated to all stakeholders, including donors, nongovernmental organizations (NGOs), all technical programs within the Ministry, and central hospitals. The Ministry organized a series of meetings for different stakeholders to develop consensus on the HMIS design. All stakeholders unanimously agreed on the following guiding principles for design and implementation of the system.

Endorsing the national HMIS strategy and implementation plan

With the consensus of all collaborating partners, MOHP endorsed a national HMIS strategy and implementation plan. The strategy aims at establishing an information culture throughout the entire health delivery network. Its focus is on using the available information for better planning and implementation of health services, rather than introducing tools to generate more information. The 10 steps involved in the process are depicted in the diagram above.

Selecting indicators

The process of designing the HMIS tools began with the stakeholders agreeing on a basic set of indicators for routine monitoring. A total of 65 input, process, and output indicators for routine monitoring of coverage and quality of health services and management were agreed on and disseminated nationwide to all stakeholders. Of these indicators, 15 are related to coverage of services; one to nutritional status of children under age five; one to OPD utilization rate; nine to reported new cases, one to voluntary counseling and testing; two to TB detection and cure rate; three to use of hospital beds; seven to inpatient death rates; four to availability of drugs, medical supplies, vaccines, and foodstuffs; four to water and sanitation; six to human resources; and five to budget allocation and cost sharing. The remaining indicators are related to supervision, management meetings, reporting status of HMIS reports, and use of vehicles.

Most indicators are used at all levels; however, a few apply to one or more specific levels only. Health centers and hospitals monitor most indicators monthly. They also monitor 49 diseases and disease categories for which diagnosis criteria are defined. District and national levels monitor quarterly. As part of the 65 indicators, some diseases are monitored quarterly at the district and national levels. The following are the national indicators

1 Percentage of pregnant women starting antenatal care during the first trimester
2 Average number of antenatal visits
3 Percentage of pregnant women receiving adequate TT doses
4 Percentage of pregnant women receiving iron supplementation
5 Percentage of pregnant women receiving sulpha pyrimethamine (SP)
6 Percentage of deliveries attended by trained health personnel
7 Percentage of deliveries attended by trained traditional birth attendants (TBAs)
8 Percentage of women with obstetric complications treated in obstetric care facility
9 Caesarean section rate
10 Percentage of women attending first postnatal care within 2 weeks of delivery
11 Percentage of postnatal women who have received vitamin A supplementation within 2 weeks of delivery
12 Percentage of women of childbearing age (WCBA) using modern family planning methods (CPR)
13 Percentage of new family planning acceptors
14 Percentage of fully immunized children
15 Percentage of expected doses of vitamin A given to under-5 children

16 Percentage of underweights in the under-fives attending clinic
17 OPD utilization rate
18 Reported new cases of acute flaccid paralysis (AFP)
19 Reported new cases of leprosy
20 Reported new cases of neonatal tetanus
21 Reported new cases of measles in under-5 population
22 Reported new cases of sexually transmitted infections (STIs)
23 Reported new cases of HIV
24 Volunteer counseling and confidential testing (VCCT) for HIV
25 Reported new cases of clinical malaria
26 Reported new cases of diarrhea in under-5 population
27 Reported new cases of pneumonia in under-5 population
28 TB cases detection rate
29 TB cure rate
30 Bed occupancy rate
31 Bed turnover rate
32 Average length of stay
33 Inpatient death rate from malaria
34 Inpatient death rate from diarrhea
35 Inpatient death rate from pneumonia
36 Inpatient death rate from malnutrition
37 Inpatient death rate from TB
38 Direct obstetric death rate in the facility
39 Inpatient death rate from all causes
40 Availability of vital drugs
41 Availability of vaccines
42 Availability of essential medical supplies
43 Availability of categories of foodstuff
44 Percentage of households with access to safe drinking water
45 Percentage of households with san plat latrines
46 Percentage of availability of vehicles for program activities
47 Percentage of doctors’ positions filled
48 Percentage of nurses’ positions filled
49 Percentage of clinical officers’ positions filled
50 Percentage of medical assistants’ positions filled
51 Percentage of health assistants’ positions filled
52 Percentage of health surveillance assistants’ (HSAs) positions filled
53 Percentage of other recurrent transactions (ORT) budget received
54 Percentage of budget spent in each sub-program
55 Percentage of income from cost sharing
56 Percentage of drug and medical supplies expenditures spent at health centers
57 Percentage of cumulative drug expenditure to date
58 Percentage of health centers with functioning communication equipment
59 Percentage of health centers with functioning water supply
60 Percentage of health facilities with functioning medical waste disposal facilities
61 Percentage of active village health committees
62 Percentage of management meetings conducted
63 Percentage of health facilities supervised by Management Team
64 Percentage of completeness of reporting
65 Percentage of timeliness of reporting

The tertiary care facilities have a subset of 25 indicators, which are as follows:

A Percentage of patients seen by specialists within 4 weeks of appointment
B Percentage of operations performed within 7 days of admission
C Cure rate
D Reported new cases of confirmed HIV positive cases
E Inpatient death rate from all causes
F Direct obstetric death rate in the facility
G Bed occupancy rate
H Bed turnover rate
I Average length of stay
J Percentage of income from cost sharing
K Percentage of budget spent on programs
L Percentage of cumulative drug expenditure to date

M Availability of key essential drugs
N Availability of key medical supplies
O Percentage of extended management meetings conducted bimonthly
P Percentage of hospitals supervised in the 4 main areas of speciality
Q Percentage of availability of vehicle for patient-related activities
R Percentage of students successfully completing practical training in the hospital
S Percentage of research findings incorporated in hospital work plans
T Percentage of specialists' positions filled
U Percentage of doctors' positions filled
V Percentage of nurses' positions filled
W Percentage of clinical officers' positions filled
X Percentage of technicians' positions filled
Y Percentage of account and admin personnel positions filled

The tertiary care indicators monitor achievement of the following objectives:

- To reduce mortality
- To increase cure rates
- To increase the number of specialists
- To expand the number of diagnostic services
- To increase the types of services offered
- To improve the use of hospital beds effectively and efficiently
- To reduce waiting time for specialist clinics and operations
- To provide practical training for trainee doctors, clinical officers, nurses, and other cadres
- To supervise and offer specialist services to district hospitals
- To increase the budget from cost sharing gradually
- To ensure rational use of resources
- To conduct and coordinate research activities
- To ensure availability of key drugs at all times
- To increase user's satisfaction with the services
- To increase provider's satisfaction with the services

Use available information before embarking on comprehensive HMIS

Recording, processing, and disseminating information alone cannot result in effective and efficient management output. Therefore, the new HMIS started with a process for maximizing the use of available information. A national workshop was organized for all 27 District Health Officers (DHOs) to compare their data sets to the 65 indicators. Availability and quality of data varied from district to district. A monitoring system was established in each district on the basis of data availability.

HMIS instruments

A total of 16 HMIS instruments were devised to improve the quality of data collection, aggregation, analysis, monitoring, and reporting at each level of the health pyramid. The client keeps three of them at home; the other 13 are kept at facilities.

Client health booklets

Three client health booklets (child health profile, woman health profile, and general health profile) were introduced in all public and private health facilities to improve the quality of health care. All of the booklets contain records of updated client history, assessment of current problems, and types of care given. Issued at birth, the child health booklet contains specific information on immunization, vitamin A, and growth monitoring. A male child can use the same booklet for his entire life, as long as there is space to record the assessment and care provided. For men, the general health booklet can be annexed to their child health profile for continuous recording of diagnoses and care provided. The girl child, however, will use a woman health booklet when she reaches puberty.

The woman health booklet contains specific information on tetanus toxoide injection, family planning services, antenatal checkups, obstetric history, and postnatal services as well as general history. Although the MOHP health services in Malawi are said to be free, these booklets are sold at cost to ensure cover expenses. The MOHP, although interested, was hesitant initially to introduce the cost-recovery system for these booklets for fear that people might resent it. Introducing these “profile revolving funds” at the facility level was done in stages: from three health facilities to 20 to 43 health facilities, including the largest central hospital in Malawi. Surprisingly, these booklets are in great demand. It should be noted that similar booklets are already used successfully in the Christian Health Association network of Malawi.

Registers

There are nine registers for recording details about the client. These registers are the only data source on health problems and services at the facility. A register is designed to provide data mainly for indicators. However, there are sufficient data at the facility level for a number of cross-variable analyses. Data are aggregated at the end of each day; they show where the people come from, what their main reported problems are, and what preparations are needed for the next working day. When facility staff look into their daily aggregates and act on the information, evidence-based decision making becomes an established habit.

Data aggregation and monitoring tools

Simple tools have been introduced at the facility and district levels to aggregate data and monitor the indicators. No report can be prepared without analyzing the data at the level where it is generated. Facilities use two printed poster-size sheets: one for data aggregation for each indicator and another for calculated rates and ratios. At the district level, A3 sheets are used for each indicator to monitor rates/ratios by facility. In this way, districts can easily detect the performance rank of each of their facilities and develop interventions to support their weaker facilities.

The worksheets contain current status, year-end targets, monthly or quarterly targets, and achievements. If the achievement of each month or quarter is less than anticipated, corrective actions can be taken in time to ensure that year-end targets are achieved.

A sample of monitoring worksheet is shown below.

				Monthly achievements in absolute numbers													
Facilities	Current	Year end	Monthly	July	August	September	October	November	December	January	February	March	April	May	June	Annual total	Annual

Monthly total														
Cumulative total														
Cumulative coverage														

Reporting forms

Two separate quarterly reporting forms—one for reporting from health facility to district and another from district to headquarters—have been devised. There are a few differences in the content of reporting of these two levels: Some of the information reported from facilities to the district is not reported to headquarters, whereas districts add more information to their reports from the data they generate at the district level. Preparing reports just consists of transfering information from data aggregation and monitoring sheets. The report contains both the numbers and rates/ratios to ensure that rates/ratios are calculated correctly at the lower level.

Indicator Number	Indicator Name	Numerator Denominator	Data	Constant Multiplie	Rates/ Ratios
1	Percentage of pregnant women starting antenatal care during the first trimester	Number of pregnant women starting antenatal care during their first trimester		100	
		Number of expected pregnant women in the catchment area			

Community-based data are collected by community health workers in a diary, using the facility-based monitoring format. Health facilities receive reports from the private practitioners operating within their catchment area, and these reports are adapted locally, according to the type of service rendered by the private clinic.

Testing, Launching, and Follow-up

HMIS tools and procedures are tested briefly, then quickly launched nationwide in the shortest possible time. Then they are followed up systematically and strategically for a long time until evidence-based decision making becomes habit for all health personnel and is incorporated into the culture of the entire health system. All health workers go through a series of real-life exercises for five days of thorough training to understand the value of the HMIS process. All participants start by demarcating the catchment area and deriving the target population for their respective facilities. They do real exercises on data-based needs assessment, resources allocation, prioritization, target setting, monitoring the targets, and disease trends. Training has been considered as only an introduction; it is not intended to cover everything. Instead, two rounds of supervision and follow-up visits are carried out at each facility every month for the first three months, then one round monthly for the next nine months, then once every quarter until the HMIS is practiced everywhere. The time allocated to each stage is shown in the following diagram.

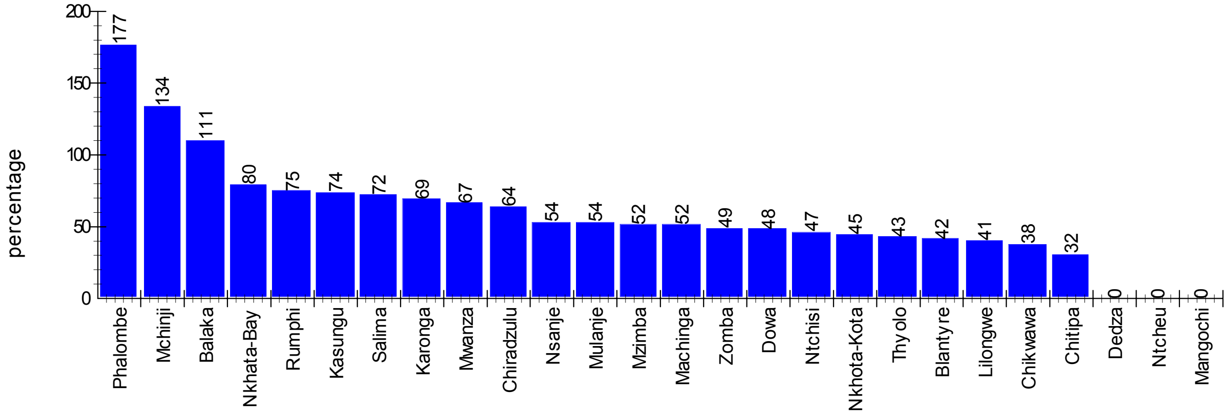
Design & testing	Nation-wide Launching	Constant supervision & follow-up until the HMIS becomes a culture
18 month	6 month	3 to 5 years or even more

Key lessons learned at the early stage

Use of available data

- Appropriate use of available data is the best *precondition* for introducing a system to generate additional information. Failure to use currently available data is obviously an indication that a system has failed to attain the main objective of an HMIS.
- People can understand the value of information only if they use it in making decisions. Knowing the HMIS alone is insufficient to understand its real purpose. Real exercise of problem analysis, resource allocation, and target setting and monitoring is necessary. The service utilization rate is one of several criteria the MOHP applies in 2001–2002 resource allocation to the districts. This small decision has had an impact on the quality of data. Thus, if data are used, the quality of reporting inevitably will be improved.
- Annual health statistics reports were unavailable at district and national levels for many years. After a five-day training session for two people from each district, and a new data aggregation and monitoring tool, all districts were able to generate quarterly and annual reports on health services and disease statistics. HMIS can be effective if the appropriate tools, procedures, and supports are available.

Indicator 14: Fully immunised under 1 children, Malawi 1999-2000



The graph above is from the annual performance review report for 1999–2000. The quality of data is questionable; however, this graph raises many questions for program managers and districts. The effects of publication of this graph are already reflected in the quality of data in quarterly reports. It is important to publish the report to allow the reporter to learn from his or her mistakes.

Use of client health booklets

Over the last six months, use of the client health booklets has had a tremendous positive impact on the quality of individual client care, which can be summarized in the following points:

Correct diagnosis: history of the client has to be updated during each visit. Going through the history and past records on assessment and care, it becomes extremely easy to assess a client's current problems. The diagnosis is recorded in the booklet, which the client keeps, so providers are more likely to make the right diagnosis.

Quick diagnosis: a provider asks about the current problem and goes through the history and past records. The client's entire health history is in the booklet, so the diagnosis takes much less time than if the provider had to take the client's history and read scattered documents.

Saving time for client and provider: a provider goes through the record instead of asking the client about past problems and types of care received. However, more time is required at the first visit to establish the profile of a client by issuing booklets and taking his or her history.

Self-assessment by client: the booklets serve as education tools. Literate clients can read their own health history, become aware of their problems, and take precautions. Even illiterate guardians can track the growth and development of their children.

Controlling fake recording of drug consumption: Malawi has immense problems with drug pilfering. The drugs dispensed and the balances in stock generally do not match the quantity received. The booklet records actual drugs prescribed, so clients might speak up if there are differences between the amounts prescribed and those actually dispensed to them. Using the booklets might reduce the volume of drug pilferage.

Create environment for cost sharing: the gap between the government's ability to provide drugs and the actual demand is very wide. Given Malawi's current poor economic growth, it is unlikely that the government will be able to meet total drug requirements. Therefore, cost sharing is the only way to ensure the uninterrupted availability of drugs at health facilities. Clients purchasing booklets establishes the habit of paying for services and supplies, and has opened the door to promoting further cost-sharing schemes.

Freedom for client to select any clinic or provider: a facility-based personal health record system compels clients to visit the same facility, even if they are dissatisfied with the quality of care given. Because the booklet is always with the client, he or she has the freedom to seek health services from any trusted provider or facility. Freedom to select a provider is important for increased client satisfaction.

Acceptance: the client health booklets are well accepted by the communities, even though clients have to pay for them. Even people who do not have any health problems have bought them for future use.

Rapid Assessment of Bhutan's Health Management Information System

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Executive Summary

As part of the second stage of Management Sciences for Health/EuroHealth Group's (MSH/EHG) technical assistance for the enhancement of Bhutan's Health Management Information System, a rapid assessment was carried out over a 4 week period from May 22 to June 15th 2000. The rapid assessment was designed and conducted by HMIS Task Force staff from the Ministry of Health and Education with technical support from a 3 person team from Management Sciences for Health.

Data were collected using 4 standard questionnaire formats by 3 separate assessment teams during 5 days of visits in 7 of Bhutan's 20 Districts. A total of 23 health facilities were visited, including Basic Health Units (BHUs), District Hospitals and District Health Supervisor Officer's (DHSO) offices. During this time, a detailed Information Technology Assessment was also conducted – the report of which has been produced as a separate document.

The rapid assessment focused principally upon knowledge and practice of health workers with respect to data management (collection, processing & use), the availability and appropriateness of resources, the general organisation of system procedures. It also solicited health workers' attitudes about problem areas and suggestions for improvement. Five different information sub-systems of the National HMIS were selected for detailed review, these included:

- STD/HIV/AIDS surveillance
- Monthly Morbidity reporting
- MCH/EPI/FP and Nutrition reporting
- Drug logistics
- Village/Household surveys.

Data was tallied manually and using electronic spreadsheets in order to prepare thematic data summary sheets, which were discussed by HMIS task force members and other health programme staff during a 2 day workshop. This group interpreted the data and came up with initial conclusions and recommendations.

The principal conclusions from rapid assessment identified the following strengths of the existing HMIS:

1. Generally speaking, adequate resources exist at the service delivery points and district levels for the uninterrupted recording and reporting of data. This includes the availability of materials (registers, forms, stationery, etc...), and adequate staff with sufficient time (in most cases) to carry out the required data management tasks. This appears to also be the case at the district level, where computers are also available and functioned well at the time of the assessment teams' visits.
2. Systems for filing and retrieval of past reports at the BHU/Hospital level are excellent and generally well maintained.
3. Staff have a good understanding of the potential uses of the information they collect, although procedures for its actual use are not well established.
4. At the BHU level staff devote considerable effort to presenting key population and service data on wall charts, graphs and maps. There is, however, scope for improvement in the selection and calculation of some of the indicators that are graphed.
5. Routine reporting from BHUs/Hospitals to districts is very effective as evidenced by very high reporting rates, although there is confusion about reporting deadlines for some of the sub-systems (e.g. Village Summary Sheets and Drug Reports).

The assessment identified or confirmed a number of weaknesses that should become the focus of immediate HMIS improvement efforts. These included:

1. Too much data is collected in current recording and reporting formats and not enough is used. There is also confusion about the calculation of several key indicators and how to estimate population targets (especially in family planning and drug management). These problems seem to be related to the design of the reporting formats that are duplicative and require excessive data and to the lack of written guidelines concerning indicator definitions and procedures for data use.
2. There is a lack of systematic feedback (especially written feedback) from DHSOs to BHUs and Hospitals regarding reporting errors and especially for providing analysis of reported data.
3. There appear to be serious problems with data quality originating at the service delivery point, which are further compounded at the district level.
4. Although computers exist and function well at the district level, they are not used systematically to help with data analysis and electronic communications. There is no mechanism, either at the central level or within districts, to build upon the individual initiatives of certain districts and cross-fertilise these uniformly throughout the country. At the national level there are also adequate numbers of computers, but the small team within the Health Information Unit is inadequately staffed and lacks skills in database management and computer hardware troubleshooting which are necessary to support more effective use of this technology.
5. Following recent staff changes at the central level, the Health Information Unit now lacks personnel with training in epidemiology and health service delivery. This expertise is critical for ensuring that surveillance functions at the national level are carried out effectively and for helping to interpret data on significant disease or service trends for feedback reports and the annual health bulletin.

Recommendations were made for enhancements in each of the following areas, some which are highlighted in bullet form under each heading:

Data transmission, feedback and supervision

- Clarify reporting deadlines – especially for the Village Summary Reports and Drug Reports.
- Improve the design of several recording & reporting formats (the Village summary sheet, household survey, morbidity reports, family planning registers, etc...) to make them simpler to complete and easier to analyse. Similarly, the MOHE should consider dropping some formats (IDD reports) or collecting the data in other ways.
- Prepare a manual documenting standard guidelines for report transmission and feedback mechanisms and explore more efficient mechanisms for transmittal from remote BHUs. These guidelines should be widely disseminated.

- Stress the need for supervisory visits by DHSOs to each health facility regularly (at least once each quarter?), and determine what data management tasks should be reviewed or discussed during these visits. These could be included in a standardised supervisory checklist.
- DHSOs should provide written feedback to BHUs and Hospitals about their performance on regular basis (at least bi-annually).

Presentation and use of information

- Clearer definition and standardisation of indicators for routine presentation would help ensure data comparability
- Monitoring, graphing or charting of key trends and setting of targets should be reinforced at every level
- Health unit staff should discuss the information collected monthly before submitting their reports. They should discuss accuracy of data, achievement of targets, outbreaks of any diseases and any other management issues that are highlighted by the data.
- HMIS enhancement efforts should take full advantage of existing computers and software in order to improve mechanisms for data aggregation and analysis starting at the District levels.

Data quality

- The development and provision of documentation in the form of a procedure manual related to standards/guidelines to all health workers involved in data collection.
- Develop simplified tools to facilitate aggregation of data for reporting (e.g tally sheet for morbidity reporting from service delivery points) with reduced errors.
- Enhance usage of computer and other information technology both at the district and national level to facilitate data validation.
- Develop new processes and/or share and standardise error trapping and correction procedures developed by some districts to control data quality.
- Define acceptable levels of error, for example 5 or 10%, and select indicators to routinely monitor data quality such as reporting rates, and on rapid data audits at health facilities.

Resources

- Provide simple solar/battery operated calculators to all the staff of BHU/Hospital/DHSO
- Establish a minimum supply list and adequate budgets for stationery including pens, poster paper and coloured markers and ensure that the supplies are provided as per the list.
- Strengthen the Health Information Unit at the Central level in order to:
    - Screen all new, or re-designed, recording or reporting formats before they are introduced at the health facility level
    - Cater to the health information needs of different projects from in and outside the MOHE.
    - Support computer systems development and maintenance and enforce standards.
    - Recruit a clinician with training in epidemiology or demography to prepare more useful epidemiological analysis of data.
    - Hire or train an existing staff member in computer hardware/network troubleshooting. More complex hardware problems should be dealt with by contracting with a local computer firm.
- Explore various learning approaches for formally institutionalising health worker training on data management with the introduction of the enhanced HMIS. This could be through some combination of the supervisory system (especially for continuous re-enforcement of data use), through short workshops built into district level staff meetings, and/or more formal training methods.

Storage and retrieval of information

- DHSOs should consider making more effective use of their computers to store more data (both current and historical) and facilitate easy retrieval and analysis.

- In some facilities additional supplies, furniture and space may be required to further improve storage conditions.

Information technology
Based upon the successful experience with the installation of computers at the level districts thus far, the provision of computers to all Health Units down to BHU grade I should be considered. In addition:

- Some existing computers in districts need replacement or upgrades.
- There is a need for better standardisation of software version numbers (many different versions of the 'standard' software were running)
- With reasonably priced access to the Internet at the district level, Internet use needs to be increased for electronic mail, data exchange and eventually other purposes (e-learning, data querying, web site maintenance). The MOHE should consider a variety of approaches to help staff learn how to use the technology more effectively.
- District and central level staff's job descriptions should be reviewed to identify specific data management tasks both manual and computerised that they should be responsible for.
- In some districts, both automatic voltage regulators and un-interruptible power supplies should be provided to protect the computer equipment against power fluctuations. Similarly, phone line surge protectors need to be supplied to avoid damage to modems from lightning and other voltage spikes carried through the phone lines.

At the central level:

- The HMIS enhancement project should help develop the capacity of the Health Information Unit (HIU) to design and maintain specialised database applications at both the centre and district levels to meet data processing needs.
- An Information Technology cell should be established within the HIU and made responsible for standardisation and maintenance of Information Technology throughout the country
- The HIU should continue with the work currently in progress to network central level computers into a local area network and establish Internet/intranet links.
- The task force should establish a small team to recommend more detailed software standards, especially for database management, and to develop a plan to implement the new standards at all levels.
- As noted earlier additional staff should be recruited or selected HIU members should receive refresher training in hardware troubleshooting especially.
- The Ministry should either recruit or have a support contract with a full-fledged computer technician or firm for backup services. This is not for basic trouble-shooting or warrantee maintenance, but rather for helping with more complex issues at will arise about the need for equipment upgrades and helping clarify technology options and standards.
- Use of computers for data transmission and tele-medicine should also be further explored, building upon the start that has already been made in the field of radiology.

Introduction

As part of the second stage of Management Sciences for Health/EuroHealth Group's (MSH/EHG) technical assistance for the enhancement of Bhutan's Health Management Information System, a rapid assessment was carried out over a 4-week period from May 22 to June 15th 2000. The rapid assessment was designed and conducted by HMIS Task Force staff from the Ministry of Health and Education with technical support from a 3-person team from Management Sciences for Health.

Assessment Objectives & Approach

The objectives of this assessment were to:

- assess current performance of the Health Management Information System both through quantitative and qualitative measures identify functional problems, if any, which will then be targeted in designing improvements in:
  - data recording & reporting
  - data analysis, presentation, and communications
  - the use of health data for decision-making and action

A detailed scope of work for the assessment is included in the Annex[1].

A participatory approach was adopted for the development of the assessment instruments, conduct of the survey, and analysis of the results in order to engage Ministry of Health and Education (MOHE) staff in the process and to ensure the relevance of the assessment to the local context.

This approach also:
Emphasized the BHU/Hospital and DHSO levels. Although some information was collected at the national level (mainly as part of the information technology assessment, which is presented as a separate document), the principal focus of the task force's efforts was on the community and district service delivery levels and district health supervisors.

Bhutan HMIS Assessment Framework

A. **Data Management**

	Collection	Processing	Use
Knowledge			
Practice			

B. **Resources** (material, human, financial)
☐ Recording/reporting formats available & appropriate?
☐ Personnel trained?
☐ Equipment for data analysis available & functional?

C. **Organisation**
☐ Data flows efficient?
☐ Data & information accessible?
☐ Time & effort required reasonable?
☐ Documentation exists & up to date?

D. **Attitudes**
☐ Individual complaints with system in general?
☐ Suggestions for improvement?

Included the collection of both quantitative and qualitative information. It was felt that the assessment should gather some quantitative data in addition to qualitative and anecdotal information. The quantitative information helps to measure the extent of problems and provide a baseline against which the results of interventions can be measured

Focussed on key indicators and functions selected by the task force. The majority of the assessment's questions were designed around:

- The health problems, services and resources selected during the workshop on essential health indicators and
- Key functions identified during the two 1-day workshops on district level information needs assessment

Assessed health worker's knowledge, attitudes and practice with respect to the HMIS as well as the availability of resources.

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[1] For complete report with annexes, please contact the author.

Provided immediate feedback to staff from participating health facilities.
Too often, assessment teams gather data from service providers and there is rarely any on-the-spot feedback to the staff members involved in the survey. Data is usually analysed at the national level and conclusions are presented at the same level. This assessment included a one-page feedback form that was filled in by the assessment team and discussed with the health facility staff immediately after the assessment (see example in Annex 2). Although this feedback is based primarily on the assessment team's observation, without the benefit of more in depth analysis, it encourages health facility staff to continue good practices and enables them to make immediate changes to their record keeping and reporting system to overcome problems that were identified.

Assessment instrument design
Members of the HMIS task force participated in a series of meetings to develop the assessment instrument. The following table describes the key steps in this process and the results/outcomes of each step:

Step	Activity	Result/Product
1	Card exercise to identify perceived problems related to the HMIS from the perspective of HMIS task force members	List of perceived problems grouped under the headings: • data collection • data analysis/processing • data use • system organisation
2	Identification of principal HMIS structure and key sub-systems	A schematic diagram listing the key HMIS sub-systems : • Surveillance • Routine service reporting • Administrative systems • Civil Registration
3	Presentation of HMIS assessment framework	List of domains of HMIS to be included in the assessment selected through consensus among task force members.
4	Use of Delphi technique to select priority sub-systems to become the focus of investigation	List of 5 sub-systems that became focus of assessment
5	Small group work to identify for each priority sub-system, key questions related to data collection, processing and use that should be included in the assessment.	List of requisite knowledge and practice related to data collection, processing and use for each selected sub-system.
6	Small group work to identify resources required for effective use of the HMIS.	List of resources to be verified/observed during assessment.
7	Development of draft questionnaires for service delivery level	Draft questionnaires for Interview and Observation
8	Discussion on the draft questionnaires for service delivery level	Questionnaire ready for pre-testing at the service delivery level
9	Pre-testing of questionnaire, first at Denchholing BHU and following initial modifications, a second time at Dawakha BHU.	Questionnaire ready for HMIS assessment
10	Development of questionnaires for DHSO	Questionnaire ready for use at DHSO

Some of the products of this process are included in boxes on these pages (Assessment Framework and Inventory of Sub-systems). The final questionnaire formats are included in annexes 5 through 8.

Using a Delphi technique, task force members selected the following HMIS sub-systems for detailed assessment (these are also highlighted in italics at right):

- STD/HIV/AIDS surveillance
- Monthly Morbidity reporting
- MCH/EPI/FP and Nutrition reporting
- Drug logistics
- Village/Household surveys.

The MSH team members created rough drafts of the questionnaire based upon the results of steps 5 and 6, above. Once the questionnaires were drafted, the task force members reviewed them for language clarity. After incorporating some changes recommended by the group, these formats were then used in a pre-test at Dechencholing Basic Health Unit, just outside of Thimpu. Further modifications were incorporated after this pre-test and a second pre-test was conducted at the BHU in Dawakha

Once the service delivery level questionnaires were finalised, the MSH team adapted those formats for use at the district level: adding questions related to data aggregation, feedback report preparation, use of computers and supervisory activities. (See examples in Annexes 7 & 8). Some questions were based upon the functional analysis of district level information needs conducted earlier in the mission.

Information related to several district level functions was selected by the Task force members to be considered during the assessment visit. The functional areas identified included:

- Information management
- Disease surveillance
- Training
- Human resource management
- Supervision

Initial Inventory of HMIS sub-systems in Bhutan

EPIDEMIOLOGICAL SURVEILLANCE

- Zero reporting for Acute Flaccid Paralysis
- *STD/HIV/AIDS surveillance*
- Iodine Deficiency Disease Monitoring (Salt)
- National Health Survey

ROUTINE SERVICE REPORTING

- *Monthly Morbidity reporting*
- Monthly Mortality reporting
- *MCH/EPI/FP and Nutrition Reporting*
- Lab report

SPECIAL PROGRAM REPORTING

- TB (Monthly + quarterly)
- Malaria (specific districts)
- Leprosy (Monthly + quarterly)
- IDD report (Quarterly salt)
- IUD monthly reports (trained personnel only)

ADMINISTRATIVE SUB-SYSTEMS

- *Essential drug logistics system*
- Human resource management system
- Training/IEC information system
- Annual/5 year planning & budgeting system
- Financial accounting/imprest system
- *Vaccine /cold chain monitoring (special surveys)*
- Monitoring and supervision system

CIVIL REGISTRATION

- *Village/Household surveys*

Sampling

A convenience sample of health facilities (both at the community and district levels) and offices of District Health Supervisors (DHSO) was selected by task force members for the assessment. Although not randomly selected, the MSH team felt that the facilities included in the assessment were fairly representative of health facilities in Bhutan. This was both in terms of their geographic distribution (a total of 7 districts, out of a total of 20) and in terms of the levels of the health care hierarchy that they represented. Efforts were made to select both service delivery points and district supervisory offices from the same district in order to better understand the relationship between the service delivery points and the district offices that supervise them. In addition, the MSH team felt that there was a good balance in the representation of high performing and low performing facilities in the sample.

In each district, efforts were made to visit at least one hospital, 2 BHUs and the DHSO during the 4-5 days allocated for field visits. Three survey teams were set up, each team consisting of several task force members and 1 MSH facilitator (assessment team members are listed in Annex 4). With one exception, task force members administered all of the interviews and completed the observations (due to a last minute cancellation, one team had only one task force member). The teams were unable to administer the questionnaires adequately in the IMTRAT hospital in Haa as it did not report data through the usual channels and did not maintain the previous year's records, nor were they able to administer the DHSO questionnaires in Bumthang because the DHSO was not present during the assessment team's visit.

Table 1, below, lists a summary of the number of each type of facility visited.

Table 1 Numbers and types of health facilities visited during the HMIS Rapid Assessment

District	BHU I	BHU II	BHU III	DHSO	Hospital	Grand Total
Bumthang		2				2
Chukha		1		1		2
Haa	1			1	1	3
Paro		1		1	1	3
Punakha		1	1	1	1	4
Trongsa		2		1	1	4
Tsirang		2		1		3
Wangdi Phodrang	1			1		2
Grand Total	2	9	1	7	4	23

The area with dark shading in the map of Bhutan, below, indicates the geographic coverage of the assessment:

Map of Bhutan Highlighting Districts Visited during HMIS Assessment

Data Analysis
Once the assessment teams returned to Thimpu from their field visits, the data from the questionnaires were analysed together by task force members and the MSH team. Most of the data were processed manually on flip charts, although some (i.e. data audit, inventory of resources) were entered onto an Excel spreadsheet for simple analysis (means, minimum, maximum, etc...) and graphic presentation.

Based upon this analysis, a number of data summary sheets covering different themes were prepared (see samples in Annex 9). These were later used by task force members in a one-day data analysis workshop during which key findings were reviewed in small groups. These data summary sheets covered the following themes:

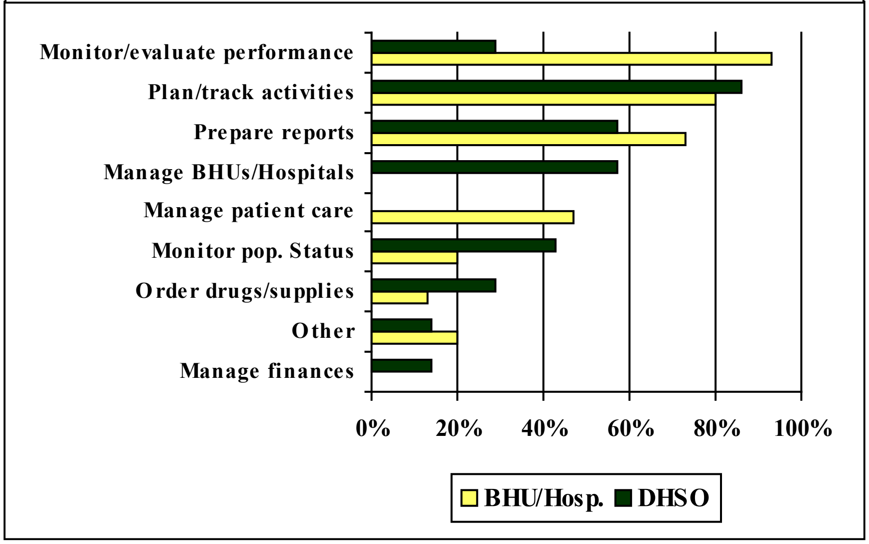
1. Data transmission, feedback and supervision
2. Presentation and use of information
3. Data quality
4. Information technology
5. Resources
6. Storage and retrieval of information

The work groups interpreted the key findings for each theme, identified potential causes of problems and suggested ways in which they could be resolved. Their suggestions have become the basis for the recommendations listed in this report.

Findings
A discussion of the findings from this assessment are described on the following pages. Although the rapid assessment methodology does not include a large enough sample to provide statistically significant

results, the assessment does provide descriptive evidence of a system with a variety of strengths and weaknesses.

Figure 1 **Knowledge about general uses of information collected**



When asked how health workers use the information they collect, there was a fairly diverse range of answers. Figure 1 illustrates the distribution of these responses. At the service delivery points the most common unprompted responses were to monitor/evaluate performance, to plan/track activities or to prepare reports. Only about half of the service delivery points visited indicated that the data were useful for individual case management.

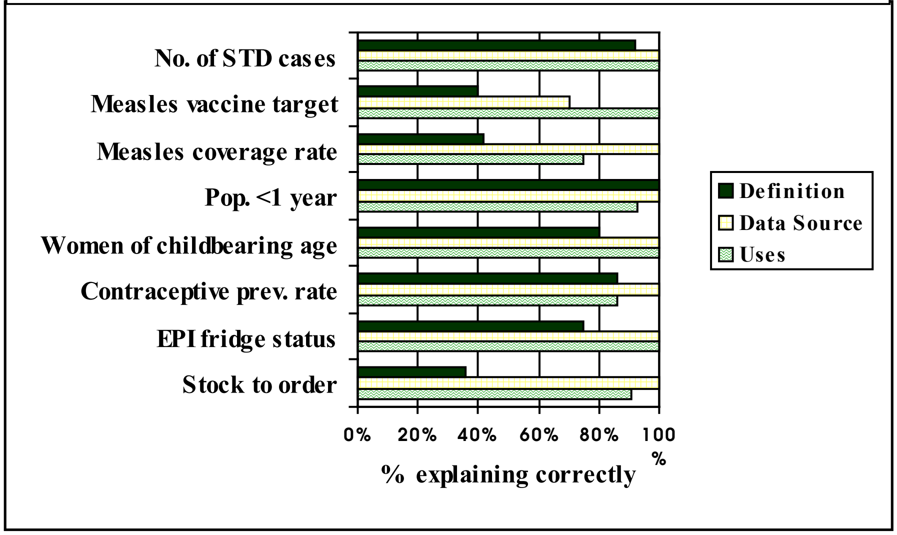
Surprisingly, only about a third of the DHSOs interviewed indicated that they used HMIS data to monitor/evaluate performance. This was in contrast to the large majority of service delivery level staff who saw this as an important use.

Specific examples of actual information use by the health facilities were stated in response to a subsequent open-ended question. Over half of the examples (16 out of a total of 31 comments or 52%) cited an increase in IEC activities (workshops, social mobilisation etc.) as the response to information showing an increase in numbers of selected health problems (e.g. diarrhoea, ARI). Over a third of the examples (12 out of 31 or 39%) cited planning or management areas where use of information was made (e.g. outbreak response, annual target setting , etc.)

Knowledge about definitions, data sources and uses of indicators

When health workers were asked to identify the definitions, data sources and uses of selected indicators an interesting pattern was noted. In nearly every case, staff were able to identify appropriate ways in which the information could be used (besides just for reporting purposes), however for several of the indicators there was confusion about the definition of the indicators.

Figure 2 Knowledge of the definition, data sources and uses of key indicators



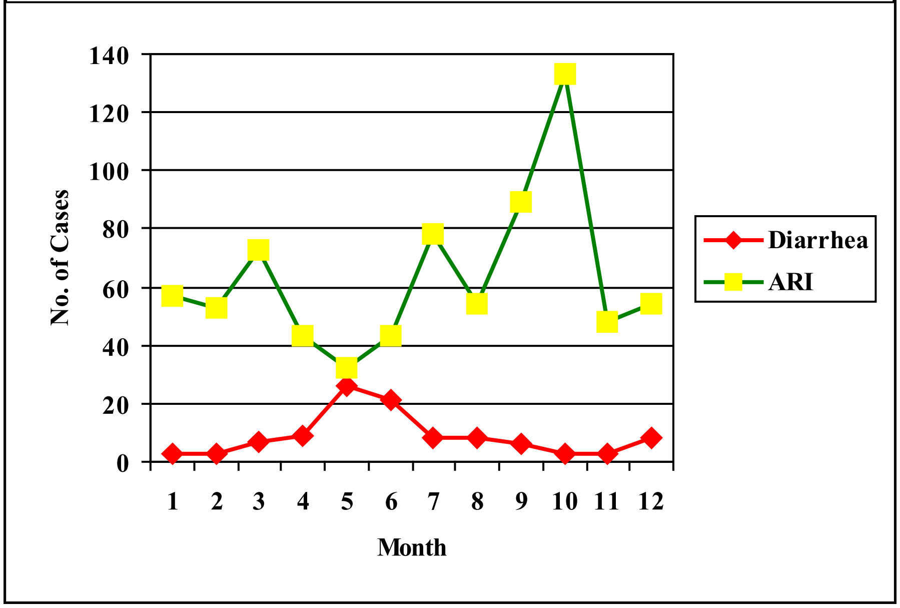
This was particularly an issue for women of childbearing age, where some staff used the 15 to 49 age groups, while others used 15 to 45. Still others only considered married women as opposed to those who counted all women in the age groups. There was also confusion about how to calculate drug stock requirement and childhood immunisation targets.

KNOWLEDGE OF DISEASE TRENDS

Another observation related to data use was the extent to which health workers were familiar with disease trends at their facilities and the degree to which perceived trends were supported by the data they collected.

This was determined by first asking them to describe morbidity trends over the last year for ARI, diarrhea and all cases combined and then comparing the responses with data reported in their monthly morbidity reports. Figure 3 illustrates the seasonal trends for ARI and diarrhoea from one facility that maintained good quality data

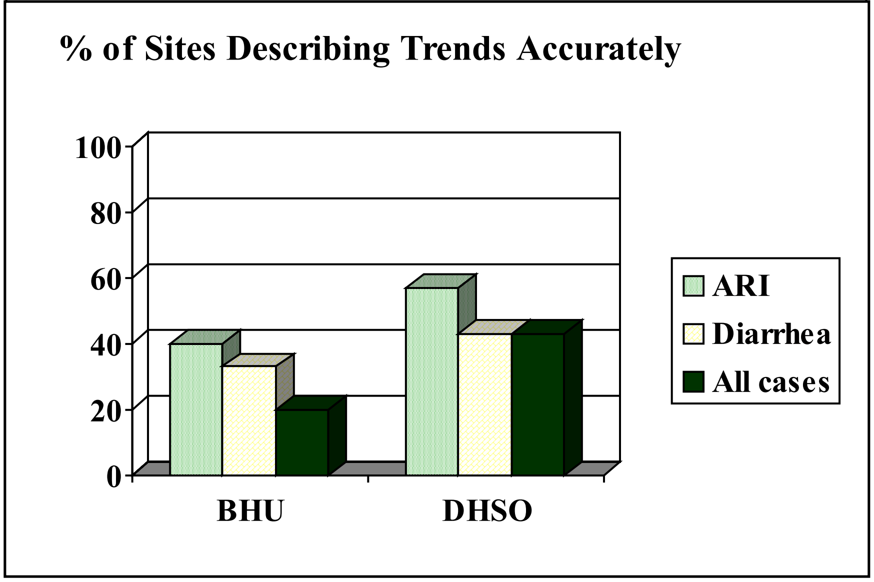
Figure 3 Selected morbidity trends from one BHU



The trend shown in figure 3 notwithstanding, the overall results of this exercise were not encouraging. Figure 4 suggests that less than half of the facilities were familiar with disease trends at their sites. This situation was somewhat better among district supervisors, nearly 60% of whom were able to identify district wide trends in diarrhoea.

The task force members felt that these levels of knowledge about morbidity trends were inadequate, but since there are no standard procedures defined for monitoring disease trends and no particular training has been provided to health facility staff in this subject, these results were not very surprising. Trend analysis is also somewhat confusing because of the variability of the caseloads within many of the BHUs visited. Several health facilities saw sharp increases in clinic attendance during the months of April and May – even though this did not correlate with any epidemiological season (e.g. rainy season for diarrhoeal diseases and winter for ARI). It was suggested that this increase may relate more to increased numbers of school children during this period or to slack times in the agricultural calendar.

Figure 4 Percent of Health Facilities describing morbidity trends accurately



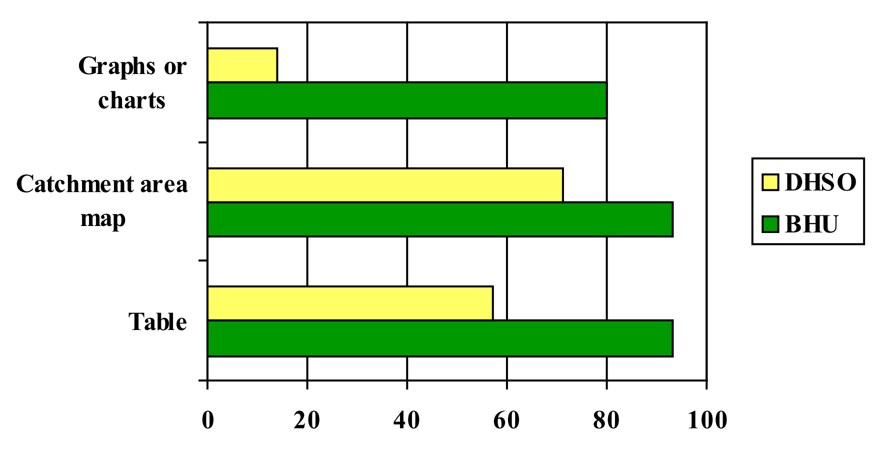
It is important to note that there might have been some errors while conducting the rapid data audits to verify the trends during the assessment process. Nevertheless, data gathered from some sites did reflect expected epidemiological trends, so assessment team members felt that the process was generally reliable.

In a follow-up question, respondents were asked to identify particular actions that should be taken if information indicates that specific disease trends are increasing. IEC-related actions were again the most often cited (12 out of 22 responses, or 55%). The additional responses referred to investigation of the causes, followed by some type of intervention (e.g. test water, chlorinate water sources).

PRESENTATION OF INFORMATION

One of the most positive findings during this assessment was the widespread practice of analysing and displaying data in various formats on the BHU walls. Figure 5 indicates the types of presentations that were observed and suggests that this practice is much more common at the service delivery level than in district supervisor's offices. The assessment teams observed that much of the data presented in this manner were drawn from the household surveys. This included tables identifying key population target groups, numbers of households with latrines as well as immunisation beneficiaries and family planning users. In addition to catchment area maps, several facilities prepared family planning stratification maps to illustrate the coverage rate in different outreach clinic areas. Annex 11 includes some photos with examples of some of these.

Figure 5 Types of data presentation observed in health facilities



During discussions with BHU staff, it was pointed out that there are no particular standards for determining what data to present nor which type of presentation would be most useful. In several instances numbers of family planning users or numbers of immunised children were graphed rather than rates, so it was somewhat difficult to compare data from year to year or between facilities. Assessment team members also found some technical problems with the way some graphs and charts were drawn (for example pie-charts totalling more than 100%). Several staff members interviewed suggested that it would be helpful for some of these techniques to be standardised, especially in view of the high mobility of staff between different BHUs.

Although there seemed to be a considerable amount of attention paid to data presentation in BHUs and hospitals, some service providers did not fully appreciate their use. When asked why they prepare graphs and charts, the staff from one BHU said "the graphs are for visitors."

Time spent on HIS reporting

The assessment team asked health workers at both service delivery and supervisory levels to estimate how much time they spent preparing reports on a monthly basis. Figure 6 illustrates the variation in responses to this question. BHU's and Hospitals reported an average of 16 hours per month, or about 2 days, while DHSOs averaged about the same (18 hours). There was, however, considerably variation in responses at the service delivery level – a quick analysis of the data suggests that this is due primarily to differences in caseloads: facilities with more patients take more time to tally and report their data. Conversely, the assessment teams observed that facilities with very light caseloads often devoted more time to preparing and wall charts and graphs.

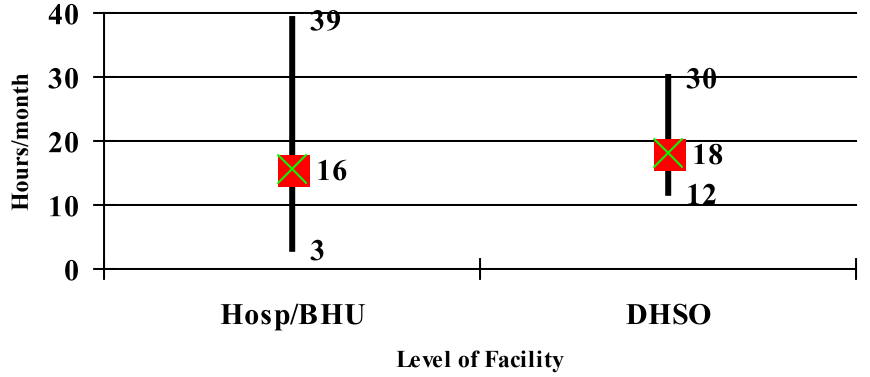
At the DHSO level, supervisors who reported taking more time to prepare HMIS related reports were also those from districts with a higher number of BHUs. In the districts that were visited, the numbers of

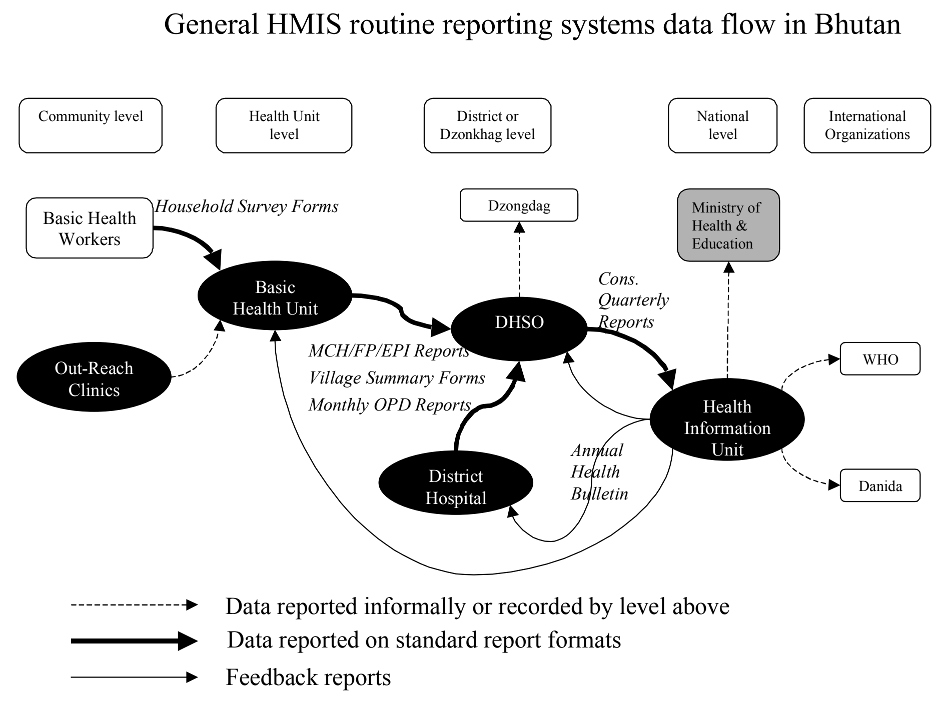
BHUs varied from 2 to 9, with one district reporting as many as 53 outreach clinics (outreach clinic data is consolidated by BHU level staff before being reported).

Reporting frequency & deadlines

Generally speaking, most of the reporting sub-systems follow the report transmission route illustrated by the following flow chart.

Figure 6 Time spent preparing HMIS related reports





A number of problems were highlighted during the assessment team's visit with respect to routine data flows. These included:

- Problems with data reporting from Out-Reach Clinics. Currently BHU staff maintain separate registers for key activities carried out in each ORC (MCH, FP, Immunizations, Out door consultations). However, at the end of each month the data about these activities are consolidated and reported with BHU data. It is therefore difficult to determine the relative performance of ORCs at the community level. In addition, some BHUs just report total numbers of consultations for ORCs and do not break them out by type of health problem.

- At the Hospital level, each department prepares monthly reports on their own activities and these are consolidated into a single report for the Hospital. Out door patient visits are, in fact, tallied by the dispenser after patients receive their prescriptions. This can result in diagnostic errors when prescriptions are not complete with diagnosis and disease code. It also means that patients who do not receive medication are not counted.
- The district aggregates most data on a quarterly basis in order to prepare consolidated reports that are sent to the national level. It is not clear whether or not there is any way to tell if reports are missing from these consolidated reports, and if so which ones. If computerised data entry could be done at the district level on a facility by facility basis, the preparation of consolidated reports would be simplified, and the data transmitted to higher levels so that adjustments could be made more systematically for missing data. This would also reduce the data entry burden on Health Information Unit staff at the central level.
- At least one District requires BHUs to prepare Quarterly Consolidated Reports as well as Monthly Reports. This is extra work for the BHU staff that is not useful to them – it only simplifies work for District level staff.
- Only one significant standard feedback report was widely observed in the Districts and BHUs, This was the Annual Health Bulletin prepared by the Health Information Unit. While this is a useful reference document, it takes a long time to prepare and does not provide feedback in a timely manner so as to promote local level action.

Figure 7 suggests that there was widespread consensus among all facilities about the frequency of most reporting, however the actual date that reports are due (deadline) was less obvious. This is likely to be related to the lack of formal procedures or guidelines governing HMIS reporting. Interestingly, of the sub-systems reviewed, there was the most confusion about village summary reports and the drug reports. For the village summary reports, this is largely due to a change in the reporting frequency from twice a year to annual that has not been well disseminated.

Figure 7 Data transmission procedures and deadlines

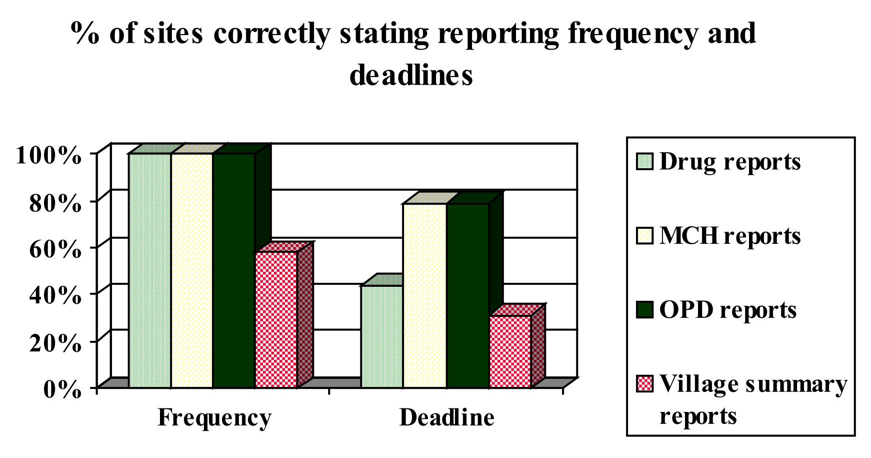
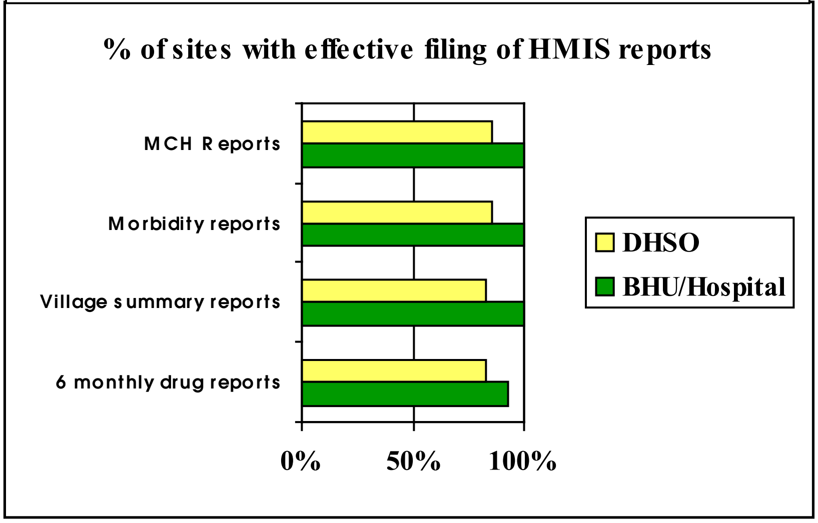


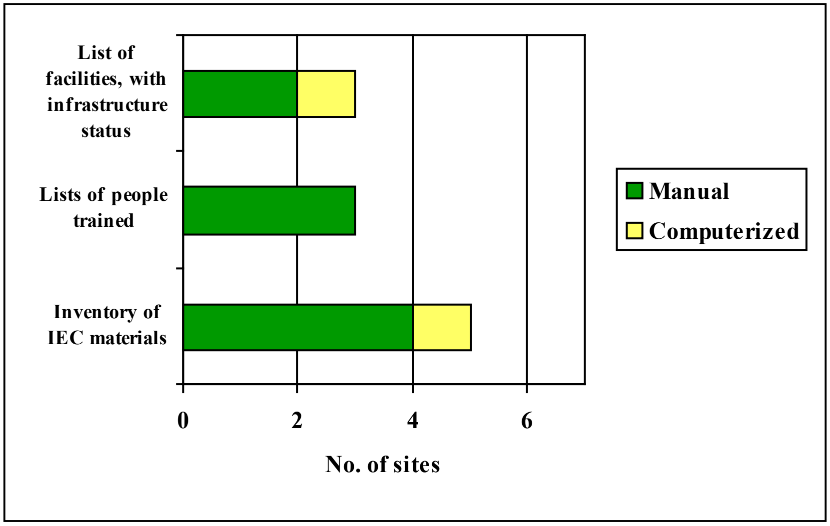
Figure 8 Effectiveness of filing systems for HMIS documents



Effective storage & retrieval of HMIS reports

One extremely positive finding in virtually all sites visited was that archived copies of reports were easily accessible and filing systems were well organised. Virtually all BHUs/Hospitals had nicely labelled ring binders for each of the types of reports that were requested. Figure 8 shows that copies of most of the specific reports that the assessment teams requested were easily retrieved. This facilitated assessment activities and provides an efficient 'database' for health workers to analyse trends over time.

Figure 9 Existence of systems for maintaining special data



In the District Health Supervisory Officer's workplace, the situation was only slightly less organised, but this is understandable given that this is an administrative office that processes a lot more paperwork. On a related front, the assessment teams asked DHSOs about whether or not they had established any kind of register systems to maintain certain types of information. Unlike chronological or subject files, such registers/lists or 'databases' make it much easier for health workers to aggregate data when tracking certain indicators or activities. For example, if DHSOs maintain a training register, it is much easier to respond to queries such as "How many of your staff have had training in syndromic management of STDs in the last year?" Answering such queries using personnel files would be rather complicated, since many individual files would have to be reviewed.

As indicted by figure 9, only about half of the DHSOs had established such systems in three of the areas we had queried them about: health facility lists, training lists and inventories of IEC materials. Only one of the DHSOs visited had used a computer to help maintain such data. Since there are no standard systems yet established, nor is the expectation that supervisors should maintain such data included in DHSO job descriptions, this finding is not surprising. It does, however, further demonstrate the untapped potential of the computers that are installed (and functional) in each of the district offices.

SUPERVISION & FEEDBACK

The links between data and supervision were explored in several ways during the rapid assessment. All BHUs reported having been supervised at least twice over the last 12 months, which was in line with what supervisors suggested as the expected norm. This may not be the case for less accessible BHUs, which were not included in our sample because of the short time available and convenience sampling methodology used. . Several sites located in the district capital reported monthly or even more frequent supervisory visits from their DHSO because of their proximity. It would be interesting to gather additional data about how frequently supervisors are able to get to health facilities that are more than 2 days walk from the district capital.

Almost all (10 of 11) BHUs and all DHSOs reported that information recording & reporting tasks were considered during supervisory visits. In nearly all cases, this involved verifying the registers and discussing errors that might have been made. Less frequently, supervisors reported that they discussed disease or service coverage trends, data presentation, drug stock level monitoring and the implications of the data on work planning.

Another important data management task for supervisors is to help control the quality of data reported from service units. More than 2/3 of hospitals and BHUs reported receiving comments from DHSO about errors in their reports during the past year. This suggests that supervisors take this role seriously, although most agreed that this type of feedback was mostly oral and not done very systematically. Given the poor quality of data reported by health facilities, it is likely that more attention should be paid to this area in future.

About half of the BHUs and Hospitals reported receiving other types of feedback, such as an analysis of disease or health service trends in the district, but nearly all was oral or took place only once a year during the Annual Review Meeting held at the district level. This is understandable given the fact that most DHSOs noted that there are no standard procedures for feedback reporting to BHUs & Hospitals.

Figure 10 Data accuracy at BHU/Hospital levels

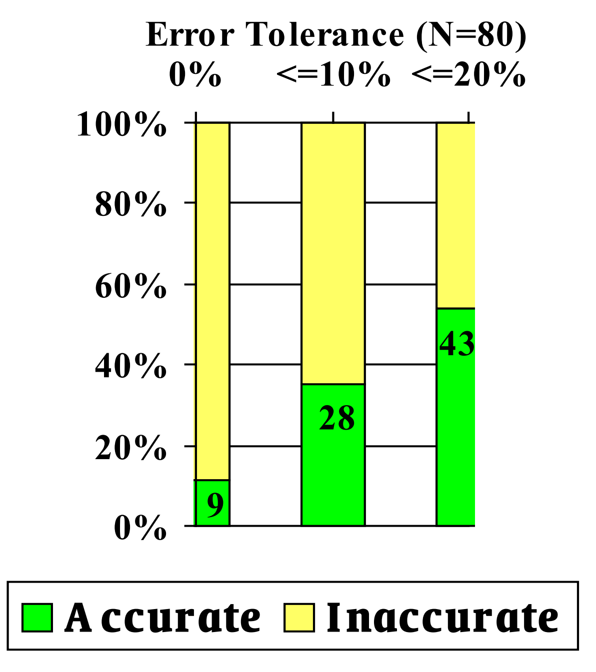
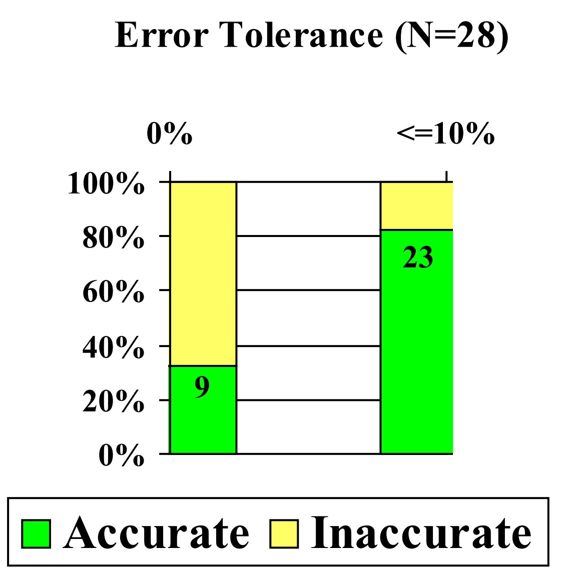


Figure 11 Data accuracy at DHSO level



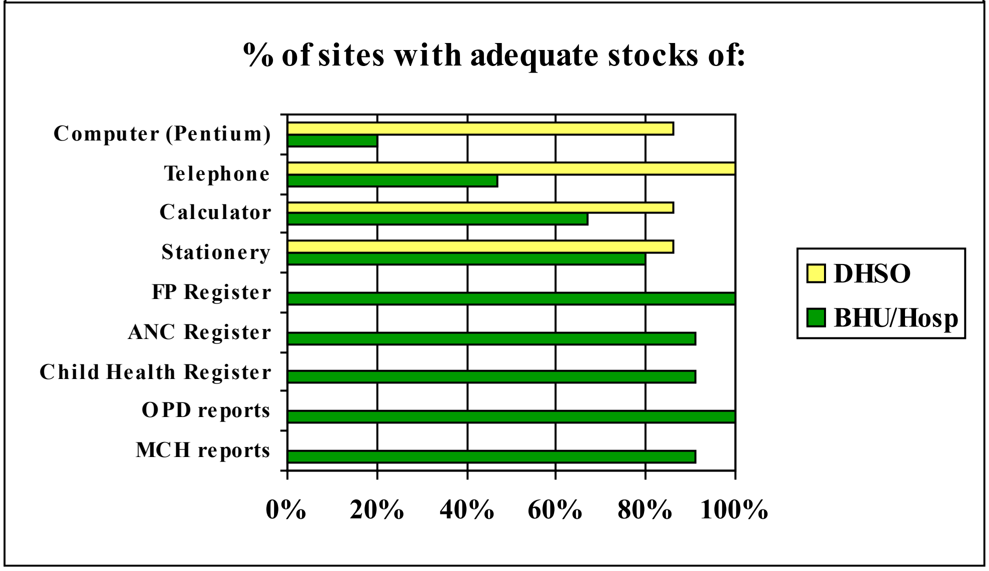
Data quality at BHU/Hospital level:
Perhaps the most surprising finding related to the quality of data reported by health facilities. These data were gathered through a data audit conducted by comparing figures from monthly morbidity reports with data from the registers used by staff to tally these reports. Only the monthly morbidity reports were used for this analysis, so it is difficult to infer much from these observations about the quality of other types of data that are reported such as population figures communicate on the village summary forms, or ANC visits reported on the MCH reports. Because of the small sample size, these results need to be used with caution even with respect to the morbidity data. Figure 10 indicates the extent of the problem at different levels of error tolerance at the BHU/Hospital levels. Of 80 figures audited only 11% were exactly correct. Even if one tolerates a plus or minus 20% margin of error, the accuracy rate still doesn't increase much more than 50%.

It must be noted that the processing of data at health facilities can be very tedious and error prone. At the end of each month BHU/hospital staff must go through their register and tally the data into 4 age categories and by sex for 48 different morbidities. There are no standard tally sheets to facilitate this effort and, until very recently, the report format itself was very condensed making it easy for people to accidentally note figures in the wrong column or row. In addition, data quality is likely to be affected by the quality of the registers (how well the writing can be read and whether or not disease code numbers are used) and the total number of cases to be tallied.

The picture is not quite as bad at the DHSO level. Of 28 figures audited 32% were exactly correct. If one tolerates a plus or minus 10% margin of error, the accuracy rate reaches 82%. These analyses are difficult to compare between the different levels, since the data processing work required at the service delivery level is quite a bit more complicated than that required of district health supervisors. DHSOs are only responsible for aggregating data from three monthly reports from each of their BHUs/Hospitals (the districts visited had between 2 and 9 service units reporting to them). The analysis suggests that the majority of the errors originate at the primary data source (BHUs and Hospitals) and are sometimes compounded further at higher levels.

Availability of HMIS resources:
In the observation portion of the rapid assessment, inventories were taken of key resources required for the effective use of the HMIS. These included tools: such as calculators, computers and telephones to facilitate data analysis, communication and action; and reporting forms and registers needed to record and transmit the data. Figure 12 gives an overview of the status of the availability of some of these materials.

Figure 12 Availability of key HMIS resources



Overall the situation looks quite good. Virtually all of the health facilities had more that one and a half months of stock of registers and reports. In fact there were substantial overstocks in some areas, as is demonstrated in Table 2 (on the following page). For example, one site had enough Child Health Registers to last for 325 months, or 27 years, at current service volumes. This is due in part to the fact that revised formats of these registers had recently been printed and distributed before old stocks were used up.

Table 2: Months of stock of selected report forms and registers in BHUs.

BHU ID	MCH Reports	OPD Reports	CH Register	ANC Register	FP Register
SD3	11.5	25.0	0.0	87.3	18.9
SD5	5.0	95.0	45.5	256.5	120.0
SD6	6.0	45.0	89.2	28.0	39.2
SD7	11.0	50.0	325.7	56.2	2.4
SD8	7.5	38.5	38.8	198.7	18.2
SD9	0.0	50.0	Missing	60.0	38.5
SD11	16.5	1.5	16.4	40.0	5.7
SD12	12.5	12.5	147.1	90.0	18.0
SD13	6.5	100.0	121.2	149.0	1.7
SD14	10.0	50.0	240.0	24.8	3.3
SD16	12.5	12.5	11.8	12.5	11.1
Average	9.0	43.6	103.6	91.2	25.2
No <=1.5	1	1	1	0	0
Minimum	0.0	1.5	0.0	12.5	1.7
Maximum	16.5	100.0	325.7	256.5	120.0

Human Resources for HMIS:
Staffing in most Districts and BHUs visited was adequate for the performance of all HMIS related tasks. In all of the BHUs, staff indicated that each staff member was responsible for data recording for the services they deliver (entering patient data on registers or patient cards), while most staff members worked together as a team to tally data for the monthly reports. Final report preparation and the control of data quality tended to be a separate responsibility of the Health Assistant who is in charge of the facility.

At the District Hospital level, there was more of a division of labour with respect to data processing. The head of each clinical unit (Indoor patients, Laboratory, Maternity, etc...) prepared the data from their section and then one member of the staff pulled together the report (in at least one case, this was done by the DHSO who was based in the hospital). The reports are then checked and signed by the DMO. During the course of the data audit, it became apparent that the current procedures for tallying data for the monthly morbidity reports may be problematic and contribute to the problems of poor data quality.

This function is performed by the dispenser, based upon notes s/he makes in a register from clinician's prescription forms. This introduces several sources of error:

- If the clinician has not clearly stated the diagnosis on the prescription form, the dispenser must guess the diagnosis before noting something in the register. This can be a source of error given the fact that certain essential drugs are used to treat multiple conditions and the lack of clinical knowledge on the part of the dispensers.
- If a patient is seen, but does not require any medical prescription, s/he may never be counted in the morbidity reports. Under current practice, it is apparently very unusual for patients to leave without some form of medication, but with efforts to promote rational prescription of essential drugs this data collection approach may begin to result in a more serious undercount.

In two of the larger districts visited, the DMO or DHSO noted that the appointment of a Health Statistical Assistant would have been useful to handle the higher volume of work – and would help to ensure better data quality. Current MOHE policy is not to fill the vacant posts of Statistical Assistants. In the current setting, where procedures for data analysis and use are not very well defined, nor particularly demanding, this policy is probably appropriate. However, once improvements are made to HMIS procedures – and particularly if they involve more systematic computerised data entry and processing at the district level – this policy may need to be reviewed. This is especially the case for districts with a large number of health facilities and consequently higher volume of work. Although computers can save time on specific tasks, the experience in most countries has been that they also create new uses of data that require additional human effort.

With respect to training, there appears not to have been any specific program to train BHU or Hospital staff in the areas of data collection, processing and use – either during initial training or in-service training. In most cases, new forms and registers were reported to have been introduced through the DHSOs - either during supervisory visits, through their monthly staff meetings or simply sent by post or messengers. While this strategy may be acceptable for communicating simple changes in reporting formats, it is probably inadequate for training staff to record and use data more effectively to improve service delivery. The unstructured nature of this approach probably explains the wide variation in indicator definitions and formats for data presentation that were observed by the assessment teams. Contributing to these problems was the fact that no written guidelines or manuals were available related to HMIS (except for the 6 Monthly Drug Reporting system where detailed instructions are printed on the cover of the booklet of forms).

Computer Resources: Central Level

A separate report has been prepared about the information technology situation in Bhutan. To sum up some of the findings at the central level, it appears that access to computing resources is very good in Thimpu. The ratio of staff to computers is 1.5 staff/computer in the three central units visited: the MOHE (secretariat, programme offices and finance office), IECH, CMS. The Ministry is on the verge of networking many of their computers together, but until this is accomplished staff will not enjoy the benefits that IT can offer for improved communications using electronic mail. Bhutan has recently introduced the Internet through the national Internet service provider: Druknet. Currently only 15% of staff have direct access to the Internet from their desks, while another 3 % can access it from another shared computer. Druknet's proactive pricing policies enable district level staff to access the Internet at the cost of a local call from anywhere in the country. Once Druknet's next phase of expansion is complete later this year, the ratio of dial-in lines to users and the gateway speed should be much improved.

In house technical support for computerisation is limited to 1 programmer, 1 web designer, 1 person with basic training on networking. There is no one within the MOHE who has any specialised training in hardware maintenance. Hardware maintenance is done through a variety of external service arrangements. Judging from the assessment team's observations, de facto standards for software are MS Office & Windows, but many different versions are in use – some of which are no longer compatible. Several specialised database applications are in use at the central level, but were developed in outdated software by external consultants and there is no local support to maintain or update them.

Computing Resources: Districts

Almost all districts have access to computers (usually both the DMO and the DHSO have their own). All of the computers observed were functioning well. This was a very positive finding given that a number of them have been installed for more than 3 years. Most staff use computers mainly for writing reports, while only about 2/3 use them to analyse data. A few good individual initiatives for application development were demonstrated to the assessment teams during their visits, but are they are not standardised so that other districts might benefit from them. Although Internet access is available from districts, only 2 of 7 districts visited are currently connected.

All DHSO's had some basic training on computer use during their initial training at the Royal Institute of Health Sciences (RIHS). This appears to have been sufficient to enable staff to use the basic features of

Microsoft Word and Excel. However, few had developed the more advanced skills with Excel or Access database software, which are necessary to create applications to systematically use their computers to analyse HMIS data. The exception to this was one DHSO who had special training on database management (in Thailand). Interestingly, the DMO in the same district had also made considerable progress teaching himself how to use the MS-Access database software by relying on his colleague's training notes.

Conclusions

Following the assessment and presentation of initial findings, the HMIS task force met to review the assessment data in more detail and develop specific conclusions & recommendations. This was done in small groups using thematic data summary sheets covering the following themes:

1. Data transmission, feedback and supervision
2. Presentation and use of information
3. Data quality
4. Resources
5. Storage and retrieval of information
6. Information technology

The conclusions of this assessment can be summarised by the following list of major strengths and weaknesses.

Strengths

Overall, the HMIS task force concluded that the existing HMIS had a number of strong points:

- Generally speaking, adequate resources exist at the service delivery points and district levels for the uninterrupted recording and reporting of data. This includes the availability of materials (registers, forms, stationery, etc...), and adequate staff with sufficient time (in most cases[2]) to carry out the required data management tasks. This appears to also be the case at the district level, where computers are also available and functioned well at the time of the assessment teams' visits.
- Systems for filing and retrieval of past reports at the BHU/Hospital level are excellent and generally well maintained.
- Staff have a good understanding of the potential uses of the information they collect, although procedures for its actual use are not well established.
- At the BHU level staff devote considerable effort to presenting key population and service data on wall charts, graphs and maps. There is, however, scope for improvement in the selection and calculation of some of the indicators that are graphed.
- Routine reporting from BHUs/Hospitals to districts is very effective as evidenced by very high reporting rates, although there is confusion about reporting deadlines for some of the sub-systems (e.g. Village Summary Sheets and Drug Reports).

Weaknesses

The assessment identified or confirmed a number of areas that should become the focus of immediate HMIS improvement efforts. These included:

- Too much data is collected in current recording and reporting formats and not enough is used. There is also confusion about the calculation of several key indicators and how to estimate population targets (especially in family planning and drug management). Some of these problems seem to be

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[2] At certain Hospitals with high service volumes, it was apparent that the large numbers of consultations made report preparation very time consuming for certain staff members (particularly the dispensers who tally OPD records and maintain drug stock data)

related to the design of the reporting formats that are duplicative and require excessive data and to the lack of written guidelines concerning indicator definitions and procedures for data use.

- There is a lack of systematic feedback (especially written feedback) from DHSOs to BHUs and Hospitals regarding reporting errors and especially for providing analysis of reported data.
- There appear to be serious problems with data quality originating at the service delivery point which are further compounded at the district level.
- Although computers exist and function well at the district level, they are not used systematically to help with data analysis and electronic communications. There is no mechanism, either at the central level or within districts, to build upon the individual initiatives of certain districts and cross-fertilise these uniformly throughout the country. At the national level there are also adequate numbers of computers, but the small team within the Health Information Unit is inadequately staffed and lacks skills in database management and computer hardware troubleshooting which are necessary to support more effective use of this technology.
- Following recent staff changes at the central level, the Health Information Unit now lacks personnel with training in epidemiology and health service delivery. This expertise is critical for ensuring that surveillance functions at the national level are carried out effectively and for helping to interpret data on significant disease or service trends for feedback reports and the annual health bulletin.

Recommendations

Based upon the assessment findings, the groups' key recommendations for system enhancement are described below:

1. Data transmission, feedback and supervision:

Reporting deadlines should be feasible and practical yet flexible for BHUs that are very remote. Reporting due dates for most monthly or quarterly reports from BHUs and Hospitals should be specified as within 7 days of the end of each month, with the exception of the Village Summary sheets that should be reported by the 15th of March. The actual data collection for the household survey should take place only once a year during January and February, so the data will be current as of the end of previous year. Care should be taken so that this data is available when the planning cycle begins.

Improve the Village summary sheet and household formats in order to make these two formats more compatible, thereby simplifying data aggregation and reducing potential sources of error.

Prepare a manual documenting standard guidelines for report transmission and feedback mechanisms and explore more efficient mechanisms for transmittal from remote BHUs. These guidelines should be widely disseminated.

Stress the need for supervisory visits by DHSOs to each health facility regularly (at least once each quarter?), and determine what data management tasks should be reviewed or discussed during these visits. These supervisory tasks could perhaps be incorporated into a more standardised supervisory checklist. Where the number of BHUs and/or distance makes this frequency of supervision difficult, a strategy should be developed to select health facilities that require more frequent visits. One such strategy might be to hold a meeting at a convenient point to cover more than one BHUs in case frequent visits to the actual sites is very difficult.

Procedures for checking data accuracy are not uniformly performed. In light of the significant problems the assessment discovered with respect to data quality, there is a need to develop new processes and/or share and standardise error trapping and correction procedures developed by some districts.

Health unit staff should discuss the information collected monthly before submitting their reports. They should discuss accuracy of data, achievement of targets, outbreaks of any diseases and any other management issues that are highlighted by the data. DHSOs should provide written feedback to BHUs and Hospitals about their performance on regular basis (at least bi-annually).

In some cases there is a need for simpler, better standardised reporting forms (e.g. morbidity reports, family planning registers). These should require capturing and reporting only the relevant and useful information. These can be designed by reviewing the content of all reporting formats to ensure that they no longer contain data that is not necessary for the calculation of the newly selected priority health indicators or for satisfying the information needs identified during the district level functional analysis. Similarly, some health staff wanted certain formats to be discontinued. For example, several noted that the IDD Salt Monitoring Report and the Lab report were not useful and wanted them be dropped.

HMIS enhancement efforts should take full advantage of existing computers and software in order to improve mechanisms for data transmission from the District levels to the centre.

2. Presentation and use of information

In general presentation of information in both district and facility levels is satisfactory, but it could be enhanced through:

- Clearer definition and standardisation of indicators for routine presentation would help ensure data comparability (e.g. MWRA 45? 49?)
- Monitoring, graphing or charting of key trends and setting of targets should be reinforced at every level
- There should be more uniformity of presentation of information. This can be enhanced through health worker training on data management and use and provision of guidelines.

The task force members also identified several other ways in which more effective use of data should be encouraged including:

- Including data as an input to regular monitoring and supervision
- Through the design of enhancements to the feedback system (new feedback report formats, for example)
- By building use of data into improved performance review and evaluation procedures.

3. Data quality:

Data quality was clearly one of the most troublesome issues identified through this assessment. Task force members felt that addressing this problem should be one of the highest priorities, since without quality data inputs, any enhancements in data use would be rendered useless (i.e. ”garbage in, garbage out”). The assessment team recommended the following interventions to begin to deal with the data quality issue:

- The development of a strategy for providing specific training on HMIS (in-service and pre-service) to health workers at all levels.
- The development and provision of documentation in the form of a procedure manual related to standards/guidelines to all health workers involved in data collection.
- Considering making a more uniform disease coding system and enforcing it’s use to simplify morbidity tallying (e.g. ICD-10)
- Improve and simplify forms, formats and registers (like the OPD registers)
- Develop simplified tools to facilitate aggregation of data for reporting (e.g tally sheet for morbidity reporting from service delivery points) with reduced errors.

- Consider the possibility of maintaining individual patient records (in particular for the OPD in Hospitals, although this might also be manageable at BHUs as well because of the low numbers of cases.)
- Enhance the usage of computers and other information technology both at the district and national levels
- Define acceptable levels of error, for example 5 or 10%, and select indicators, such as reporting rates, to routinely monitor the completeness of data. Conduct rapid data audits at health facilities during supervision to monitor data quality.

4. Information Storage and retrieval

Understanding and practice with respect to information storage and retrieval was felt to be generally very good. The assessment team members did, however, recommend a couple of opportunities to strengthen this area even more:

- DHSOs should consider making more effective use of their computers to store more data (both current and historical) and facilitate easy retrieval and analysis. This may also solve some space problems (since old paper reports could be archived outside of the DHSO office or eventually disposed of).
- In some facilities additional supplies, furniture and space may be required (some were storing on the window shelves…) to further improve storage conditions.

5. Resources

The HMIS Task Force felt that material resources (supplies and equipment necessary for HMIS tasks) were mostly in good supply with some few exceptions:

- Provide simple solar/battery operated calculators to all the staff of BHU/Hospital/DHSO
- Establish a minimum supply list and adequate budgets for stationery including pens, poster paper and coloured markers and ensure that the supplies are provided as per the list. Supply problems can be included in the monthly reports to ensure speedy replenishment.
- The Health Information Unit should be strengthened as a central resource to support HMIS developments and take on several additional functions, including:
  - All new, or re-designed, recording or reporting formats should be routed through the information unit before being introduced at the health facility level. The Health Information Unit can help to avoid unnecessary duplication of data collection and provide assistance with the forms' introduction and use.
  - Another critical role of the Health Information Unit would be to cater the health information need of different projects from in and outside the MOHE. (One DHSO mentioned that quite a few different projects ask for the same information. They even ask districts for information that already exits at the centre.)
  - The staffing of the Health Information Unit needs to be reviewed in order to ensure the following staff members are included in the team:
    - at least one physician or epidemiologist to provide clinical and public health perspectives.
    - one person should be hired, or an existing staff member trained, in computer hardware/network troubleshooting. More complex hardware problems should be dealt with by contracting with a local computer firm.
- Although staffing is adequate at the BHU and Hospital levels, n some populous Districts with more than 5 BHUs and no Statistical Assistant, there was a need for additional clerical staff to help with data entry and aggregation.

Also under the heading of resources came the group's recommendations regarding human resource development or training.

Some basic training in computer use is provided for DHSOs, during their initial training at the RHIS, and ANMs, HAs and BHWs have some experience in data recording by during their practicum (also during initial training). Apart from that, there appears not to have been any formal training specific to data management or HMIS. Various learning approaches should be explored for formally institutionalising health worker training on data management with the introduction of the enhanced HMIS. This could be through some combination of the supervisory system (especially for continuous re-enforcement of data use), through short workshops built into district level staff meetings, and/or more formal training methods. The development of a strategy of the implementation, or roll out of enhanced HMIS formats and procedures will be the focus of the 5th phase of this project.

6. Information technology at central and district levels

The assessment team members noted that the introduction of information technology at the central and district levels has been generally successful. Although computers are not used to their full potential, nearly all computers the assessment team observed during visits to the facilities were functional and the basic preconditions of adequate electricity supply and security appear to be in place.

At the district level, task force members recommended the following:

- Based upon the successful experience with the installation of computers for DMOs and DHSOs thus far, the provision of computers to all Health Units down to BHU grade I should be considered where reliable electric supply and local support are available. Some existing computers in districts need replacement or upgrades
- There is a need for better standardisation of software version numbers (many different versions of the 'standard' software were running)
- With reasonably priced access to the Internet at the district level, Internet use should be increased for electronic mail, data exchange and eventually other purposes (e-learning, data querying, web site maintenance). The MOHE should consider a variety of approaches to help staff learn how to use the technology more efficiently.
- Computer resources should be shared among DMOs and DHSOs. In general, DMOs seem to restrict others from using their computers -- and they currently have more powerful computers, even though they generally have less demanding data processing tasks. An effective mechanism for the shared use of computers by the DMO and DHSO should be formalised, especially in the event of a computer breakdown.
- District and central level staff's job descriptions should be reviewed to identify specific data management tasks both manual and computerised that they should be responsible for.
- In some districts, the quality of power supplies is not good. The voltage fluctuates a lot. Both automatic voltage regulators and un-interruptible power supplies should be provided for these regions to protect the equipment. Similarly, phone line surge protectors need to be supplied to avoid damage to modems from lightning and other voltage spikes carried through the phone lines.

The assessment team concluded that computer resources were largely sufficient at the central level, with a ratio of 1.5 users per computer. Equipment was generally in good working order and used appropriately for basic functions such as word processing and electronic spreadsheets. Software standards were also a problem at this level. The team noted, also, that there was a lack of specialised application programs for HMIS data management and that those that exist are outdated and also difficult for health information unit staff to maintain.

The group recommended that:

- The HMIS enhancement project help develop the capacity of the Health Information Unit (HIU) to design and maintain specialised database applications at both the centre and district levels to meet data processing needs.
- An Information Technology cell should be established within the HIU made responsible for standardisation and the coordination of backup maintenance services for information technology throughout the country
- The HIU should continue with the work currently in progress to network central level computers into a local area network and establish internet/intranet links.
- The task force should establish a small team to recommend more detailed software standards, especially for database management, and to develop a plan to implement the new standards at all levels.
- As noted earlier additional staff should be recruited or selected HIU members should receive refresher training in hardware troubleshooting especially.
- The Ministry should either recruit or have a support contract with a full-fledged computer technician or firm for backup services. This is not for basic trouble-shooting or warantee maintenance, but rather for helping with more complex issues at will arise about the need for equipment upgrades and helping clarify technology options and standards.
- Use of computers for data transmission and tele-medicine should also be further explored, building upon the start that has already been made in the field of radiology.

More detailed recommendations on computer use and management are included in the separate Information Technology Assessment Report.

Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Lali Khotenashvili
Director
Georgian State Research Institute of Dermatology and Venerology

This paper's objective is to present the findings of an assessment of case management and medical recording performance of sexually transmitted diseases in Georgia. This assessment was carried out with the intention of contributing to the improvement of the national health information systems. The objective of the activity was to assess the quality of case management and medical recording of clinical procedures.

The specific objectives included:

- improving the quality of care in selected health services;
- assessing current case management performance in selected services as compared to diagnostics and treatment standards
- assessing the data entered into patient records in terms of validity, relevance to tasks performed, completeness and usefulness for case management;
- assessing the usefulness and accuracy of summaries in facility reports; and
- identifying opportunities to improve the validity and consistency of data, including the use of standard case definitions and nomenclature.

The methods used in the assessment were following:

- direct observation of a clinical examination;
- direct observation of laboratory investigation;
- review of medical records;
- interview with health staff;
- interview with patients.

Data obtained showed that assessment of case management and recording performance should be applied as a quality assurance method. This methodology allows the rapid assessment of the quality and use of clinic data as a means to improve the quality of health services and the quality of service data.

Power Point presentation follows.

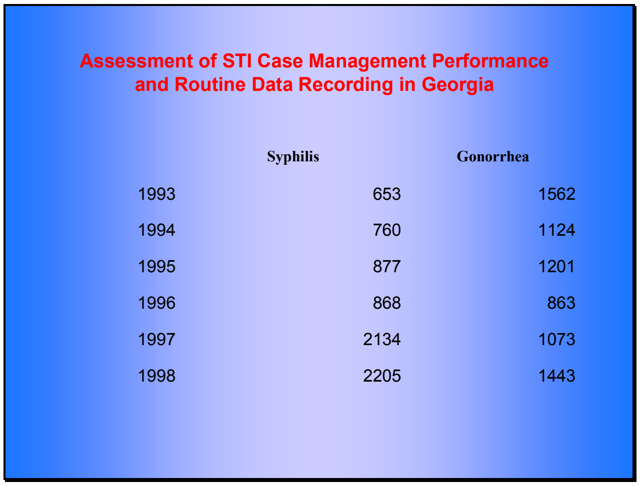
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Lali Khotenashvili
Director
Georgian State Research Institute of Dermatology and Venerology

Workshop on "Assessment of Clinic Diagnostics, Treatment and Recording performance" 1996.

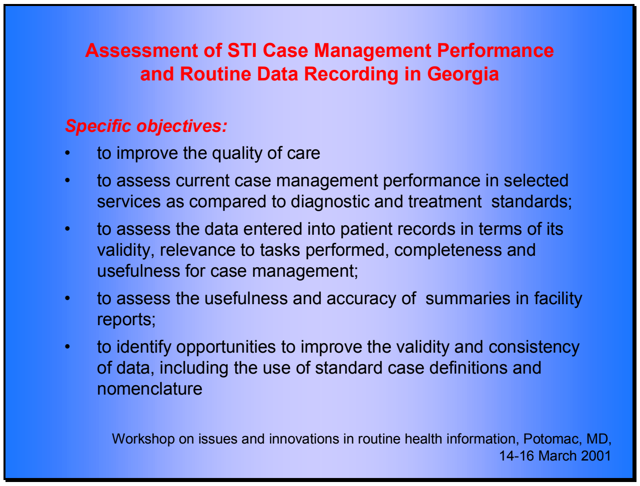
Main objective: to assess the quality of case management and of the medical recording of clinical procedures.

Workshop on Issues and Innovations in Routine Health Information,
Potomac, MD, 14-16 March 2001



Assessment of STI Case Management Performance and Routine Data Recording in Georgia

	Syphilis	Gonorrhea
1993	653	1562
1994	760	1124
1995	877	1201
1996	868	863
1997	2134	1073
1998	2205	1443



Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Specific objectives:

- to improve the quality of care
- to assess current case management performance in selected services as compared to diagnostic and treatment standards;
- to assess the data entered into patient records in terms of its validity, relevance to tasks performed, completeness and usefulness for case management;
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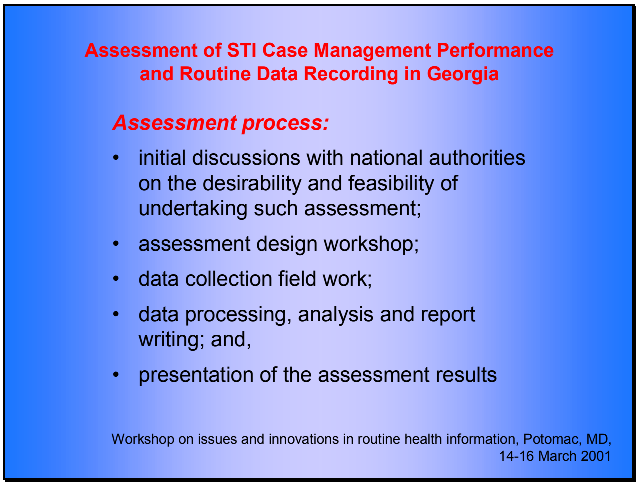

Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Assessment process:

- initial discussions with national authorities on the desirability and feasibility of undertaking such assessment;
- assessment design workshop;
- data collection field work;
- data processing, analysis and report writing; and,
- presentation of the assessment results

Workshop on issues and innovations in routine health information, Potomac, MD,
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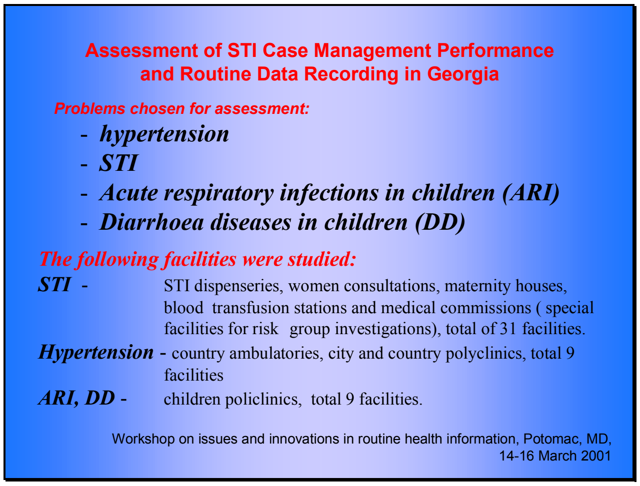

Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Problems chosen for assessment:

- ***hypertension***
- ***STI***
- ***Acute respiratory infections in children (ARI)***
- ***Diarrhoea diseases in children (DD)***

The following facilities were studied:

STI - STI dispenseries, women consultations, maternity houses, blood transfusion stations and medical commissions (special facilities for risk group investigations), total of 31 facilities.

Hypertension - country ambulatories, city and country polyclinics, total 9 facilities

ARI, DD - children policlinics, total 9 facilities.

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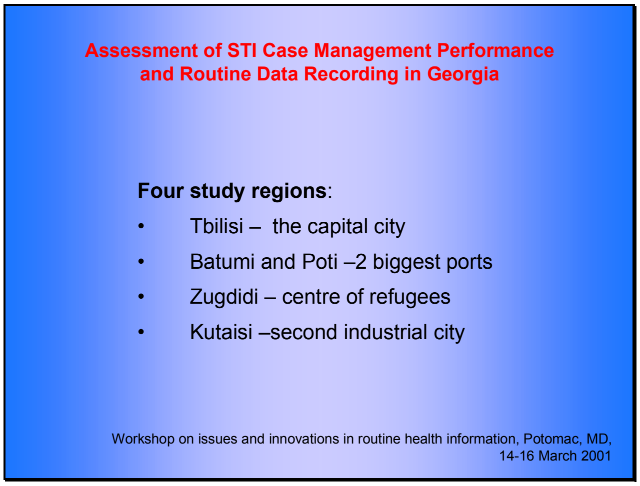

Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Four study regions:

- Tbilisi – the capital city
- Batumi and Poti –2 biggest ports
- Zugdidi – centre of refugees
- Kutaisi –second industrial city

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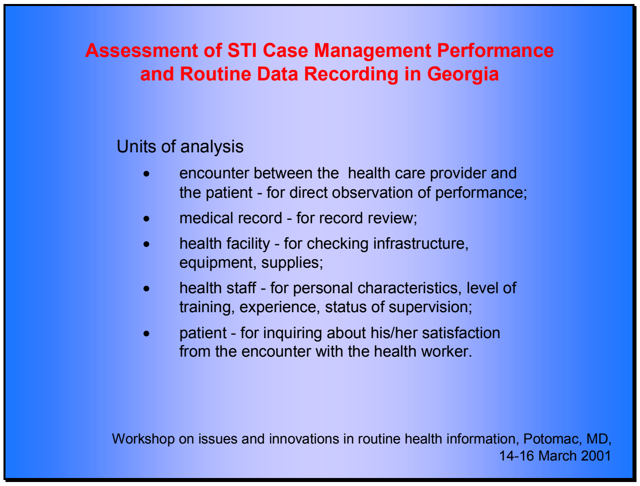

Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Units of analysis

- encounter between the health care provider and the patient - for direct observation of performance;
- medical record - for record review;
- health facility - for checking infrastructure, equipment, supplies;
- health staff - for personal characteristics, level of training, experience, status of supervision;
- patient - for inquiring about his/her satisfaction from the encounter with the health worker.

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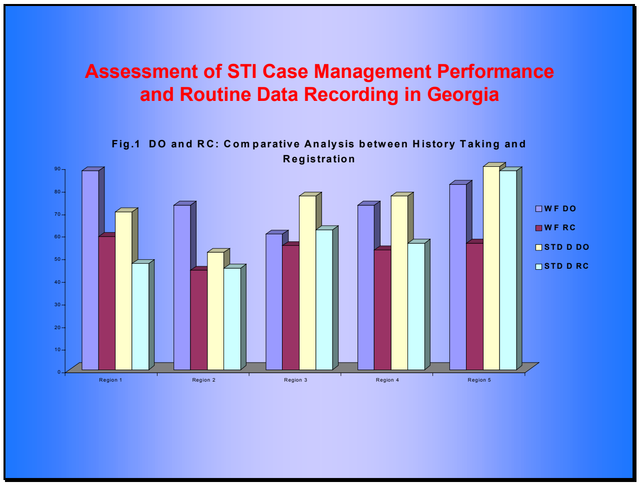
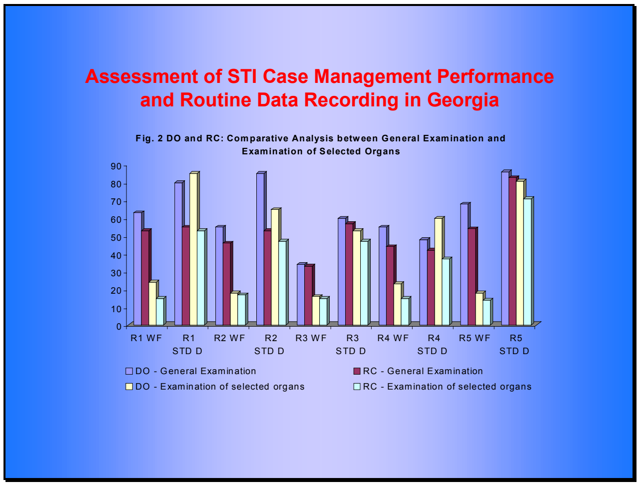


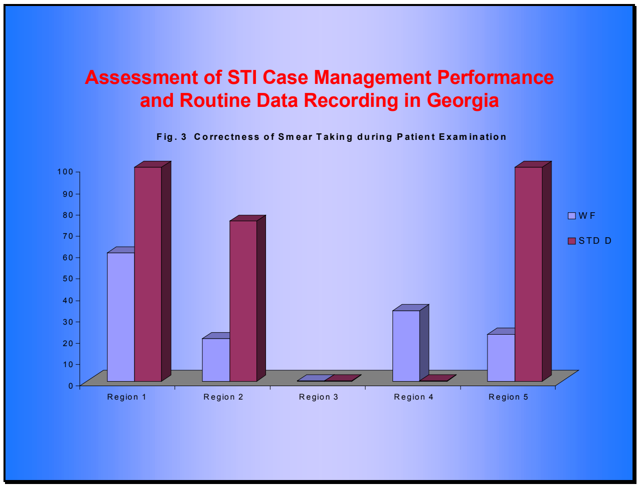
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig.1 DO and RC: Comparative Analysis between History Taking and Registration



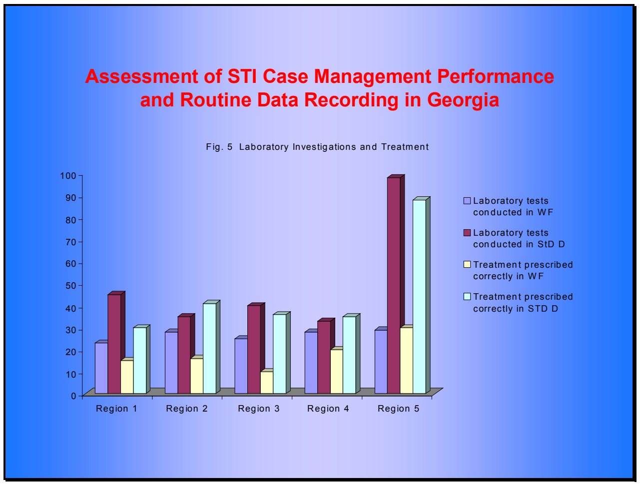
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 2 DO and RC: Comparative Analysis between General Examination and Examination of Selected Organs



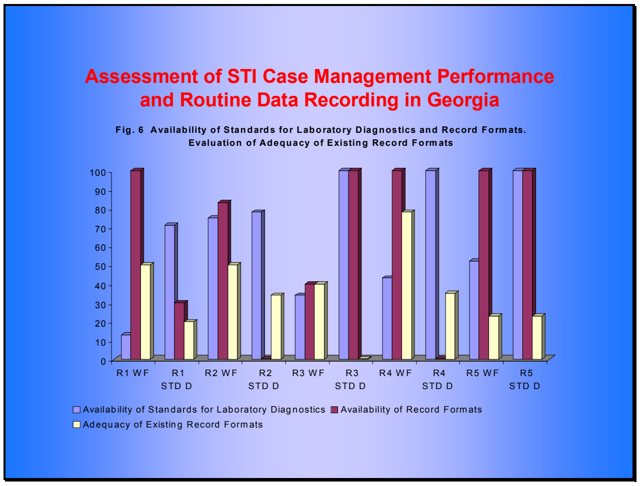
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 3 Correctness of Smear Taking during Patient Examination



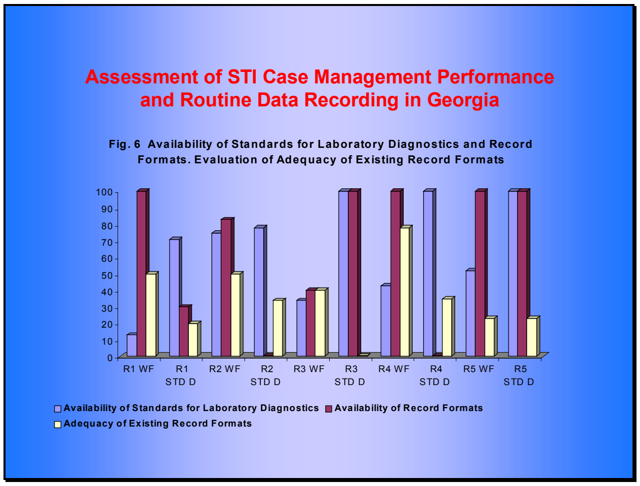
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 5 Laboratory Investigations and Treatment



Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 6 Availability of Standards for Laboratory Diagnostics and Record Formats. Evaluation of Adequacy of Existing Record Formats



Assessment of STI Case Management Performance and Routine Data Recording in Georgia

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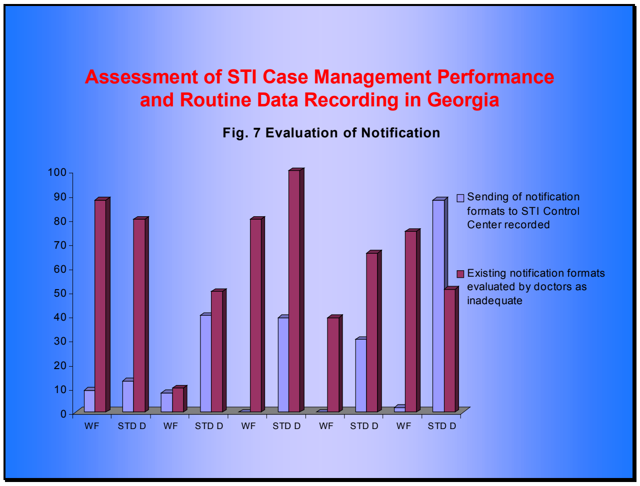
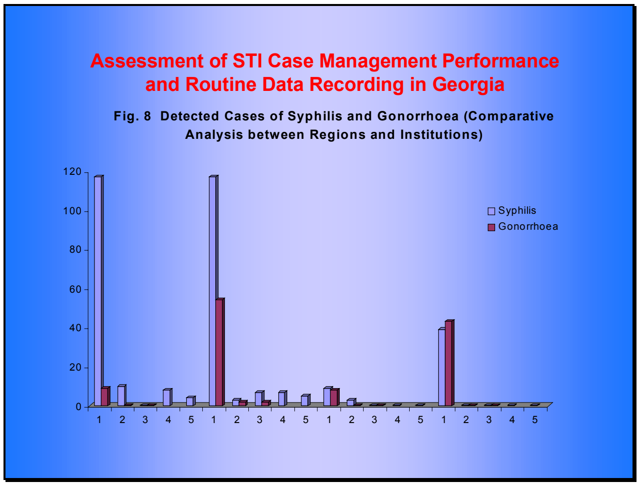


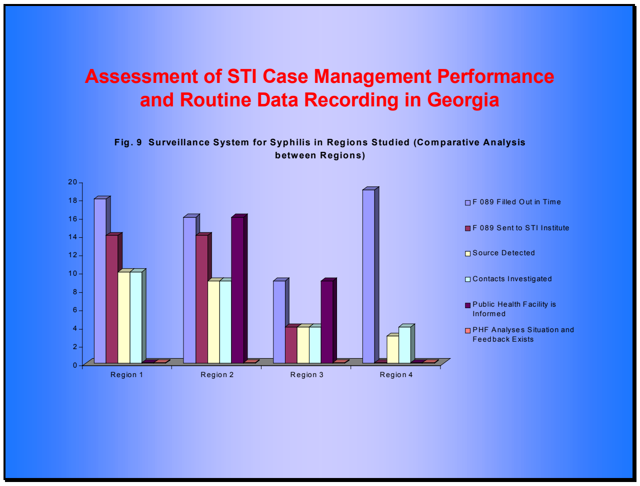
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 7 Evaluation of Notification



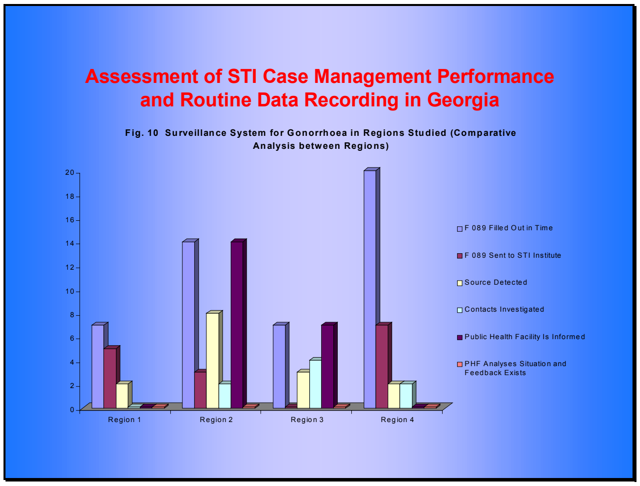
Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 8 Detected Cases of Syphilis and Gonorrhoea (Comparative Analysis between Regions and Institutions)



Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 9 Surveillance System for Syphilis in Regions Studied (Comparative Analysis between Regions)



Assessment of STI Case Management Performance and Routine Data Recording in Georgia

Fig. 10 Surveillance System for Gonorrhoea in Regions Studied (Comparative Analysis between Regions)

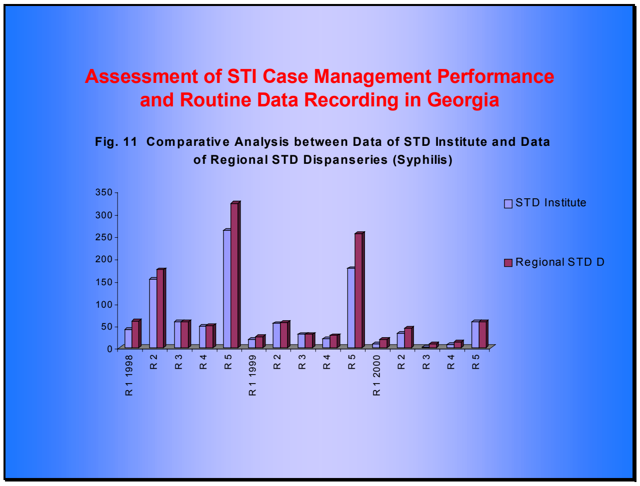


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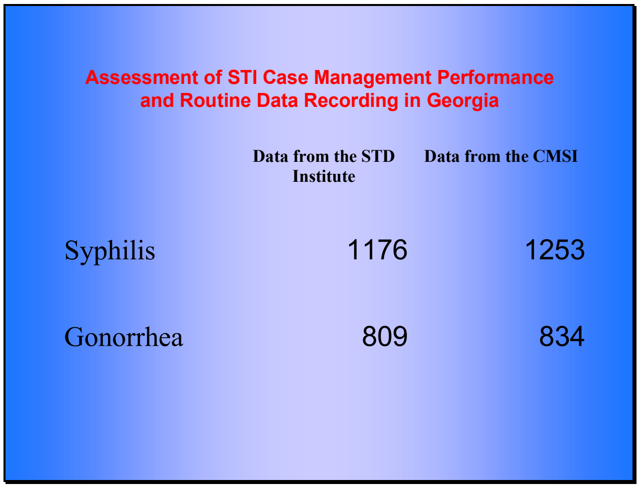
Fig. 11 Comparative Analysis between Data of STD Institute and Data of Regional STD Dispanseries (Syphilis)



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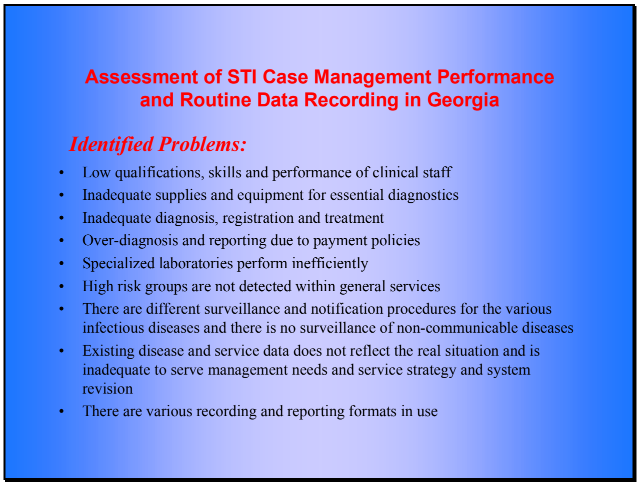
	Data from the STD Institute	Data from the CMSI
Syphilis	1176	1253
Gonorrhea	809	834



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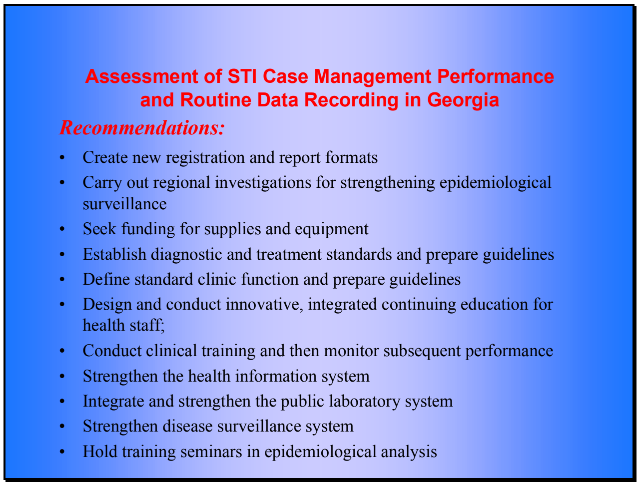
Identified Problems:

- Low qualifications, skills and performance of clinical staff
- Inadequate supplies and equipment for essential diagnostics
- Inadequate diagnosis, registration and treatment
- Over-diagnosis and reporting due to payment policies
- Specialized laboratories perform inefficiently
- High risk groups are not detected within general services
- There are different surveillance and notification procedures for the various infectious diseases and there is no surveillance of non-communicable diseases
- Existing disease and service data does not reflect the real situation and is inadequate to serve management needs and service strategy and system revision
- There are various recording and reporting formats in use



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Recommendations:

- Create new registration and report formats
- Carry out regional investigations for strengthening epidemiological surveillance
- Seek funding for supplies and equipment
- Establish diagnostic and treatment standards and prepare guidelines
- Define standard clinic function and prepare guidelines
- Design and conduct innovative, integrated continuing education for health staff;
- Conduct clinical training and then monitor subsequent performance
- Strengthen the health information system
- Integrate and strengthen the public laboratory system
- Strengthen disease surveillance system
- Hold training seminars in epidemiological analysis

Demographic Surveillance Systems in Burkina Faso: The Case of Nouna Health Research Centre

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Introduction

Demographic surveillance systems (DSSs) continue to be established in rural Africa to collect good and reliable demographic and health data on the populations in these areas. The objective is to ameliorate the persistent problem of insufficient health information. Linked to specific health research questions, DSSs can be an important source of information for health policymakers.

The Nouna Health Research Center is located in the Health District of Nouna in the North-West area of Burkina Faso, some 300 kilometers from the capital of Ouagadougou. Burkina Faso is a West African state with a population of about 11 million.[1] The health system is divided into 11 administrative health regions, which comprise 53 health districts altogether. Each of the districts covers a population of 200,000–300,000 individuals. At least one health care facility in each district is a hospital with surgery capacities.[2] The districts themselves are subdivided into smaller areas of responsibility that are organized around either a hospital or a *Centre de Santé et de Promotion Sociale* (CSPS), the primary health care facility in the Burkinian health system.

The Nouna Health District covers an area of 7,464 square kilometers, which is identical to the administrative province of Kossi. With a population of 240,000 inhabitants, this district has a population density of 32 inhabitants per square kilometer. It covers 16 CSPSs, one district hospital, and one medical center. The DSS area is part of the health district it covers an area of 1,775 square kilometers, with 55,000 people. The population density of this area is about 31 individuals per square kilometer. This population is distributed in 41 villages and the city of Nouna, a semi-urban center.

DSS activities

Objectives of the DSS

The DSS in Nouna was established to meet the following objectives:

- to provide a platform for multidisciplinary health research projects;
- to provide information to health planners and policymakers;
- to follow and evaluate health interventions; and
- to monitor a population over time in a geographically delimited area.

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[1] *African Development Indicators 2000*. Washington: World Bank, 2000.

[2] *Statistiques Sanitaires*. Ouagadougou: Burkina Faso Ministry of Health, 1996.

Data collection

The first baseline census, which took place in 1992, collected demographic information on all individuals in the study area. The baseline census for the semi-urban area took place in January 2000.

Two censuses were held in 1994 and 1998 to verify and supplement the data from the previous censuses. Censuses are planned every two years to provide a clear picture of the study population at certain fixed points in time. In the meantime, the population is monitored by a system for vital events registration. Previously conducted as a monthly activity, vital event registration was designed as a three-month cycle data collection system, beginning in January 2000. All of the households in the surveillance area are covered. The previous procedure included an interviewer visit to the key informant of the village to acquire information about any vital events in the village. Now, the seven interviewers visit each household and inquire about all the members previously registered or actually living in the household. The interviewer identifies any new vital events that have taken place since the previous visit. Registered events include births, deaths, pregnancies, and migration in/out of the household, as well as data related to these events.

Deaths that were detected during the vital events registration are investigated further through means of a verbal autopsy questionnaire. The interviewer confirms a death by asking in a diplomatic way if the individual is present. In case of a negative response, the interviewer asks for further information on the circumstances of the death. The form used by the interviewers includes identification information retrieved from the DSS. For ethical reasons, the interviews are held three months after a death has occurred. Subsequently, two physicians evaluate the filled-in questionnaires. In the case of differing diagnoses, a third physician evaluates the questionnaire under scrutiny. The cause of death is accepted if at least two medical doctors agree on one cause; otherwise the cause of death is specified as unknown. During data collection, the interviewers use preprinted household registration forms for data collection to reduce errors. Three field supervisors are employed to safeguard the quality of the collected data in the field by the following means: they inspect the questionnaires, supervise the interviews, control five percent of the total number of interviews, blind control-interviews, and correct the questionnaires.

Data Management and Analysis

The Nouna DSS uses a locally developed database based on MS Access. The database is capable to register longitudinal information and check data consistency. The current database will soon be converted to HRS II, a generic household registration software distributed by the Population Council.

A data entry supervisor regularly checks the data. During data entry, the data entry clerk reports problematic questionnaires to a supervisor, who tries to resolve the problem. Complicated problems are send to the database manager, who can decide to contact the field team to investigate the cause of the problem further. The database team and the field team work together closely, so most inconsistencies are resolved quickly.

Demographic Indicators Generated by DSS and Some Results

The following indicators were produced by the 1998 control census covering the rural part of the area under surveillance. The population size was 30,886 individuals, distributed among the following main age groups: 0–4 years, 18.3 percent; 5–15 years, 29.9 percent; 15-–64 years, 47.7 percent; and 65+ years, 4.1 percent. The proportion of women is 50.1 percent. The annual growth rate is 1.5 percent, with a fertility rate of 6.6 percent. Compared to the 1996 national census, most of the indicators present a similar picture with no significant differences. The mean household size is eight individuals, and the dependency ratio is 109.8. Migration is dominated by internal movements and, to some extent, by the external movement from the center of the country to the river banks in this zone.

A number of studies have been performed based on the Nouna DSS population. Baltussen et al. demonstrate the feasibility of eliciting disability weights using a culturally-adapted visual analogue scale (VAS)[3]. The authors suggest that the preferences of health professionals on disability weights could be used as a proxy for those by lay people with only small deviations.
In Sankoh et al., a subset of the Nouna DSS data is analyzed by concentrating on the clustering of total childhood mortality (children under age five) in the study area.[4] They used a space and space-time scan statistic proposed by Kulldorff to identify clusters and test for their statistical significance.[5] Several statistically significant clusters of higher childhood mortality rates were identified from different sets of villages. One specific village was identified consistently in the study population indicating a nonrandom distribution of childhood mortality. The authors conclude that their "study may be regarded as a first step in prioritizing areas for follow-up public health efforts."

In another recent study, Würthwein et al. discuss the measurement of the local burden of disease (BOD) with respect of years of life lost (YLL), using the same DSS population.[6] The DSS data exhibit the same qualitative BOD pattern as the Global Burden of Disease Study (GBDS), but with different ranking of the diseases. They recommend that "local health policy should be based on local BOD measurement, rather than on extrapolations that might not represent the true BOD structure by cause."

Research agenda related to the DSS
The DSS provides a platform for multidisciplinary health systems research. Linked to the DSS, our research agenda comprises qualitative studies (illness perception and home treatment strategies, perceived priorities for intrahousehold resource allocation), clinical studies (drug trials, micro-nutrient supplementation studies), parasitological studies (*Plasmodium falciparum* multiplicity), and entomological studies.

Opportunities for Linking the DSS and the HMIS

Motivations for Linking DSS and HMIS
Parallel to the DSS component of the research center is another major information system in the health district: the routine reporting system for the management of health services (HMIS). It comprises a monthly reporting system, from the health facilities to the district level and further on to higher administrative structures. While the two systems are basically disjunctive with respect to their procedures, their aims and observed objectives still overlap to a certain degree. This is especially obvious for data related to morbidity, mortality, and natality. A closer look at both systems could reveal opportunities to link them in order

- to verify comparable results,
- to complement missing results, and
- to gain new insights on the basis of merged results from both systems.

The task, therefore, is to observe both systems with regard to their purpose, structure, procedures, and limitations to find differences and similarities that could promote or prohibit a link between them.

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[3] Baltussen RMPM, Sanou M., Sommerfeld J, Würthwien R, Eliciting Disability Weights Using a Culturally-Adapted Visual Analogue Scale (VAS) in Rural Burkina Faso, Discussion Paper Series, Univeristy of Heidelberg, 2000.

[4] Sankoah, OA, YeY, Sauerborn R, Müller R, and Becker H. Clustering of childhood mortality in rural Burkina Faso. *International Journal of Epidemiology* (in press).

[5] Kulldorff M, (1997). A spatial scan statistic, communications in Statistics - Theory and Methods 26, 1481-1496.

[6] Wurthwein R, Gbangou A, Sauerborn R, and Schmidt CM. Measuring the local burden of disease: A study of years of life lost in rural Burkina Faso. *International Journal of Epidemiology* (in press).

Different Stages of Data Processing

When looking at complex systems, it is always useful to break them into smaller units. To compare the DSS and the HMIS, it seems to be most promising to elaborate distinct levels of data processing according to stages that both systems have in their respective information chains. On each level it can then be observed

- which type of information is available in which granularity,
- how and at what cost this information was produced,
- how valid the information is, and, as a result,
- under what conditions the information from the two systems can be linked.

From the objects under observation, up to the observing subjects, the following broad stages are prevalent in both systems:

- Data are being produced by objects in the real world.
- These data are collected and stored in operational data stores designed to directly support activities in the real world.
- The operational data are consolidated, aggregated, and reduced into data stores that were designed to directly support analysis.
- The reduced data are compiled, analyzed, and transformed into results as a basis for decision making.

The analysis of the two systems should be done, therefore, on the levels of the expected results, the reduced data, the operational data, and the real world.

Linking Individuals and Patients

The observed objects of the DSS are the people who live in a geographically defined area and their demographic events, including their causes of death and, to a certain degree, their illness episodes. The observed objects in the HMIS are basically the health services provided within a clearly defined area and their clients who are using these services (those who are not using the services usually remain unknown). Linking the two systems on this level could provide answers to whether the services really are achieving the targeted coverage, and whether the self-diagnoses recorded in the DSS can be verified in the services. While it is easy to match the targeted villages, it is extremely difficult to identify the individual people seeking health services. ID cards for individuals could provide a solution, but they are costly to implement and have serious limitations.

Linking Operational Data

Linking operational data from the two systems can directly match observed cases from the DSS with cases seen at health services. In both systems, the granularity of the data goes down to the level of the single case and the single day. Operational HMIS data on service activities are stored on paper in the facilities—e.g. patient/case registers. The health services don't have digitized case recordings. The first challenge on this level, therefore, lies in physically transmitting the data. If this barrier is overcome, cases and individuals have to be matched. This effort is being made for specific studies by searching the register books manually, but is surely too costly for routine linkages.

Linking Analysis Data

In the HMIS, the operational data are aggregated locally for service management and reported to higher levels in the administrative hierarchy. In Nouna, the aggregated data are entered into the computer. The granularity of the data is normally no finer than a month per health facility, except for some diseases under special observation, for which the granularity goes down to a week. As in other HMISs, the quality of the aggregated data cannot approach that of a DSS, since data collection is not and may not be the primary activity of health services. For this reason, the monthly summary reports of health services that lie within the focus area of the DSS are entered again at the center. Via the Geographical Information System (GIS), it should be fairly easy to link those data to DSS data, which are aggregated to the same level as the HMIS data. The primary benefit of the DSS for the HMIS here is providing reliable data on the size of the catchment population of a facility, but it can go beyond that.

Linking Results

Research results from the DSS and the center in general have to be applicable outside the research area. They have to be set in relation to comparable studies in other settings and to observations of the health services, locally and nationally. Results are exchanged at conferences and meetings or disseminated in publications. Special topics are covered by dedicated consultancies carried out by the center.

Conclusion

DSS and HMIS can potentially profit from each other and already do so to a certain extent. If the specific potentials and limitations of each system are taken into account, it should be possible to gain a fair benefit from linking the two systems at a reasonable expense.

The Politics of HIS Restructuring in Pakistan: The Importance of Policy Analysis

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Abstract

In 1991, the Ministry of Health decided to transform its routine reporting system for first-level care facilities into an integrated and comprehensive health management information system (HMIS/FLCF). This paper illustrates the importance of the contextual and process factors involved in the restructuring process.

HMIS/FLCF was designed through a consensus-building process involving future information users at all levels of health services. Senior managers from provincial health departments, vertical program managers, district health officers, and peripheral users were involved in the design process from the very first stage of planning. With initial financial support from USAID, HMIS/FLCF implementation of the new system started at the end of 1992, but came to a halt in 1994 when USAID's bilateral assistance program ended. At that time, barely 50 percent of health districts had been trained to use the new system. It took major advocacy efforts to identify support from other donors. With financial assistance from UNICEF and the World Bank, HMIS/FLCF was implemented nationwide by 1997.

The restructured system's integrated and simplified information-generating process tailored to the needs of the peripheral health services makes it a potentially powerful tool for planning and management of health services in Pakistan. Unfortunately, the overall weak management environment of basic health services, together with the absence of a real "information culture," seriously limits appropriate use of the information generated by the new system. Without appropriate strategies to improve the health services management environment and develop more accessible and more relevant health services, the information system will remain underused.

Three main lessons can be learned from this effort regarding the design of appropriate health information systems:

- The outcome of health information system reform is heavily dependent on the administrative and broader sociocultural context in which the reform takes place.

- Consensus building among future users in the process of restructuring the routine health information system is central to developing local ownership of the system.

- Donor-assisted health information system reform requires close coordination between the Ministry of the Health and various donors to mobilize the required resources in a timely fashion.

Introduction

In Pakistan, as in many developing countries, the existing institution–based routine reporting system in first-level health care facilities did not include essential health indicators, such as coverage for preventive services in the community, information on quality of care provided, and data on resource use. Large amounts of data were collected through a complex system of registers and report forms, mostly consisting of lists of diseases by sex and age category, but data was of poor quality. Health information systems assessment studies[1] showed that health workers perceived data collection activities as burdensome and of little use to their daily work. They received virtually no feedback concerning the data reported to higher levels. The quality of the data was compromised further by inefficient manual data processing. The only reliable data on health indicators came from sporadic sample surveys. Public health managers, supervisors, and care providers lacked training in the use of information for management. Public health professionals in the country felt that only an in-depth, overall restructuring of the health information system could address these problems in the long run.

In May 1991, the Ministry of Health, in coordination with the Provincial Health Departments, organized a national workshop on health information systems. Based on the recommendations of an in-depth assessment study by a team from Harvard Institute for International Development[2], it was decided to transform the existing routine reporting system of government-managed first-level care facilities into a comprehensive health management information system.

The main strategy underlying the restructuring process was the use of a consensus-building approach. During the design phase, an extensive consensus-building process was used both to win over potential opponents of the system and to ensure that the newly designed health information system would respond to the information needs of all health services levels. As many future users of the information system as possible were actively involved in the design phase. HMIS working groups were constituted at the federal level and in the provinces that included managers of the health services and categorical disease programs and health care providers from selected primary-level care facilities. For several months, these HMIS working groups met to discuss the content and the structure of the future HMIS. First, an agreement was reached on a standard and comprehensive package of health care services and resource management activities to be performed in every first-level care facility. Essential indicators for each of these services and activities were then defined. Designers then defined data collection instruments, reporting procedures and data flows within the health services. Finally, for the first time in Pakistan, it was decided to computerize data processing for the reports sent by the first-level care facilities, initially at divisional levels, and later at district levels as well. Therefore customized data processing software was developed.

Priority was given to FLCF because it could address most of the population's priority health problems. The intention was to develop the HMIS at a later stage into a comprehensive, nationwide system, to include inpatient/referral services information, information for personnel and financial management information from private sector health services, vital events registration, and a community-based survey system.

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[1] Frere, Jean-Jacques. *Health And Management Information System for Child Survival Project in Pakistan.* December, 1987. PRITECH.

[2] Lippeveld, T., Gul, Z. Limprecht, N. *Assessment Study on Health Information Systems in Pakistan.* Final Report prepared for the Ministry of Health and the United States Agency for International Development, Islamabad, Pakistan, 1991.

In July 1992, after several months of field-testing in a sample of health facilities, the newly designed HMIS/FLCF was approved by the Federal Ministry of Health and by the departments of health of all the four provinces, including the Northern Areas and AJK. It was decided at the third national workshop in Islamabad to implement the system throughout the whole country. Initial funding for the system was provided by USAID and UNICEF, and technical assistance came from the Pakistan Child Survival Project team.

This paper recounts the importance of the contextual and process factors involved in the restructuring of the HMIS in Pakistan.

Background

The health services delivery system in Pakistan is a mix of public (i.e., government) and private providers. In the *public sector,* provincial, federal, and some local governments operate tertiary care hospitals for the larger urban areas. In rural areas and smaller towns, the provincial governments (and the governments of FANA, AJK, ICT, and FATA) operate an extensive infrastructure of first-level care facilities and secondary care hospitals, supported by several federal programs. The government is by far the largest provider of hospital care in rural areas, and it is also the main provider of preventive care throughout the country. The majority of curative care is provided through the private for-profit sector.

The public health care delivery system is composed of four tiers:
outreach and community-based activities that focus on immunization, sanitation, malaria control, maternal and child health, and family planning;
primary care facilities, mainly for outpatient care;
tehsil (i.e., subdistrict) and district headquarters hospitals for basic inpatient care and outpatient care; and
tertiary care hospitals located in the major cities for more specialized inpatient care. Primary care facilities are mostly managed by a Medical Officer, except for Maternity and Child Health Centers, which are managed by Lady Health Visitors (LHV - i.e., trained midwives), and dispensaries, which are managed by medical assistants.

Health Infrastructure

Basic Health Units (BHUs) provide curative and preventive services for a catchment population of about 10,000–20,000 people. *Rural Health Centers (RHCs)* provide more extensive outpatient services and some inpatient services, usually limited to short-term observation and treatment of patients who do not require transfer to a higher-level facility. RHUs serve catchment populations of about 25,000 to 50,000 people, and employ about 30 staff, including several doctors and a number of paramedical staff**.** They typically have 10–20 beds and X-ray, laboratory, and minor surgery facilities. *Tehsil Headquarters Hospitals* provide basic inpatient and outpatient services. They serve a catchment population of about 100,000–300,000 people with 40 to 50 beds and appropriate support services, including x-ray, laboratory, and surgery facilities. *District Headquarter Hospitals* serve catchment populations of about 1 to 2 million people and provide a range of specialist care in addition to basic hospital and outpatient services. They typically have about 80100 beds.

The District Health Officer (DHO) is responsible for all health services in his district. Managers of all Tehsil Headquarters Hospitals and first-level care facilities report to him. District Headquarters Hospitals are headed by Civil Surgeons, who, along with the DHOs, report to the Director General of Health at the provincial level. Tertiary care hospitals are directly under the Provincial Secretary of Health.

Table 1 Province-wise Distribution of Health Facilities (December 2000)

Province	DHQ	THQ	Disp.	TB	MCH	RHC	BHUs	Total
Punjab	28	57	1006	46	404	307	2494	4342
Sindh	11	44	309	1	41	119	781	1306
*NWFP	15	10	623	24	112	100	1135	2019
Balochistan	18	-	652	9	76	58	432	1227
*AJK	3	6	105	1	10	29	181	335
*Nas	3	21	99	0	1	0	15	139
ICT-	-	-	6	0	1	3	13	23
Grand	78	138	2800	81	645	616	5051	9409

*NWFP=North West Frontier Province, AJK=Azad Jammu & Kashmir, NA= Northern Areas

Private Health Services

The *private health sector is* dominated by more than 20,000 "clinics," small, office-based practices of general practitioners. These practices include more than 300 MCH Centers (also known as maternity homes); about 350 dispensaries, which are outpatient primary health care facilities; and more than 450 small to medium-size diagnostic laboratories. There are also more than 500 small and medium-size private hospitals with about 30 beds per hospital on average. They are equipped only for basic surgical, obstetric, and diagnostic procedures, and concentrate on low-risk care. In addition**,** there are a few large private hospitals, mainly run by NGOs and located in major cities. Private health services are concentrated in urban areas.

Assessing the need for HIS restructuring in Pakistan

Public health specialists, health service managers, and information technology experts all recognized that the existing routine institution-based reporting system was of little help to their specific needs. The system did not include essential health indicators, such as coverage for preventive services in the community or information on quality of care provided and resource use. Moreover, the health workers saw data collection activities as burdensome and of little use to their daily work.

In 1990, a team from the Harvard Institute for International Development[3] carried out an in-depth assessment study of Pakistan's institution-based information system. The main findings from this study were:

1) Disease indicators are unfocused. Information on more than 100 health problems is being collected, but it is vague and of poor quality.

2) So much information is collected that it becomes virtually impossible to consolidate or draw some meaningful conclusion from it.

3) The system lacks management indicators, such as those on personnel, equipment, and supplies/drugs.

4) Data collection methods are improper. Staff motivation, data standardization, and printed supplies are lacking.

5) Data reporting is fragmented, with many overlapping and chaotic transmission procedures.

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[3] Ibid.

6) Data processing is mostly manual and grossly deficient, and data analysis is virtually nonexistent, with no use of computers.

7) The higher-level information feedback/guidance, both to field supervisors and facility staff, are lacking.

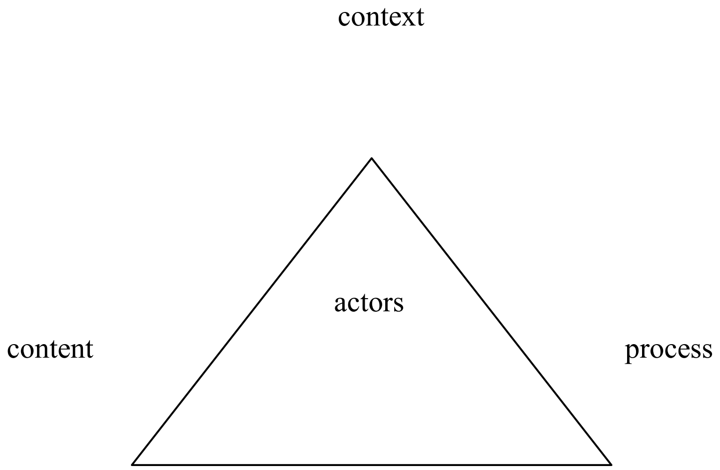
8) Central Information Management is very weak, both at the federal and the provincial levels, so technical support from these levels is meager.

In light of these findings, and taking into account the growing concerns of various stakeholders, it was decided to transform the existing routine reporting system of government-managed first-level care facilities into a comprehensive health management information system. By health management information system, it was understood that the system would provide all necessary indicators for decision making at different management levels of the health services: patient/client management level; health unit management level; and health system management level.

HIS restructuring in Pakistan: Content, process, and context

Walt and Gilson's model[4] for health policy analysis is well suited to describe health information system reform in Pakistan between 1992 and 1994. In the following paragraphs we analyze, first, how the specific technical content of health information system reform influenced the reform outcome. Second, we examine the process of health information system reform itself. Third, we focus on the role contextual factors have played in health information system reform in Pakistan.

Figure 1



The content of the system

The new system provides most of the information needed for decision making on various health services provided by an FLCF: information on maternal mortality, priority health problems in children under age five, quantity and coverage of services provided, quality of case management of mothers and children, and essential resources to operate health services adequately. HMIS/FLCF also has an epidemiological dimension, since the data collected can be related to selected population groups in the catchment areas of first-level care facilities. Compared to the former system, the set of indicators generated by the new

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[4] Walt, G., and L. Gilsen. Reforming the health sector in developing countries: The central role of policy analysis. *Health Policy and Planning.* 9(4), 1994.

system is more focused on specific information needs for planning and management of health services. The information needs of care providers in the peripheral health facilities, in particular, are taken into account. One of the main causes explaining the poor quality of data from routine reporting systems is the irrelevance of the indicators to the operational levels in the health system.[5]

While providing important information for planning and management, indicators on continuity of care of patients/clients and on coverage of MCH services are also directly useful to the care provider in his or her daily activities. This will motivate the care provider to ensure the quality of the data collected.

Through its simplified and standardized data collection and reporting procedures, HMIS/FLCF has the potential to generate timelier, more valid, and more reliable information. To ensure immediate correct application of all these procedures, intensified supervision in the health facilities was necessary, in addition to the introductory four days of training. The supervisors scrutinized the incoming reports regularly to improve the quality of data collection and reporting under the new system.

Computerization of the data processing system greatly facilitated, sped up, and improved the quality of data aggregation and the production of action-oriented feedback reports. The technology is simple enough to be handled by available statistical and clerical staff after a short training course. All district headquarters offices are computerized. This approach is consistent with the government's current decentralization efforts that call for delegating more and more decision-making power to the districts.

The feedback system permits immediate use of the data collected by health care providers and supervisors and through computerized feedback reports. Through the choice of relevant indicators and appropriately designed data collection instruments, most of the data collected can be used immediately for daily operations in the health unit and at the district level. For example, the mother health register and the child health register permit identification of mothers who did not show up for their appointments and planning for home visits. The monthly report provides a direct estimate of coverage for preventive MCH services. The supervisory checklist permits supervisors to identify service delivery problems and discuss them immediately with the health unit team. The computerized feedback reports provide a series of easily generated and user friendly formats to managers at different levels in the health services system.

The implementation process

During the design phase, an extensive consensus-building process was used to win over potential opponents of the system and to ensure that the newly designed health information system would respond to the information needs of all health services levels. First, a series of meetings were held with national program managers. Initially, Expanded Program on Immunization managers were very worried that by dismantling vertical information systems, health information system reform would disrupt effective programmatic and logistic management. Potential problems in defining indicators and information flows were discussed openly until satisfactory compromises could be found.

Then the Ministry of Health set up health information system working groups in each province. These groups included district managers, care providers, and statistical officers. During two workshops, the members of these health information system working groups discussed the content and structure of the future HMIS. Representatives presented a provisional list of indicators and a proposed macrostructure for HMIS/FLCF from each province during a national workshop in January 1992. Representatives from the federal Ministry of Health, national programmers, professional medical groups, and the donor community also participated. Although the Ministry would have accepted provincial differences in indicators and data collection procedures, all of the participants felt it would be more efficient to develop a national list of

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[5] Lippeveld, T. et al. 1991.

indicators and a uniform reporting system. It took some heated debate and tedious compromises to reach that objective. The biggest stumbling block was disease reporting. Everyone agreed that the previous reporting on more than 100 disease categories was cumbersome and needed to be simplified, but they had difficulty agreeing on the ideal number of disease categories and which ones to choose. The final list of 18 health problems included primarily those for which potential action programs already existed, so that monitoring trends for these problems was important for programmatic decision making.

It was also decided to delegate the development of data collection instruments and the computerized data processing system to a team of experts. After six months of design and field-testing, during which the experts maintained close contact with the provincial work groups, the final design and implementation plan of HMIS/FLCF was approved at the end of another national workshop. One of the compromises developed at these meetings concerned data transmission procedures. While vertical programme managers wanted to maintain parallel reporting procedures until HMIS/FLCF implementation was complete, district managers objected to the additional time and work burdens this would engender for care providers. The compromise solution was that all separate reporting would be discontinued as soon as a full district had been trained in using the new system.

Although this entire consensus-building process took more than a year, the benefits became obvious during the implementation phase. Managers at provincial and district levels who had been involved in the design phase started using preliminary computerized feedback reports in discussions with their staff. Also, every time an attempt was made to change the content of or procedures for HMIS/FLCF implementation, members of the workgroups objected vehemently. For ammunition they cited the written agreements of the national workshop, which had been distributed widely throughout the country.

The context for implementation

The outcome of health information system reform is heavily dependent on the broader sociocultural context in which the reform takes place. In this paper, we address two main contextual issues encountered in the restructuring of HMIS/FLCF in Pakistan.

1) Role of International Donors

Pakistan is a poor country, with less than 1 percent of its GNP spent in the health sector. Because health information system reform was initiated within the public sector framework, the financial and administrative capacity of the government is a critical determinant in the outcome of the reform.

The new HMIS/FLCF obviously has recurrent cost implications. A study performed in 1993 showed that the new system would not cause a substantial increase in recurrent costs over the former system. But one of the reasons the former system did not function well was the insufficient allocation of funds to operate the system. Therefore, the net effect of the HMIS/FLCF meant increased expenditures for the health departments.

The role of international donors in the initial phase of HMIS restructuring is absolutely vital for implementation and future sustainability of the system. Health information system reform was initiated in 1991 in Pakistan, with the funding and technical assistance provided through USAID. Unfortunately, after one year, during which time about half of the districts in Pakistan had worked with the new system, USAID's financial support stopped, and alternative funding did not become immediately available. This financial constraint slowed down the pace of implementation, and at various periods during the implementation phase, the lack of financial resources and the premature withdrawal of the technical assistance team threatened HMIS/FLCF survival It took major advocacy efforts to identify support from other donors. Eventually, with financial assistance from UNICEF and the World Bank, HMIS/FLCF was implemented nationwide by 1997. Table 2 shows the status of reporting between at the end of 2000.

Table 2 Districts Covered for HMIS, Reporting (December 2000)

Province	Total Districts	Districts Reporting	# Districts Computerized	# District Computer Centers Functioning
Punjab	34	34	34	34
Sindh	21	21	21	21
NWFP	28	24	26	20
Balochistan	26	25	10	10
A.J.K.	05	05	5	5
ICT-Islamabad	01	01	1	1
N.A.'s	05	05	5	1
Total:	**120**	**115**	**102**	**92**

2) Absence of an "Information Culture"

In spite of the clearly improved structure of the information-generating process, we have reason to believe that use of this information within the prevailing context of Pakistan's health services will remain problematic in the years to come, unless other, more fundamental interventions are envisioned. Indeed, prevailing contextual factors, in particular the management environment of health services and, more generally, the sociocultural environment in Pakistan, could threaten the potential of HMIS/FLCF to improve health care services in general and maternal and child health services in particular.

Generation of more relevant and more reliable information in itself is not sufficient. Care providers and managers of basic health services in Pakistan are not ready to use this information for improved planning and management. Most district managers have been trained as clinicians, but they are ill prepared for their tasks as information managers, health planners, and supervisors of basic health services. Also, they consider their decision-making power to be minimal in a health system centralized at provincial and federal levels. Whatever decisions they are allowed to make have always been made without information. The heavy bureaucratic demands of the system take up most of their time. Their recurrent budget is insufficient to ensure regular supervision and print data collection instruments in time. A supervisory visit to an FLCF mostly consists of a five-minute stop to check on the presence of staff or to verify some records.

This situation also applies to the care providers themselves. The basic training of most FLCF staff does not prepare them to set up efficient, community-based preventive services and to use information effectively to manage such services daily. Most health facilities lack the necessary drugs and equipment to offer essential services of acceptable quality. In the absence of substantial financial incentives or other measures to improve quality, the simple addition of a more efficient data collection system is not an immediate reason for the staff to change behavior overnight.

Yet, the deficient management environment of basic health services is not the only factor explaining the inadequacy of health services for the population of Pakistan. The problem has deeper roots related to the broader sociocultural context. Without the development of innovative strategies to deal with these contextual constraints, it is unlikely that the new health management information system will be used widely for the planning and management of health services. Yet, HMIS/FLCF as a planning and management tool can contribute to further research on such strategies.

The consensus developed during the HMIS/FLCF design to provide preventive mother and child health services as part of a comprehensive minimum package offered in each first-level care facility triggered interest at the highest levels in initiating the necessary policy and system reforms. Both the Social Action Program and the Family Health Project, created in 1992 with World Bank funds, call for health services reorganization with decentralization of administrative and financial powers, and for improvement of gender staffing imbalances. Also, HMIS/FLCF can become the main monitoring instrument to measure progress toward a better-managed health services system where women can have access to culturally acceptable health care. For these reasons, it was decided in March 1995, during a national meeting of the Social Action Program, to give full support to nationwide implementation of HMIS/FLCF.

Lessons Learned from HMIS design and implementation
A policy analysis of the health information restructuring in Pakistan points to three important lessons.

1. Consensus building among future users in the process of restructuring the routine health information system is key to ownership of the system:
For successful health information system restructuring, it is vital to involve all relevant stakeholders at all levels from the very start. In the design phase, this consensus-building process provided ownership, commitment, and built-in understanding of how the system worked. It helped to ensure that existing strong vertical programs do not ultimately maintain a separate, vertical reporting system. Consensus building in the design phase ensured participation during the implementation phase, which helped to achieve 90 percent reporting rates from the new system. It also ensured some degree of decentralized analysis and use of information. However, the absence of a real "information culture" in the weak management environment of basic health services limits appropriate use of the information generated by the new system. Without optimum participation, it would probably be impossible to establish a real health information system that delivers the benefits described.

2. The outcome of health information system reform is heavily dependent on the administrative and broader sociocultural context in which the reform takes place.
The success of health information reform depends not only on technical improvements, but also on an in-depth understanding of the country's political, sociocultural, and administrative factors. Establishment of a health information system must closely match the structure of the health services delivery system to support the decision-making process fully at various levels of the health system.

Contextual factors, such as the country's political environment, administrative capacity of the government, and information use culture in the society, can heavily influence the health information system reform process. This is well illustrated in our case study. In Pakistan, the reform took place within the bureaucratic arena. During the two-year design phase of HMIS/FLCF, consensus building among the provincial health departments was seriously hampered by the frequent changes of directors general heading the delegations of each province.

In a weak health system management environment, decisions are made on the basis of value judgments and power relations, and there is an almost total lack of perception about the link between information and management. This is more prevalent at the lower levels of a health care delivery system, where managers typically have no control over the production and use of information. This lack of an "information culture" can be the biggest constraint to any health system reform.

It is necessary, therefore, that a careful preliminary analysis of these contextual factors must be made at a very early stage of the program. This will help to identify the potential constraints these factors will place not only on the reform process, but also on potential strategies to cope with such problems during the design and the implementation phase.

3. Donor-assisted health information system reform needs close coordination between the Ministry of the Health and various donors to mobilize the required resources in a timely fashion.

Another part of the political context is the international donor community and the role it plays in health information system reform. Restructuring of health information systems in developing countries is typically donor driven. Mostly, the donors promote their own indicators while providing financial assistance to develop routine recording system for capturing the necessary data. But it is obvious that without mobilizing national support, such projects ultimately cannot be sustained and may actually damage the existing health information system in the country.

The second problem arises when several agencies support the health information system development process. Each agency has its own approach and may find it difficult to collaborate with others. The national administration may find it difficult to coordinate the effort when most of the resources, both financial and human, are provided by donor agencies.

The sustainability of the restructured system is very much reliant on the availability of resources—specifically, skilled manpower and money for supplies. Problems arise when the total cost of the project is not well planned at the outset. The Pakistan case study illustrates this situation very well. Due to a lack of funding, the process of HMIS/FLCF implementation was slowed down and practically came to a standstill. Fortunately, UNICEF supported the Ministry of Health with funds to hire a full-time, motivated HMIS National Coordinator. He took up the challenge of implementation during the vulnerable period after the withdrawal of the Pakistan Child Survival Project's technical assistance, and when the system's implementation was only half-completed. Implementation was finally completed in 1997, with the financial support of the World Bank and UNICEF.

Ukraine Health Information System (HIS)

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Background

The Ukraine Infectious Disease Program: Health Information Systems and Management Reform program was developed in part from lessons learned from the USAID humanitarian assistance program to combat the diphtheria epidemic in Ukraine. In working with the Government of Ukraine (GOU) during that effort, concern arose regarding the effectiveness of Ukraine's public health surveillance and management information systems. USAID/Kiev requested assistance in the evaluation and development of a three-year plan to provide technical assistance and support to the GOU's efforts to reform its health information system.

An assessment of the Ukraine health and management information systems was conducted in April 1997. The evaluation and design team was composed of staff from USAID/Washington, U.S. Centers for Disease Control and Prevention Epidemiology Program Office, USAID's Basic Support for Institutionalizing Child Survival Project (BASICS), and the Program for Appropriate Technology in Health (PATH). The team conducted two assessment trips and held a three-day project-planning meeting in 1997 to draft a strategy and workplan. PATH was selected as the lead organization, with technical assistance provided by all three partners.

Due to funding constraints, the second and third years of work were implemented by PATH through the Technologies for Child Health (HealthTech) cooperative agreement.

Strategic Approach

An approach was used that provided the GOU with an assistance package that concentrated on the development of public health management information tools and technical training to monitor, evaluate, and adapt the HIS to strengthen local and regional management and meet the changing needs of the Ministry of Health (MOH). This strategy was intended to address the current gap between public health monitoring and evaluation as defined and practiced in the West and those statistics coming out of Ukraine. To implement this strategy, the project:

- Focuses on data collection, analysis, and utilization needs at each level of the public health surveillance system, reforming the system from the initial point of data collection upward.

To ensure effective use, data quality, and timely response, tools were developed that enabled each level to collect, monitor, and analyze data and translate them into action. This approach explicitly shifted the decision-making capability to local health workers, especially at the point of data collection, and reinforced the relevance of data to their daily decision-making responsibilities.

- Limits the collection and processing of data to relevant information at each level and only sends directly relevant information to successive management levels.

This ensures that the system is not overwhelmed with irrelevant data and reinforces at each level of responsibility the ability to make timely decisions based on appropriate surveillance and management information.

- Promotes the "democratization" of public health management data.

The old system was designed around centralized, top-down decision making, while access to and use of data at the point of service delivery empowers local management.

- Recognizes that public health and administrative data are not separate, but interconnected, and must be addressed simultaneously to have any impact.

The project specifically targeted interventions and processes designed to facilitate the integration of public health and program management *information.*

- Concentrates on the quality and management use of Health Information System content rather than the more common HIS emphasis on information technology and computer-based data processing and automated report generation.

Strengthening data integrity and management problem solving was the overarching program goal. The project development team felt that an emphasis on computers would not guarantee this, and could actually be counterproductive. Furthermore, the program recognized that available computer resources would vary widely by region and, as a result, computer-dependent systems would not be appropriate for many oblasts (administrative area) during the life of the project, and probably for several years after. Accordingly, the need to focus on reforms that were independent of computerization became a central strategic decision of the program design team. This strategic decision has been strongly endorsed by the MOH.

- Designs and introduces reforms according to public health priorities and management needs as defined by the local oblast and raion authorities.

Locally appointed Working Groups of pediatricians and epidemiologists from raion and oblast levels of the health system, as well as the national MOH, were a key factor in program success. These Working Groups set priorities, review, propose, and approve changes to data and processes and assure that program activities directly address the management needs and capabilities of oblast and raion health staff. This strategy ensures Ukrainian ownership of the program and a greater likelihood of sustainability.

Results to Date

Since October 1997, the project has accomplished the following:

- Developed and introduced public health surveillance reforms throughout three oblasts, Lviv, Odessa, and Zhitomir.
- Convened a national working group within the MOH composed of national and regional representatives. This working group, appointed and empowered by the Minister of Health, determined policy and prepared the reform package for national adoption. This national introduction began during the last quarter of 1999. The system was adopted formally nationwide in January 2000 and is now operating in every oblast in the country. The new forms, definitions, and procedures completely replaced the old system on July 1, 2000.

  As a result of changes in recording and reporting policy and practice introduced by the program, every level of the immunization service delivery system, from the central oblast SES to the village ambulatory clinic, can now monitor and evaluate immunization program activities, identify problem areas, and accurately forecast needs.

  Principal outputs have been:
  - Developed, published, and disseminated revised reporting forms, procedures, and training manuals that are appropriate for management and public health surveillance at each level of the system, from the FAP and village ambulatory clinic to the oblast SES.

- Introduced changes in the definition and interpretation of key public health indicators, including computation of key statistics needed for monitoring EPI activities in accordance with World Health Organization (WHO) standards.
- Introduced standardized, epidemiologically valid methods for calculating base populations for annual and monthly surveillance statistics and annual workplans, and for monitoring program performance.
- Introduced forms and procedures for continual, timely, and accurate tracking of the distribution and consumption of biological supplies, remaining stores, wastage, and forecasted need.
- Established systems for public health data collection and analysis that enable efficient resource management and allow cost efficiency and economic evaluations of different program strategies and disease control interventions.
- Developed instruments and procedures for ongoing monitoring of service delivery indicators, including cold chain maintenance, accuracy and completeness of record keeping, and completion of inservice training.

As a result of these changes in recording and reporting policy and practice introduced by the program, the following is apparent:

- Every level of the public health service delivery system, from the central oblast SES to the village ambulatory clinic, now has the capability to accurately forecast needs and monitor and evaluate their activities.
- Standardly applied, internationally accepted definitions and procedures for computing key performance indicators are in use.
- Oblasts have the capacity to monitor supplies from existing stores accurately, through distribution, consumption, and equipment maintenance.
- Oblasts now have the ability to monitor and respond to vaccine wastage and contraindication rates, major causes of inadequate immunization coverage in the past. For the first time, oblast and national authorities have evidence of the extent of these problems and the information tools necessary to address them effectively.
- Forecasting of key biological supply requirements can be computed accurately and rapidly.

In summary, as a direct result of program reforms, Ukrainians now have evidence of previously hidden major constraints in their public health service delivery systems. Problem areas (raions) have been identified and interventions targeted to identify and correct the source of program deficiencies. Managers at every level now have access to up-to-date supply balances with usage patterns, and tools for accurate forecasting and efficient, effective resource management and program monitoring and evaluation. In immunization programs, this has resulted in more children being immunized, and those immunizations being more timely.

Routine Health Information Systems that Operate in Tanzania

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Introduction

In the implementation of health sector reform, the Government of Tanzania places great emphasis on health management information systems (HMISs) as one of the key tools for monitoring and evaluation, particularly with regard to assessing progress in achieving strategic sectoral plans and quality assurance of health care provision. The generation of burden of disease (BOD) information, essential for planning and decision making, is another emerging responsibility. In the short term, this is being shared with the Epidemiology Section of the Ministry of Health (MOH) and sentinel site surveillance systems such as the Adult Morbidity Mortality Project (AMMP), Tanzania Essential Health Intervention Project (TEHIP) CSPD, and National AIDS Control Program (NACP). Therefore, this paper looks at various HMIS issues, including background of the system and its rationale; methodology for data collection, analysis, and dissemination; success and problems; and recommendations and future plans to strengthen the system.

What is the Health Management Information System?

The health management information system (HMIS) is a routine reporting system that covers all health facilities in the country. The role of this system is to provide solutions to management questions through developed indicators. In this case, the indicators are the basis of the process of determining management problems at all levels of the health delivery system. Indicators could be defined as anything that can identify a problem or a success of any activity. HMIS indicators are in the form of ratios, rates, and absolute numbers, and each has a threshold and target value that is used as the standard measure for monitoring and evaluation. Data recorded in the HMIS tools are used mostly as numerators; however, some of them are used as denominators.

Background of HMIS

Before HMIS came into existence, several systems were operating. Most of these systems existed in public and nongovernmental organization (NGO) health facilities. In addition, programs such as the Expanded Program for Immunization (EPI), TB and Leprosy and the National AIDS Control Program (NACP) had their own separate reporting systems. In the 1980s, several studies of existing systems were undertaken by internal and external consultants, and they revealed the following weaknesses:

- The systems were fragmented. A lot of data were collected with little capacity for analysis, interpretation, or use at all levels of delivery, but most of the vertical programs had limited capacity to analyze and use the data.
- The flow of data was from the bottom up. There was no significant feedback between the higher and lower levels.
- Health facility workers were overburdened with having to fill out several forms from different programs.
- Resources were wasted.
- Policy and legal guidelines from the MOH directing data collection activities in the health sector were lacking.

These problems rendered the existing systems ineffective and unreliable. During the design stage, one of the objectives was to have a decentralized, integrated, functional, and reliable system. Also, different stockholders were involved to ensure that their interests were addressed. Thus, the new HMIS provided a comprehensive picture of health service performance at each level of administration. Integrating different systems has resulted in the following advantages:

- Gaps and overlaps are avoided.
- The quantity of data demanded from collectors has been reduced.
- The system does not require routine feedback to low levels.
- The data generated are used first for management purposes at all levels of the health delivery system .

Implementation of HMIS

Implementation of the HMIS was done in phases, with the largest share of support coming from DANIDA. However, other donors, such as the World Bank, UNICEF, GTZ and KUWAM contributed in one way or another. Development of HMIS concepts and materials began in 1989–90. A number of professionals from different programs were involved, with the assistance of an external consultant. The pilot-test was done in the Mbeya and Iringa regions between June and November 1991. The outcome of this test enabled necessary corrections to be made to the systems, and from that time, the HMIS was a practical and useful management tool for the health sector. Beginning in 1993 the system was operational, first in the Mbeya region and, by 1997, all 20 regions were implementing the new system. However, referral hospitals were excluded because the system had to be developed further to capture data that are not generated in smaller facilities. The system has been developed, and training has stated.

Primary data collection analysis and reporting

Health facility level

The health facility is responsible for patient care and preventive services. When they provide these services, information is generated and documented in registers, ledgers, and forms, the primary tools for data collection. These tools are classified as follows:

- **Book no. 1: Guidelines Manual**

Used as a reference by health facility staff, this book explains how to collect and compile raw data.

- **Book no. 3: Community Book**

In Tanzania each community is assigned to one health facility that belongs to the government or NGOs. Staff from those health facilities are supposed to conduct community outreach to improve the environment, knowledge, and community health. The HMIS provides a register known as a community book for recording information about that community—e.g., total population, deaths, births, etc. These books are kept at the health facilities and taken along on each community visit.

- **Book no. 4: Ledger Book**

This book is used to collect the information that is used for monitoring the flow of drugs and other medical supplies. Keeping it up-to-date allows for monitoring to avoid stock-outs and oversupplies.

- **Book no. 5: OPD Register Book**

The register is used to collect outpatients', such as person attending, his or her name, village/street, age, and sex; new attendance; diagnoses; return visits; referrals; and treatment. The last pages of a register are used to record notifiable diseases. Information about laboratory results and immunization status is also included.

- **Book no. 6: Antenatal Register**

This register is used to monitor pregnant mothers, from their first visit to the health facility up to the last visit of their pregnancy. Information recorded includes date of first visit, re-attendances, risk factors, and whether the last child born to the mother is still alive.

- **Book no. 7: Child Register**

This register is used to record information about all of the children who come to a health facility, including children who come as newborns, children who are transferred from other facilities, and children who are registered during community outreach. The main function of this register is to monitor all child immunizations. A child is monitored until he or she reaches the age of five.

- **Book no. 8: Family Planning Day-to-Day Book**

This book is used to record all family planning clients, including those who are continuing with the program and new acceptors. The register keeps track of the quantity of contraceptives supplied to customers.

- **Book no. 9: Diarrhea Treatment Corner (DTC Register)**

This register is used to record information about the management of all patients referred to the DTC from OPD and MCH clinics. Data recorded include date, name, village, age, weight, degree of dehydration, amount of oral rehydration salts (ORS), registration number, symptoms, treatment other than ORS, time spent at the facility, and outcome.

- **Book no. 11: Dental Register**

Used at dental clinics, this register tells health centers or hospitals that provide emergency oral care the patient's name, village/address, sex, age, diagnosis, referral, whether he/she is a new or returning patients.

- **Book no. 12: Laboratory**

This is a record of work done in the laboratory. It includes date, serial number, name, age, sex, patient number, investigation, test requested, results, abnormalities, and remarks.

- **Delivery Register**

The register contains information both on mothers and their newborn babies. It is supposed to be used at health centers and hospitals but, due to the births taking place at dispensaries, this register can also be used at that level.

Tools for health centers and hospitals

- **Register for admission**

This register is used at health facilities that admit patients. Information recorded in it includes inpatient number, ward, name, address, next of kin, age, date in, diagnosis, final status (recovered, improved, died), and date out.

Forms

Forms for data collection tally sheets and monitoring are:

- F201 Child Tally Form. This form is used to capture children's attendance and to record the weight of children who come for measles immunizations.
- F202 Immunization and Vitamin A Tally Form. This form records information on immunizations and vitamin A supplementation for children.
- F203 General Tally Form. This form is used to prepare summaries from different registers
- F204 Neonatal Tetanus. This form is used to monitor neonatal tetanus disease.
- Inpatient Treatment Form. This form records information kept in the inpatient register.

Secondary data book

Secondary data books are Health Facility data and book for reporting. Details of these books are follows:

- **Book no. 2: Health Facility Book Data**

This book contains summaries that are transcribed from the primary books. It also has different tables that are used to do simple analysis. The book is organized by management topics by which final management indicators are computed. Summary tables and management indicators are put in the following groups:

- Information on administration issues, including information on personnel, finance, and performance indicators
- Community outreach
- Target population estimates, provided by Council Health Management Teams and used as denominators in computing various performance indicators
- Monitoring of drugs and consumables
- Information on outpatients
- Information on inpatients
- Information on laboratory
- Dental clinics
- MCH services

- **Book no. 10**.

This book includes forms that are used to prepare health facility reports. The types of reports prepared are:

- **Staff Listing Form F001** (reported by all health facilities).

This form is completed and submitted at the beginning of the year. All staff employed at the health facility are listed on this form, with specific information about each staff member. The form is completed in duplicate; one copy is kept at the health facility, and one is sent to the office of the District Medical Officer (DMO)

- **Equipment Inventory F002** (reported by all health facilities).

Completed and submitted at the beginning of the year, this form lists all equipment. In large health centers and hospitals, separate pages can be used for each department or section. The form is completed in duplicate; one copy is kept at health facility, and one is sent to the DMO's office. (If a department wishes to keep a copy, the form is completed in triplicate.)

- **Physical Structure Inventory F003** (reported by local government health facilities and all government hospitals).

This form, completed at the end of the year and submitted immediately, lists all rooms in all buildings. It is completed in duplicate; one copy is kept at the health facility, and one is sent to the DMO's office

- **Health Facility Quarterly Report F004** (reported by all health facilities).

This report is filled at the end of each quarter (at the end of March, June, September, and December). All of the information is described in the Guidelines Manual, and recorded in the health facility data book. The form is completed in duplicate; one copy is kept at the health facility, and one copy is sent to the DMO's office

- **Health Facility Annual Report F005** (reported by all health facilities).

This report is filled out at the end of the year and submitted immediately. Based on data collected throughout the year, the form is completed in triplicate: one copy is kept at health the facility, one copy is sent to the DMO's office, and one copy is sent to Regional Medical Office.

- **Renovation/Maintenance Report F006** (reported by local government health facilities and all government hospitals).

This report records equipment repair or replacement and renovation and maintenance work done at health facilities during the year. The form, which is submitted at the end of the year, is completed in duplicate; one copy is kept at the health facility, and one copy is sent to the DMO's office

- **Equipment Breakdown Report F008** (reported by local government health facilities).

This report is filled when and if there is a breakdown of any essential equipment at the health facility. Each breakdown is reported only once. The form is completed in duplicate; one copy is kept at the health facility, and one copy is sent to the DMO's office

- **Notifiable Disease Report F009** (reported by all health facilities).

This report is required immediately when a notifiable disease is suspected by the health facility. It is sent to DMO's office as soon as possible.

Data Processing at District Level

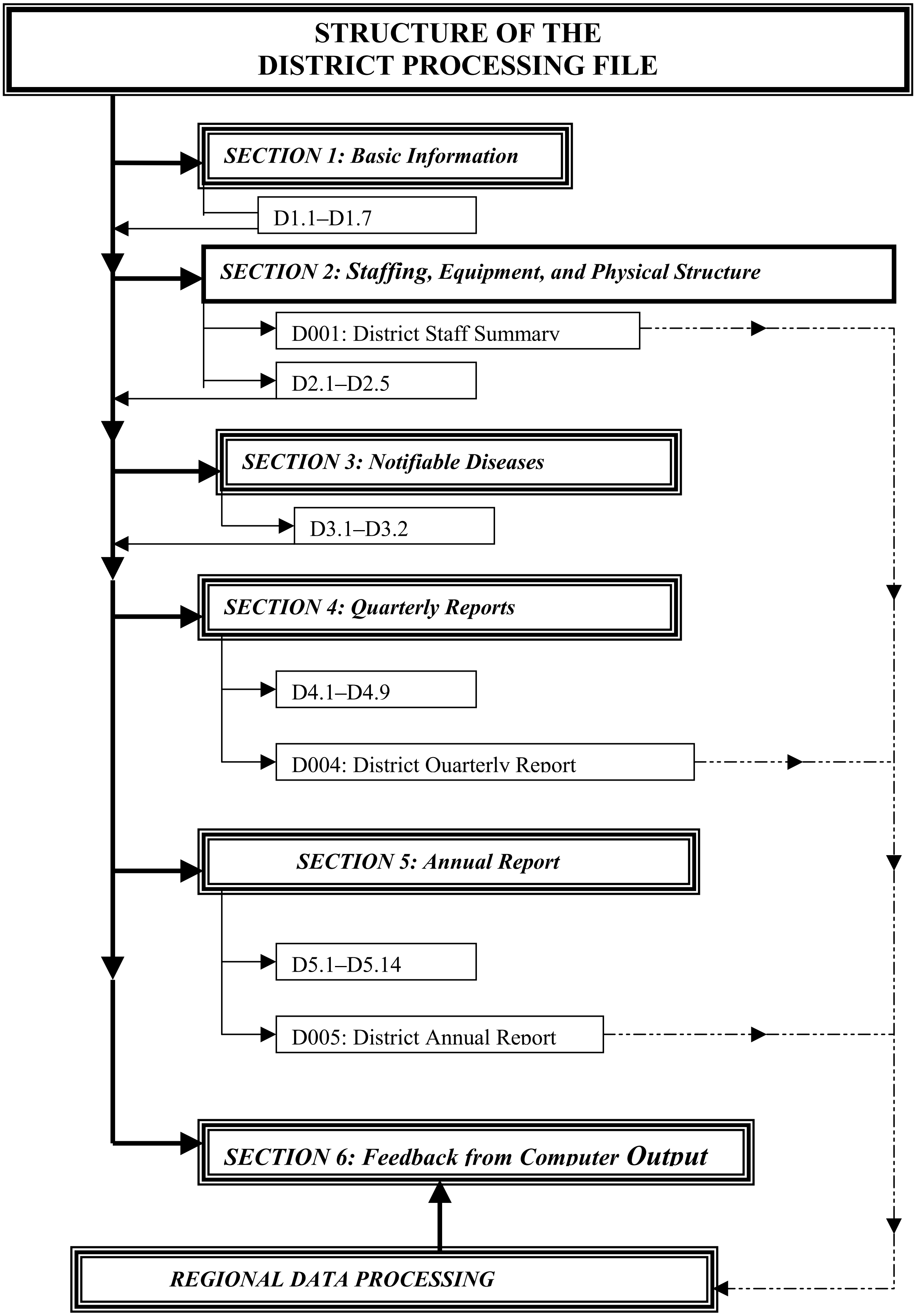
Districts get their raw data from health facility reports. Once the report is received the data are transcribed immediately into the district processing file. The file has the working sheets that are used to transform transcribed data into district aggregates and indicators. In general, the district processing file is a data bank for the district and is used is the same way as the health facility data book.

District reports

- District Staff list (D001). This report is prepared at the district level and sent to the region at the beginning of each year

- District Quarterly Report (D004). This report is prepared at the district level and sent to the region.
- District Annual Report (D005). This annual report is prepared at the district level and extracts information from the F005 report.

The district processing file is divided into the following sections:


STRUCTURE OF THE
DISTRICT PROCESSING FILE
SECTION 1: Basic Information
D1.1–D1.7
SECTION 2: Staffing, Equipment, and Physical Structure
D001: District Staff Summary
D2.1–D2.5
SECTION 3: Notifiable Diseases
D3.1–D3.2
SECTION 4: Quarterly Reports
D4.1–D4.9
D004: District Quarterly Report
SECTION 5: Annual Report
D5.1–D5.14
D005: District Annual Report
SECTION 6: Feedback from Computer Output
REGIONAL DATA PROCESSING

Regional level

The system is computerized at the district level, where data are entered. Data for the regional computer come from the following reports:

- Annual Health Facility Report (F005)
- District Staff list (D001)
- District Quarterly Report (D004)
- District Annual Report (D005)

National level

At the national level, the system is computerized and no data entry is done. The data are transferred from the region to the national system through floppy diskettes that are sent to the central level monthly.

Computer data analysis and output

Data analysis

Data currently are analyzed at all levels of the health delivery system. Data analysis is done manually at health facilities and at the district level. At the regional and national levels, data analysis is done by computer. It is possible to retrieve customized reports from computer analysis.

Type of report	Time	Specific Report
1. Resource Management	1.Quarterly Data	1. Commodity Data 2. Commodity Statistics
	2. Annual Data	1. Staffing Data 2. Service Provision Data 3. District Supervision 4. Titles of In-charges Data 5. Structures and Equipment Data
2.Community Outreach	1.Quarterly Data	1. Community Activity Data and Statistics
	2. Annual Data	1. Community Resource and Amenity Data 3. Community Resource and Amenity Statistics
3. Health Facility attendance	1.Quarterly Data	1. Attendance Data 2. Curative Statistics 3. Preventive Statistics
	2. Annual Data	1. Attendance Data 2. OPD Diagnoses Data and Statistics 3. Hospital OPD Diagnoses Data and Statistics 4. IPD Admission and Death Data 5. Hospital IPD Admission and Death Data 6. IPD Census Data and Statistics 7. Maternity Data 8. Special Services Data 9. Laboratory Data 10. Curative Statistics 11. Maternity Statistics 12. Preventive Statistics 13. Single OPD Diagnosis by Area 14. Single IPD Admission by Area 15. Single IPD Death Diagnosis by Area
District Indicators	Quarterly D004 Indicators	
	Annual D005 Indicators	

Successes and problems of the system

In January 2000, the HMIS was reviewed by a team of external consultants. After analyzing the basic data collected from different sources, the team came up with a list of findings that cover all aspects of the HMIS and other information systems.

Absence of information strategy/policy guidelines in the MOH

- There are 15 parallel systems that are not coordinated centrally by HMIS; some are national, some sentinel site-based, and some project- or donor-initiated.
- Current procedures for reporting information from lower to higher levels and feedback from higher to lower levels are ineffective.
- There is no standard procedure for sharing information among departments within the MoH, other ministries, or partners in health.
- There are separate data banks in the MoH, and each department, program, and project is responsible for the data it collects.
- There is no information officer with a detailed and comprehensive overview of health information available in Tanzania, nor is there an information unit responsible for information and communication.

HMIS benefits

- A wide range of information, which covers different programs and services, is collected countrywide. Most of it is facility–based, but it does include some data from the community.
- Registers and records are generally located in all health facilities;
- If supervision is effective and/or local procedures for submission of reports are devised, timeliness and completeness of reporting could reach an acceptable level.
- The district processing file is a well-developed tool for local evidence-based decision making and performance monitoring, but it is not generally used for that purpose.
- National statistical abstracts have been published annually since 1993.
- Data collection tools are well developed.

HMIS weaknesses

- Data quality and accuracy is not sufficiently assured through simple validation or verification procedures.
- Information is generally used insufficiently. Data presentation, analysis, and feedback is generally very weak.
- Timeliness of reporting is generally.
- HMIS-related activities result in high workloads, especially for health staff at the dispensary and health center level.
- Accessibility to data is unsatisfactory at the district, regional, and central levels.
- HMIS-generated information is not linked to planning and budgeting.
- Software and hardware problems at the regional and central levels cause major inefficiencies in the system.
- The capacity of the central HMIS unit is limited for the task at hand.
- HMIS indicators are mainly service and output indicators.

HMIS main opportunities

- The local government reform presents the right opportunity for the HMIS to move from recording and compiling data to analyzing and using those data for planning, management, and evidence-based decision making. In that sense, health sector reform may become the impetus for HMIS to become productive.

- Data for comparing district performance are largely available in the HMIS, and performance indicators can be developed on the basis of the current system.
- If data are analyzed and used, the HMIS may become a powerful tool for decision making.

Reasons for low use of information from HMIS
- Processed Information is not available when it is needed.
- Information bypasses decision makers (DHMT, DPLO).
- There is little incentive to use the data locally because authority for decision making is still centralized, and lower levels are not involved effectively in the planning process.
- Initial HMIS training during the introduction of the program focused primarily on data collection, compilation. and reporting.
- The local level has little ability to organize, extract, and present information in a user friendly way;
- There is a high workload related to HMIS activities, especially at lower-level health facilities.
- The HMIS unit lacks the capacity and competence or skill mix to lead the whole exercise, which is even more difficult in the absence of an MoH information strategy and poorly performing regional level.
- There is generally poor capacity in evidence-based decision making, because of the lack of lack of preservice and inservice training.

Recommendations
Recommendations listed in this presentation correlate with the main problem areas. The problem issues and suggested recommendations are as follows:

Problem issue: Information effort seen as a burden
- Constraints to work should be minimized.
- Adequate technological support should be ensured.
- Select data collection and management tools should be improved.
- Creativity should be accommodated in the HMIS, and local needs should be acknowledged.

Problem issue: Inadequate access to data
- The quality, timeliness, and rate of reporting need to be improved.
- The data storage and retrieval system needs to be improved.
- Management of inpatient information needs to be improved.

Problem issue: Poor preparation of data for use
- There is a need for widespread use of a minimum package of information to support health care decisions.
- HMIS quality control needs to be improved.

Problem issue: Weak analysis of data
- Human resource involvement in HMIS needs to be rationalized at mid- and senior management levels.
- Improved information products need to be made available from the district, regional, and central levels.
- Evidence needs to be available to show how data analysis is being used for planning and evaluation.

Problem issue: Poor capacity for decision making
- An HMIS capacity development plan should be in place and implemented.
- A system review process/plan should be in place and implemented.

- There should be evidence of information-based decisions and priorities at all levels.

Problem issue: Little initiative for using data
- There should be a functioning system of supportive supervision.
- The supervision and feedback system should be linked to improved use of information.
- Linkages between performance and funding should be strengthened.

Problem issue: Central HMIS unit unable to contribute effectively
- An information strategy for the health sector (MOH) should be in place, understood, and implemented.
- An HMIS should be institutionalized that enhances involvement with information strategy and utilization products.
- The role of regions in the HMIS should be clarified.

Future plans
- Conduct needs assessment and capacity-building plan for the HMIS and National Sentinel System.
- Develop an essential/minimum package of information.
- Develop tools for data use.
- Undertake capacity-building and skills enhancement.
- Develop an information strategy.
- Train HMIS staff in information technology.
- Develop a national data bank.
- Purchase and install computers in districts and hospitals.

Using Routine Health Information Systems in Europe
"Focus on Countries in Transition"

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Abstract

International, national, and subnational indicators derived from routine health information systems will be used to demonstrate that comparative information is an essential component in the drive to improve the health of people and the delivery of health care to patients. It is needed at all levels of health services, for a variety of purposes and for many "end users." The overall objectives are to pinpoint areas for public health action and share and tap success (and failures) to initiate "practice-oriented exchange of experience."

Today there is increasing decentralization in Europe, there are countries whose economies and health systems are in transition, and many countries are undertaking health care reforms. These trends give even greater emphasis and urgency to such sharing of "good practices" and, therefore, to the crucial role of sharing comparative health information. The presentation also explores some of the problems and barriers to such sharing and suggests some tried and tested solutions.

Introduction

Sound and relevant information—feedback —enables comparisons among peers and is an essential basis for knowledge and considered action. This simple statement is especially significant in the field of health, as there are no absolute standards of health outcomes against which actions can be judged. Even benchmarks or guidelines are best deduced through comparisons. The advantages of comparative information at all levels of the health service are rapidly creating an impetus for sharing relevant information to add to the pool of knowledge for improved action, be it for health policy formulation, planning, management, or monitoring and evaluation. Rapid advances in computer and telematics technology can now facilitate ready and quick access to and use of such comparative information, much of it derived from routine health statistics.

Unfortunately, routine health information systems generally do not meet these needs. This is because, historically and traditionally, these systems have tended to serve central levels, mainly for control, rather than other organizational levels for policy-making, planning, management, accountability, and the efficient administration of health services. Furthermore, voluminous statistical yearbooks with aggregated data are the only way of presenting available information in many countries. These are neither flexible, nor user friendly, and are of very limited use since they do not allow end users to tap the power of comparison—an essential prerequisite in health. Therefore, it is not unusual for large amounts of data to be collected but not used adequately or completely. This can be the case not only at national level, but also at local level, where the data are actually collected.

The above has been true for many European countries and probably elsewhere as well. It is also the case for the countries of Central and Eastern Europe (CCEE) and the Newly Independent States (NIS), whose health care systems and their corresponding statistical reporting were highly centralized, practically without any feedback of data to the local level. This situation has also led to a lack of practice and skills among health managers to make full and proper use of available information to support policy-making and health service management at all levels of the health service. This problem becomes particularly important when moving toward decentralization, a key element of health reform in CCEE and NIS.

A Solution

The above situation can also lead to the belief that the required data are just not available or that they are not reliable. This is partially and independently true, but the real breakthrough will not come from collecting even more data or from restricting use of available data until their reliability and quality improves. The solution lies in making existing data more accessible and easy to use so that end users can harness the power of comparison. Experience has shown that greater use of existing data is a very powerful stimulus to improve reliability, quality, and timeliness. At the same time, increased and widespread use of existing data also gives a greater impetus to extending the coverage for the collection and reporting of data from all areas and sectors relevant to health.

Starting to implement this solution requires coordinated and user friendly access to a wide variety of data on health and health-related areas (e.g., health status, hospital activity, spending, staffing, environment, lifestyles, economy, demography, etc.) that are relevant to improving the efficiency and effectiveness of health services and the health of the population. More specifically, there are at least four essential prerequisites:

- A national integrated health database that provides a single, readily accessible source (bringing together a variety of data on indicators of health and areas related to health) for use at the national and subnational level.
- Identification of core indicators and creation of national minimum basic core indicator databases referred to above (which can also be used for international reporting and comparisons).
- A user friendly, menu-driven system that allows the nonexpert (policymakers, managers) to access and use both of the above.
- Management training in the use of such systems for improved decision making.

There are many examples at the national and international level in Europe today that try to implement some or all of the above elements as part of their health information strategies. At the international level, the World Health Organization (WHO) HFA indicator database system and the OECD health database are examples, while at national level, there are the UK health indicator systems, the Swedish and Norwegian systems (based on the HFA DPS) and the Finnish SOTKA database. The WHO Health Service Indicator (HSI) project for the CCCE (supported by the UK Know How Fund and the European Community) and the EUPHIN East project (also supported by the EC) are examples of international efforts to implement the above in countries with economies in transition.

However, what is common to all of these systems is that the power of comparison is a fundamental underlying principle to compare relevant data among countries, regions, hospitals, doctors, specific population groups, etc. Some of the above (e.g., the WHO HSI project) have management training as a key element, although without the other prerequisites, the training cannot realize its full potential.

The crucial role of computer technology and telematics

The historical lack of greater use of existing data at international, national, and local levels was also due to the fact that:

- the many “sectoral” health databases (e.g., mortality, hospital, manpower, etc.) were large, and the contents quite naturally focused on the particular needs of their primary constituencies;

- each of these “sectoral” databases was generally located on “large” central mainframes and often derived from other primary databases (e.g., manpower numbers from salary records, hospital data from admission and discharge information); and
- the telematics and computer technology was not sufficiently developed to enable ready and quick access and feedback to users to enhance comparisons (at best it was limited to “time share” via “large” mainframes).

As computer and information technology with greater storage capacity has been developed, the first tendency has been to centralize even larger amounts of data. This can lead to a self-defeating “overload” situation, with users so overwhelmed by the vast amounts of data that they may even find it difficult to select those data most relevant to their needs. Therefore, in this case, the key features for successful use of computer technology and telematics lie in:

- Recognition that all users do not want all of the data all the time. This points to a system of “distributed” databases, hosted at the sites of the sectors concerned (which could be both national or international-level institutions and agencies depending on the reporting level). These can then be linked telematically so that users can access those data that they may need, when they need them and at the level they need them.
- Development of user friendly software interfaces that meet the needs of the users to manipulate, access, select, and display information in a manner that facilitates comparison.
- Technical solutions that retain the concept of distributed databases but deliver reasonable performance in terms of access times
- Giving flexibility and choice in the technology used (diskette or telecommunication networks) for feedback, sharing, and access.
- Low operating costs (and solutions therein) that ensure continued use.

The current rapid advances in informatics mean that all the above features can become a reality, the overall objective being to provide a “seamless” system from the point of delivery of data to their eventual use for public health policy, management, and decision-making support.

Conclusions

The principles and solutions described in this paper have acted as a powerful stimulus and have boosted development of national health information systems, not only in the CCEE/NIS, but also in many other countries in Europe and elsewhere. They have also helped implementation of new information technology toward practical and focused approaches for better use of health information to manage national health services, rather than for new technology per se. To a large extent, the approach has also helped to improve the perception and importance of and the attitude toward the use of routine health statistics in decision making among large numbers of health managers at all levels in participating countries. Finally, the approach has created a solid basis and commitments for further, better internationally harmonized developments of national health information systems in participating countries and to expand them to other countries as well.

The challenge for the routine information systems of participating countries (and others) is to consolidate this progress and to ensure that the power of comparison continues to be used to extend systematically the sharing of knowledge, actions, and experiences resulting from those actions at international, national, and subnational levels so that there is “a practice-oriented exchange of experience” leading to a continuous improvement in the delivery of care to patients and the health of the population.

Survey of Completeness and Quality of Vital Statistics in Georgia

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Head
Division of Data Analysis and Data Presentation
Centre of Medical Statistics and Information
Ministry of Health, Georgia

In 1996, the Centre for Medical Statistics and Information (CMSI) and SSD initiated comparative analysis of data on live births and still births submitted by the Medical Facilities and Civil Registry Bureaus (CRB). This analysis disclosed serious discrepancies between data in two systems: health information and governmental statistics. In 1996, CMSI and the Demography division of SSD started to control mortality data. As a result, many errors were revealed, the majority of which were related to the process of coding the main cause of death. With the purpose of precise assessment of the quality of mortality data in the state database, under-registration level of the births and deaths, and developing practical approach for solving those problems, CMSI and Demography Department of the SSD conducted a three-part study:

- A study of completeness of registration of births and deaths;
- A consistency check of the main cause of death in the Medical certificate of death and in the medical history of the deceased patient;
- Quality control of coding of the main cause of death by the SSD.

The aim of this survey was to identify an objective picture of registration accuracy and information quality and produce subsequent recommendations.

Power point presentation follows.

Survey on Completeness and Quality of Vital Statistics, Georgia

Presented by
Marina Shakhnazarova
Division of Data Analysis and Data Presentation
Centre of Medical Statistics and Information
Ministry of Health, Georgia

PROJECT PARTICIPANTS:

- *Centre for Medical Statistics and Information under the Ministry of Labour, Health and Social Affairs (CMSI)*
- *Maternal and Child Health Department, Ministry of Labour, Health and Social Affairs*
- *State Department for Statistics of Georgia (SSD)*

Project was implemented under financial support of the WHO/EURO

Survey on completeness and quality of vital statistics,

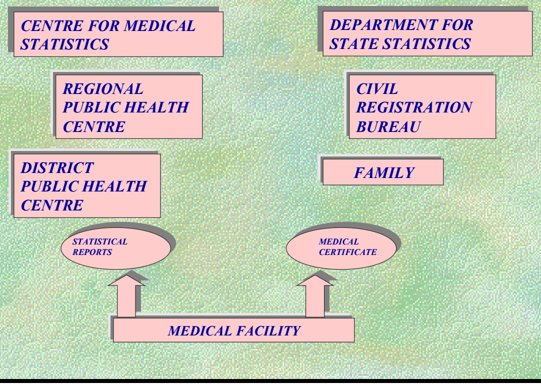
Georgia

Survey on completeness and quality of vital statistics,

Georgia

Year	Total number of the population		Total number of live births		Total number of infant deaths	
	SSD (hundred)	Expert (hundred)	SSD	CMSI	SSD	CMSI
1997	5,388.2	4,180.9	52,000	52,287	849	1,254
1998	5,387.9	4,130.0	46,800	49,588	710	1,054
1999	5,100.7	4,090.7	40,778	46,827	713	1,094

REGISTRATION OF BIRTHS AND DEATHS



CENTRE FOR MEDICAL STATISTICS

DEPARTMENT FOR STATE STATISTICS

REGIONAL PUBLIC HEALTH CENTRE

CIVIL REGISTRATION BUREAU

DISTRICT PUBLIC HEALTH CENTRE

FAMILY

STATISTICAL REPORTS

MEDICAL CERTIFICATE

MEDICAL FACILITY

Survey on completeness and quality of vital statistics,

Georgia

PROBLEM DESCRIPTION:

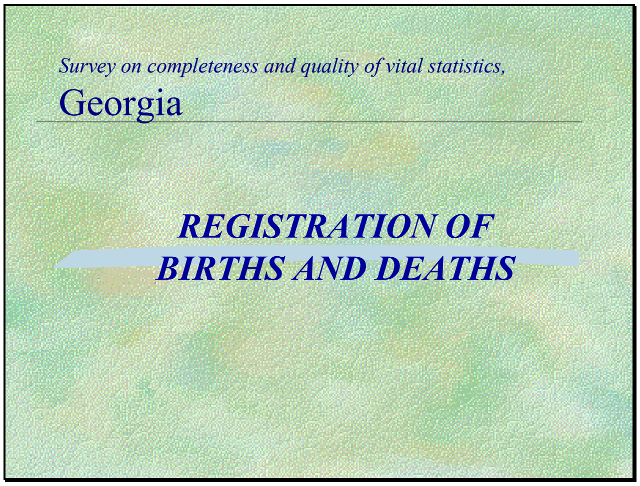
- Incomplete and imperfect death, live birth and still birth registration;
- The lack of possibility to evaluate and project demographic situation and related social and economic problems and health status of the population;
- Errors committed on coding of main cause of death;
- The invalid definitions of main cause of death made by a physician filling a Medical Certificate of Death.

Survey on completeness and quality of vital statistics,

Georgia

THREE COMPONENTS OF THE SURVEY:

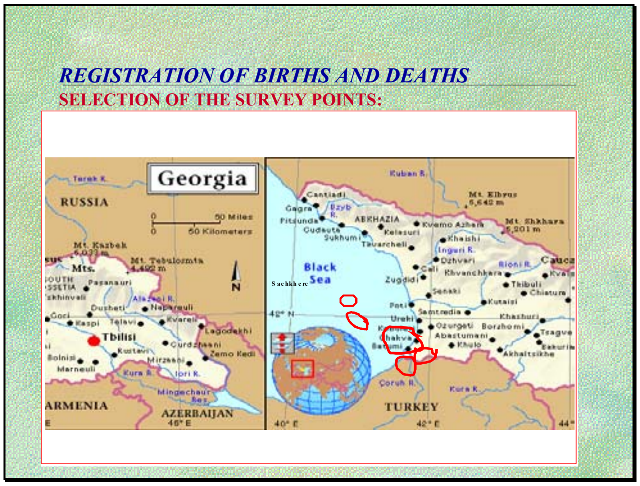
- Study of completeness of registration of births and deaths in medical facilities and civil registration bureaus (CRB);
- Consistency check of the main cause of death in the Medical certificate of death with the records in the medical history of the deceased patient;
- Quality control of coding of the main cause of death.



Survey on completeness and quality of vital statistics,

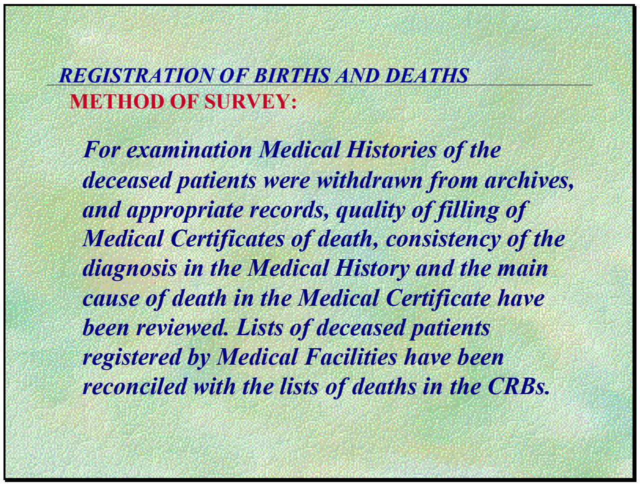
Georgia

REGISTRATION OF BIRTHS AND DEATHS



REGISTRATION OF BIRTHS AND DEATHS

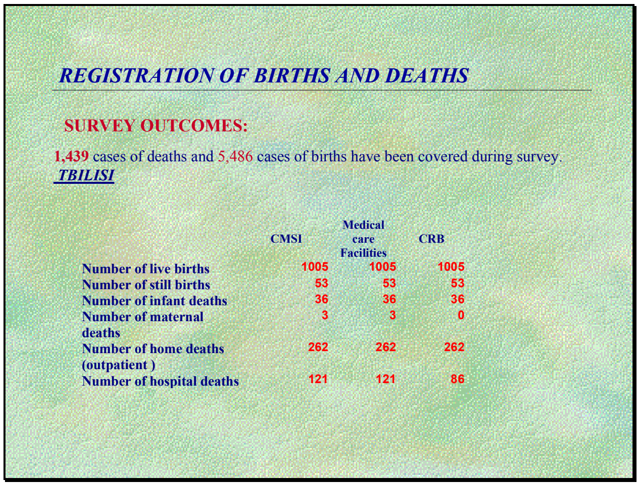
SELECTION OF THE SURVEY POINTS:



REGISTRATION OF BIRTHS AND DEATHS

METHOD OF SURVEY:

For examination Medical Histories of the deceased patients were withdrawn from archives, and appropriate records, quality of filling of Medical Certificates of death, consistency of the diagnosis in the Medical History and the main cause of death in the Medical Certificate have been reviewed. Lists of deceased patients registered by Medical Facilities have been reconciled with the lists of deaths in the CRBs.



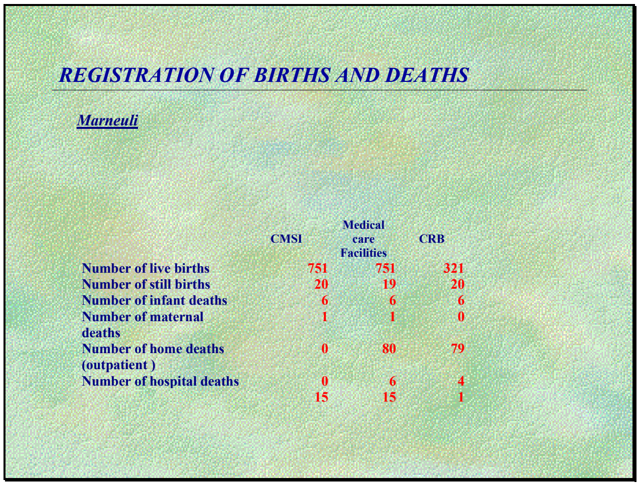
REGISTRATION OF BIRTHS AND DEATHS

SURVEY OUTCOMES:

1,439 cases of deaths and 5,486 cases of births have been covered during survey.

TBILISI

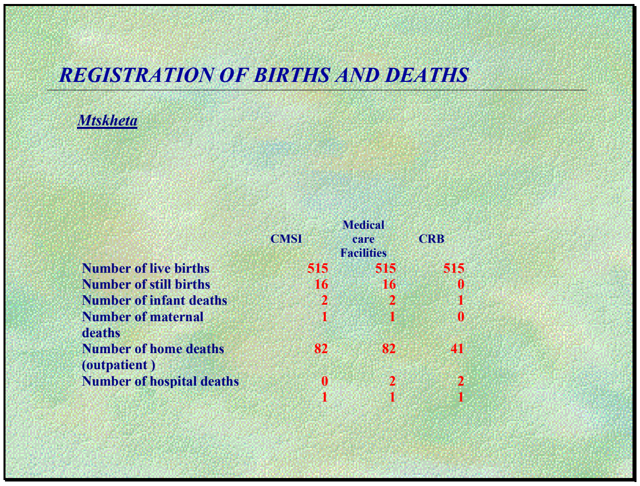
	CMSI	Medical care Facilities	CRB
Number of live births	**1005**	**1005**	**1005**
Number of still births	**53**	**53**	**53**
Number of infant deaths	**36**	**36**	**36**
Number of maternal deaths	**3**	**3**	**0**
Number of home deaths (outpatient)	**262**	**262**	**262**
Number of hospital deaths	**121**	**121**	**86**



REGISTRATION OF BIRTHS AND DEATHS

Marneuli

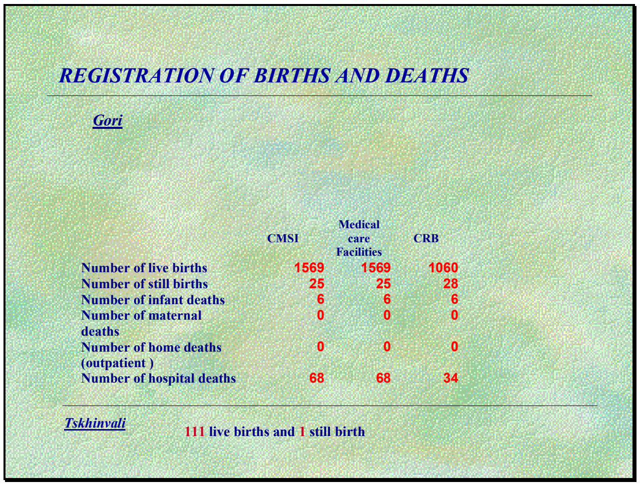
	CMSI	Medical care Facilities	CRB
Number of live births	**751**	**751**	**321**
Number of still births	**20**	**19**	**20**
Number of infant deaths	**6**	**6**	**6**
Number of maternal deaths	**1**	**1**	**0**
Number of home deaths (outpatient)	**0**	**80**	**79**
Number of hospital deaths	**0 15**	**6 15**	**4 1**



REGISTRATION OF BIRTHS AND DEATHS

Mtskheta

	CMSI	Medical care Facilities	CRB
Number of live births	**515**	**515**	**515**
Number of still births	**16**	**16**	**0**
Number of infant deaths	**2**	**2**	**1**
Number of maternal deaths	**1**	**1**	**0**
Number of home deaths (outpatient)	**82**	**82**	**41**
Number of hospital deaths	**0 1**	**2 1**	**2 1**

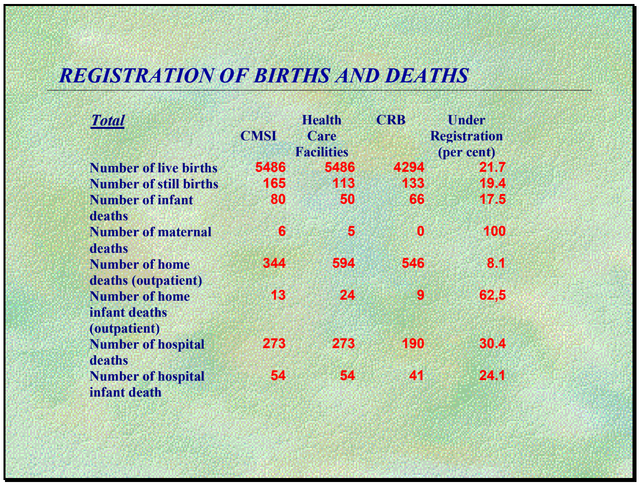


REGISTRATION OF BIRTHS AND DEATHS

Gori

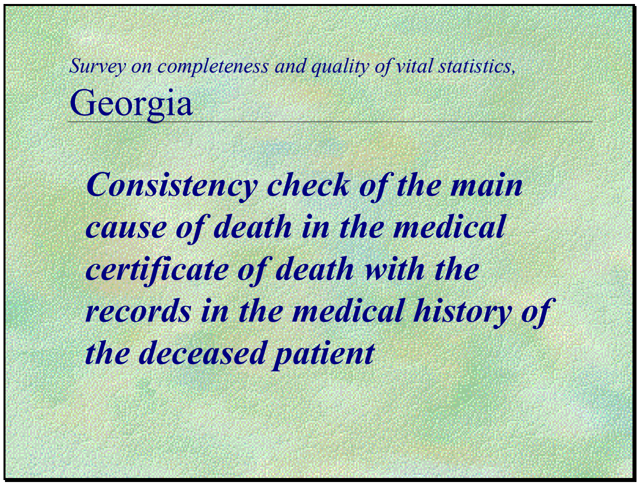
	CMSI	Medical care Facilities	CRB
Number of live births	1569	1569	1060
Number of still births	25	25	28
Number of infant deaths	6	6	6
Number of maternal deaths	0	0	0
Number of home deaths (outpatient)	0	0	0
Number of hospital deaths	68	68	34

Tskhinvali **111 live births and 1 still birth**



REGISTRATION OF BIRTHS AND DEATHS

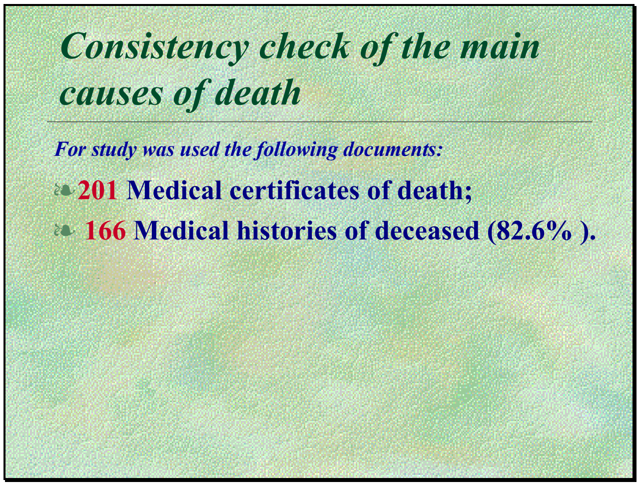
Total	CMSI	Health Care Facilities	CRB	Under Registration (per cent)
Number of live births	5486	5486	4294	21.7
Number of still births	165	113	133	19.4
Number of infant deaths	80	50	66	17.5
Number of maternal deaths	6	5	0	100
Number of home deaths (outpatient)	344	594	546	8.1
Number of home infant deaths (outpatient)	13	24	9	62,5
Number of hospital deaths	273	273	190	30.4
Number of hospital infant death	54	54	41	24.1



Survey on completeness and quality of vital statistics,

Georgia

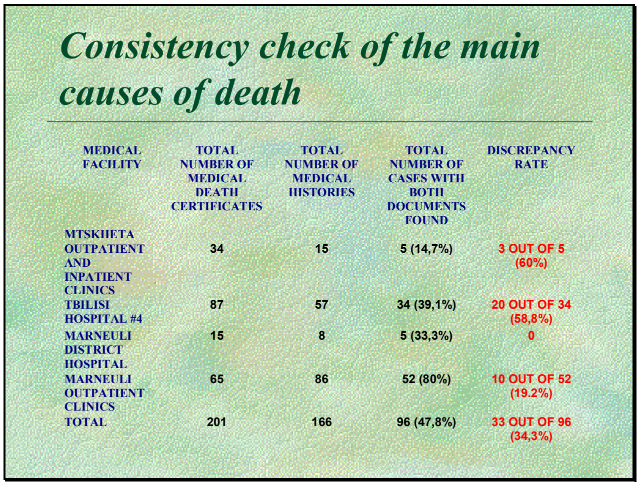
Consistency check of the main cause of death in the medical certificate of death with the records in the medical history of the deceased patient



Consistency check of the main causes of death

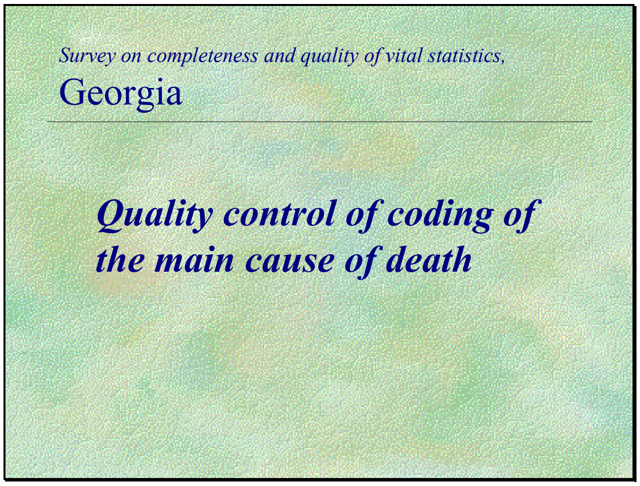
For study was used the following documents:

- **201 Medical certificates of death;**
- **166 Medical histories of deceased (82.6%).**



Consistency check of the main causes of death

MEDICAL FACILITY	TOTAL NUMBER OF MEDICAL DEATH CERTIFICATES	TOTAL NUMBER OF MEDICAL HISTORIES	TOTAL NUMBER OF CASES WITH BOTH DOCUMENTS FOUND	DISCREPANCY RATE
MTSKHETA OUTPATIENT AND INPATIENT CLINICS	34	15	5 (14,7%)	3 OUT OF 5 (60%)
TBILISI HOSPITAL #4	87	57	34 (39,1%)	20 OUT OF 34 (58,8%)
MARNEULI DISTRICT HOSPITAL	15	8	5 (33,3%)	0
MARNEULI OUTPATIENT CLINICS	65	86	52 (80%)	10 OUT OF 52 (19.2%)
TOTAL	201	166	96 (47,8%)	33 OUT OF 96 (34,3%)



Survey on completeness and quality of vital statistics,

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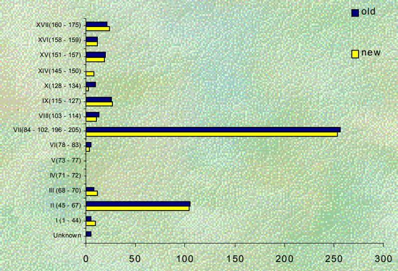
Quality control of coding of the main cause of death

Quality control of coding of the main cause of death

- ***36.8%** of all checked records covering 1996 - 1997 and **24.2%** of records covering 1998, codes of the main cause of death contained an error;*
- ***Mortality structure according to the main classes of diseases differs insignificantly when correct codes are used; but the situation within the classes is quite different.***

Quality control of coding of the main cause of death

Moratlity Structure According to the Main Groups of Diseases (existed and correct codes)



Quality control of coding of the main cause of death

CORRECT AND EXISTED CODES IN THE GROUP OF DISEASES OF CIRCULATORY SYSTEM

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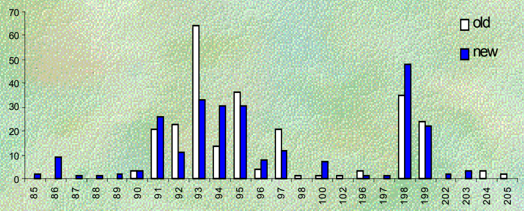
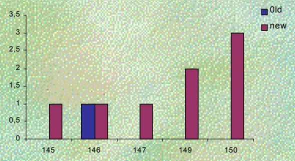
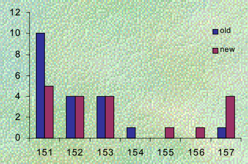


Quality control of coding of the main cause of death

CORRECT AND EXISTED CODES IN THE GROUP OF CONGENITAL MALFORMATIONS



CORRECT AND EXISTED CODES IN THE GROUP OF CONDITIONS ORIGINATING IN THE PERINATAL PERIOD



Survey on completeness and quality of vital statistics,

Georgia

RECOMMENDATIONS:

- To consider information, submitted by Medical Facilities registering births and deaths, verified by the manager's signature and sealed by the stamp of the facilities, as the main source of the official vital statistics;
- To issue an order of the MoLHSA obliging medical facilities to issue medical birth and death certificates and present a copy of the document to the State statistical offices at the district level, independently of the wish of relatives to register the fact;
- To use a capacity of the CMSI for quality control of the collected information;
- To modify medical death and birth certificates according to the demand on information;
- To arrange training of the proper personnel of medical facilities, SSD and CRBs.

To obtain actual picture of the social and economic situation in Georgia, a Census must be arranged. This needs approximately $6 million to be done

Maternity Registers: An Untapped Source for Monitoring Maternal Health Status in Guatemala?

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Background

Better tools and methods are required for monitoring progress in maternal health. Until recently most countries have relied on monitoring changes in the maternal mortality ratio, but this method of assessing progress is now recognised as being inappropriate for determining short term change. Experience with other approaches, such as the use of process indicators, is limited and there is an urgent need to find sustainable, low cost methods for monitoring and evaluating maternal health status, particularly at district level. In most countries maternity facilities routinely collect information about women and the outcome of their pregnancy in delivery or maternity log books. There is, however, little evidence that these log books are used for monitoring purposes, even in many developed countries. Although the possibility of deriving process indicators from maternity registers has previously been considered, no other study, as far as we are aware, has systematically explored the use of maternity registers for this purpose.

Methods

In late 2000 MEASURE Evaluation and Gestion de Soluciones en Desarrollo (GSD) conducted an in-depth case study of maternity registers in three states in Guatemala in collaboration with the Ministry of Health. The overall aim of the study was to determine the feasibility of using maternity registers for monitoring maternal health status at facility, district and national level. The study was designed to identify the range of process indicators that might be derived from maternity registers and to assess the quality and validity of the register data. Financial support for the study was provided by USAID-Guatemala and USAID-Washington.

In the first phase of the study a detailed census of public and private facilities was conducted. Multiple sources of ascertainment were used, including the state public health departments and project staff from the Maternal and Newborn Health Project. Each facility was then visited to determine if they conducted deliveries and if they possessed a maternity register.

Results

In addition to the 8 MOH facilities from which state statistics are compiled, the initial listing identified a further 36 facilities. Thirteen of these facilities were later found to be ineligible (either closed or did not attend deliveries) one had been open less than six months and had not managed any deliveries by the time of the census and one facility refused participation in the study. Only two delivery facilities reported that they did not routinely record information on their clients. The majority of the additional 16 study facilities performed caesarean sections.

All the remaining 27 facilities maintained a maternity register of some type. For the purposes of the study we defined “maternity register” as the record that is kept permanently in or near the delivery room and that is used for the purpose of recording all admissions and deliveries to the delivery suite. Larger facilities usually had several registers in addition to a maternity register. Smaller facilities recorded similar information but usually in one all purpose register, variously described as an admissions, discharge or procedures register. A total of 46 different variables were collected in the 27 registers. Each register contained between 2-27 variables (median 10 variables).

Discussion

Preliminary assessment suggests that maternity register data in the three states may be able to provide at least two internationally recognised indicators; proportion of skilled attendant deliveries and caesarean section rate. However, the finding of a large number of additional facilities in our census, whose information is not routinely included in national statistics, highlights the importance of identifying all delivery facilities to obtain accurate district/state rates for monitoring purposes. In a next step, in each participating facility a retrospective sample of register entries will be examined to determine the range and validity of the data.

Power Point presentation follows.

The Maternity Register Project

MEASURE *Evaluation*
Gestion de Soluciones in Desarollo

Background

- Limitation of maternal mortality measures for monitoring purposes
- Little experience with process indicators
- Increasing awareness of critical role of emergency care

Process indicators

- Coverage of ANC
- Proportion of births with skilled attendant at delivery*
- Caesarian sections as a proportion of all births*
- Met need and unmet need for obstetric care*
- Number of EOC facilities (basic and comprehensive) per 500,000 population

* could potentially be derived from maternity registers

Maternity register

The record that is kept permanently in or near the delivery room and is used for the purpose of recording all admissions and deliveries to the delivery suite/labour room.

The ideal monitoring system ?

- A minimum data set can be collected easily and quickly
- Used and understood by the people who collect the data
- Universal
- Sustainable
- High quality

Literature review of maternity registers

- Methods
  - Medline & Popline search
  - 14 articles
  - Used for identifying specific morbidities of pregnancy; perinatal characteristics and outcomes; evaluation
- Findings
  - Registers record data on many crucial variables, retrospective or prospective study designs possible,
  - No articles systematically studied the validity of the data

Workshop

- "Towards improving monitoring and Evaluation in maternal and perinatal health."
- Most facilities maintain maternity registers
- 80% of facilities collect 9 common variables

Project Aim

To explore the feasibility of using maternity registers for monitoring maternal and newborn health status at facility, district and national level.

Objectives

- To describe the extent, quality, and use of the information that can be derived from the existing and redesigned birth registers for monitoring maternal health.
- To calculate district estimates of important key variables that can be derived from the registers.
- To make recommendations as to whether maternity register data can be used for monitoring and evaluating maternal and newborn health status and if so how it can be used most effectively.
- Where appropriate to develop and test interventions to improve the quality, validity and use of maternity register information.

Guatemala

- MMR 200
- IMR 45
- ANC coverage 59.6%
- Skilled attendant coverage 40.6%

Source DHS 1998/9

Monitoring maternal & newborn health

- MMR
- ANC coverage 1+
- Coverage of "high risk" pregnancies (<20,>35)
- TT 2 (pregnant women & women of RA)
- Proportion of LBW births
- Early and late NMR

Sala Situational

Sistema de Informacion Gerencial (SIGSA)

- National HIS data quality poor
  - too many forms & many repetitive
  - no standardised source used for completing any SIGSA forms
  - private hospitals and IGSS not included in SIGSA data
  - differing reporting requirements for national hospitals and lower level facilities
  - no code for maternal death in local civil registration system

Project area

- San Marcos
- Tontonicapan
- Quiche

Comprehensive survey of the obstetric information system.

- Census of all facilities where deliveries take place
- Survey of the range, quality and quantity of the information in facility birth registers
- Interviews and focus groups with staff to determine how information is collected, managed and used at all levels of the health system.

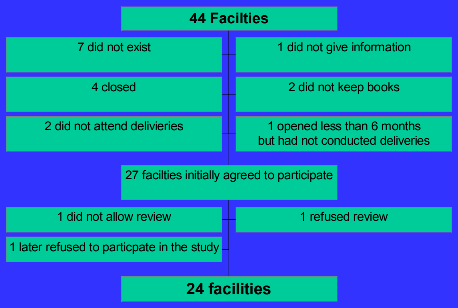
Methods 1

Study 1	Assessing the validity of the data by comparing a sample of register entries with information recorded in the medical records.
Study 2	Determining the proportion of women missing from the birth register by cross validation with other registers
Study 3	Determining facility and district rates of selected maternal health indicators. » Delivery with a skilled attendant » C/section rate
Study 4	Staff perceptions of data collection and use

Census

- Multiple sources of ascertainment including
  - Ministry of health
  - State (department) health directors
  - Maternal and Newborn Health Project staff
  - Local bus drivers, policemen, pharmacists.

Facility selection



44 Facilties

7 did not exist

1 did not give information

4 closed

2 did not keep books

2 did not attend delivieries

1 opened less than 6 months but had not conducted deliveries

27 facilties initially agreed to participate

1 did not allow review

1 refused review

1 later refused to particpate in the study

24 facilities

Facilities

- 8 MOH hospitals
- 2 IGSS (social security hospitals)
- 14 private clinics
- All except one of the private clinics were equipped to do C/Sections (facility rates between 40-70%)

Facilities

- 8 MOH hospitals
- 2 IGSS (social security hospitals)
- 14 private clinics
- All except one of the private clinics were equipped to do C/Sections (facility rates between 40-70%)

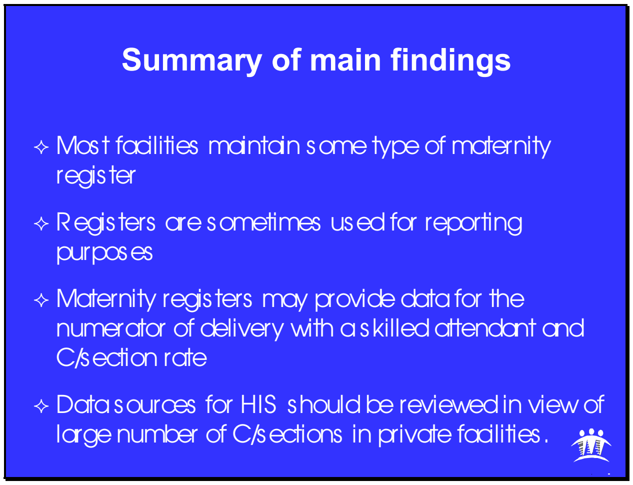
Maternity Register Example

Maternity Register Example 2

Maternity register example 3

Maternity registers

- All facilities kept register of some type
- 16 criteria maternity register
- Total of 46 different variables collected in study facility registers (range 2-27, median 10)
  - at least 75% of registers recorded name, age, admission date, delivery date
  - at least 50% recorded address, admission diagnosis, attendant*, type of delivery*, sex and weight of baby



Summary of main findings

- Most facilities maintain some type of maternity register
- Registers are sometimes used for reporting purposes
- Maternity registers may provide data for the numerator of delivery with a skilled attendant and C/section rate
- Data sources for HIS should be reviewed in view of large number of C/sections in private facilities.

A Proposal to Develop a Sustainable Digital Health Information Systems Infrastructure in Uganda

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Executive Summary

In the past 20 years, more than 30 new infectious agents that threaten human health have been discovered, including rotavirus, cryptosporidium parvum, legionalla pneumophila, hantavirus, and ebola. No region of the world is immune from the onslaught of disease.[1]

There is a fundamental difference between leadership and unilateralism because leadership implies followership. But the principal activity that has become the day-to-day 'meat n taters' of foreign policy has to be consultations with the other major centers of power in the world. We have to be consulting with them regularly.[2]

The purpose of this proposal is:

- to obtain assistance for necessary hardware, software and training for a Digital Health Information Systems (DHIS) infrastructure in Uganda; and
- to show the benefits of a (DHIS) in the Uganda health sector.

Such benefits include: a reduction in illness and poverty thereby bettering economic and social conditions in Uganda; epidemiological surveillance of diseases important to global interests; improved collaboration and consultation for development; and regional stability.

The world has an interest in Uganda to support its economic growth (6% over the past 12 years) with the aim of promoting regional stability in Africa and opening Africa to import and export market opportunities. Uganda continues to move towards an open economy with free markets and democratic reforms. Uganda has many attractive qualities that make it a focal point for leadership in Africa. Uganda has an excellent University, Makerere, providing education to students throughout Africa. Uganda could become a food exporter to Africa; Uganda contains unique ecosystems critical to the conservation of globally important biological diversity. Uganda has instituted reforms to increase educational opportunity for girls, and finally, Uganda has decentralized its government with 45

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[1] JE Frazer in America's National Interests in Multilateral Engagement: A Bipartisan Dialogue Princeton N. Lyman and Michael H.C. McDowell, Co-Directors A report on a Project of the Overseas Development Council. Washington DC September 2000 http://www.odc.org/conference/final_report/final_report.htm

[2] JD Sachs in America's National Interests in Multilateral Engagement: A Bipartisan Dialogue Princeton N. Lyman and Michael H.C. McDowell, Co-Directors A report on a Project of the Overseas Development Council. Washington DC September 2000 http://www.odc.org/conference/final_report/final_report.htm

newly-created district administrations which give communities direct access to local government policy makers.

Improvement in the health sector is a basic component of development strategy in Uganda. Besides humanitarian efforts to reduce suffering, decreasing the prevalence and impact of infectious and communicable diseases has the pragmatic result of providing more workers, with less time lost to illness, and a longer life span leading to senior leadership expertise. These issues are especially important as knowledge workers become a more important part of the Ugandan economy, mirroring recent changes in northern economies.

Planning for a DHIS has been ongoing for a number of years with numerous participants. This prospectus is the culmination of a number of these efforts which include:

- Institute of Public Health (IPH) and the Institute for Statistics and Applied Economics (ISAE) at Makerere University
- Ugandan Ministry of Health (MOH)
- Johns Hopkins University School of Public Health (JHSPH)
- The Rakai Project
- The US Agency for International Development (USAID)
- The Ugandan Virus Research Institute
- The Italian Government Ugandan Cooperative Mission
- The Bill and Melinda Gates Foundation
- The Mellon Foundation
- The Rockefeller Foundation
- George Mason University (ICASIT)
- Uganda Online
- The University of Oregon Network Startup Resource Center (NSRC)
- The Regional Center for Quality of Health Care at IPH (RCQHC)
- The Johns Hopkins Program of International Education in Gynecology and Obstetrics (JHPIEGO)

Overview

Uganda is a sub-Saharan Africa country in Eastern Africa on the shores of Lake Victoria. In area, it is about 92,000 square miles or slightly smaller than Oregon and topographically is a central plateau with a rim of mountains that are as high as 15,000 feet in the west. Uganda enjoys natural resources of copper, cobalt, hydro-electric power, limestone, salt and fertile land with good rainfall. It has great bio-diversity from deserts to high mountains and the marine life of Lake Victoria and other smaller lakes. The high mountain areas include mountain gorilla reserves. Agriculture is the most important sector of the economy, employing 80% of the work force. Coffee is a major export crop.

Based upon a recent plebiscite the political system is a one party system, with a legal system based on English common law in a unicameral national assembly. The government has been decentralized and decision making placed at district levels. English is the official national language, taught in grade schools, used in courts of law by most newspapers and radio broadcasts and there are several other languages.

Education

Uganda has a number of institutes of higher education including universities, teacher colleges, business colleges and technical colleges. The most important of these is Makerere University (http://imul.com/muk/) located in the capitol, Kampala. Makerere is a large modern university with a faculty of arts, sciences, public health, medical, nursing and library science. Makerere provides education to students from all of Central Africa. Under a previous despotic Ugandan government in the 1970s, the University libraries languished and have been unable to restock with current books and journals. The libraries seek Web access as a solution.

Health

Health conditions in Uganda reflect those of a poor country in the tropics with limited resources to spend on both preventive and curative medicine. The population of Uganda is about 23.3 million and is growing at the rate of 2.7% per year with a total fertility rate (number of births per woman) of almost 7. The infant mortality rate is 93 deaths per thousand live births. Life expectancy is about 43 years at birth. Communicable diseases are the most important health problems in Uganda. The most common causes of death and illness are Malaria, Cholera, Measles, Meningitis, AIDS, and Sexually Transmitted Diseases (STDs). Considered epidemic are Cholera, Measles, and Yellow Fever. Non communicable diseases, such as diabetes, hypertension and cancer are becoming a more important causes of morbidity and mortality in the country. A significant proportion of the adult population is infected with HIV and Uganda may have one of the lowest life expectancies in the world as a result of AIDS. In response to this, Uganda has promoted an aggressive effort to reduce the spread of AIDS through awareness and prevention. These campaigns have resulted in significant decreases in new infections especially in the young adult population. There are both public and private health services in Uganda. The government health service is active in each of the 45 districts of the country with a medical director, at least one hospital and several medical clinics.

Information Technology and Telecommunications

Uganda has one of the lowest penetrations of telephone service in the world. In 1995 Uganda Telephone Company had just under 70,000 lines and 42,000 subscribers with an estimated 80,000 potential subscribers were waiting to be served. Because of the inadequacy and unreliability of the wired system, wireless telephone service has made major in roads in Uganda.

Computer and computer networking are growing at a rapid rate. Uganda was one of the first countries in sub-Saharan Africa to obtain full, but limited, internet connections. Currently internet service providers usually use radio lines of site services, and high frequency radio bandwidth for long distance e-mail. There are four active internet service providers which had about 4,000 accounts (about 2,500 users) in January 2000. One of the most prominent internet service providers is Uganda Online (http://www.uol.co.ug/), whose company owner, Charles Musisi, is the domain administrator for the top level domain in Uganda and a key participant in this proposal.

The Uganda Global Distance Learning Center (UGDLC) in Kampala, is supported by the World Bank and has cutting edge technology to allow this site to participate in meetings and short courses held around the world. In the conference-lecture room are 40 Dell desktop computers and the front wall contains two large (two meter by three meter) screens that project images of local and international participants. A command module sends videos, slides, and other documents to the web. Faxing is also possible. Two way communications use a large dish at the facility, uplinked to a satellite and then to the World Bank in Washington DC and from there to be redistributed. In addition to the conference room, the facility has two computer labs with Dell computers that can be used for IT training purposes.

Institutions Participating in the Ugandan Health Information System

There are six participating institutions in this proposal, each with an important part to play. They stand alone but combined provide a synergistic pilot program where the sum of the parts is greater then the whole.

The institutions are:

1. The Institute for Public Health (IPH) at Makerere University. IPH trains public health professionals for Uganda and other African countries, it provides research and consultation to the Ministry and other health providers in Uganda
2. The Institute for Statistics and Applied Economics (ISAE) at Makerere University. ISAE was established in 1969 to train statisticians, demographers, and population experts for English

speaking countries in Africa.
3. The Regional Center for Quality of Health Care (RCQHC) at Makerere funded by USAID to train health care providers for the sub-Saharan African Region; the RCQHC is attached to the IPH.
4. Two Rakai Project centers consisting of offices in the Uganda Virus Research Institute (UVRI) in Entebbe and the Rakai project for HIV control in the Rakai District
5. The Ministry of Health (MOH).

The MOH is the policy making agency for health in Uganda. For about ten years, the MOH has had a paper-based Health Information System which provides comprehensive reports from the district to the central office in Kampala. The academic agencies provide education, training, research, and consultation on issues related to health in Uganda. The Rakai project is closely associated with Johns Hopkins University. Its two sites provide the opportunity to test the network over longer distances and to immediately begin to make use of Web connectivity to international libraries for research.

Computers have been making inroads into public health and related areas more rapidly than into the curative medicine side. The IPH and the ISAE have used stand alone computers for data analysis and more recently e-mail. The UVRI and Uganda health district offices use computers primarily for data analysis, and word processing. The MOH headquarters building in Kampala has individual computers with some network capability, but overall there is little computer networking available within the health service community in Uganda. The medical school has a computer laboratory in which none of the computers are networked.

The paucity of internet access for public health providers to the cornucopia of resources available on the internet results in poor information flow both into and out of Uganda. The data drought keeps Uganda researchers from developing and writing the most up-to-date reports, and having access to the most up-to-date research information available throughout the world on the net.

Statement of Need: How Information Technologies Can Improve the Health Sector in Uganda

Improvement in the public health sector is a critical component of development strategy in countries with transitional economies. Infectious and communicable diseases destroy lives, initiative and creativity in the population; they are burdens on the health system and remove productivity from the economy. Resources dedicated to public health, to prevention of these diseases and conditions can show multiplicative benefits in the economy. Healthy people not only forgo curative health services, thus saving those resources, but also produce more goods and services over a longer period of time. Uganda has demonstrated that public health programs can make a difference by a focused effort to reduce the incidence of HIV through education and intervention programs.

Health Information Systems (HIS) are a necessary part of any nation=s effort to maintain and improve citizen health. HIS includes patient records, the aggregating of individual information into data and reports that take the pulse of the country=s population, births, deaths, old, and new cases of illness, logistics, manpower, and budgets. All of this information has to be communicated to those knowledgeable enough to interpret it and with the authority to act as warranted. The Digital HIS (DHIS) will be a network of pipelines for communication and access to the latest data, research results, and health information. Necessary to the DHIS are management and support for the hardware, software, transmitters, Web, and data systems that make up the DHIS. In the USA, until the advent of computers, HIS were paper-based and took over 150 years to develop. Through the past 30 years with the burgeoning of computers and networks the USA today has a DHIS that contributes to an increasing healthy and productive life span.

In Uganda, as in much of Africa, HIS have been under development for a short time and have been paper-based. With the advent of computers and telecommunications in Africa, and as Uganda increasingly becomes a part of the global economic and health network, HIS must become digital. Uganda has a singular benefit in this project: because there is a lag time between DHIS development in Uganda and in the USA where DHIS is a mature technology, DHIS development in Uganda can look to the USA for expert guidance on how to proceed and thus get an DHIS that will be right the first time.

There have been a number of projects, meetings and consultations (shown in Appendix 1) with the objective of identifying goals and addressing specific needs for the DHIS in Uganda. These assessments have identified the following currently existing staff and infrastructure at participating institutions.:

- Trained and motivated IT staff in key posts;
- International level computing and telecommunications expertise at Uganda Online (Mr. Musisi);
- Some hardware, software, network and Web access at each institution (shown in Table 1);

Table 1 Hardware and software currently in place for Digital Health Information System in Uganda

Institution and size		Computers	Printers	Network Systems***	Software
Name	Number of users*	Have	Have	Have	Have
IPH	30 Faculty 50 Students	30	6	2	30
RCQHC	10 Faculty 5 Students	15	4	2	15
ISAE	40 Faculty 450 Students	70	4	0	10
UVRI	15 Senior staff	6	2	0	6
Rakai	20 Senior staff	15	2	0	4
MOH**	300	280	100	2	280
Total	**920**	**416**	**118**	**6**	**345**

* Faculty includes faculty and their supporting staff, secretaries, IT specialists, etc.

** The MOH will obtain the majority of the necessary functions outside of this proposal.

*** Hubs, servers, cable, and radio transceivers

The numbers of computers and printers in Table 1 and Table 2 below are straightforward as they are related to the numbers of users. The items labeled *Network Infrastructure Systems* and *Software* require explanation. The Network System components are described in Appendix 1 and 2. Software includes: productivity software (e.g. MS Office), statistical and analytical software (e.g. SPSS, Stata), and email and web software (e.g. Netscape, pine).

The assessments (Appendix 1) have identified five goals and six functional needs of a Ugandan DHIS. The goals are:

1) To increase the health of the public by reducing the incidence and prevalence of infectious disease;
2) To expand knowledge and skills of faculty, students and health providers;
3) To improve access to and quality of health services;
4) To promote public health by improved health communications;
5) To have a model system that would be a pilot for other countries in the region.

The six functional needs were identified as:

a. Makerere University (IPH and ISAE) and Ministry of Health (MOH) to have email and Web access including access to JHSPH for online learning;
b. To provide email and Web access to specific Health Districts and select sites (Rakai, UVRI) as a pilot test;
c. To provide access for IPH, MOH, and researchers at district sites to international centers of excellence such as SPH and the USA National Library of Medicine;
d. To have a digital health library accessible to IPH, MOH, and ISAE;
e. To develop Web sites for participating institutions;
f. To access data stored on local servers.

Proposed Digital Health Information System

To address the goals and functional needs there are three necessary components:

- Hardware, software, and network infrastructure (detailed in Appendix 2 and Tables 2 through 4)
- Technical training for the support staff and users
- Sustainability and growth once the system is installed and operational

Table 2 identifies the specific equipment requirements of each institution to meet its functional needs. The hardware, software and network infrastructure items were identified by Mr. Kambic during his trip to Uganda in summer of 2000. They were made in consultation with the key IT faculty, staff, and personnel of the individual institutions and with Mr. Charles Musisi. The assessment shows a need for 124 computers, 25 printers, 7 network systems including routers, gateways, and radio transceivers, and 139 computers (including the 124 new ones) needing software. We note that these numbers describe a basic level of functionality and do not exhaust the needs for IT of the individual institutions.

Table 2 Hardware and software needs for Digital Health Information System in Uganda

Institution and size		**Computers**	**Printers**	**Network Systems*****	**Software**
Name	**Number of users***	***Need***	***Need***	***Need***	***Need***
IPH	30 Faculty 50 Students	30	10	1	30
RCQHC	10 Faculty 5 Students	0	0	1	5
ISAE	40 Faculty 450 Students	60	10	2	70
UVRI	15 Senior staff	9	2	1	9
Rakai	20 Senior staff	5	3	1	5
MOH**	300	20	0	1	20
Total	920	**124**	**25**	**7**	**139**

* Faculty includes faculty and their supporting staff, secretaries, IT specialists, etc.

** The MOH will obtain the majority of the necessary functions outside of this proposal.

*** Hubs, servers, cable, and radio transceivers

The components are broken down by institution for several reasons. Each institution is autonomous but contributes in several ways to the overall health information infrastructure of the country. Each institution's IT architecture can stand alone. In other words, each is an individual project that if funded and established will improve communication, research, collaboration, and public health in Uganda. However, it is by bringing the agencies together digitally, in a collaborative effort that a Digital Health Information System will be established in a synergistic way that will enable the whole to be more than the sum of its parts.

Budget
Table 3 shows the one time (non recurring or capital) costs for hardware and software related to this proposal. The amounts are based on the cost multiplied by the needed number shown in Table 2.

Table 3 Non recurring (Capital) costs for hardware and software related to Digital Health Information System in Uganda[1]

Institution and size		**Computers** at $1500 each	**Printers** at $300 each	**Network Systems** at $15,000 each	**Software** at $500 each	**Total Cost Per Institution**
Name	**Number of users***	**Cost**	**Cost**	**Cost**	**Cost**	
IPH	30 Faculty 50 Students	$45,000	$3,000	$15,000	$15,000	$78,000
RCQHC	10 Faculty 5 Students	$0	$0	$15,000	$2,500	$17,500
ISAE	40 Faculty 450 Student	$90,000	$3,000	$30,000	$35,000	$158,000
UVRI	15 Senior staff	$14,500	$900	$15,000	$4,500	$34,900
Rakai	20 Senior staff	$7,500	$1,200	$15,000	$2,500	$26,200
MOH**	300	$30,000		$15,000	$10,000	$55,000
Total	**920**	**$187,000**	**$8,100**	**$105,000**	**$69,500**	**$369,600**

* Faculty includes faculty and their supporting staff, secretaries, IT specialists, etc.
** The MOH will obtain the majority of the necessary functions outside of this proposal.
*** Hubs, servers, cable, and radio transceivers

Computer costs	Are averaged between high end workstations and lower end email and word processing machines. Pentium with 128 Ram, 10 Gig disk, CD rom drive, and network card are minimum requirements.
Printers	Are laser printers with a network card.
Network systems	Are two servers, gateway, and radio transceiver with all associated software and cabling.

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[1] Cost is in thousands of US Dollars

Software	Includes MS Office suite, statistical packages, email, Netscape, Real, and other productivity tools.

Table 4 shows recurring costs each year for hardware and software maintenance, supplies, training, use, and staff related to Digital Health Information System in Uganda. These estimates are based on Gartner Group data from the USA where, what Gartner calls Total Cost of Ownership (TOC) is $8,000 to $12,000 per year for each computer in Table 1 and/or Table 2. Included in the TOC are the printing and software costs because these two items are integral to computer use; therefore the recurring cost for printing and software is shown as $0 here. These estimates have been adjusted for the differential in personnel costs in Uganda. The total is $97,500 dollars in yearly recurring costs spread over six participating institutions.

Table 4 Recurring costs (total cost of ownership) each year for hardware and software maintenance, supplies, training, and staff related to Digital Health Information System in Uganda[2]

Institution and size		**Computers**	**Printers**	**Network*** Systems Including Line and ISP Fees**	**Software costs included with computers**	**Total Cost Per Institution**
Name	**Number of users***	**Cost**	**Cost**	**Cost**	**Cost**	
IPH	30 Faculty 50 Students	$15,000		$4,000		$19,000
RCQHC	10 Faculty 5 Students	$7,500		$4,000		$11,500
ISAE	40 Faculty 450 Students	$30,000		$8,000		$38,000
UVRI	15 Senior staff	$4,500	.	$4,000		$8,500
Rakai	20 Senior staff	$2,500		$4,000		$6,500
MOH**	300	$10,000		$4,000		$14,000
Total	**920**	**$69,500**	**$0**	**$28,000**	**$0**	**$97,500**

* Faculty includes faculty and their supporting staff, secretaries, IT specialists, etc.
** The MOH will obtain the majority of the necessary functions outside of this proposal.
*** Hubs, servers, cable, and radio transceivers

Computer cost is the cost per machine in Uganda to install, support, train to use the machine for one year. Support includes network connections, disk defragmentation, and standard application installation. Training includes formal and informal training of staff and the computer user. Printer and software costs are included in computer costs
Network systems include setup, connections, and ISP fees for the radio links.

The overall startup costs are $369,600 and the yearly recurring costs to maintain and use the system are $ 97,500.

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[2] Cost is in thousands of US Dollars

Evaluation

There are a number of ways to evaluate this project. They are:

- Functional level efficiency and effectiveness of IT use;
- Impact on health communication;
- Impact on disease incidence and prevalence.

The functional level of IT use will measure items such as speed of email and web availability, access to local datasets, institutional web site pages and hits. Impact on health communication can be measured by the number of email flowing into and out of each institution, the use of exterior web sites, the number of libraries that can be accessed by Ugandan researchers, and the hypothesized increase in the number and quality of reports and papers that will be generated by improved web access. The number and quality of reports would be a temporal observational study whereby pre-DHIS and post-DHIS publication efforts are compared.

The most interesting evaluation will be that which measures the impact of a DHIS on the health of a population. The way the DHIS project is structured provides a natural experiment whereby some health districts in Uganda will not benefit from the DHIS until later than others. Measures such as infant and maternal mortality could be used as outcome variables and multivariate methods used to adjust for the numerous factors which go into calculating such measures on a regional basis.

Appendix 1

Needs Assessments Meetings and Consultations 1997 to 2000

There have been a number of projects, meetings and consultations with the objective of identifying and addressing specific needs for the HIS in Uganda these are shown below.

1997

- Johns Hopkins University School of Public Health (JHSPH) signs a Memorandum of Agreement with Makerere University to provide technical assistance and CD rom based public health courses for students of public health, statistics, and demography.
- The Mellon Foundation provides funds to support the development of the CD rom courses.

1998

- JHSPH (Mr. Kambic) reviews computing systems at Makerere and Rakai HIV project
- The Gates Foundation through JHSPH provides $14K dollars to upgrade computer systems at Makerere

1999

- Mellon Foundation through George Mason University (International Center for Applied Studies in Information Technology (ICASIT http://www.icasit.org/) provides $10k dollars to upgrade networks and Web access at the IPH
- The MOH plans to develop a Web site, and reviews Geographical Information Systems (GIS) for health data mapping

2000

- January - The MOH assesses their Infectious Disease Surveillance Systems for future planning and integration into an East Africa network
- January - IPH hosts a computer and network planning meeting in Kampala with experts from twelve agencies with an interest in HIS in Uganda
- June - Mr. Kambic reviews computer systems at Makerere, IPH, and other Ugandan sites
- Summer - Key personnel of the MOH (Drs. Mukooyo and Talisuna) visit SPH for information technology consultation

Specifications and current IT architecture at participating sites

There are a number of initiatives currently under way in Uganda to combat the infectious and communicable diseases which plague Uganda's people. Often these efforts are confined to local districts and health care centers far from the University and the MOH. Other such efforts in neighboring countries are also underway. Telecommunications, computers, and computer linking can provide health leaders in Uganda with the means to rapidly access the latest information in preventive medicine, and to monitor the progress of current conditions and potential areas where other outbreaks may occur. In this section of the proposal, we outline the details of what currently exists at sites specific to the DHIS and the infrastructure needs of the site to become a full participant in the DHIS.

The IPH is the training ground for public health professionals in Uganda. It is the center from which students go out to local health districts to practice public health and disease control under the guidance of the local MOH health officers, IPH, along with MOH, is also the place where current disease prevention specialists evaluate and develop the programs to reduce disease and increase health. It is central to the development of a DHIS in Uganda.

The current computing situation at IPH is as follows: 26 faculty and staff all with computers but only 14 attached to the network with desktop email and Internet access. There are 50 students with about 25 owning their personal computers (usually laptops). There are eight student computers in the student computer lab with two printers in the lab. Four laboratory computers are on the IPH local area network (LAN) and the IPH LAN is attached to the internet by a wireless connection to Uganda OnLine.

The RCQHC is located on the medical campus of Makerere. The Center is funded by USAID and is in a completely renovated complex with the latest in equipment and a beautiful training room for 20 participants. The Center is organizationally attached to the IPH. There are 15 PCs networked at the RCQHC. Ten will be for the faculty and staff and five for student use in the airy, well-lit training classroom. The computers are currently networked and use a radio link to Afsat a local ISP.

The ISAE is on the Arts and Sciences campus of Makerere. ISAE trained experts are crucial to public health information systems. The Gates Grant has provided about $14,000 to ISAE for the development of a distance learning laboratory. The room is secure, newly painted, and air conditioned with offices for the head of IT. It however contains only four computers, two purchased by Gates, Dell Optiplex G1s, and two others. There is another computer laboratory at ISAE which is overcrowded.

The Ministry of Health (MOH) is in a new MOH building which is quite large and impressive. It is in a valley about one kilometer from the Milago Medical campus of Makerere housing the IPH and perhaps two kilometers from the University on the other side of the valley. The MOH has a room designated to become the IT center which will house the hardware and staff responsible for IT functions. The current MOH information system consists of paper reports. It was implemented in 1994 and is based upon a series of reports which begin at the local health center and are passed upwards eventually to arrive at the MOH. There have been several evaluations of this system and the conclusions are the same, reports are not completed in a timely manner, and there is little feedback to the district and local level. There are a number of reasons for this: lack of trained personnel, lack of time as there is a large amount of detail to be completed. There also may be emphasis on particular diseases or conditions that are the focus of NGO agencies. Furthermore the private health provides are not obligated to participate in the system.

The Rakai project Entebbe office computing resources are as follows: there are eleven professionals with five PCs, one secretary without a PC, and eleven data entry and lab personnel with eight PCs. Five of the current PCs are Pentium and have sound capability but only one has Web access. The Rakai Entebbe office would require a LAN system similar to the current simplified system at IPH. The system would connect to the IPH through the HF radio link discussed above, and be provided with access to data, the web, and email. SPH courses on CD could be used locally. A similar LAN and connectivity arrangement could be installed at the Rakai project office in the Rakai district where there are several stand-alone PCs.

This proposal would be remiss if it did not mention Uganda Online. Mr. Charles Musisi, Director of Uganda OnLine and internationally recognized computing and networking expert is a member of a prestigious seven member committee of the Internet Consortium for Assigned Names and Numbers (ICANN www.icann.org/nomcom/), three of whom are professors at US academic institutions and one each from Asia, Africa, and Latin America. Mr. Musisi is also a Board Member of AfriNIC -- The African Regional Internet Registry (www.afrinic.org) and co founder of the Africa Netowrk Operator's Group --AfNOG(www.afnog.org). Uganda OnLine is a private company, a computer and telecommunications Asolution provider. This means that they consult with their clients on best and cost effective approaches to computer and network usage. They can provide a range of services from consultation to full Internet connectivity with associated computer training.

Uganda Online will assist the development of IT infrastructure supporting the DHIS. For example, Mr. Musisi was willing to consider having IPH computer support staff attached to his company one day a week for on the job training, as long as there is no cost to be borne by Uganda OnLine. It is possible for

Uganda OnLine to monitor Internet usage of the IPH to check for spurious usage. This becomes important when such usage interferes with the DHIS goals and objectives noted above.

Uganda Online will provide consultation for the development of computing and connectivity at the IPH, ISAE, and Rakai Project. Mr. Musisi would provide specifications and costs for internal hardware, software, and personnel training as well as plans and costs for Internet connectivity, acting as Senior Project IT consultant in Uganda.

The current network connectivity at IPH provides a proven scalable architecture which can used as a model for connectivity and network access for other institutes participating in this proposal. Uganda Online has, with the funds from Mellon Foundation through George Mason University and ICASIT, provided the current connectivity at IPH. The existing architecture is straightforward. Network computers use Genius ethernet cards and 10BaseT cable to a hub and a Linux server (Pentium, 128 ram, 8 gig disk). There is a bridge between the server and a high frequency (HF) radio relay station on the roof of the IPH. The radio relay station provides a secure encrypted link to the Internet server at Uganda OnLine. The encrypted link means the digital radio signals cannot be read by anyone without the encryption keys and prevents those who might intercept the radio signals from understanding them. Download times were tested on the computers at 9:00 am 12:00 PM and 3:00 PM on three sites, two in the USA (average download time 36 and 18 seconds) and one in Uganda (time = 16 seconds). These times were adequate for student and faculty use. This setup provides a desktop link to the Internet for 12 of 23 (50%) of the professional staff. The students have access to the web through the eight computers in the student computer lab.

Appendix 2

To provide more functionality, security, and internal and external access, we propose additional servers all protected by a firewall to prevent unauthorized access (hacking). The additional servers and other hardware will distribute functions and provide rapid reliable network functioning. The functions the hardware will provide are:

- Hub providing connectivity for PCs and servers behind the firewall (Genius 10BaseT 10/100)
- Web server hosting the IPH web site, distance courses, and data (Pentium 500, 128 Ram, 20 Gig disk, Jazz Backup).
- Email server providing POP3 mail functionality for Eudora and Netscape mail, and DNS service (hardware as above).
- Access server which will provide dial-in services for access from home and provide firewall protection for the IPH site (Cisco Access Router with a minimum of 20 modems scalable). The router controls Internet access.
- An HF radio bridge to allow connectivity to both the health districts and to local agencies participating in the network. For example IPH and ISAE could use one HF radio bridge.
- A leased line radio to the Internet Service Provider (ISP, Uganda Online) similar to that which currently exists.

Computers and critical functions at IPH sit behind the firewall. All external access to IPH and from IPH is outside the firewall. These external access point include IPH users working at home who will dial in, IPH users at the district who will use the HF radio gateway to access IPH, users at ISAE who will use the HF radio gateway to access IPH, and the internet and World Wide Web both inside of Uganda and outside of Uganda.

To summarize, for secure and reliable internet connectivity each institution needs one or more hubs, at least two internet servers, an HF radio bridge, and a leased radio line to the ISP or five pieces of hardware and firmware each with its associated software. Depending on the size of the institution, its projected data usage and associated traffic, an institution may need more servers. Figure 2 shows a schematic map of Digital Health Information System. Here we see the component institutions and how they will communicate with each other and with the outside world by passing information over the network using local area networks (LANS) that are cabled as well as wireless and a wide area network (WAN) that is wireless based.

IPH	Has a current network and Web connectivity but requires additional internal cabling and servers to increase access and functionality.
RCQHC	Has connectivity but could use an additional server and some additional development software.
ISAE	Has no network and has aging computers. It needs to have a full network, data storage, and Web access for its faculty and students. Some of the software on their current computers should be upgraded and the software needs show that addition.
UVRI	Is in Entebbe and is a part of the Rakai project. They currently have only modem access to the internet and no internal networking. The Rakai project is in the Rakai district along the southwestern edge of lake Victoria about 100 miles from Kampala. The project office there has no internal networking and no access to the internet.
MOH	Plans to provide funds for its own network and connectivity, but the key components of the DHIS is the resource and information center of the MOH. In addition the MOH would benefit from some additional computing power and functionality. This proposal provides for a computer user laboratory that would give access to public health and

medical staff from the unconnected districts, when they come to the MOH offices in the capital.

Establishment of an Information Culture: Achievements and Challenges in Zambia

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Background

Zambia is a landlocked country of 10 million in south central Africa, with a per capita gross national product (GNP) of approximately US$370.[1] It faces severe health problems: one of the highest HIV/AIDS prevalence rates in the world, with an estimated 20 percent of adults between the ages of 15 and 49 infected;[2] increasingly drug-resistant malaria; and severe budgetary constraints, with approximately US$10.50 per capita available to the health sector.[3] Life expectancy has fallen from 54 years in 1990 to an estimated 37 in 2000.[4] Zambia also faces severe shortages of qualified health workers, many of whom find better working conditions and salaries in countries to the south (Botswana and South Africa). Public health administration is divided into the Ministry of Health (MoH), which determines health policy, and the Central Board of Health (CBoH), which implements policy (and houses the information system).

In the early 1990s, the MoH began reviewing health reform options. By the mid–'90s, the Minister of Health had made implementation of the health management information system (HMIS) a priority, as part of an ambitious health reform project. An information system was included as part of the national strategic plan to improve management of service delivery at all levels, from Health Center workers to national managers. Accordingly, design and implementation commenced in the fall of 1996. Testing and training proceeded through 1997 and 1998. By January 1999, the HMIS was used nationwide in all Health Centers, all District Health Offices, and in the national CBoH office. Currently it is also used in all nine Provincial Offices, and at hospitals in two of nine Provinces.

Approach

The challenge is to develop a culture of constant use of data. While the HMIS was designed, and health workers trained in accord with internationally documented practices, a technically sound system, in and of itself, does not mean that data are incorporated routinely into the decision-making process. What people often call the HMIS is really just an information pipeline. But, in fact, the system, in the broader sense, is the interaction of information consumers with the pipeline. In Zambia, the pipeline has been built, and the emphasis needs to be on the people using the information. Therefore, the current objective is to strengthen managers' skills and improve data through strong feedback loops.

The evolution of health reform policy has strongly influenced the HMIS. In brief, the MoH has rethought its reform strategy several times since late 1997. Since then, the national CBoH has restructured twice, and the intermediate administration—the province—has been redefined and relocated. During the several

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[1] Data for 1997, World Bank.

[2] Estimate for late 1999, UNAIDS.

[3] In 1995, the government assessed the burden of disease in Zambia based on Disability Adjusted Live Years (DALYS), followed by defining a cost-effective package of interventions. While the basic health care package, which guarantees access to health services for the poor, has been identified and estimated to be US$11.50 per capita, the health sector has only US$10.50 per capita available.

[4] *Poverty Reduction Paper-Health Chapter*, Zambia Ministry of Health, Planning Division, 2001.

administrative restructures, the HMIS's institutional home has also changed. In other words, while districts and facilities have remained fairly stable, the upper support lines, at the provincial and national levels, have changed several times. Therefore, there is a need to strengthen the information skills of new national and provincial officers, while identifying and disseminating best practices in district and facility information use.

Staffing patterns throughout the CBoH are quite lean, including the HMIS unit. No one is responsible for supervising/stimulating management use of the information. Two documentation specialists have several responsibilities, including dissemination of HMIS information, and an information technology specialist's numerous responsibilities include support of the HMIS. This staffing pattern is not adequate for the tasks, so several partners provide assistance in the form of local consultants (two trainers and two data entry clerks) and long-term advisors with HMIS responsibilities in their portfolios.[5]

In general, staffing at provincial, district, and facility levels has gone down by about 10–15 percent in recent years due to voluntary separation, transfers or altered responsibilities, and deaths. It has not been possible yet to incorporate HMIS training into preservice curricula or to establish inservice HMIS training. High staff turnover, combined with the absence of ongoing training mechanisms, means that new staff may not have the basic skills needed to use the HMIS.

Field experience

While this description of the field experience focuses on the challenges, there are also a number of accomplishments to be reported. A small number of indicators (74) have been agreed on for routine monitoring; these indicators reflect health status and service delivery, as well as drugs and supplies, finances, etc. Standard case definitions were introduced for the first time nationwide. The information flow has been rationalized into a single channel from multiple channels, and the data collection instrumentation reduced from some 36 forms to just two. Each facility, district, and province, as well as the national office, is directed to assess its information and performance quarterly, using standard guidelines, although the quality of data and assessments varies considerably from place to place. Data are transferred fairly quickly and are available at each level much more quickly, and with many fewer human resources, than in the past. However, the goal of having prompt quarterly dissemination of information and feedback to reporting units has not yet been accomplished, except in two provinces and some districts.

The Western and Southern Provinces were drawn into the implementation cycle early. The Western Province, in particular, has been a focus for the Netherlands for several decades, and some of the decentralization processes were tested there before national implementation. It was hoped that these areas would adopt the practice of using information for management readily. And, indeed, these provinces and districts provide some of the best examples of how local expertise can develop. Even these areas report that improvement at the facility level is very slow, and it has not been possible to devise a mechanism to transfer the skills developed in these provinces to other areas of the country.

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[5] Both Danida and USAID have provided continuous support for the HMIS since the mid–'90s. Currently, Danida focuses on national and provincial support, including automation. The Zambia Integrated Health Project (ZIHP), a USAID-funded effort to support initiatives in demonstration districts, provides technical support to the HMIS by using district field visits to inform the national level, by working with provincial teams, and by developing district strengths in the demonstration districts. The Government of the Netherlands supports physicians acting as advisors to selected districts and provinces; these "Dutch doctors" also have provided considerable technical assistance (and valuable unrestrained criticism) in HMIS implementation and ongoing use.

National constraints

As already mentioned, at the national level, the CBoH has restructured itself several times in the past five years, most recently in summer 2000, and the HMIS's institutional home has changed accordingly. There has been an ongoing need to train new staff and to reinvent dissemination and feedback protocols. The challenge for CBoH is how to make data available to interested parties in a timely manner and to ensure that data are not misinterpreted.

The HMIS data have been presented at the following forums: cooperating partners meeting in April 2000, quarterly basket fund steering committee meetings, and in an annual health bulletin. The fact that some performance data have been presented during the meetings was underscored as a positive step in ensuring that CBoH/MoH uses HMIS data as a management tool. While an attempt was made to include HMIS data in the five-year plan during a joint assessment exercise in early 2000, the HMIS data have not been included in the national annual planning exercises. (Facilities, districts, and provinces, however, have begun to use HMIS data and peer review in their annual planning.)

There is no national HMIS advisory board; this has led to several problems. There has been no continuity in advocating routine use of data in decision making and planning. Coordinating HMIS support by donors, and responding to their information needs, has not always been a transparent process. For example, in recent months, a review of disease surveillance has been scheduled, and the Roll Back Malaria program has instituted a separate reporting system in selected districts. It is not entirely clear whether these efforts will be integrated into the HMIS protocols or whether they will retain their focus on a specific technical area. Danida and USAID continue to provide technical support for specific HMIS issues; while there is informal coordination, there is no mechanism to draw all interested parties into the process.

Provincial constraints

Like the CBoH at the national level, provinces have restructured and relocated as well. Attracting qualified staff, then training them in information use and supervision and performance review, are the current challenges. Only five of nine provinces have filled the position of Data Management Specialist, the officer who is responsible for HMIS operations at the province. The provinces use information to plan their own activities and to supervise/review their districts' performance. Although provincial review of districts is viewed as a major mechanism for improving district use of information, it is not clear how provinces' information skills will be reviewed and improved. While two provinces have begun producing quarterly health bulletins, staff and resource limitations in other provinces permit little supervision or feedback to districts.

District constraints

While district administrative procedures have changed little since the introduction of the HMIS, district staff turnover has been fairly high, and there is a constant need for on-the-job training in the HMIS. For several years, provincial support of district information use was weak to nonexistent. During that same period, district funds were only 30–50 percent of the allocated budget, so most District Health Management Teams (DHMTs) operated in crisis management mode, unable to complete planned activities. In short, just as the HMIS was introduced nationwide, funding for planned activities and supervisory support to use the system disappeared.

Most observers agree that if the District Health Officer (DHO) is interested in using information to support management decisions, and the District Health Information Officer (DHIO) has interest in providing reliable data, use of the HMIS as a decision support tool, and the quality of the data, will improve. However, this is probably not the situation in most districts, where data quality is unreliable and information is used infrequently and poorly. Clearly, the next steps are to identify best practices in district use of information and encourage their adoption in weaker districts. This is easier said than done, especially when provincial and national support is only beginning to emerge.

Facility constraints

As observed at the district level, if the facility in charge is interested in using information, use of the HMIS and the quality of its data, improve. And, as at districts, this is the exception. Particularly at rural Health Centers, staff members often are not equipped to use numbers, either by education or experience. Classroom exercises during HMIS training have not implanted these skills. For example, aggregation of results can produce a different result each time it is done. The concept of percentages, which is basic in assessing service delivery, is all too often simply not understood. Rural Health Center staff may also have weak diagnostic skills and little understanding of principles of rational pharmaceutical use.

These constraints are intended to be addressed by supportive supervision from the district to the facility; the supervision is directed to both data verification and analysis. But given the magnitude of the problem, resource limitations for supervision, and the sometimes limited skills of the district supervisors themselves, the process of improving use of information and data quality at the facility is very slow.

Supervision, review, and local use of information

By local use of information we mean the comparison of information on performance to standards and expectations—for example, coverage rates to standards, and disease cases to the number expected—followed by an action-oriented problem-solving cycle if the difference indicates a problem. As is common practice, this analytic process should occur at least quarterly at all management levels, to ensure the quality of data and, more important, improve performance.[6] In Zambia, an intensive part of the HMIS training was directed toward this self-assessment process. We saw it as the heart of the system, the way to create an institutional culture that values information.

We also assumed that information use is a self-enhancing process: as the information is used, the quality of the data and the decisions improves. Stimulating and supporting self-assessment was seen as the key tool for institutionalizing information use. Supervision of self-assessment should be conducted at all levels at least quarterly, when special actions may be required to respond to results not anticipated in the annual plan. Written feedback should be a part of supervision. This process is distinct from, although, one hopes, intertwined with, clinical supervision, which focuses on the way care is provided to individuals.

In fact, lack of resources, both human and financial, may not permit this ideal mode of supervision. Several alternatives are being tried in Zambia.

- Quarterly feedback to districts from national and/or provincial levels is seen as essential, even if routine quarterly supervision is in place. Similar feedback from districts to facilities is strongly encouraged.
- Quarterly review of results from each reporting area to identify “trouble spots” as priorities for on-site supervision or at least communication.
- Peer review using data during province-wide and district-wide meetings and planning sessions.
- Skills in data use included as part of performance evaluation.

It is too early to assess the effectiveness of any of these measures.

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[6] Quarterly frequency is a compromise between monthly (probably unrealistic) and annual (not frequent enough for micro-planning). People argue about the ideal frequency, but that’s another discussion.

Lessons learned

We have described the status and current issues in the operation of the Zambia HMIS. It is clear that while much has been accomplished, the HMIS is not yet used as broadly for evidence-based decision making as hoped, nor does it consistently produce evidence of the quality required to support good decisions. While some of the shortcomings might be removed by changing instrumentation, data, and indicators—what we could call "technical fixes"—the root problems are more systemic and require changing the way people interact with information. In looking at these problems, it is useful to bring in the experience of other countries that have initiated nationwide information systems.[7]

Institutional emphasis on information

Creation of an institutional culture that promotes use of information at all levels generally begins as a top-down process. This can be seen in case histories of private and public sector organizations whose successful use of routine information is often cited as an model for information use and health sector reform in general. In Zambia, as in many other countries, the institutional imperative to introduce a new information system came from the top and worked its way down, even though it was intended to promote and stimulate bottom-up decision-making processes.

In Zambia, we failed to solidify initial national support for the HMIS into an ongoing institutional framework that includes both Ministry officials and cooperating partners. Besides the ongoing advocacy that such an advisory group can provide, there is the question of continuing refinement of the information system. Certainly the information system will need adjustment over time to reflect emerging priorities and, it is hoped, increased sophistication in using the information. There is also the question of demands for information from cooperating partners. In Zambia, the calls for change in the information system seem to come from cooperating partners, not the Ministry. While some of these changes might lead to service delivery improvements, some may simply reflect international demands for information that have little operational relevance. It can be quite difficult for Ministry officials alone to negotiate with a powerful external partner; a national advisory group that includes representatives from several cooperating partners introduces transparency and balance into the sometimes contentious process of refining the information system.[8]

Among the national HMIS efforts with which we are familiar, only Ghana and Zambia did not concentrate on establishing an ongoing national advisory group early in the process. For Ghana, this question is well documented in Bruce Campbell's book on information systems in Ghana and Nepal,[9] and we have briefly described the issue in Zambia. While the details differ, in both cases national support depended on a few individuals; the situation changed rapidly when these individuals changed assignments. In Ghana the effect was to cancel national deployment; in Zambia, this outcome was averted, but a national advisory group likely would have alleviated ongoing problems of advocacy and revision.

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[7] The comparison is limited to national systems because the root problems revolve around national infrastructure and capacity issues. While there is much to be learned from systems implemented in the context of specific projects, questions remain regarding how successfully these systems can be brought to national scale, and what happens when overall project support is withdrawn. This is a separate issue.

[8] Several interesting innovations have been made in building national consensus. In Nepal, collaborating partners were asked to provide services or funds as a way of deepening their involvement. In Malawi, district officers have been encouraged to use the information available to them even before introduction of the new HMIS. This will probably increase understanding as well that can be used in developing the HMIS itself.

[9] Campbell B. *Health Management Information Systems in Lower Income Countries*. KIT Press, 1997.

Investments in system implementation.
The organizers of this conference have asked us to express the lessons learned in terms of investments in information systems. If we defer for a moment the question of ongoing support to create an institutional culture that uses and values information, we can draw some conclusions from the Zambia experience.

- **System design.** Once the design is implemented, it becomes very expensive to completely reengineer. It is important to get it right the first time. There is a fairly large and growing body of experience in implementing national information systems. Study of this experience in the design process, as well as soliciting the participation of national and international experts, pays off. Much of this documentation is in the public domain. An archive of these materials, accessible through the Internet, would be a fairly inexpensive but valuable service.
- **National advisory group.** The consequences of not making this investment have been discussed. It is well worth the time and negotiation required.
- **Training and documentation.** In Zambia, we invested heavily in training, both in data collection and information use, and in classroom and on-the-job training. Documentation, both for training and procedures manuals, was also a substantial investment. It is difficult to quantify the impact of these investments, but, at the same time, it is difficult to see how a somewhat revolutionary concept, using information for management, can be introduced without extensive training. Our experience suggests that the on-the-job part of the training should be emphasized as much as possible. Ongoing preservice and inservice training is also essential.
- **Automation.** In Zambia, the HMIS is automated from the district level upwards. Automation, with sensible data verification procedures, allows managers to focus on the information rather than the calculations that produce the information. Automation at the district level is usually technically feasible, and it gives managers direct insight into the quality of data at the collection point. Costs associated with automation include purchase of technology and training.
- **Recurrent costs.** It is estimated that annual recurrent costs for the HMIS in Zambia are US$89,000. This includes stationery (about one-third of the total), equipment maintenance, training, and travel/office supplies; equipment depreciation and staff time are not included. This sum represents only 0.75 percent of the total health budget in Zambia, or a cost of less than US$.01 per capita.

Establishing an information culture
Supervision, review, and local use of data are the techniques we all use to establish an institutional culture that uses and values information. In some places, we can see slow improvement; often these are places where external partners emphasize and support the process. While these improvements reassure us that we are not pursuing a totally impossible dream, most observers also report that, in general, supervision and data use remain important issues for the information system.

To see a way forward, let us turn for a moment to some accomplishments in stimulating the use of information. In Kyrgyzstan[10] and Ukraine, similar systems were introduced for managing immunizations. While both report ongoing problems with supervision and data quality, new management practices were adopted quickly, and the quality of data seems to be good. It has been possible to show that use of the information system has improved service: timely coverage has increased through detection of incorrect application of protocols for contraindications, and vaccine use and centralized procurement procedures have resulted in more cost-effective use of resources. These results were clear quite quickly, within a year or two of nationwide system deployment.

What's their secret? The fact that these systems are limited to vaccine preventable diseases is doubtless a factor. The introduction of MIS systems for HIV/AIDS or TB would have been much more difficult

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[10] Weeks M Firsova et al. Improving the monitoring of immunization services in Kyrgyzstan. *Health Policy and Planning 15* (3).

because of the political ramifications within the medical establishment and other areas of government. If we look more closely, however, we discover that many of the same analytic tools used in Kyrgyzstan and Ukraine were introduced in other countries in the last half of the 1980s, as part of the Universal Childhood Immunization (UCI) effort. All too often, these tools were not integrated into routine management practices and were unused, especially after external support for UCI disappeared.

I believe that the main reason why the Kyrgyzstan and Ukraine systems have been so successful is that these countries already had an established information culture. For example, both have fairly accurate vital events registration for births and deaths. In the Ukraine, surveillance for Acute Flaccid Paralysis was incorporated into the existing surveillance system without external assistance; in the first year of operation, the surveillance proved itself sufficiently sensitive to satisfy the World Health Orgnization's requirements for polio surveillance. Vital events registration and surveillance have been far more problematic in many countries. There is also a long history of the use of information for performance evaluation in Kyrgyzstan and Ukraine, dating back to the practices of the former Soviet Union. To be sure, in the past the information was used for centralized, not decentralized, management. While it is also acknowledged that data were falsified, many who admit to falsification also know the "real" figures. Information has been valued in Kyrgyzstan and Ukraine, and managers were ready to adopt the new practice of evidence-based decision making.

The stories of Kyrgyzstan and Ukraine are both hopeful and cautionary. Hopeful in the sense that they validate our premise: the use of information can improve management practices. Cautionary in the sense that we should remember our earlier UCI efforts and not immediately decide to try to replicate the strategy in settings where information is not valued as highly. This brings us back to the reasons why we introduce an integrated HMIS in poorer countries, like Zambia. While a handful of vertical programs may be able to report fairly accurate and timely information, the information system as a whole is, frankly speaking, in a shambles when we begin. We know the characteristics only too well: too much data, largely unused, inconsistent, inaccurate, and reported too late to be of any use. There do not seem to be any alternatives other than the one we adopt: an integrated system with a small number of indicators that can be used for action-oriented decision making. And this strategy does work to some extent. We are able to produce more timely and useful information, and some health workers are stimulated to use this information to improve management practices. However, we have been unable to find an example where the national integrated systems produce overall measurable improvements in performance, as in Kyrgyzstan and Ukraine.

We have little choice but to find a way that national integrated systems can support the use of information to improve health care. Perhaps the strategy we used in Zambia has some use: early involvement of areas where we anticipated ready acceptance of the new practices. Or it may be that at the same time we introduce integrated systems, we need to focus on a specific national problem that can be tackled to demonstrate how information can be used to improve service. There does seem to be a threshold effect: once people recognize the value of information, this understanding transfers fairly easily to different technical areas. Or perhaps someone has an innovative solution to the vexing problems of supervision and local data use. It might also be useful to review the experience of countries where the use of information for management has improved over the past 10–20 years.

So the last investment in information systems is to use our collective experience to find an answer to questions that Ministries and partners ask:

- How long will it take for the information to be reliable enough, and health system managers to have enough skills, to support evidence-based decision making?
- How much more will it cost?
- What do we do until then (and how do we monitor the process so we know when "then" is)?

These are perfectly reasonable, indeed important, questions, even if we cannot answer them very well. We hope that one of the results of this conference will be agreement on how to tackle these questions.

Annexes

Workshop Agenda

WORKSHOP ON ISSUES AND INNOVATION IN ROUTINE HEALTH INFORMATION IN DEVELOPING COUNTRIES

March 14–16, 2001
Bolger Center for Leadership Development
Potomac, Maryland

Wednesday, March 14

Welcome
Erin Eckert, MEASURE Evaluation
Paul Ehmer, USAID
Orvill Adams, World Health Organization
Jean-Jacques de St. Antoine, World Bank
Ties Boerma, MEASURE Evaluation

Presentation of workshop agenda
Anne LaFond, MEASURE Evaluation

Keynote presentation
Routine Health Information Systems: The Glue of a Unified Health System
Theo Lippeveld, JSI

Theme 1
The Rationale for Investing in Routine Health Information in Developing Countries
Facilitator: Bob Emrey, USAID

Introduction to the theme
Bob Emrey, USAID

Overview
The Interface Between Routine Health Information, Rapid Assessment, and Survey-Based Information
Peter Sandiford, Institute for Health Sector Development

A Decentralized Information System for Monitoring and Evaluation of MCH/FP Program Performance: Morocco
Mustapha Azelmat, MOH Morocco, and Michael Edwards, JSI

State of the Art in Vital Events Registration
Michel Garenne, Centre Français sur la Population et le Développement (CEPED)

Surveillance: What Is It? How Does It Relate to Routine Information Gathering and Use? Do We Need It?
Peter Nsubuga, Centers for Disease Control

Discussion and summary
Bob Emrey, USAID

Theme 2 **The Role of Routine Health Information in Facilitating and Monitoring Health Sector Reform**
Facilitator: Jean-Jacques de St. Antoine, World Bank

Introduction to the theme
Jean-Jacques de St. Antoine, World Bank

Overview
Health Information and Health Sector Reform: Improving Decision Making Through Better Information
Ed Bos, World Bank

Using Health Information to Sustain Support for Health Reform in Africa
Julie McLaughlin, World Bank

Health Information and Decision-Making at the Community Level: Building and Using Simple Systems
Karima Saleh, World Bank

Health Sector Reform and the Role of Decentralized Information Management and Innovative Design at District Level in South Africa
Arthur Heywood, Equity Project, and Randy Wilson, MSH

Health Sector Reform and Health Information System Development in Cambodia
Khol Khemrary, MOH Cambodia

Discussion and summary
Jean-Jacques de St. Antoine, World Bank

Introduction to working group discussions and working group selection

Reception and Book launch
Design and Implementation of Health Information Systems by Theo Lippeveld, Rainer Sauerborn, and Claude Bodart

HIS Expo
An Overview of the HMIS in Eritrea by Besrat Hagos
Abbreviated information on Design Principles and Key Functionality of the District Health Information Software (DHIS) by Calle Hedberg
HMIS in Nepal by Bruce Campbell

Thursday, March 15

Theme 3 **Restructuring and Strengthening Existing Routine Health Information Systems**
Facilitator: Orvill Adams, WHO

Introduction to the theme
Orvill Adams, WHO

Overview

Restructuring and Strengthening Existing Routine Health Information Systems: Issues and Ideas

Steve Sapirie, MSH

Theme 3 Subgroups

Co Facilitators: Stanislaw Orzeszyna, WHO, Bruce B. Campbell, UNFPA and Besrat Hagos, MOH Eritrea

Theme 3A

Facilitator: Stanislaw Orzeszyna, WHO

HIS Development in Malawi

Chet Chaulagai and Chris Moyo, MOH Malawi

HIS Assessment and Development in Bhutan

Randy Wilson, MSH

Identifying Information Needs and Defining Indicators in HIS Development in Georgia

Lali Khotenashvili, MOH Georgia

Demographic Surveillance Systems in Burkina Faso: The Case of Nouna Health Research Centre

Yazoumé Ye, Nouna Health Recherche Centre

The Politics of HIS Restructuring in Pakistan: The Importance of Policy Analysis

Syed Mursalin and Nasim Haque, MOH Pakistan

Reforming Routine Information Systems to Strengthen Local Management in Decentralized Health Systems: The National Immunization Program in Ukraine

Anton Luchitsky, PATH

Mary Church and Alex Simwanza, Zambia Integrated Health Programme, Charles Kachaka, MOH Zambia

Working groups begin work

Theme 3B

Facilitators: Bruce B. Campbell, UNFPA and Besrat Hagos, MOH Eritrea

Community-based Tracking of Adult Mortality and Morbidity: Tanzania
Josibert Rubona, Adult Mortality and Morbidity Project

Examples in the Use of Routine Health Information Systems in Europe: Newly Emerging Countries
Arun Nanda, WHO EURO

Survey of Completeness and Quality of Death, Birth and Fetal Death Registration by the Civil Registration Bodies and Health Care in Georgia
Marina Shakhnazarova, MOH Georgia

The Potential for Using Maternity Registers in Guatemala to Monitor Maternal Health Programs
Amanda Rose, MEASURE Evaluation

A Digital Health Information System in Uganda: Plans and Prospects
Robert T. Kambic, JHU School of Public Health and Eddie Mukuyoo, MOH Uganda

Establishment of an Information Culture: Achievements and Challenges in Zambia

Friday, March 16

Working group presentations and discussion
Facilitators: Orvill Adams, WHO and Theo Lippeveld, JSI

Adoption of the Workshop Statement on Future Investment in Routine Health Information Systems in Developing Countries and Countries in Transition
Orvill Adams, WHO
Theo Lippeveld, JSI

Closing Remarks

Theo Lippeveld, JSI
Robert Emrey, USAID
Orvill Adams, WHO

Working Group Topics

Working Group 1
Defining a Rationale for Coordinated Investments in Routine Health Information
Facilitators: Anne LaFond, Erin Eckert
Mark Spohr, Thobile Mbengashe, Liz Goodburn, Bob Kambic

Working Group 2
Coordination Issues
Facilitator: JJ de St. Antoine, Theo Lippeveld, Syed Michel Thieren
K Khemrary, Syed Mursalin, Alex Simwanza

Working Group 3
Restructuring HIS and HIS Sub Systems
Facilitator: Besrat Hagos, Stan Orzeszyna
Remi Rakotomalala, Jeanette Hunter, Alphonse Akpamoli, Paul Fisher, Randy Wilson

Working Group 4
RHI and Health System Development
Facilitator: Orvill Adams
Anton Luchitsky, Alok Jain, Chris Moyo, Cesar Gattini, Michel Garenne, Peter Nsubuga, Bambang Hartono, Eddie Mukooyo, Calle Hedberg, Maryse Simonet, Flo Harding

Working Group 5
Promoting Sustainable Outcomes
Facilitator: Steve Sapirie
Lali Khotenshavili, Ed Wilson, Mimi Church

Working Group 6
Technology: Information Technology, Computers (Hardware, Software), Networks and Internet, Digital devices, Interactive Communications
Facilitator: Bob Emrey
Mustapha Azelmat, Oumiki Khumisi, Charles Kachacka, Carlos Castillo, John Zingeni, Mike Edwards, Roberto Rodrigues

Working Group 7
Strategies for Promoting use of Information
Facilitator: Bruce Campbell
Chet Chaulagai, Henry Kitangi, Josbert Rubona, John Barton, Albertine Rasoarimiadana, Emily Wainwright, Mandy Rose, Arun Nanda, Karen van Roekel, Nasim Haque, Arthur Heywood, Bruce Campbell, Pat David, Yazoumé Ye

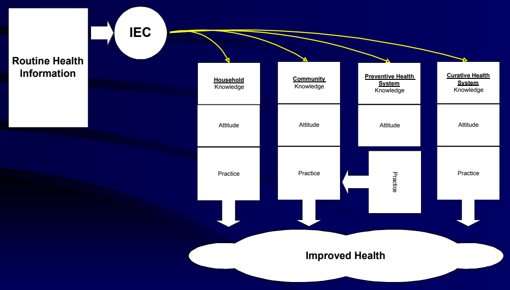
Working Group 8
Integration of private sector (for profit and not-for-profit) into the public sector HIS...
Facilitator: Joe Valadez
YC Chong, Lyndon Brown, Wayne Stinson, David Hotchkiss, Ed Kelley, Sushil Karki, Randy Kolstad

Working Group Presentations

Working Group 1: Defining a Rationale for Coordinated Investments in Routine Health Information

Better Information is Central to
Better Health

Information to Health


Routine Health Information
IEC
Household Knowledge
Attitude
Practice
Community Knowledge
Attitude
Practice
Preventive Health System Knowledge
Attitude
Practice
Curative Health System Knowledge
Attitude
Practice
Improved Health

Lessons Learned

- Project-related investments are not sustainable
- Horizon for results is long-term (10+ years)
- Quality Will Improve with Investment
- Data should be “organic”

Recommendations

- Invest in Improving the Quality of RHI to Nurture Investor Confidence
- International Groups Should Support the local RHI system
  - Negotiate for Mutual Gains
- “Information Overhead” Budget Item

Specific Activities

- Information Bank on RHIS benefits
- Online Journal on RHIS
- Operations Research on RHIS

Working Group 2:

COORDINATION ISSUES

Participants:

de St.Antoine J.J.
Khemrary K.
Lippeveld T.
Mursalin S.
Simwanza A.
Thieren M.

COORDINATION IN QUESTIONS

- What mechanisms exist for coordinating of investments at international and national levels?
- What lessons learned from the past related to: setting national priorities for RHIS investment; the role of external assistance organizations in RHIS development; *the role of the private sector?*
- What recommendations would the group make to improve coordination of investment in RHIS?
- *Where is more evidence required?*

COORDINATION: SCOPE

National	Existing mechanisms
	Lessons Learned
International	Recommendations *Principles* *Activities* *Research Agenda*

EXISTING MECHANISMS

- *At international level:* not much on RHIS in particular but many networks on public health information and general contents do exist (helena, epiet, RNIS)
- *At national level:* existence of RHIS committees mostly focused on the public sector

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NATIONAL LEVEL: general principles

Lessons learned:

•The establishment of broad-based (MoH, providers, users, funders) RHIS coordination committee has been successful in most of the cases

•Early consensus building leads to conflict resolution and sense of ownership of the process

Recommendations:

•Promote national coordination committees to deal with planning (TA), regulation (IT, data management), implementation, monitoring and evaluation of the RHIS development process

•The development process is slow and lengthy, and this should be taken into consideration when planning, or funding such program

•However, it is necessary to select elements for showing quick results that keep momentum for the overall process

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INTERNATIONAL LEVEL (general principles)

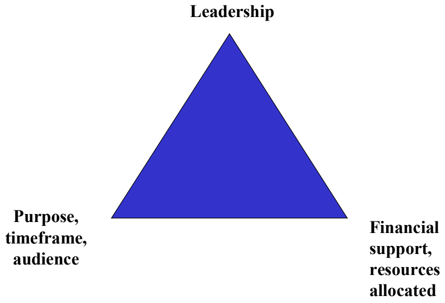
Lessons learned:

• Examples of coordination network which failed were those with little financial support and institutional commitment, as well as those with too ambitious objectives and poorly defined mandate, and no focused leadership

Recommendations:

- RHINO = a network of institutions and individuals sharing the same goals in RHIS is an appropriate coordination mechanism
- The requirement for such a network to exist and to be sustainable is appropriate funding, leadership, purpose and audience/participation
- Donor coordination needs to be in place and related to RHINO

COORDINATION: PRE-CONDITIONS FOR SUSTAINABILITY



Leadership

Purpose, timeframe, audience

Financial support, resources allocated

INTERNATIONAL LEVEL: RECOMMENDATION ON ACTIVITIES (1)

- ***The immediate deliverable:***
  - Report on this workshop
  - Set up of the RHINO secretariat under the Measure/Evaluation Project
  - Pooling of experience and learnings and make this available to RHINO members (through an accessible and efficient communication mechanism i.e. www)
- ***The mid-term or conditional*** (funding and official commitment)
  - resource mobilisation,
  - creation of an information exchange platform through the development of a web site that follows a process of identifying the network objectives, content, communication features, audience, users,
  - give legitimacy to the network (MoUs? Boards?)
  - Is it the last time we meet?

INTERNATIONAL LEVEL: RECOMMENDATION ON ACTIVITIES (2)

- ***The long-term vision:***
  - workshop (live and on line)
  - exchanges visits,
  - coordination of research activities (including ethical review board),
  - data center and virtual library,
  - tool box (case studies, software applications, communication channels)

RESEARCH AGENDA

- Explore existing HIS coordination bodies and their relationship with RHINO
- How coordination can maximise evidence-based decision making

Working Group 3: RESTRUCTURING HIS AND HIS SUB-SYSTEMS

GROUP 3
Remi Rakotomalala
Jeanette Hunter
Besrat Hagos
Stan Orzeszyna
Alphonse Akpamoli
Paul Fisher
Randy Wilson

ASSUMPTIONS

- **Many countries with fragmented, vertical systems want to increase integration of services and thus HIS.**
- **Service integration is not such an issue at District or facility level but information systems are not integrated.**
- **Restructuring of HIS should follow and support the decision to restructure the health system.**
- **Restructuring is a continuous process – not a one shot deal.**
- **Focus should always be on changes that improve management of health care delivery to the population (including planning, implementation and M&E).**

WHAT CAN BE RESTRUCTURED

- **Sub-systems**
- **Organizational Units**
- **Responsibility for different HIS functions (Centralization or Decentralization)**
- **Data collection methodologies**
- **Staff roles/responsibilities**
- **Tools (formats, tally sheets, analysis tools)**
- **Timing/frequency of reporting**

Lessons Learned: Gaps in existing sub-systems

- **Lack of use of data**
- **Duplication of effort**
- **Fragmentation, difficult to link data between sub-systems**
- **Poor quality of data (Completeness, Timeliness, Accuracy)**
- **No harmony with or link to reform of Health System/policy**
- **Does not respond to info needs at provider/patient level**
- **Too much data (essential, useful, useless + dangerous)**
- **Not sustainable**

Typical Sub-systems in an HMIS

Specific Programme Reporting

- **Surveillance**
- **Surveys**
- **Routine Service Statistics**
- **General Mgmt (logistical, financial, human resource management systems)**
- **Civil/vital registration (Birth, Deaths, Census)**

Approach:

- **Don't expect quick fixes**
- **One size doesn't fit all**
- **Seek sustainable solutions**
- **Process should be participative (Lessons could be learned and ownership ensured by talking to providers and users).**
- **Bottom – up focus on improving data use**
- **Ensure that restructuring is a practical not purely theoretical exercise.**

Recommendations 1

- Start by doing info systems assessment – looking at the big picture – establish a baseline about how existing subsystems function and interrelate.
- Harmonize HIS restructuring with Health System restructuring
- Restructuring should be in the context of the specific country and should reflect the country's situation.
- Phased implementation of restructuring works best:
  - By level: Health centers * hospitals *national *
  - By geographic area (pilot projects)
  - By priority subsystems.

Recommendations 2

- Where service is integrated (same person doing multiple functions) review tools and methodologies (in team context) with view to simplify and integrate.
- Restructuring works best when there are clear policy directions and priorities (political will & support from the top)
- Ensure financial/material resources for restructuring are not purely dependent on donors
- Improve data flow – include timely feedback loop and mechanisms for local use of data. Facilitate mechanisms for discussion of feedback interactively (reports & discussions)

Recommendations 3 (Data Sets)

- Establish essential/minimum data sets:
  - Reviewing indicators through a consensus building process is an excellent way to reduce data requirements and build ownership with priority health problem focus.
  - Make sure data collected meets a services delivery requirement – eliminate the rest
  - Data elements selected should be indicator driven, to enable measurement of progress

Recommendations 4 (Tools)

- Standardize tools (better quality, simpler)
- Ensure that health staff involved in service delivery are provided with "provider friendly" tools
- Provide clear simple guidelines and definitions for indicators
- Ensure availability of tools through improved logistics

Recommendations 5 (HR issues)

- Plan for Human Resource needs at district and central level to support HMIS restructuring,
  - These may include:(District information officers, Trainers, Medical/epidemiologists, bio-statisticians)
  - Multidisciplinary team at central level (not just statisticians)
- Include data management responsibilities in their job descriptions of medical staff and in pre-service training
- Make more effort to train in problem solving with data as opposed to training people on merely filling in forms
- Establish system for motivation of staff (feedback, supervision)
- Decentralization of authority and functions make data use more meaningful

Working Group 4
RHI & Health System Development

Facilitator: Orvill Adams

Participants

Anton Luchitsky	Peter Nsubuga
Alok Jain	Bambang Hartono
Chris Moyo	Eddie Mukooyo
Cesar Gattini	Calle Hedberg
Michel Garenne	Maryse Simonet
	Flo Harding

RHINO Workshop, 14 - 16 March 2001

Lessons Learned

RHI should support not drive the health system development process

- Data should be used by all levels of the system
- All levels of staff need to be engaged in the use and analysis of data
- RHI can be used in the assessment of appropriateness, effectiveness and efficiency of interventions
- RHI provides an opportunity to bring together stakeholders who wouldn't normally come together [Catalyst]
- RHI requires the mapping stakeholders' interests to be successful [politics and power]
- RHI can be used to monitor process and intended outcomes of reform

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Lessons Learned (Cont.)

- On-the-job training must be supported by well-written, culturally appropriate manuals
- RHI can be made more powerful through bringing in logical blocks of semi permanent data and linking it with sentinel systems and surveys
- Incentive systems have been found to make RHI more effective [positive feedback is a strong incentive]
- In order to provide a strong functioning public sector RHI system, it is important to find ways to gather information from the private sector

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Priority One

Recommendations	Activities
Countries should have a health information policy which is compatible with overall health policy	Nationally developed policy using a broad participatory approach
RHI should be flexible to support change as a result of health sector reform	Collect and keep data dis-aggregated for use at the community & facility level
RHI should work on the continuous improvement of data quality	Find mechanisms to assess the quality of data

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Priority Two

Recommendations	Activities
Explore ways to involve local govts. in RHI	Build capacity for local govt. to understand and use RHI Research on the contribution of RHI to local govt. decision-making
Senior policy makers should encourage the use of data in decision-making	Performance review workshops Creation of a non-punitive environment
Countries should be encouraged to have a policy on capacity building in order to reduce fragmentation	Assessment of RHIS needs A govt.-led not donor-led strategies
➢ Capacity building needs to be followed up ➢ Opportunities to use training should be provided ➢ There must be a capacity to train locally	Training should be linked to daily activities

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Priority Three

Recommendations	Activities
Technical assistance (TA) should be of the highest quality tailored to needs and capacity of countries (human resource, training, technology)	QA mechanism for TA Create database of experts and monitor long term impacts of their activities Involve govt. in identifying TA
RHI should support facilitate innovation	
A database of evidence of what works and what doesn't work in RHI in health systems development	Development of a research agenda to achieve this, e.g. meta analysis, tracer studies

Working Group 5:

Promoting Sustainable Outcomes

Lessons Learned

- Value of expanding participation
- Value of customer-driven projects
- Need to identify all stake-holders early
- Need to insure effective coordination among partners
- Possible coordination through “buy-in”
- Need for clinical and managerial task specifications

More Lessons

- Implementing change through rewards and incentives
- Recognize different perceptions of “success”
- Danger of differing donor strategies
- Risk of large donor domination
- Effectiveness of specialized support system and service program development

Most Needed Principles

- Systems development must support clinical and management work
  - Method to facilitate description of functions in clinical care, public health and management, especially reform. What info is needed?
  - Project packaging and design. Information system must map to management functions.

Most Needed Principles

- At care provision (or transaction/administrative) point data recorded determined by technical needs.
  - Determine data to be captured @ interaction.
  - Determine data to be transferred upwards.
  - Influence groups @ upper levels re “international indicators”

Most Needed Principles

- Cost influences sustainability
  - Comparison of sustainability and costs *
  - Cost of RHIS startup and recurrent costs *
  - Does info make a difference and how much does it cost? *
  - Is info used in making decisions and how? *

Most Needed Principles

- Coordination among stakeholders/customers (donors, ministries, private, etc) for technical input and institutional cooperation.
  - Review of stakeholder coordination techniques. Document examples of national leadership of design process in order to build national capacity in sustainability information system. *
  - Critical mass for cultural change in use of information. *
  - Define standards for information quality. *
  - Stakeholder buy-in for information system.

Most Needed Principles

- Address stewardship responsibilities of the national government that require public/private data collection and monitoring

Most Needed Principles

- Establish guiding principles for RHIS development. Need evidence to establish rationale for IS design, e.g., integration vs. focussed.
  - Compare cost-effectiveness, sustainability and usefulness of program specific information system and integrated IS. *

Increasing Prospects for Sustainability

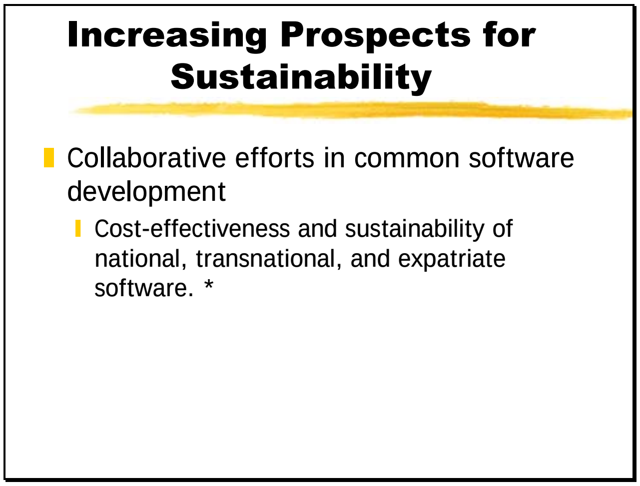
- Design and implementation of IS takes time and show allow for several iterations in design and testing. Allow for alternative interim systems.

Increasing Prospects for Sustainability

- Methodologies – RHIS may not include all info: rapid assessment, survey, etc. are also necessary.
  - Alternative sources and uses of resources for information need to be clear at design time.
  - Strategy review of DHS, burden of disease, national health accounts. What is the value for capacity building? What is the value for data for planning/management? *

Increasing Prospects for Sustainability

- Rewards build support for system
  - Reinforce practice with incentives. These don't have to be financial, but users should get something out of collecting and using data.



Increasing Prospects for Sustainability

- Collaborative efforts in common software development
  - Cost-effectiveness and sustainability of national, transnational, and expatriate software. *

Working Group 6
Technology

[Information Technology, Computers (Hardware, Software), Networks and Internet, Digital devices, Interactive Communications]

Bob Emrey
Mustapha Azelmat
Oumiki Khumisi
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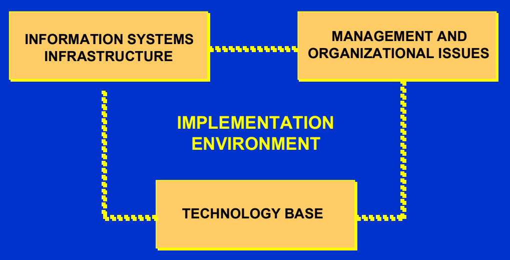

INFORMATION SYSTEMS INFRASTRUCTURE

MANAGEMENT AND ORGANIZATIONAL ISSUES

IMPLEMENTATION ENVIRONMENT

TECHNOLOGY BASE

Technology Base

Lessons:
- Technology can be a blessing or an impediment (but shouldn't be)
- Devices now are available in wide variety of forms and functions and costs
- New Concepts (data warehousing, data mining, data visualization, interactive communications)
- Health Sector has lagged behind in technology and communication infrastructure and tools

Recommendations:
- Principles - Health Sector should benefit from information technology available from other sectors
- Donor Actions - Donors should support communication platforms and linking of existing information systems
- Country Actions - Share experiences, open their systems to others – study tours

Organization and Management

Lessons:
- Political changes often are faster than implementation process for new systems
- Health system has problem holding IT specialists
- Management in health organizations don't understand how to make policy and investment decisions
- Impact evaluation is difficult but important

Recommendations:

Principles – Improve incentive and mechanisms for IT professionals

Donor Actions – Advocate discounts and joint development, expand training opportunities

Country Actions – promote training of Health Professionals in IT, Data Analysis

Implementation Environment

Lessons:
- Maintaining and upgrading is under supported because focus in on product development

Recommendations:
- Information Technology Project should include maintenance and upgrade support

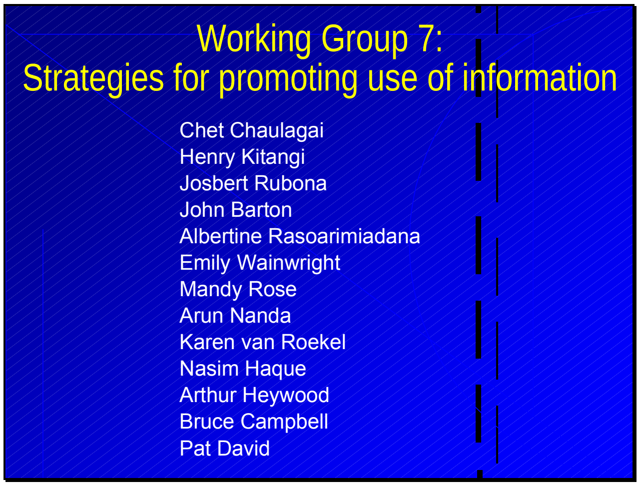
Information System Infrastructure

Lessons:

Essential framework for any routine health information system development

Recommendation:

Clear definition of objectives, data standards, routines and procedures, and a user-focus orientation



Working Group 7:
Strategies for promoting use of information

Chet Chaulagai
Henry Kitangi
Josbert Rubona
John Barton
Albertine Rasoarimiadana
Emily Wainwright
Mandy Rose
Arun Nanda
Karen van Roekel
Nasim Haque
Arthur Heywood
Bruce Campbell
Pat David

Lessons Learned

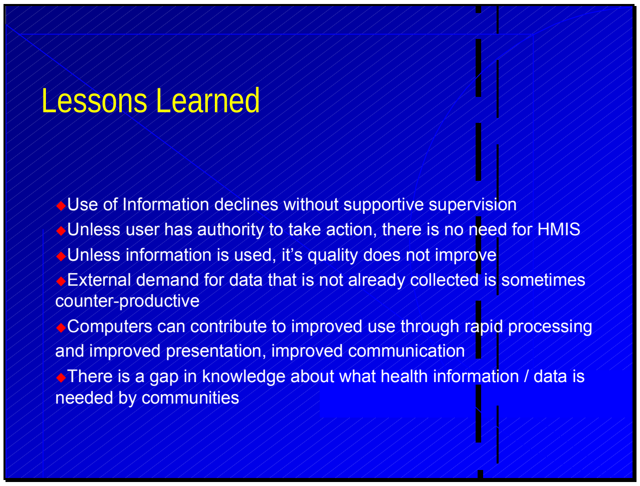
Data produced are not being used because:

- Lack of confidence in existing data
- Lack of access to data
- Data systems are not user-friendly
- Data innappropirate in relation to level of user

Lessons Learned

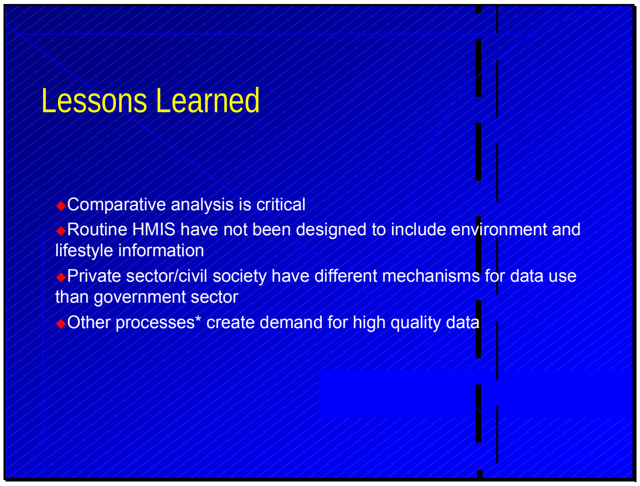
Data produced are not being used because:

- End users not involved in determining essential data requirements
- Data is too complex
- Data is not presented in a useful format



Lessons Learned

- Use of Information declines without supportive supervision
- Unless user has authority to take action, there is no need for HMIS
- Unless information is used, it's quality does not improve
- External demand for data that is not already collected is sometimes counter-productive
- Computers can contribute to improved use through rapid processing and improved presentation, improved communication
- There is a gap in knowledge about what health information / data is needed by communities

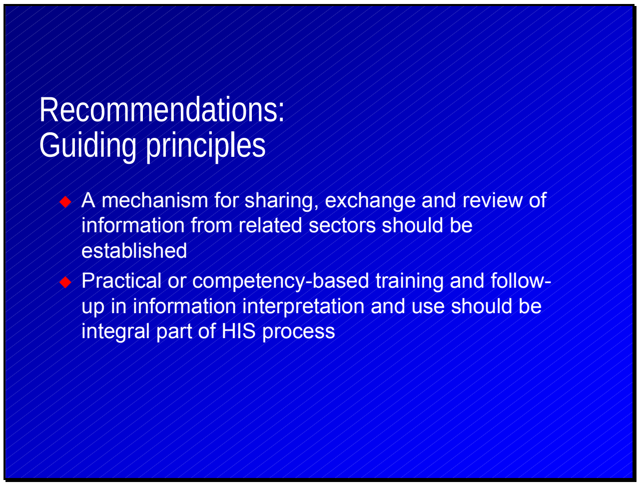


Lessons Learned

- Comparative analysis is critical
- Routine HMIS have not been designed to include environment and lifestyle information
- Private sector/civil society have different mechanisms for data use than government sector
- Other processes* create demand for high quality data

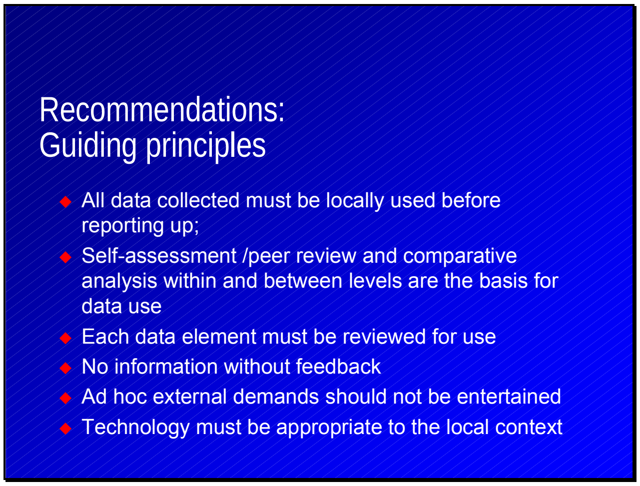
Recommendations:
Guiding principles

- HIS must not be designed as an end in itself but only as part of a larger management – strengthening strategy
- Information presented must be appropriate to level of use / stakeholders (from CHWs to policy makers)
- Channels of communication must be set up between data users and producers



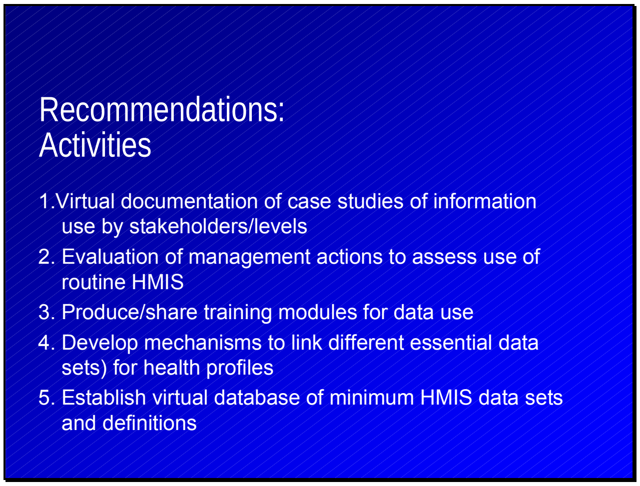
Recommendations: Guiding principles

- A mechanism for sharing, exchange and review of information from related sectors should be established
- Practical or competency-based training and follow-up in information interpretation and use should be integral part of HIS process



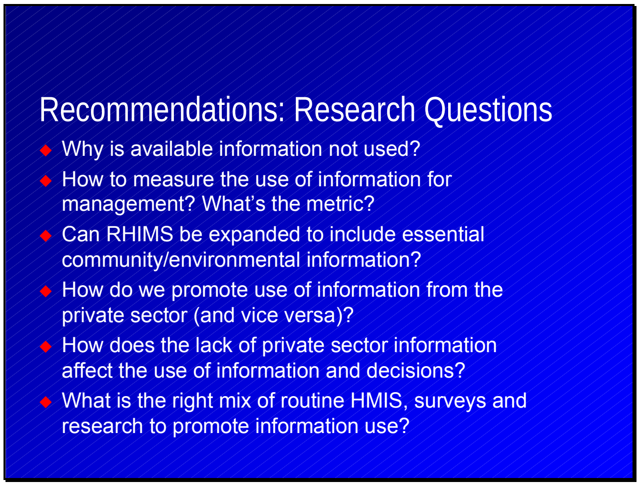
Recommendations: Guiding principles

- All data collected must be locally used before reporting up;
- Self-assessment /peer review and comparative analysis within and between levels are the basis for data use
- Each data element must be reviewed for use
- No information without feedback
- Ad hoc external demands should not be entertained
- Technology must be appropriate to the local context



Recommendations: Activities

1.Virtual documentation of case studies of information use by stakeholders/levels
2. Evaluation of management actions to assess use of routine HMIS
3. Produce/share training modules for data use
4. Develop mechanisms to link different essential data sets) for health profiles
5. Establish virtual database of minimum HMIS data sets and definitions



Recommendations: Research Questions

- Why is available information not used?
- How to measure the use of information for management? What's the metric?
- Can RHIMS be expanded to include essential community/environmental information?
- How do we promote use of information from the private sector (and vice versa)?
- How does the lack of private sector information affect the use of information and decisions?
- What is the right mix of routine HMIS, surveys and research to promote information use?

Just Use It

Working Group 8: The Private Sector Working Group Mandate

Integration of private sector (for profit and not-for-profit) into the public sector HIS...

Joe Valadez	David Hotchkiss
YC Chong	Ed Kelley
Lyndon Brown	Sushil Karki
Wayne Stinson	Randy Kolstad

What is the private sector?

- INGOs / PVOs / LNGOs
- For-profit providers:
  - clinical providers
  - traditional healers
  - TBAs
  - Pharmacies
  - Drug sellers
- Volunteer health workers
- Community based organizations (CBOs)
- Faith based organizations
- Professional hospitals
- Social marketing outlets
- Counseling centers (VCT)
- Insurance programs
- Microfinance / micro-credit financing schemes

What routine (regular or periodic) data can/might the private sector provide?

- Diseases
- Vital events
- Treatment
- Community Knowledge
- Community Practices
- Community Coverage
- Logistics
- Human resources
- Facility characteristics

What is the public sector?

- Ministry of Health (also Population) at local, district, provincial and national level

BUT ALSO

- Ministries of Defense, Education, Interior, Statistics, Planning have HIS needs

What questions should we ask?

- How can the private sector supplement public sector information?
- How can the public and private sectors coordinate their information systems?

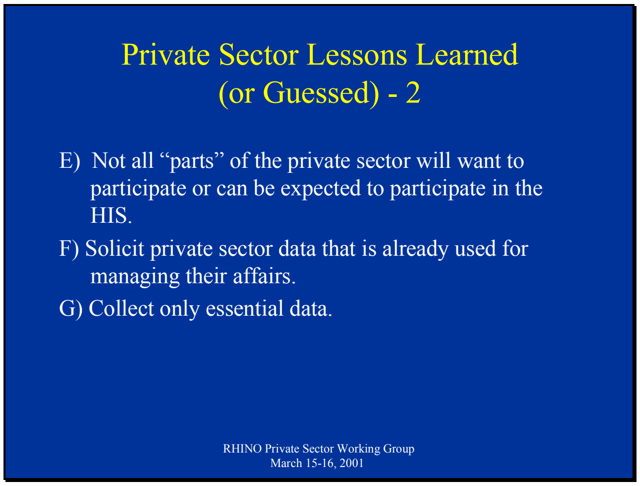
Private Sector Lessons Learned (or Guessed) - 1

A) There is little information we know of about public / private relationships.

B) The private sector is a mosaic of multiple types of organizations and individuals.

C) NGOs collect population-based data which can supplement routinely collected public sector service data.

D) No single strategy would be effective to build a public / private linkage.

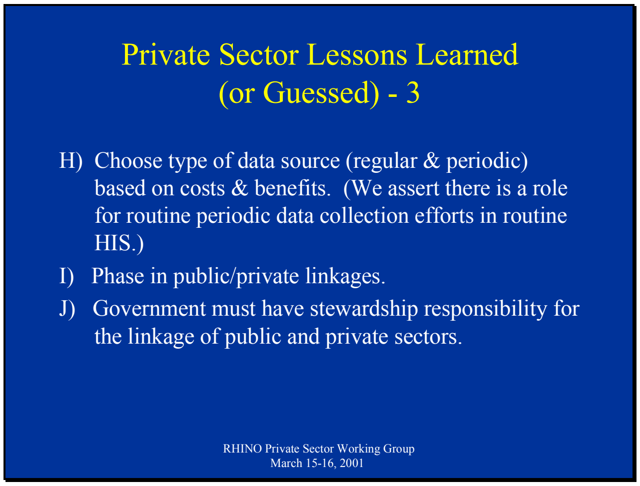


Private Sector Lessons Learned (or Guessed) - 2

E) Not all “parts” of the private sector will want to participate or can be expected to participate in the HIS.

F) Solicit private sector data that is already used for managing their affairs.

G) Collect only essential data.



Private Sector Lessons Learned (or Guessed) - 3

H) Choose type of data source (regular & periodic) based on costs & benefits. (We assert there is a role for routine periodic data collection efforts in routine HIS.)

I) Phase in public/private linkages.

J) Government must have stewardship responsibility for the linkage of public and private sectors.

Private Sector Recommendations - 1

1) Donors should fund a review of instances of private / public relations to identify lessons or potential models that are generalizable. (NGOs, insurance organizations, private hospitals, etc.)

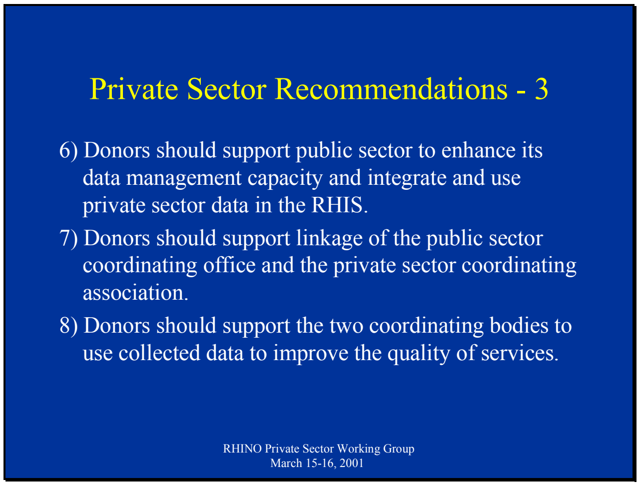
2) Government should establish an NGO/private sector coordinating office, and develop its capacity with donor assistance.

3) Donors should support development of a private sector coordinating association, and develop its capacity to work with government and the diverse elements of the private sector.

Private Sector Recommendations - 2

4) Donors should support research on "Who are the stakeholders and what are their respective stakes?" in order to identify strategies.

5) The two coordinating offices should define very clearly the essential data to be collected / transmitted in the RHIS and why the information is necessary. (e.g., case definitions, indicator definitions.)

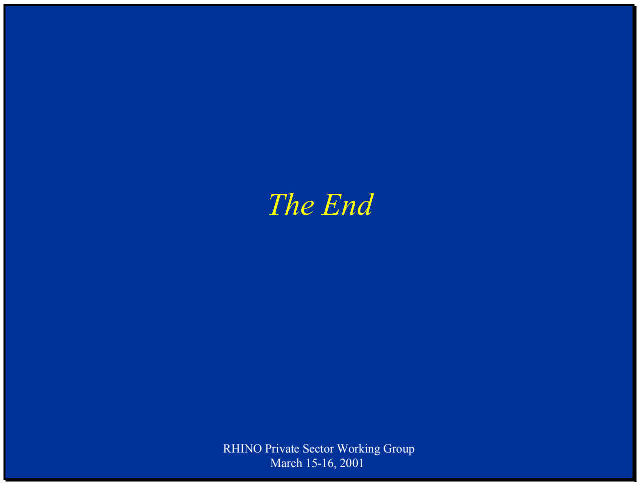


Private Sector Recommendations - 3

6) Donors should support public sector to enhance its data management capacity and integrate and use private sector data in the RHIS.

7) Donors should support linkage of the public sector coordinating office and the private sector coordinating association.

8) Donors should support the two coordinating bodies to use collected data to improve the quality of services.



The End

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