Project Report

A Situation Analysis of the Health Information System in Swaziland

April – July 2004

A World Bank Funded Project
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Executive Summary

Swaziland has identified the strengthening of the national health information system (HIS) as a key component of HIV/AIDS prevention, care and mitigation. The Health Information Systems Programme (HISP) was requested to conduct a situation analysis of the Swaziland HIS and to provide recommendations for improving the system.

An assessment of the HIS was conducted during the period April to July 2004. This report documents the assessment findings and recommendations.

Effective health management relies on relevant, accurate and timely information at all stages of planning, implementation, monitoring and evaluation of health services. Information for management decision-making is expressed as indicators. These indicators should reflect the priority management information needs and must be linked to a monitoring and evaluation framework, which measures progress towards achievement of health service objectives. Priority management indicators are drawn from a minimum essential dataset (EDS). Information systems should be aligned to the collecting of this essential dataset.

An information system includes three components: human resources, technical resources and an information process. The information process involves an information cycle: data collection and collation, processing, presentation and use of information. All three components must be addressed if the system is to be strengthened.

Key findings

Human resources
The current skills mix in the Health Statistical Unit is not optimal for the tasks expected of the unit. There is a lack of clearly-defined roles and responsibilities for HIS staff. Staff at all levels of the health system require strengthening of their skills in processing data and using information for management.

Technical resources
The computers used for the HIS at the regional offices and at the HSU are reasonable for their current utilisation, but the computers used in the hospitals are generally inadequate for HIS use. The software applications used for the capture of outpatient and inpatient data both contain serious flaws, contributing to significant data quality problems.

Outpatient information process
The outpatient information process is based on aggregated data and includes a well-functioning paper-based data collection mechanism. The data capture process at regional level faces challenges relating to the software application, notably the lack of validation mechanisms, resulting in significant data quality concerns. Old, slow computers and software problems contribute to delays in data capture and reporting. Data are not presented in an analysed format as information. Indicators are not used. A combination of factors thus contributes to suboptimal use of information for management decision-making.
Inpatient information process

The information process is based on individual patient data and is an epidemiological surveillance information system rather than a health services information system. There are significant concerns relating to completeness and accuracy of data. The data capture process is labour intensive and data entry is at present significantly behind time. The software application contains serious flaws. The system is not considered sustainable in its current format.

Recommendations

The recommendations suggest that there are three key areas for consideration, namely developing an essential dataset, developing an information data flow policy, and creating a culture of information use. The MOHSW should develop a health information systems policy that reflects these three areas and incorporates human resources (staffing and training aspects), technical resources, and the information process (for both in-patient and outpatient processes).

An essential dataset of between 100 and 120 indicators should be developed. This should address the most important information needs of all programmes and donor organisations. Additional information can be obtained through the use of surveys and sentinel surveillance. The information/data flow policy is required to establish areas of responsibility for information officers, and creates clear timelines for submission of reports and provision of feedback. In order to provide evidence that senior management supports the concept of creating a culture of information use, it is suggested that senior management convene quarterly information review meetings where managers are required to address the information that is in the system.

Human resources

- A clear vision and mission for the HSU must be established.
- Job descriptions, roles and responsibilities must be defined for HIS staff at all levels.
- HIS responsibilities should be integrated into the job descriptions of clinical staff in peripheral facilities.
- The value of HIS work should be recognised and staff time ‘ring fenced’ to this function.
- The addition to the HSU of staff with a health background, including public health and information systems experience, will contribute to maximizing the functionality of the HSU.

Important training needs include:

- Awareness-raising among clinical staff and health managers of the role of health information in the delivery of effective health services
- Training of health managers in the interpretation and use of health information in management decision-making
- Training of HIS and health managers on the information process
- Training of health staff at all levels on the calculation, interpretation and use of indicators
- Training of HIS staff on use of the software
- Training of HIS IT support staff on hardware and software maintenance and problem solving

Training may be facilitated through partnerships with appropriate tertiary institutions or non-governmental organisations.

Technical resources

A policy should be developed which ensures that a certain number of computers are purchased on a regular basis, so that out-dated equipment is replaced on a rotational basis. As the current software application contains significant problems, the HISP recommends that a free and open-
source software system, such as the District Health Information Software (DHIS), be implemented for the management of both the OPD and inpatient datasets. The DHIS approach is based on a simple paper-based data collection system in all reporting units. Data are aggregated onto a monthly reporting form and entered into the software program at a central unit, where the data are analysed and reports generated. This does not preclude the process of manually calculating indicator values from the paper-based reports.

The information process
For the present, efforts should focus on strengthening the information system, rather than producing out-dated and potentially unreliable annual reports. The outpatient and inpatient information systems should remain separated and should produce separate reports.

The outpatient information process
- Data collection and reporting tools should be aligned to the EDS.
- Mechanisms should be developed to ensure that quality data is submitted for data entry and analysis.
- Mechanisms should be developed for the production of routine quarterly reports and for feedback, as a means to improve the use of information.

The inpatient information process
The report suggests that a system be introduced in each hospital whereby each ward reports on a daily basis (midnight census data) and a monthly basis (aggregated summary of anonymised information on admissions, discharges and deaths).

The recommendations also include the following:
- Develop (or strengthen existing) data collection tools;
- Utilise a list of diseases/conditions of public health importance to identify conditions for which a disease surveillance report should be submitted;
- Identify the software system to be used for processing data;
- Develop skills and systems to ensure that analysis of the routine reports is done at both ward and hospital management level within a specific timeframe;
- Submit analysed reports to region and MOHSW for aggregation with reports from other facilities;
- Establish monthly management meetings at which information is presented and discussed.

The recommendations section concludes with a section outlining the sequence of steps to improve the information system in Swaziland.

The Swaziland health information system contains many encouraging features, notably a culture of data collection, a well-established OPD data collection mechanism and dedicated staff members. Further strengthening of the HIS will constitute a significant contribution to the improvement of health services, including the prevention, care and mitigation of HIV/AIDS.
**List of abbreviations**

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<th>Abbreviation</th>
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<td>AFP</td>
<td>Acute Flaccid Paralysis</td>
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<td>ANC</td>
<td>Antenatal Care</td>
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<td>DHIS</td>
<td>District Health Information Software</td>
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<td>EDS</td>
<td>Essential Data Set</td>
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<td>EPI</td>
<td>Expanded Programme of Immunization</td>
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<td>FDS</td>
<td>Facility Data Set</td>
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<td>HIS</td>
<td>Health Information System</td>
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<td>HISP</td>
<td>Health Information Systems Programme</td>
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<td>HIV/AIDS</td>
<td>Human Immunodeficiency Virus / Acquired Immune Deficiency Syndrome</td>
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<td>HMIS</td>
<td>Health Management Information System</td>
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<td>Health Statistical Unit</td>
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<td>IT</td>
<td>Information Technology</td>
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<td>MOHSW</td>
<td>Ministry of Health and Social Welfare</td>
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<td>NERCHA</td>
<td>National Emergency Response Council for HIV/AIDS</td>
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<tr>
<td>OPD</td>
<td>Outpatient Department</td>
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<td>PHU</td>
<td>Public Health Unit</td>
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<td>PMTCT</td>
<td>Prevention of Mother to Child Transmission</td>
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<td>RDS</td>
<td>Regional Data Set</td>
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<td>TB</td>
<td>Tuberculosis</td>
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<tr>
<td>STI</td>
<td>Sexually Transmitted Infection</td>
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<td>VCT</td>
<td>Voluntary Counselling and Testing</td>
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<td>WHO</td>
<td>World Health Organisation</td>
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Acknowledgements

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This report was initially prepared by Ms Norah Stoops and Ms Gugu Shongwe. Vincent Shaw and Wendy Venter assisted with the editing and final layout of the report.

Correspondence and feedback on this report would be welcomed, and should be sent to Ms Norah Stoops at norah@mweb.co.za
1. Introduction

1.1 Background

The Government of the Kingdom of Swaziland has received funding from the Global Fund for HIV/AIDS, Tuberculosis and Malaria to support HIV/AIDS prevention, care and mitigation over a 5-year period (2003-2008). The Ministry of Health and Social Welfare (MOHSW) and the National Emergency Response Council (NERCHA), in partnership with other stakeholders, identified a need for technical assistance in various HIV/AIDS-related interventions. The improvement of the national Health Information System (HIS)\(^1\) was identified as a key area.

Although a HIS is in place, the system requires strengthening. Improvement of the HIS is critical to improving the country’s monitoring and evaluation capacity in relation to HIV/AIDS and other priority health problems.

The Health Information Systems Programme (HISP) was requested to support the MOHSW in reviewing the HIS by assessing and analysing the current system, identifying areas for improvement, and proposing a plan for strengthening the system. This report documents the assessment findings and provides recommendations.

The HISP was also requested to assist in analyzing the 2001 and 2002 health data and producing draft reports. These reports are presented in a separate document.

1.2 Structure of the report

Section 2 presents a brief overview of health information concepts and the uses of information in health management. Section 3 introduces the components of a health information system: human resources, technical resources and an information process. This theoretical overview may be considered part of the recommendations section, but is presented initially as it provides a framework for the assessment findings and the specific recommendations that follow. The various sections of the report are structured around the components of a health information system.

Section 4 describes the assessment methodology. Section 5 documents the assessment findings, presenting the outpatient (OPD) and inpatient systems separately. Section 6 provides recommendations relating to the three components of the HIS, again presenting OPD and inpatient systems separately. The annexed documents in Section 7 serve to illustrate aspects of the report and provide supplementary information that may be helpful in the process of strengthening the Swaziland health information system.

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\(^1\) In this report the term HIS is used rather than HMIS. This is in line with the thinking expressed in Lippeveld (page 3), because HIS reflects a broad information system, integrating management, administrative and epidemiological surveillance systems. The term HMIS might be misunderstood to refer only to a management information system.
2. Health information for management

Good management is a precondition for increasing the effectiveness and efficiency of health services. Effective health management relies on information at every stage of planning, implementation, monitoring and evaluation of health services. The purpose of a health information system is to provide managers and health care workers at all levels of the health system with information that is relevant, appropriate, timely and of good quality, in order to inform their decision-making. A well-functioning health information system is thus crucial to a well-functioning health system.

2.1 What is health information?

2.1.1 Health information categories

Health information may be broadly grouped into the following categories\(^2\):

- **Health status information**
  Reflects the health needs of the population (i.e. the patterns of disease)
  Involves:
  - epidemiological surveillance data (mortality and morbidity)

- **Health service information**
  Reflects the coverage, quality and efficiency of health services.
  Involves:
  - general health service data (e.g. ANC coverage, bed occupancy, etc.)
  - vertical programme data (e.g. EPI, TB, HIV)
  - administrative data (e.g. finance system, personnel management system, drugs and supplies management system)

- **Population information**
  Provides the denominators for surveillance and service coverage.
  Involves:
  - vital registration data (births, deaths, population movements)
  - census data

This report will focus on the second category, health service information, and specifically on general health service reporting. However, it is important to realise that the categories are linked and that the coordinated use of all three categories is necessary for good health management decisions. An overall integrated health information system may thus include a number of information subsystems to provide the various categories of information.

2.1.2 Data element types

Information is obtained through collecting and processing data. Data elements may be considered routine, periodic or permanent.

- **Routine data**
  Vary over short time intervals and require ongoing routine collection, e.g. total headcount, inpatient days, VCT visits. Should be based on a minimum essential data set.

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Periodic data
Vary over medium time intervals and thus require periodic updates, e.g. number of staff positions in a facility; equipment available in a facility. Usually obtained through audits or surveys.

Permanent data
Change slowly over long periods, e.g. population data, health facility structures.

Most of the information needed for health management decisions consists of routinely collected data, but some indicators are calculated using permanent or periodic data, e.g. population size, bed capacity.

2.1.3 Methods of collecting data

Routine methods

Routine data ("normal" data or "stats")
This is collected from all facilities every month as aggregated data.

Sentinel data
On certain issues, there is a need for more in-depth data than in the routine dataset. This is also collected on a routine basis, usually in aggregate form, but only from designated sites which are selected to be representative of a larger number of sites. e.g. sexually transmitted infections etiology; anonymous unlinked testing for HIV prevalence among ANC clinic attendees.

Notifiable diseases data
This is partly an aggregate system and partly a patient-based system. Routine mechanisms must be in place in order to detect and follow up individual cases of notifiable conditions as they occur, so that immediate action can be taken, e.g. when a case of cholera or acute flaccid paralysis is diagnosed, notification is effected immediately. Notifiable diseases data are also presented in aggregate form for particular time periods in order to calculate incidence rates (This aspect of the information system could be part of an Integrated Disease Surveillance and Response programme.)

Intermittent methods

Facility audits
A facility audit is a facility-level situation analysis. The conducting of audits is a mechanism to expand the permanent and periodic data about facilities, e.g. number of staff posts, posts filled, state of clinics, number of consulting rooms, availability of equipment, etc. These audits provide managers with information that complements the routine dataset.

Surveys
Surveys are also used to complement routine data. They collect specific data elements to answer specific questions and are conducted according to a defined methodology in defined areas over a defined time period.

Ad hoc methods
At times there are requests for data that do not fit into any of the above categories, e.g. numbers of diabetics seen, trauma cases, etc. This data would be collected for a short time period only in response to a specific need.

The health information in the various categories is obtained through linked subsystems, relying on combinations of data types and data collection methods. The functioning of these subsystems must be coordinated by a central Health Information Systems Unit.
Table 1: Health information categories, data types and collection methods

<table>
<thead>
<tr>
<th>Health information categories</th>
<th>Data types</th>
<th>Data collection methods</th>
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<tr>
<td>• Health status information:</td>
<td>• Routine data</td>
<td>• Routine methods:</td>
</tr>
<tr>
<td>- epidemiological surveillance data</td>
<td>• Periodic data</td>
<td>- routine data</td>
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<tr>
<td>• Health service information:</td>
<td>• Permanent data</td>
<td>- sentinel data</td>
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<td>- general health service data</td>
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<td>- notifiable diseases data</td>
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<td>• Population information:</td>
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<td>- surveys</td>
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<td>- vital registration data</td>
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<td>• Ad hoc methods</td>
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<tr>
<td>- census data</td>
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2.2 How is information useful for management?

2.2.1 Basing decisions on information

Reliable, timely information provides managers with evidence of how services are performing. This information provides a basis for planning, budgeting, allocating resources and identifying service problems. Information linked with a monitoring and evaluation framework also provides funding organizations with the information they need to continue funding.

Box 1: Examples of health management decisions based on health information

- A region has decided on the goal of reducing mother to child transmission of HIV. One of the objectives contributing to this goal is to make HIV testing available to all pregnant women in the region. The number of women attending ANC clinics in the region over the past year provides a starting point for planning. If data were provided per clinic and per region, this would allow the estimation of the number of testing kits required per clinic and region and the costs involved. As not all women will accept testing, a target could be set of testing 25% in the first six months, moving up to 60% by the end of the year. In the following year the target could be moved up to 80%. Budgeting for and ordering HIV testing kits is then based on these targets.

- In South Africa, children should receive a Vitamin A dose between six and eleven months of age. In one region of the country, monitoring revealed that coverage of Vitamin A was poor but that coverage for measles immunization at nine months was high. A decision was then made to give Vitamin A simultaneously with the measles immunization. Vitamin A coverage subsequently improved considerably.

- In reviewing the monthly facility report, a clinic supervisor noted that the number of women attending the ANC clinic had decreased significantly over the past three months. An investigation revealed that women were dissatisfied with the quality of service provided by two new staff members. The clinic supervisor was then able to take action to resolve the problems.

- After reviewing quarterly regional reports, a national supervisor noted that the number of neonatal deaths in a particular regional referral hospital was significantly higher than in other referral hospitals. An investigation revealed substandard infection control practices in the...
neonatal unit, resulting in a high number of nosocomial infections. Action was taken to educate the staff on appropriate practices and to provide appropriate equipment and supplies to facilitate adequate infection control.

- The maternity staff in a hospital complain that they are overworked, and cannot cope with the workload. They believe that they need more staff in their unit. On closer inspection, the hospital management find that over the last year, the 40 bedded maternity unit has an occupancy rate of 115%, while the chronic care wards (60 beds) have an occupancy rate of only 40%. Both units have the same staff allocation. A decision is taken to reduce the number of active beds in the chronic care ward by 20 beds, and increase the maternity beds to 50 beds (this 25% increase in beds should address the shortage of beds in the maternity unit). They also decide to move two nurses from the chronic care ward to the maternity ward, thus bringing about greater equity in staff allocation between the units.

- A district hospital finds that the male surgical ward is constantly full, and cannot accommodate new admissions. They also find that the length of stay for patients in this ward is 6 days, compared to an average of 3.5 days for the other wards. The doctor managing this ward is extremely conscientious, and wants management to allocate him more beds so that he can accommodate new admissions. But management cannot accede to this because additional beds would require additional staff, and incur additional cost. A decision is taken to develop protocols for the management of common diseases, and to improve follow-up of patients at clinics. As the protocols are implemented over the next 4 months, they find that the average length of stay in the male surgical ward decreases, and the new patients requiring admission can be accommodated.

2.2.2 Indicators

Information for management decision-making is expressed in the form of indicators. An indicator is a variable that describes a particular situation and can be used to measure changes in that situation over time.

Indicators are calculated from data elements usually collected on a routine basis.

Different types of indicators can be calculated:

- Count indicators: Measure the number of events without a denominator.
  e.g. number of new clients presenting for VCT

Most health service indicators however include a numerator and a denominator:

- Proportion indicators: The numerator is contained in the denominator and the indicator is usually expressed as a percentage.
  e.g. % ANC clients accepting HIV testing = \( \frac{\text{number of ANC clients tested}}{\text{number of ANC clients offered testing}} \times 100 \)

- Rate indicators: Measure the frequency of an event over a specified time period in a defined population. Often expressed per 1000 or per 100,000 population.

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e.g. TB incidence = \frac{\text{number of new cases of TB detected in one year}}{\text{defined population}}

- Ratio indicators:
  The numerator is not included in the denominator; used to express comparisons between two groups.
  e.g. ratio of males to females using VCT services = \frac{\text{number of males using services}}{\text{number of females using services}}

Indicators measure progress towards management targets and objectives. A health information system should be built on a set of indicators that reflect management priorities for improving the coverage, quality and efficiency of health services.

**Box 2: Helpful questions for operationalizing an indicator**

- What are the sources of the data? (numerator and denominator)
- At what frequency should the numerator and denominator be collected?
- At what frequency should the indicator be processed and analysed?
- Who will actually make use of the indicator (determining the level of aggregation over time and space)?
- What is the target (objective) of the indicator that needs to be achieved?
- What is the threshold, the minimum or maximum value, of the indicator that should trigger an action?
- What will be the nature of the action (decision) once the indicator reaches the threshold?

**2.2.3 Essential data set (EDS)**

A minimum essential data set (EDS) is used to provide indicators that reflect the priority management information needs. An EDS usually contains about seventy indicators across all programmes. (Refer to Annex 1 for an example of an EDS.)

The examples in Box 1 illustrate that different kinds of decisions are required at different levels of the health system. All decision-making levels do not require all indicators. The amount of information needed at successive levels of the health system decreases from peripheral to central levels. An information pyramid is thus created (Figure 1), with the EDS being the minimum data necessary to flow through all levels to the central level.

Each level can add to the EDS the indicators they believe to be important at that level. The regional level can expand the national EDS and develop a regional data set (RDS) specific to regional needs. Facilities can in turn add further data elements to develop a facility data set (FDS) to suit their particular management needs. These additional elements may not be relevant at a higher level and are therefore not submitted to higher levels.

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Vertical programmes such as EPI, TB and HIV/AIDS can include relevant data elements within the EDS, and/or submit additional data that could be collected using surveys.

Surveys should be used to collect information that will complement the routine reporting. As some indicators do not change much over time, they do not need to be reported on monthly – they can be collected annually or quarterly through the use of surveys. Typical contents of a survey questionnaire would be questions about quality of care, availability of equipment, staffing and budget allocations. Surveys can be used creatively to strengthen health services – for example, it may be that in order to reduce the cost of surveys, a three year rolling plan is developed, ensuring that annually a third of all facilities are surveyed. Over the three year period all facilities are surveyed. A survey dataset would contain core information that is common to all the years, and additional information that could be changed from year to year, depending on the need.

2.2.4 Developing a HIS based on EDS indicators

The process of developing indicators should be done in conjunction with the making of strategic and operational plans. Important indicators include those that measure the coverage of critical services. Indicators should be chosen in such a way that they collectively provide an indication of the inputs, processes, outputs and outcomes of health interventions, i.e. indicators should be linked with a monitoring and evaluation framework. This will ensure that the data collected will inform the objectives of these plans. (Refer to Annex 2 for an example of a monitoring and evaluation framework with indicators.)
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The decision on the number of indicators to be collected should take into account the available resources at each level and should not overburden peripheral health workers with data collection.\textsuperscript{6}

If a decision is made to establish a new indicator-based dataset, an information audit is required. All registers, forms and reports previously completed and submitted by each level are assessed and the data elements on them are either included in the new dataset or discarded. Preferably, a single monthly reporting form for each level is created for submission to the next level.

A new dataset also requires the adaptation of old or the development of new data collection tools, e.g. registers, tally sheets, summary sheets. In order to avoid duplication and confusion, all previous registers/sheets/forms/reports should be discarded.

3. Introduction to health information systems

A HIS consists of an information process and the support structure that enables the process. The information process involves a cycle of obtaining data and turning the data into information that can be used for management decisions. The support structure includes human and technical resources. Improvements to the HIS require adequate attention to all three components of the system: human resources, technical resources and the information process.

3.1 Human resources

3.1.1 Staffing

A health information system must be able to respond to the needs of health services management. Thus, the HIS requires appropriately qualified personnel at all levels of the health system. HIS personnel include two categories: those involved in information technology (IT) support (usually at regional and national levels), and those involved in the information process at all levels. A health background is considered an advantage for staff in the latter group. At senior management level, the inclusion of staff with public health and/or epidemiology backgrounds in the HIS team can assist in optimising the use of health information.

Table 2: HIS staffing requirements

<table>
<thead>
<tr>
<th>Level</th>
<th>Position</th>
<th>Functions</th>
<th>Requirements</th>
<th>HIS Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health facility</td>
<td>Health workers</td>
<td>• Enter data into register books</td>
<td>Knowledge of basic principles of information systems (definitions of data elements; collection systems; data quality; use of information)</td>
<td>Part time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Complete tally sheets / summary forms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervisors</td>
<td></td>
<td>• Receive and check information</td>
<td>Knowledge of the above, plus analysis skills and an understanding of their role in reviewing, interpreting and acting upon locally relevant information</td>
<td>Part time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Pass information on to the next level</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Analyse relevant local information</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Act upon local information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data capturers (Can be located at this level or higher)</td>
<td></td>
<td>• Enter data into computer</td>
<td>Computer literacy Knowledge of basics of health information</td>
<td>Part time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ensure data quality</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Produce local reports</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional and national</td>
<td>Information officers</td>
<td>• Receive and process data (collate, analyse and prepare reports)</td>
<td>In-depth knowledge of information systems plus basic knowledge of health management information needs</td>
<td>Full time</td>
</tr>
<tr>
<td>Programme managers</td>
<td></td>
<td>• Advise on information needs</td>
<td>Knowledge of basic principles of information systems and use of information for programme management</td>
<td>Part time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Receive information for decision-making</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Present information at management meetings</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Act upon information received</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.1.2 Training
All management levels should use information for monitoring and evaluation of their programmes on a routine basis. Information then becomes the basis for management decision-making processes. If a culture of effective information use is to be achieved, staff at all levels require training and support.

Important training areas include:

- Awareness-raising among clinical staff and health managers of the role of health information in the delivery of effective health services
- Training of health managers in the interpretation and use of health information in management decision-making
- Training of HIS and health managers on the information process
- Training of health staff at all levels on the calculation, interpretation and use of indicators
- Training of HIS staff on use of the software
- Training of HIS IT support staff on hardware and software maintenance and problem solving

3.2 Technical resources
The technical resources supporting an information system must be appropriate to the context. In most developing countries, paper-based and computerised systems are combined to varying degrees, depending on the infrastructure and resources available.

3.2.1 Computer hardware
Annex 3 provides guidance on the appropriate hardware required to support a HIS in resource-constrained settings.

3.2.2 Computer software
Free and Open Source Software that has been tried and tested in other developing countries should be considered. This software must meet a number of criteria, summarized in Box 3:

**Box 3: Criteria for HIS software**

**Data capture:**
- Prevents the capture of duplicate datasets.
- Has validation checks that allocation of dates to data is consistent e.g. will not allow capture of data for December 2004 when it is only July 2004.
- Has various mechanisms for data validation.
- Adherence to basic principles of information systems
- Can be adapted by users to reflect the changing reality in the health sector. This includes changing facilities, adding new data elements and defining new indicators
- Is able to calculate indicators that use population as a denominator

**Reporting functions:**
- Reporting must be readily available to provide managers with real time data. Historical data is of little value if rapid responses to changing indicators are required.
- Can provide automatic reports to various organisational levels.

**Export/Import function:**
- Can automatically export data from lower levels for import at higher levels.

**Maintenance:**
- Can be locally supported.
3.3 The information process

"...Data do not speak for themselves..." (Albert Einstein)

The process of turning data into information for management decision-making is described using a conceptual framework called the information cycle.

Figure 2: The information cycle

3.3.1 Stages of the information cycle

Stage 1: Collection and collation

The data collected should be based on goals, target and indicators that monitor the current operational plans. All data elements used as numerator or denominator for indicators must have standardised definitions. Data collection sources must be identified and tools must be aligned to the essential dataset. Health service data should be collected from routine sources. If uniform data capturing tools are not developed, then the data captured at different sites is likely to have different meanings. Both manual and computerised data capturing processes require mechanisms (checks) that support good data quality. For example, manual systems can have simple double check procedures to ensure that arithmetic is correct and comparisons with previous data help to highlight unlikely entries. In computerised systems, a validation rule included in the software can be programmed to flash a warning when an unlikely figure is entered.
Stage 2: Processing

The data processing stage should also include various data quality checks and data validation processes. This ensures that when raw data are converted into information during the analysis phase, the resulting indicators are accurate and provide a true reflection of the situation they are intended to measure. If data quality is not assured, the other stages of the information process have little value.

Good quality data are defined as being:

- correct: the data are accurate, i.e. the numbers provided are what actually occurred.
- complete: all, or almost all, of the data have been collected from the available sources and reporting units have reported for each month they functioned.
- consistent: the data are stable and show no unexplained large variances.

At each level, analysis should be performed to determine the indicators relevant to that level. This helps to ensure that staff see the immediate relevance of data to their work situation, e.g. a clinic supervisor may note that the percentage of clients actually wanting HIV testing after pre-test counselling is very low. This may highlight a problem with the quality of counselling.

Stage 3: Presentation

Presentation involves compiling information into a format that is quickly and easily understood. After analysis, the information is presented as reports which emphasize indicators and include tables and graphs. Reports are essential in supporting the feedback process.

The establishment of a data flow policy is necessary to ensure appropriate flow of information and feedback. Data/information flow should occur vertically in both directions, i.e. upwards from facility through intermediate levels to national level and downwards from higher levels to facilities. A horizontal flow of information between role-players at each level is also important. Thus, feedback to facilities should include analysis of indicators for each facility or region as well as across facilities and regions. This allows for comparisons as well as providing an overall view of a situation. Reports must be regular and timely if the information is to be used to inform decision-making. Review of historical data is rarely of value, as the current trends may be quite different.

Stage 4: Use of Information

Information is used to support the management processes of planning, budgeting, operationalizing, monitoring and evaluation. Indicators reveal progress towards stated management targets and objectives. A culture of regular use of information must be developed through the production of regular reports, and the process of analysing these reports and acting upon them must be institutionalised as a monthly activity.

A simple evaluation tool has been developed for evaluating the use of information for management. This tool is described in Annex 4. The initiation of an evaluation exercise using this tool is helpful in raising awareness of the information process.
3.4 Characteristics of a good health information system

Characteristics of a good health information system include:

1. A dataset that is small, focused, integrated and relevant.
2. Definitions of all data items agreed by all stakeholders.
3. Simple tools, minimum overlap, useful, relevant, clearly laid out and effective.
4. Indicators that are relevant, agreed, valid, easy, sensitive and specific.
5. Indicators that link in with the national monitoring and evaluation framework for the health sector.
6. Flexibility to adapt to changing health information needs.
7. Analysis done locally by data gatherers themselves.
8. Presentation as graphs at meetings, in-service trainings and workshops.
9. Feedback is regular, focused and relevant.
10. Supervision is information-focused and supportive.
11. Teamwork is encouraged at all levels.
12. A close supportive relationship between HIS and management staff, particularly at senior levels.
13. Training in information use is ongoing and part of an overall “learning culture”.

4. Assessment methodology

Between April 2004 and July 2004, three visits were undertaken to Swaziland to conduct a situation analysis of the health information system. Assessment methods included:

- Key informant interviews: a wide variety of stakeholders was interviewed in order to obtain a range of perspectives on the status of HIS in the country.
- Assessment of data sources and data collection tools
- Assessment of the information process, including data flow within health facilities as well as from facility level through other levels of management
- Assessment of use of information by health management staff
- Review of MOHSW health information reports
- Review of previous consultancy reports

Annex 5 provides a list of institutions visited and individuals consulted in the preparation of this report.

The third assessment visit included two workshops where provisional assessment findings and recommendations were presented. The purpose of the workshops was to involve a broad base of stakeholders in the review of the findings and also to ensure that the report captured critical issues.

The first workshop was held with the staff of the Health Statistical Unit (HSU) and representatives from World Health Organisation and NERCHA. At this workshop the reports were presented and comments invited. Various suggestions were made and have been incorporated in this report.

The second workshop was held the following day and again included staff from the HSU as well as MOHSW senior management staff, various programme managers, hospital officials and regional representatives (approximately twenty participants in all). At this workshop, the assessment findings and recommendations as well as highlights from the OPD report were presented and extensively discussed both in plenary as well as in small group sessions. Again comments arising from this workshop have been included in this report.

The assessment team reviewed the following reports:
- Health Sector Study Phase 2 Report. Section 5.2.7 Health Management Information Systems. Undated. Author/source unknown.
- 1999/2000 Swaziland health information report (this was not a consultancy report, but a report produced by the HSU), as well as similar reports for the preceding years through to 1996.

Aspects of these reports are commented on in the findings section of this report.

The team was not able to obtain copies of the following reports/information:
- Consultancy report produced by the Italian Corporation – it appears that the original version could not be found even on the computers of the Italian Corporation, and staff at the Ministry did not have a hard copy of this report available;
- Information submitted as part of vertical reporting systems (HIV/AIDS and EPI Programmes);
5. **Assessment Findings**

The Swaziland health system consists of the following service delivery levels:
- Public Health Units (PHU) and clinics
- Health Centres
- Regional Hospitals
- Mbabane Government Hospital (central level)

PHUs provide preventative and promotive health services while clinics provide basic curative services. Health centers provide outpatient services and limited inpatient care. Regional and central hospitals provide outpatient and inpatient care and specialist services.

Health information reporting levels are:
- Health facility
- Regional office
- Health Statistical Unit in MOHSW

The process of developing a comprehensive monitoring and evaluation framework for Swaziland is currently at a formative stage. Most programmes have developed objectives and set some targets. However, these do not appear to have been included in the operational plans. No clear definitions of indicators or sources of data that would provide this information were available.

There are two main health datasets, the OPD dataset and the inpatient data set, each relying on a separate information process. The OPD dataset includes data related to outpatient visits at all facility levels. The inpatient dataset includes data from health centres and regional and central level hospitals.

### 5.1 Human resources

#### 5.1.1 Staffing

**National level**

The Health Statistical Unit (HSU), located in the MOHSW in Mbabane, is responsible for the HIS throughout the country. The HSU forms part of the Policy and Planning Directorate. Coordination with vertical programmes, e.g. TB, MCWH, EPI, appears to involve a supportive role rather than the provision of routine data for management purposes.

<table>
<thead>
<tr>
<th>Title</th>
<th>Individual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Statistician</td>
<td>Ms Nelisiwe Sikhosana</td>
</tr>
<tr>
<td>Assistant Statistician</td>
<td>Ms Nombulelo Dlamini</td>
</tr>
<tr>
<td>Statistical Clerk (also provides IT support)</td>
<td>Mr Ernest Mnisi</td>
</tr>
</tbody>
</table>

The following personnel provide assistance to the HSU:

- Data capturer – informal & on loan from another section: Ms Dudu Fakuze
- Data capturer – previously funded by NERCHA; now volunteer: Mr Cedco Dlamini
- Geographical Information Systems Malaria Specialist based in Manzini – provides occasional support: Mr Steven Campbell

Current HSU staff members are all from non-health backgrounds. The expectations placed upon this unit appear extremely diverse. According to HSU staff, it is expected that the HSU will:
• provide IT support to the MOHSW;
• collect and collate aggregate OPD data as well as individual inpatient data;
• provide routine reports informing management on health issues;
• be responsible for research activities; and
• provide input at meetings relating to health information systems.

The assessment team was unable to obtain copies of either the responsibilities of the HSU or the job descriptions of individual staff positions. It was therefore not possible to assess the formal role of the HSU.

• Regional level
Data capturers are situated in the regional offices. They are primarily responsible for capturing outpatient (OPD) data but also capture some inpatient data. The Italian Corporation has provided substantial support to the MOHSW in terms of assistance in developing the regional offices in each of the regions (mainly through the provision of computers and office equipment).

• Facility level
Data in peripheral facilities and hospital OPDs are collated by facility staff (the category differs from facility to facility, but includes nursing and clerical staff) and sent to the regional office. All hospitals have designated staff members that are, in theory, responsible for capturing in-patient data. This cadre of hospital staff has a myriad of other administrative functions. The capturing of inpatient data is seen as a lesser priority and is often passed up to another level. Supervision of these staff members is theoretically the responsibility of the hospital, but in reality the HSU tends to provide support and guidance.

Training
HIS training appears to have focused mainly on technical (IT) aspects. Staff from the HSU, regional offices and hospitals have been trained to capture either OPD or inpatient data. They have also been trained to use the Pivot tables, and on making changes to the computer programme.

Data capturers in hospitals and staff at regional units have received some training on the software currently in use. However, they seemed unsure of their ability to make any unsupervised changes. There was no manual available on how to change the programme.

Little training has been done on issues such as the need for linking health information to management, the development of indicators and the understanding of where information fits into a monitoring and evaluation framework for the country. Staff members in the HSU appeared unaware of what indicators could be calculated, or how to calculate and interpret indicators.

5.2 Technical resources

5.2.1 Computer hardware
The computers used for the HIS were found to vary in quality. Those located at the regional offices and at the HSU are considered reasonable for their current utilisation (Pentium 3 processors, hard drives of 10Gig and RAM of 256Mb). However, the computers used in the hospitals are generally inadequate HIS use. They have small hard drives, are still using Windows 98 and are generally not appropriate for the work required of them.

5.2.2 Computer software application
An Access-based computer software application, termed the "Ministry of Health Intranet", is used to capture both outpatient data and hospital inpatient data. The application was installed
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about three years previous to the assessment. The Annual Report for 2001/2 is the first attempt at a reporting process since the new Access database was installed.

Data capture is done on standalone computers. (Therefore, the term “intranet” is not quite accurate.) Although the data is captured on separate screens, it resides in the same data file. This is a hand-coded Microsoft Access application where the raw data is extracted into Excel Pivot tables.

Data is captured at regional offices and hospitals. HSU staff members drive from hospital to hospital and to regional offices to copy the relevant Access tables from each of the computers onto a floppy, as there is no automatic export/import function for updating the main database. In the HSU the data is then appended into the computers based at the HSU, either in the OPD dataset computer or the inpatient dataset computer. These data collection trips occur every two to three months.

Problems relating to the software application

The application was developed by a private contractor who is sporadically called in when problems occur. There is however no formal contractual arrangement to provide support. Some changes have been made since the programme was introduced three years ago. Examples of problems include programming issues and difficulties in resolving data discrepancies. Previously, DOS-based DBF files were used to capture the data. It was found that in some instances, while attempting to refresh the Pivot tables, the message ‘Pivot table invalid’ appeared. This implies that the Pivot Table cannot be refreshed and would suggest a break in the link between the database and the pivot table. The staff members on site were unsure of how to fix this problem, and it appears that little further training and development of staff has taken place on the software in use.

Several problems in the software became apparent when data analysis was attempted:

- Date formats differed at different capture sites, resulting in jumbled data formats and an inability to determine accurate information (e.g. month of visit, length of stay, admission and discharge dates);
- No data validation was carried out, allowing the capture of unrealistic values and values that differed markedly from trends in previous months;
- No mechanism was in place to ensure that the captured information reflected an event occurring prior to the date of data capture (e.g. data for December 2004 could be captured during April 2004);
- No function was available to allow captured data to be exported to the next level;
- No function was available to ensure that imported data does not duplicate existing data;
- Data were not converted into indicators;
- Few reports were produced from the database.

Software problems specific to the inpatient data set:

- As data capture is based on individual patients, much maternity data has been captured with details relating to birth weights, live and stillbirths and types of delivery. This could have proven useful for calculating various maternal health indicators like low birth weight rate, stillbirth rate, etc. However, an error in the computer programme relating to live births and stillbirths has caused potentially inaccurate data. All live births, by default (computer programming error) have a macerated stillbirth recorded. This was only discovered when the data analysis process was started. The default option for stillbirths is a macerated fetus as opposed to a fresh stillbirth. The resulting data has some 60% of the stillbirths as macerated which is considered too high to be accurate. These issues have rendered this potentially valuable source of information to be of dubious quality.
- Of the 150,000 inpatient records, some 4,320 had discharge dates prior to the admission dates. For example, an admission date of 6 July 2002 is read by the computer as 2002/07/06; the computer discharge date is 2002/06/28 which reads as 28 June 2002. The corrected admission date could be assumed to be 7 June 2002. This would read as 2002/06/07, i.e. no blocks were included in the system to prevent incorrect entries.
Large numbers of patients were found to have lengths of stay in excess of 300 days; some ten patient records had a length of stay of 8000 days; some patients had been or will be discharged in 2024.

Due to incorrect computer settings, some patients have admission and discharge dates recorded as hours, minutes and seconds instead of dates.

Many of these data errors can be related to confusion between the day and the month when using a date setting that starts with a year as described above. Other problems arise when the month of data capture for a specific discharge form is January 2001 but the actual admission and discharge date is July 2001, some six months ahead of the data capture.

Problems of the above nature point to suboptimal computer programming and a failure to put various blocks in place which prevent such gross errors from arising when data capture staff make incorrect entries. These problems unfortunately have the potential to make any analysis and use of the dataset problematic.

5.3 **The information process**

The conceptual framework used for the assessment of the HIS in Swaziland is based on the “Information Cycle”. Although this framework is not yet instituted in Swaziland, it provides a reference to aid understanding of the system and to highlight areas for improvement. The information cycles for OPD data and inpatient data will be described separately.

5.3.1 **The outpatient (OPD) information process**

**Stage 1: Collection and Collation**

**Data collection**

OPD data is collected from 190 facilities on a monthly basis.

**PHUs and clinics**

There is a long-established, well-functioning data collection mechanism, using various tally sheets to record the various types of clients seen and the services provided. Tally sheets and summary forms are supplied in pre-printed books. There is provision for morbidity, family planning, immunisation, child health and antenatal care data with clear guidelines and generally well-defined data elements. The summary sheets require a maximum of 160 fields to be completed per month. On-site inspections revealed carefully kept tally sheets and copies of the summary forms that have been sent to the next level. The summary forms are submitted monthly to the regional office by the clinic supervisor.

**Areas identified for improvement include:**

- No monthly headcount is calculated. Data is collected per activity and one patient could be seen at numerous points during the same visit.
- It was not clear whether or not any data quality checks are applied before submission of the summary form.
- The tally sheets and summary forms appear to have been last revised in 1990. The data set collected has thus not been adapted to reflect the new and evolving health situation. For example, the term “Genital Disorders”, should have been replaced by the current internationally accepted term “Sexually Transmitted Infection”. Although HIV/AIDS is a recognised health priority, the HIS has not been adapted to include HIV/AIDS-related data elements.
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- No provision is made in the data collection tools for facilities and regions to include additional data elements that they would like to collect at that level.

**Hospital Outpatients**

OPD data from regional hospitals is collated on a monthly basis and sent to the regional office for capturing. The Mbabane Government Hospital however does not submit any monthly OPD data. (The reason is not apparent.) A visit to the Mbabane Government Hospital OPD department involves going through an admission process to get a folder, after which patients are referred to a specialty area (i.e. Sexually Transmitted Infections; Dermatology; General OPD; Paediatric OPD, etc.) In the various specialty consulting rooms, data is collected in registers. These registers aggregate the patient data at the end of the year in order to provide a yearly report of activity per specialty area. The data collection process is satisfactory but the reporting processes are problematic with no monthly data being submitted for capture. The gap in the data from Mbabane Government Hospital is substantial because of its high patient load.

**Other programme specific information systems**

Vertical programmes, such as EPI and Reproductive Health, have implemented parallel information processes and data flows in order to obtain information needed for programme management. This situation has developed because the existing HIS does not adequately cater to their specific information needs. These separate data collection processes are controlled by each of the programmes and not known or supported by the HSU. The assessment team was unable to access any of the data collected by these parallel systems and therefore cannot comment on the data or the information systems.

**Data collation**

The monthly aggregated OPD data per facility is entered in the computer by data entry clerks at regional data capture sites. All data have to be entered twice, i.e. all the data are entered for the facility and then entered a second time before final acceptance by the computer programme. This process is an attempt to help ensure that the figures provided on the summary sheets are captured correctly. However, it makes the assumption that the figures submitted on paper are correct. Staff members verbalised their frustration with this cumbersome process, particularly if they were working on old small computers, i.e. little RAM, small processing capacity and small hard drives. At the time of the visit (May 2004) to the Hhohho regional data capture office (at the Mbabane Public Health Unit), data for March 2004 was in the process of being captured. This reflects that timeliness of reporting of the OPD dataset is possible. However, one of the regions was a year behind with data capture and had sent three months of forms away for capture at the Mbabane Public Health Unit.

Areas identified for improvement include:

- Duplicate datasets exist. i.e. the same data for the same facility had been entered twice and in some cases up to ten times.
- The programme allows for data to be captured for future months, e.g. for some facilities, data had already been captured for December 2004. Furthermore, it was not possible to determine the true period reflected by this data and therefore not possible to immediately correct the problem.

**Stage 2: Processing**

No further quality checks or validation are performed. A number of problems were uncovered related to the quality of the OPD data set. These are detailed in Annex 6.

After data capture, the raw data is exported and refreshed on the Excel Pivot tables. Analysis of the raw data is done once the data is in Excel. An assessment of the extent to which data analysis is performed at each level revealed the following:
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- National level: Review of the previous annual reports revealed limited analysis from a public health perspective. Population-based indicators to assess coverage or utilisation rates were not included in the reports. These reports also indicate that the data is incomplete, and this limits the ability to interpret trends.
- Regional level: Review of a regional report showed that no analysis of any OPD datasets was included. (The assessment team was unable to obtain a copy of this report, nor spend much time assessing it, and so are unable to comment further.)
- Facility level: The staff interviewed at facility level were unaware of any analysis occurring at that level.

Stage 3: Presentation

Table 4: Reporting at various levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Type or report/analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>National</td>
<td>Mainly annual reports. The annual reports for 1996, 1997, 1998 and the combined report for 1999 and 2000 were available. The OPD dataset is presented in the same report as the hospital inpatient dataset, so that although the OPD data may be available, no reports are produced until the hospital dataset is completed. No other routine reports were available.</td>
</tr>
<tr>
<td>Regional</td>
<td>At a regional data capture site, copies of raw data reports (i.e. no analysis done) are printed and sent back to facilities.</td>
</tr>
<tr>
<td>Facility</td>
<td>Monthly summary forms are submitted to the regional offices.</td>
</tr>
</tbody>
</table>

The Annual Report for 2001/2 is the first attempt at a reporting process since the new Access database was installed.

The annual reports are required to present both outpatient and inpatient data. Delays in processing the inpatient dataset therefore limit the availability of outpatient information.

As no interim reports are produced on a regular basis, managers do not have access to up-to-date information and are dependant on annual reports, which are delayed.

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8 Coverage – are we seeing everyone we should be seeing? Utilisation – what percentage of the population is accessing our services?
Flow of Information and feedback

Figure 3: Data flow in MOHSW - OPD

The flow of information appears to be mainly in one direction, from the facilities to the regional offices to the HSU office. Visits to various facilities and discussions with senior health service management, including the Director of District Health Services and the Deputy Director of District Health Services, revealed a need for feedback, in relation to both service management and public health issues.

Stage 4: Use of Information

Due to time constraints, the assessment team was unable to interview many programme managers. However, senior reproductive health programme staff were interviewed. The discussions highlighted a significant need for information based on routine data which could be used by different management levels.

5.3.2 The inpatient information process

The information cycle was assessed in the Mbabane Government Hospital, as well as in the Mankayane, Raleigh Fitkin Memorial and Good Shepherd Hospitals. This provided insights into the inpatient information systems at both national and regional levels.

Stage 1: Collection and Collation

The ward discharge procedure includes the completion of an Admission and Discharge form (Refer to Annex 7). Both copies are placed in the patient’s folder. After discharge the patient takes the folder to the Admission section where the hospitalisation costs are paid. The folder then goes to Medical Records where the top copy of the Admission and Discharge form is removed.
In the case of Mbabane Government Hospital, the top copy is sent to the Health Statistical Unit (national office), where the data is captured. In the case of other hospitals, the top copy is submitted to the Statistical Office in each hospital. At Raleigh Fitkin Memorial Hospital the Statistical Officer estimates that she only receives 50% of the forms. The rest just never arrive. At Good Shepherd Hospital about 80% of the forms arrive. At Dvokolwako Health Centre, the Statistical Officer believes that she has collected every form. (As this is a small institution with 33 beds, this is possible.)

Discussions with staff members at the Admissions and Medical Records sections revealed that some folders may not reach Medical Records. The number of forms lost is difficult to estimate, but some staff estimate the amount at thirty to forty percent.

**Reasons for loss of forms include:**

- Time constraints and pressures on staff in the wards prevent them from completing the form at time of discharge;
- Maternity clients ask ward staff to retain the folders and forms as they will collect them later in order to pay hospitalisation fees. However, the patients almost never return, resulting in the forms not being forwarded for data capturing;
- If the form is incomplete, unclear or there is uncertainty about the coding to be used, the form may be returned to the ward, but is almost never sent back to Medical Records again.

**Figure 4: Sites where loss of forms may occur**

**Data capture process**

Most hospitals have assigned staff members to capture the data on a part time basis. As this data is not seen as important for the hospital functioning, there is no pressure to complete the data capture process as quickly as possible after patient discharge, resulting in an accumulation of forms waiting to be entered. Regional HSU staff are then requested to come and remove the forms to capture the data themselves. (The staff in the regional hospitals appointed to capture this data are seen as belonging to HSU, with the HSU being responsible for all the issues relating to these data capturers.)

NERCHA recently provided funding for four data capturers for three months in order to get the data capture up to date. Although substantial progress has been made with capturing the outstanding data, the existing system cannot be sustained with existing resources.
If all the necessary sections of the form have been completed, the actual data capture process is quite quick, with each form taking about one to two minutes to enter. However, old slow computers make this process much slower. Furthermore, a number of problems relating to data capture were identified:

- In order to capture the forms, the data capture staff must identify a discharge diagnosis code based on WHO ICD 10 coding lists.
- If the diagnosis section of the form does not contain a diagnosis but instead has a list of symptoms like cough and fever, the form cannot be coded.
- If the form is sent back for a diagnosis, it is almost never returned for coding and capture.
- The staff doing the coding are unable to access the correct codes for diarrhoea and gastro from the WHO ICD 10 coding options.
- Coding is not done or provided by health staff, but by the data capturer or the statistician. Issues of understanding the abbreviations and the medical technology used and deciphering the handwriting, may lead to incorrect coding and thus potentially inaccurate data capture, e.g. if data capture staff do not understand a diagnosis, they may capture it as “unknown”.
- Some forms are missing certain information, e.g. sex, diagnosis. Missing information is captured as “unknown”.
- There are a number of computer software-related problems associated with inpatient data capture. These have been described in section 5.2.

Some hospitals are using parallel systems to collect data in order to calculate bed occupancy and average length of stay. These systems are considered simpler, more user-friendly and more accurate than the national system.

**Stage 2: Processing**

As not all inpatient data is captured, any information produced through analysis is based only on available data. As the missing data have not been quantified, reports produced do not reflect the reality and cannot be used to accurately quantify incidence rates, admission rates or death rates.

Similarly, reported bed occupancy rates do not reflect the reality, due to the missing forms. In addition, the bed numbers used for calculating bed occupancy rates are unknown at the time of data collection. When writing the annual report, the hospitals are contacted in order to ascertain their current bed numbers. However, the information being reported on originated some 2 – 3 years ago when bed numbers could have been different, thus further affecting the validity of the resulting rates.

Hospitals appear to have developed parallel systems which they use to calculate various performance indicators. As the definitions of these indicators are potentially not standardised, the information provided may not be comparable across the country.

**Stage 3: Presentation**
Similar to the dataflow in OPD, the flow of inpatient data is also one-way, from lower to upper levels, without any mechanisms for feedback.

The inpatient data is presented in the national annual report and provides information on admissions, case fatality rates, reasons for admissions, causes of deaths, etc. Some information relating to bed occupancy and average length of stay is also provided.

As noted previously, the last annual report providing inpatient and OPD data was a combined report for the years 1999 and 2000. Interim reports were not available.

An encouraging finding was that some hospital statistical officers had made graphs indicating admissions and deaths in their hospitals and displayed them on the office walls. These graphs were produced from the Excel Pivot tables. The staff indicated that they were not asked to produce any reports from this system on a routine basis, but that at the end of the year there was a request for data for the annual report. There were also requests from doctors for reports on specific diagnostic categories.

Some hospitals generate a monthly report giving admissions, deaths, births, average length of stay, bed occupancy, etc. This is obtained by going from ward to ward to inspect the registers. The data on the admission and discharge sheets should be providing this information, but as the data capture process is not up to date, parallel systems have developed to collect information for hospital management. In some hospitals a midnight bed status report is collected which can provide a summary at the end of the month of various patient activities. No correlation is made between the actual number of patients that went through the hospital and the number of Admission and Discharge sheets received and sent for data capture.

Stage 4: Use of Information

| Regular review of data | Relate to operational plans | Maintain service coverage & quality |

It was difficult to determine whether hospital information was used by management, or, if they did use information based on hospital activity, what the source of this information was.
6. Recommendations

A good HIS is crucial to the functioning of a health system. However, the HIS of Swaziland, like those in many other developing countries, faces various constraints. To address this problem, the followings are recommended:

The recommendations focus on making optimal use of existing resources through:

- Strengthening existing systems and processes where appropriate;
- Building capacity amongst staff currently employed in the public sector so as to ensure the development of institutional knowledge on information systems;
- Building on existing networks with NGO's and tertiary institutions as partners of government

A health information systems policy incorporating human resources, technical resources and the information process will form the basis of the health information system. The recommendations aim to provide guidelines for implementation within a policy framework.

The aim of any intervention in the information system must be to provide managers at all levels (facility, regional office, and ministry of health) with relevant, timely, and quality information with which they can monitor the implementation of health services and programmes, and use to inform their decision-making. The recommendations are formulated with this aim in mind. This section is divided into five subsections:

- The first subsection identifies the foundations that need to be laid for the information system;
- The next three subsections provide specific recommendations for each of the three components of the system: human resources, technical resources and the information process.
- The final subsection summarises the action steps required.

6.1 Laying the foundations of the information system:

There are three main considerations in laying the foundations of a health information system:

- Developing an essential dataset;
- Developing an information/data flow policy;
- Creating a culture of information use within the organisation.

6.1.1 Developing an essential dataset:

While Swaziland is collecting data, the type of data being collected should be reviewed to ensure that it addresses the information needs of managers, and is aligned with operational plans and departmental objectives. Key issues here are to ensure that:

- All programmes and programme managers, including NGO’s, buy into the creation of an essential dataset. The aim is to develop an integrated EDS that addresses the needs of all managers and programmes;
- The data set identifies indicators used by programme managers to measure the implementation of their objectives and action plans. This will ensure that information collected is relevant to the needs of programme managers;
- The dataset is limited to about 100-120 indicators;
- The dataset is reviewed from time to time, enabling the dataset to develop over time in response to the changing needs of managers;
- The indicators to be reported on are applicable to all facilities within the health service;
- Managers at each level in the hierarchy can add indicators that are considered important for their particular management purposes.
An example of an essential dataset is included in Annex 1.

The development of an EDS does not preclude having other information systems with specialised functions. Epidemiological surveillance systems may still be required – these generally require data with which the patient can be identified (name, address, age, contacts, etc.) and an anonymised routine reporting system cannot support this need. In addition, other systems are needed which provide detailed, or specialist information, to specific groups (for example, a human resource payment or accounting system). In these cases, it is often advisable to support the development of such systems, but to develop interfaces so that subsets of data can be transferred from the specialist system to the routine reporting system, e.g. the number of cases of Acute Flaccid Paralysis (AFP) reported on a monthly basis from regions.

The functioning of the various components of the integrated HIS should be coordinated by the HSU, whose role it is to ensure that duplicate systems are not developed and that all systems meet the criteria set by the MOHSW.

Another important point is to utilise survey methods and introduce sentinel surveillance sites as mechanisms to complement routine data. These tools allow the EDS to be kept small, yet allow programme managers to obtain detailed information to address their programmatic needs.

Population (census) data is required to enable the calculation of certain coverage indicators. While some of this data is already available, it will require some time to adjust the data to a format which matches the arrangement of reporting units.

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**Developing an essential dataset requires the following steps:**

1. Evaluate existing departmental objectives and operational plans;
2. Review reporting requirements for vertical programmes and NGO’s;
3. Assess managerial needs at each level of the health service (facilities, region, and ministry);
4. Use the above information to compile a draft essential dataset for the country;
5. Define the extent to which surveys and sentinel surveillance sites will be used to complement the EDS;
6. Identify mechanisms to include population (census) data in the system to provide certain denominator data;
7. Convene a stakeholder workshop to ratify the proposed essential dataset.

Once the EDS has been developed, appropriate data collection tools and reporting formats can be developed (see below). While it is understood that a process of revising data collection tools and data elements has already taken place, this was not done using a set of indicators as the basis.

**6.1.2 Developing an information/data flow policy:**

An important requirement for an efficient information system is adherence to reporting timelines. A data flow policy is required to clearly articulate the requirements of the information system: what information is required, from whom, and by when. It should also articulate the feedback process, ensuring that comparisons are provided so that facilities/regions can assess their performance in relation to the rest of the health service.

Annex 8 provides an example of a data flow policy developed for the Eastern Cape Hospitals, and one that was developed for the PHC services in the Eastern Cape Province. It is suggested that these be used as a framework for developing a data flow policy for Swaziland. Note that the
steps in the information cycle differ somewhat between hospitals and PHC services, hence the need for two different policies.

**Developing the data flow policy requires the following steps:**

1. Obtain agreement on the use of the formats in Annex 8;
2. Adjust the data flow policy to reflect the Swaziland information system so that a draft data flow policy is developed. The data flows described should include other vertical reporting systems (surveillance data, for example);
3. Obtain agreement from stakeholders on the draft data flow policy;
4. Ratify the data flow policy and circulate it amongst stakeholders and service providers.

Note that the policy for hospitals may take longer to develop as the recommendations (see below) propose intense re-thinking of the information system in use in hospitals, and clarity on this process is required before the data flow policy is developed.

**6.1.3 Creating a culture of information use within the organisation:**

Managers are using available information to some extent within the organisation. These practices can be strengthened by senior managers demonstrating their use of reliable and accurate information to inform their decision-making. The creation of a culture of information use will take time. However, the above steps will demonstrate the importance that senior management places on timely and accurate information.

**To emphasise the central role that information plays in decision-making, the following steps are suggested:**

1. Ensure that standard reports are provided to the Head of Department on a monthly basis;
2. Conduct information reviews on a quarterly basis. Reviews of this nature would require regions to present and discuss the information “in the system” before a panel of reviewers (senior managers, and representatives from academia and NGO’s). A process of this nature rapidly demonstrates to health workers the importance that senior management places on information, enables managers to gauge the quality of services in a short period of time, and is a very powerful platform for learning through peer review.

**6.2 Human Resources**

**6.2.1 Staffing**

The current HSU staff complement performs admirably in the face of high expectations and significant challenges. However, the current skills mix within the HSU is not optimal for the tasks required of the unit. The unit is expected to provide both IT support and HIS support. In addition, the HSU must act as a focal point in the MOHSW to accept information from the reporting units, and to collate the data to produce a national dataset. The national dataset needs to be made available to managers in the MOHSW so that they can extract the information that is relevant to them. The skills requirements for staff performing these functions differ. The workload at the HSU is unrealistic, with staff expected to provide support and
guidance beyond their fields of expertise. There are no dedicated IT staff members that can provide support to the HSU or to the regional offices and hospitals. The absence of team members with a health background in the HSU at national and regional levels may also limit the ability of the unit to provide optimum support in terms of guiding the information requirements at various levels of the health system and in providing relevant reports using the existing datasets.

A further challenge to staff is the lack of clearly defined roles and responsibilities, e.g. the relationship of the staff responsible for data capture at the regional and hospital levels with the HSU appears to be uncertain.

The following steps are recommended:

At Ministry of Health and Social Welfare level:

1. Establish a clear vision and mission for the HSU. This should include clarification of roles in terms of HIS support, particularly in providing information to programme managers, and feedback to regions/reporting units;

2. Establish a clear distinction between IT support and HIS support: create a separate, dedicated IT team at Ministry level;

3. Define the expectations, staffing norms, functioning and relationships, job descriptions and responsibilities, and training of HIS staff at each level of the health system (Annex 9 provides an example of a job description for a district/regional information officer).

4. The status of the unit in the MOHSW should also reflect the importance of health information in the delivery of good quality health services. Increasingly, HIS support staff report directly to the head of department, reflecting the increased emphasis on use of information to inform decision making.

5. Rename the HSU to the Health Information Systems Support Unit in order to reflect the broader role of the unit than merely the collection of statistics.

At health facility level:

1. Ensure responsibility is allocated to staff as part of other responsibilities at PHUs and clinics. In these facilities the role of ensuring that data is collected accurately and communicated to the next level in a timely way, can be integrated into the job description of a senior staff member in the unit. For example, the professional nurse in charge of a clinic could have this responsibility included in their job description.

2. Identify staff to be dedicated “Information Officers” at larger hospitals and regional offices. At hospital level, the task of coordinating information flows and ensuring quality is a more full-time responsibility than in clinics. While technical support should be provided by the HSU, hospital information officers should be accountable to hospital management.
6.2.2 Training

There is an encouraging awareness within the MOHSW of the need to move toward using indicators for the monitoring and evaluation of health services. HIS staff at all levels will thus benefit from training to refine their skills in the calculation and interpretation of indicators.

During the initial stages of strengthening the HIS (certainly for the first two years), the hiring of a full-time HIS technical advisor to support the HSU should be considered.

The establishment of a core group of staff with HIS skills who will ultimately train and support others is essential to ensure sustainability. The development of linkages with a formal tertiary level teaching institution, e.g. a technicon or university, will also help ensure ongoing support and build sustainability.

Training may include a series of one week courses/workshops at various levels (refer to Table 5).

### Table 5. Possible topics for short courses

<table>
<thead>
<tr>
<th>Level</th>
<th>Types of courses that might be provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ministry</td>
<td>Using Information for management of health services</td>
</tr>
<tr>
<td></td>
<td>Refinement of operational plans to include the use of routine indicators</td>
</tr>
<tr>
<td></td>
<td>Interpretation and use of Information</td>
</tr>
<tr>
<td>HSU</td>
<td>Using Information for management of health services</td>
</tr>
<tr>
<td></td>
<td>Use of software (basic, intermediate, advanced)</td>
</tr>
<tr>
<td>Regional Offices</td>
<td>Using information for management of health services</td>
</tr>
<tr>
<td></td>
<td>Use of software (basic, intermediate, advanced)</td>
</tr>
<tr>
<td>Hospitals/health centers</td>
<td>Using information for management of hospital services</td>
</tr>
<tr>
<td></td>
<td>Use of software (basic, intermediate, advanced)</td>
</tr>
<tr>
<td>Clinics/PHUs</td>
<td>Using information for local management of health services</td>
</tr>
</tbody>
</table>

Ongoing in-service training and support are crucial to support staff in making optimal use of newly acquired skills.

The following issues should be considered for developing a training plan:

1. Identification of a partner in a tertiary institution or NGO to assist and support the MoHSW in developing and implementing a sustainable training plan;
2. Identification of who needs training;
3. Clarification of course content for each cadre;
4. Quantification of the training needs at each level (numbers of staff, likely duration of training, implications of this in terms of absence from workplace, cost of training, etc);
5. Who will fund the training?
6. Who will do the training at various levels?
7. When and where will training take place?

6.3 Technical resources

The small and old computers used at regional and hospital levels result in data capture being a slow and frustrating process, which is demotivating to data capture staff. The computer software contains a number of serious flaws and is considered inadequate for the task required.
Numerous comments were heard about the frustration of working with the software and the lack of support when problems occur.

6.3.1 Computer Hardware
A policy should be developed which ensures that a certain number of computers are purchased on a regular basis, e.g. annually, so that replacement of out-dated equipment takes place on a rotational basis.

Developing a policy to provide appropriate computer hardware:
A policy detailing how the MOHSW will maintain an adequate standard of hardware for its services is required. This should spell out a plan which is practical and affordable, and ensures that computers of an acceptable standard are purchased to replace outdated equipment.

Annex 3 provides recommendations on hardware appropriate for health information systems.

6.3.2 Computer Software
The current software application contains significant problems. The discussion and recommendations that follow should be considered for both the inpatient as well as the outpatient datasets and information systems. In order to meet the standards suggested in Box 3, section 3.2.2 (Criteria for HIS software), there are two options:

- Invest a significant amount of time and financial resources in the existing system to get the programming adjusted to meet the criteria listed; or
- Obtain a free and open source system that has been developed and tested in other sites, and which can be adapted at relatively little cost to the Swaziland context. An example of such a system is the DHIS. This is an Access-based (programmed in VBA) programme developed for use in the PHC setting and has been adapted to accommodate the hospital setting. It is a simple system that has been shown to work in resource-constrained settings. The system is affordable, the only requirements being one computer, with MS-Office (with MS-Access), and some training and initial support. The software is adaptable in terms of determining the reporting units, developing data elements and indicators, validation rules, etc. It can thus be customised to suit an individual hospital's needs. The DHIS software programme allows data from the various reporting units to be entered and then uses reporting tools to present the aggregated data in different ways. (There are two reporting tools, Excel pivot tables and a built-in report generator.) For example, the paediatric ward data from multiple paediatric wards could be aggregated to provide an overview for the paediatric department. In the case of less specialised hospitals, all the data from all the wards could be aggregated to provide an overview for the entire hospital. Furthermore, the DHIS allows the addition of modules to meet the needs of vertical programs, e.g. HIV/AIDS. Annex 10 provides a more detailed description of the DHIS.

The HISP has adopted the approach of gradually building up a system from the bottom, and building on existing systems. The intention is to encourage the development of small software programmes in individual units, based on need as well as the availability of programmes/software/hardware, while at the same time finding ways of ensuring that data from these smaller systems are integrated into the broader “Health Information System”. It is envisaged that, as the system develops, it will include increasingly complex data related to service delivery, transport, personnel and financial datasets.
The software needs of the in and out-patient systems are discussed in detail in the following sections.

### 6.4 The information process

The outpatient information system functions better than the inpatient system and will provide a good basis to start strengthening the HIS. The inpatient system contains serious constraints and is not sustainable in its current form.

Irrespective of which software application is selected, a developmental approach should be adopted to the establishment of information systems in the PHC and hospital sectors. The approach involves beginning with simple systems and gradually increasing the level of complexity as the need arises and as resources become available. In the beginning, the most important task is to ensure that some simple paper-based data collection systems are in place in all the reporting units. A reporting unit can be a ward, an out-patient clinic, a transport office, a pharmacy outlet, etc. Each unit uses a register to collect the data. Based on the register, aggregated data is collated on a monthly reporting form. This form is then submitted to a central unit, from where it is entered into the software programme.

Recommendations relevant to both outpatient and inpatient systems are listed below. Key to these is the implementation of the recommendations listed in section 6.1 (Laying the foundations of the information system):

- “Outpatient” and “inpatient” information should be available in separate reports, so that delays in reporting of one section do not delay availability of the other section. (In general they target different managerial groups, and should be directed at the specific needs of managers).
- Data collection tools must be aligned with the EDS and the required reporting formats.
- Mechanisms should be developed for the production of routine feedback to all providers and users of information. Feedback reports differ in their detail and format. Basic feedback reports should be made available to managers on a monthly basis, while more detailed comparisons and feedback reports should be available on at least a quarterly basis.
- Efforts should be made to encourage active support from different role players, including NGOs, for changes and improved implementation of the HIS to support a standard monitoring and evaluation framework. The development of parallel systems should be discouraged.
• For the present, efforts should be directed at improving the system, rather than attempting to produce reports which are out of date and potentially unreliable.

6.4.1 The outpatient (OPD) information process

The OPD information system contains a well-established and well-used set of data collection tools and collation systems. Data capture happens within a reasonable timeframe in at least some of the regional data capture sites, with staff displaying skill and commitment. The use of pivot tables to create graphs is also an encouraging sign of interest in and insight into the information process. A culture of information management is thus already in place and forms a strong foundation for improving the existing system.

For outpatient (primary health care) information, the use of the term “PHC information system” may help to create a new mindset that moves away from collecting ‘stats’ to collecting health data that provides relevant and useful health information.

The recommended actions are described in the box below:

<table>
<thead>
<tr>
<th>Suggested steps towards a PHC service information system:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Review the EDS to reflect programme objectives and operational plans.</td>
</tr>
<tr>
<td>2. Define data sources and develop data collection tools.</td>
</tr>
<tr>
<td>3. Define data quality checks that should be applied by supervisors.</td>
</tr>
<tr>
<td>4. Develop data processing and data transmission procedures.</td>
</tr>
<tr>
<td>5. Develop systems to ensure the use of information.</td>
</tr>
</tbody>
</table>

These steps are discussed in detail in the following box:
6.4.2 The inpatient information process

The current system has been in place for many years and is well accepted. Again, a culture of information collection is in place, which provides an important basis for strengthening the information system.

Given existing human resources, effective functioning of the current system is not sustainable. Correction of many of the problems identified will require significant changes to the existing system as well as additional human resources.

Data collection and collation:

The provision of necessary information to managers in a timely manner is not negotiable – it is the basic requirement for any hospital management team.

The current inpatient information process is based on individual patient data and is an epidemiological surveillance information system rather than a health services information system. It is suggested that this system be reviewed, and a system developed which addresses the needs of both facility managers and programme managers (including epidemiological surveillance needs).

1. Routine reporting systems:

Managers requiring information to address their management needs must have timely information available on a regular basis. Within seven days of the end of the reporting period, they should be able to create a report which provides the following:

- bed occupancy rate,
- average length of stay.
HIS Report Swaziland

- admission/discharge and death rate, and
- certain information from specific services:
  - maternity: number of deliveries, still birth rate, caesarean section rate, maternal death rate, etc;
  - paediatrics: death rates from various paediatric units (nursery, neonatal intensive care, paediatrics ward) and for age groups (early neonatal, late neonatal, under five).

It is suggested that in order to gather this information efficiently, anonymised and aggregated information is needed from the wards.

2. Disease surveillance reports

In addition to aggregated routine information, the MOHSW will need to be informed urgently of admissions of patients with conditions having public health importance (cholera, measles, typhoid in particular). In order to alert the MOHSW of these conditions, a reporting format including patient details is required. This type of reporting (disease surveillance) is event triggered (admission and diagnosis), and must be separated from the routine reporting system.

3. Data collection and collation systems for in-patients:

The way in which information is collected is negotiable. In terms of information systems for hospitals, a wide variety of options exists, from entirely paper-based to entirely electronic systems. From a practical point of view, the electronic systems are generally sophisticated and costly, are less likely to provide information in a short period of time, and require high maintenance costs. The paper-based systems are less sophisticated, cheap, require lower maintenance costs and are likely to reveal results in a short period of time. A realistic solution for Swaziland will probably lie somewhere between these extremes.

In order to address these key aspects, three options are suggested for strengthening the inpatient information system.

Option 1: Introducing paper-based data collection tools and the DHIS software at hospital level:

The HIS Report recommends the implementation of a system of collecting aggregated data from reporting units using tick registers (or a similar tool) on a monthly basis as discussed above. Data from monthly reports would be entered into the software programme at the hospital management level on a monthly basis. The system will allow the calculation of various indicators such as bed occupancy rates, average length of stay, death rates and several maternal health indicators on a comparable basis across the country as a matter of routine and in a timely, organised manner. It will facilitate the transmission of information upwards through the hierarchy to the MOHSW. As an initial step to facilitate the process, the HIS Report recommends the installation of the DHIS for hospitals on at least one computer in each hospital.

Option 2: Improving the existing system:

This option, the less preferred option, requires upgrading of the existing system, including:

- Improvement of the flow of data so that ALL admission and discharge sheets are captured;
- Ensuring that data capture is completed by the 15th of the following month;
- Exporting the data to the MOHSW level; and
- Production of quarterly reports.

Improvement of the existing system also requires the following:

Data collection...
At the change-over of each shift, a check list must be developed that accounts for all discharges and deaths during the shift. This list is then tallied with the number of Admission and Discharge Forms to ensure that all the forms are obtained. The person in charge of the shift is also responsible for ensuring that the forms are completed with all the necessary details and signs off that this had been done. These details include age, sex, correct diagnosis and admission number. This can only work if sufficient staff are available to complete all the required administrative procedures. This process also implies a de-linking of the completion and submission of the Admission and Discharge forms to payment procedures, which removes the request not to complete the form in order to avoid payment.

Coding of the forms
Improving the system in this aspect is challenging. The process of improving the system at ward level may result in some improvement, but problems may still be experienced with handwriting, unclear diagnosis, etc. The employment of staff with an in-depth understanding of WHO ICD 10 coding may solve some of the problems or alternatively a restricted list of codes could be utilised.

Data capture
The investigation of free and open source software to replace the existing computer software application is suggested. Failing that, the correction of the worst of the faults needs urgent attention. Attention must be given to the date setting of computers used to capture the data. There is a need for an automatic export/import module so that data can be exported from regions and hospitals and imported at the HSU. Included in the export detail needs to be the number of hospital beds so that bed occupancy can be calculated based on the correct number of beds. The development of a module to handle the calculation of indicators is also recommended.

The above depend upon having sufficient staff available to capture this data. The hospital CEO is responsible for ensuring that there are staff members available for data capture and that all data capture is done in a timely fashion. No forms should be sent up to the next level ‘because there is no one to capture the data at the hospital’.

Option 3: Introducing an electronic patient record system:
This option is the least likely to address the needs of the MOHSW, is expensive in terms of technical requirements, and likely to take a long time to implement. It is mentioned here for the sake of completeness. If this option is considered, the HISP advocates exploring options amongst free and open source software systems. These systems are less costly than proprietary systems, and the user is able to draw on development and improvements from a global pool of programmers without any maintenance costs. They will generally require extensive computerisation and networks, and fairly intense programming support to enable customisation of systems to local circumstances. Examples include :
- Littlefish http://sourceforge.net/projects/resmedicinae/

Data processing
Two main areas of support required here, but they are interrelated:
Report formats need to be developed once the data collection and collation systems have been implemented. The development of basic monthly and quarterly reports is recommended. These reports could provide information for management on admission and death rates, length of stay and occupancy rates, as well as information on specific clinical conditions (e.g. maternal health data such as low birth weight rates, still birth rates and C-section rates). A yearly report documenting case fatality rates, etc. could be developed.
The availability of the reports will provide opportunities for managers to interrogate and use information. This is the second area that requires support.

In order to make information available to hospital management, the following is suggested:

1. Agree on the introduction of a system in each hospital whereby each ward reports as follows:
   - **Daily report:**
     Midnight census data (this provides information on admissions, discharges, deaths, and provides the total in-patient days) to keep management informed of critical events in the hospital;
   - **Monthly report:**
     Aggregated summary of anonymised information related to admissions, discharges, deaths, inpatient days, specific diagnoses (for example: paediatrics reports on kwashiorkor, severe diarrhoea, new HIV patients, measles) and services (for example: surgery will report on number of operations) according to the type of reporting unit;

2. Develop (or strengthen existing) data collection tools;
3. Utilise a list of diseases/conditions of public health importance to identify conditions for which a disease surveillance report should be submitted;
4. Identify the software system to be used for processing data;
5. Develop skills and systems to ensure that analysis of the routine reports is done at both ward and hospital management level within a specific timeframe;
6. Submit analysed reports to region and MOHSW for aggregation with reports from other facilities.

2. Establish monthly management meetings at which information is presented and discussed.

### 6.5 Summary of key recommendations:

This section summarises key recommendations and discusses a possible sequence of events for strengthening the Swaziland HIS. This report provides a basis for discussion, including the clarification of issues and correction of misunderstandings which may influence the process of improving the existing information system.

Suggested sequence of events to implement key recommendations:

1. **Develop information systems policies:**
   Develop an information systems policy incorporating human resources, technical resources and the information process. The human resources component should clarify the roles and responsibilities of the HSU as well as information officers and managers at all levels of the hierarchy.

2. **Develop an essential dataset and data flow policies:**
   The processes of developing an essential dataset and clarifying the data flow policy can run in parallel because both require a consultative process involving the same people. These processes need to be completed prior to embarking on revision of the data collection tools currently in use in different facilities.

3. **Ensure decisions by the MOHSW on the following:**
   - the renaming of the HSU and its relationship to the head of department
HIS Report Swaziland

- the mechanisms available to ensure that computer hardware is replaced at appropriate frequencies
- the recommendations for separation of the disease surveillance systems from routine reporting for management
- the allocation of resources to improving the existing software system, or the introduction of the DHIS, or another system.

4. Provide support to improve the information system:
   - Revise the data collection tools in use in all facilities
   - Define data quality checks that should be applied by supervisors
   - Develop data processing and data transmission procedures
   - Facilitate the production of standard reports and analysis of data:
     - ensure that standard reports are provided to the Head of Department on a monthly basis.
   - Develop systems to ensure the use of information:
     - conduct information reviews on a quarterly basis.

5. Develop a training plan:
   This step can run in parallel with the processes in step 4.

6. Address issues relating to staffing:
   - Obtain agreement and approval to adjust the skills mix of staff in the HSU.
   - Identify and adjust job descriptions for staff dealing with information systems at all levels of the department.

The progression of the MOHSW towards an organisation that uses information to inform its decision making can be tracked using the TALI Tool (briefly described in Annex 4).
Annex 1 Draft national minimum indicator set

**DRAFT National Minimum Indicator / Data Set for Hospital, CHC, and PHC services**

**June 2004**

### PHC attendance and Staff work input

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Utilisation rate (PHC)</td>
<td>PHC total headcount</td>
<td>Total population</td>
<td>PHC total headcount (+)</td>
</tr>
<tr>
<td>2</td>
<td>Utilisation rate under 5 years (PHC)</td>
<td>PHC headcount under 5 years</td>
<td>Population under 5 years</td>
<td>PHC headcount under 5 years</td>
</tr>
<tr>
<td>3</td>
<td>Utilisation rate 5 years and older (PHC)</td>
<td>PHC headcount 5 years and older</td>
<td>Population 5 years and older</td>
<td>PHC headcount 5 years and older</td>
</tr>
<tr>
<td>4</td>
<td>Nurse work load</td>
<td>PHC total headcount</td>
<td>Nurse clinical work days</td>
<td>Nurse clinical work days</td>
</tr>
<tr>
<td>5</td>
<td>Doctor work load</td>
<td>PHC case seen by doctor</td>
<td>Doctor clinical work days</td>
<td>Doctor clinical work days</td>
</tr>
<tr>
<td>6</td>
<td>Supervision visit rate</td>
<td>Supervisor visit this month</td>
<td>All PHC facilities</td>
<td>Supervisor visit this month</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected**

<table>
<thead>
<tr>
<th>Hospitals</th>
<th>CHC</th>
<th>Clinic/smobil</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>6</td>
<td>6</td>
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### Inpatients and Outpatients

<table>
<thead>
<tr>
<th>No</th>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Bed utilisation rate (by specialty in hospitals)</td>
<td>Inpatient days + 1/2 Day patients</td>
<td>Useable bed days</td>
<td>Inpatient days - total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Day patients - total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Useable beds - total</td>
</tr>
<tr>
<td>8</td>
<td>Length of stay (by specialty in hospitals)</td>
<td>Inpatient days + 1/2 Day patients</td>
<td>Separations</td>
<td>Deaths - total</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Discharges - total</td>
</tr>
<tr>
<td>9</td>
<td>Case fatality rate for surgery separations</td>
<td>Deaths - surgery</td>
<td>Separations - surgery</td>
<td>Death - surgery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Discharge - surgery</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Day patient - surgery</td>
</tr>
</tbody>
</table>
### Patient day equivalent

Inpatient days + 1/2 Day patients + 1/3 (OPD/CAS total headcount). The OPD/CAS total headcount = Specialist headcount + General OPD headcount + Emergency total headcount

### Patient days

Inpatient days + 1/2 Day patients

Constant of $1/square^2$

### Day Surgery rate

Day patients - surgery

Separations - surgery

Sub-total data elements to be collected: 11 8 0

The specialty list below applies to the Indicators Bed Utilisation Rate, Length of Stay, Patient day Equivalent, and Patient days - all of which can also be calculated at specialty level.

**Specialty list:**

<table>
<thead>
<tr>
<th><strong>District hospitals</strong></th>
<th><strong>Regional hospitals</strong></th>
<th><strong>Tertiary and central hospitals</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>Medicine</td>
<td>Medicine</td>
</tr>
<tr>
<td>Surgery</td>
<td>Surgery</td>
<td>Surgery</td>
</tr>
<tr>
<td>Maternity</td>
<td>Maternity</td>
<td>Maternity</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>Paediatrics</td>
<td>Paediatrics</td>
</tr>
<tr>
<td></td>
<td>Intensive care</td>
<td>Intensive care</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gynaecology</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Orthopaedics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psychiatry</td>
</tr>
<tr>
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<td>Indicator</td>
<td>Numerator</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>13</td>
<td>Weighing coverage (annualised)</td>
<td>Children under 5 years weighed</td>
</tr>
<tr>
<td>14</td>
<td>Not gaining weight under 5 years rate</td>
<td>Not gaining weight under 5 years</td>
</tr>
<tr>
<td>15</td>
<td>Underweight for age under 5 years rate</td>
<td>Underweight for age under 5 years - new cases</td>
</tr>
<tr>
<td>16</td>
<td>Incidence of severe malnutrition under 5 years</td>
<td>Severe malnutrition under 5 years - new cases</td>
</tr>
<tr>
<td>17</td>
<td>Admissions of severe malnutrition under 5 years</td>
<td>Severe malnutrition under 5 - admitted</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Incidence of diarrhoea under 5 years with dehydration</td>
<td>Diarrhoea with dehydration under 5 years - new</td>
</tr>
<tr>
<td>19</td>
<td>Incidence of diarrhoea under 5 years with no dehydration</td>
<td>Diarrhoea with no dehydration under 5 years - new</td>
</tr>
<tr>
<td>20</td>
<td>Admissions under 5 years with pneumonia</td>
<td>Pneumonia under 5 years - new</td>
</tr>
<tr>
<td>21</td>
<td>Incidence of pneumonia under 5 years</td>
<td>Pneumonia under 5 years - new ambulatory</td>
</tr>
<tr>
<td>22</td>
<td>Admissions with diarrhoea with dehydration under 5 years</td>
<td>Diarrhoea with dehydration under 5 years - admitted</td>
</tr>
<tr>
<td>23</td>
<td>Admissions with diarrhoea without dehydration under 5 years</td>
<td>Diarrhoea without dehydration under 5 years - admitted</td>
</tr>
<tr>
<td>24</td>
<td>Deaths under 5 years with pneumonia</td>
<td>Pneumonia under 5 years - death</td>
</tr>
<tr>
<td>25</td>
<td>Deaths under 5 years with diarrhoea with dehydration</td>
<td>Diarrhoea with dehydration under 5 years - death</td>
</tr>
<tr>
<td>26</td>
<td>HIV positive rate under 5</td>
<td>HIV positive under 5 years - HIV test done on child</td>
</tr>
</tbody>
</table>
### HIS Report Swaziland

<table>
<thead>
<tr>
<th>years</th>
<th>new</th>
<th>under 5 years</th>
<th>HIV test done on child under 5 years</th>
<th>✓</th>
<th>✓</th>
<th>✓</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sub-total data elements to be collected</strong></td>
<td>17</td>
<td>17</td>
<td>11</td>
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</table>

#### Nutrition

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>27 Vitamin A coverage under 1 year (annualised)</td>
<td>Vitamin A supplement to 6-11 months infant</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>28 Vitamin A coverage 1-4 years (annualised)</td>
<td>Vitamin A supplement to 12-60 months child</td>
<td>Target population 1-4 years multiplied by 2</td>
<td>✓</td>
</tr>
<tr>
<td>29 Vitamin A coverage – new mothers</td>
<td>Vitamin A supplement to women within 8 weeks after delivery</td>
<td>Total deliveries</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Sub-total data elements to be collected</strong></td>
<td>3</td>
<td>3</td>
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#### EPI

<table>
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<th>Routine Data elements</th>
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</thead>
<tbody>
<tr>
<td>30</td>
<td>Immunisation coverage under 1 year</td>
<td>Immunised fully under 1 year – new</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>31</td>
<td>Immunisation drop-out rate (DPT-Hib3 – Measles1)</td>
<td>DPT-Hib 3rd dose – Measles 1st dose before 1 year</td>
<td>DPT-Hib 3rd dose</td>
<td>✓</td>
</tr>
<tr>
<td>32</td>
<td>Immunisation drop-out rate (DPT-Hib 1 – DPT-Hib 3)</td>
<td>DPT-Hib 1st dose – DPT-Hib 3rd dose</td>
<td>DPT-Hib 1st dose</td>
<td>✓</td>
</tr>
<tr>
<td>33</td>
<td>OPV 1st dose coverage</td>
<td>OPV 1st dose</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>34</td>
<td>OPV 3rd dose coverage</td>
<td>OPV 3rd dose</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>35</td>
<td>Hep B 1st dose coverage</td>
<td>HepB 1st dose</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>36</td>
<td>Hep B 3rd dose coverage</td>
<td>HepB 3rd dose</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>No</td>
<td>Indicator</td>
<td>Numerator</td>
<td>Denominator</td>
<td>Routine Data elements</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------------</td>
<td>-----------------------------------------------------</td>
<td>------------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>37</td>
<td>Measles coverage under 1 year (annualised)</td>
<td>Measles 1st dose before 1 year</td>
<td>Target population under 1 year + B158</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Measles 1st dose under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>38</td>
<td>Measles 2nd dose coverage (annualised)</td>
<td>Measles 2nd dose</td>
<td>Target population of 1 year old</td>
<td>✓</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>Measles 2nd dose</td>
<td>✓</td>
</tr>
<tr>
<td>39</td>
<td>BCG coverage</td>
<td>BCG dose under 1 year</td>
<td>Target population under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>BCG dose under 1 year</td>
<td>✓</td>
</tr>
<tr>
<td>40</td>
<td>DT dose at 5 years coverage</td>
<td>DT dose at 5 years</td>
<td>Target population at 5 years</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DT dose at 5 years</td>
<td>✓</td>
</tr>
<tr>
<td>41</td>
<td>DT dose at 12 years coverage</td>
<td>DT dose at 12 years</td>
<td>Target population at 12 years</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DT dose at 12 years</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sub-total data elements to be collected</td>
<td>10 12 12</td>
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</table>

**Women’s / Maternal Health**

<table>
<thead>
<tr>
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<th>Denominator</th>
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</thead>
<tbody>
<tr>
<td>42</td>
<td>Antenatal visits before 20 weeks rate</td>
<td>Antenatal 1st visit before 20 weeks</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit 20 weeks or later</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Antenatal 1st visit before 20 weeks</td>
<td>✓</td>
</tr>
<tr>
<td>43</td>
<td>Antenatal coverage</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit after 20 weeks</td>
<td>Potential antenatal clients in population (~ Children under 1 year * 1.15)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Antenatal 1st visit 20 weeks or later</td>
<td>✓</td>
</tr>
<tr>
<td>44</td>
<td>Antenatal visits per antenatal client</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit 20 weeks or later + Antenatal follow-up visit</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit 20 weeks or later</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Antenatal follow-up visit</td>
<td>✓</td>
</tr>
<tr>
<td>45</td>
<td>Tetanus Toxoid coverage of pregnant women</td>
<td>Tetanus Toxoid 2nd dose to pregnant woman</td>
<td>Potential antenatal clients in population (~ Children under 1 year * 1.15)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Tet Tox 2nd/Booster dose to pregnant woman</td>
<td>✓</td>
</tr>
<tr>
<td>46</td>
<td>Institutional delivery rate to women under 18 years</td>
<td>Delivery to woman under 18 years</td>
<td>Total deliveries</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Delivery to woman under 18 years</td>
<td>✓</td>
</tr>
<tr>
<td>47</td>
<td>Institutional delivery rate</td>
<td>Total deliveries</td>
<td>All expected deliveries (~Children under 1 year * 1.07)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Total deliveries</td>
<td>✓</td>
</tr>
</tbody>
</table>

51
<table>
<thead>
<tr>
<th></th>
<th>HIS Report Swaziland</th>
</tr>
</thead>
<tbody>
<tr>
<td>48</td>
<td>Caesarean section rate</td>
</tr>
<tr>
<td></td>
<td>Assisted delivery</td>
</tr>
<tr>
<td></td>
<td>Normal delivery</td>
</tr>
<tr>
<td>49</td>
<td>Facility low birth weight rate</td>
</tr>
<tr>
<td>50</td>
<td>Facility still birth rate</td>
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<tr>
<td></td>
<td>Live birth</td>
</tr>
<tr>
<td></td>
<td>Total births</td>
</tr>
<tr>
<td>51</td>
<td>Perinatal mortality rate</td>
</tr>
<tr>
<td>52</td>
<td>Neonatal death rate</td>
</tr>
<tr>
<td>53</td>
<td>Male sterilisation rate</td>
</tr>
<tr>
<td>54</td>
<td>Female sterilisation rate</td>
</tr>
<tr>
<td>55</td>
<td>TOP rate</td>
</tr>
<tr>
<td>56</td>
<td>Prevalence of positive syphilis serology in antenatal clients</td>
</tr>
<tr>
<td>57</td>
<td>Women year protection rate (annualised)</td>
</tr>
<tr>
<td></td>
<td>Oral pill cycle</td>
</tr>
<tr>
<td></td>
<td>Medroxyprogesterone injection</td>
</tr>
<tr>
<td></td>
<td>Norethisterone enanthate injection</td>
</tr>
<tr>
<td>58</td>
<td>Cervical smear screening rate</td>
</tr>
</tbody>
</table>

<p>| Sub-total data elements to be collected | 24 | 22 | 21 |</p>
<table>
<thead>
<tr>
<th>No</th>
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<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td>CD4 testing rate</td>
<td>Blood drawn for CD4</td>
<td>Client tested HIV positive new (excluding antenatal) + Antenatal client tested HIV positive new</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Blood drawn for CD4</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HIV test positive - new (excluding antenatal)</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>60</td>
<td>ART assessment referral rate</td>
<td>Referral to ART service point for ART assessment - new</td>
<td>HIV test positive new (excluding antenatal) + Antenatal client tested HIV positive new</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Referral to ART service point for ART assessment - new</td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Inpatient days per registered ART patient</td>
<td>Inpatient days ART patients</td>
<td>Total number of registered ART patients</td>
<td>✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>In-patient days ART patient</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Inpatient days proportion of ART patients</td>
<td>Inpatient days ART patients</td>
<td>Inpatient days - total</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Scheduled dose ART regimen defaulting rate</td>
<td>Scheduled dose defaulted (&gt; 3 days) ART any regimen</td>
<td>Scheduled dose of ART any regimen - total</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Scheduled dose defaulted (&gt; 3 days) ART any regimen</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Incidence of STI treated new episode among ART patients</td>
<td>STI treated new episode - ART patient</td>
<td>Registered ART patient on any adult regimen</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>65</td>
<td>Incidence of STI treated new episode</td>
<td>STI treated new episode x 100 x 12</td>
<td>Population &gt;=15 years</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STI treated - new episode</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Incidence of Male Urethritis Syndrome treated new episode</td>
<td>MUS treated new episode x 100 x 12</td>
<td>Male Population &gt;=15 years</td>
<td>✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male Urethritis Syndrome treated - new episode</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>STI partner notification rate</td>
<td>STI partner notification slips issued</td>
<td>STI treated new episode</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STI partner notification slips issued</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>STI partner tracing rate</td>
<td>STI partner treated new</td>
<td>STI partner notification slips issued</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STI partner treated - new episode</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>STI partner treatment rate</td>
<td>STI partner treated new</td>
<td>STI treated new episode</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STI treated new episode</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Male condom distribution rate</td>
<td>Male condoms distributed x 12</td>
<td>Male population &gt;=15 years</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Male condoms distributed</td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Formula</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------</td>
<td>-------------</td>
<td>---------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Proportion clients HIV pre-test counselled (excl. antenatal)</td>
<td>HIV pre-test counselled (excluding antenatal)</td>
<td>total PHC headcount - (antenatal 1st visit before 20 weeks + antenatal 1st visit 20 weeks and later + antenatal follow up visit)</td>
<td>HIV pre-test counselled (excluding antenatal)</td>
</tr>
<tr>
<td>72</td>
<td>HIV testing rate (excl. antenatal)</td>
<td>HIV client tested (excluding antenatal)</td>
<td>HIV pre-test counselled (excluding antenatal)</td>
<td>HIV client tested (excluding antenatal)</td>
</tr>
<tr>
<td>73</td>
<td>HIV prevalence among clients tested (excl. antenatal)</td>
<td>HIV test positive - new (excluding antenatal)</td>
<td>HIV client tested (excluding antenatal)</td>
<td>HIV test positive - new (excluding antenatal)</td>
</tr>
<tr>
<td>74</td>
<td>Proportion antenatal clients tested for HIV</td>
<td>Antenatal client tested for HIV</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit 20 weeks or later</td>
<td>Antenatal client tested for HIV</td>
</tr>
<tr>
<td>75</td>
<td>HIV prevalence among antenatal clients tested</td>
<td>Antenatal client tested HIV positive - new</td>
<td>Antenatal client tested for HIV</td>
<td>Antenatal client tested HIV positive - new</td>
</tr>
<tr>
<td>76</td>
<td>Proportion antenatal clients tested for syphilis</td>
<td>Antenatal client tested for syphilis</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit 20 weeks or later</td>
<td>Antenatal client tested for syphilis</td>
</tr>
<tr>
<td>77</td>
<td>Syphilis prevalence among antenatal clients tested</td>
<td>Antenatal client tested positive for syphilis - new</td>
<td>Antenatal client tested for syphilis</td>
<td>Antenatal client tested positive for syphilis - new</td>
</tr>
<tr>
<td>78</td>
<td>Nevirapine uptake rate among pregnant women with HIV</td>
<td>Nevirapine dose to woman at antenatal or labour</td>
<td>Antenatal client tested HIV positive - new</td>
<td>Nevirapine dose to woman at antenatal or labour</td>
</tr>
<tr>
<td>79</td>
<td>Nevirapine uptake rate among babies born to women with HIV</td>
<td>Nevirapine dose to baby born to woman with HIV</td>
<td>Live birth to woman with HIV</td>
<td>Live birth to woman with HIV</td>
</tr>
<tr>
<td>80</td>
<td>Nevirapine dose to baby coverage rate</td>
<td>Nevirapine dose to baby born to woman with HIV</td>
<td>Total live births x provincial (national) HIV prevalence among antenatal clients</td>
<td>Nevirapine dose to baby born to woman with HIV</td>
</tr>
<tr>
<td>81</td>
<td>HIV transmission rate at 1 year</td>
<td>HIV 1st test of baby at 1 year positive</td>
<td>HIV 1st test of baby at 1 year positive</td>
<td>HIV 1st test of baby at 1 year positive</td>
</tr>
<tr>
<td>82</td>
<td>Proportion ARV prophylaxis among rape cases</td>
<td>ARV prophylaxis to rape case - new</td>
<td>Rape case - new</td>
<td>ARV prophylaxis to rape case - new</td>
</tr>
</tbody>
</table>

Rape case - new
### HIS Report Swaziland

<table>
<thead>
<tr>
<th></th>
<th>Proportion ARV prophylaxis among occupational HIV exposure case</th>
<th>ARV prophylaxis to case with occupational HIV exposure - new</th>
<th>Occupational HIV exposure case - new</th>
<th>ARV prophylaxis to case with occupational HIV exposure - new</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>83</td>
<td>Proportion ARV prophylaxis among occupational HIV exposure case</td>
<td>ARV prophylaxis to case with occupational HIV exposure - new</td>
<td>Occupational HIV exposure case - new</td>
<td>Occupational HIV exposure case - new</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>84</td>
<td>TB case finding index</td>
<td>Suspected TB - new episode</td>
<td>PHC Headcount 5 years and older</td>
<td>Suspected TB - new episode</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>85</td>
<td>Proportion TB smear positive</td>
<td>Suspected TB - smear positive episode</td>
<td>Suspected TB - new episode</td>
<td>Suspected TB - smear positive episode</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>86</td>
<td>Proportion treatment start among TB smear positive</td>
<td>Smear positive TB treatment start</td>
<td>TB smear positive - new episode</td>
<td>Suspected TB smear positive - treatment start</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>87</td>
<td>Incidence of INH preventive therapy start in HIV+</td>
<td>INH preventive therapy start in HIV+ x 100 x 12</td>
<td>Population &gt;=15 years</td>
<td>INH preventive therapy start in HIV+</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>88</td>
<td>Incidence of cotrimoxazole prophylaxis start in HIV+</td>
<td>Cotrimoxazole prophylaxis start in HIV+ x 100 x 12</td>
<td>Population</td>
<td>Cotrimoxazole prophylaxis start in HIV+</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected:** 32 33 32
<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>89 Mental health case load</td>
<td>Mental health visit</td>
<td>PHC total headcount</td>
<td>✓</td>
</tr>
<tr>
<td>90 Hypertension detection rate</td>
<td>Hypertension case put on treatment - new</td>
<td>Population 45 years and older</td>
<td>✓</td>
</tr>
<tr>
<td>91 Hypertension case load</td>
<td>Hypertension visits</td>
<td>PHC total headcount</td>
<td>✓</td>
</tr>
<tr>
<td>92 Diabetes mellitus detection rate</td>
<td>Diabetes mellitus case put on treatment - new</td>
<td>Population 45 years and older</td>
<td>✓</td>
</tr>
<tr>
<td>93 Diabetes mellitus case load</td>
<td>Diabetes mellitus visits</td>
<td>PHC total headcount</td>
<td>✓</td>
</tr>
<tr>
<td>94 Asthma under 18 years rate</td>
<td>Asthma visit under 18 years</td>
<td>Asthma visit</td>
<td>✓</td>
</tr>
<tr>
<td>95 Asthma case load</td>
<td>Asthma visit</td>
<td>PHC total headcount</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected**: 7 7 7

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 Dental extractions to restorations rate</td>
<td>Tooth extractions</td>
<td>Tooth restorations</td>
<td>✓</td>
</tr>
<tr>
<td>97 Dental utilisation ratio</td>
<td>Dental visits</td>
<td>Total population</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected**: 3 3 3

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>98 Wheelchair issued rate</td>
<td>Wheelchair issued - new</td>
<td>Total population</td>
<td>✓</td>
</tr>
<tr>
<td>99 Hearing aid issued rate</td>
<td>Hearing aid issued - new</td>
<td>Total population</td>
<td>✓</td>
</tr>
<tr>
<td>100 Walking aid issued rate</td>
<td>Walking aid issued - new</td>
<td>Total population</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected**: 3

### Oral Health

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>96 Dental extractions to restorations rate</td>
<td>Tooth extractions</td>
<td>Tooth restorations</td>
<td>✓</td>
</tr>
<tr>
<td>97 Dental utilisation ratio</td>
<td>Dental visits</td>
<td>Total population</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected**: 3 3 3

### Rehabilitation Services

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>98 Wheelchair issued rate</td>
<td>Wheelchair issued - new</td>
<td>Total population</td>
<td>✓</td>
</tr>
<tr>
<td>99 Hearing aid issued rate</td>
<td>Hearing aid issued - new</td>
<td>Total population</td>
<td>✓</td>
</tr>
<tr>
<td>100 Walking aid issued rate</td>
<td>Walking aid issued - new</td>
<td>Total population</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Sub-total data elements to be collected**: 3

### Pharmaceutical indicators
### HIS Report Swaziland

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>101 Essential drugs out of stock</td>
<td>Number of tracer items out of stock any time in month</td>
<td>Number of items on tracer list.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACE inhibitor out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Adrenalin out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amoxicillin 125mg/5ml suspension (75ml) out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Amoxyxillin capsules out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any ARV drug out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cetriaxone out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ibuprofen out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Insulin out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Morphine out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Salbutamol inhaler out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Paracetamol 500mg out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co-Trimoxazole 480mg out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Co-Trimoxazole syrup out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Norethisterone enant or Medroxyprogesterone injection out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rapid HIV test out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DTP-Hib vaccine out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Any nutrition supplement out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Male condom out of stock</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>102 Items per prescription items dispensed</td>
<td>Items dispensed</td>
<td>Prescriptions issued</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Item dispensed</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prescription issued</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>103 Proportion of vaccine fridges missing or not working</td>
<td>Vaccine fridge missing or not working</td>
<td>All facilities reporting</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vaccine fridge missing or not working</td>
<td>✓ ✓ ✓</td>
</tr>
</tbody>
</table>

Sub-total data elements to be collected: 21 21 20
Financial indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>104 Expenditure per patient day equivalent (PDE)</td>
<td>Total facility expenditure</td>
<td>Patient day equivalent</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>105 Expenditure compared to budget</td>
<td>Total facility expenditure</td>
<td>Total facility budget</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>106 Patient fee income as percentage of total budget</td>
<td>Patient fee income</td>
<td>Total facility budget</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>107 Expenditure on maintenance as percentage of total hospital expenditure</td>
<td>Expenditure on facility maintenance</td>
<td>Total facility expenditure</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>108 Expenditure on staff as percentage of total hospital expenditure</td>
<td>Expenditure on staff</td>
<td>Total facility expenditure</td>
<td>✓ ✓ ✓</td>
</tr>
<tr>
<td>109 Expenditure on drugs as percentage of total hospital expenditure</td>
<td>Expenditure on drugs</td>
<td>Total facility expenditure</td>
<td>✓ ✓ ✓</td>
</tr>
</tbody>
</table>

Sub-total data elements to be collected: 6 6 6

Hospitals | CHC | Clinic s/mo biles
---|---|---
140 | 138 | 121

Grand Total data elements to be collected: 140 138 121
## Data/Information Flow

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Routine Data elements</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 Data input coverage</td>
<td>Separations data for area (district/province) submitted to National DoH</td>
<td>All expected PHC total headcount data for area</td>
<td>Automatically estimated in the DHIS</td>
</tr>
<tr>
<td>111 Facility data submission rate</td>
<td>Number of facilities with data submitted to National DoH</td>
<td>All facilities expected to submit data to National DoH</td>
<td>Automatically estimated in the DHIS</td>
</tr>
<tr>
<td>112 Facility data timeliness rate</td>
<td>Number of facilities with data submitted to National DoH within 60 days after end of period</td>
<td>All facilities expected to submit data to National DoH</td>
<td>Automatically estimated in the DHIS from version 1.4</td>
</tr>
<tr>
<td>113 DoH feedback report rate</td>
<td>Number of provinces that receives detailed feedback reports from National DoH within 90 days after end of period</td>
<td>9 provinces</td>
<td>Automatically estimated in the DHIS from version 1.4</td>
</tr>
</tbody>
</table>
Annex 2: Example of a Monitoring and Evaluation Framework

A monitoring and evaluation framework provides guidance for measuring progress in a programme by using indicators. Indicators are selected to reflect various aspects of a programme, namely input, process, output, outcome, and impact. The table below describes these indicator categories:

<table>
<thead>
<tr>
<th>Indicator Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input indicator</td>
<td>Measures resources needed to carry out activities</td>
</tr>
<tr>
<td>Process indicators</td>
<td>Monitor the activities carried out</td>
</tr>
<tr>
<td>Output indicators</td>
<td>Measure the results of activities (coverage, knowledge, attitude and behavioural changes)</td>
</tr>
<tr>
<td>Outcome indicators</td>
<td>Determine changes in health status (longer term changes)</td>
</tr>
</tbody>
</table>

Impact indicators are difficult to measure, and change very slowly over time. They are seldom useful for short term monitoring of services, and are influenced by a number of different initiatives, many of which may lie beyond the realm of health care provision (e.g. provision of water and sanitation services can have a more marked effect on childhood mortality than the provision of nevirapine to HIV positive pregnant mothers)

Input, and process indicators on the other hand are relatively easy to measure, and can change rapidly over time. They are specific to the objective and associated activities.

Data elements used to calculate these indicators can be sourced from routine systems, sentinel sites, surveys, ad hoc and research based systems. The table on the next page provides an overview of a monitoring and evaluation framework for a maternal, child and women’s health programme to reduce HIV transmission from mother to child through the provision of nevirapine.

The framework may be expanded to include
- Behavioural surveillance
- Financial monitoring
- Human resource issues
Programme: Maternal, Child and Women's Health
Goal: To reduce child mortality
Objective: To reduce HIV transmission from mother to child through the provision of Nivaripine

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Indicator type</th>
<th>Numerator</th>
<th>Denominator</th>
<th>Numerator source</th>
<th>Denominator source</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT INDICATORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability of testing kits</td>
<td>Count indicator</td>
<td>Test kits out of stock</td>
<td>Constant of 1</td>
<td>Routine reporting on out of stock items</td>
<td></td>
</tr>
<tr>
<td>Availability of antiretroviral drugs</td>
<td>Count indicator</td>
<td>Anti-retroviral drugs out of stock</td>
<td>Constant of 1</td>
<td>Routine reporting on out of stock items</td>
<td></td>
</tr>
<tr>
<td>Privacy for counselling</td>
<td>Count indicator</td>
<td>Private area for counselling</td>
<td>Constant of 1</td>
<td>Survey</td>
<td></td>
</tr>
<tr>
<td>Staff trained on PMTCT programme</td>
<td>Proportion indicator</td>
<td># of staff trained on PMTCT in the year</td>
<td>Total number of staff to be trained in the year</td>
<td>Survey</td>
<td>Survey</td>
</tr>
<tr>
<td>PROCESS INDICATORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proportion of antenatal clients tested for HIV</td>
<td>Proportion indicator</td>
<td>Antenatal client tested for HIV</td>
<td>Antenatal 1st visit before 20 weeks + Antenatal 1st visit 20 weeks or later</td>
<td>PHC Routine data</td>
<td>PHC Routine data</td>
</tr>
<tr>
<td>HIV prevalence among antenatal clients tested</td>
<td>Proportion indicator</td>
<td>Antenatal client tested HIV positive - new</td>
<td>Antenatal client tested for HIV</td>
<td>PHC Routine data</td>
<td>PHC Routine data</td>
</tr>
<tr>
<td>OUTPUT INDICATORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nevirapine uptake rate among pregnant women with HIV</td>
<td>Proportion indicator</td>
<td>Nevirapine dose to woman at antenatal or labour</td>
<td>Antenatal client tested HIV positive - new</td>
<td>Delivery register</td>
<td>Delivery register</td>
</tr>
<tr>
<td>Nevirapine uptake rate among babies born to women with HIV</td>
<td>Proportion indicator</td>
<td>Nevirapine dose to baby born to woman with HIV</td>
<td>Live birth to woman with HIV</td>
<td>Delivery register</td>
<td>Delivery register</td>
</tr>
<tr>
<td>OUTCOME INDICATORS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Percentage of babies born to HIV positive women who test HIV positive at 15 months</td>
<td>Proportion indicator</td>
<td>HIV 1st test of baby at 15 mths positive</td>
<td>HIV 1st test of baby at 15 mths</td>
<td>Routine reporting (sentinel sites)</td>
<td>Routine reporting (sentinel sites)</td>
</tr>
<tr>
<td>IMPACT INDICATORS</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Under 5 child mortality rate</td>
<td>Rate indicator</td>
<td># of children under 5 who die in a year</td>
<td>(Per 1000) Live births per year</td>
<td>Household survey, vital events data</td>
<td>Census data</td>
</tr>
</tbody>
</table>
Annex 3: Hardware and software for district routine health information systems

Calle Hedberg – January 2004

Some computer equipment available at district or local levels are either hand-me-downs or purchased some time back using the rock-bottom options in various “Government tender” specifications. Many provincial/national administrations have traditionally also been constrained to the latter when purchasing personal computers. Such equipment, while adequate for word processing, simple spreadsheets and small databases, is inadequate for processing the rapidly growing Minimum/Essential Data Sets (MDS/EDS) at local, provincial, and national levels. The most serious problems are:

1. Small hard disks (1-4 GB) and minimum amount of RAM (16-64 MB), combined with a relatively slow CPU (200-800 MHz), result in unacceptable response times.

2. Small monitors (14”-15”) are ergonomically sub-standard for people spending a large part of their time working on the computers (eye-strain, neck and shoulder pains). Research has indicated 20-30% productivity gains by using larger monitors due to less strain and the ability to display a larger part of your data simultaneously.

3. Most PCs bought prior to 1999 have no CD drive, and whereas one can use external CD drives these are cumbersome to transport and sometimes unreliable. Maintenance of PCs is often poor because technical support personnel in the public sector usually are very young and inexperienced IT people, or it has been outsourced to companies on a cut-throat price basis.

4. Few printers able to produce colour wall graphs in colour (A3 size).

The net result of using such equipment is that time is wasted waiting for data processes to finish, and the focus of users shifts from data analysis and output towards solving equipment constraints. In other words, buying sub-standard equipment is penny-wise and pound-foolish. Another key point to keep in mind when confronted by the bean counters is that district information systems probably receive only 1-10% of total investment in health care information systems in most developing countries, despite attempts at information-driven Health Sector Reform and a shift in focus towards a district-based health system.

This memo aims to give some guidelines to users on what kind of computer equipment to buy for purposes of running a District Health Care Information System (e.g. the District Health Information Software from HISP). The first sections deal with the main types of such equipment. The last section deals with upgrades and minor modifications to existing equipment that would improve its performance etc as a stopgap solution.

Tentative prices based on recent quotes are included, but note that the computer market is volatile. It takes only 12-24 months for e.g. a new microprocessor to move from the top-end to the bottom-end of the market. We are currently (Jan-2004) seeing very low prices for many core computer hardware components (in particular in South Africa, due to the
strong Rand). Software (unless you use Free and Open Source software) cost today more than low-end hardware.

Finally, note that a number of web sites can provide you with both good information and performance/quality tests as well as links to web-based vendors. Some examples:

- Tom’s hardware Guide: [http://www.tomshardware.com](http://www.tomshardware.com)
- Computer shopper: [http://shopper.cnet.com](http://shopper.cnet.com)
- ComputerWorld: [http://www.computerworld.com](http://www.computerworld.com)
- PC World: [http://www.pcworld.com](http://www.pcworld.com)

I can also provide SA users with the contact details of my own computer supplier in Cape Town – it’s a small company with competitive prices and very good, personalised technical service (but most of you would prefer a local supplier, I presume). Otherwise, most of you will probably have to buy based on the Government tender or at least get three quotes for smaller orders. Large orders should obviously go out on tender, or you might have to use the standard government tender specs. These have become better recently, with clauses that keep prices constant but upgrades components as the market moves – they are also more flexible than before with regard to options (e.g. using more RAM or larger monitors).

**Technical Options**

The current desktop PC market can be broken down into four groups (these examples use Intel processors, but note that AMD and other manufacturers have similar processors on the market):

1. **Entry-level PCs** (‘home computers’), using 2.2-2.6 GHz Celeron or AMD CPUs with 256 KB cache or similar, 256 MB DDR RAM (266 MHz), 40-80GB hard disks, and 15-17” monitors – base price from to USD 600-1,000 (R 5-8,000). Note that 14” monitors have nearly disappeared from the market, and that “old” SDRAM chips are being phased out and replaced by the faster DDR RAM (266/333/400 MHz).

2. **Medium-level PCs** (‘small business computers’), using 2.2-3.0 GHz Pentium 4 Hyper-Threading or AMD CPUs with 512 KB of cache, 533-800 MHz Front Side Bus (FSB), 512 MB DDR RAM, 60-120 GB ATA-133 or Serial-ATA hard disks, and 17-19” monitors – base price USD 1,000 – 1,500 (R 8,000 – 12,000).

3. **Technical Workstations**, using (multiple) 2.6-3.2 GHz Pentium 4 (Xeon) with 533-800 MHz Front Side Bus (FSB) with 512kb-2MB cache, 1GB – 4GB DDR RAM (333 MHz – 400 MHz), 120-250GB GB Serial-ATA RAID hard disks, and 19-21” monitors – base price USD 1,500 – 5,000 (R 12,000 – 40,000).

4. **Organisation-wide Servers**, using (multiple) 2.6-3.2 GHZ Pentium 4 (Xeon) with 533-800 MHz Front Side Bus (FSB) with 512kb-2MB cache, 2-64GB DDR RAM, multiple RAID hard disks, and small monitors – base price USD 5,000 – 10,000 (R 40,000 – 80,000).

Intel Celeron and many AMD CPUs are cheap (R 600-1,000), but they have only 256KB on-board cache (very fast memory integrated with the CPU) and is generally used in PCs
with cheap components and motherboards overall. Medium performance Intel Pentium 4 (2.4-3.0 GHz) or AMD Athlone CPUs are therefore recommended. The price of computer memory is low compared to a year or two ago – you get 256MB DDR RAM chips for R 400 and 512 MB DDR RAM chips for R 750. It no longer makes sense to buy less than 512 MB for PCs that are supposed to do serious database or data analysis work. Note that faster RAM chips, like 266/333/400 MHz DDR (Double Data Rate) RAM, now have very good price/performance ratios. High quality motherboards that support faster RAM and include RAID controllers are relatively cheap, and the older SDRAM (twice as expensive as DDR RAM) is on its way out.

Considering most aspects of current and future needs as well as the funds normally available, I would recommend a group 2 model (‘small business computer’) for Health Informatics Teams at district level and a group 3 model (‘technical workstation’) for Health Informatics Teams at Provincial/National levels. Provincial/national levels might also need a larger server in order to share the software and data among 10-100 managers. In addition, provinces and larger regions/cities might need a digital projector, in order to facilitate group discussions with provincial management and public presentations to others.

A few additional components (e.g. an A3 inkjet printer) are also described below with some tentative prices. The reasoning behind the selection of various components is as follows:

- **Computer case:** Most users would be OK with a standard Midi case at USD 60-100 (R 500-800). If possible, try to get a case with a 300 W power supply and with 1 or 2 USB ports in front. Front-side USB ports saves you from a lot of crawling when you want to plug in thumb drives, printers, etc. For larger workstations or servers with several hard disks and CD-readers / CD-writers, a full-tower case with 400 W power supply might be better. If possible, test the case on beforehand with regard to noise – good quality cases have negligible noise from fans and no vibration.

- **CPU:** The Intel Pentium 4 2.4-2.8 GHz has a good price/performance ratio, the same goes for the AMD Athlone XP 2200+ to 2800+. The technical workstations should ideally support dual processors, which would allow an easy and cheap ‘upgrade’ in a year or two, but dual-processor motherboards are still relatively expensive. The technical workstations should also be using motherboards and CPUs running at 533 or 800 MHz bus (FSB), which might make a significant performance boost (older Pentium III/Celeron CPUs run at 100/133 MHz). Note that tests by the DHIS development team indicate that DHIS performance is more dependent on CPU speed, CPU cache, and RAM type/amount than on hard disk speed.

- **Motherboard:** The standard office desktop PC would use a motherboard supporting one CPU only and slots for 1.5-4.0 GB RAM – 533 MHz Front-Side Bus or the new 800 MHz FSB is recommended. A workstation PC might have a motherboard with two CPUs (don’t have to buy both at once) and slots for at least 4 GB of RAM. Servers might have 4 or more CPUs. Both types should preferably have AGP slots for the graphics adapter.

- **Monitor:** Ergonomics and productivity are decisive factors for suggesting 19” and 21” monitors. It is well worth the extra cost of USD 100-500, compared to a 17” monitor (which increasingly is standard for office computers). Some suppliers have also started to provide 20-23” LCD flat panel displays for high-end workstations – nice if you are going to use it for GIS or Image Processing work (but very expensive!). LCD (flat-panel) monitors are often chosen because of their small footprint (takes up much
less space on your desk). Prices have come down, but they are still relatively expensive compared to normal monitors. A 15” LCD panel would cost around R 3,000, and its effective viewing area is roughly equivalent to a normal 17” monitor. 17” LCD panels are around R 4,000, and 19” panels around R 6,000.

- **Graphics cards**: A 32MB graphics cards will support 1600x1200 resolution and true colour for 19” monitors – a 64 MB card will do the same for a 21” monitor. The price difference is relatively small, and 64-128 MB cards are now standard for both small business PCs and workstations.

- **Hard disk**: Database applications and GIS applications is hard disk I/O intensive, so 7,200 rpm or 10,000 rpm drives are clearly preferable to 5,400 rpm hard drives. The price difference is negligible as long as you stick to IDE drives, and some manufacturers like Western Digital are providing longer warranty for 7,200 rpm drives. (probably because the 5,400 rpm drives are on their way out). ATA-133 (actual transfer speed up to 80MB/second) and Serial-ATA (theoretical transfer speed of 150MB/second) are now increasingly the standard. High-end motherboards also have RAID controllers that enable mirroring of dual hard disks for maximum safety – if one hard disk crashes; it can be replaced and set up again using the second mirror drive. All PCs today also have one or more so-called USB ports that allows daisy-chaining devices like printers and scanners + allows easy transfer of data using USB thumb drives. USB 1.1 is still dominant (transfer speed 2MB/s), but the new USB 2.0 (theoretical transfer speed of 480MB/minute) are increasingly standard in new PCs.

**Warning**: Many new ATA-100/133 IDE hard disks are no longer compatible with the older ATA-33 and ATA-66 controllers.

- **Removable media**: Both district, regional and provincial PCs should have a CD writer/rewriter, in order to facilitate local replication of e.g. DHIS freeware, exchange of large data sets, and regular backups. Today, the standard model would be at least 4X re-writing, 24X writing, and 24-50X reading for a price of R 400 (IDE interface). The first combo models with both a CD writer/rewriter and a DVD writer have just entered the market. An important factor is the CD media itself – our experience is that Sony or Verbatim CDs, despite costing R3-7 each compared to others costing R2-4, are very good choices. The CD-writer software we have found best is Nero.

- **CD-ROM**: All PCs should have a standard (32-52X) CD-ROM drive in addition to the CD writer/rewriter, to facilitate CD replication. **Note that it might be smart to put the CD writer/rewriter on one IDE channel and the CD reader on the other – this will speed up transfers during CD replication.**

- **Network adapter**: Any standard 10/100 Mbits Ethernet adapter will do, just make sure that the connector fits your network. They cost around USD 15 (R 100) each. A standard 10/100Mbits Ethernet hub with 8-12 ports cost around R 600. 1,000 Mbits (1 gigabits) Ethernet adapters cost around R 300 and an 8-port Gigabit hub around R 6,000, but prices are dropping fast. The most common networks are using Twisted Pair cabling (the contacts looks like large size telephone plugs), but Thin Ethernet is still in use (the contacts are BNC, a kind of plugs to screw in with a half-twist). If your network is the latter, the smart thing is usually to buy a combo card with both options. **Note that if you have two computers with twisted pair cards, you can connect them using a modified network cable: Pins 1 and 3 and pins 2 and 6 must be swapped on one of the contacts.**
• **Mouse:** An optical mouse (USD 25 or R 200) is much better than a mouse with one of those roller-balls (USD 7-10 or R 50-80) – the latter always picks up dirt and becomes nearly useless after a while. So called wire-less mice is using a separate “base station” connected to the PC, and is not recommended unless you have special needs to move around while working.

• **USB thumb drive:** USB thumb drives – about the size of a cigarette lighter – are increasingly popular for easy transfer of larger amounts of data between PCs not on the same network. Note that old-fashioned “Laplink” cables connecting serial or parallel ports work poorly with newer PCs and Operating Systems, whereas USB thumb drives work very well. Expect around USD 50 (R 400) for a 128 MB drive, USD 90 (R 750) for 256 MB, USD 170 (R 1,400) for 512 MB, USD 400 (R 3,200) for 1 GB, and USD 850 (R 7,000) for 2 GB drives. Note that newer computers might have the new USB 2.0 port, which is much faster than USB 1.1, and thumbdrives should ideally support the same (but most support only 1.1).

Our general experience with USB to USB cables has been mixed, but they are generally more difficult to set up and use than USB thumb drives. One big advantage of thumb drives is that you do not need to install extra drivers under Windows 2000 and XP – just plug in the drive. BUT you need drivers for Win98 and Win95B!

• **Modems:** A modem is needed for Internet and email connections, unless this is done via your network. On the South African market, there are currently three main options available: (1) Dial-up through a normal phone/fax line is done using standard 56-90Kbits analogue modems – a Telkom line is about R 80 per month plus call units. (2) ISDN lines/modems give you two channels of 64Kbits each – an ISDN line is around R 300 per month + call units (plus the cost of the ISDN modem). (3) Telkom has recently introduced ADSL in South Africa, which provide 256 KB upload and 512 KB download speeds as well as a continuous connection – an ideal solution for intensive Internet users. The cost is R 680 for domestic users and R 800 for business users + R 200 or more for email accounts, but the ADSL modem and initial installation is around R 2,000 extra. The ADSL modem sold by Telkom is not recommended – better self-dialing modems are available, in particular if you want to share one ADSL account over a network. ADSL is currently mainly available in metropolitan areas, but it will be rolled out to other areas in the years to come.

• **Notebooks:** The items above must be modified if you are purchasing a notebook. The main recent improvement here is the new Intel Pentium M (also called “Centrino”) processors – they have lower clock-speed but a 1 MB internal cache. The net result is that they have low power consumption, resulting in notebook battery life of 5-7 hours. Performance is good – a Pentium M 1.4 GHz CPU runs the DHIS as fast as a Pentium 4 2.4GHz CPU, and a Pentium M 1.7 GHz (currently the fastest) is roughly equivalent to a Pentium 4 2.8 GHz.

• **Operating system:** All users should select Windows 2000 (preferred, but sometimes difficult to get) or Windows XP Professional, depending on what’s in use around them. Windows ME and Windows XP Home are NOT recommended, Windows 95 and NT are no longer supported by Microsoft, and while Windows 98 and Windows ME will receive some support from Microsoft longer than anticipated (until 2006) they are falling behind in many respects. Make sure all service packs are installed. The main reason for using 2000/XP is the possible use of e.g. ArcView (see below), as
well as the fact that Windows 9x is being phased out (Win9x versions are still running on top of MS-DOS). Windows 2000/XP Professional both cost around USD 240 (R 1,900). You are today increasingly paying more for Windows + Office than you pay for the PC itself – a good argument for increasing the use of Open Source software.

- **Application software:** All PCs should preferably have Microsoft Office 2000/2002/2003 Professional (with Access), even if the DHIS software also runs reasonably well without Access by using the 97 or 2000 Runtime module. Office 2003 Professional costs around R 5,700 (upgrade around R 4,000), but it is usually possible to get it cheaper through organisational licenses or through PC bundles. Anti-virus software is also a must, including regular (weekly or even daily) updates.

- **GIS software:** The District Teams could be using ArcExplorer 2.0 or later (freeware) to generate maps. The provincial/national PCs should have ArcView 3.3 (R 12,000) or ArcView 8.3 (R 15-20,000) or later, a desktop GIS package that allows advanced spatial analysis and development of spatial data sets tailored to health sector needs. MapInfo is another package that’s popular, but my impression is that the Arc/Info family of software (including ArcView) is dominating in SA. There might be some variation from province to province, though. Note here that some provinces are in the process of establishing spatial databases, often using Spatial Database Engine (SDE) and Arc/Info software. The spatial layers in this database will be available to everybody over the provincial network. (Note: The distribution rights to ESRI products in Southern Africa are vested in Geographical Information Management Systems – GIMS – in Midrand, so the ArcView software must be purchased there or through a local reseller.)

- **Inkjet printer:** Most district offices already have either a black & white laser printer or an A4 inkjet printer, but experience shows that A3 colour graphs are far more suitable for wall displays etc. A3 colour graphs / pictures can also be included in A4 reports as foldouts, with good effect. If the office has no A4 printer, I would recommend both an A4 laser printer (faster with standard pages) and an A3 colour inkjet. The price of an A4 laser printer is in the R 1,500-4,000 range, and an A3 (for instance HP Deskjet 9300) will normally be around R 4,000. Note that the prices of colour A4 laser printers have come down – for instance, the HP Colour Laserjet 1500L costs around R 5,000.

- **Scanner:** All informatics teams need a standard A4 flatbed scanner. A medium quality 30-36 bits colour scanner with at least 1200x1200 real optical resolution will be sufficient to scan printed text, drawings, clippings, photos and similar. It is assumed that graphical and OCR (Optical Character Recognition) software of reasonably quality is bundled with the scanner.

- **Digital camera:** The regional and provincial Health Informatics Teams should have a small digital camera. As elsewhere in the world, politicians, decision-makers and mass media tend to focus most of their attention on larger hospitals. Community Health Centres, clinics and mobile services are widely distributed and often difficult to access. A digital camera would make it possible to visually document the state of Primary Health Care facilities – many of them dilapidated and with broken equipment. Relevant cameras are today 2.5-3.5 megapixels (e.g. 1280x1024 pixels) costing R 1,000-5,000, but the field is developing extremely fast. Semi-professional cameras, costing R 4-10,000, have 3-4.5 megapixels (e.g. 1600x1200 or better) and
are sufficient for pictures to be printed in e.g. newspapers. The cameras should either have a CompactFlashRAM card of reasonable size (64MB+), or they should be using stiffys to transfer the images to a PC.

- **Digital Projector:** The provincial and regional teams need a digital projector for training, sensitisation, and workshop discussion purposes. It must be portable (max 2-3 kg for the basic unit – really light-weight units are only about 1.1 kg), with at least XGA (1024 x 768) resolution and provide even light of 1,000-1,500 lumen under variable lighting conditions. Two replacement bulbs should be included with each projector. Prices have dropped radically and are now in the R 10-20,000 range. NEC, 3M, HP and InFocus are known brands with good quality projectors.

- **Memory and hard disk upgrades:** If you have an older PC and cannot afford a new one, the best performance gains are normally achieved by increasing the amount of memory (RAM). The really old type of RAM chips with 72 pins is now very expensive – if you can get it at all – and standard SDRAM chips are nearly twice as expensive as DDR RAM. So it might be more cost-effective to purchase a new motherboard, a 2.0-2.4 GHz CPU, and 256 MB DDR RAM (approximately R 1,500). Consider carefully if others could utilise older PCs for word processing, email, etc, though – if yes, it is more cost-effective to buy another new computer.

**Equipment for District Informatics Teams**

Based on the technical considerations outlined in the previous section, the equipment for each District Team should be as follows:

**One or two Office PCs with**
- **CPU:** Pentium 4 or AMD processor 2.4 GHz w/ 512K Cache and 533MHz FSB
- **Memory:** 512MB 266Mhz DDR RAM, expandable to at least 1,024 MB
- **Monitor:** 17” or 19” colour monitor (or 15-17” LCD panel)
- **Graphics Accelerator:** 64-128MB AGP Graphics Accelerator
- **Hard Drive:** 60-80GB 7200RPM ATA-133 or Serial-ATA hard drive
- **Floppy Drive:** 3.5inch 1.44MB diskette drive
- **CD-ROM:** 40X-52X CD-ROM drive
- **CD writer/rewriter:** Recordable/Re-Writeable drive, at least 4X 24X 48X
- **Network Adapter:** PCI 10/100 twisted pair Ethernet (might be integrated on motherboard)
- **Keyboard:** Standard Keyboard
- **Mouse:** Microsoft (IntelliMouse) Optical Mouse or similar
- **Operating System:** Microsoft Windows 2000/XP, depending on local standard (usually extra)
- **Application Software:** MS Office 2003 Professional (bundled or extra)
- **Additional Software:** File compression utility (e.g. WinZip 8.1) and anti-virus software. The approximate price per system would be around R 10-15,000.

**Peripherals**
- **Printer:** A3 colour inkjet, at least 300dpi, with 3m cable. Approximate price R 4,000
- **Scanner:** 30-36 bits colour A4 flatbed scanner, min. 1200x1200 real optical resolution, with necessary interface card and bundled graphics/OCR software. Approximate price R 1,500.
- **Network hub**: A standard 8-12 port Ethernet hub. Approximate price R 600. A hub that also support Gigabit Ethernet is around R

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**Equipment for Provincial/National Informatics Teams**

Based on the technical considerations outlined in the previous section, the equipment for each Provincial/National Team should be as follows:

**One or more Technical Workstation PCs with**
- **CPU**: Pentium 4 2.8-3.0 GHz w/ 512K Cache & 800 MHz FSB
- **Motherboard**: Must support CPU and Memory options, preferably with RAID controller
- **Memory**: 1,024 MB (2x512MB) 400 MHz DDR RAM, expandable to at least 2.0 GB
- **Monitor**: 19” or 21” colour monitor (use 21” if you are going to do GIS work) or 17-19” LCD
- **Graphics Accelerator**: 128MB AGP Graphics Accelerator
- **Hard Drive**: 2 ex 80-120GB 7200RPM RAID ATA-133 or SATA hard drive (mirroring for safety!!)
- **Floppy Drive**: 3.5inch 1.44MB diskette drive
- **CD-ROM**: 40X-52X CD-ROM drive
- **CD writer/rewriter**: Recordable/Re-Writeable drive, at least 4X 24X 48X
- **Network Adapter**: PCI 10/100 twisted pair Ethernet (might be integrated on the motherboard)
- **Keyboard**: Standard Keyboard
- **Mouse**: Microsoft (IntelliMouse) Optical Mouse
- **Operating System**: Microsoft Windows 2000/XP, depending on local standard (usually extra)
- **Application Software**: MS Office 2003 Professional (bundled or extra)
- **Additional Software**: File compression utility (e.g. WinZip) and anti-virus software.

The approximate price per system would be around R 20,000.

**Peripherals**
- **Printer**: A3 colour inkjet, at least 300dpi, with 3m cable. Approximate price R 4,000
- **Scanner**: 30-36 bits colour A4 flatbed scanner, min. 1200x1200 real optical resolution, with necessary interface card and bundled graphics/OCR software. Approximate price R 1,500.
- **Digital camera**: Compact model, 1280x1024 resolution or better. Approximate price: R 3,500
- **Digital projector**: Portable, at least 1024x768 resolution, 1,000-1,500 lumen, not more than 3 kg. Approximate price, including 2 spare lamps: R 10,000-15,000
Notebooks
Provincial/national teams, and people involved with on-the-job training, might want notebooks to be able to move around to different venues easily to demonstrate the use of the databases. Interactive use of the database requires a powerful notebook. Also note the USB thumbdrive – highly suitable for rapid data transfer and data base synchronisation between e.g. District desktop computers and provincial/national notebooks.

A high-end Notebook PC with
- CPU: Pentium M 1.4-1.5 GHz with 1MB cache
- Memory: 512MB DDR RAM, expandable to at least 2 GB
- Screen: 14.1” or 15” active matrix TFT XGA display (1024x768 resolution or better)
- Graphics Accelerator: 64-128MB Graphics Accelerator
- Hard Drive: 40-60 GB removable hard drive
- Floppy Drive: 3.5inch 1.44MB diskette drive or compatible SuperDisk drive
- CD-ROM/writer: At least 4X-16X-24X CD writer/reader
- Fax/Modem: Usually on motherboard (56-90Kb)
- Network Adapter: Usually on motherboard – Ethernet 100Mbit or Gigabit
- Mouse: Extra external optical mouse and a mouse pad
- USB thumb drive: Recommended for users transferring data often – preferably min 256MB.
- Carrying case: Standard
- Battery charger: 90-260V external battery adapter.
- Operating System: Microsoft Windows 2000/XP, depending on local standard (usually extra)
- Application Software: MS Office 2003 Professional (bundled or extra)
- Additional Software: File compression utility (e.g. WinZip 8.1) and anti-virus software.

The approximate price per notebook would be R 15-35,000, mainly depending on LCD panel choice and amount/type of RAM (1 GB RAM modules for notebooks are still very pricey: about R 8,000 compared to R 2,000 for a 512 MB module).
Annex 4: Tool for evaluating information use

Determining Levels of Information Usage for the PHC Dataset

<table>
<thead>
<tr>
<th>Level 1: Facility:</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility has an Essential Dataset defined (or uses that for the country)</td>
<td>At least 4 indicators are graphed for the year and up to date for the year and up to last reported month.</td>
<td>At least one problem has been identified and addressed through an action plan.</td>
</tr>
<tr>
<td>Has submitted all of the expected reports in the last year within the period set for the submission of reports.</td>
<td>At least 3 meetings were held in the last 6 months to evaluate the data elements/indicators.</td>
<td>The effect of the action has been monitored and can be shown.</td>
</tr>
<tr>
<td>Feedback reports (at a minimum a printout of the data entered into DHIS for this facility for the last few months – standard report) are received by the facility once data entered into DHIS within the timeframes set for feedback reports.</td>
<td>The facility manager has validated 80% of the feedback reports (checked, signed, and sent back to IO if any errors were noted).</td>
<td>The actions are documented in a written report to the region, the clinic committee, or the annual report.</td>
</tr>
<tr>
<td>The facility manager has validated 80% of the feedback reports (checked, signed, and sent back to IO if any errors were noted).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Level 1: Region:</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>The region has a Minimum Essential Dataset defined(^9)</td>
<td>The regional office has determined which reports (detailing data / indicators and targets for their area of responsibility for the last reported month) are required for each manager</td>
<td>At least 5 problems have been identified and addressed through an action plan.</td>
</tr>
<tr>
<td>Regional office has received reports from 95% of facilities for the last reporting month within the period set for the submission of reports.</td>
<td>At least 80% of expected reports are made available within the expected timeframe.</td>
<td>The effect of the action has been monitored and can be shown.</td>
</tr>
<tr>
<td>100% of expected feedback reports to facilities have been issued within the timeframes set for feedback reports.</td>
<td>At least 8 indicators are graphed in the regional office for the year and last reported month.</td>
<td>The actions are documented in the annual report or other written report.</td>
</tr>
<tr>
<td>The Provincial office has held at least 3 meetings in the last 6 months to evaluate the</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^9\) As determined by it having its own additional indicators, the data elements to determine these indicators, and validation rules to ensure data quality.
<table>
<thead>
<tr>
<th>Ministry:</th>
<th>Indicators.</th>
</tr>
</thead>
<tbody>
<tr>
<td>MoH has a Minimum Essential Dataset defined</td>
<td>MoH has determined which reports (detailing data / indicators and targets for their area of responsibility for the last reported month) are required for each manager.</td>
</tr>
<tr>
<td>MoH has received reports from 95% of regions for the last reporting month within the period set for the submission of reports.</td>
<td>At least 80% of expected reports are received within the expected timeframe.</td>
</tr>
<tr>
<td>100% of expected feedback reports to regional offices have been issued within the timeframes set for feedback reports.</td>
<td>At least 10 indicators are graphed in the ministry office for the year and last reported month.</td>
</tr>
<tr>
<td>The MoH office has held at least 3 meetings in the last 6 months to evaluate the indicators.</td>
<td>The MoH office has held at least 3 meetings in the last 6 months to evaluate the indicators.</td>
</tr>
<tr>
<td>At least 5 problems have been addressed through an action plan.</td>
<td>The actions are documented in the annual report or other written report.</td>
</tr>
<tr>
<td>The effect of the action has been monitored and can be shown.</td>
<td></td>
</tr>
</tbody>
</table>
# Annex 5 Institutions and individuals visited

The assessment included visits to:

| Ministry level          | Director of District Health Services  
|                        | Deputy Director District Health Services  
|                        | Health Statistical Unit staff  
|                        | Reproductive Health Unit staff  
| Hospitals              | Mbabane Government Hospital  
|                        | Mankayane Hospital  
|                        | Raleigh Fitkin Memorial Hospital  
|                        | Good Shepherd Hospital  
|                        | Dvokolwako Health Centre  
| Clinics and Public Health Units | Mbabane PHU  
|                        | Lobamba Clinic  
|                        | Dvokolwako Health Centre  
| Organizations          | NERCHA  
|                        | World Health Organisation  
|                        | Italian Corporation  


Annex 6: OPD data set issues

Comments on Outpatient data used in the Annual Report 2001/2002

This section provides comments on the data that was used to construct the Annual Report. The Annual Report needs to be read in conjunction with these comments.

Before a dataset can be analysed, it must be assessed for quality. Good quality data are defined as:

- **Correct** – the data are accurate i.e. the numbers provided are what actually occurred
- **Complete** – all, or most, of the data have been collected from the available sources and reporting units have reported for each month they functioned.
- **Consistent** – the data are stable and show no unexplained large variances. Good quality data should be stable, and if there are fluctuations, they should be explained.

Poor quality data provide poor quality indicators resulting in poor management decision-making.

The data in this report are described according to the framework of good quality data.

1. **Correctness**

It is not possible to verify the data submitted without going back to the facilities to review the tally sheets and registers which were the initial source of the data. However consistency of data, as discussed below, is a good guide to correctness of data.

2. **Completeness**

Table (i) indicates **Data Input Coverage**.

This is calculated by estimating the percentage of received data for a month against the expected data for that month. Usually, the total headcount of each facility is used as the basis for this indicator. An example would be where each of the 10 facilities in a region sees on average 1000 patients per month. Therefore the expected headcount would be 10,000. If only six facilities submitted their data, and using the actual headcount data (6 x 1,000) compared with the expected headcount data (10,000), the data input coverage would be 60%. Ideal Data Input coverage should be between 98 – 99% every month for each region. Figures below 85% affect the final results of various indicators making them potentially inaccurate, as insufficient data is available. When we look at the data below, it appears as if the coverage is adequate. However, when one considers, that “headcount” data is not in fact collected, and that the consistency is not very good (see below), we cannot put much weight on the data input coverage values.

```
<table>
<thead>
<tr>
<th>Year</th>
<th>Hhohho</th>
<th>Lubombo</th>
<th>Manzini</th>
<th>Shiselweni</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>97.50</td>
<td>91.13</td>
<td>80.30</td>
<td>97.93</td>
<td>91.72</td>
</tr>
<tr>
<td>2002</td>
<td>97.65</td>
<td>95.41</td>
<td>85.81</td>
<td>80.44</td>
<td>89.83</td>
</tr>
</tbody>
</table>
```

Table (i) Data Input Coverage 2001 - 2002
3. Consistency

Consistency can be demonstrated by selecting a specific data element that can be assumed to be consistent every month. For the purposes of this assessment, Measles 1st dose under 1 year has been selected. Consistency is best evaluated at facility and regional level because when data is aggregated, differences between regions become less prominent. We will thus drill down through various levels of data aggregation to assess data consistency.

Analysis of Measles 1st Dose at Ministry Level:

Table (ii) shows the data aggregated at Ministry level, and this data is reflected in Graph 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>1,776</td>
<td>1,486</td>
<td>1,652</td>
<td>1,219</td>
<td>1,706</td>
<td>1,470</td>
<td>1,345</td>
<td>1,301</td>
<td>1,182</td>
<td>1,278</td>
<td>1,337</td>
<td>1,347</td>
</tr>
<tr>
<td>2002</td>
<td>1,945</td>
<td>1,729</td>
<td>1,915</td>
<td>1,880</td>
<td>1,932</td>
<td>1,829</td>
<td>1,543</td>
<td>1,625</td>
<td>1,597</td>
<td>1,733</td>
<td>1,417</td>
<td>1,341</td>
</tr>
</tbody>
</table>

Table (ii) Measles 1st dose aggregated at Ministry level

Graph 1. Line Graph depicting Measles 1st dose aggregated at Ministry level

The graph clearly depicts the problems in the data:
1) there is an unacceptable degree of fluctuation in the data, the worst instance of which is highlighted by the arrow (Note 1), but which is also apparent in September 2001;
2) The gradual decrease in data values over the course of the year (24% drop in 2001 and 31% in 2002), with a 30% jump at the start of the new year (Dec 2001-Jan 2002) suggests that these data are not very accurate.
Analysis of Measles 1st Dose at Regional Level:

Table (iii) shows the measles 1st dose data at Regional level, and Graph 2 depicts this graphically.

<table>
<thead>
<tr>
<th>Year</th>
<th>Region</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Hhohho</td>
<td>519</td>
<td>512</td>
<td>604</td>
<td>516</td>
<td>697</td>
<td>598</td>
<td>562</td>
<td>545</td>
<td>523</td>
<td>591</td>
<td>472</td>
<td>701</td>
</tr>
<tr>
<td></td>
<td>Lubombo</td>
<td>429</td>
<td>353</td>
<td>388</td>
<td>303</td>
<td>495</td>
<td>456</td>
<td>433</td>
<td>372</td>
<td>349</td>
<td>417</td>
<td>369</td>
<td>316</td>
</tr>
<tr>
<td></td>
<td>Manzini</td>
<td>470</td>
<td>304</td>
<td>332</td>
<td>1</td>
<td>73</td>
<td>98</td>
<td>4</td>
<td>9</td>
<td>364</td>
<td>3</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Shiselweni</td>
<td>358</td>
<td>317</td>
<td>328</td>
<td>399</td>
<td>441</td>
<td>318</td>
<td>346</td>
<td>384</td>
<td>310</td>
<td>261</td>
<td>132</td>
<td>327</td>
</tr>
<tr>
<td>2002</td>
<td>Hhohho</td>
<td>647</td>
<td>493</td>
<td>496</td>
<td>613</td>
<td>589</td>
<td>718</td>
<td>516</td>
<td>536</td>
<td>653</td>
<td>518</td>
<td>422</td>
<td>354</td>
</tr>
<tr>
<td></td>
<td>Lubombo</td>
<td>525</td>
<td>418</td>
<td>397</td>
<td>405</td>
<td>454</td>
<td>364</td>
<td>438</td>
<td>407</td>
<td>449</td>
<td>471</td>
<td>418</td>
<td>306</td>
</tr>
<tr>
<td></td>
<td>Manzini</td>
<td>373</td>
<td>544</td>
<td>644</td>
<td>477</td>
<td>526</td>
<td>494</td>
<td>258</td>
<td>325</td>
<td>276</td>
<td>523</td>
<td>479</td>
<td>472</td>
</tr>
<tr>
<td></td>
<td>Shiselweni</td>
<td>400</td>
<td>274</td>
<td>378</td>
<td>385</td>
<td>363</td>
<td>253</td>
<td>331</td>
<td>357</td>
<td>219</td>
<td>221</td>
<td>98</td>
<td>209</td>
</tr>
</tbody>
</table>

Table (iii) Measles 1st dose aggregated at Regional level

![Graph 2: Measles 1st dose aggregated at Regional level for 2001](image)

The reasons for the drop in April 2001 becomes apparent – data from Manzini is missing altogether (this is also the case for the months of Jul - Oct, and Dec, and the data for May and Jun is obviously incomplete). Shiselweni has inconsistent data for Oct – Dec 2001 and again from September 2002.
The data for 2002 (Graph 3) show fewer gross errors, but the gradual decline in numbers as the year progresses points to a problem in data completeness. All regions have gaps in the data in various months. This graph highlights an important principle – it is no use identifying in July 2004 that data was missing from Shiselweni in November and February 2002 – these gaps should be identified within six weeks of the end of the reporting period – hence the emphasis we make on timely reporting.

Analysis of Measles 1st Dose at Facility Level:

In this analysis, we have only concentrated on the facility data for Shiselweni for 2001. The table below depicts the data for the year 2001 in this region, and Graph 4 depicts this data graphically. (While not a good example of a "user friendly graph", it is inserted here to emphasise the point) The facilities shown here were the first 14 in the alphabetical list of all facilities for this region.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dinga</td>
<td>0</td>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr Gama</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
<td>1</td>
<td>1</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dudusini</td>
<td>1</td>
<td>0</td>
<td></td>
<td>1</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dumako</td>
<td>1</td>
<td>5</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dwaleni (Shi)</td>
<td>23</td>
<td>15</td>
<td>21</td>
<td>30</td>
<td>5</td>
<td>9</td>
<td>20</td>
<td>13</td>
<td>14</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dzakasini</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emphelelandzaba</td>
<td>30</td>
<td>8</td>
<td>20</td>
<td>30</td>
<td>30</td>
<td>15</td>
<td>25</td>
<td>32</td>
<td>30</td>
<td>27</td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
Table (iv). Measles 1st dose at facility level for 2001.

<table>
<thead>
<tr>
<th>Facility</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gege</td>
<td>17</td>
<td>7</td>
<td>6</td>
<td>14</td>
<td>10</td>
<td>9</td>
<td>13</td>
<td>10</td>
<td>6</td>
<td>27</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Hhohho South</td>
<td>1</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hlatikulu Casualty</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Hlatikulu PHU</td>
<td>48</td>
<td>42</td>
<td>39</td>
<td>39</td>
<td>50</td>
<td>54</td>
<td>48</td>
<td>39</td>
<td>42</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hluti</td>
<td>6</td>
<td>2</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td>10</td>
<td>21</td>
<td>13</td>
<td>8</td>
<td>9</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>KaMbboke (Shi)</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td>6</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KaNdlovu</td>
<td>20</td>
<td>9</td>
<td>8</td>
<td>11</td>
<td>20</td>
<td>7</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Often a table like this makes it difficult to differentiate the wood from the trees. However, by eyeballing the graph below, we see that there are three big facilities (Dwaleni, Empelandzaba and Hlatikulu) and that all of them have outstanding data for at least one month in this year. Again, even in months in which there is some data, the value appears suspicious. Similar problems, and probably more severe, are apparent for the other smaller facilities as well.

Graph 4. Measles 1st dose for some facilities in Shiselweni Region 2001

The points made above, regarding timely submission of data, and ensuring that data is complete, are all the more relevant at a regional level. If for example, the region wishes to ensure that they achieve an immunisation coverage of 85% for a specific year, they need to be monitoring this trend on a month by month basis. Similarly, each clinic should be doing the same, otherwise the target will never be reached.

Further examples of inconsistent data:
If we find this tendency with the data indicated above, we can expect similar trends for other data as well. This becomes apparent when we look at the table below.

<table>
<thead>
<tr>
<th>Nov</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Planning - Postnatal visit</td>
<td>46</td>
<td>12</td>
<td>11</td>
<td>7</td>
<td>9</td>
<td>22</td>
<td>546</td>
<td>4</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>Family Planning - STI</td>
<td>140</td>
<td>143</td>
<td>1</td>
<td>120</td>
<td>176</td>
<td>3,762</td>
<td>4</td>
<td>53</td>
<td>140</td>
<td>92</td>
</tr>
</tbody>
</table>

Table (v): Example of inconsistent data

It must be stated that not all the data is of poor quality. However, we are not convinced that the quality is good enough at this stage to be able to say with confidence that the data can be used to plan and evaluate health services.

Revised Dataset

Much effort has recently been put into developing a revised essential data set for the country, together with the various programmes, in order to create a uniform agreed dataset. This was based on the data that was defined as needed i.e. a data-led information system (as compared to an indicator-led dataset). Unfortunately the data elements selected are not linked to the operational plan, and they do not lend themselves easily to the calculation of indicators. Registers have been designed and are being piloted. These registers also include the new Integrated Disease Surveillance Response events that need to be reported.
Annex 7: Admission and Discharge Summary Sheet

<table>
<thead>
<tr>
<th>Ministry of Health</th>
<th>Swaziland Government</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADMISSION AND DISCHARGE SHEET</td>
<td></td>
</tr>
<tr>
<td>Hospital:</td>
<td>Code:</td>
</tr>
<tr>
<td>Name:</td>
<td>Admission No:</td>
</tr>
<tr>
<td>Patient No:</td>
<td>Age: Yes No</td>
</tr>
<tr>
<td>Sex (M/F):</td>
<td>Other</td>
</tr>
<tr>
<td>Address:</td>
<td>Ethnic Org: Swazi Other</td>
</tr>
<tr>
<td>Occupation:</td>
<td></td>
</tr>
<tr>
<td>Indv:</td>
<td></td>
</tr>
<tr>
<td>Date of Admission:</td>
<td>Date of Discharge:</td>
</tr>
<tr>
<td>Final Diagnosis:</td>
<td></td>
</tr>
<tr>
<td>Surgery:</td>
<td></td>
</tr>
<tr>
<td>Discharge Status:</td>
<td>Discharge Self-Discharged</td>
</tr>
<tr>
<td>Obstetric History:</td>
<td>No of previous deliveries:</td>
</tr>
<tr>
<td>Did mother receive antenatal care?</td>
<td>No Yes</td>
</tr>
<tr>
<td>Was mother identified as a high risk case?</td>
<td>No Yes</td>
</tr>
<tr>
<td>Present Delivery: Date of delivery:</td>
<td></td>
</tr>
<tr>
<td>No. term alive: Birth Wt (1): kg (2): kg (3):</td>
<td></td>
</tr>
<tr>
<td>If still born: Male/Female</td>
<td></td>
</tr>
<tr>
<td>Type of delivery:</td>
<td>C/S</td>
</tr>
<tr>
<td>Assistant at birth:</td>
<td>Nurse</td>
</tr>
<tr>
<td>Neonatal Final Diagnosis:</td>
<td></td>
</tr>
<tr>
<td>Condition of newborn when leaving the ward:</td>
<td>Healthy</td>
</tr>
<tr>
<td>Remarks:</td>
<td></td>
</tr>
<tr>
<td>Date Completed:</td>
<td>Completed by:</td>
</tr>
</tbody>
</table>

Send to: Health Statistics Unit, Ministry of Health, P.O. Box 5, Mbabane.
Annex 8: Example of a job description for a district/regional information officer:

PROVINCE OF THE EASTERN CAPE
DEPARTMENT OF HEALTH
JOB DESCRIPTION

<table>
<thead>
<tr>
<th>1. JOB DETAILS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Holder:</td>
</tr>
<tr>
<td>Job Title: Assistant Director: Health Information</td>
</tr>
<tr>
<td>Department/Section: Cradock District Health Office</td>
</tr>
<tr>
<td>Location: Cradock</td>
</tr>
<tr>
<td>Rank/Grade: Middle Manager (Information Technology)</td>
</tr>
<tr>
<td>Salary Level: R</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. JOB PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-ordinate the collection, analysis, presentation and appropriate utilization of District Health and Management Information at District, Sub-district and facility level.</td>
</tr>
<tr>
<td>Provide good quality information at sub-district level to assist with indicator driven decision-making.</td>
</tr>
<tr>
<td>Responsible for the overall quality of health data at the sub-district office and provide accurate and appropriate information to facilities and management.</td>
</tr>
<tr>
<td>Participation in the development of the DHIS.</td>
</tr>
<tr>
<td>Provide management and professional support within the sub-district health information unit.</td>
</tr>
<tr>
<td>Submission of required data to Provincial level.</td>
</tr>
<tr>
<td>Manage health information and coordinate and support related activities at sub-district level.</td>
</tr>
<tr>
<td>Contribute to other strategic and operational programs/policies within the Inxuba Yethemba Health sub-district by being an active member of the SDHMT.</td>
</tr>
<tr>
<td>Supervision/on going review of individual performance of the data typist.</td>
</tr>
</tbody>
</table>
3. **JOB DIMENSIONS**

- Report to District manager; liaise with Provincial Informatics Deputy Director; Hospital Management, Clinic Supervisors and Clinic staff.
- Organising and coordinate the District’s data collection and the management of the data for District and Provincial Health Management requirements.

4. **ORGANOGRAM**

```
Provincial Office

Dist. Manager --|---|--|---|---
|         |         |
Program Managers -| Distr. Info Manager -| Distr. Computer Operator

Distr. Data Typist
```

5. **REQUIREMENTS: KNOWLEDGE, SKILLS AND EXPERIENCE**

**Knowledge**

- Proficient in the use of computers and Microsoft programs and in possession of an appropriate recognized tertiary qualification
- Thorough working knowledge of District Health System (DHIS).
- Working knowledge of basic statistics and experience in informatics.
- Sound public health knowledge.
- Information for health.
- District health information requirements.

**Skills**

- Ability to work in MS Excel and MS Word as well as a working knowledge of email, intranet and internet.
- Working knowledge of Arc Explorer.
Ability to work with DHIS (MS Access based).
Efficient in manipulating the DHIS and converting data into meaningful information.
Efficient in dealing with people from diverse disciplines and good interpersonal skills.
Independent activity, initiative, integrity, interpersonal understanding, patience, perseverance, problem solving, self responsible, team facilitation.

### Experience

- Use of computers and working with data.
- Knowledge in conducting Public Health Research and Surveys.
- Experience in informatics.
- Experience in hospital management.
- Experience in Budget and Finance.
- Experience in PERSAL

### 6. KEY RESULT AREAS

1. Coordinate and manage all information needs at District level.

2. Ensure the collection of data at District level.

3. Validation of data collected at District level.

4. Coordinate and manage the computer entry of data collected.

5. Producing reports for supervisors of clinics and hospital management.

6. Produce reports for the District Management Team.

7. Providing feedback for management purposes to District level staff.

8. Submission of data analysis and reports to Provincial Offices.

9. Process relevant data and information from external sources.
10. Assist with District Information Technology needs.

11. Define training needs in District regarding Health Information.

12. Coordinate, manage, develop and maintain DHIS.
13. Manage staff.
14. Ensure welfare of the staff.

7. **LIST OF DUTIES**

   Being responsible for managing data collection, analysis, and reporting of information. This will entail the following:

   - Coordinating and manage the collection of quality data and the maintenance of the DHIS
   - Coordinate health research and surveys within the District – evaluate, analyse and interpret data for management information
   - Coordinate/ensure data is of good quality
   - Analysing, and interpreting data
   - Be able to manipulate data
   - Feeding back information through both summary and comprehensive reports using DHIS
   - Teaching and supporting others by giving them advice, assisting them with information technology and systems related needs
   - Influence appropriate policy development and implementation

**ADDITIONAL TASKS (multi tasking)**

- Fulfil duties of unfilled computer operator post
- Conduct PC training
- Manage Budget and Finance of District
- Assist with District office Provisioning Administration
- Part of Regional Finance and Assets Sub-Task Team – part of restructuring of health services.
- Part of DHERT- District Health Expenditure Review Team
- PERSAL Controller for the district
- Assist Wilhelm Stahl Hospital Management
8. **COMMUNICATIONS AND WORKING RELATIONSHIPS**

<table>
<thead>
<tr>
<th>INTERNAL</th>
<th>EXTERNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Provincial Information Manager</td>
<td>• Approved external users (Researchers)</td>
</tr>
<tr>
<td>• District Coordinator/Manager</td>
<td>• Other Departments (When need arises)</td>
</tr>
<tr>
<td>• Facility/Program Managers/Coordinators</td>
<td></td>
</tr>
<tr>
<td>• Facility/hospital Managers/Supervisors</td>
<td></td>
</tr>
</tbody>
</table>

9. **MOST DIFFICULT ASPECT OF THE JOB**

Ensuring adequate feedback from managers and supervisors regarding data.

10. **JOB DESCRIPTION AGREEMENT**

Job Holder's Signature: ___________________________ Date: ______________

Supervisor/Manager’s Signature: ___________________________ Date: ______________
Annex 9: Example of a data flow policy

PROVINCE OF THE EASTERN CAPE

ISEBE LEZEMPILO / MINISTRY OF HEALTH

DATA FLOW POLICY AND
GUIDELINES ON THE
ESSENTIAL DATA SET FOR
EASTERN CAPE HOSPITALS
1. BACKGROUND

The Eastern Cape Provincial DoH has reviewed the data and information processes that are occurring in the EC hospitals and this review lead to modifications in the implementation of the essential data sets in hospitals.

This document is a data flow policy guideline that focuses on the Hospital Dataset, which is composed of data elements from other data sets such as the National Hospitals Dataset, Hospital Revitalisation Grant Dataset, National Tertiary Services Conditional Grant Dataset, Client Satisfaction Survey and other data sets like the TB and PHC datasets. It seeks to

- describe the data flow process and explain the purpose thereof, and timelines
- outline and direct responsibilities of the people involved in the data flow process,
- provide an explanation on the reporting and feedback functions of the system.

The Eastern Cape Hospital Essential Data Set (EDS) is a set of data collected monthly from all Public Health hospitals in the Province. The data set records elements of access to hospitals, service provision (Hospital, PHC and TB), management functions, the organisational structure and resources used as well as the levels of activity. The system is both paper-based and computerized, with the data collection done at facility level in the wards (units) on paper based tools and the data capturing, analysis and reporting done on computer. The level at which the data is computerized will vary from institution to institution, depending on the size of the facility, its organisational structure, and access to computers.

2. PURPOSE

The purpose of a data flow policy is to provide guidance, and set standards for the flow of information from the point of collection of data to the provincial (and National) levels. This is necessary to ensure that complete hospital data sets of good quality are available at all levels as soon as possible after the end of a report period (month/quarter), so that this information can be used to inform decisions.

The purpose of the Essential Data Set (EDS) for hospitals is to establish a dataset of useful indicators that will enable management to make better decisions based on objective information. Indicators provide information about access to services, performance of service delivery, quality of care, administrative and managerial status, to staff at each level of the system. This will enable managers and staff to measure their own performance, and that of the services that are provided in the hospital, and to take corrective action in a timely manner.
The system is designed to provide the essential information to each level of the hospital system in a timely way and in a format that can be easily used by managers and service providers. Thus the data is carefully selected to provide sensitive indicators and specifically attempts to avoid gathering all possible data, much of which is not necessary or even may divert managers’ attention from the key hospital information needs.

3. COMPONENTS OF THE HOSPITAL INFORMATION SYSTEM:

In the past, information from hospitals was entered into the DHIS at the district, or Provincial levels. However, in order to ensure that managers have access to information on the various reporting units, it has been decided to capacitate hospitals with the skills and resources to enter information into the DHIS at the hospital level. This will result in changes to the data collection and collation tools that were previously in use. We envisage that there will now only be a need for two types of paper-based tools – data collection tools (such as tick registers, tally sheets, and other kinds of primary data collection tools), and reporting tools.

The Data Collection Tools are designed with specific reference to the data elements required (in order to calculate indicators) for that reporting unit. Unlike the primary health care setting, where data elements are similar across most reporting units, reporting units in hospitals can vary significantly in the nature of services provided (for example, theatres differ compared to out-patients departments, maternity ward is very different from the medical ward, etc), and therefore in the types of data required to be reported on.

This implies that data collection tools should reflect the specific reporting requirements of that reporting unit, and should the data elements and indicators be changed or adjusted at any level, the data collection tool will have to be adjusted accordingly. It is important that data collection tools are consistent with reporting requirements in order to ensure that accurate data is provided.

Data collection tools should be designed in a manner that is consistent with the purpose of the dataset that is being collected. For example, a clinic providing anti-retroviral treatment to HIV/AIDS patients is required to ensure that compliance is high. In order to do this, data collection tools should assist staff in ensuring that compliance is high – and so a card based system is more useful than a tick register. On the other hand, a register in an out-patients department is required to provide accurate and easily accessible information about the range of services provided, and therefore a tick register would be more suitable.

Having developed specific data collection tools, one needs a reporting format – this is a summary of the data collected in the primary data collection tools, and is used to calculate
indicators. Reporting formats can be used to summarise daily, weekly or monthly information.

All reporting units are required to provide monthly returns. This is a summary of the data for that month, and can be compiled from the daily, and weekly summaries.

Monthly summaries are entered into the DHIS. This will be done at various levels within the hospital, depending on availability of computers and organisational structure.

The monthly data sheet, tick register and tally sheets can also be customized and printed from the DHIS for each reporting unit individually. During the course of this project an initial set of registers will be printed for the participating hospitals. In the longer term, it is envisaged that the Department will print registers through the government printers, so that they can be available for all hospitals.

The Indicators and Data Elements with their accompanying descriptions and definitions need to be revised at least once in two years. As the annual cycle for this system is based on a calendar year, this document is open for revision from October each year for finalization by the end of November. This arrangement allows for enough time to communicate any changes for implementation by January of the next year.

It may be that at the reporting unit level, the reporting requirements are much broader than that required at the hospital level – and this may be larger than that required at the Complex, provincial and national levels. This means that not all data that is collected at the reporting unit level needs to be transmitted to the next level in the hierarchy.

4. DATA FLOW PROCESS:

The diagram gives a graphic depiction of the proposed flow of data through the hospital. There are a few aspects that require explanation:
4.1 TIMELINES AND RESPONSIBILITIES:

Data for this system is collected monthly in the wards (reporting units). The Monthly Reports for the ward data are to be completed and collated by the person in charge of the ward and submitted to the ward supervisor within three (3) working days following the end of the reporting period. Each reporting unit should have a person identified with the responsibility for ensuring that a monthly report is produced.

The Ward supervisor is responsible to check the data sheets for completeness and correctness. Once this is done the ward supervisor must sign the form and submit it to the hospital information officer by the sixth (6) working day following the end of the reporting period. Supervisors need to become familiar with the requirements of the information system, and have an understanding of the data elements, their definitions, the indicators, their definitions and calculation, and should be able to assess the quality of information supplied from the reporting units under their care.
The hospital information officer (HIO) is to capture the data into the District Health Information Software (DHIS), check for data completeness and correctness; and correct any mistakes after consultation with the supervisors.

Once the data is entered into the DHIS by the hospital information officer, the following needs to happen by the 13th working day after the end of the reporting period:

- A printout of the data needs to be returned to the supervisor and reporting unit for verification;
- Indicators need to be calculated, and these reports produced for a number of roleplayers (depending on the type and size of the hospital, this could include all or some of the following) for example:
  - Supervisor
  - Reporting unit
  - Departmental head (or via the Complex information officer, as some departments may span more than one hospital, and if this information was distributed in this way, would result in fragmented delivery of data)
  - Hospital management
  - How this is done can differ, but could be done using a paper based format, electronically, or via the web using various web-based reporting formats.

- Data should be exported to the Hospital Complex information officer, who will import data from all the hospitals, check the data for completeness and accuracy, and make reports available to the following by the 15th working day after the end of the reporting period:
  - Departmental head
  - Complex management
  - Province

The Provincial Hospital Information Officer (PHIO) is to ensure that all hospitals submit the data sheets on time (by the 20th day following the end of the reporting period) and in the correct format. The PHIO is to analyze the data, develop reports and provide feedback to the CIO and provincial hospital managers.

The Provincial Information Unit is responsible for reformatting the Provincial Hospital Dataset into the structure required by National (i.e. with the hospitals as the OU5 structure rather than the wards/clinics as the OU5 structures). A register recording the dates on which data sets are received will be kept by the Provincial Information Unit. The Provincial
dataset must be compiled and exported electronically to the National Department of Health (Hospital Services) by the twenty-fifth (25) working day following the last day of the reporting period.

4.2 REPORTING AND FEEDBACK

Key aspects about feedback are contained in the diagram below:
This diagram suggests that on average, about 10 days after having received the data/information, feedback should be formulated for the level below. The form of the feedback may differ from level to level, but could include:

- Comparisons between similar units (departments, hospitals, complexes);
- Development of norms and standards for the units
- Questions and reasons for certain patterns

Each of the reporting units and receiving levels as indicated on the data flow process (figure 1) are to use the submitted data sheets to develop reports that will be used to inform decisions at that level of management. Reporting and providing feedback to each immediate counterpart/level has to be done once a month.

Feedback reports are to be made available to each section by the 25th day following the end of the reporting period.

The primary use of the data collected through this system is at the hospital level. It is therefore the duty and responsibility of the person in charge of the hospital to ensure that the data is validated, analyzed and interpreted for action at the hospital. A graphic display of key data elements is recommended. This action should take place immediately after the monthly return is compiled.

The Hospital Information Unit must produce a Data Report for each ward once the data validation process is completed. This report will reflect the data just entered together with data from previous months selected. This report must be sent to the ward via the Ward Supervisor together with any queries or requests for corrections.

The Hospital Information Unit must produce a report on all outstanding input forms immediately after the data has been exported to the Province. This report will list the names of all wards that did not submit data for that month and previous months if appropriate. The report must be channeled to the individual hospital managers/CEO’s via the office of the District Manager.

The Information Managers at both Hospital and Complex level must ensure that a set of Routine Reports is monitored on the DHIS for the different Service/Clinical Departments Managers and Management. These reports must be customized to the need of the individual stakeholders. These reports must be printed and distributed immediately after the validation process. Reports are made to be used for decision making and improvement of services, efficiency and effectiveness in a timely manner. Thus, they must be brief, focused, easy to visualize and understand and lead to action. This is the challenge to Information Managers to make timely attractive and meaningful reports. Success in information systems is when managers make decisions based on information!!
Policy and Procedures for the Monthly PHC Essential Data Set

1. Introduction

This document is a policy guideline that focuses on the Primary Health Care (PHC) Essential Data Set (EDS). It seeks to describe the Information System, explain the purpose thereof, describe the data collection tools and their revisions, explain the data flow and timelines, outline and direct responsibilities as well as provide an explanation on the reporting and feedback functions of the system.

2. Description

2.1 The PHC/EDS is a set of data collected monthly from all Public Health facilities in the Province rendering PHC services. It records elements of service provision, management functions and resources used to enable both accountability for PHC as well as to identify problems. The system is both paper-based and computerized, with the data collection done at facility level on paper based tools and the data capturing, analysis and reporting done on computer. The data is collected at facility level by using two data collection sheets namely the Monthly Report on PHC Activities and the Supplies / Drugs Available.

The data on these forms are compiled from different sources as preferred by the relevant supervisory authority (eg. Tally Sheets or Tick Registers). The data is captured, analyzed and reported on by using a computer system known as the DHIS (District Health Information Systems), which is an MS Access based software package.

2.2 The data elements reported in this system are used to calculate a set of essential indicators identified by the relevant program managers and other stakeholders. The strength of the system lies in the fact that it is based on an Essential Set of Indicators, which is carefully selected to ensure that it is usable by managers at all levels whilst adhering to both national and International data requirements. The system furthermore allows for additional data requirements to be added at each level of the hierarchy. In forwarding data up the hierarchy all additional data remains behind keeping the system streamlined. Copies of the Indicators and definitions can be obtained from the relevant Information Unit.

3. Purpose

The purpose of the PHC/EDS is to enable management at all levels to be better informed on a range of relevant issues, in order to make better decisions based on objective information. Thus, indicators of service delivery and quality, of administrative and managerial concerns, and of community relevant health status
have been identified to provide to staff at each level of the system. This will enable staff and managers to measure their own performance, and that of the programs for which they are responsible, and to take corrective action in a timely manner to assure rapid responsiveness. The system is designed to provide the essential information to each level of the PHC system in a timely way, and in a format that can be easily used by providers and managers at each level. Thus the data is carefully selected to provide sensitive indicators and specifically attempts to avoid gathering all possible data, much of which is not necessary or even may divert managers’ attention from the key information needs.

4. Data Collection Tools & Revisions

4.1 The Data Collection Tool is designed with specific reference to the relevant set of indicators. This implies that should indicators be added at any level, as stated above, a corresponding (new) data collection tool will apply. A copy of the data collection tool, data descriptions and definitions, based on the relevant set of indicators is available from the Information Unit at each level.

4.2 The Monthly Returns as described above are compiled at facility level, and can be done by using the Tick Register for patient data or any other form of Tally Sheet that might be preferred by the facility. Should the facility prefer to use the Tick Register it can be ordered directly from Government Printers under reference number ECH212. The monthly data sheet, tick register and tally sheets can also be customized and printed from the DHIS for each facility individually.

4.3 The Indicators and Data Elements with their accompanying descriptions and definitions are revised once a year. As the annual cycle for this system is based on a calendar year, this document is open for revision from October each year for finalization by the end of November. This arrangement allows for enough time to communicate any changes for implementation by January of the next year.

5. Data Flow, Time Lines & Responsibilities

5.1 Data for this system is collected monthly at facility level. The Data Sheets for both patient and drug data are to be completed by the person in charge of the facility and submitted to the facility supervisor within five (5) working days following the end of the reporting month.

5.2 The facility supervisor is responsible to check the data sheets for completeness and correctness. Once this is done the facility supervisor must sign the form and submit it to the District PHC coordinator by the eighth (8) working day following the end of the reporting month. He/She is also responsible to ensure that all facilities under his/her control submit these forms in a correct and timely fashion.

5.3 The relevant District Municipality is overall responsible for the execution of paragraphs 5.1and 5.2 above for all PHC rendering institutions under local authorities within their district in terms of the Eastern Cape Provincial Health Bill of 1999 and with specific reference to the Partnership Performance &
Service Agreement between the Eastern Cape Department of Health and the District Municipality (see Schedule on Quality Standards).

5.4 The District PHC coordinator must ensure that all facilities rendering PHC services within his/her district submit a return in a correct and timely fashion. This includes hospitals rendering PHC services. He/She must make spot checks on each form to ensure that it is correct. The form must be initialed and dated at the top left corner of the first page by the District PHC coordinator. All forms must be forwarded by the District PHC Coordinator to the District Information Unit by the eleventh (11) working day following the end of the reporting month.

5.5 The District Information Manager (DIM) must ensure that the receipt of all forms is recorded and dated on a register. In the event that any forms are returned for corrections, this must be indicated on the same register.

5.6 The DIM must ensure that all PHC facilities in his/her District are properly registered on the DHIS software, and that appropriate minimum and maximum values for each data item specific to each facility is set up on the software before capturing any data. It is expected of the DIM to determine the appropriate minimum and maximum values for each facility through direct consultation with the nurse in charge of the facility. It is believed that this action will improve the involvement and understanding of the facility staff, which in turn will have a positive impact on data quality.

5.7 The DIM must ensure that all PHC data in his/her possession is captured, validated and exported electronically to the Provincial Information Unit by the twentieth (20) working day following the last day of the reporting month.

5.8 The DIM must ensure that all reports and feedback are generated and disseminated as described in point 6 below, by the thirtieth (30) working day following the last day of the reporting month.

5.9 The District Manager of each District is overall responsible for the execution of paragraphs 5.4 to 5.8 above.

5.10 The Provincial Information Unit is responsible to import all data from the Districts into the DHIS in order to compile a Provincial dataset. A register recording the dates on which data sets are received will be kept by the Provincial Information Unit. The Provincial dataset must be compiled and exported electronically to the National Department of Health by the twenty-fifth (25) working day following the last day of the reporting month.

5.11 The Provincial Information Unit must ensure that all reports and feedback is generated and disseminated as described in point 6 below, by the thirtieth (30) working day following the last day of the reporting month.

1. 5.12 The Director responsible for the Provincial Information Unit is overall responsible for the execution of paragraphs 5.9 and 5.10 above.
2. 5.13 To facilitate the smooth and timely flow of relevant data and reports, it is recommended that Information Managers be included in management meetings to provide rapid access to needed information.

6. Reports & Feedback

6.1 The real purpose of the PHC Essential Data Set is to provide Health Service Providers at all levels with up-to-date information to evaluate and improve the rendering of PHC services. This makes timely feedback and reports to be an essential cornerstone of the system.

6.2 The primary use of the data collected through this system is at the facility level. It is therefore the duty and responsibility of the person in charge of the facility to ensure that the data is validated, analyzed and interpreted for action at the facility. A graphic display of key data elements is recommended. This action should take place immediately after the monthly return is compiled.

6.3 The District Information Unit must produce a Data Report for each facility once the data validation process is completed. This report will reflect the data just entered together with data from previous months selected. This report must be sent to the facility via the Supervisor together with any queries or requests for corrections.

6.4 The District Information Unit must produce a report on all outstanding input forms immediately after the data has been exported to the Province. This report will list the names of all facilities that did not submit data for that month and previous months if appropriate. The report must be channeled to the individual supervisors via the office of the District Manager. The Provincial Information Unit will do the same once the data has been exported to the National Department of Health. This report will be sent to each District Manager via the office of the Head of Department of Health.

6.5 The Information Managers at both Provincial and District level must ensure that a set of Routine Reports is monitored on the DHIS for the different Program Managers and Management. These reports must be customized to the need of the individual stake holders. These reports must be printed and distributed immediately after the validation process. Remember – reports are made to be used for decision making and improvement of services, efficiency and effectiveness in a timely manner. Thus, they must be brief, focused, easy to visualize and understand and lead to action. This is the challenge to Information Managers to make timely attractive and meaningful reports. Success in information systems is when managers make decisions based on information!!

6.6 The format of Periodical Reports (eg Quarterly, Half-yearly and Annual) must be negotiated between the Management Team and the Information Unit. These reports contain more detail and interpretations than the rapid Routine Reports (eg, Tables, graphs, maps and comments). The compilation of these periodical reports is a collaborative effort between the different Program Managers and the Information Unit.
6.7 Any reports requested from the Information Unit, other than those mentioned in paragraphs 6.5 and 6.6 above must allow for at least three working days from the time of the request to the due date. This arrangement emphasizes the importance of Program Managers’ active involvement in the design of both Rapid Routine and Detailed Reports. The Routine Reports should ideally satisfy those ad hoc and unexpected requests for information.
Annex 10: The District Health Information Software

**Introduction:**

The District Health Information Software, developed by the HISP team, is developed in accordance with the principles espoused by the “Free and Open Source Software” philosophy, and is therefore freely available to anyone who wishes to use it, as long as it is not abused for commercial purposes. Furthermore, open software may be freely probed, customised and modified. This is the cheapest way of generating software suited to the country’s needs. Whether the software has been used in South Africa or other countries, any one with programming skills and who wishes to make changes is encouraged to do so. All such developers are encouraged to in turn share their improvements as Open Source.

**A brief description of the programme:**

Its high degree of user definability (based on the premise that the information system must contain data relevant to the smallest organizational unit if they are going to use the system to evaluate their services) has lead to it being translated into other languages for use in those countries. Currently, supported languages include Spanish (Cuba), Portuguese (Mozambique, Angola), Mongolian, Russian, and Chinese. Efforts are underway to complete the translation into Swahili (Tanzania), Telugu (Andhra Pradesh, India), Kannada (Karnataka, India), and Norwegian. The screenshots below show the English, Portuguese, Russian, and Spanish versions of the routine/monthly data module:

The software allows clinics and hospitals to enter data relating to their services if they have access to a computer. However, because not all facilities have a computer on site, the data is usually entered into a computer system in Health District or Sub-district offices and then transmitted electronically to Provincial and National Departments. Some of the principles used in the development of the software are:
1. That users at a local level should be able to adapt the software system to suite their needs. Hence, in addition to data entry (Step 1 of diagram below), the system allows users to:
   - Add new facilities (organisational units);
   - Define new data elements and indicators, define new validation rules, set maximum and minimum limits for data entry;

Once data has been entered, it needs to be exported to the next level in the health system (District Municipality or Province). When data is exported (step 2 in diagram) the system allows the user to determine which data elements and indicators need to be exported. Thus, the principle of the information pyramid (whereby not all information is needed or relevant to all levels) can be applied by the software. On the other hand, if facilities are added, these are included in the exports so that data integrity at higher levels of aggregation is maintained.

2. That users at all levels should be given feedback on the data that is entered into the system. To this end the system uses a transient database (data mart – step 3 in diagram) from which users can generate reports (step 4 of diagram). Reports can be tailored to include certain data elements or indicators, from various sources (monthly data or routine survey data). Health indicator sets can also be interfaced with the free ArcExplorer software that allows data to be presented as thematic maps or analysed.
further in Geographical Information System software. The generation of pivot tables is another tool that allows data to be presented in various ways.

3. The DHIS supports not only routine monthly or quarterly data, but also the capture and analysis of semi-permanent data (population estimates, equipment, infrastructure, number of personnel, services provided per facility, etc) and survey/audit data. This stems from the premise that not all information needs to be collected on a routine basis – some can be collected annually or six-monthly through regular surveys, and some semi-permanent data can be updated whenever changes are occurring. It is important to recognise that surveys or research project often are conducted in certain areas for limited periods, and our experience is that most of this data is later lost because it is not linked to existing data collection tools or an integrated HMIS. It is also our experience that for instance population mid-year estimates, which is crucial for population based indicators and public health strategies in general, often might exist but in a format and location where health managers have no easy access.

One clear success story is from the South Peninsula Administration in Cape Town – SPA used the DHIS as a core tool for bringing their TB cure rates up from 61% in late 1995 to a stable 85% in 2001. Their approach is spreading to other areas.

Cure/Completion Rates - New Smear+ TB

4. That the system should incorporate patient data where appropriate, either by interfacing to other Patient Record systems or through a web-based Special Patient (SP) Module linked to the Routine Data Module. The illustration below shows an integrated TB/HIV register based on the SP module which is still under development.
5. We view the DHIS as a Management Information System which will include financial and personnel data as well. This will provide managers with a user friendly tool to access integrated management information. The financial and personnel modules are expected to be incorporated during the course of this year.

6. Some provinces are using the DHIS to track their transport services. The graph below indicates how through tracking vehicle use and expenses, using the DHIS, the cost of services has been reduced over the years.
Conclusion:

The brief outline of the DHIS software shows that we have an emerging global network aimed at fostering and sharing health information systems solutions on a Free and Open Source basis. Our South African team consists of professionals with lots of experience and a proven track record. This track record includes considerable work related to developing and implementing information systems.

We regard our over-arching vision of an integrated but modularised public health information system, based on free sharing of solutions and public access to all anonymous health data, as a crucial factor in combating HIV/AIDS with its many opportunistic infections and widespread damage to the social fabric of society. Our public health approach is reflected in our efforts to also interface health information systems to financial/personnel systems, physical infrastructure (water, sanitation), standard of living (poverty, welfare), and disease mapping & analysis particularly oriented towards cross-border flows of disease organisms and their hosts (patients).