Guidelines for the development of Health Management Information Systems

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Foreword

Consistent with the adoption of the Global Strategy of Health for All by the Year 2000 (HFA 2000), WHO Member States have been reorienting their health services delivery systems based on equity and following the primary health care approach to providing health care to their citizens. This reorientation process involved achievement of improved health service delivery to formerly underserved, underprivileged and difficult to reach population groups. These efforts revealed, on a global scale, the inadequacy of information available upon which to manage this major undertaking.

During the last decade the health information programmes of WHO together with Member States have documented these information shortage problems during a number of workshops and the several monitoring and evaluation exercises of the HFA 2000 strategy. In developing improved systems or access to data, attention has been focused on four primary areas: design and implementation of improved records systems and reporting instruments; development of shared or minimum data sets; strengthening of application of appropriate informatics technology and increased emphasis on ultra-programme and intersectoral coordination in systems development.

Several Member States have carried out major information systems development activities during the past five years. In response to requests from governments for collaboration in such developments in the future, technical cooperation was provided for the documentation of the process in a number of “model countries”. This publication is the realization of those requests - that is - a set of guidelines to aid others who contemplate redesign or reorientation of an information system or to overhaul the entire national health information system(s).

These guidelines and the implicit exchange of experience will allow senior managers to capitalize on their colleagues’ successes in other countries, and help them avoid their pitfalls.

S.T. Han, MD, Ph.D.
Regional Director
Preface

Health management information systems are being developed and formed in many countries. These guidelines have been prepared as a practical aid to support these activities. They have been written by Dr Ron van Konkelenberg and Professor Ian Ring following consultant visits to a number of countries in the Western Pacific Region. The purpose of these visits was to review the development experiences in a range of settings in order to draw lessons about practical problems in designing and implementing information systems as well as the factors that contributed to their success.

The guidelines cover a broad range of aspects related to information systems including the need to ensure adequate support for their development, planning, implementation, maintenance, review, management and computing system support. They also place individual health management information systems in the broader context of national health information resources. A set of exercises have also been provided to assist in the use of the guidelines for training or teaching purposes.

The guidelines should not be seen as a definitive set of rules applicable in every situation, but rather as an aid to ensure that significant activities and tasks are not overlooked before decisions are taken by health authorities about the development of information systems that are appropriate to their own setting.
Introduction

There is an internationally observable trend towards more systematic planning and management of health care systems. Reliable and timely information, obtained from a wide range of sources, is increasingly required to support the more quantitative approaches being adopted. In this context, information is used to:

- coordinate activities between health services to help develop effective referral patterns and avoid unnecessary duplication of costly services,
- define the functions of health care services and administrative units,
- define the role of public and private sectors,
- monitor health status and service needs,
- set priorities for the allocation of health care resources,
- plan health services,
- evaluate health programmes.

While the demand for information is clearly evident, recent experience with design, implementation and redevelopment of Health Management Information Systems in countries such as Fiji, Papua New Guinea and the Philippines* demonstrates that the refocusing

*see WHO publication ICP/HST/O02, RS/91/0561.
Guidelines for the development of health management information system

of existing systems to meet emerging needs involves highly complex processes. These include technical tasks as well as a change in management cultures or even in the organisation of health systems.

From a technical perspective it is necessary to ensure that information implementation or redevelopment projects are systematically planned and managed. A critical weakness in many health management information projects is that tasks are conducted as uncoordinated technical tasks or, alternatively, a sequence of major tasks is undertaken while leaving out vital intermediate activities. However, the broader perspective shows that health management information systems are not developed in a vacuum but are superimposed upon existing structures. Thus, projects which aim to improve information for health system managers must place the system under consideration within an overall information systems context. Further, after implementation, good information systems can be made ineffective because of a lack of coordination between systems or because individual systems are not managed effectively. It is important that adequate management and support structures are provided to enable information systems to be effectively operated, maintained and enhanced.

Aims and objectives

The purpose of this work is to provide a set of guidelines by which health information systems can be refocused to improve the timeliness, quality, access and use of management information. The guidelines describe the activities and tasks that must be considered and addressed before work can begin in order to help avoid some of the more common pitfalls previously observed in health management information projects.

A basic premise presented here is that new or redeveloped information systems will not in themselves provide the information
required to manage a national health system. This is because the information is typically collected from sources which meet specific service or purely local management needs. Such systems were not originally designed to meet the needs of the health system as a whole and because they evolve independently it is often difficult to derive comparable data from them in a time frame suitable for management purposes.

Theoretically, it is possible to replace the many different systems with a single, integrated system. However, in practice it is often too costly to do this. This work also shows that an alternative way of improving the flow of health management information is to dedicate resources specifically to coordinate access, use and ongoing development of relevant information systems.

**Audience**

Because policy and information project work inevitably overlaps, this work addresses a dual audience. The first part includes the policy makers and executives responsible for the operation of the health system and the various health care programmes. The second part includes the information managers responsible for the conduct of system design, implementation, redevelopment as well as ongoing management of health information systems.

**Using the guidelines**

Although health authorities often have similar problems, they can only solve those problems in local settings, with local perspectives and with local priorities. It is necessary, therefore, to treat the guidelines in this paper not as a set of definitive rules applicable in every situation but as an *aide memoire*, which helps ensure that important activities and tasks have at least been considered and
addressed before final decisions are taken in the course of information development or redevelopment projects.

For those who wish to use this work as a manual on health management information system development, a set of practical exercises is included to help reinforce key concepts introduced. The exercises and examples provided can be examined, modified or expanded by participants in future regional or national information workshops.

**Sections following**

Part I of the text deals with two areas of general relevance to the development of any major information system. The first of these areas is policy and management planning, primarily addressed to executives and policy makers but with useful background information for system and project managers. Sections in this part of the report identify the preparatory activities required to ensure that information systems are effectively designed, implemented or redeveloped to provide policy makers and managers of the health system with the information they require.

The second main area of Part I deals with specific systems development issues. This part of the discussion is primarily addressed to information managers and project staff but also contains useful detail for policy makers and health care executives with an interest in information systems development. Sections in this part of the report describe the redesign of a health care activities information system as an example to demonstrate the major elements of an information systems development project.

Part II of the work describes how individual information systems must be placed in an overall systems context so that all systems can work effectively. This part of the report deals with the coordination.
and integration of health management information systems. It is aimed at executives, policy makers and information management staff. This part of the text outline the main activities required to improve overall performance of information systems in terms of generating relevant and timely information for system managers.
Part 1

The development of a major health information system

Chapter 1 Policy and management planning issues
   Policy context
   Identification of shareholders
   Support committees
   Management of information user
   expectations
   Commitment to health management
   information projects

Chapter 2 Project plans
   Goals, objectives and terms of reference
   Achievement milestones
   Project stages
   Timetable, deadlines and achievement milestones
   Resources and expenditure requirements
   Project management

Chapter 3 Situation analysis
   Needs assessment
   Application areas
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      Design
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Field manual and guidelines
Testing
Design of output tables

Chapter 4 Computing system development
and implementation

Chapter 5 Implementation
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  Programme managers
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  Replacing existing information systems

Chapter 6 Maintenance, review and enhancement
  Settling down of the new Health Care Activity Information System
  Continuing support of field and system staff
  Initiating routine reporting programmes
  Newsletters
  Post implementation review
Part 1

The development of a major health information system

Health management information systems ideally support management cultures that both recognize and use quantitative methods in support of decision making processes. The refocusing of existing information networks or the introduction of new systems to support such a culture cannot be treated as just a technical activity whereby new systems are simply superimposed over pre-existing structures. A refocusing of information systems also requires a change of existing administrative and management structures. All changes of this type are more or less painful and can take considerable time to achieve.

If new or redeveloped information systems are to be successful in meeting the needs of health system managers, development projects must consider both policy and management planning issues and system development issues.
Chapter 1

Policy and management planning issues

To initiate the changes which are necessary to ensure new or existing information systems are effectively focused on management needs, senior policy makers and executives must undertake (or at least endorse) some specific preparatory activities. The most important of these activities are:

- Identification and endorsement of the policy context to be supported by the information network;
- Identification and selection of the key stakeholders to be consulted and involved in information projects;
- Establishment of consultative committees and management structures;
- Management of information users’ expectations; and
- Commitment to funding and staffing long-term project work and ongoing management of information systems.
Policy context

Health management information systems are not an end in themselves but a support for the management and delivery of health services. Accordingly, health management information systems should be able to clarify relationships with a comprehensive conceptual framework of the health system to show at least how the resourcing of services relates to disease or demand patterns and subsequent changes in health outcomes (see Figure 1).
Within such a generalized perspective information should help to:

- support strategic planning;
- assess health status and needs;
- provide data which makes the health system more accountable;
- assist resource allocation; and
- facilitate management of the health system.

To serve such needs, information systems must be designed to provide data that is relevant in a local policy context. It is important to the outcome of any major information project that the local policy context be clearly established.

Specific needs for a health management information system are ideally obtained from national or central plans, which define the mission statements and programme objectives for health systems.

National plans may identify a series of broad programmes and sub-programmes dealing with the main issues confronting the health service. For example, the national plans may identify priority areas in immunization, prevention of malnutrition or reduction of maternal and infant mortality. Major issues should also be identified. These might include the need to decentralize services, plans for new or redistributed hospitals and planned modification of health insurance schemes.

National plans define the policy context in which state, provincial or regional plans operate. Intermediate plans show how local
needs and priorities are linked to national priorities. The priority given to different national programmes and sub-programmes within regions will depend on the relative importance of the relevant health problems within each region (see Needs assessment, page 29).

To ensure that current priorities are considered, the policy context set by health plans should be verified with the permanent head or minister. Policy would not be expected to identify the specific data items required to manage the system but it should establish a process for information systems development and promulgation. Further, current or proposed organizations and operational structures of the health authority must be described in the policy context. Information relating to organizational structures considered at early stages of information systems design can be highly sensitive and it is likely that it will be divulged only to selected staff in the organization. Thus, the selection of the individual responsible for the conduct of health management information projects is of utmost importance to its success.

Identification of stakeholders*

It is important to the successful design, implementation or redevelopment of health management information systems, that the people with a real ability to influence the system - the key stakeholders - are identified, and then consulted and involved in its development, implementation, management and use.

There are many people involved in connection with the operation, maintenance and use of health systems (see Appendix A). People such as the programme or clinical managers, may claim to have a

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*"Stakeholders" is used to describe individuals or groups who have a stake in a project rather than a financial commitment.
right to ownership of the system’s resources. Others, including health workers, field and clerical staff, may simply want to be consulted when decisions are made so that their views can be expressed and appropriately considered. Whatever the legitimacy of their claims, many people will have some degree of influence over the effective implementation, maintenance and use of the information system.

The head of the health authority would normally be involved in the selection of people to be consulted, either individually or as part of the committee structure. Relevant people include users of information, especially those in the legislature and the finance departments who may facilitate design, implementation or redevelopment of the information systems, as well as managers of programmes or health care units. Information managers would normally consult users of information on the basis of their direct involvement in data collection and processing. These people can provide important grass-roots knowledge about the health system and the people who will be operating the new or modified system should be given sufficient information for them to be able to operate effectively. It is desirable to make a checklist of the stakeholders in the early stages of an information project. The list would be used as a mailing list for distributing relevant information and generally to facilitate the consultation process.

Consultation with operations staff will foster cooperation in the changeover from one system to another.

Because the success or failure of a health management information system will ultimately depend on those who actually record and report the data, it is important to involve and consult directly with field staff.
Wherever possible, include field staff recommendations in the design, implementation or redevelopment of information systems.

Key stakeholders can be consulted individually, in group seminars or in workshops to share information, or they can be involved in advisory or working groups. Consultation with stakeholders is ideally an ongoing process but it should especially occur when any significant decisions are being made concerning management information. The aim of consultation is to seek cooperation by advising and informing stakeholders of developments, to gain support from people who can determine whether the information project is successful or not, to seek advice concerning procedures and directions and to get details right by involving the appropriate people at each level.

**Support committees**

Major information projects should be systematically managed during the implementation and ongoing operation phases. For this reason, and to assist ongoing consultations, it is important that the health authority executive establish appropriate steering and advisory committees. Steering committees are policy bodies responsible for the overseeing of information development and implementation projects. Advisory committees have both policy and technical responsibility to oversee information management units. Membership on these committees can overlap and, if required, the advisory committee can be assigned the responsibilities of a steering committee.

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**Actual work on development projects is ideally carried out by a task force of specifically appointed people. These people should have development and implementation skills as opposed to routine management skills.**
Management of information user expectations

The range of expectations about the performance of health information systems will depend on the roles of the people involved. Executives will need summary information on the achievement of aims and objectives, the costs and the efficiency of services. Managers will want information relating to performance indicators, activity levels, resources used and relative effectiveness of care or treatment. Clinicians will need information to assist with the management of individual patients and to compare treatment outcomes. Public health staff will need information to assist with the management of individual patients and the delivery of public health services. Epidemiologists need information on disease patterns while programme managers require specific details on health care or administrative programmes.

Unfortunately, not all needs can be met with a single information system and in particular it is not always possible to simultaneously meet the information needs of system managers, planners, clinicians and epidemiologists. Ultimately, it should be made clear what functions a specific information system will and will not fulfil to allow the systems to meet a maximum of needs. Additional needs for information must be obtained from other systems. Access to and coordination between various systems can be facilitated by a dedicated management information coordination resource. In order to ensure that information needs can be met from the most effective parts of the system, policy makers and senior executives should foster a broad understanding of the information system network and encourage cooperation between the various systems.

Resources for information projects will inevitably be limited and not all needs can be met simultaneously. It is therefore necessary for policy makers to set, understand and endorse development priorities, timing and phasing in of health system information.
activities. This will involve active participation in information advisory committee meetings, maintaining and promoting knowledge of information project plans, and use or promotion of national minimum datasets and common data dictionaries.

**Commitment to health management information projects**

The single most important determinant of a successful information system project is ministerial and permanent head endorsement to legitimize and to help assign the highest level priority to proposed activities.

It is desirable for the minister and permanent head to advise all staff in the health system when a key information project has been initiated, and to indicate the relative importance that has been attached to the work.

Not all countries will have the staff and financial resources needed to develop and implement a major new information system. Where necessary, a number of organizations and nations such as the World Health Organization (WHO) or governments in donor countries can be approached for assistance. Overall strategy and priorities for the information systems are ideally set and endorsed locally, and subsequently at the highest possible levels. However, in some cases, funding agencies such as WHO, the Asian Development Bank (ADB) or private agencies may offer to define the goals and priorities.

Whatever the assistance offered, such agencies should be encouraged to provide a long term commitment to this task.
To obtain this commitment, a list of information system goals, objectives, and development and implementation plans should be used to demonstrate what the health system intends to achieve and how it intends to manage the project. It is important that the senior heads of the health authority be involved when support for information activities is sought from external agencies.

Countries often receive offers from organizations to help develop prototypes, test, implement or donate information systems. Such offers can be tempting especially when they provide a solution to a particular information problem which is under current consideration. However, it is in the interest of the receiving country to ensure that this type of *ad hoc* support is in keeping with the priorities of national information development. Because of their potential to disrupt local priorities, offers for *ad hoc* information development activities should not proceed independently. Such activities should be managed and coordinated within the context of detailed information development and implementation plans.

Although many external agencies are willing to support management information developments, in some cases there has been a lack of coordination between agencies with the result that work has not always been in accord with national information systems objectives. The following tasks are required to improve the way external resources are used in a national context:

- Formulating and promoting a national health information plan and showing how specific information systems link with other elements such as the financial, patient activity, human resources, patient care systems as well as any intermittent survey programmes.
- Encouraging agencies to work within national objectives and priorities. Support from external agencies should be systematic and not merely an *ad hoc* development of new systems, especially if such systems have the capacity to conflict with rather than complement the information strategy.

- Coordinating between agencies to implement long-term system priorities. Support should be for development, implementation and where appropriate, enhancements but, with rare exceptions, not for long term operations.

- Facilitating effective decisions about information systems and helping design development strategies, seeking early clarification from external agencies about the recurrent cost implications of projects. Ensure the commitment of adequate funds and budgets for recurrent expenditures on a long term basis from health sources, from additional budget allocations or perhaps on a user pays basis.

- Encouraging external agencies to fund development and maintenance of information systems to meet their own regional or global reporting requirements for specific projects.
• Ensuring that external agencies act in an advisory and not a decision-making capacity. Policy decisions relating to information systems should be made by national representatives. All policy decisions can be evaluated and, where necessary, amended in the context of a systematic maintenance and enhancement programme.

This chapter has described the way senior executives and policy makers must support information projects to ensure that a new or redeveloped system can help serve their management needs. Chapters 2 - 6 describe the activities that health system managers must carry out to design and implement or to redesign a major information system. The discussion is illustrated with reference to the development of a Health Care Activity Information System (HCAIS) but the main activities and tasks listed will also apply to the development of other information systems.

Designing a major information system requires many individual tasks. The main activities include the following:

• Preparation of project plan;
• Situation analysis;
• Needs assessment;
• Design and testing;
• Computing system development;
• Implementation; and
• Evaluation, maintenance and enhancements.
The list of activities is not necessarily exhaustive and not all listed items apply in all situations. Because the context in which each health authority operates is different, it is appropriate to review the list and amend it for local conditions.
A major project such as the design and implementation of anew HCAIS requires a statement of goals, objectives, priorities and achievement milestones documented in formal project plans. Project plans are required to assist with the effective management of the project and to ensure that components of the project are completed in the right order. The plans should set out what is to be achieved in a series of interrelated steps, the deadlines and critical path for achievement of the component parts, the resources required for the project and the project management process. Plans should be formulated in consultation with the key stakeholders.

Specific elements of a project plan might include sections on:

- Goals, objectives and terms of reference
- What can be accomplished
- Project stages
- Timetable, deadlines and achievement milestones
- Resources and expenditure requirements
- Project management
Guidelines for the development of health management information systems

There should be some flexibility in designing plans and, if necessary, updating. However, there should be no substantial material changes unless they are absolutely required for successful completion of the project. A new HCAIS should be given an opportunity to work, so while difficulties should always be resolved, it is necessary to distinguish between problems that hinder development and implementation and those which can be dealt with during maintenance or enhancement phases.

Goals, objectives and terms of reference

The goals, objectives and terms of reference should clearly state what the HCAIS project is attempting to achieve, as well as give boundaries for the project. For example, the goal may be to provide primary health care activity information for managers at all levels in the health system.

Specific objectives may be to improve field workers’ recording and reporting processes, to establish an effective data processing network involving all levels of the health care system, and to provide routine statistical tables for primary health care managers.

The terms of reference would restate the objectives including guidelines on how the objectives should be achieved: for example, through consultation with established advisory committees, taking account of existing or proposed organizational structures, or by reducing the duplication of effort on the part of field workers.
Achievement milestones

A project plan typically identifies the specific outcomes of the project, completion of which represent the major project milestones. For an HCAIS these might include:

- Revised data collection and reporting mechanisms and information flow network;
- Documented and operational computing systems;
- An operational information system with documentation and guidelines;
- Trained field staff;
- An established HCAIS management unit; and
- Maintenance, enhancement and reporting programmes.

Project stages

The project stages should include a list of major activities such as shown in Appendix B and, where necessary, a list of the subordinate tasks to be performed under each heading. The level of detail would depend on local requirements and the extent to which tasks are delegated beyond the immediate project team.
**Timetable, and deadlines**

The plan should show the expected start and end dates for each task. This can be illustrated with a chart showing the major steps and expected time frame in which they will be taken. The time frame should identify the deadlines by which critical steps should be completed so that the project progresses in a systematic manner.

However, tasks need not be strictly sequential; they can be initiated in parallel. Some, like the test of data collection procedures and development of the computing system, may be run in parallel. The sequence of other tasks may depend on decisions to be made in the course of the project. For example, decisions relating to the type of computing system to use may well determine if an interim processing system is required or, alternatively, if there is to be an interim period where dual systems are operated.

It is important that time be allowed for consultation and this should be reflected in a realistic deadline for completion of the project. It is equally important that the consultation process not be used to delay completion of the project.

**Resources and expenditures**

The project plan should include a detailed estimate of the cost of resource requirements. There are four major areas of expenditure:

- One-time developmental or design and testing costs. These may be completely externally funded, for example by UNFPA, World Bank, UNDP, WHO, USAID or other support sources.
Project plans

- Implementation costs. These may be charged to or shared by other ministry budgets such as Maternal and Child Health, Tuberculosis Control, Family Planning and Malaria control. Each programme shares the cost of the systems that provide their data. An example of the types of implementation costs that may be expected is shown in Appendix C.

- Recurring costs: These are also funded from ministerial funds or departmental budgets but may be shared by a number of stakeholders such as local government or other users on a cost shared basis. In this case the users become stakeholders rather than just stakeholders in the system or resource. An example of the types of recurrent costs that may be expected is shown in Appendix C.

- Organization and operational staff. New or refocused information systems often have additional staffing implications over and above the staff required to maintain the system. For example, programmes or information units may require additional staff to handle requests for information or staff to analyse data and publish reports. These may be funded from ministerial funds or departmental budgets. Staffing issues are discussed in greater detail on pages 79-82.

Adequate time should be allowed for negotiations with funding organizations to give sufficient opportunity to prepare for the channelling of funds for establishment of recurrent expenditures.
into the health budget. Budgets will be required for the establishment of the HCAIS but recurrent operating costs should also be considered before the system is completed. Projects may fail after installation because support and recurrent expenditures have not been considered or cannot be realized when required. It is important to realize that the expenditures can be quite large. If recurrent funds are not going to be available, either from local or external sources, it would be wise to choose an alternative direction for the HCAIS. Expenditure estimates should be linked to project stages to show when funds should be made available.

If the initiative for HCAIS development and implementation comes from an external organization, the funding agencies should be requested to identify the magnitude of recurrent expenditure implications of proposals before a system is tested and implemented. This will help the receiving country to establish priority for a proposed project and, if necessary, to set in motion appropriate budget processes to commit the necessary funding.

**Project management**

The project plan should identify the project manager, the implementation team (task force) and the support committees to be established. It should be indicated if or when external assistance or consultants are to be employed to supplement local staffing.

Tasks should be assigned to individuals who have both responsibility and authority to undertake the tasks which they have been allotted. Promotion of the HCAIS project with the key stakeholders should assist this process. Where this is not sufficient the task force working on coordination of information systems can invoke the authority of executive or political sponsors of the HCAIS project (see initial commitments, page 18).
Progress on the project should be reported by exception in routine monthly reports to the steering committee. Progress reports should show only actual progress achieved, potential problems in meeting deadlines or budget over-runs and suggestions for their resolution.
Chapter 3

Situation analysis

The situation analysis describes existing information systems and shows why change is required. The analysis is conducted by a joint group of information users from health programme areas and formation management staff. This group identifies the purposes for which data are currently used and shows how needs are currently met. Existing information processes, data collection forms, data flow and processing networks and reporting mechanisms should be defined. The situation analysis should identify what is working, what is not and what is indifferent so that the parts of the system that need to be changed can be identified and those that do work can be retained.

Needs assessment

A full needs assessment is required as the basis for effective Health Care Activity Information System (HCAIS) development. It is also a prerequisite for computing work to be commissioned. Needs assessment will involve at least formal analyses of the requirements of HCAIS information, the data required to meet those needs and the data flows. The needs assessment should be linked with the current situation analysis to show how the existing system should be modified to meet management requirements more effectively.
Application areas

The main purpose of the HCAIS is to support decision making in relation to management of the health system, so the first requirement is to determine the types of decisions that will be made. This will involve an analysis of the policy framework and consultation with managers and health authority executives. As indicated on page 28, information needs will vary depending on the management context.

Whether or not there is a formal health plan, it is necessary to define the aims of the health service and its various programmes as this will determine the core of the information requirements for health services. Information should also help to focus on a realistic conceptual framework of the health system.

One of the specific tasks of the information project management team is to establish provisions for defining and measuring programme goals and targets, information requirements for the operation of the programme, performance indicators, resource use and evaluation.

It is important in terms of effectiveness of the HCAIS that it be designed in such a way that it directs the attention of field staff to target coverage of the health services. This will require a close interaction between health service managers and information staff, particularly staff in the HCAIS management unit. It is appropriate to include a member of the HCAIS management unit in the management team for each health programme when information needs are discussed in programme conferences.

As a starting point, health information needs can be conceptualized in four major dimensions taken from the conceptual framework of health systems.
Major elements of the framework that information systems should be able to identify are:

- Perceived health problems with incidence rates;
- Environmental, socio-economic and other risk factors which influence health, under-serviced, poor, inaccessible areas and other geographic and demographic factors;
- Population sub-groups with specific health problems, health status needs and demands;
- Health services directed at health problems or risk factors for all or part of the population;
- Health care inputs - e.g. staff, funds, capital resources, medicines and equipment used, etc. The HCAIS should not just measure expenditures, but be capable of estimating the costs of producing activities, outputs and outcomes;
- Health care outputs - e.g. numbers of client contacts or public health contacts made, proportion of population reached for particular programmes and proportion of target population reached; and
- Health care outcomes - e.g. change in health status as a result of intervention or health care programme.
There are many specific applications for which information may be required (see Appendix D). In addition to applications, current as well as short term and future information needs should be identified. All areas to be serviced by a HCAIS should be documented. A list should be made of areas not to be considered or which will be considered during the review and enhancement processes. Functional needs, including a description of output tables and the required timing of outputs from the system, should be documented.

**Data items**

When the specific needs to be served by the HCAIS are defined in terms of general applications and output tables, an analysis should be made of the data items, collection processes and recording systems which meets those needs. This analysis should determine what data items should be collected, the specific source of data items, the manner of collection and if data can be derived or calculated from items already available. The analysis should also determine if all data are actually required from HCAIS sources or if other sources can be used. It is important to ensure there is complementarity but no duplication in collections. Part of the data analysis should then show how the HCAIS can be coordinated or linked with other data collection methods such as surveys and other sources of data to meet overall information needs.

A common mistake in routine data collections is to address current instead of routine management issues. The result is that data items used to answer one-time or intrinsically research questions are built into an ongoing management system. For example, it may be of interest to know that low birthweight or spontaneous abortion is associated with smoking. However, when this fact has been established there is no further need to collect data to prove this point unless reduction in the proportion of pregnant women who smoke becomes a planning target.
The identification of specific data requirements should be closely linked with design of data collection forms, collection and processing procedures and output tables (see sections following).

The HCAIS should complement and not duplicate or compete with the existing systems. If an existing system is to be replaced, it should take into account the previously existing functions because, if those functions are not adequately dealt with, information users will develop their own systems to meet their specific needs.

**Design and testing**

When the data items have been tentatively identified (see Appendix E), the proposed data collections should be documented and the proposed standards and definitions should be included. This list should be circulated and discussed through the HCAIS management advisory committee to enable the list of data items to be refined. Note that the discussion should not be needlessly extended. In particular those being consulted should be reminded that the data items are designed primarily to serve routine management needs and that consideration of low priority items will be addressed during ongoing enhancement programmes which will follow implementation.

**Standardization**

One of the main requirements from an information point of view is to ensure standardization of information flow between regions. To help achieve an appropriate level of standardization, the essential data items to be collected should be declared and managed as part of a National Minimum Data Set (NMDS) which defines the list of data items to be collected by all service units throughout the country. Different areas may also collect a variety of additional
items but the NMDS contains a common core to be used by everyone. In addition to the NMDS it is desirable to create a data dictionary which contains standard definitions of all data items collected, whether or not they are included in the NMDS.

**Design**

**Design of the data collection forms, recording and reporting instruments involves making specific decisions on who collects what and how.**

At this stage the actual scope of the NHMIS, that is, what it will cover, where the information will be obtained and what data items are to be collected should be known. The following specific collection design tasks are required:

- Selecting the data collection, recording and reporting procedures. This involves making a final decision on who initially records and who collects the HCAIS data at various points in the information system, the way it will be collected and the way it will be processed. An effective health information system is one which is used by the health worker who initially records the data. In selecting the procedures, recognize that HCAIS data should be a by-product of the process by which health services are provided. Data should relate meaningfully to the health services provided by field workers and in health centres. The purpose for the collection
and each individual data item collected should be clear and documented. As far as possible the process of data recording should contribute to the conduct of provision of health care derived from diagnosis. Provision should be made to feed back information to the staff who collect, record and report the data to show how they fit into the scheme of things, both at a local level and at other levels of the system.

• Making a draft of the data collection forms. If existing patient and health programme recording systems are not operating efficiently or do not have appropriate data items, the basic recording systems should be revised. Tally and summary sheets should be drafted making sure that only the basic data items are collected. Derived data for aggregated items can be computed at a later date. As far as possible the data collection forms should be useful for collection staff; layout should be clear but concise and should provide logical sequence of collection.

Recording, collection and processing systems should be designed with the assistance of field workers. However, the specific data items to be collected in the new HCAIS will depend in part on how data flows through the health system, the levels of aggregation and data storage in different parts of the system.
It is necessary to identify the location of the major functional elements of the information system within the current or proposed organization. In particular it will be necessary to ensure that any new HCAIS fits into and supports reorganizations including regionalization and decentralized decision making.

Organizational arrangements

It may be appropriate to have interim locations for some functions such as HCAIS management while the system is being developed and implemented. For example, the HCAIS design and implementation stage may be managed through an information branch, in administrative services or in a dedicated projects unit. A more permanent location for ongoing management of the HCAIS allowing systematic use, maintenance and enhancement may be at a high level in the health authority, for example, in an executive unit or in a programme information branch.

Information flow

The specific design of the flow of information from one level to the next, as well as the feedback mechanism, will depend on local conditions and many options are possible (see Appendix F). However, for large systems or where resources are scarce, it is possible to design a HCAIS in which data is summarized at each step in the processing sequence. For example, field workers can use tally sheets to count contacts and pass these sheets (or the totals) to the next level for processing. The local centre enters data into the computer and passes it to the regional centre. The regional
centre then passes the totals on to the national centre. It is not necessary to duplicate local databases throughout the system or even to have all data retained at a central level. Supervisors at each level should routinely provide feedback including performance of staff in relation to targets.

To maintain support for the HCAIS it is necessary to avoid situations where service units only receive reports after lengthy delays due to regional processing and then filtering information back to service levels.

The best approach is to have either simple manual or computer processing as close to the collection points as possible so that service units have immediate access to their own data. However, if this is not considered feasible, resources for regional processing must be sufficient to ensure prompt return of reports to service units.

Often it is useful to summarize data at each level of the health system and to report only information specifically required for routine purposes to the next level. More detailed data can then be accessed from appropriate sources as required to amplify or clarify management issues as they arise. This approach allows the minimum amount of data to be processed at each transmission step while maintaining an appropriate amount of information for use at local levels.

**Field manual and guidelines**

When the information collection and processing procedures have been designed, field manuals and guidelines should be drafted. It is important that field staff be consulted in the formulation of information processing procedures.
Testing

Records and reports must be proven useful, simple and easy to use for the person delivering the care, performing the service or providing the programme access. Why data are required and how they relate to programme objectives and performance standards should be explained; the collection forms and draft manuals used by field workers who have not previously been involved in discussions should be pretested; the draft collection forms, manuals and guidelines should be amended on the basis of this pretest. The selected procedures and forms should be feasible and logical and necessary amendments to the draft data collection forms should be included.

If possible, the data flows, use of records and lists, registers and tally sheets in several areas should be tested before the system is fully implemented. This manual test should not be computerized until the collection process has been tested. A manual stage gives an opportunity to test aspects of data flows and helps establish a default backup mechanism if there are subsequent delays in the implementation or breakdown of computing systems. The necessary tasks include:

- Testing the information forms in selected areas. Clearly specify if the forms being tested are replacing existing systems or if the system will run parallel with the old system for the duration of the test period. A short-term loss of data from existing systems is probably only a small intangible cost to the health system so it is worth considering that only the new system be run during the trial period. However, if the two sets of forms are to be used together, ensure sufficient re-
Guidelines for the development of health management information systems

sources are available in the test areas to run both. Listen to field staff during the trial and make amendments to the drafts as required.

- Testing the information collection process and submission of forms through each level of the information system. Accept constructive criticism from field staff and, where required, amend proposed information flow and procedures in the light of the tests. Establish an effective communications feedback loop. Communicate effectively with field staff; listen to what they have to say. Show how their recommendations have changed the system or give an explanation why recommendations have not been acted on; Recognize that this is a period of high activity for field staff and, if necessary, supplement with additional resources during the period of the trial.

**Design of output tables**

Management needs both routine and *ad hoc* reports. The HCAIS must therefore have both a standard and an *ad hoc* information retrieval system which can generate responses to standard questions such as counts or simple tabulations as part of the routine operation of the system. Resources to carry out more complicated retrievals involving complex screening and analysis of data should also be available.

In addition to *ad hoc* reporting the HCAIS should generate specific tables on a routine basis for the use of health programme managers.
Indeed, because of their specialized knowledge it should be programme staff who translate, analyse and interpret data presented in the tables. Accordingly, sufficient skilled staff should be provided in the area where analysis takes place. If this is in information or in analysis areas, these areas should have access to staff with programme skills. On the other hand, if programme areas are responsible for analysis and reporting, such areas should have access to adequate information and statistical support.

Tables should be designed in cooperation with the programme managers who will be using them and reports should be reviewed at regular intervals to see if they are actually being used.

However, data sets and procedures should not change too often, as frequent change can be disruptive to management of the system. The changes should be made systematically as part of an ongoing, publicized maintenance and enhancement programme.

The following main types of routine tables should be generated:

- Output tables designed to support management and decision making. Output tables should, wherever possible, provide information on the extent to which programme goals and targets have been achieved. Output tables should relate to the mission of the health service and indicate levels of achievement of defined objectives and targets.
• Performance indicators. These indicators may not directly provide information on outcome but provide information on some intermediate or proxy measure which can be used to gauge the success of the programme.

• Tables specifically designed to support the conduct of programmes. These tables provide details of specific activities such as use of resources, finance, and supplies.

• Efficiency tables. These tables relate outcomes, or activities to resource use. They indicate the cost of carrying out the programme or some component of it; for example, the average cost of a community health contact or the average cost of an antenatal visit.

• Efficacy tables. These tables relate treatment and health care activities to specific health outcomes to illustrate service effectiveness. For example, ante and post natal programmes have an impact on reduction of neonatal mortality or morbidity, on controlling the severity of diabetes or other chronic, non communicable diseases.
Chapter 4

Computing system development and implementation

The development and implementation of the computing system can be considered separate from, but complementary to the development and implementation of information collection procedures. However, although defined as a separate activity, the computing system activities should be carried out in parallel with the Health Care Activities Information System (HCAIS) development and implementation activities described above and below. It is important to note that most of the technical computing tasks depend on decisions described in the needs analysis, output design and collection procedures. Thus computing specialists must be involved in the early stages of system design. Computing staff should be part of the advisory committee to help advise on the best computing facilities to use and to facilitate consultation with programmers who should be advised of the critical time path for HCAIS implementation as soon as available.

Computing systems development is not a substitute for information system developments. Computers may be used to facilitate the processing and use of data but cannot be relied upon to solve all information problems.
Indeed, because of weaknesses in the initial design or simply because they break down, the use of computers may lead to problems not previously encountered in the health information area.

The key activities in computing system development are classified under three broad headings (see Appendix G). These are:

- **Design of output tables.** The physical design of output reports is crucial (see Appendix G). Not infrequently they are designed by programmers who have little knowledge of the management uses of the reports. Consequently the reports may be inappropriately voluminous and packed with unnecessary detail.

- **Selection of hardware and software.** Who is to be responsible for the technical tasks of computer development and implementation and how computing is to be coordinated or managed within the overall HCAIS development and implementation projects should be determined.

- **Design and testing of computer system.** User requirements should be defined in advance and fixed for the initial development period. However, the systems analysts and coders should recognise that health systems are constantly evolving and need frequent change in information systems. The system must therefore be designed as flexibly as possible so that subsequent enhancements and modifications can be made in a timely manner. Programmes
should be flexibly designed with open systems architecture in which changes or additions are made with changes in parameters or the addition of modules instead of hardwired into code.
Chapter 5

Implementation

Implementation of the Health Care Activity Information System (HCAIS) should include at least the following:

- Preparation tasks
- Training
- Installation of computing systems
- Replacement of existing information systems
- Handover to HCAIS management unit

Preparation

The following tasks are required to prepare the HCAIS for implementation:

- Bulk printing of forms, documentation and manuals. Arrange for ongoing printing and distribution of the materials to be used in training and operation of the HCAIS.

- Design logical training and implementation programmes and schedule staff to carry out the training and implementation activities.
Note in particular that training should be timed to allow the new system to commence at a logical new date such as the first day of the financial or fiscal year or some other logical reporting period.

- Arrange for support facilities to answer questions that will arise during training and the first stages of operation.

- Conduct a full dress rehearsal by testing the training and implementation programmes in one or more remote areas to anticipate and help avoid problems in the transition process.

**Training**

Training is paramount to the success of implementation and maintenance of the HCAIS. There are a number of ways in which staff can be trained: in central office workshops, in regional workshops, with remote teaching aids such as videos, or through a trickle down effect with trained supervisors training local and regional staff. Whatever form is selected, the training should always revolve around the forms and manuals prepared for the system with a model of the expected information collection and reporting tasks to be performed under the new system.

Three major groups of staff require training. These are:

- the field staff charged with initial use of, collection and reporting of data;

- intermediate supervisors responsible for managing field staff;
• managers of health programmes who will use the data; and
• information officers who support the operation and use of the HCAIS.

**Field staff**

Training of field staff is initially prepared by involving selected field health workers in the design of the manual of procedures to be used in the collection and processing of data. This prepares such staff for involvement in planning for training other field workers as instructors and workshop facilitators. The method used in training is critical but the actual choice will depend on local conditions. In general the trickle down effect is not considered to be the best approach. A preferred method is use of prepared manuals, tapes and self-learning methods in workshops supported by the field staff who originally helped design the system.

Effective training and provision of support for field staff -the people who initially record, collect and use HCAIS data -is a vital component for the success of the HCAIS implementation process. Field staff training sessions should be scheduled as required before the system is implemented. The training sessions should be scheduled just prior to replacement of the old system. This means timing the training sessions to enable changeover at a logical date. Invitations and information about arrangements should be sent out early enough to allow sufficient time for staff to make arrangements to attend training sessions.

The field staff manuals, draft collection forms and data definitions are an ideal way to introduce staff to the new collection procedures, data processing and transfer of forms or data to supervisors. They
Implementation

should include descriptions of the processes to be followed, the data to be collected, definitions of data, timetables and contact names for assistance and support, as well as copies of the National Minimum Data Set (NMDS) and data dictionaries.

It is particularly important to the success of a health information system that data be relevant to the management of patients or health programmes. Field staff should see the value of and be trained in the use of basic information recording and reporting systems. For example, recorded data should have direct application for post natal visits and child immunization so that reporting will be from relevant and meaningful sources.

Programme managers

Specific efforts should be made in training managers in the appropriate use of data and information.

Part of this training should focus on identification of management information needs and specification of those requirements to information officers and programmers. It may also be desirable to change management routines and processes. A new information system should be apart of a different approach to management rather than merely trying to force managers to respond to anew system while they continue to operate in the old way. The following specific tasks are required to train managers :

- Formulating a training programme and developing appropriate training material in use of data for programme and system management;
• Training managers in use of routine data collections including use of regular reports, interpretation of tables and graphics. Show how the HCAIS differs from irregular and disease monitoring systems and how such systems can complement each other. Demonstrate how the HCAIS can generate *ad hoc* requests for information to help answer non routine questions.

• Training managers to use routine information systems for specifically defined management functions and to use alternative sources such as surveys or customized analysis to answer individual questions. Note that management functions should have contributed to establishing the information system. Managers should also be encouraged to conduct basic health services research using record systems in retrospective analysis.

• Arranging national and regional training seminars either through the HCAIS management unit or with external funding agencies. These training sessions can be arranged before implementation.

**Information staff**

Information staff require basic knowledge on the operation of hardware, data entry and data retrieval of the HCAIS. The tasks
required to maintain an adequate supply and to train information officers are:

- Determining if information staff are to be a centralized or decentralized resource, provided in-house or under contract. The number of information officers required is discussed under staff planning issues.

- Training the information officers in operation of the system by using the data collection forms, field manuals, guidelines, data definitions and operations manuals. Implement an ongoing training programme run by the HCAIS management unit alone or in conjunction with the technical training sector in your country.

- Including general computer literacy as part of the training programmes with basic operating system, spreadsheet, graphics, database and word processing skills. Information staff will require skills beyond the basic operation of the HCAIS. Some skills in basic data analysis are also required.

**Installation of computing systems**

Installation of computing systems can take place in parallel with preparation and training tasks and may be initiated soon after the computing systems have been completed.
For smooth installation of systems:

- Make sure the computer system(s) are functioning effectively;
- Consider the sequence in which computers and computing systems will be installed and install equipment and software; and
- Ensure there are adequate replacement facilities, consumables for computers and printers, uninterruptable power supplies, and support facilities.

Replacing existing information systems

To make most effective use of newly acquired skills, implementation of the HCAIS system should follow as closely as possible after the initial training of field staff and information officers.

It is a good idea to introduce new HCAIS forms and formally stop collection of data with old forms on a specific date, e.g. on 1 January or 1 July. Channelling the new information to key information users ensures that immediate needs continue to be met. However, there will be lack of continuity in data collections and there should not be excessive concern about an initial lack of data. This lack frequently occurs during a period of transition from one information system to another.

New data transmission processes and computerized data entry should be implemented according to the timetable determined by managers during the needs assessment.
After implementation the HCAIS should be formally transferred to a HCAIS management unit. This unit will then be a focal point for the ongoing operations, maintenance, review and enhancement of the system.
Chapter 6

Maintenance, review and enhancement

Because of their inherent complexity, the diverse activities and functions of a Health Care Activities Information System (HCAIS) must be carefully managed and coordinated. This can best be achieved through a formal management unit acting as a focal point for information activities and as a channel for carrying out development and implementation tasks. The HCAIS management unit is ideally supported by an advisory committee to help set priorities, give policy guidance and to facilitate the functions of the unit. The HCAIS management advisory committee should include representatives from major programme areas in the health system and key stakeholders including information user groups who are in a position to influence the outcome of the project. In this way the advisory committee can be used as a channel for communication and as a means of obtaining support for development and implementation tasks. The unit's manager and some information officers may have worked on the implementation project. However, in general the implementation staff will have a different set of skills compared with routine management staff so the overlap should not be large.

The HCAIS management unit should be small and, where necessary, assimilate additional resources or skills to supplement staff. The unit should have a single manager, and, depending on the size of the system, one to three information staff to help process data.
and carry out administrative tasks. The HCAIS management unit works closely with other information units and a health management information coordination unit.

The HCAIS management unit is responsible for ongoing operations, coordination of field workers and training, maintenance, enhancement and review of the system. In the transition period between implementation and the routine management stage the HCAIS management unit should:

- settle the HCAIS;
- promote use of and support operation of the system;
- initiate routine and ad hoc reporting programmes;
- start a monthly newsletter; and
- conduct a post implementation review

**Settling down of the new HCAIS**

The new HCAIS should have sufficient time to settle so that both the good and bad points are recognized. The objective of this task is to defend and protect the system and to promote change in the use of management information. Any obvious, small problems should be corrected but the system should not be revised too quickly. In the short term only those features which actually inhibit HCAIS operation or use should be adjusted.
Guidelines for the development of health management information systems

Continuing support of field and system staff

Initially, field staff and information officers will have difficulty carrying out their prescribed information duties because of unforeseen "teething problems" in the design or documentation of the system, because of weaknesses in the training programme, or simply because they perceive ambiguities others have overlooked.

An ongoing support system with telephone support or supervisory visits and a contact network are essential.

Initiating routine reporting programmes

When the first two months of data have been processed the reporting process should be initiated according to agreed time-tables set out in the needs assessment. Health programme managers should see this information and establish a feedback mechanism to correct data where necessary.

Procedures for answering ad hoc questions from the system, preferably by giving users controlled access to the system instead of responding directly can now be initiated.

Newsletters

Publication of a periodic circular facilitates communication of issues of common interest to HCAIS operations staff. This should include publication of problems addressed, their solutions and suggestions on use of the system. The circular can also discuss issues and unique uses of data or findings from previous periods.
Post implementation review

After a period of 12-18 months, when the HCAIS has had an opportunity to prove itself, it is time for a post implementation review. This is necessary for three reasons. For accountability and effectiveness purposes it is necessary to conduct a review of the development and implementation processes. Because of time or resource constraints it is not always possible to meet all of the user requirements during initial development and implementation phases. Finally, it is not possible to anticipate the evolution of requirements. It is necessary, therefore, to establish a formal process to address issues which were not addressed and to enhance the system as needs change. A new HCAIS is a major health system resource and of value in itself. It will incur considerable running costs and it is important that its operations be systematically managed and maintained.

The post implementation review should be a formal evaluation designed to show if the system is able to achieve the objectives as set out in user requirements documents and the final resources used during development and implementation (See Appendix H). Answers to the questions posed in the review will help to generate a maintenance and enhancement plan to be implemented by the HCAIS management unit. A timetable endorsed by the HCAIS management advisory committee will address the more substantial problems.
Part 2

Coordination and integration of health management information

Chapter 7 Routine information system management activities

Chapter 8 The health management information coordination unit
  Executive Information Systems
  Regional Information Systems

Chapter 9 The national health statistics committee
  National Health Information Agreements

Chapter 10 The National Minimum Data Sets and data dictionary

Chapter 11 Staff planning and management
Part 2

Coordination and integration of health management information

Part 1 described activities to be undertaken and supported by senior policy makers in a health system to support the design, implementation or redevelopment of information systems to ensure that an adequate management focus can be achieved in those systems. It described the specific activities that information managers should carry out to create or redevelop a health care activities information system as one example of a major information system.

The focus of the discussion has been directed towards the development of an information system to support the operation of health services. However, there are many other information systems relevant to the health system. Other systems include hospital, finance, human resource management, disease specific and even systems not directly under the control of the health authority such as census or survey sources. These systems collectively make up the national health management information resource (see Figure 2).

Information may need to be drawn from several sources for many purposes. Thus senior managers will need to relate information from resource usage in finance and human resource systems to service delivery and activities, from throughout the information resource, from the executive information system or from regional information systems.
Guidelines for the development of health management information systems

Figure 2: The National Health Management Information Resource

A

Health Services
National Health Survey
Bio-Medical & Disease Systems
Cancer, Perinatal, Dental, Diabetes, TB, Malaria, etc.
Census & Statistics
Vital Statistics
Other Non Health Authority

Health Authority Services

B

Coordination and Integration Resources
(Linkages not shown)

Health Management Information Coordination Unit
Executive Information Systems
Information Support Publication & Analysis Unit
Information Advisory & Steering Groups
Regional Information Systems
Information System Management Units
Part 2 demonstrates how a Health Care Activities Information System (HCAIS) is coordinated and integrated with other information systems to make all systems more effective for management purposes. The major activities include:

- Ensuring each major information system is systematically managed;
- Establishing a health management information coordination unit;
- Establishing a national health statistics committee;
- Maintaining national minimum data sets and data dictionaries;
- Systematically planning and managing information systems staffing requirements.
Chapter 7

Routine information system management activities

Health management information is potentially obtained from many different sources. All such major information systems must be systematically managed to ensure they operate and evolve effectively. Management of systems can best be achieved through small, dedicated management units (see Appendix I). Information management units can be responsible for one or more systems, depending on the stage of development, and the volume of work required. For example, major systems may be managed as separate units shortly after implementation but when the system is well established it may be managed with other systems in an integrated management unit. Similarly, a management unit can be responsible for a number of small systems from the outset.

Information management units should be supported and directed by advisory committees with representatives from the major users in health care programmes, the health management information coordination unit, computing services and the unit's management, advisory committees can oversee one or more information system.

In this type of unit it is appropriate to coordinate rather than to undertake all the work centrally. Staffing of information management units should be as small as possible. Temporary staff can be seconded to the unit if specific tasks require additional resourcing. Notwithstanding the need to keep the unit small, there should be sufficient staff to undertake the central support, publication and quality assurance tasks.
The short term tasks for an information system management unit immediately following hand-over from the implementation task force are described above. These tasks are part of a transition period that lies between implementation and routine management of a health system. The routine and ongoing functions of information management units include:

- Routine operation of the information system including final stage processing i.e. aggregation of reports submitted from regional and provincial centres and maintenance of an ongoing publications programme;

- Formulation and management of an information systems maintenance and enhancement plan. The first plan should be linked to the post implementation review (see Appendix J);

- Implementation of a quality assurance programme with support for field staff and routine publication of processing performance (See Appendix K). Routine reports generated from the system should remain relevant and timely and provide an effective ad hoc data access system;

- Maintenance of an ongoing evaluation and review cycle (See Appendix L);

- Support for monitoring of emerging disease patterns (See Appendix M);

- Coordination of activities with other information units and the national health management information coordination unit;
• Maintenance of training programmes relevant to the information system for users and information officers;

• Providing ongoing support to information users and processors. The user manuals should be maintained and, where necessary, updated. Generally the information system should be kept relevant to local level health workers who maintain the records and create the reports.
The health management information coordination unit

Health information systems include sentinel systems required for epidemiological monitoring, patient information systems required to manage the care of individual patients, resource management systems and a range of others primarily with specific programme orientations. It is most unlikely that a single information system would be able to meet all health management information needs or that a single integrated system could be developed for large health authorities. Indeed, for management purposes, a given information system is often supplemented or complemented with other routine systems, ad hoc surveys and other sources.

It is the total of all information sources that comprises the national health management information resource. To avoid or to refocus the effects of individual evolution of those systems, national health authorities should coordinate information activities with a National Health Management Information Coordination Unit (NHMICU).

A NHMICU does not replace existing information systems but provides a focal point for information coordination activities (see Figure 2, page 62).
The NHMICU should relate to a national information advisory committee made up of representatives of major programme users and managers of the health information management units. Because it has no direct operational functions, the NHMICU can be small with a director and a few support staff. However, the chief of the unit must have strong promotional, entrepreneurial and leadership qualities and a detailed knowledge of the use of information systems in the health sector.

The NHMICU should be viewed as a coordinating unit only. It will have the authority and responsibility to see that the units (persons) best suited for a set of information tasks are the ones who carry them out. Major tasks are to reduce and reorient existing systems and to monitor the interrelationships between information systems.
Specific functions of the NHMICU:

- Maintenance and promotion of a National Minimum Data Sets to meet management information needs;
- Maintenance and promotion of a national data dictionary;
- Maintenance and promotion of an inventory of information sources including health and literatures sources;
- Suggested priorities for information system development, redevelopment or integration;
- Coordination of information systems development to avoid duplication of effort and promote information sharing;
- Monitoring the interrelationships between information systems;
- Assessment of evolving information needs; and
- Draft, management and review of the national health information plan.
Executive Information Systems

Because of its role in coordinating information for management, the NHMICU can support or include an Executive Information System (EIS). An EIS is a resource which can combine information from the separate information system and present key elements in a way that supports programme management. The functions of an EIS are to:

- Integrate data from a variety of sources in and outside health authorities and to present them on a single platform;
- Provide management information with respect to major health programmes;
- Provide data more flexibly for decision making;
- Provide more relevant data;
- Provide more timely information;
- Increase data quality through increasing use; and
- Increase consistency, relevance and intelligibility of information.
Regional Information Systems

A Regional Information System (RIS) is an example of an EIS at a regional or state level. Its general aims are also to combine information from separate data systems for management purposes. Specific aims include:

- Development of key performance indicators (resource allocation and utilization, service demand, output and utilisation, quality of service, health outcomes);
- Development of linkages for a feeder information system from a variety of sources;
- Design of standard regional outputs for programme management (e.g. inputs, outputs and efficiency measures) and operational management;
- Manipulation and presentation of data at the regional level; and
- Contribution to the national EIS.
Chapter 9

The national health statistics committee

A national health statistics committee advises the health authority on matters relating to information systems. The specific functions of the committee are to:

- Direct and oversee the activities of the NHMICU;
- Make recommendations concerning the implementation of a national health information agreement to annual meetings of ministers for action required;
- Present an annual report of progress towards national health goals and targets to health ministers; and
- Present an annual report of developments in national health statistics to health ministers.

The suggested membership of the national health statistics committee is:

- National health department;
- State or regional health agencies;
• National statistics agency; and
• Non government and private organisations.

National Health Information Agreements

In federal or decentralized systems with two or more layers of government it may be desirable to develop a National Health Information Agreement (NHIA) which establishes a basis for cooperation for the purposes of developing and operating national health management information systems. The NHIA should involve all major organisations with a significant stake in the development of national health management information systems.

The NHIA has the following main elements:

• Framework for cooperation between the organizations involved (national and state or regional governments, national statistics agency, private and nongovernment organisations) for the development and implementation of the main health information systems;

• Standardization methods such as the National Minimum Data Sets;

• Policies relating for example to privacy, ownership and access to data;

• Priorities for development of national health statistics;

• Multi-year work programme for the major priorities;
• Funding arrangements; and
• Responsibilities of the various parties to the agreement.
Chapter 10

The National Minimum Data Sets and data dictionary

Where possible, information systems should have common definitions, data formats and codes to facilitate linkages and these should be built into the standard data dictionary. A National Minimum Data Set (NMDS) and data dictionary should facilitate this standardization. The NMDS identifies the core data items that must be collected as a minimum. Other data items may be collected to meet local needs. The data dictionary defines data items and related collection processes. The data dictionary contains at least the NMDS data items but may contain other definitions.

A standardization of a minimum core of data items and definitions is required to manage the health information system and to compare regions. The core of the NMDS should be the data items collected by all health programmes for the HCAIS. These and any other data items can be fully defined in a data dictionary which lists what the data item means, how it is collected or processed and where it is stored. The NMDS and data dictionary should be officially promulgated by the ministry or national government.

The following tasks are required to maintain a NMDS and data dictionary:

- If it has not been done in the earlier stages of the HCAIS development and implementation project, data items collected as part of
the HCAIS should be declared to be strategic data requirements. These are the minimum data items to be collected at appropriate points in the system. Additional items beyond the NMDS may be collected as required by health programmes and service providers. Where possible these additional items should also be defined in a standard data dictionary.

- Data items should be managed as a valuable system resource and appropriate resources should be allocated to the formulation and management of the NMDS and data dictionary.

- The NMDS and data dictionary should be revised as part of the ongoing management of the NHMIS, a task which can be built into the HCAIS maintenance plan.
Chapter 11

Staff planning and management

Health information systems in general have a poor record of retaining qualified staff which are syphoned off by private enter-prise offering more money.

Trained information staff are a valuable resource to the health system. It is important to give adequate priority to information systems and to generate an industrial climate aimed at attracting and retaining qualified staff in this area.

To address this problem it is necessary to engage in long term training and staff retention programmes. During implementation stages particularly there will be a heavy demand for staff training and support and this should be anticipated early in the development stages so that the training programme can be appropriately financed.

If there are insufficient funds for planning and training programmes from local sources, national or regional training programmes should be implemented on an ongoing basis by the major funding agencies. External funding authorities can support national or regional programmes, scholarships and establishment
of national or regional support centres with necessary support and training skills in each of the relevant areas. Of course, this also applies to other skills in the agency than just to the information component. Career ladders and post description or functional tasks for units with well defined billet descriptions are a must for all types of manpower.

The following related planning activities are required:

- Determining who will be responsible for staff planning and training and allocating appropriate resources to undertake this process.
- Formulating a staffing plan which leads to provision of support throughout the HCAIS network. This support requirement should be considered part of an overall information systems support scheme. Refer to "Health Workforce Planning - A Workbook and Training Guide"* for planning methods. Assess the need for the following staffing categories in terms of number, expected periodic replacement of staff, and temporary support for the HCAIS as a whole and for local and regional levels:

  Field staff
  Computer operators
  Information officers
  Programmers and systems analysts
  Data users and managers

* An unpublished document of the WHO Regional Office for the Western Pacific Region, Manila 1993.
Guidelines for the development of health management information systems

- Initiating changes in the industrial infrastructure, career paths and pay scales to ensure newly trained staff can be retained in the health system.

- Appointing staff to appropriate areas in the information system as required. Ensure there are formal duty statements and appointed staff are effectively trained to perform their required duties.

In the development and implementation of a new HCAIS it is worth some effort to anticipate how the new information functions will affect staff. Some staff will see opportunities for development in the new system and will give it whole-hearted support; others will require unambiguous instructions to operate the new system; yet others will see their personal opportunities eroded by the system and these people will oppose its introduction. Staffing and structural difficulties should be anticipated when preparing for change not only because some staff will oppose the system but also because change can be threatening to some people.

To minimize opposition, staff should be encouraged to participate in the change process. Staff can be consulted and advised of changes before they occur.

Staff should have an opportunity to have a say in changing the system and feedback should be taken seriously. Unfortunately, consultation and invitations to be involved in the process are not
always enough to obtain the necessary cooperation. In these cases it may be necessary to obtain support from the executives sponsoring the project.

To encourage support, staff should be advised that it is recognized that health system information needs are fluid and that organizational structures change over time; new information systems are designed so that they can respond to change with minimum effort, and after an initial period during which the system will be evaluated, there will be a maintenance and enhancement programme.
# Appendices

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Appendix A - Potential stakeholders in health management information systems.

Key stakeholders can include the following:

1. Politicians, government officials including local representatives of the users of health systems, at national, regional and local levels and a range of nongovernment organizations, international organizations and non health sector interest groups

2. National and intermediate levels and programme executives

3. Managers of the health programmes and administration

4. Managers of the health care units

5. Health care and field staff

6. Personnel responsible for record keeping and collection of data

7. Personnel at local, regional and national levels responsible for collation, processing and submission to the next level in the information network

This list can be used as a guide to identify actual stakeholders’ specific applications. It can also be modified as required to reflect local conditions.
Appendix B - Project stages in a HCAIS project plan

The following activities and tasks are included as an example of the project stages to be listed in a HCAIS project plan:

1. Situation analysis
2. Needs assessment
3. System design and testing
   i. Design and testing of field collection and reporting forms
   ii. Design and testing of information network
   iii. Design of routine tables
   iv. Drafting and testing of field manuals and guidelines
   v. Pretest (dress rehearsal) of information system in selected areas
4. Computing system development
   i. Selection of equipment and computer programmes
   ii. Design and testing of computer system
Appendix B

5. Implementation
   i. Training of field staff
   ii. Training of information officers
   iii. Training of system managers
   iv. Installation of computing systems
   v. Replacement of existing systems

6. Evaluation, maintenance and enhancements workplans

7. Final reports and handover

This list can be used as a guide to formulate an actual project plan and can be modified as required to reflect local conditions.
Appendix C - Implementation and recurrent expenditure items

Establishment expenditure budgets

The main direct cost items for establishing the HCAIS would include:

1. Staff costs, including staffing of the HCAIS management unit, staff for data processing, training and computer support staff. This also includes specialist implementation management and consultants to support the project and to train staff in necessary skills. Some staff with specialized skills may not be required beyond the implementation period.

2. Design and printing of forms and manuals.

3. Computing equipment including items such as computers, printers, continuous power supply units, and airconditioning units. Additional telephone lines and modems may also be included.

4. Software including purchase of proprietary computer programmes and the design and coding of the systems.

5. Travel and communication for development, implementation and training purposes.
The establishment costs exclude indirect costs such as existing staff involvement in HCAIS development activities or existing computer support units.

It may be necessary to obtain assistance from specialist departments such as personnel, finance and computing to ensure realistic establishment budgets are formulated. Proposed budgets should also be reviewed by members of the HCAIS management advisory committee and external funding agencies.

**Recurrent expenditure budgets**

The operation, maintenance and enhancement of a NHMIS, particularly if it is computerized, can be quite large. These costs should be identified before a system is implemented and, if adequate priorities are set for the project, appropriate budget processes should be set in process to commit the necessary recurrent funding. It is important to be aware of the magnitude of recurrent expenditures associated with new information technology.

Some major recurrent expenditure items include:

1. Ongoing staffing costs including HCAIS management unit staff, computer operators, information officers and training staff. Include on-going costs such as holidays, sick pay and staff replacement costs.

2. Depreciation and replacement of computing equipment including the computers, printers, surge protectors, constant power supplies, and air conditioning.
3. Consumables including paper, printer ribbons and ink, postage, diskettes, backup tapes, increased use of telephone or Facsimile machine, increased demands for software and software upgrades, etc.

4. Technical support for computer and programming maintenance and enhancement.

5. Training programmes for staff and users of information. Include the preparation, distribution of material and transport costs.

6. Data analysis, extraction and printing costs.

7. Cost of publishing routine and intermittent tabulations for management and *ad hoc* data users.

These lists can be used as a guide to formulate a set of expenditure estimates. They can also be modified as required to reflect local conditions.
Appendix D - Applications of health management information

In general, information is required for the following main purposes:

1. Assisting with definition of the aims of health services
2. Establishing and measuring goals, targets and objectives
3. Supporting the administration of health programmes with information on budgets, personnel activities, etc.
4. Monitoring performance
5. Supervision of staff
6. Training activities
7. Evaluation of the effectiveness of health programmes
8. Assessing the efficiency of resource usage
9. Trend analysis and projections
10. Management of change

This list can be used as a guide to document the needs analysis. It can also be modified as required to reflect local conditions.
Appendix E - Programme management data requirements

Specific data items to be collected in a new HCAIS will be different for each health authority as information is passed on to each level in the system. However, examples of the type of data required include:

1. Identifying information to help link data and tabulate it into appropriate classifications: for example, programme, clinic and type of health worker providing services as well as geographic location of the services and the residential origin of patients.

2. Service activities including numbers of patients and resources consumed by programme: for example, number of contacts by type of contact, type of care given and level of need for care.

3. Demographic characteristics of the patients including age and sex.

4. Size and gender composition of the population being targeted by each health programme: for example numbers of population in defined age/sex groups, poor, elderly, women of child bearing age, etc.

5. Health status of the target populations measured by selected sentinel indicators and levels of coverage of services by programme.
For example, incidence of diabetes, malnutrition or stillbirths, and number of ante natal visits or communicable disease inoculations.

6. Costs of services including staffing costs, medicines, transportation costs and capital equipment such as buildings and other equipment.

7. Catchment area and populations of service centres, hospitals, etc.

This list can be used as a guide to document data items required. It can also be modified as required to reflect local conditions.
Appendix F - Information processing networks

Information networks will be different in each health authority. However, some of the major elements of an information network include:

1. Contact between patients and health services and field workers
2. Data collection centres (the organizational hierarchy) including local nursing stations, local hospitals and health centres, regional centres and the central office
3. Processing stations (manual or computing)
4. Reporting and publication centres
5. Information management units

The following specific tasks are required to define a HCAIS information processing network:

1. Defining the proposed data collection procedures - who collects what, how and when. In particular the burden of data collection for field staff should be minimized by avoiding duplication of reporting. Primary data sources that are relevant for the field workers should be used, and only data that will be routinely used for management purposes should be collected.
2. Defining the information network including data collection points, data entry points and processing procedures. Duplication of data bases between different levels of the information hierarchy should be avoided by transmitting summaries instead of all available data items at each level to pass to the next level in the information chain.

3. Determining where the central data base will be located and how it will be linked with other parts of the system including the information suppliers and final information users.

4. Defining the HCAIS management and support structures; showing where support services are to be located and which support services are to be centralized or regionalized.

5. Describing where, by whom and for whom the HCAIS will generate reports and how data will be accessed; drawing up rules and guidelines that will be used to access data, including who will be responsible for accessing, and backup arrangements.

This list can be used as a guide to design an information system. It can also be modified as required to reflect local conditions.
Appendix G - Computing tasks

Selection of hardware and software

Qualified systems analysts are required to:

1. Draw up technical specifications from the needs analysis, output requirements and collection procedures. It will be necessary to estimate the size of data bases, expected computer response times and capacity requirements. This should include consideration of any additional computer applications such as word processing, spreadsheets and databases which local users might require.

2. Select the software to be used and choose between purchase of an off-the-shelf pack- age, or purpose built system either in-house or by consultants or a combination of both.

3. Identify special local conditions such as climate, whether the electricity supplies are reliable, if adequate maintenance is offered and if capital costs are a controlling factor.

4. Define equipment requirements from the specifications outlined above.

5. Define backup and support facilities required to protect and maintain the system.

6. Call tenders and purchase software and equipment.
Design and testing of computer system

Computing systems specialists are required to:

1. Code or purchase the computing system according to technical specifications discussed on pp 40-42; use flexible, parameter databases and code with a minimum of hardwiring; include a menu driven system, system management and maintenance functions and routine and ad hoc reporting capabilities.

2. Test the functional elements of the computing system in the HCAIS management unit and revise as required.

3. Test the computing system(s) at a selected test site and amend as required.

4. Provide technical and user documentation for the computing system.

Design of Output Tables

Output Tables should be:

1. Concise. Few managers will use a report which is too long. Two to three pages at most is desirable; longer reports should be used for reference purposes only - i.e. to look up a specific piece of information if necessary.
2. Well laid out. Only the essential concepts should be included and the reports should not be too densely packed.

3. Graphed. Graphs are desirable as many managers can get the message more easily and quickly from a graph than from a table context. Quantitative information can only be readily interpreted if it is presented in some kind of context. E.g. by comparing this year with last year or one area with another and cumulative frequencies of activities, etc.

4. Timely. For most management purposes the need for information is measured in weeks, months or even years, depending on the level and administrative responsibility. For clinicians and epidemiologists a week may be too late to plan effective intervention and much shorter time frames are required. In general, the timing of reports should be geared to the needs of users. If they are too late, reports will not be used but, on the other hand, if reports are produced too frequently, they may also be ignored.
Appendix H - The post implementation review

Specific questions to be asked in the post implementation review of all data users and providers are:

- Are data collection forms and processes working?
- Are field manuals and system guidelines accurate and understood by field staff and system operators?
- Is the computing system working according to specifications?
- Is data transmitted to the appropriate centres at the correct time?
- Are tables generated and distributed to users according to agreed time frames?
- Is the system generally able to answer the questions posed by health programme managers?
- What are the perceived weaknesses in the system?
- How can the system be improved?

This list can be used as a guide to design a post implementation review. It can also be modified as required to reflect local conditions.
Appendix I - The information management unit

Functions of the information management unit include:

1. Formulating development and implementation plans for an information project.

2. Coordinating development or implementation activities and ensuring that the deadlines for component tasks are achieved to avoid delays in completion of the overall project.

3. Providing a focal point for information staff, hardware suppliers and software developers during the course of the project. Where necessary, activities of sub-contractors and consultants should be coordinated to ensure activities continue to focus on national objectives.

4. Distributing allocated resources to appropriate areas and managing problem areas. If possible, potential shortfalls in resources should be anticipated in sufficient time to enable the health authority to find alternative sources of funds or revise priorities.

5. Supporting and managing the consultative mechanisms. Communicating with key stakeholders to maintain support for the project and to keep a focus on the main objectives of the project. Providing regular reports on progress to relevant advisory and policy groups.
6. Ensuring that an effective feedback loop is established between information processors and information suppliers. The feedback loop may result in modification of proposed methods, formulation of an enhancement programme for consideration after the implementation phase, referral for consideration in other information systems or arguing for rejection of proposals through appropriate management mechanisms.

7. Keeping the project moving. Where necessary, this means providing interim solutions to problems and re-evaluating those solutions as part of subsequent maintenance or enhancement programmes.

8. Information systems will be required to change as needs or knowledge or conditions evolve. It is appropriate that an information system is able to respond to calls for change as rapidly and as effectively as possible. Where choices are available, the most flexible processing, computing, coding and staffing solutions should be selected.
Appendix J - Formulation and management of the maintenance plan

The maintenance plan sets out the proposed activities for maintenance of an information system for the management unit and associated resource requirements. It helps justify the provision of ongoing support to the information system and identifies the maintenance and development priorities for information users (see Project plans page 23). The following tasks are required:

1. Reviewing the membership of the HCAIS management advisory committee and modifying as required to achieve an ongoing management structure as opposed to an implementation structure. However, key stakeholders should continue to be represented.

2. If no plan was developed during final implementation stages, formulating a formal HCAIS maintenance and enhancement plan. Assessing the need for change from the post implementation review and working with health system executives and information users represented on the HCAIS advisory committee to set priorities for ongoing activities.

3. Obtaining a commitment to funding the maintenance plan. Preliminary commitment should be sought very early in the life of the development and implementation projects.
4. Setting effective priorities for change to the HCAIS but allowing sufficient time to give the new system a chance to work. In particular unnecessary *ad hoc* changes should not be made. Existing limitations of the system should be accepted and eventually changed within the time frame and the priorities of the agreed maintenance programme. A process for revision and change in data sets, etc. should be established.
Appendix K- Implementation of a quality assurance programme

A quality assurance programme is required to maintain information systems at an acceptable level of accuracy. The programme should have both intermittent audit and ongoing components. The intermittent audit activities involve random checks of data collection and processing activities, either as dedicated activities or as part of the general training and support programmes. The ongoing quality assurance activities involve routine checks of data submitted to the processing centres and the management unit. The programme involves the following:

1. Assigning responsibility for the quality assurance programme to appropriate staff in the regional and HCAIS management unit offices.

2. Formulating a programme for checking the completeness of coverage, accuracy and consistency of processed data against field, processing, system and data dictionary documents.

3. Monitoring the timeliness of HCAIS data submissions.

4. Ensuring effective edits are embedded in the computer programmes. This should include the logical range of values that are permitted for data items as well as consistency checks between items such as recording antenatal care for male patients.
5. Ensuring that the data which are collected are meaningful to the collectors. The specific requirements of the HCAIS through the initial and ongoing training programmes should be explained.

6. Providing effective feedback to field staff and to the health services. This can be done directly each month (or similar time frame) with comparative reports which set out by exception the regions which are not complying with manuals and documentation. Feedback both reports on activity levels and quality of systems such as the timing and accuracy of the reporting process.

7. If it has not been started during the HCAIS development and implementation stages, a newsletter should be started. It should include solutions to regular errors, tips for improving reporting and names of the most successful reporting regions.
Appendix L - Initiation of an evaluation and review cycle

Health systems and the needs for information within those systems are constantly evolving so the HCAIS cannot be considered constant. Instead, it should be designed to change in response to changing needs. The needs for data in each new programme should go through the process (part II) to link it into an existing system or to develop a new system. New data sets can only be introduced on a periodic, planned basis which includes design, communication, pilot-testing, training and timed implementation set out in a maintenance and enhancement plan.

The following specific tasks are required to ensure the HCAIS remains responsive to user requirements:

1. The HCAIS management advisory committee should formally review the system on a yearly or two-year cycle. This review should consider current operations and functions to suggest amendments as required, and emerging needs to suggest enhancement as required.

2. Amendments and enhancements should be built into the HCAIS management plan. Executive endorsement should be obtained for the proposals and the work priorities to ensure a maximum level of support is retained.
3. Enhancements or amendments to the system can also stem from information passed to the system management unit between formal re-view periods. These should be reviewed by the HCAIS management advisory committee and, if it is deemed appropriate, built into the maintenance programme.

4. The maintenance and enhancement programme should be publicized but it is not wise to make changes too quickly.
Appendix M - Monitoring of emerging disease patterns

It is important that information systems be adapted to provide information about emerging disease patterns. For example, in many countries there is concern about the rising importance of non-communicable diseases such as diabetes and heart disease where previously these have not been observed to any great extent. The following need to be considered:

1. Monitoring of the disease itself; the numbers of patients treated and deaths from hospital and health centre statistics.

2. Monitoring the utilization of hospitals and health centres by different types of diseases and the pattern or mix of diseases.

3. Monitoring the underlying factors likely to lead to increased incidence of diseases including adverse environmental, behavioural and social factors.

4. Estimating and monitoring of the population groups affected by different types of diseases.

5. Monitoring and reporting on the population coverage of relevant control programmes i.e. progress in achieving programme goals, targets and performance indicators in treatment or prevention of disease or disabilities.
6. Monitoring the effectiveness of treatment, for example, through case fatality.

7. Monitoring and reporting on resource usage such as expenditure, staff, equipment or supplies.

8. Monitoring and reporting on programme efficiency especially in relation to meeting defined goals and objectives.

9. Relating findings to other sources of information including other routine data collections, surveys or sentinel systems.
Exercises

The following exercises are designed to support discussions in the text. The exercises have been loosely grouped to reinforce related topics.

- Identify the most senior individuals in your health authority.
- Do they support the new management information system?
- How can they be approached to obtain and maintain their support?
- Make a list of external organizations that can be approached for long-term and large-scale support for the development and implementation of a new management information system.
- Who should approach these organizations?

* * * * *

- What arguments and supporting information should be presented when seeking support?
- What are the ongoing maintenance implications of information systems?
- Who should fund these?
Exercises

- What would be a reasonable settling down period of a new information system in your health authority?

- Why would it be appropriate to "do nothing" to the system once it has been implemented?

- Design a workplan for a post implementation review for the new management information system.

- Draft a maintenance plan for the new management information system.

- Who will be responsible for maintaining the National Minimum Data Sets and data dictionary?

- Design a quality assurance programme for the new management information system.

- Who will be responsible for quality assurance in your health authority?

- Design a workplan for the first review of the management information system.

- How can recommendations from this review be implemented?

- Develop an outline of a user requirements document for an emerging health problem for your health authority.

- How will the inter-relationships between the management information system and other
Exercises

information systems be coordinated in your health authority?

• Discuss the impact *ad hoc* information developments can have on national information development projects.

• What is the long term role of external funding authorities in relation to ongoing management of the management information system?

• Identify the formal plans developed by your health authority for national, provincial or regional levels.

• Whether they exist or not, make a list of goals for the major health programmes.

• Make a list of data requirements to help support those goals.

• Who should be consulted in compiling this list?

• What information functions do you expect to exclude?

  * * * * *

• Make a list of the key stakeholders you would expect to consult in the implementation of a new management information system in your country’s health system.
Exercises

- Why would it be important to consult each of these stakeholders?
- How can those who support the system be encouraged to change their mind?
- What should be done in the face of persistent opposition?
- Is it possible in your health system to take the necessary industrial action which will make it easier to retain staff trained in new information processes?
- What steps should be taken?
- Who should be involved in taking the necessary industrial steps?
- Assuming that an external agency is involved, make a list of questions relating to financing of a new management information system you would put to the external agency.
- Prepare an establishment budget for a proposed new management information system in your health authority. Prepare a recurrent expenditure budget for the new management information system in your health authority.
- At what times do you expect the expenditures to be made in relation to your draft workplan?
- Who will fund this work?
• Who do you propose to consult in the preparation of your budgets?
• Who will approve the budgets?

* * * * *

• Prepare draft management information system development and implementation plans for your health authority.
• Show the major steps to be taken, the timelines, major milestones and achievements, deadlines, consultation processes and expected reporting dates for the lifetime of the project.
• Prepare a chart to illustrate your plans.
• Undertake a needs assessment for a management information system for your health authority.
• Identify the formal plans developed in your health authority at national, provincial and regional levels.
• Whether they have been formalized or not, make a list of goals for the major programmes. Identify the main health problems to be considered and the environmental, social, economic and behavioural factors which are to be the target of health programmes.
Exercises

- Describe any particular section of the population which will be given priority in the health programme.

- List the aims and objectives of the programme, performance indicators and main inputs and outputs.

- Define the specific aims and objectives of a new management information system.

- Make a list of no more than 30 data items which the management information system should collect. Include data definitions and collection procedures.

  * * * * *

- Define the organization and administrative structures within which the management information system will operate.

- Within the organization and administrative context show a detailed management information system information flow structure and associated functional relationships.

- Where would each component be located in your health system?
Design routine management information system reports for a major programme for your health authority. Include mock lay-outs and a tables publication timetable.

Who will be collecting the management information system data?

Is it necessary to modify existing patient care and health programme information systems?

Design a draft set of management information system data collection forms.

Who will you include in this design phase?

How and where do you propose to test these forms?

What provision can be made to amend the drafts?

Design a manual information flow network for the management information system.

Show where the system is to be tested, who will be involved and the duration of the test.

Specify if the old and new systems are to be run in parallel or if the new system is to replace the existing system and give a reason for the choice.

What arrangements are to be made to give and obtain feedback from staff involved in the trial?
Exercises

* * * * *

• Who will be assigned responsibility for the computing component of the management information system development and implementation tasks in your health authority.

• How will those assigned responsibility be coordinated and managed in the management information system projects?

• Draft a work request for systems analysts to formulate development and implementation plans.

• Check that such plans include at least the relevant component tasks outlined in this volume. If not, can the differences be reasonably explained?

• Define the elements of the computing system that can be parameter-driven.

• Where will the code be tested?

• Who will do the acceptance testing?

• Design a workplan to undertake a computing system acceptance test.

* * * * *

• Design a staff plan for the management information system to be introduced into your health authority.
• What staffing categories should be considered?
• What documentation should be produced to train or retrain staff?
• Prepare an outline of the training manuals to be used for each staffing category.
• How are these to be tested?
• Formulate a timetable for training staff in each relevant category.

* * * * *

• Determine the sequence in which computers and computing systems are to be implemented at field, local and regional levels in your health authority.
• Who will be responsible for installation of the Management Information System?
• Is operating staff available? How will assistance be given to answer questions during the implementation stages?
• Who would need to be consulted and involved in the process of replacing systems?
• Who would give the instruction to cease collecting data for the old system?
Exercises

- Which of the key stakeholders cannot function effectively without interim supplies of data?
- What arrangements have been made to ensure data are processed on a timely basis?
- What arrangements have been made to produce and distribute management information system reports?
- Design a Management Information System management unit for your health system.
Glossary

**AD HOC REQUEST.** Request for information that requires a customized extraction from a database or a customized data collection process.

**ADMINISTRATIVE UNITS.** The units responsible for administration or management, of services, health programmes or support services.

**ADVISORY COMMITTEE.** A committee which gives technical and, in selected situations, policy advice to decision-makers regarding the development and maintenance of information systems.

**BIOMEDICAL SYSTEMS.** Systems which deal with specific disease issues such as cancer, and perinatal and dental systems.

**COMPUTING STAFF.** Staff employed in a computing services division responsible for technical support including design, installation and use of equipment and computer programmes.

**CONCEPTUAL FRAMEWORK.** A broad overview embracing the major elements and functions of a system or process.

**CONSULTATIVE COMMITTEE.** A committee established to provide a formal mechanism for the consultation process. Consultative committees call have an advisory function (see ADVISORY COMMITTEE).

**DATA COLLECTION FORMS.** The forms used for data collection, summary and reporting purposes.

**DATA DEFINITIONS.** A description of a data item, including collection or calculation rules, meaning, formats and classification codes.

**DATA DICTIONARY.** A manual or computerized collection of data definitions.

**DEMAND.** Levels or distributions of actual use of health services (see also HEALTH NEEDS).

**DISEASE MONITORING SYSTEMS.** An information system designed to monitor specific diseases such as tuberculosis or malaria.

**EFFICACY EFFECTIVENESS.** The extent to which a service or function meets its objectives.
Glossary

EFFICIENCY. The relative cost or volume of resources required to provide a service.

EIS. See EXECUTIVE INFORMATION SYSTEMS.

EMERGING DISEASE PATTERNS. Changes in the relative distribution of existing diseases, appearance of previously unencountered diseases, or elimination of existing diseases.

ENHANCEMENT. Modification or extension of an existing information system to improve operation and/or functionality.

EVALUATION. Review of the efficiency and effectiveness of all information system.

EVALUATION AND REVIEW CYCLE. A systematic and planned cycle of review of the efficiency and effectiveness of information systems conducted to justify the existence of or to identify the need for change of an information system.

EXECUTIVE INFORMATION SYSTEM. An information system used to combine information from a range of separate data sources to help generate information, that supports programme and health system management.

FIELD MANUAL. The reference manual which sets out the tasks and operational guidelines relating to information systems for use by field staff.

FIELD STAFF. The health workers providing health care and prevention services. These workers maintain case notes from which data are extracted for entry to information systems.

FUNCTIONAL NEEDS. A requirement for information that is necessary to carry out a specific service or function.

GUIDELINES. A specific set of rules that describes and defines the tasks and elements of an information system.

HARDWARE. Computing equipment including the computer, printers, modems etc.

HCAIS. See HEALTH CARE ACTIVITIES INFORMATION SYSTEM.

HEALTH INFORMATION SYSTEM. An information system designed to routinely provide information about health services.

HEALTH AUTHORITY. The government department or agency responsible for the health sector.
HEALTH CARE ACTIVITIES INFORMATION SYSTEM. All information system specifically designed to provide information about the level of activities of health services or programmes.

HEALTH CARE INPUTS. The resources used to deliver health care, including finance, staffing, pharmaceuticals, facilities, transport etc.

HEALTH CARE OUTCOME. The effect a health care programme has on improving the health status of a community (see also EFFICACY).

HEALTH CARE OUTPUT. The activities or work generated by a health service. It shows how busy the system is, but not how effective it is.

HEALTH CARE PROGRAMMES. A service or group of services aimed at a specific health problem or target population.

HEALTH CARE RESOURCES. The finance, staffing, pharmaceuticals, facilities, transport etc. required to provide health care (See also HEALTH CARE INPUTS).

HEALTH CARE SERVICES. The services used to deliver health care within a given programme. There are one or more sets of services in any HEALTH CARE PROGRAMME.

HEALTH CARE UNITS. The physical and or administrative units that provide health care, including nursing stations, health centres and hospitals.

HEALTH MANAGEMENT INFORMATION. Information required to assist the management and planning of health programmes or health systems.

HEALTH MANAGEMENT INFORMATION PROJECT. A project designed to implement a new or to modify or enhance an existing information system.

HEALTH MANAGEMENT INFORMATION SYSTEM. An information system specifically designed to assist management as opposed to delivery of care. MANAGEMENT INFORMATION SYSTEM often derive information from clinical information systems.

HEALTH NEEDS. The resources, care or programmes actual required to prevent, cure or improve health disabilities (see also DEMAND).

HEALTH OUTCOMES. See HEALTH CARE OUTCOMES
HEALTH PROGRAMMES. A service or group of services aimed at a specific health problem or target population. This may include preventative as well as curative or palliative programmes.

HEALTH SERVICES. The range of services available in a health system, including preventative, curative and palliative care.

HEALTH SERVICES RESEARCH. Formal research into levels, distribution and interrelationships between need, demand and supply of health services.

HEALTH STATUS. Measures of the relative prevalence or incidence of disease, health disability, function or dysfunction in a given population.

IMPLEMENTATION COSTS. The costs associated with implementing an information system includes design, equipment, programming, training, transport, communication, task force and other staffing and initial consumables such as paper and printer ribbons.

INFORMATION COLLECTION PROCEDURES. The methods set out for recording, collecting and reporting data items.

INFORMATION FLOW. The reporting and use of information between different parts of the health system.

INFORMATION MANAGERS. Managers responsible for the operation of an information system.

INFORMATION NETWORK. The identifiable parts of the health system where information is recorded, summarised, reported, stored, processed, analysed and used.

INFORMATION OFFICERS. Technical support staff responsible for the operation of information systems. Their duties include processing of data, operation of computing systems, local reporting and data retrieval, data analysis and representation of local information nodes in the overall information system. Information officers may be highly specialised in one or more areas of responsibility such as statistics, data analysis or reporting.

INFORMATION RESOURCES. The resources that make up the whole of the information system. Include all information systems, technical support services, analysis research and reporting services, information management and coordination services and support committees.
INFORMATION SYSTEM MANAGEMENT UNIT. The management unit responsible for operation, administration maintenance and enhancement of an established information system.

INFORMATION USERS. The people within and beyond the health system who have a need for information. Information users needs can be routine or ad hoc.

INTEGRATED SYSTEM. An information system that combines standardized information from a number of sources to meet a broad range of routine and ad hoc needs for data.

INVENTORY OF INFORMATION SOURCES. A manual or computerized listing of the source of data and processed information,

LOCAL MANAGEMENT NEEDS. The information needs of local as opposed to national managers.

LOCAL POLICY CONTEXT. The subordinate policies that operate at a local level to implement national goals subject to variations in locally perceived needs and priorities.

MAINTENANCE. The support for an information system that enables it to operate as required (see also ENHANCEMENTS).

MANAGEMENT INFORMATION. Information required to support management of programmes and health authorities.

MANAGEMENT CULTURE. The prevailing methods, opinions and relationships that underpin the administrative and management structures of an organization.

MANAGEMENT STRUCTURES. The formalized structure and interrelationships between administrative units of an organization.

MANAGEMENT UNIT. A unit responsible for ongoing operations and maintenance of a service or function.

MISSION STATEMENT. Formal statements of the direction and purpose of a service.

NATIONAL DATA DICTIONARY. Data dictionary defining data items at a national level.
**Glossary**

**NATIONAL HEALTH GOALS AND TARGETS.** Formal mission statements and quantified levels to be achieved by a health service.

**NATIONAL HEALTH INFORMATION AGREEMENT.** A national agreement of cooperation for the purposes of developing and operating NATIONAL HEALTH MANAGEMENT INFORMATION SYSTEMS.

**NATIONAL HEALTH INFORMATION PLAN.** A formal plan setting out the objectives, stages, resource allocation and timetables for major information system projects at the national level.

**NATIONAL HEALTH MANAGEMENT INFORMATION COORDINATION UNIT.** A formal unit established to standardize and coordinate the operation or enhancement of health care information systems specifically to help improve the quality and timeliness of information for programme and system managers.

**NATIONAL HEALTH STATISTICS COMMITTEE.** A committee which advises the HEALTH AUTHORITY on matters relating to information systems. It also provides link to coordinate information activities between health and other authorities.

**NATIONAL HEALTH SYSTEM.** All health authorities and health services providing or coordinating supply of services in a country. It may include both private and public sectors.

**NATIONAL INFORMATION ADVISORY COMMITTEE.** See NATIONAL HEALTH STATISTICS COMMITTEE.

**NATIONAL MINIMUM DATA SET.** An agreed minimum core of data items that is to be collected by all health services, facilities, centres and authorities within the national health system.

**NEEDS.** See HEALTH NEEDS.

**NEEDS ASSESSMENT.** A formal analysis of information required to meet the needs of information users, in particular the managers of health programmes.

**NHIA.** See NATIONAL HEALTH INFORMATION AGREEMENT.

**NHMICU.** See NATIONAL HEALTH MANAGEMENT INFORMATION COORDINATION UNIT.
NMDS. See NATIONAL MINIMUM DATA SET.

OPERATIONAL STAFF. The staff responsible for routine operations of an information system.

OPERATIONAL STRUCTURES. The division of a health authority into functional units.

ORGANIZATION OF HEALTH SYSTEMS. See operational structures.

ORGANIZATIONAL ARRANGEMENTS. The operational arrangements between the functional components of a health system.

OUTPUT. See HEALTH CARE OUTPUTS.

PERFORMANCE INDICATORS. Measures that relate activities and resource usage to programme objectives and targets.

POLICY CONTEXT. The major issues confronting the health service, mission statements, programme objectives. These may or may not be documented in formal plans.

POLICY MAKERS. Politicians and executives responsible for setting and interpreting health policies.

POST IMPLEMENTATION REVIEW. A review of the efficiency and effectiveness of all information system conducted at a set time after completion of all information project.

PRE-TEST. Field testing of an information system, documentation, processes and forms before designs are finalized.

PROGRAMME GOALS. Formal statements setting out the purpose of a programme. For example, one goal of the maternal and child health programme may be to reduce neonatal mortality.

PROGRAMME MANAGERS. Managers of a health programme.

PROGRAMME OBJECTIVES. Formal statements setting out what is to be done in order to achieve specific goals of a health programme. For example, within the goal of reducing infant mortality one objective may be to provide comprehensive antenatal services.
PROGRAMME TARGETS. Formal statements setting out how much of a given objective is to be achieved within a given time frame. For example, within the objective of providing antenatal services a target for a calendar year may be to increase contacts from 50% to 75% of all pregnant women in a given catchment area.

PROGRAMMERS. Computing staff responsible for tile coding of computer programmes.

PROJECT PLAN. A formal statement of goals, objectives, priorities and achievement milestones documented to be achieved in the course of an information project. A project plan should include what is to be achieved in a series of interrelated steps, the deadlines and critical path for achievement of tile component parts, the resources required for tile project and tile project management process.

QUALITY ASSURANCE PROGRAMME. A programme designed to maintain information systems at all acceptable level of accuracy involving both intermittent audit and ongoing checking activities.

QUALITY OF SERVICE. A combination of the effectiveness and standard of a service.

RECURRENT COST. The annual operation expenditures including staffing, consumables, transportation and communication.

REFERRAL PATTERNS. The patterns of utilization that result from the referral practices of health professionals when they advise their clients to attend health clinics or services.

REGIONAL INFORMATION SYSTEM An information system used to combine information from a range of separate data sources to help generate information that supports programme management or a health system at a regional level.

RESOURCE ALLOCATION. The distribution of funds, staffing, facilities and equipment etc. for the purpose of providing health services. Resource allocation should be based on community needs and not tile expectations of service providers.

RIS. See REGIONAL INFORMATION SYSTEMS.

ROUTINE DATA COLLECTION. A collection with data items justified on regular use grounds, with a regular collection process and publication timetables.

ROUTINE OPERATIONS. The phase of regular and systematic use, administration and management of an information system.
ROUTINE REPORTING PROGRAMMES. Regular reporting of information, tables and publications according to a timetable that meets the needs of programme managers.

SITUATION ANALYSIS. An analysis of existing information processes, data collection forms, data flow, processing networks and reporting mechanisms. The analysis identifies the purposes for which data are currently used, shows how needs are currently met and describes why change is required.

SOFTWARE. Computer programmes.

STAKEHOLDERS. People involved with the operation, maintenance and use of health systems and with a real ability to influence the system.

STEERING COMMITTEE. Policy body responsible for the supervision and overseeing of information development and implementation projects.

STRATEGIC PLANNING. The planning process which establishes long term health system goals and objectives preferably based on an analysis of trends in needs or requirements for health care.

SUPPORT COMMITTEE. Advisory, consultative and steering committee convened to assist the design, implementation, redevelopment or ongoing management of information systems.

SYSTEMS ANALYSTS. Computing staff specialising in the design of hardware and software systems.

TASK FORCE. A group convened specifically to work on an information project.

UTILIZATION. Actual use of health services (see also DEMAND AND HEALTH NEEDS).