Ministry of Health and Social Welfare

NATIONAL HEALTH MANAGEMENT INFORMATION SYSTEM STRATEGY AND IMPLEMENTATION PLAN

June 2009

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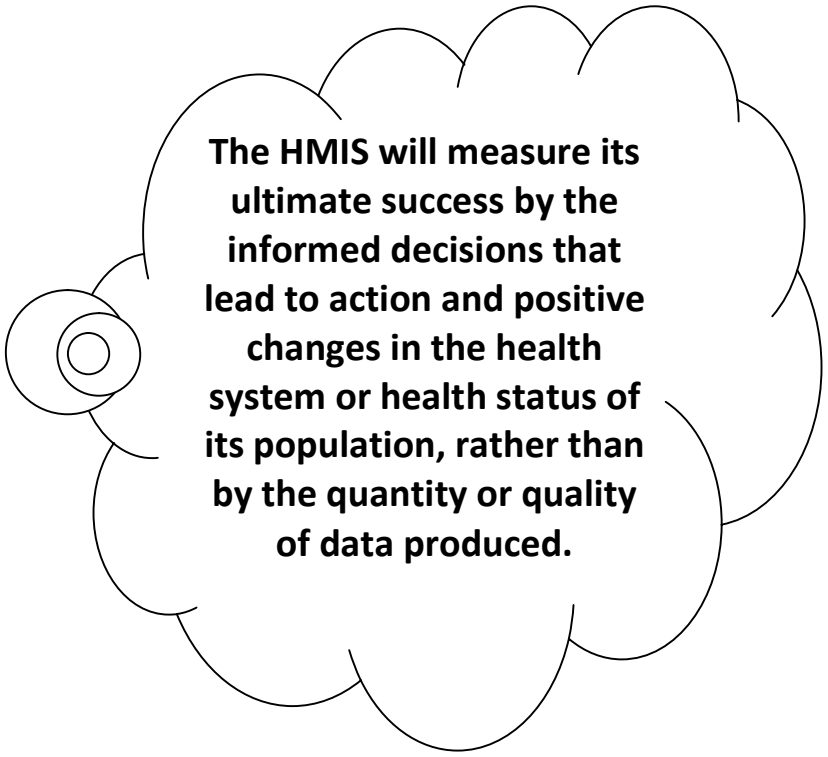
BASICS


The HMIS will measure its ultimate success by the informed decisions that lead to action and positive changes in the health system or health status of its population, rather than by the quantity or quality of data produced.

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Acronyms

BPHS	Basic Package of Health Services
CBHIS	Community-Based Health Management Information System
CHV	Community Health Volunteer
DHIS	District Health Management Information System/software
FMIS	Financial Management Information System
GIS	Geographical Information System
GOL	Government of Liberia
GPS	Global Positioning System
GSM	Global System for Mobile Communication
HMIS	Health Management Information System
HMN	Health Metrics Network
HRIS	Human Resource Information System
HSCC	Health Sector Coordination Committee
ICD	International Classification of Diseases
IT	Information Technology
LAN	Local Area Network
LISGIS	Liberia Institute of Statistics and Geo-Information Services
LSMIS	Logistics and Supply-chain Management Information System
M&E	Monitoring and Evaluation
MOHSW	Ministry of Health and Social Welfare
MTOT	Training of Master Trainers
NGO	Nongovernmental Organization
NHP	National Health Policy, National Health Plan
PAMIS	Physical Assets Management Information System
PRS	Poverty Reduction Strategy
TWG	Technical Working Group

Acknowledgements

On behalf of the senior management of the Ministry of Health and Social Welfare (MOH/SW), I would like to whole heartedly extend our heartfelt thanks and appreciation to all institutions and individuals that made the development of the Health Information Management System (HMIS) Strategy Policy possible.

While it would be impossible to list each contributor by name, I would like to mention some key organizations without whose support the development of the HMIS Strategy would have been impossible.

The BASICS Project with funding from USAID was instrumental in fielding the consultants who worked with the Ministry of Health and Social Welfare and other health partners to develop and refine this document. In addition to making inputs in the finalization of the Strategy, a number of our health partners contributed significantly during all stages of the strategy development; among these are Merlin and the Health Information system Project (HISP) of South Africa.

Again, I sincerely convey my gratitude to all individuals and organizations that contributed to putting together the various strategic pieces that made up the HMIS strategy.

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Preface

Emerging from more than 14 years of destructive war, Liberia is highly committed to attaining an acceptable standard of health for its entire population in the shortest possible time. The Health Policy Framework 2007 and the National Health Plan (NHP) 2007-2011 have clearly described national goals and priorities. The Health Management Information System (HMIS) has been considered one of the health system's essential building blocks and, therefore, has been placed as a high priority item. A separate Health Management Information System Policy has been developed to guide the information system design and operationalization.

This strategy is guided by the HMIS Policy 2008 that embraced the framework and standards set by the Health Metrics Network. The HMIS thus developed will meet international standards and be fully compatible with health management information systems in the majority of low- and low- to middle-income countries worldwide.

The HMIS design will be guided by the principles of information for action. The HMIS is designed to provide programme managers and staff with reports on how well each programme is functioning and to alert the service providers and programme managers to take timely necessary corrective actions. The HMIS will provide systematic data on a regular basis, highlighting the level of achievements made by each programme. Each programme will explore the details and take corrective actions.

The HMIS has well-defined information sources including routine versus periodic, institution (facility)-based versus population-based, service output versus resource input; all need to be developed and strengthened to have an effective HMIS.

HMIS operationalization requires skilled people. Provision has been made to train all health workers in generating and using information; this includes record keeping, processing, and reporting skills.

This strategy document is designed to be "rolling" or "evolving" in nature. In this regard, the strategy will be updated as system components are put in place and areas for additional strengthening are identified. An outline of activities, resource requirements, and timeframe will be included in each version.

S. Tornorlah Varpilah
Deputy Minister for Planning, Research & Development
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Chapter 1: Introduction

1. Context[1]

Liberia is emerging from more than 14 years of destructive war. Its population is 3.489 million with a growth rate of 2.1 percent.[2] Land area comprises 111,370 square kilometers (kms). Population density is around 30 persons per square km, but is very uneven, with four counties housing 70 percent of the total population. Massive population displacement in the rural areas during the war led to artificially accelerated urbanization, resulting in severe overcrowding in towns and cities. The literacy rate is less than 40 percent. Three-quarters of the population live below the poverty line on less than US$1 a day.

Liberia's health services have been severely disrupted by years of conflict and looting. While the revitalization of the health services has begun, health services are still far from satisfactory. Liberia's health status may be summarized as follows[3]:

- Infant mortality rate of 71/1,000 live births
- Under-five mortality rate of 110/1,000 live births
- Child mortality rate 41/1000 live births
- Maternal mortality ratios of 994/100,000 live births.

The Ministry of Health and Social Welfare (MOHSW) Rapid Assessment identified 354 functional health facilities, including 286 clinics, 50 health centers, and 18 hospitals. An additional 200 health facilities are currently nonfunctional. Access to health services is estimated to be 41 percent.

The health workforce consists of approximately 4,000 full-time and 1,000 part-time staff. This includes 168 physicians, 273 physician assistants, and 453 registered nurses, and more than 1,000 nurse aides and other health professionals.

The health care system is fragmented, uneven, and heavily dependent on vertical programs and nongovernmental organizations (NGOs).

There are many and diverse challenges to rebuilding the health system. The immediate challenge is **expanding access to basic health care of acceptable quality** by:

- Ensuring the availability of funds at the county level to support the continuous

[1] National Health Policy 2007 and National Health Plan 2007-2011.
[2] National Population and Housing Census 2008: Preliminary Results.
[3] Liberia Demographic and Health Survey 2007.

delivery of basic services
- Improving the availability of essential medicines and other critical health commodities
- Rehabilitating health facilities in underserved areas
- Upgrading the skills of health workers and redeploying them to areas where they are most needed
- Improving the availability of safe water and sanitary facilities
- Boosting management capacity at all levels to support the delivery of services.

The first step in boosting management capacity is to improve the information base and monitoring and evaluation capacity.

Long-term challenges include:
- Ensuring the availability of adequate resources to sustain investments called for by reconstruction as well as the increased recurrent expenditures resulting from reconstruction
- Restructuring resource allocation patterns so that underserved communities benefit adequately from the health sector's recovery
- Reducing the present strategic and operational fragmentation to ensure coherence of sector development and attain efficiency gains
- Upgrading, streamlining, and restructuring the workforce through a long-term training program and the introduction of effective personnel management practices
- Strengthening the supply chain and rationalizing pharmaceutical management to ensure the availability of affordable, safe, effective, and essential drugs and other critical commodities
- Revamping the health care network through targeted investments in health care and support facilities, in view of increasing access to primary and referral health services
- Establishing effective management systems capable of operating a modern health sector and of responding to the changing context and health needs of the Liberian population over time
- Introducing effective regulatory provisions and mechanisms to ensure adhesion to norms, fair and productive competition, and quality health services.

2. National Health Policies and Plans

The National Health Policy proposed a revised policy that concentrates on several overarching priorities, e.g., 1) expanding access to a basic package of health care through investments in infrastructure, human resources, and decentralized management; and 2) establishing the building blocks of an equitable, effective, lean, responsive, and sustainable decentralized health care delivery system.

The Poverty Reduction Strategy (PRS) outlines the emerging process and path of economic reform and reconstruction. It represents a bridge to a more comprehensive and longer-term national economic development framework for Liberia. The health sector is included

within the PRS pillar of "rehabilitating the nation's badly conflict-devastated infrastructure and delivering basic pro-poor services and facilities."

The provision of basic health and nutrition services is a major government priority. With assistance from its development partners, the government of Liberia (GOL) will continue to strive to improve the health status of the population, especially the rural and urban poor. The GOL will ensure that an equitable, affordable, and integrated Basic Package of Health Services (BPHS) is provided to all communities and persons, especially to the poor, to the vulnerable, and to women and children. Health systems planning and management will be decentralized to the county level to more fully engage communities and coordinate local partners in the health development process. Major priority areas of the PRS include:

- Building human capacities of health workers and health managers
- Ensuring a financially sustainable primary health care system
- Re-establishing an efficient health referral system
- Reducing maternal, infant, and under-5 mortality rates
- Reducing malnutrition among infants, children and pregnant/lactating mothers
- Fighting malaria, tuberculosis, and HIV/AIDS
- Strengthening health management and information systems
- Establishing early warning systems for epidemic response and disease control.

3. Health Management Information System (HMIS)

Both the Poverty Reduction Strategy and the National Health Policy have placed establishing the Health Management Information System (HMIS) as a high priority task. Health and management information are integral parts of a national health system. This information is a basic management tool and a key input for the improvement of the health status in the country. The HMIS primary objective is to provide reliable, relevant, up-to-date, adequate, timely, and reasonably complete information on health needs, delivery of services, availability and use of resources, and effectiveness of services for health managers at the facility, county, and national levels. Information plays a central role in supporting strategic goals and in underpinning the principles of the National Health Policy and Plan.

As the country has just started rebuilding its various systems including the health sector, understandably, a functional HMIS does not yet exist. It needs to be conceptualized, designed, and developed so as to provide much needed information support for better planning and management of health services.

The HMIS policy has been already developed. The development of this strategy and implementation plan is an important step toward the establishment of an effectively functioning HMIS. The purpose of this strategy is to recommend the framework and

actions required to make sure that all those who need health and management information get the information they need and are in the position to use competently, confidently, and effectively. Access to good health information provides the tool for evidence-based decision making at all levels. It also provides the means for ensuring that best use is made of resources in delivering quality health service.

The policy context for the development of this strategy is clear. The National Health Policy (NHP) 2007, National Health Plan 2007-2011 (NHP), and BPHS have recognized that a high-quality information infrastructure is a fundamental necessity for achieving the country's health objectives. The BPHS and decentralization of health program management can only be planned, supported, and evaluated through the effective use of information. It is for these reasons the National Health Policy and National Health Plan have identified information as one of critical outputs for change.

Given the wide-ranging definition of HMIS, the broad scope of information required to encompass the needs of the stakeholders includes information:

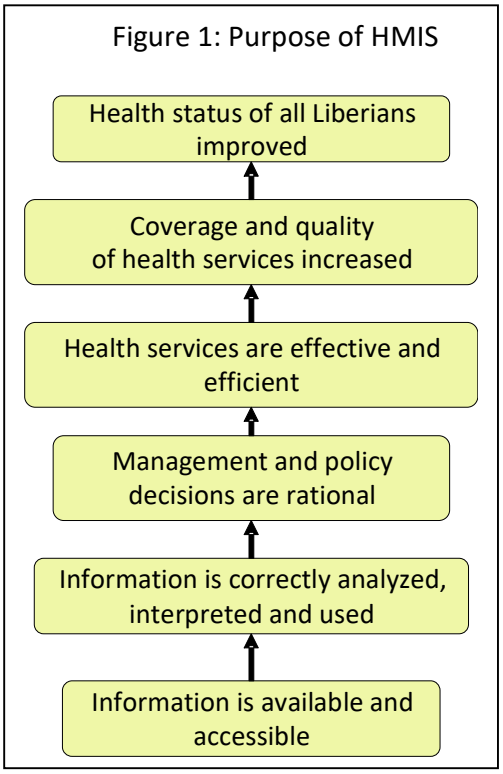
- For the public about health and the health services to empower them to make health-related decisions
- To assist health professionals in clinical decision making and to provide quality care
- To support the planning, monitoring and evaluation of health services, including human resource management, planning, and resource allocation
- To support the development and implementation of policies and the allocation and use of resources to promote, protect and restore the health of individuals, special needs groups, and the general population
- On health status and health determinants
- On health resources and physical assets
- On pharmaceutical and health care products.

The strategy's fundamental objectives are elaborated upon in later chapters and listed below. The objectives are to:

- Support the implementation of the NHP (2007), PRS, NHP 2007-2011, and BPHS
- Adopt an integrated national approach to the development and expansion of information sources and systems to best meet the strategic health information needs
- Establish processes and structures that ensure the fuller use of health information in policy making, planning and implementation processes, and care provision, and to support quality assurance and accountability arrangements in the health system
- Improve health information access for all stakeholders
- Establish health information standards that ensure the quality and comparability of health information and enable appropriate information sharing
- Exploit the enabling technologies in the collection, processing, analysis, and dissemination of health information.

4. The Purpose of HMIS

Figure 1: Purpose of HMIS



This strategy is designed to ensure that the required health and management information are available and accessible to all users and that each piece of information is adequately and appropriately used in its predefined and intended purposes (see figure 1). The four main reasons for collecting health sector information are summarized below:

4.1. Assess Individual Health Needs and Manage Care

The primary purpose of establishing a health system and its support systems, including HMIS, is to provide appropriate health services to an individual. Therefore, the information that HMIS captures must be adequate to assist health professionals in clinical decision making and in providing quality care.

4.2. Assess Health Status

The assessment of population health and of the factors that influence health requires the availability and analysis of a diverse range of information from within and outside the health sector, including the following:

- Trends and patterns in the demographic profile of populations and subgroups
- Trends in the determinants of health in populations and subgroups
- Trends in morbidity and mortality of populations, subgroups, and ecological and development regions
- Trends in the use of services by populations, subgroups, and ecological and development regions
- Effectiveness of health promotion, protection, and intervention initiatives.

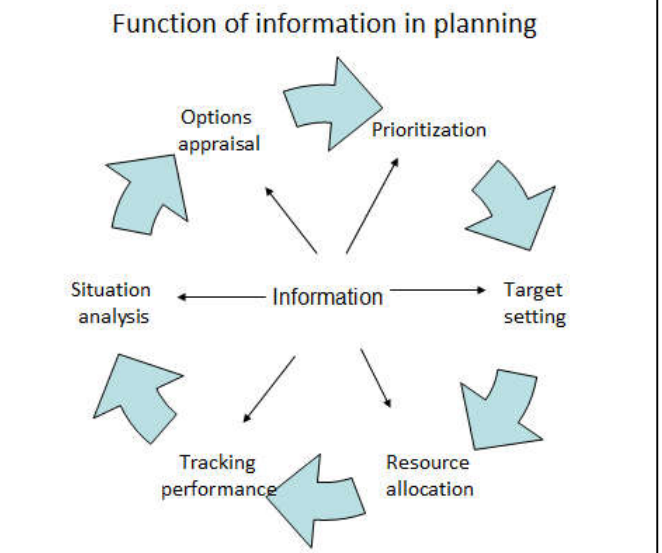
There is limited and fragmented information on morbidity, health inequalities, health status, and health determinants of the population and its subgroups. It is generally not possible to see the interplay between health status, health determinants, service utilization, and the effectiveness of services on influencing the health of populations at the county and health facility levels. Without such information, it is virtually impossible to determine health priorities, support the evidence-based approach for targeting resources through the service planning and implementation processes, conduct health impact assessments, narrow inequalities in health, or demonstrate improvements in health in line with national targets.

Population statistics published by the Liberia Institute of Statistics and Geo-Information Services (LISGIS) can be used for geo-coding health data. Use of the national grid coordinates allows a finer, but more complex, level of analysis. Geo-coded data and the use of modern geographical information systems and spatial analysis techniques can support the following:

- Service planning and evaluation
- Providing an evidence base for accurately and objectively allocating resources to meet the priority needs of local populations
- Comparing access to and viability of health services across geographic regions
- Rapidly investigating local health concerns
- Identifying areas of low service use to improve targeting of preventive measures
- Identifying areas with high levels of morbidity and mortality to improve targeting of preventive measures.

4.3. Plan Health Services

Figure 2:



A primary goal of health policies, plans, and strategies is to provide an equitable service that best meets the population's priority needs. To achieve this goal, emphasis is placed on the need to strengthen accountability by developing annual implementation plans. Planning is a key management process that must be supported by reliable, timely, and well-defined information, if it is to be effective. There is a need to enhance planning through the better use of information (see figure 2). It is essential that annual planning processes align with the priorities identified in national policies, plans, and strategies. The processes should also effectively and objectively target health inequalities and be supported by a comprehensive needs assessment of the local population along with a balanced set of performance indicators that systematically measure service outcomes. In this way, funding decisions will promote equity as a whole and create implementation incentives. To meet the above requirements, financial and human resource information should be integrated with service activity and clinical and population health data. This composite information, together with information derived from ongoing research and evaluation in the local, county, and national contexts, should form an evidence base in health service planning and implementation processes.

To improve management, there is an urgent need for greatly improved and comparable health information that is continually updated and can be used locally on a daily basis. It is essential that human resource information be integrated with financial information and other systems, and that this data support workforce planning, time management, staff retention and recruitment, benchmarking, and management information processes. Such a system would allow an in-depth analysis where economic and demand factors can be incorporated into forward extrapolations to make reliable predictions of future staff and skill-mix requirements.

Health care facilities and organizations at all levels will be required to demonstrate the appropriate use of information in health services planning and management. A core part of NHP and BPHS is that there will be more effective planning and development over a period of years. It establishes how annual budgeting and implementation plans will be implemented on an ongoing basis. It is essential that the planning and evaluation processes make better use of available health information and that there is no disconnection between the short-term annual plans for operational service delivery and the longer-term view encompassed in national policy objectives and strategy. There will be a requirement for implementation and plans to be demonstrably and firmly based on available and high-quality information. The result is better planning that:

- Is clearly supported by high-quality information derived from appropriate needs assessments, including information that reflects the present and projected population structure, local determinants of health, health status, health inequalities, deprivation, remoteness, priority needs, and the quality of service provision
- Is shown to be evidence-based
- Relates to current and projected capacity requirements
- Is in line with national policies, strategies, and targets
- Is based on information on existing service provision that demonstrates quality of care through the use of performance indicators of efficiency and effectiveness
- Maps the progress of MOHSW pillar programs.

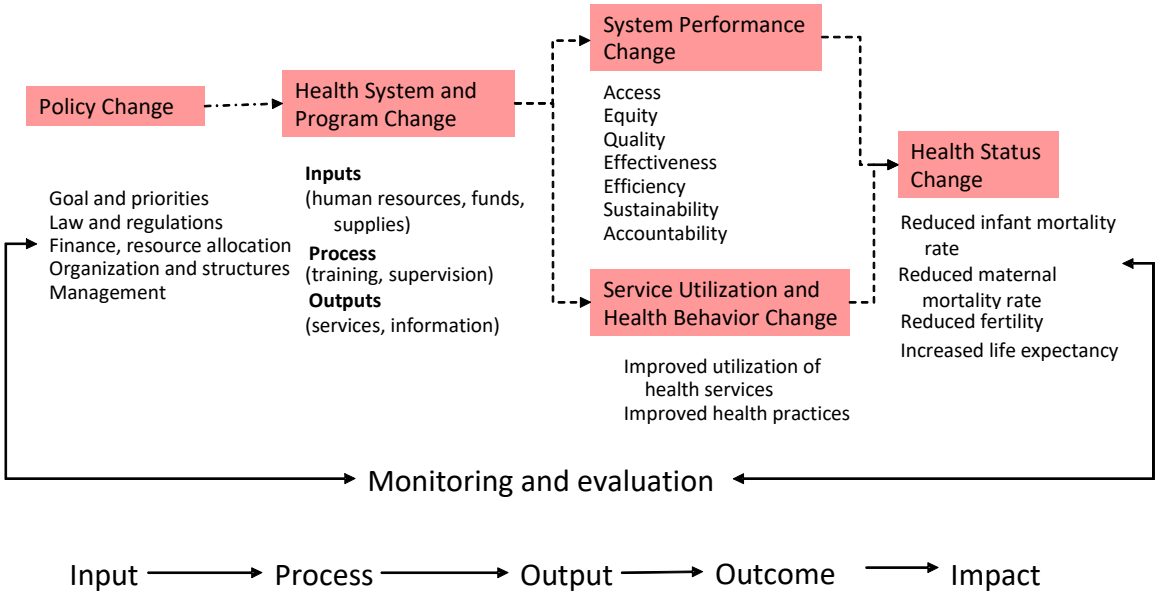
4.4. Measure Performance and Results

The health sector aims to achieve the following objectives:

- Increased availability of the basic package of health services to all those living in rural and remote areas, with special emphasis on poorer section of the population and needy women through the development of an effective and efficient health management system
- Decentralized health system with a participatory approach at every level
- A public-private-NGO partnership established in the delivery of health care services
- Improved quality of health care provision by a public-private-NGO partnership through the total quality management of human, financial, and physical resources.

Health sector reform aims to improve access, equity, quality, efficiency, effectiveness, sustainability, and accountability. This section places performance measures in a framework that maps the linkage between health system reforms, changes in health system performance, and, ultimately, changes in health status. It also provides a rationale for focusing on system performance. The framework for measuring results is presented in figure 3, below.

Figure 3: Framework for Measuring Results



The health monitoring and evaluation strategy provides a detailed elaboration of the monitoring and evaluation (M&E) framework, indicator system, routine monitoring, periodic reviews, and evaluation plans.

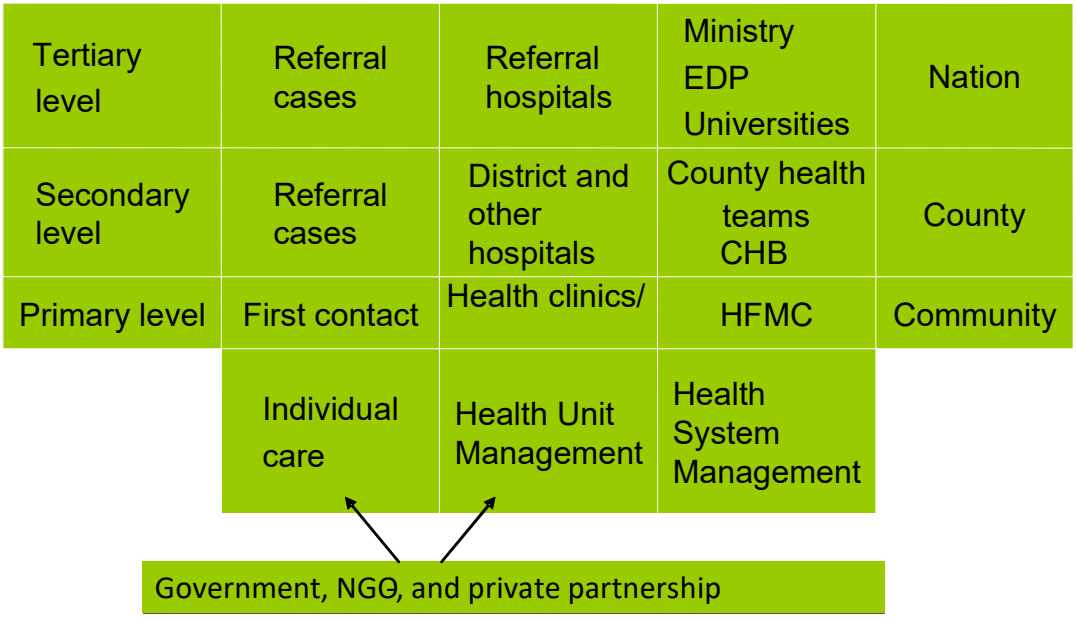
Chapter 2: System Architecture

This chapter describes the requirements and characteristics of a national HMIS. A national HMIS will provide a platform for investments to improve health outcomes and promote health system efficiency and effectiveness.

1. Organizational Structure of the Health System

Figure 4, below, presents the structure of Liberia's current health system. In this diagram, each stakeholder at each level has specific functions, and each requires information to conduct his/her daily functions in efficient manner.

Figure 4: Organization Structure of Health System



2. Information Requirements: Essential Core and Common Indicators

Information products and services should support the MOHSW goals and objectives. Therefore, understanding the MOHSW goals is one of the most important first steps in assessing its information needs. The national health policy, plan, and strategy have documented MOHSW information needs.

The National Health Policy 2007 and National Health Plan 2007-2011 identified two sets of indicators. A total of 29 indicators were suggested for observing progress in NHP

implementation. Ten indicators were suggested as milestone indicators; four of these indicators are new, bringing the total number to 33 indicators.

A total of 36 indicators are suggested for the county level; some of these also national indicators, covering different domains of the core business and support systems: BPHS, human resources, support systems, infrastructure, finance, partners, maternal and newborn care, child health, reproductive health, and disease control.

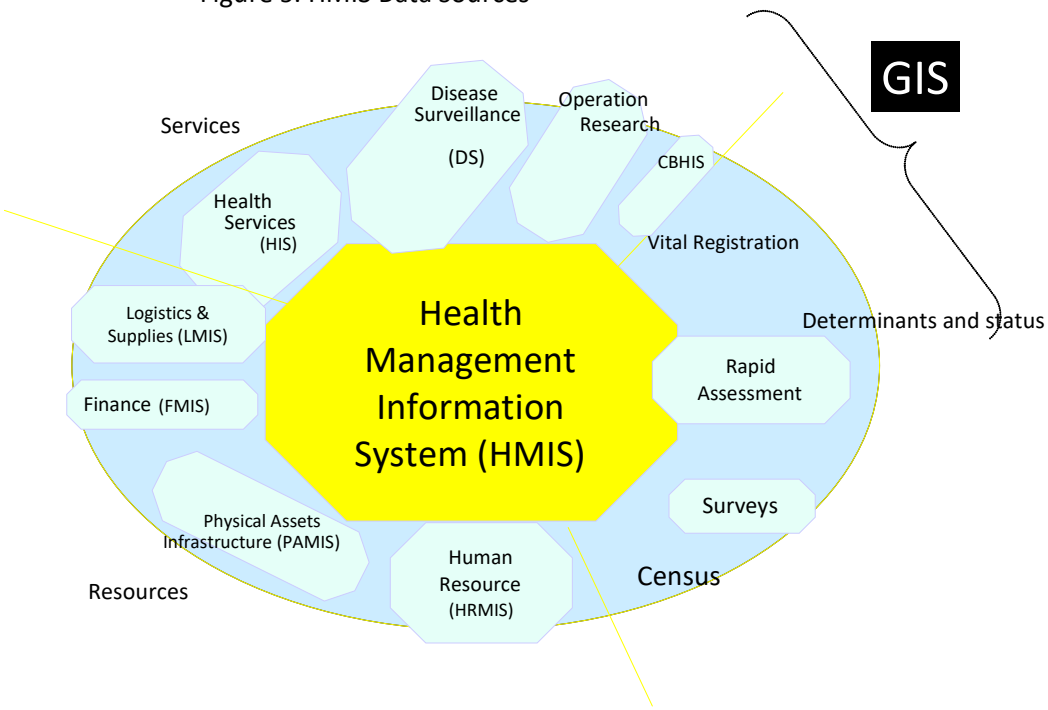
As part of the Health Information System (HIS) implementation, a number of indicators and corresponding data elements were introduced into the DHIS database.

All these fragmented and ad hoc indicators and datasets were examined against their purpose and the final set of national core and common indicators were determined and are presented in annex 2**,** below.

3. Health Information Sources

The HMIS will obtain information from several direct sources as well as other systems within and outside the health sector (see figure 5). All the sources and their current performance status and each of their strengthening strategies are described briefly in the sections below.

Figure 5: HMIS Data Sources



3.1. Census

Population data is at the HMIS foundation. Up-to-date population figures must be available for health facility catchments and counties to plan for health services and measure changes. Health systems will continue to obtain population data from the national census. Target populations for each year will be projected for each level using the inter-census growth rate for that particular level. The MOHSW will provide its population data requirements to the LISGIS Office to be incorporated into the decennial census. The 2008 census data is available for 10,297 enumeration units, with each of their latitude and longitude addresses.

Working in collaboration with LISGIS, the Monitoring, Evaluation, and Research Division will derive total catchments population for each health facility and estimate target populations for each service on an annual basis.

3.2. Vital Registration

In Liberia, the MOHSW has the mandate of vital registration. Though the vital registration is mandatory by law, the registration rate is very low. Liberia is starting birth registration as part of universal child registration as an entry point to vital registration.

Death registration will be gradually incorporated into the vital registration system, and some effective strategies will be devised to ensure the registration of all deaths.

3.3. Surveys

The latest Demography and Health Survey (DHS) was conducted in 2007. Such surveys will be conducted periodically to update population data on health outcomes and impact indicators. At a minimum, the information below on impact indicators will be obtained from such surveys:

- Life expectancy
- Total fertility rate
- Crude death rate
- Maternal mortality rate
- Infant mortality rate
- Under-five mortality rate
- Neonatal mortality rate

Other health information will also be included in the survey to verify the quality of information generated from routine sources and to collect additional information that are not routinely available.

A health facility census and health facility accreditation survey will be planned and implemented in a coordinated manner to avoid duplication and to complement one another. The possibility of incorporating both into single survey needs to be examined and implemented, if feasible.

3.4. Rapid Assessment

Several rapid assessments or targeted studies will be conducted periodically to furnish quantitative and qualitative data on concurrent health issues. Exit interviews and facility-based record reviews will be the preferred assessment methods.

3.5. Sentinel Sites

Correctly classifying each disease and establishing the cause of each death (based on the International Classification of Diseases [ICD]-10) is not possible in the current health service delivery system. The diagnosis of a fever by a physician assistant in a clinic and by a physician at a teaching hospital could be completely different. Obtaining case details from each facility in the country is neither required nor feasible. However, the country needs to know the prevalence of each disease and cause of each death.

Therefore, the inpatient and outpatient data from John Fitzgerald Kennedy Medical Center and two other well-equipped referral hospitals will be used to generate more comprehensive information, specifically disease surveillance, to obtain trends in common conditions. The quality of data from well-equipped sentinel sites will be obviously high and can provide a strong basis for setting the health sector's priorities.

3.6. Research

Health research plays a crucial role in the ongoing development and provision of quality healthcare that best meets the needs of both individuals and the general population. This strategy supports collection and management of information for health research purposes and vice versa.

3.7. Disease Surveillance

Occurrence of disease of public health importance will be timely analyzed, investigated, and fed into the management at the facility, county, and national levels for their appropriate response in a timely manner.

Currently, the following diseases are under active surveillance system:

- Acute Flaccid Paralysis
- Acute water diarrhea
- Bloody diarrhea
- Cholera
- Other hemorrhagic fever
- Lassa fever
- Measles
- Meningitis
- Tetanus
- Yellow fever
- Rabies

Trends and distribution of these diseases will be analyzed and fed into the planning process.

3.8. Human Resource Information System (HRIS)

Human resources information is required for broader human resource planning purposes. In the context of the decentralized management of health services, there is a need for a comprehensive human resource database to be maintained in each county for each government and non-government facility located in the county. With this arrangement, human resources data that are updated in the counties will be electronically sent to the MOHSW headquarters. This information system component will generate information for each facility and county and for the entire health system, such as the following:

- Health personnel by professional cadre by facility and by county, and for the entire nation
- Established versus filled positions
- Population providers ratio by facility and by county, and for the entire country
- Personnel attrition rates by professional cadre and by cause
- Human resource production ratio by professional cadre
- Health personnel trained in different technical and management support programs
- Human resource intake ratio by professional cadre
- Estimated attrition rate for the next five years by cause of attrition.

3.9. Financial Management Information System (FMIS)

The government's financial management procedures require routine reporting on disbursement and expenditures. The system should feature datasets to measure progress towards equity and efficiency in the delivery of services. The financial component of the information system will generate information on the following indicators:

- Annual budget by cost centers and by program/subprogram
- Cumulative budget disbursement by county and subprogram
- Population budget ratio by county
- Cumulative expenditure by county and subprogram
- Expenditure by cost centre by category of expenditure (salaries, drugs, medical equipment, building, vehicle, etc.)
- Percentage of cost-sharing contribution of in total expenditure by county and by the central hospital.

3.10. Physical Assets Management Information System (PAMIS)

A record of health facilities and equipment (medical and non-medical) will be established for each health facility in the country. The record will contain current status, remaining life span, and rehabilitation needs. Each health facility in the public sector will establish and maintain such records. The county health officer will maintain electronic records by

facility for the entire county; the ministry will electronically combine the records from all counties, analyze the current situation, and plan for the future. Such records will be routinely updated when there is a change due to construction, supply, and/or rehabilitation. However, a thorough comprehensive updating will take place at least every five years.

This information system component will generate information on the following indicators:

- Health facility building requirements, current situation and gaps by facility, by county and for the entire country
- Forecast of next five years' construction and rehabilitation requirements of health facility buildings
- Electricity, communication, and water supply situation by facility and by county
- Equipment requirements versus availability by facility
- Capital investment by county for the current fiscal year
- Comparative capital investment plan for primary, secondary, and tertiary care
- Planned versus rehabilitated buildings and equipment

3.11. Logistics and Supply-chain Management Information System (LSMIS)

Each health facility and county health office collects, compiles, and uses information to:

- Estimate the annual requirements for drugs, vaccines, contraceptives, and essential medical supplies by health facility and by county, and for the entire country
- Supply drugs, vaccines, contraceptives, essential medical supplies by health facility and by county, and for the entire country
- Estimate per capita expenditures on drugs, vaccines, contraceptives, essential medical supplies by health facility and by county, and for the entire country
- Maintain the quality of drugs and commodities.
- Maintain vehicles.

3.12. Health Information System (HIS)

Each health facility—whether it is government-, NGO-, or privately-run—requires record keeping of the services that it generates. Each facility will compile service data and analyze service quality and coverage. The minimum record keeping requirements will be inclusive of:

- Identification of the person served (given and family name, age, gender, address, health facility catchments, county)
- Health status assessment
- Services given
- Outcome.

The HMIS subsystem is being implemented retrospectively.[4] The DHIS database has been customized for Liberia, and existing data is being captured in four counties. HMIS design and implementation are a top priority.

3.13. Program Reporting

In addition to information from the above 12 different sources, reporting on implementation of different activities will be required for the comprehensive monitoring of the National Health Plan and BPHS.

4. Geographical Information System

The Geographical Information System (GIS) is a powerful visual tool to assess and plan for health services. It is very useful in tracking and monitoring health in terms of geographical variations in the types and magnitude of problems, equity in distribution of health services across the country, and service utilisation.

Most baseline data on the spatial dimensions of health are currently available. LISGIS appears to have the data needed to derive catchment boundaries of each public health facility in the country; this can be further defined during the training of county health teams and health facility staff.

The GIS will be used to present different thematic maps, specifically information on:

- Public and private health facilities
- Health facilities meeting accreditation standards, in general and physical equipment and human resource standards, in particular
- Key services including emergency obstetrics care (EmOC), voluntary counselling and testing, anti-retrovirals, and child survival
- Distribution of eradicable diseases
- Major medical equipment, vehicles, and ambulances
- Endemic areas
- Key service coverage indicators by health facility catchments area at the county level and by county at the national level.

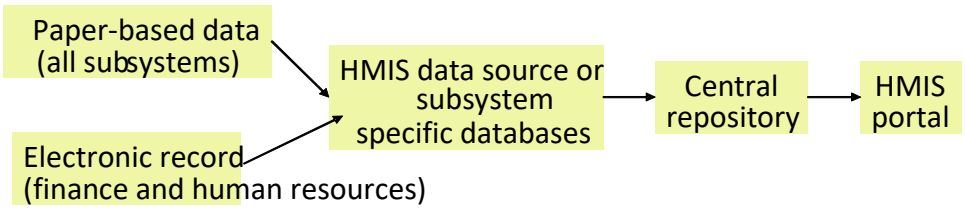
The MOHSW has already developed a GIS database for counties and health facilities. However, information on both spatial and attribute dimensions have not yet been updated. In collaboration with the LISGIS, the MOHSW will periodically update the health GIS and disseminate GIS data to relevant stakeholders for their understanding of prevailing situation and for deciding a future course of actions. Spatial data will be updated annually, and attribute data will be updated quarterly or at other times, as and when available.

[4] Currently available data will be captured in the DHIS while waiting for the revisions of tool guidelines that will include all the data elements.

5. Interfaces

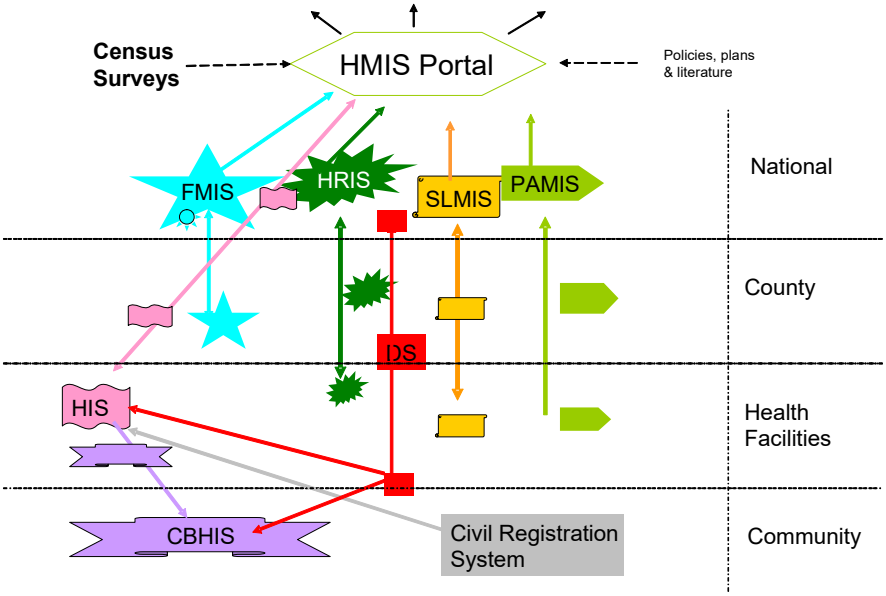
Figure 6, below, presents the overall interface depicting the different layers of HMIS data management.

Figure 6: Interfaces between Layers



The locale and overall interface between HMIS subsystems are explained in figure 7, below.

Figure 7: Information Repositories and Flows



The Civil Registration and Community-Based Health Information Systems (CBHIS) are community based whereas the integrated HMIS and disease surveillance are entirely facility based. Other management information subsystems, such as HRIS, FMIS, and PAMIS, are managed at the MOHSW headquarters. LSMIS procurement and its supply component are managed at headquarters; demand and consumption are managed at the local level. The local level records are on paper; data are processed using a simple calculator and disseminated in manually-prepared table, graphs, and wall charts.

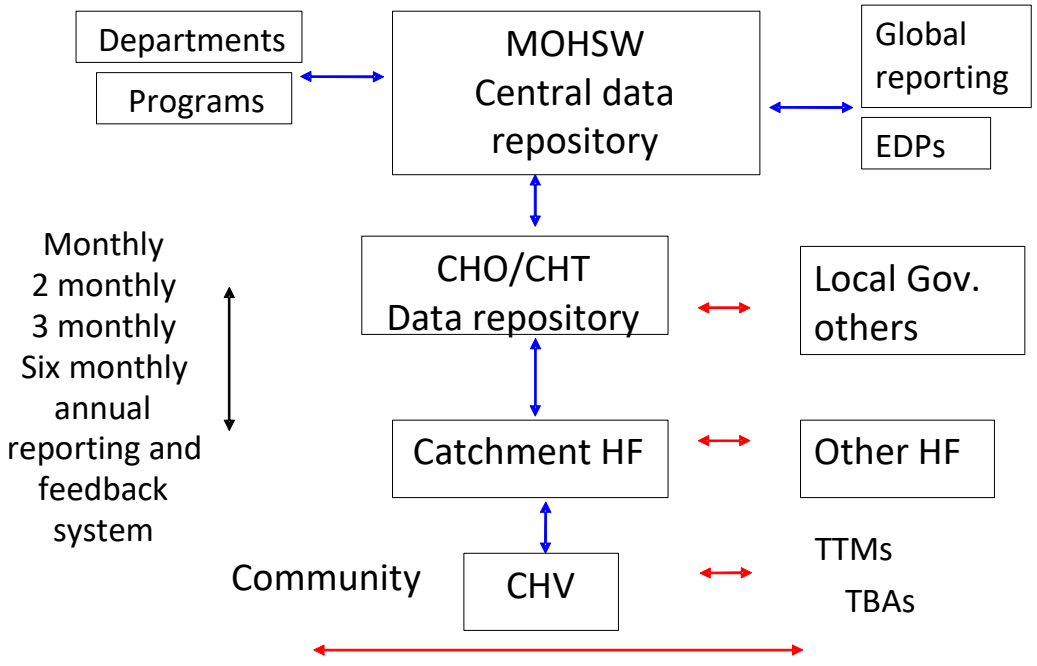
The county health offices also keep primary records of all HMIS subsystems on paper. However, the data of all HMIS subsystems are computerized at the county health office level and reported to MOHSW in electronic form to be integrated into an HMIS central repository.[5] The county generates electronic reports and distributes them in hard copy to county health team members and health facilities.

The HMIS subsystems managed at headquarters—such as human resources, finance, and procurement and supply—will be recorded directly into an electronic database that sends data to an HMIS central repository. The subsystem data are required for calculating indicators.

6. Information Flow

Reporting will be always bidirectional, moving in both vertical and horizontal directions. Using the data received from health facilities, statistical tables, and analytical reports, data will be generated and reported back to the reporting facilities for their use in health services planning and management. Similarly, statistical tables will be submitted to MOHSW headquarters for its information and use in policy and strategic decision making.

Figure 8: Information Flow



Note: CHO = county health office; CHT = county health team; CHV = community health volunteer; EDPs = external development partners; HF = health facility; TBAs = traditional birth attendants; TTMs = trained traditional midwives.

[5] A
file

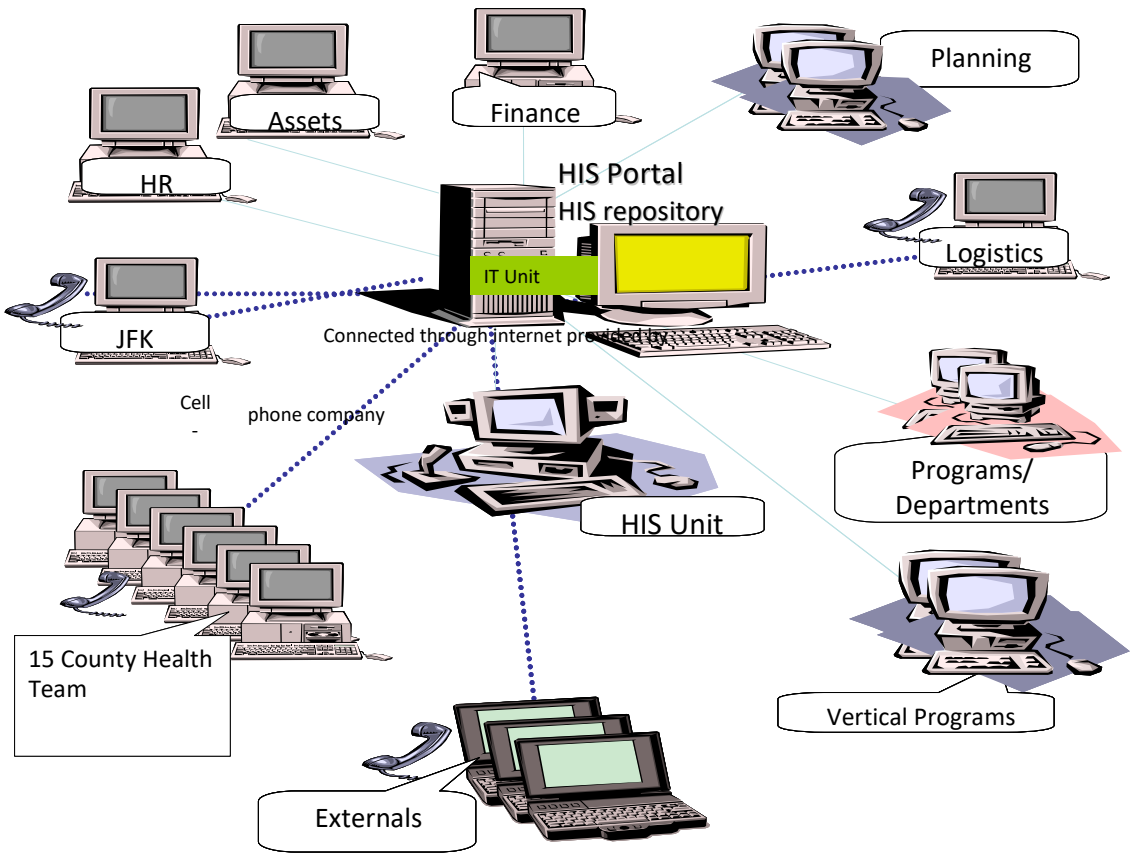
Figures 8 through 10 explain the logical information flow between levels and between stakeholders within each level.

The information flow between levels will follow the logical channels as shown in figure 8, above.

Figure 9, below, shows how information is disseminated or accessed at the national level.

All stakeholders at MOHSW headquarters will access electronic data through the HMIS portal[6] connected through either a local area network (LAN) or via the Internet. All

Figure 9: Information Flow at the National Level



counties will submit their routine reports using the Global System for Mobile Communications (GSM) technology. The MOHSW will consider installing a VSAT (very small aperture terminal) to connect Gbarpolu County, which does not yet have cellular coverage.

7. Feedback

Reporting will also move in both vertical and horizontal directions. Each facility will receive feedback from the county health office, and each county health office will receive feedback from MOHSW headquarters in the same interval as the reporting intervals.

[6] The HMIS portal is a framework for integrating information across health sector boundaries. It provides a secure unified access point in the form of a Web-based user interface and is designed to aggregate and personalize information through application-specific data warehouse /repository.

Report feedback must reach the recipients before the submission deadline of the next report.

8. Information Management

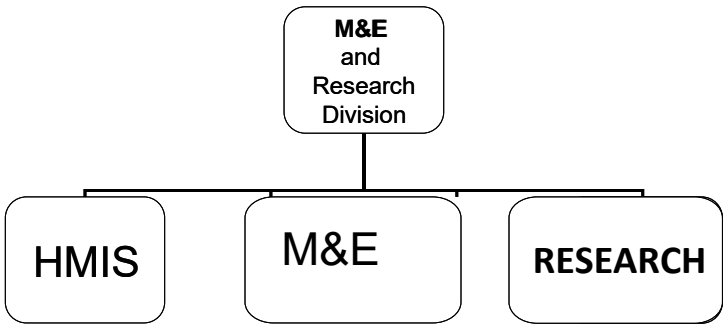
Implementation of this strategy will require a range of developments and changes in organization, management, and culture. This will present significant challenges throughout the sector, and effective change management processes will be particularly important. This strategy's success will depend on a strong central driving force and mechanisms that ensure its consistent, effective, and timely implementation.

As described below, major investment in human resources, new technology, and change management are required.

8.1. Institutional Requirements

Institutional requirements to operate a comprehensive HMIS and facilitate the MOHSW's monitoring and evaluation functions at MOHSW headquarters are shown in figure 10, below.

Figure 10: Organizational Structure of the HMIS at the MOHSW



The development and operation of a comprehensive HMIS requires well-established policy planning, coordination, facilitation, and control mechanisms. The complexity of managing an HMIS and the importance of providing comprehensive information in strategic planning and policy making demand a separate highly competent and fully dedicated body in the MOHSW headquarters as well as in county health offices. Therefore, the currently fragmented HMIS, Monitoring & Evaluation (M&E), and Research-related units will be restructured in a format similar to that shown in figure 10, above.

8.2 Human Resource Requirements

The availability of appropriately skilled and trained staff to support the potential of information in the health sector is critical for the strategy implementation. Developing the capacity of the health system to deliver on the actions in this strategy requires a significant and sustained investment in human resources. At the minimum, a team of three to four people with the following qualifications is required:

- Health Management Information Systems
- Demography

- Public Health
- Biostatistics and Research.

Similarly, an HMIS and an M&E Officer, with minimum qualifications of a bachelor's degree, will be required for each county. Once recruited for all counties, they will be trained in HMIS and M&E.

8.3 Funding Requirements

Substantial funding support is needed to establish the various management information subsystems in a coherent manner. Though the current national health plan has allocated US$1.31 million for HMIS development, the vertical program-specific funds will have to be channeled through the pool funds to ensure adequate inputs for rational development of each HMIS subsystem. A medium-term expenditure framework will be developed to this effect.

8.4 Health Information Governance and Legislation

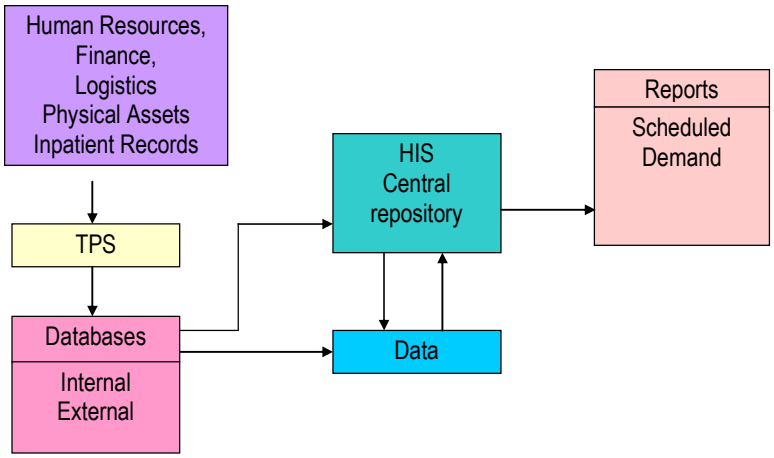
The health service's primary objective is to ensure that the highest levels of health and social well-being are achieved for the whole population. This strategy proposes to exploit information to the fullest in pursuit of this objective. In doing so, it recognizes that there is a need for a set of rules to ensure the availability of the highest quality information and their full and correct use in health services planning and management.

Information governance refers to a strategic framework that brings coherence to the information collection, analysis, dissemination, and use. It provides the stakeholders with a practical basis for the appropriate use of information. The policy framework addresses issues such as reporting of notifiable diseases by practicing health professionals, complying with reporting requirements by public and private health institutions/facilities, and quality assurance of information management (collection, analysis, and dissemination). The next amendment in the Public Health Act will need to incorporate these issues to ensure full compliance by all stakeholders, including private partners.

Chapter 3: Use of Technology

Information technology (IT) is a tool that facilitates health information collection, analysis, dissemination, and use. Figure 9 in previous chapter and the adjacent diagram (figure 11) explains technology's role in the overall work process of a modern health system or a health institution. It includes hardware and software for the support of health information. IT offers many ways to improve the quality of care, to help staff to make better use of their time and expertise, and to promote greater efficiency.

Figure 11: Transaction processing system



Programs and departments in central offices as well as in county health offices have computers but, because of a lack of software and appropriate training, their use is confined to word processing. There is a need for a national, cohesive, and integrated approach to the implementation of modern IT solutions in response to priority health information requirements.[7]

Information management—storing, analyzing, and disseminating—at the county and national levels will be computerized over time.

The county will be the centre point of a national comprehensive HMIS. Each county will have an electronically maintained comprehensive database in which information from all sources will be compiled, stored, processed, and reported to all stakeholders. Each county health office will have a standard set of IT equipment, including computers, a printer, facsimile machine, scanner, surge protectors, and modem, and other necessary equipment to collect, analyze, print, and electronically share information with the MOHSW.

At MOHSW headquarters, all program managers will have a computer and a modem to download and analyze data in their programmatic interest. Such data will be available from the health information portal either through a local area network in the MOHSW complex or through an Internet connection.

[7] Hardware and software specification will be worked out in detail by a computer engineer to be hired for designing and developing databases, interface software, and the HMIS portal.

1. Software Applications

HMIS data will be collected in papers at the health facility and county levels. In the national MOHSW, financial logistics and procurement data can be recorded directly in an electronic database with the ability to print selected details and summary datasheets.

The health services component of the HMIS is in the process of being computerized at the county and MOHSW headquarters levels. DHIS software and database have been adapted for this subsystem. The LSMIS system is being developed with a paper-based system at facilities and an Excel-based database at the county and ministry headquarters levels.

The financial management system is using an off-the shelf package known as ACCPAC that runs on an SQL server. It uses a local area network with 12 terminals.

The human resources database and infrastructure database are being developed in Access software. The GIS is using ARCGis. The Monitoring, Evaluation, and Research Division will require a license key to update the GIS database and thematic maps. Vertical programs, departments, and counties will use free Arc Explorer to read the thematic maps generated by the Monitoring, Evaluation, and Research Division in headquarters.

As resources are extremely limited, the software will have to be robust, affordable for development and maintenance, and, most importantly, user friendly. All the software for specific subsystems and the broader HMIS interface should run in the MYSQL server.

2. Hardware Platforms

Hardware requirements and their specifications are presented in table 1, below. This specification will be revisited by the software engineer to be hired for IT design and development for HMIS.

Table 1: Hardware Specifications

Hardware Specifications	National Monitoring Evaluation and Research Division	County Monitoring Evaluation and Research Division	Hospital Medical Record Unit	Health Center and Clinics
Calculator			2 units	1 unit
All new purchases of computers must have at least the following specifications: ▪ Intel® Core™2 Duo processor E7200 ▪ Intel (3MB L2, 2.53 GHz, 1066	2 units for the central Monitoring, Evaluation, and Research	1 unit	1 unit	

MHz) ▪ DG30 motherboard ▪ 1GB DDR2 RAM , 160 GB Sata ▪ 17" monitor , ATX Cabinet, ▪ Optical Mouse Multimedia Keyboard, ▪ DVD Writer	Division, and 1 unit for each sub-system			
Surge protector	10 units	3 units		
GPS		1 unit		
Scanner	1 unit	1 unit		
A3 color printer	1 unit	1 unit		
Digital camera, 10 megapixel		1 unit		
HP DesignJet 1050C, a color printer for GIS users	1 unit			
LCD Projectors and accessories	1 unit			

3. Local and Wide Area Networks

Installation of a local area network in the MOHSW building is underway. The LAN will connect all departments and divisions to the health information portal. Overall connectivity at the national level would be similar to figure 9, above.

The HMIS will provide up-to-date information, and the IT unit will disseminate this information through the portal. The LAN will be a medium of vertical and horizontal communication in the MOHSW headquarters.

Communication between the MOHSW headquarters and the counties will be through GSM data transfer technology and general packet radio services data transfer protocol. Each county will have 24-hour connection through a GSM cell phone.

4. Operating System

The HMIS will use a Linux operating system and MYSQL database server in its all servers and network terminals.

5. Interoperability

The hardware, software, LAN, and telecommunication system used by HMIS and source-specific databases will be user-friendly. Impediments to interoperability, involving language, interface, or data structure, will be taken into account at the outset. HMIS users will be able to access required information in the predefined required format through simple menu-driven procedures.

6. Web-Based Health Information Portal

Modern technology and, in particular, Internet-based technology, provides a practical solution to the delivery and use of health information for those who require it, when they require it, and in appropriate formats. This strategy recommends the development of an Internet-based Health Information Portal to provide a range of information services for the public, health professionals, researchers, and policy makers. A key objective of the Health Information Portal will be to facilitate access to statistical data and databases to serve the needs of policy analysts, service planners, researchers, epidemiologists, and others with health data requirements. General access to aggregate statistics will be available online, and restricted/authenticated access to disaggregated data for more in-depth research will be authorized in line with information governance requirements. The new and extended access offered through the Health Information Portal will take the form of a National Health Atlas. This will be developed over time and is envisaged to be linked with county health atlases to allow for a more detailed link to county and health facility catchment data, as appropriate. In addition to providing national and subnational access to health data and analysis tools, the portal will also be linked with other national and international health management information systems. National links will include LISGIS and other ministries. International links will include United Nations systems, among others.

Chapter 4: HMIS Strategy

1. Guiding Principles

- Data generated or collected must be action-oriented; it will support better management and service improvement.
- Changes to data recording and information reporting will align closely with clinical, health, and managerial information needs.
- Duplication in data collection will be avoided. Efforts to improve data flow and information sharing across programs and services will be encouraged.
- Practical data analysis and use will occur as close as possible to the point of data collection.
- Health indicators to measure progress will focus on priority health problems.

2. Objectives

The plan objectives are to achieve the following six objectives:

(1) To harmonize the HMIS functions
(2) To implement the health services component of HMIS
(3) To conduct a health facility survey to update human resources, health infrastructure, and physical asset information
(4) To develop the HMIS portal
(5) To improve the use of information for decision making
(6) To promote information access
(7) To ensure that there are adequate staff for information system development
(8) To regularly evaluate system functions and quality.

3. Strategies and Activities by Objectives

Objective 1: To harmonize the HMIS functions

Appropriate data collection depends on a clear understanding of the information required for action. Data collection and recording and reporting forms will be closely matched with desired outputs. These outputs are typically expressed as health indicators. Such indicators will be clearly stated and prioritized.

It is important not only to collect morbidity and mortality data, but also to collect data of adequate quality and to use the resulting information to achieve an important impact on health. Care is needed to ensure that the duplication of data collection and reporting is avoided and that the flow of data is optimized. The most efficient means of data collection will be used. For example, while most routine systems do require substantial

strengthening, for some indicators, periodic surveys will result in better quality and more easily obtained data than will continuous data collection through routine systems.

Health systems are data intensive. Over time, the need for management control has resulted in large volumes of data being reported to higher levels. The often-uncoordinated requests for the same data by various domestic and international agencies may result in duplicate data collection and reporting systems. There is an obvious need to streamline and coordinate the collection and dissemination of information, and to harmonize the various program databases at the central and county levels.

An important mechanism to reduce duplication is the establishment of a national level steering committee to oversee and approve the establishment of indicators, databases, and methods. The existing Health Sector Coordination Committee (HSCC) will act as HMIS Steering Committee.

It is vital that the harmonization process cover two important aspects:

(1) **Data generation and collection:** Data to be included in the databases will be determined by program needs and be approved by the steering committee. Additional data collection forms will not be introduced without the prior approval of the steering committee. This strict control measure is necessary to ensure that there is a standardized data collection system and to avoid wasteful ad hoc data generation.

(2) **Information requests**: To streamline the information request process, the MOHSW Monitoring, Evaluation, and Research Division will be entrusted with the responsibility of handling information requests. It will screen requests and channel them to relevant units or programs for action. The screening process will scrutinize the content of the information, its availability, and source. If the information is not available, alternative sources will be identified. Such screening will ensure that information requests are controlled and coordinated, and do not burden operational level staff whose primary responsibilities are to deliver services.

Data harmonization will include the following:

- A common set of databases to facilitate data collection
- Use of standard definitions for health indicators or measurements to facilitate national and international comparisons
- Introduction and use of ICD-10, the standard international system for the classification of diseases at sentinel sites
- Standardized data collection procedures to ensure data consistency, integrity, and comparability.

Strategies / Activities

1. Orient HMIS Steering Committee (HSCC) and Establish Technical Working Groups

Overseeing of the HMIS structure and function will be added to the HSCC's existing terms of reference.[8] The MOHSW will empower the HSCC with the authority to set standards for computer hardware and software, to promote the adoption of common indicators and coordinated systems of data collection and reporting, to approve all forms or modifications of forms used in the HMIS, and to ensure that the overall system remains as simple and well-integrated as possible. The capacity to produce and use priority indicators for decision making will be a benchmark of the success of this effort. Technical working groups (TWGs) will be formed for various tasks with regard to prepare for HMIS implementation. Terms of reference for the HSCC and TWG are in annex 1.

2. Endorse Core and Common Health Indicators

As mentioned above, the National Health Policy and National Health Plan 2007-2011 proposed 33 indicators; among them are 10 benchmark indicators with milestones for 2008, 2011, and 2015. Another set of indicators was proposed for the country level. Similarly, the HMIS has incorporated 168 data elements from which 78 indicators have been identified. However, the wording of the indicator name, their construction, definition of numerator and denominator data elements, function, and interpretation of these indicators are either incomplete or missing.

Data elements and core and common indicators need to be harmonized. The following eight attributes should be defined for each indicator: code, indicator name, numerator, data source, denominator, data source, purpose of indicator, and users. The numerator and denominator for each indicator will be explicitly defined, together with the required information source or sources. Where two similar indicators are being used by different agencies, efforts will be made to agree on a single indicator.

Common databases will be established at the national level. These will be capable of being integrated across programs. Because access to information is critical to HMIS success, information retrieval will be available to all those involved. Summary reports are an important element of this process, but users may often need access to the raw data that generated the reports. The national Monitoring, Evaluation, and Research Divisions will develop standardized datasets with key variables in common and make these accessible to users.

3. Endorse the HMIS Strategy and Implementation Plan

Endorsement of this strategy and implementation plan will be the first step toward establishing the HMIS. The steering committee will carefully examine the design, strategy,

[8] The Health Sector Coordination Committee (HSCC) and the HMIS Steering Committee (SC) have been used interchangeably to denote the same committee.

and implementation plan proposed in this document and make its recommendations to the MOHSW for its endorsement. This strategy will come into effect after its endorsement by the MOHSW.

Objective 2: To implement the HIS component of HMIS

Based on discussions during the national health plan review the following actions are proposed for year two:

Year Two Infrastructure Implementation Plan (* = PRS Strategic Objective)

***1. Establish a Decentralized HMIS**

a) Establish a Monitoring, Evaluation, and Research Division (central & county)
b) Develop job descriptions for HMIS staff
c) Prepare guidelines for data flow and data submission between levels in health system
d) Develop a detailed implementation plan
e) Define other HMIS components
f) Conduct a training of trainers
g) Rollout training in the counties

***2. Develop and Implement Other HMIS Programs**

a) Develop the HMIS components including tools
b) Integrate the HMIS components into the existing DHIS software
c) Provide training for and disseminate data collection tools to all facilities

HIS component of HMIS has been piloted in 4 counties, and there is a pressing need for rollout to the other 11 counties. As the health service statistics of all vertical programs are captured in this subsystem and the information generated in the health facilities, it will be a massive undertaking for which resources are required in terms of trainers, materials, and money.

Strategies and Activities

1. Revise the DHIS Database According to the Revised Indicators and Datasets

The current Liberia DHIS database contains 168 data elements and 78 defined indicators. Some data elements may not be owned by any program or department, while some vertical programs believe that they will have to collect additional missing information to satisfy their funding agencies. This is an opportune time to harmonize the database so that the data requirements of each stakeholder are satisfied and the data elements that are not owned by any stakeholder are removed.

2. Conduct Training Needs Assessment

The HMIS implementation requires the use of new tools that are not familiar to many health service providers and management support personnel. Data analysis, interpretation, dissemination, and use are new concepts for many of them. Therefore, all

health workers and support personnel will require some training, but the depth of training will vary among staff. Therefore, training needs will have to be assessed. The assessment can be done in a sample of clinics, health centres, and hospitals as well as with some county health teams.

3. Revise Data Collection Instruments

The HMIS introduced a number of new data elements in its database and reporting forms. However, it has not revised the source documents such as registers, tally sheets, and so on. Data collection and processing tools will be revised based on the approved data elements for HMIS.

4. Develop Standard Operating Procedures (SOPs) and Trainers' Guide

Each member of the health system will play a role with regard to information management (collection, analysis, interpretation, dissemination, and archival) and use. Each of them will need to know his/her tasks. For this reason, SOPs will be developed based on the function of institution or different positions.

5. Install Revised DHIS Database and Train Its Users

Once the DHIS database is updated with revised data elements, data managers from 11 new counties as well as 4 old counties will be trained or retrained. A new database will be supplied to each county.

6. Print Data Collection Instruments SOPs

All revised tools and copies of SOPs will be printed and supplied to all health facilities in adequate quantities.

7. Conduct Training of Master Trainers (MTOT)

At least 15 teams of 2 people each will be formed and trained as master trainers; they, in turn, will conduct training for health and support personnel in the designated counties. More than 4,000 health workers, 500 registrars, and staff in other categories will have to be trained to collect quality data and maximize their use. If 20 people are trained in a group session, more than 200 training sessions will be needed.

8. Conduct Training of Health and Support Personnel Working at Health Facilities (clinic, health clinic, hospital) and the County Level

The trainers with MTOT will conduct training in the assigned county. All health and support personnel will be trained on how to manage information and make their use in planning and management of health services.

Objective 3: To develop/strengthen all other sub-systems / data sources

To make the HMIS comprehensive, all data sources that will feed information into the HMIS (the umbrella system) will have to be reviewed and strengthened to their fullest potential. A specific information subsystem will be developed/strengthened for human resources, finance, drugs and supplies, and physical assets (facility and technical

equipment). A disease surveillance system will be strengthened, and death registration will be incorporated into universal birth registration initiatives as part of the vital registration system. Annual target populations for each health facility catchment area will be estimated in coordination with LISGIS. Data on national indicators will be triangulated from primary and all secondary sources, analyzed to see national trends and subnational variations, and disseminated to policy makers, planners, and development partners. Priorities for health system and operations research will be defined, budgeted, and scheduled.

Strategies / Activities

1. Conduct Health Facility Census

Currently, there are no reliable data on health personnel, infrastructures, and equipment. A health facility census will be conducted to establish baseline information on the indicators related to these areas.

Health facility census tools will be adapted and tested. A census will be conducted nationwide within a month. Data collection tools with guidelines will be sent to each health institution with a 15-day period given to complete the form. A well-trained supervision team will visit each institution (government, non-government, and private) to complete and collect the data collection forms. Census data will need to be updated every two years.

2. Update GIS Database and Disseminate Thematic Maps

A database will be established for human resources and physical assets. Both databases will provide baselines for the respective information subsystem. The data will be analyzed, generated in reports, and presented in GIS maps. Key thematic maps will be printed and distributed to all counties and relevant stakeholders. Maps of programmatic interest will be provided to the concerned program. However, maps on all indicators as specified in the strategy will be made available on the MOHSW Web site.

3. Inventory Ongoing Efforts on Strengthening Human Resources, Financial, and Logistic Management Information Subsystems

Current status and plans for strengthening human resources, finance, and logistics management information subsystems will be assessed from the perspective of broader HMIS. Gaps will be identified and measures worked out to mitigate the gaps.

4. Estimate Annual Target Population for Each Health Facility Catchment Area

Each facility must know the population it is to serve each year and the population for each programmatic target group. Defining each health facility's catchment area will be finalized at the latest, by the end of training of health personnel on HMIS. The Monitoring, Evaluation, and Research Division in the MOHSW headquarters will work with LISGIS to derive population data for each health facility catchment and estimate the target population for different services. This will provide a basis for planning and allocating

resources to each health facility, setting targets, and monitoring the coverage of each service.

5. Integrate Death Registration into Universal Birth Registration Initiatives as Part of Vital Registration

In Liberia, the majority of deaths occur at home. The cause of death and age and gender of the deceased do not appear in a formal record. Death registration is a very important component of vital registration. Under the universal child rights and birth registration of global initiative, Liberia is starting a birth registration program. This forum will be used as an opportunity to start death registration. It might take quite some time to accomplish 100 percent birth or death registration for the entire nation. Therefore, some extra efforts will be made to achieve 100 percent birth and death registration in a few communities in each county. Data generated from such sentinel communities will be generalized for the entire county and nation until 100 percent registration is achieved.

6. Strengthen the Disease Surveillance System

Though the current surveillance system of notifiable diseases is quite effective, the formal mechanism in the community to report an occurrence of such diseases needs to be strengthened. The MOHSW is preparing to introduce a community health volunteer (CHV) program. Notification on birth, death, and occurrence of any notifiable disease or outbreak can be made one of the key CHV functions.

Diagnosis capacity at clinics and health centres and even in some hospitals is extremely limited. Most health facilities report diseases on lay format. Introduction of IDC-10 in all health facilities is neither feasible nor required. Therefore, three hospitals, representing the entire nation, will be identified as sentinel sites for reporting of inpatient cases according to ICD-10.

7. Triangulation of Data on National Indicators from Primary and All Secondary Sources

Recent population census and demographic and health survey provide authentic information on some impact and other indicators. The number of input, process, and output indicators identified in national health policy and plans do not have baseline value. The data being generated from routine reporting system are incomplete and, therefore, cannot be used as a definite value. As a result, efforts will be made to gather information from all secondary sources such as research and case studies, and will be triangulated with routine data to derive baseline data for all indicators to the extent possible. Reports with discussions on those figures will be generated and disseminated to all stakeholders for their information and use.

8. Develop a Health System and Operation Research Plan

Health sector information needs cannot be fully satisfied through routine data collection systems, decadal census, and five-year demographic and health surveys. Research on numerous health system issues and programmatic issues will have to be continuously

conducted to fill the information gaps. Therefore, areas of health system and operations research will be identified, prioritized, and costed.

Objective 4: To develop an HMIS Portal

Soon the MOHSW will have plethora of information. The data will need to be analyzed and disseminated. Since the MOHSW already has a Web site and most of its national level stakeholders are already connected by Internet, the HMIS portal will be developed and information in public domain will be disseminated.

A high-level IT expert experienced in the Linux operating system, SQL database design, networking, and Web technology will be hired to develop subsystem specific databases, interface software, and the HMIS portal.

Strategies

1. Identify Software and Hardware Requirements

A draft terms of reference is attached to this report for hiring a software engineer for designing and developing the Web-based HMIS information portal with interface software for each subsystem (human resources, finance, physical assets, infrastructure). The consultant will be responsible for defining software and hardware requirements of the full HMIS. The technology must be appropriate to the Liberian context.

2. Develop and Implement Software

The software specifications required for each HMIS subsystem, including an integrated HMIS, will be elaborated. We will explore the potential of both options—off-the-shelf and custom software. Priority will be given to open source software.

The IT consultant will conduct a needs assessment exercise, make recommendations, and develop the software based on the options agreed to by the steering committee and endorsed by the MOHSW.

Objective 5: To improve the use of information for decision making

A lot of the data collected at service delivery points are not put to use for policy formulation, service management, or evaluation of health services. It is sometimes implicitly assumed that the value of information is understood by health workers, and that this will lead to evidence-based decisions, and thus to more effective and appropriate use of scarce resources and better execution of work priorities. However, this is often not the case.

Users of information need first to have confidence in the quality of information available for decision making. They may need assistance in locating, interpreting, and applying the information to satisfy their particular requirements. Often these users have inadequate understanding or skills to access the information available.

It is important that training and technical support for computer end-users and technical managers of these network systems be made available. Such training will ensure the smooth implementation of the networks and develop local expertise to ensure the sustainability of the networks. Users of informatics systems often need assistance and the proper tools to locate and apply the correct data or information to satisfy particular requirements.

To allow simple analysis, data are transformed into information in the form of indicators or statistical measurements that facilitate comparisons between areas or show health trends. Data are turned into information through a process of selection and reduction. A basic assumption is that managers and users must have the required expertise to interpret and use this information in resource management. Therefore, the goal is to foster a closer link between management processes and information, so that the information can more effectively influence the decision-making process.

Strategies / Activities

1. Develop and Support Networks of Public Health Practitioners

Long-term training in epidemiology, health planning, and related disciplines will be supported through fellowships. Electronic and other communications networks will also be promoted among public health practitioners in the field, to raise the standards of practice and to exchange knowledge and experience. Short refresher courses will also be arranged.

2. Improve the Data Presentation Skills of HMIS Staff

Data compilers, statisticians, and data managers will be trained in tailoring the data to client needs, and in presenting data in standardized and consistent tabular and graphic form. This will allow comparisons over time among population groups and geographical areas, and will facilitate interpretation and decision making.

3. Improve the Skills of Data Users

Data users will receive short focused training courses to help them to understand the data sources and limitations, to interpret data presented in tabulated form, and to use information for decision-making.

Objective 6: To promote access to information

Periodic publication of health information (in bulletins, technical studies, applied research findings, and monthly, quarterly, or annual statistical reports) remains the dominant means of information dissemination. In addition, ad hoc requests for health information

may come from senior health management personnel, technical programs, and research and educational institutions, or from international or nongovernmental organizations, and the general public.

With recent advances in telecommunications, however, information dissemination is changing rapidly. Much health information is now accessible through the MOHSW Web site. MOHSW has established computer networking systems that enhance information exchange and allow access to e-mail, the Internet, and Intranet systems. Such networks increase access to new clients, new services, and, most importantly, to other networks.

Data and reports can be transferred to or from the county level to the national level with ease. This can speed up data processing and feedback at all levels. Communication products, especially written reports, need to be customized to reflect the time pressures faced by decision-makers. Short and tentative conclusions will be circulated for discussion. The full report will act as a back-up rather than the main document for communication.

Strategies / Activities

1. Produce Regular Health Reports

Information dissemination will be ensured through the regular production and monitoring, at the national and subnational levels, of health reports, disease surveillance reports, and health performance assessment reports. In MOHSW, this may require new attention to the format and content of such reports, and support for design and production.

2. Access Information Electronically

Electronic data standards will be developed for computerized databases and, as far as possible, for interactive updating and access to these databases through the Internet. This will require work at the national level to ensure that standards are set for the transfer, maintenance, and access to data, including guidelines on confidentiality, data security, and the avoidance of data misuse. For example, some information may be available to anyone interested (the electronic equivalent of published data) and some to selected authorized users, while other may be reserved for a small group of official data suppliers, for interactive updating and modification.

Objective 7: To ensure there are adequate staff for information system development

HMIS staff includes of epidemiologists, statisticians, medical records officers, and information or systems analysts. Ideally, the chief of the HMIS operation will have a broad range of experience in various fields, including the methodology of HMIS development, health applications, health statistics, health informatics, medical records management, and survey methods. Departure of a key member of HMIS staff can jeopardize the entire HMIS operation. Long-term training and staff programs need to be developed.

Strategies / Activities

1. Prepare and Update an HMIS Organizational Chart

A staff organizational chart will be prepared and annually updated for the HMIS, detailing the national and county health information program managers, medical records personnel, health statisticians, epidemiologists, technical support, and other relevant personnel. It will include a list of all individuals directly responsible for the HMIS, listing responsibilities and levels of training.

2. Assess Staffing and Training Needs

Formal assessments will be made of staffing needs and of training needs. The number and the skills of staff will match the system requirements as closely as possible. If needed, proposals will be developed to modify HMIS organizational structures and propose opportunities for advancement to retain skilled and experienced HMIS staff in the health system.

Objective 8: to regularly evaluate system functions and quality

Periodic assessments of HMIS operations are crucial to ensure that the system operates within the established framework, meets its objectives, and supports evidence-based decision making. A decision-oriented information system can support management in performance assessment and allow resources to be directed to the areas of greatest need.

For accountability and effectiveness, periodic reviews will be conducted. Assessments will focus on data accuracy and timeliness of information, and relevance of information and its use by the management group.

Strategies / Activities

1. Develop Data Audit Tools and Guidelines

The Monitoring, Evaluation, and Research Division will develop data quality assurance tools and guidelines. These tools and guidelines will be piloted and endorsed.

2. Conduct Supervisory Visits /Data Audit

HMIS staff will periodically visit peripheral levels of the health system, where data are collected, to audit data quality and to assess adherence to national policies and guidelines.

Health facility data will be annually audited to assess quality with respect to coverage, comprehensiveness, accuracy, and adequacy of validation procedures, and the timeliness,

use, and dissemination of information. Within the national data quality framework, the M&E and Research Department will conduct annual data auditing activities in coordination with six monthly supervision visits.

3. Assess Data Use by Management and Other Users

HMIS staff will develop mechanisms to assess appropriate data use at all levels and will periodically evaluate the use of health information for decision making. Assessments will include a review of data collection efficiency and flow through the system.

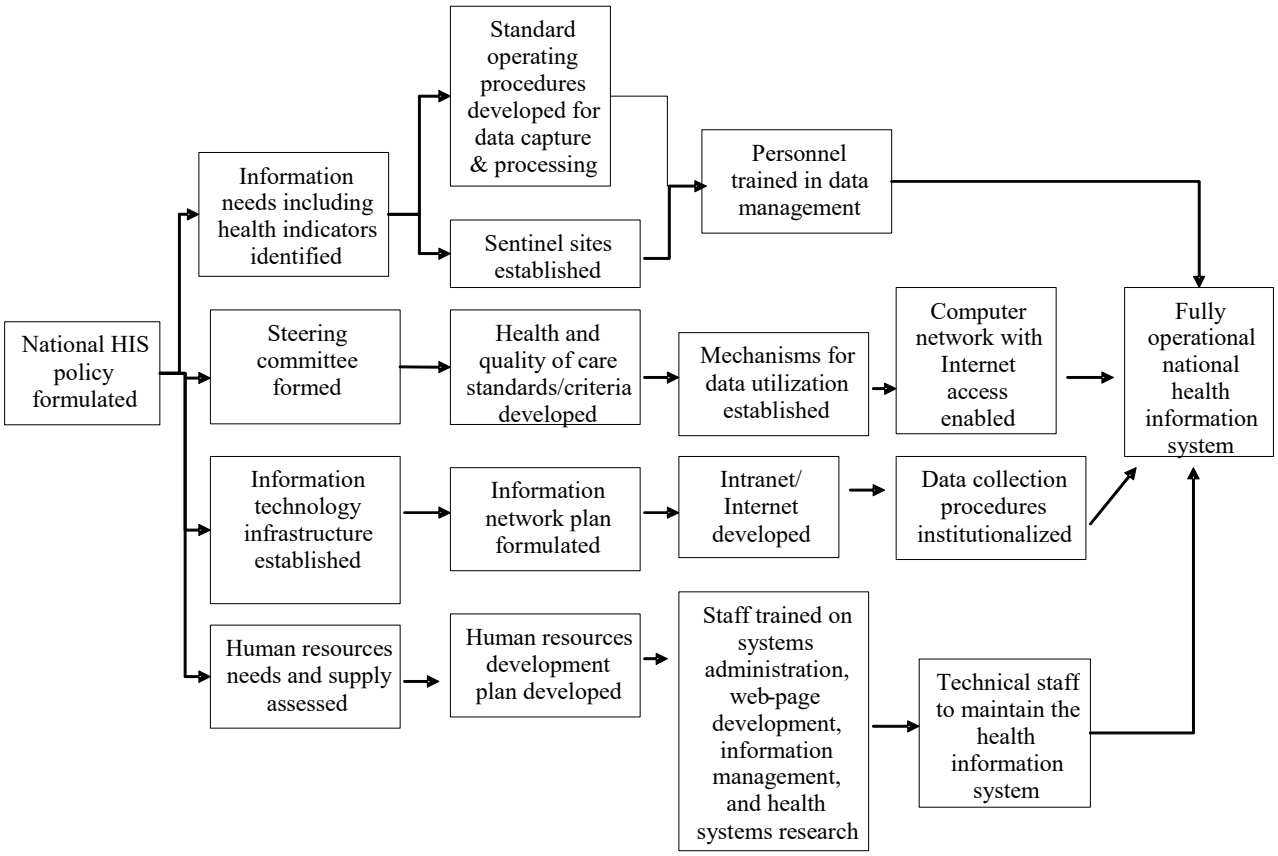
4. Assess the Performance of HMIS

The performance of overall HMIS will be reviewed periodically. The first comprehensive review will take place in 2011 and every five years onward. Such a review will be done using the Health Metrics Network (HMN) framework, standards, and tools. The review findings will provide the way forward for strengthening the HMIS to fully satisfy the health sector's information needs.

Chapter 5: Implementation Plan

Different component of health management information system will be implemented in an incremental manner. The process will follow the steps as shown in figure 11, below.

Figure 12: HMIS Development Road Map



Implementation Timeline and Budget

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Objective (1) To harmonize the functions of Health Management Information Systems															
Orient HMIS Steering Committee (HSCC) and establish Technical Working Committee / Group(s)															$200.00
Endorse core and common indicators														Funds for meetings	$200.00
Endorse HMIS policy and Strategy	Conduct a working meeting of the SC to review and modify HMIS Policy & Strategic Plan; Endorsement of HMIS Policy & Strategic Plan; Produce and Disseminate HMIS Policy & Strategic Plan; Form a Technical Working Group (TWG) to implement the approved strategy													Funds for production and dissemination of policy & strategy documents; meetings	$30,200.00
Sub-Total															**$30,600.00**
Objective (2) To implement the HIS component of HMIS															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Revise DHIS database according to revised indicators and datasets															
	Identify and hire a TA, consultant													Technical Support, consultancy services	$50,000.00
	Revise data elements in DHIS database according to revised indicators and corresponding data elements; revise data collection instrument													DSA, materials, Transportation cost, cost of venue for participants	$5,200.00
	Conduct training needs assessment and training in all counties													Funds for planning meetings; Tools cost, DSA, Transportation cost,	$7,200.00
Install revised DHIS database and train its users															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Conduct MTOT-Identify 30 trainers from different vertical programs, partner NGOs, MOHSW departments who can be trained as master trainer who in turn train all health and support personnel in assigned county;													DSA, materials, Transportation cost, cost of venue for participants	$10,000.00
	Develop training plan for each county by the respective master trainers														$0.00
	Conduct training of health and support personnel at health facilities (clinic, HC, Hospital), county													DSA, materials, Transportation cost, cost of venue for participants	$120,000.00
Develop SOP and trainers guide															
	Organize a workshop of TWG and develop SOP with regard to data collection, analysis, reporting, dissemination and using information in planning and management of health programs;													DSA, materials, Transportation cost, cost of venue for participants	$10,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Develop trainers guides for training each category of health personnel;													DSA, Transportation cost, cost of venue for trainees	$2,000.00
	Produce and Disseminate SOP and trainers guide to all counties													Funds for preparation, mass production and distribution of SOP	$30,000.00
Upgrade the DHIS Software to web-base and train its users															
	Identify and hire a consultant													Technical Support, consultancy services	$50,000.00
	Conduct MTOT-Identify 30 trainers from different vertical programs, partner NGOs, MOHSW departments who can be trained as master trainer who in turn train all health and support personnel in assigned county;													DSA, materials, Transportation cost, cost of venue for participants	$10,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Develop training plan for each county by the respective master trainers														$0.00
	Conduct training of health and support personnel at national & county levels													DSA, materials, Transportation cost, cost of venue for participants	$120,000.00
Sub-Total															**$414,400.00**
Objective (3) To develop/strengthen all other sub-systems of HMIS															
Inventory ongoing efforts on strengthening human resource, financial and logistic management information sub-systems															
	Form three separate TWGs for human resource, finance and logistics													Funds for technical meetings	$300.00
	Adapt the HMN assessment tools for the above three sub-systems and conduct assessment together with respective department													Stationery	$100.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Develop detailed plan for strengthening each sub-system as interdependent and well linked part of the broader HMIS													DSA, materials, Transportation cost, cost of venue for participants	$10,000.00
Conduct health facility survey to update human resource, health infrastructure and physical asset.															
	Update, adapt health facility survey tools that capture HR, PA, and infrastructure data													Technical meetings	$100.00
	Organize a workshop of TWG and revise tools to capture the required details													DSA, materials, Transportation cost, cost of venue for participants	$3,000.00
	Conduct the survey													Planning meetings, field work, analysis and report writing	$100,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Update GIS database, analyze data, generate reports in tables and GIS maps and disseminate to stakeholders electronic and print media															
	Hire data entry clerks and commence data entry on human resource, infrastructures, equipment and durable supplies;													funds for data entry clerk fees	$50,000.00
	Hire a GIS consultant to build capacity in GIS technologies													Technical Support, consultancy services	$160,000.00
	Update GIS database														$0.00
	Produce and Disseminate poster size printed maps on five themes which are of most importance to selected policy and programme planners and managers; disseminate thematic maps through HMIS portal													Funds for preparation, mass production and distribution of thematic maps	$50,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Provide county specific thematic maps, both electronic and hard copy to counties													Funds for preparation, mass production and distribution of thematic maps	$40,000.00
Estimate annual target population for each health facility catchment area															
	Define primary catchemnt area for each health facility (this can be done during health facility survey and further validated during HMIS training)														$0.00
	Identify/define the target population group for different services														$0.00
	Organize a meeting/workshop with LISGIS, CHTs, HF staff, etc and agree on formula and working procedure; calculate target population for primary catchment area of all health facilities													Funds to support LISGIS produce results on catchment area of health facilities	$60,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Integrate death registration into universal birth registration initiatives as part of vital registration															
	Form a TWG to develop guidelines and tools for registration of death by the person responsible for birth registration													Funds for technical meetings	$100.00
	Print guidelines and tools													Funds for preparation, production and distribution of guidelines and tools	$20,000.00
	Identify a couple communities from each county to be consider as sentinel sites for vital registration														$0.00
	Train selected members of communities on utilizations of tools for the registration of death													DSA, materials, Transportation cost, cost of venue for participants	$30,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Provision additional input for sentinel sites to accomplish 100% birth and death registration														$0.00
Strengthen disease surveillance system															
	Form a TWG and review performance of disease surveillance system													Funds for technical meetings	$100.00
	Assess the current performance identifying the areas to be strengthened.													Planning meetings, field work, analysis and report writing	$2,000.00
	Devise rectifying measures and implement them.														$0.00
	Identify 3 better equipped hospitals balancing the regional representation in order to introduce ICD-10.														$0.00
	Train clinical and statistical persons on use of ICD-10 in all inpatient departments.													DSA, materials, Transportation cost, cost of venue for participants	$120,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Analyze sentinel data from both sources, generalize them for the national and disseminate to relevant stakeholders for their use in planning and management of health programs.													Printing and distribution cost	$30,000.00
Triangulation of data on national indicators from primary and all secondary sources															
	TWG examines all secondary potential data sources for national core and common indicators.													Funds for technical meetings	$100.00
	Collect the identified document/ reports and compile data on all available indicators.														$0.00
	Analyze national trends and sub-national variation and disseminate to the stakeholders.													Printing cost	$25,000.00
Develop health system and operations research plan															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Form a TWG involving researchers from university, research institutions, LISGIS, NGOs and donor organization													Funds for technical meetings	$100.00
	Identify the area of health system research and operation research and prioritize with justifications.														$0.00
	Estimate the cost and identify focal person or institute for each research														$0.00
	Assign the research work to identified focal point and allocate resources.														$0.00
	Oversee the implementation of research and disseminate the findings.													Printing and distribution cost	$2,000.00
Sub-Total															**$702,900.00**
Objective (4): To develop HMIS Portal															
Identify software and hardware requirements															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Hire a software engineering consultant													Technical Support, consultancy services	$120,000.00
	Carry outs need assessment exercises (consultant)													Transportation cost and DSA	$3,000.00
	Steering Committe endorse the hardware and software specifications recommended by consultant														$0.00
Develop and implement software															
	Procurement of off the shelf software													Software cost	100000
	Development, testing and implementation of customize software to achieve the fullest functionality of HMIS architecture														$50,000.00
Sub-Total															**$273,000.00**
Objective (5): To improve the use of information for decision-making															
Develop and support networks of public health practitioners															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Conduct workshops for selected public health practitioners to further develop and promote the analysis, interpretation, and use of public health data.													DSA, materials, Transportation cost, cost of venue for participants	$130,000.00
Improve the skills of HMIS staff in data presentation.															
	Organize workshops (in country) or support external training to provide skills to HMIS data compilers, statisticians, and data managers, to consistently present data to users in formats which are easily understood and interpreted													Plane ticket, hotel and allowance costs,	$100,000.00
Improve the skills of data users.															
	Conduct workshops for key data users within MOHSW to demonstrate the interpretation and use of national data.													DSA, materials, Transportation cost, cost of venue for participants	$40,000.00
Update GIS database and presentation															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Carry out annual GIS database update exercise														$0.00
Sub-Total															**$270,000.00**
Objective (6): To promote access to information															
Produce regular health reports.															
	Conduct workshop with report committees to review and revise routine monthly, quarterly, or annual reports to ensure that the priority information they represent is accurately and concisely presented													DSA, materials, Transportation cost, cost of venue for participants	$50,000.00
Access information electronically															
	TA (in collaboration with HMIS and IT staffs) to develop electronic data standards and technical guidelines on the management, transfer (including communications standards) and access to data, and on data security.													Technical Support, consultancy services	$100,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Establish a national network and a website for health information and disease surveillance													Technical Support, consultancy services	$80,000.00
	Provision of hardware, sofware and local training to promote electronic management of Health Management Information Systems													Hardware, software. Development of WAN consultancy	100000
Sub-Total															**$330,000.00**
Objective (7): To ensure there is adequate staff for information system development															
Support to HMIS															
	Provision of compensation commensurate with qualification for national & county HMIS units													Funds for salaries	$2,700,000.00
Prepare an HMIS organizational chart.															
	Prepare or update an organizational chart providing as much information as practicable about the staff skills and responsibilities.														$0.00
Assess staffing and training needs															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Develop a medium-term staffing plan, identifying areas where new staff are most needed, and where opportunities for advancement must be available to retain experienced staff.														$0.00
	Develop a medium-term training plan, identifying in-country and overseas training needs.														$0.00
	Provide training for 5 HMIS staff in-country (local costs) and overseas (fellowships), as needed, in health informatics, epidemiological surveillance, health statistics, medical records, ICD-10, and computer networking and systems administration.													Plane ticket, tuition and boarding costs	$150,000.00
Sub-Total															**$2,850,000.00**
Objective (8): To regularly evaluate the functions and quality of the system															
Meeting the HMIS minimum package at National & County Levels															

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Procure vehicles, motobikes, necessary logistics, etc													Equipment, Vehicles, fuel office materials, etc	$800,000.00
Develop data quality assurance tools and guidelines															
	Collect data quality assurance tools and guidelines used elsewhere and adapt them into Liberian context.														$0.00
Conduct supervisory visits															
	Visit peripheral data collection sites to audit data quality and compliance with national guidelines.													Field work, transportation cost and DSA	$95,000.00
Assess data use by management and other users.															
	Develop and print a simple instrument to assess appropriate data use and flow of information at all levels.													Funds for preparation and printing of instruments	$20,000.00

Strategy	Activity	2009				2010				2011				Resources needed	Estimated Budget
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
	Review the efficiency of data collection and flow and the use of data at various levels in the health system.													DSA, materials, Transportation cost	$30,000.00
Review the performance of overall HMIS															
	Conduct assessment following the standard procedures													Field work, transportation cost, DSA and material cost	$120,000.00
	Review, print and disseminate the assessment results													Planning meetings, field work, analysis and report writing	$50,000.00
	Update HMIS strategy and develop 5 year implementation plan for strengthening system of information management and use													Funds for preparation, mass production and distribution of HMIS Strategy	$80,000.00
		Sub-Total													**$1,195,000.00**
		Grand Total													**$6,065,900.00**

INDICATOR TABLE

ID	Full Name of Indicator
1	Infant mortality rate
2	Under-five mortality rate
3	Maternal mortality ratio
4	Life expectancy at birth
5	Total fertility rate
6	Contraceptive prevalence rate (Percentage of women 15-49 using modern contraceptive methods)
7	Contraceptive use rate by modern method
8	Couple years of protection
9	HIV Prevalence among 15-24 year pregnant women
10	HIV Prevalence in general population
11	Condoms use rate as part of contraceptive prevalence rate
12	Condoms use rate at last high risk sex
13	Percentage of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS
14	Percentage of HIV infected pregnant women receiving a complete course of ARV prophylaxis to reduce the risk of MTCT
15	People with advanced HIV infection receiving antiretroviral (ARV) combination therapy
16	STI cases treated as percentage of population 15 years and older
17	Percentage of health facilities providing HIV laboratory services
18	Percentage of health facilities providing HCT
19	Percentage of health facilities providing ARV/PMTCT services
20	Health expenditure per capita
21	Percentage of Government budget allocated to health sector
22	Annual private expenditure on health as a percentage of total expenditure on health

ID	Full Name of Indicator
23	External resources on health as a percentage of total expenditure on health
24	Percentage of annual budget utilized
25	Annual expenditure by major program components (i.e. Malaria, TB, HIV/AIDS, FP, RH, CH)
26	Annual expenditure by major expenditure categories (i.e. Salaries, drugs, capital investments) as perentage of total expenditure in health
27	Pentavalent 3 coverage
28	Percentage of children under 1 immunized by antigen and shots)
29	Percentage of children under 5 with pneumonia who received antibiotics treatment
30	Percentage of children under 5 with diarrhea receiving oral rehydration
32	Percentage of children 6-59 months old receiving vit A every 6 months
33	Percentage of children 6-59 months old receiving deworming every 6 months
34	Percentage of children 6-59 months old receiving iron supplementation
35	Percentage of children 6-59 months with severe acute malnutrition who are treated (disaggregated by sex)
36	Percentage of children 6-59 months with severe acute malnutrition who are treated and cured (disaggregated by sex)
37	Percentage of LBW
38	Percentage of children 6-59 months whose growth is monitored
39	Prevalence of malnourished children under 5 (weight for height)
40	Percentage of health facilities having birth registration program
41	Percentage of infants under 6 months who are exclusively breastfed
42	Percentage of children 6 - 23 months receive breastmilk as well as semi-solid or solid food
43	Percentage of deliveries conducted at health facilities by skilled health personnel
44	Percentage of certified midwives trained in life saving skills (LSS)
45	Percentage traditional midwives trained in home based life saving skills (LSS)
46	Percentage of pregnant women receiving adequate Iron and folic acid tablets
47	Percentage of pregnant women receiving adequate TT dosage

ID	Full Name of Indicator
48	Percentage of pregnant women receiving at least 4 antenatal care visits
49	Percentage of women receiving comprehensive obstetric care
50	Percentage of postpartum women who received 1 vit A capsule within 6 weeks of delivery
51	Direct obstetric death rate
52	Gender based violence
53	Percentage of health facilities providing BEmONC services
54	Percentage of pregnant women (attending ANC) receiving two or more Intermittent preventive treatment (IPT)
55	Percentage of children under age 5 sleeping under insecticide treated bed nets **the previous night**
56	Percentage of pregnant women sleeping under insecticide treated bed nets **the previous night**
57	1. Cumulative **number of** insecticide-treated nets (ITNs) distributed to pregnant women **or 2. percentage of pregnant women attending ANC who received an ITN**
58	Percentage of children under five treated for malaria (including clinical malaria) in children under five
59	Percentage of five and above population treated for malaria (including clinical malaria)
60	Prevalence of malaria in children under five
61	Malaria death rate (health facility-based)
62	Proportion of children under five with fever having access to prompt and effective antimalarial treatment within 24 hours of onset of fever
63	Proportion of households with at least one ITN
64	Community Health Volunteer rural population ratio
65	Doctor per 1000 population
66	Nurse per 1000 population
67	Midwives per 1000 population
68	Percentage of position filled by category of doctor, dentist, nurses, midwives, pharmacist, environmental technician, administrators, and others

ID	Full Name of Indicator
69	Annual output of training health professionals by category of doctor, dentist, nurses, midwives, pharmacist, environmental technician, administrators, and others as percentage of vacant positions in public and NGO sector
70	Cumulative percentage of health personnel retuned to work after completing advance course as per country's needs
71	Cumulative percentage of health personnel receiving in-service training by type of training
72	Annual attrition of health professionals by category of doctor, dentist, nurses, midwives, pharmacist, environmental technician, administrators, and others as percentage of their total number at work in public and NGO sector
73	Health professionals to the population ratio by category of pharmacist, environmental technician, administrators, and others per 1000 population
74	Number of accredited traditional healers
75	Percentage of health facilities accredited (disaggregated by type of facilities: referral hospital, hospital, HC, Clinics)
76	Percentage of health facilities providing full BPHS
77	Percentage of health facilities reporting no stock outs of essential drugs
78	Quantity of drugs, contraceptives, and supplies dispensed to users as percentage of previous balance plus new supplies received during this reporting period
79	Percentage of health facilities reporting no stock outs of medical supplies
80	Percentage of health facilities receiving drugs and supplies based on request
81	Percentage of health facilities supervised by DHMT members using integrated supervision checklist
82	Percentage of health facilities with functional power supply system
83	percentage of private health facilities inspected by health facility accreditation committee (HFAC)
84	Percentage of clients satisfied with services
85	Percentage of health facilities up to equipment standard
86	Percentage of health facilities up to physical facility standard
87	Coverage of vital /civil registration for birth

ID	Full Name of Indicator
88	Coverage of vital /civil registration for death
89	Percentage of health facilities with means of functioning communication (radio, phone etc)
90	Ambulance to population ratio
91	Ratio of transport for supervision and supply to health facilities
92	Population bed ratio
93	Bed utilization rate
94	Parentage of hospitals providing 24 hours emergency surgical services
95	Average length of stay
96	OPD utilization per capita
97	Percentage of household having sustainable access to clean, safe and adequate water
98	Percentage of households with access to improved sanitation
99	Percentage of persons practicing proper hand washing
100	Parentage of population aware of STIs/HIV/AIDS prevention and control
101	Cure rate among smear positive TB cases (Under Directly Observed Treatment Short Course)
102	TB detection rate of smear positive pulmonary per 100,000 population
103	HIV Prevalence of TB patient
104	Percentage of health facilities providing TB laboratory services
105	Percentage of health facilities providing DOTS
106	TB death rate
107	TB Mortality Rate
108	Treatment success rate
109	Case detection rate
110	HIV Sero-prevalence rate among TB patients
111	Case Notification Rate
112	New pulmonary TB cases with no smear result rate

ID	Full Name of Indicator
113	New adult smear positive rate
114	Retreatment TB rate
115	New extra pulmonary TB rate
116	New TB cases with no smear conversion rate
117	Sputum conversion rate
118	Cure Rate
119	Treatment completion rate
120	Death Rate
121	Treatment Failure Rate
122	Default Rate
123	Transfer Out Rate
124	Typhoid cases treated as percentage of total population
125	Meningitis cases treated as percentage of total population
126	Jaundice cases treated as percentage of total population
127	Acute rheumatic fever cases treated as percentage of total population
128	Acute watery diarrhea cases treated as percentage of total population (all age(
129	Acute bloody diarrhea cases treated as percentage of total population (all age)
130	Mental conditions treated as percentage of total population
131	Injuries cases treated as percentage of total population
132	Sexually assault cases treated as percentage of total population
133	Prevalence of Multi Drug Resistant (MDR) among new and retreatment
134	Annual incidence of morbidity due to infectious disease
135	Annual incidence of morbidity due to non-communicable disease
136	Annual incidence of mortality due to infectious diseases
137	Annual incidence of mortality due to non-communicable diseases
138	Percentage of outbreaks detected and responded to within 48 hours
139	Top five causes of OPD visits with disaggregation of sex and under five, over five

ID	Full Name of Indicator
140	Top five causes of admission with disaggregation of sex and under five, over five
141	Inpatient death rate by cause: gender and under five, over five disaggregated
142	Percentage health facility having functional health committee
143	Percentage of coordination/management meeting held in the year
144	Percentage of county having own 5 year health plan
145	Prevalence of current tobacco use in adolescents
146	Percentage of population drinking excess alcohol
147	Percentage of health facilities running CHV program
148	Percentage of health facility rehabilitated
149	Reporting coverage of health information
150	Reporting coverage of SLMIS reports
151	Percentage of health facilities meeting data quality standard (hospitals, HC, Clinic)