MINISTRY OF HEALTH

BELIZE: NATIONAL HEALTH INFORMATION SYSTEM

STRATEGIC PLAN 2010-2014

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FOREWORD

This document was prepared by the Ministry of Health and other national stakeholders under catalytic funding from the Health Metrics Network (HMN), Geneva, Switzerland and the Pan American Health Organisation, Belize country Office (PAHO-Belize). It reflects a commitment to improve the quality and reliability of the national health information system. The strategic plan relies in great part on the assessment of the Health Information System (HIS) conducted in April 2008 and was followed in November 2008 by the preparation of a draft strategy. Although, the plan provides a comprehensive list of activities to close HIS gaps, the list is not exhaustive. The plan acknowledges the importance of strengthening partnerships among stakeholders, in particular, the National Health Insurance (NHI) and the Social Security Board (SSB), Vital Statistics Unit (VSU), Non-Governmental Organizations (NGOs) and private sector producers and users of health information.

The selection of strategic interventions was guided by a desire to achieve the following specific objectives:

- Expand coverage of the Belize Health Information System (BHIS) to rural and outlying areas
- Strengthen the vital registration system
- Improve data security and privacy of health information
- Integrate data sources electronically to facilitate data analysis and reporting of health information
- Enhance IT support functions, particularly, at regional and lower levels
- Strengthen disease surveillance
- Reinforce control of non-communicable diseases (notably diabetes and cardiovascular illnesses) via use of decision-support tools
- Promote health research
- Strengthen local and international partnerships on HIS

Technical support for this work was provided by a Consultant. The insight that various stakeholders brought to the strategy development process is duly acknowledged.

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ACRONYMS

BFLA	-	Belize Family Life Association
BHIS	-	Belize Health Information System
EHR	-	Electronic Health Record
GoB	-	Government of Belize
HIT	-	Health Information Technology
HMN	-	Health Metrics Network
ICD	-	International Classification of Diseases
ICT	-	Information and Communication Technology
IDB	-	Inter-American Development Bank
MOAG	-	Ministry of Attorney General
MOH	-	Ministry of Health
MPSGIEB	-	Ministry of Public Service, Governance Improvement, Elections and Boundaries
NHI	-	National Health Insurance
NHIS	-	National Health Information System
NHISC	-	National Health Information Steering Committee
PAHO	-	Pan American Health Organization
PHR	-	Personal Health Records
RAA	-	Registration and clinical Activity Application
SIB	-	Statistical Institute of Belize
TOR	-	Terms of Reference
SSB	-	Social Security Board
UB	-	University of Belize
VRS	-	Vital Registration System
VSU	-	Vital Statistics Unit

I. BACKGROUND: HEALTH INFORMATION IN THE CONTEXT OF NATIONAL DEVELOPMENT

The Government of Belize (GoB) is committed to building a health system that promotes universal access to health care and equity in the use of resources. This commitment is reflected in the elimination financial barriers to the use of preventive and primary care services, and subsidies for in-patient care in government-run health facilities. Access to health services is good; high immunization coverage rate (DPT3 rate of 96% in 2007)[1] and equally high proportion of births delivered by skilled health workers (around 95%) attest to a health system that has emerged as one of the strongest in the Central America/Caribbean Region.

In 2004, the Government embarked on health sector reform with support from the Inter-American Development Bank (IDB). Six administrative districts were grouped into four regions and Regional Health Management Teams (RMTs) were created to decentralise planning and decision-making. To support the process, the GoB invested in Electronic Health Records (EHRs). The result is the Belize Health Information System (BHIS), a home grown health IT solution that was installed in 2004 at the Karl Heusner Memorial Hospital (KHMH), the main referral hospital in the country. The enterprise software combines clinical and administrative functionalities (medical records, patient scheduling, billing, etc). It allows portability of health information across geographical zones and across the continuum of care enabling caregivers to follow-up patients effectively and to deliver care that is appropriate and safe. Patients admitted to the referral hospital can receive follow-up care at district health centres with all their medical records relayed electronically.

The BHIS has grown in terms of functionality and geographical coverage. Nationwide roll-out of the BHIS has begun in phases starting with urban areas. In 2008, the supply chain, HIV/AIDS and laboratory modules were added to the system. Today, a patient who visits the laboratory is assured that his/her test results are transmitted promptly and direct to the attending clinician's desk. The transaction is done electronically and in a safe environment. As at August 2009, the BHIS was deployed at KHMH, all 4 Regional hospitals, and urban health centres and polyclinics. Overall, 54 health facilities run by the MOH are networked. Together, these account for approximately 80% of encounters in public health facilities.

The BHIS is also deployed in two private hospitals in Belize City. The goal is to have every Belizean covered by EHRs within 10 years. The small size of the population and rapid advances in health information technology (HIT) make this goal attainable over the medium term. However, many challenges confront the health system. The Belizean economy is enduring major strain at this time. Still recovering from losses caused by tropical storms in 2008, the country must contend with a global economy in recession. The IMF estimates real GDP growth rate in 2009 at just around 1% in contrast to 3% in 2008, the sluggish growth reflecting declines in tourism, remittances and foreign direct investment.[2]

[1] Pan American Health Organization. 2008. Health situation in the Americas: basic Indicators. Washington, DC.
[2] International Monetary Fund. 2009. Public Information Notice (PIN) No. 09/58, May 14.

Traditionally, the government financed 50-60% of healthcare in the country.[3] However, the global recession and impending economic restructuring could constrain public expenditures in the near future. And this is coming at a time that emerging health trends, characterised by rising prevalence of obesity and chronic diseases, warrant additional investment in public health programs. On the upside, the medium-term outlook for tourism in Belize is good. That should increase inflow of revenues. But with it comes greater exposure to new public health threats. The recent outbreak of H1N1 virus in the country re-states the importance of effective disease surveillance, particularly, in the rural areas. [4] Belize needs reliable information to strengthen emergency preparedness and response, and to support good practices in patient care.

Better information can lead to more prudent investing with lower recurrent cost implications. More accurate and complete information on patients will enable health care providers to deliver care that is appropriate and is backed by evidence. Decision-support tools will promote safety in health care delivery. Improvements in the quality and efficiency of health services will be good in the long term for population health and for the economy. Higher productivity can be expected from a healthier workforce. Precisely what the NHIS Strategic Plan seeks to achieve – create a roadmap that guides policy makers, investors and healthcare providers towards a national, integrated health information network that facilitates data and information exchange in a secure environment powered by HIT. Belize needs support from international partners to take investment in people to the next level.

II. STRUCTURE OF THE NATIONAL HEALTH INFORMATION SYSTEM

In Belize, health information is generated from population and health facility-based activities. The former include census, registration of vital events and for the latter, health service records. The institutions that oversee these activities are largely under government control. They are governed by laws, many of which require updating. But non-governmental and private sector organizations constitute a growing source of financing and delivery of social services. Hence, excluding these sources from a national HIS results in under-reporting of events as well as the resources available for national development.

Sources of Health Information

Census: The Statistical Institute of Belize (SIB) oversees census activities in the country. It conducts a national census every 10 years; the last was in 2000. Annual projections from the census are used as a basis for national planning and resource allocation.

Vital Registration: Authority for the registration of births, deaths, marriages, divorces and other vital is vested in the Ministry of Attorney General (MOAG). Births and deaths that occur in

[3] Estimates for 2003-06 are extracted from WHO Statistical Information System (WHOSIS), 2008.
[4] An outbreak of H1N1 virus was reported in 2009 in the northern part of the country (area adjoining Mexico).

public health facilities are registered by offices of the Vital Statistics Unit (VSU) situated in the health facilities where the vital events occur. With over 95% of deliveries attended by skilled health workers, nearly all births are captured by the Vital Registration System (VRS). The publication of vital statistics updates, however, falls under the jurisdiction of the Statistical Institute of Belize (SIB).

Population Surveys: The SIB has the technical know-how to design and conduct population-based surveys but has limited human resources capacity. There are no demographic surveillance sites in the country, although, the central MOH has an epidemiological surveillance unit that monitors and responds to disease outbreaks. Work is currently on-going to expand the Geographical Information System (GIS) via mapping of community resources in the rural areas.

Health Service Records: The Belize Health Information System (BHIS)

Detailed description of the BHIS is provided in the document referenced below.[5] The enterprise architecture presents the following capabilities that make it user friendly, secure and scalable:

Functionality: The system comprises several interconnected modules which include patient scheduling and billing; admission, transfer and discharge; clinical order entry; laboratory; and supply chain management. Recently, an HIV/AIDS module was added and plans are underway to add public health and human resource modules.

Interoperability: The software runs on PostgreSQL, a powerful open source object relational database system that is available on all major operating systems (Linux, Unix and Windows). The combination of PostgreSQL, Java-based web technologies and Extensible Markup Language (XML) allows the BHIS to easily overcome barriers to information exchange arising from use different ICT infrastructures by stakeholders.

Security: Hardware and software configurations present multiple layers of security to protect health information. They include use of firewalls, hypertext transfer protocols,[6] usernames and passwords, audit trails and other features. Access codes provided to users are monitored continuously for abuse and additional security features continue to be added to ensure the integrity of the system.

Interface with Stakeholders: The BHIS uses social security numbers to generate unique patient identifiers. Currently, there is no interface between BHIS database and those compiled by units outside the MOH. The same information, registered in the VRS, for instance, is duplicated manually in the BHIS. However, the government intends to link all major sources of health information (MOH, SSB, NHI and VSU) to achieve bi-directional data feed on near real time basis. Among other things, this will produce efficiency gains in the use of human resources.

[5] MOH. (Undated). BHIS: Belize Health Information System. Brochure jointly developed by the Ministry of Health, PAHO and Health Metrics Network.

[6] HTTPS is the language or protocol used for browsing secure sites on the internet (used banks and commercial enterprises).

Expansion: Rural expansion of the BHIS is envisaged as part of the MOH agenda. In 2008, the BHIS added to its network, the San Antonio Poly Clinic II, located in a rural municipality in the southernmost part of the country. The facility records approximately 14,000 encounters per year. The intent is to cover 12 health centres and polyclinics in 4 regions by 2011 but national coverage could take up to 10 years given the limits of financing, human resource capacity and the telecommunication network in Belize.

Telemedicine: The use of video conferencing technology to deliver health services in Belize is a relatively new development. Limited bandwith presents a major obstacle. The application currently supports teleconsult and continuing medical education.[7] However, discussions are underway between the MOH and Belize Telemedia (BTL)[8] to facilitate installation and activation Voice Over Internet Protocol (VOIP) technologies in two hospitals - the Southern Regional Hospital in Dangriga and the Karl Heusner Memorial Hospital in Belize City.

III. APPROACH TO STRATEGY DEVELOPMENT

The National HIS strategic plan is the outcome of a broad consultative process that began in April 2008 with the conduct of an assessment of the HIS. A great deal of effort was devoted to forging consensus among diverse stakeholders on the future direction of HIS in Belize. The following are key elements of that process:

Leadership and Governance: The National Health Information Steering Committee (NHISC) led the strategy development process under the overall guidance of the MOH. It comprises of 13 members drawn from the MOH, key government departments and the donor community (Annex I). The MOH relies on the NHISC for expert advice on issues relating to HIS. In pursuit of its mandate, the Committee must ensure adherence to the national policy and strategy on electronic governance and ICT. A national e-Government policy is currently in place; it was formulated in 2008. A national ICT strategy is also being developed.[9,10] A high-powered steering committee made up of CEOs of key ministries including health has been proposed to guide the development and acquisition of ICTs. However, consensus is yet to be reached on the strategy.

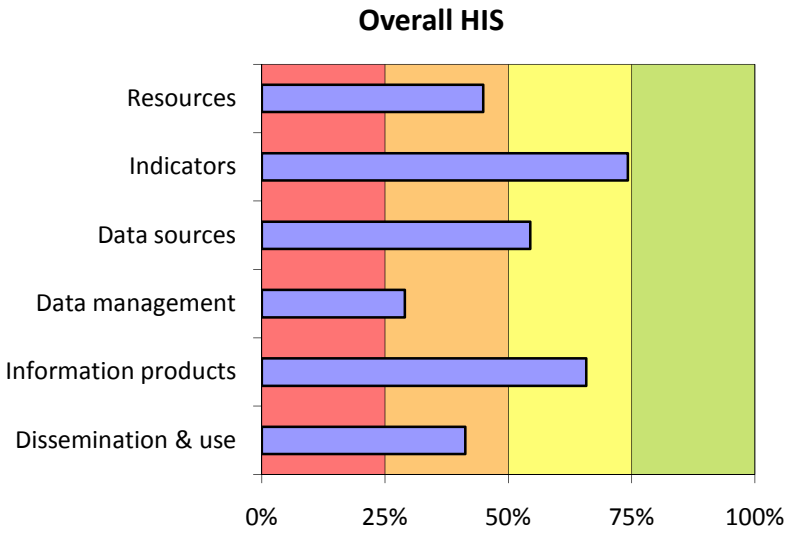
Consultation and Ownership: There was broad participation in the development of the NHIS strategic plan. A two-day stakeholder workshop was convened with participants drawn from the public, NGO and private sectors (list provided in Annex II). Attendance was good and the discussion vibrant. A Core Team comprised of the MOH, MPSGIEB and PAHO facilitated the workshop and subsequent drafting of the strategy. The stakeholders articulated a vision for the HIS, reviewed the findings of the HIS Assessment (presented below), and defined strategic

[7] Supported by Rochester General Hospital, Rochester, NY, USA.
[8] Belize Telemedia Limited (BTL) is Belize's premier telecommunications provider. It offers the most reliable data and communication services nationwide.
[9] Government of Belize (GoB). 2007. Electronic Government Policy, 2007-2011, Office of Governance, Mar.
[10] GoB 2009. National ICT Policy for the Government of Belize: Scoping Exercise. Final Draft Report, Feb.

objectives for the coming five years. The priority activities selected by the group were subsequently costed and performance indicators defined by the Core Team. A draft plan was distributed to stakeholders for comments, which were incorporated in the final document.

Review of HIS Assessment: In June 2008, the NHISC conducted an assessment of the HIS using the HMN framework.[11] The assessment covered six domains of HIS - Resources, Indicators, Data Sources, Data Management, Information Products, and Dissemination & Use. Scores ranged from "Highly Adequate" (above 75%) to "Not Adequate at all" (less than 25%). As Table 1 shows, the system demonstrates strengths in the areas of Indicators, Health Information Products and Data Sources – combined scores in each of these areas was above 50%. However, significant weakness exists with regards to HIS Resources (45%), Data Management (29%) and Dissemination & Use of information (41%).[12] In particular, human resources are weak but generally, there is poor documentation of health resources (33%). Besides, the use of information for policy, planning and resource allocation is weak. Furthermore, data quality assessments (or audits) are not instituted and whereas a data warehouse exists at the central level, this is not accessible to other stakeholders. Indeed, Belize lacks the necessary policy and legal framework to permit enforcement of regulations relating to vital registration, disease notification, private sector reporting, and privacy of health information. Findings from the HIS assessment were validated by stakeholders at the strategic planning workshop.

Figure 1: Belize - Assessment of the HIS, June 2008



[11] HMN 2007. Assessment tool for country Health Information Systems. Geneva, Switzerland.
[12] Extract from "Diagnostic Study of the National Health Information System in Belize". MOH, Belmopan, 2008

Beyond HIS Assessment: The 2008 assessment did not cover all areas of the HIS. The Vital Registration System (VRS) and Telehealth are some examples of on-going HIS activities that are not included. Limited consideration was also given to the system's performance as it relates to the non-profit and the private sectors. These issues will be revisited as system evolves.

Table 1: Belize HIS Assessment, June 2008 - Consolidated Scores

Resources	**45%**
Policy and planning	38%
Institutions, human resources & financing	43%
Infrastructure	59%
Indicators	**74%**
Data sources	**54%**
Census	70%
Vital statistics	53%
Population-based surveys	54%
Health & diseases records	57%
Health service records	59%
Resource records	33%
Data management	**29%**
Information products	**66%**
Health status indicators	77%
Mortality	76%
Morbidity	79%
Health system indicators	62%
Risk factor indicators	67%
Data-collection method	73%
Timeliness	77%
Periodicity	66%
Consistency	65%
Representativeness	55%
Disaggregation	68%
Estimation method	33%
Dissemination & use	**41%**
Analysis and us of information	38%
Policy & advocacy	75%
Planning & priority setting	44%
Resource allocation	42%
Implementation & action	28%

SWOT Analysis: The HIS assessment provides a systematic approach to identifying gaps in the HIS. It is however, an incomplete and subjective review process. Stakeholder analysis of Strengths, Weaknesses, Opportunities and Threats can complement information derived from the assessment. The case for Belize is summarised in Table 2 below:

Table 2: Belize NHIS - SWOT Analysis

Strengths	Weaknesses
• Comprehensive set of health indicators • Standardized tools and guidelines for data collection at health facility level • Small population – facilitates coverage by EHRs • Central and Regional M&E units within MOH • Core group of dedicated and competent personnel in the MOH and stakeholder institutions • Existence of an e-government policy • National health statistics is published annually • Political commitment to the development of the BHIS and e-Health	• Too many indicators and reporting requirements – stems from different programmes by different partners • Inadequate financing of M&E activities – arising in part, from failure to budget adequately for M&E activities under national programs • Limited capacity for in-depth analysis on health systems data at central and regional levels • Weak IT support, especially, at district level • Poor information sharing among government departments and with non-public sector organizations; • Limited reporting of data by private sector providers • Data quality audits are not done • Resistance among clinicians and managers to use EHRs • Managers' limited capacity to use information for decision-making • Lack of standards for ICT – barrier to interoperability and data sharing by different stakeholder organisations • Limited human resources • Weak legislation to support (electronic) health records
Opportunities	**Threats**
• Growing awareness of need for data protection laws • Government e-Strategy to provide unified framework • Commercial sector with ICT support capabilities • Growing donor interest in the BHIS • Increasing popularity of performance-based funding (requires timely, reliable information)	• New donors with new reporting requirements – will use up limited capacity • Natural disasters – Belize is prone to hurricanes • Global economic slowdown • Potential for security breach – higher with web-based applications like the BHIS • Competition from private sector for IT staff

Stakeholders recognised the unique opportunities that present for improving health services via adoption of processes and tools that promote the use of information for decision-making. The collaborative approach to analysing HIS strengths and weaknesses thus set the stage for developing shared vision and mission. A sketch of the proposed system is presented in Figure 2.

IV. MISSION

To provide information that is accurate, relevant and timely and enables health care providers and program managers to make decisions that are evidence-led, promote rational use of health care resources, and result in better health outcomes.

V. VISION

Belize will have an integrated national health information system that is accessible, reliable and sustainable, and which respects human rights and promotes appropriate use of information for improving the quality of life for all Belizeans.

VI. GUIDING PRINCIPLES

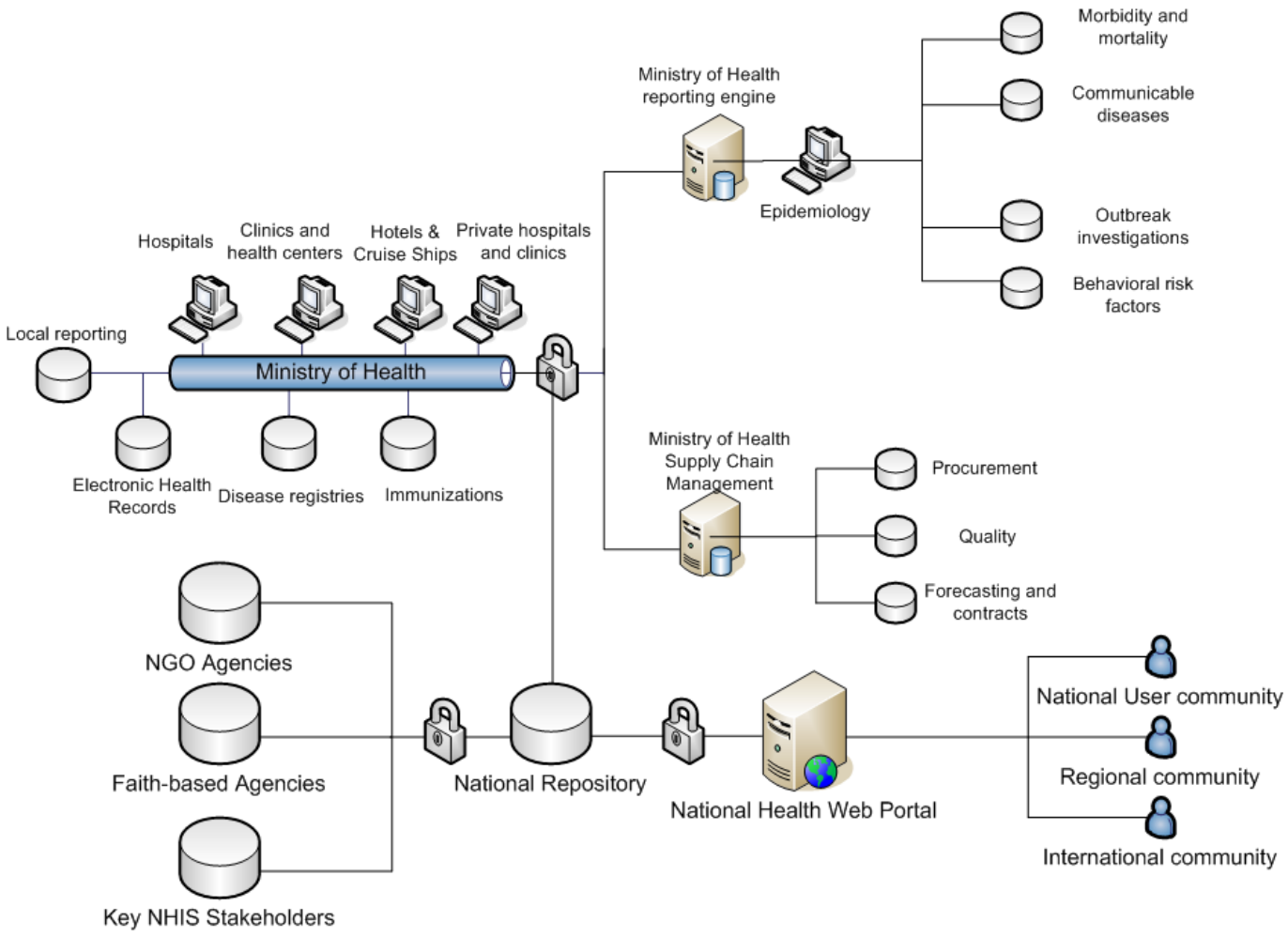
Our vision is founded on shared aspirations and the realization that a NHIS that is accessible and delivers accurate information in a timely manner serves the interest of all stakeholders. In pursuit of this goal, the NHIS will embrace the following core values:

- **Electronic Platform:** The NHIS will transition from partially paper-based to fully electronic system at all points of data entry and analysis. It will provide EHRs for every citizen and legal resident in the country. The BHIS will form the backbone of the NHIS architecture.
- **Integration:** The NHIS will interconnect multiple sources of health information (population and facility-based) in a seamless manner. The system will therefore need to adopt technologies that are interoperable.
- **Representativeness**: Information gathering, presentation and dissemination will be non-discriminatory. It will seek to include all segments of the population. Data will be disaggregated so that disparities by gender, socio-economic status and geographical location are duly reflected.
- **Security** and **Privacy**: The NHIS will assure privacy of health information. The system will be monitored continuously and upgraded to prevent unauthorised access to PHRs. Release of information will be in strict compliance with the law.
- **Standardization:** The NHIS will conform to national guidelines on the development and acquisition of ICT (software, hardware and processes). The system will streamline indicators and harmonise reporting formats to minimize duplication and capacity overload that could arise from competing (donor) demands.

- **Partnership:** More effective collaboration with internal stakeholders (public, non-profit and private sectors) will be sought. Effort will be made to address the needs and concerns of these stakeholders in the development of tools for data collection, analysis and dissemination. Exchange with countries in the Latin America/Caribbean region will also be encouraged to share experiences and benefit from best practices. To this extent, the GoB will actively seek the support of international partners.

The NHIS will continue to support the production and distribution of high quality information products. It will promote the use of evidence for investment, resource allocation and clinical decision-making. Ready access to information on near real time basis will enhance disease control and emergency preparedness efforts. The NHIS will strive continuously for excellence in customer service.

Figure 2: Proposed National Health Information System in Belize



VII. STRATEGIC OBJECTIVES, ACTIVITIES AND PERFORMANCE MEASURES

In defining the strategic objectives, stakeholders seek to sustain aspects of the HIS that are assessed as been "adequate" (or highly adequate) and strengthen areas that are judged to be weak. Furthermore, aspects of the HIS that are deemed to be relevant to national health development but which the HIS Assessment did not cover are included. In addition, the strategy takes into account other segments of the health system, which are not under the direct control of the MOH. In particular, the development of interfaces between the BHIS and IT systems used by the NHI, SSB and the VSU is seen as a major step towards building an integrated NHIS.

Key Performance Indicators are defined for each strategic objective as shown in Annex III. These indicators are qualitative and quantitative but focus largely on outcomes. They are additional to the process indicators for each activity listed in the detailed work plan.

OBJECTIVE 1: Legal, Policy and Regulatory Framework is strengthened to support further development and operations of the NHIS.

A committee made up of representatives of the MOH, MOAG and MPSGIEB will be set-up to review policies and legislation that govern HIS in the country. The committee will assess the adequacy of existing legislation and recommend updates where necessary. This might include drafting of a HIS policy or legislation to provide legal mandates in different aspects of HIS and in particular on issues privacy of PHR, reporting requirements of NGO and private sector providers, and use of EHRs by physicians and other healthcare providers. The approved policy or regulation will be communicated timely to all stakeholders. Communication will be by paper or electronic media or as recommended in the communication strategies under development.[13] Also, advocacy will be intensified to increase awareness on the value of the NHIS to national development; to sustain the political support necessary to increase budgetary allocation to HIS; to enhance resource mobilisation from development partners; and to increase buy-in from stakeholders in NGOs and the private sector.

Activities:

1.1 Review existing policies and legislation on HIS and draft National HIS Policy
1.2 Disseminate HIS Policy to stakeholders
1.3 Revise legislation to align with HIS policy
1.4 Implement HIS advocacy plan

Key Performance Indicator(s):

i) HIS policy and legislation published and disseminated to key stakeholders
ii) Percent of MOH budget allocated to HIS

[13] Ministry of Health. 2009. Design of a public communication strategy (draft). Belmopan, Mar 24.

OBJECTIVE 2: Information and Communication Technology infrastructure is upgraded to enhance data consistency, access and security.

Additional ICT (hardware and software) will be procured and configured to upgrade the functional capability of the BHIS and improve security of health information. This, in part, will address privacy concerns raised by private sector and NGO stakeholders. In addition, a metadata dictionary and national data repository will be created to improve consistency of and access to health information. The metadata dictionary will define data attributes, their context, use, and association with other data elements, among others. It will also aid refinement of the agreed set of national health indicators (Activity 4.1 below). Achieving this objective will entail software design, development and deployment. The complexity of the tasks will require that the MOH outsource their implementation given limited capacity in-house to undertake such complex assignments. Training in the use of these newly developed tools will be provided to stakeholders in the public, private and NGO sectors.

Activities:

2.1 Procure, install and configure security equipment to create national virtual private health system data network
2.2 Develop metadata dictionary
2.3 Design national data repository and database
2.4 Construct national data repository and database
2.5 Deploy national data repository and database
2.6 Train personnel on use of data repository and database

Key Performance Indicator(s):

i) Percent of core indicators reported nationally within 30 days of end of quarter
ii) Percent of users accessing the virtual private network via secure connections for data and information dissemination

OBJECTIVE 3: BHIS is expanded and data sources interfaced to enhance completeness of health information.

The MOH will complete GIS mapping of community resources and input coordinates in the BHIS. Coverage of the BHIS will be extended to rural health facilities in the four regions. The MOH will assess cost-effective options for achieving full BHIS coverage in small and remote settlements. To complement information on the HIS, an assessment of the VRS will be done. An interface that links the VRS and BHIS databases will then be designed. Likewise, the database used by the NHI will interface with the BHIS. Because the former contains data from public and non-public health facilities, linking the two systems will enhance completeness of health information and provide better aggregates on utilisation and costs in health care. The BHIS will likewise connect with the WinSig, a tool that facilitates contracting of health services in the public sector. The link will offer stronger information base for drafting Service Level Agreements (SLAs) between the MOH and Regional Management Teams (RMTs) – a key

element of health sector reform as well as the economic restructuring programme under negotiation with the IMF. A more robust NHIS will aid performance monitoring and improve adherence to contracts. The MOH will explore different approaches to building the linkages in close collaboration with other stakeholder organizations.

Activities:
3.1 Conduct mapping of house-holds and community resources
3.2 Input co-ordinates into BHIS database
3.3 Expand coverage of BHIS to rural areas
3.4 Conduct assessment of Vital Registration System (VRS) using the WHO tool
3.5 Design VRS functionality in BHIS or design interface of BHIS-VRS systems
3.6 Develop and deploy interface to integrate VRS with BHIS
3.7 Train VSU staff in the use of integrated system
3.8 Interface BHIS with WinSig
3.9 Interface BHIS with RAA Software (NHI)

Key Performance Indicator(s):
i) Percent of communities mapped and input in the BHIS
ii) Percent of patient visits in MOH facilities recorded at point of care in the BHIS

OBJECTIVE 4: Data quality and data management improved for greater reliability.

Stakeholders will reach agreement on core indicators for assessing progress with national health development. The current list of indicators will be streamlined to enhance coordination of interventions and conserve human resources. The list will be reviewed every 2 years. New health programmes and existing ones will strive to adopt the core indicators monitored by the NHIS. New indicators will only added with the approval of the NHISC. Because periodic audits of data quality are not organised by the MOH and routine assessment of data quality is not undertaken at health facility level, there is no systematic approach to validating what is fed into the HIS. To improve the data quality at different points in the network, training on Data Quality Audit (DQA) will be provided. A DQA will subsequently be conducted and results shared with stakeholders. External audits will be repeated every 2 years but health facilities will be encouraged to undertake routine assessments at least once a year. Furthermore, the adoption of unique codes (personal identifiers) by key stakeholders (MOH, NHI, SSB and MOAG) will allow exchange of information within a secure environment. Such exchange is limited at the moment because different agencies use different identifiers for the same individual. Furthermore, the capacity of the MOH to undertake detailed analysis of health data will be strengthened via installation of software packages with advanced database and forecasting functions. This is necessary to better understand epidemiological trends in the country, and to improve forecasting and emergency preparedness.

Activities:
4.1 Revise minimum set of national indicators.
4.2 Develop protocols for data exchange.
4.3 Provide training on methodology data quality audit (DQA)
4.4 Conduct DQA
4.5 Identify data sources for unique codes for harmonization of data sets (to enhance systems interoperability).
4.6 Enhance capacity for data analysis and reporting at central MOH

Key Performance Indicator(s):
i) Percent of public health facilities conducting data quality assessments annually

OBJECTIVE 5: The capacity to manage an integrated, national HIS that responds promptly to user needs will be strengthened.

Human resource capacity weaknesses pose a major constraint to service delivery and expansion of the BHIS. As at July 2009, the MOH employed just one each of the following: (a) Information and Communication System Manager (b) Computer System Administrator (c) Information Technologist (d) System Analyst. This level of staffing is simply inadequate to maintain the BHIS infrastructure and permit the refinements needed to meet user expectations. Expansion of the network to rural districts will generate additional workload. To enhance performance, an assessment of HIS human resource needs will be conducted. Roles and competencies will be reviewed and job descriptions prepared for approved posts. Areas of need already identified include Epidemiology, Biostatistics and HIT. Recruitment and retention strategies will be reviewed to retain competent HIS staff in key institutions. Training will be provided to public, NGO and private sector personnel on the use health information for decision-making. HIS staff in the MOH will also benefit from short-duration (certificate) courses to enhance skills and meet requirements for continuing education. To improve support services, the MOH will recruit four (4) additional IT technicians/specialists on contract (one per region). This will contribute to reducing system downtime. Better customer service would in turn encourage more clinicians to use EHRs. The MOH commits to absorbing contract staff by the end of the programme.

Activities:
5.1 Conduct needs assessment for HIS Human Resources.
5.2 Recruit qualified personnel in Epidemiology, Biostatistics and IT.
5.3 Train HIS stakeholders in reporting and use of health information.
5.4 In-service training in Epidemiology, Statistics and IT.
5.5 Provide IT support for regional/district health facilities.
5.6 Provide technical support on use of information for decision-making.

Key Performance Indicator(s):
i) Number of HIS staff at national, regional and health facility level trained in reporting and use of health information

ii) Percent of clinicians using diagnosis and laboratory functions in the BHIS
iii) Percent of clinicians using e-prescribing function of BHIS
iv) Average resolution time (in days)

OBJECTIVE 6: Dissemination and use of health information for clinical and public health action is facilitated and institutionalised.

Dashboards will be developed to aid management decision-making at central MOH, regional, district and referral hospital levels. Clinical dashboards will likewise be designed to aid patient care and improve chronic disease management. Stakeholders will be actively involved in the development of these tools so that they are relevant to user needs. Senior and mid-level managers (including clinical heads of department) will be trained to use of dashboards for decision making. Collaboration with NGOs and the private sector will be intensified – assistance will be provided on use of clinical and management tools as requested. The availability of personnel with specialised skills (as identified under Objective 5) will permit in-depth analysis and reporting of health statistics. Feedback to stakeholders will be improved and timely notification of disease outbreaks will enhance targeting of interventions to contain threats to public health. A study will be conducted to assess the impact of EHRs on chronic disease management in rural communities with focus on diabetes and cardiovascular diseases. The findings of the study will be widely disseminated.

Activities:
6.1 Develop clinical and management dashboards.
6.2 Train MOH senior managers on use of dashboards for decision-making.
6.3 Train mid-level managers, regional and hospital managers on use of dashboards for decision-making
6.4 Train clinicians/clinical service providers in the use of dashboards.
6.5 Enhance information communication & feedback with key stakeholders at different levels (information communication strategy elaborated).
6.6 Strengthen regional collaboration on HIS.
6.7 Conduct baseline assessment of chronic disease management in Northern rural districts not connected to the BHIS.
6.8 Assess impact of EHRs on chronic disease management in Northern rural districts newly connected to BHIS

Key Performance Indicator(s):
i) Percent of trained MOH senior staff and RMT members who use management dashboards on weekly basis.
ii) Percent of rural health centres that received quarterly feedback on health statistics

VIII. COSTS, FINANCING AND SUSTAINABILITY

A detailed work plan and budget for the 5-year programme are provided as separate attachments to the strategy document. Estimates are based on the actual cost of procuring assets or delivering services in Belize. Fixed costs are not annualized and prices (expressed in US dollars) are current for the year 2009. A price contingency factor of 3% is built into total costs.

Table 3: NHIS Strategic Plan - Summary Budget by Objective (in US$)

	Strategic Objective	2010	2011	2012	2013	2014	Total	Gap	Percent
1	Reinforced Policy, Legal and Regulatory Framework	21,275	2,100	-	-	-	23,375	15,540	1%
2	Enhanced ICT Infrastructure	78,667	315,083	461,148	22,481	5,372	882,751	866,751	33%
3	Integrated and Expanded National HIS	274,713	279,793	39,788	39,788	39,788	673,872	529,772	25%
4	Improved Data Management	35,732	64,910	30,650	-	13,050	144,342	101,992	5%
5	Human Resource and Capacity Building	34,998	141,264	114,137	114,276	114,421	519,094	390,544	19%
6	Enhanced Dissemination and Use of Health Information	136,370	102,950	5,900	1,340	1,340	247,900	152,000	9%
7	Programme Management	63,100	23,100	37,435	23,100	37,435	184,170	120,060	7%
	Sub-total	644,855	929,200	689,058	200,985	211,406	**2,675,505**	2,176,660	100%
	Price Contingency (3%)	19,346	27,876	20,672	6,030	6,342	80,265	65,300	
	Total	**664,201**	**957,076**	**709,730**	**207,015**	**217,748**	**2,755,770**	**2,241,959**	
	Percent	24%	35%	26%	8%	8%	100%	81%	
	Cumulative	24%	59%	85%	92%	100%			

As shown in Table 3 above, the cost of implementing the programme is estimated at US$2,755,770. This represents around 6.4% of total government health expenditures in 2007.[14] Costs to be financed by the GoB total US$513,810 (approximately one-fifth of total programme costs). These comprise of staff salaries, per diems and rental fees for venues used for local training. The salaries largely reflect opportunity costs rather than incremental personnel costs but there is US$75,000 in new spending on human resources (contract staff required to strengthen IT support services in the Regions). In addition, the government will cover incremental (recurrent) costs that arise from an expanded BHIS network and the national data repository. Considering however that recurrent expenditures take up more than 85% of the

[14] Public health expenditures in 2007 totaled US$43,213,108 (Source: Health Statistics of Belize 2003 to 2007. Ministry of Health, Belmopan

public health budget in 2007, it seems likely that external assistance will be required to close resource gaps.

A closer look at the cost structure reveals that more than 50% of the budget (Table 4) will go towards financing technical assistance and procuring IT equipment. This is not unexpected given that the design and development of the national data repository and interface between disparate IT systems require more capacity than the MOH is able to supply or can be obtained from the private sector in Belize at this time. Consequently, the needed expertise will have to be sourced from regional and international markets. However, since capacity building is an integral part of the NHIS strategy, national counterparts will work closely with external consultants thereby facilitating transfer of skills. Besides, these are largely one-time capital expenditures with little recurrent costs associated. Hence, sustainability does not present a major issue under this circumstance.

Table 4: Programme Costs by Category of Expenditure (US$)

	Category	Amount[&]	Percent
i	Advocacy & Communication	21,970	0.8%
ii	Equipment	268,532	10.0%
iii	Human Resources	301,749	11.3%
iv	Monitoring & Evaluation	288,965	10.8%
v	Other	224,706	8.4%
vi	Planning & Administration	17,225	0.6%
vii	Research	52,315	2.0%
viii	Technical Assistance	1,130,888	42.3%
ix	Training	369,154	13.8%
	Total	**2,675,504**	**100.0%**

&: Excludes Price Contingency

To keep costs under control, preference will be given to use of national consultants where local capacity exists. External consultants will be sought as appropriate and where the required expertise is not available locally. In addition, the GoB will explore Open Source technologies to upgrade the functionality of the BHIS in order to minimise systems development and maintenance costs. It is recognized however, that it may be cost-effective to go for turnkey solutions in some instances particularly with regards to the acquisition of new tools and

functionalities such as clinical and management dashboards. Though more expensive, this option offers many advantages:

- Reliable sources of supply – there are off-the-shelf solutions of superior quality from industry leaders that are tested, debugged, and ready to go

- Reduced delivery time – they require limited configuration and the data to populate them are available in the BHIS (this eliminates time-consuming software development, a major consideration where human resource capacity is limited)

- Extended benefits – in terms of quality improvement and better use of health care resource potentially outweigh the licensing costs.

To ensure adequate funding, the MOH will incorporate license fees in its recurrent budget starting from Year 3 of the programme (2012).[15]

IX. PROGRAMME IMPLEMENTATION

The implementation of the strategic plan is front-loaded with 60% of the budget utilised by the end of Year 2 (2011) and over 80% by the third year. A detailed Work Plan is provided as a separate attachment to the strategic plan. This is understandable given that expansion of the BHIS and interface with NHI, VRS and WINSIG will commence in Year 1 and be completed by Year 3. Consolidation of the gains made in HIS strengthening will take place in the remaining two years. To this extent, priority will be given to boosting the technical and implementation capacity of the HIS unit of the MOH so that it is able to manage an extended network and provide reliable client services.

Multiple levels of oversight will be established to ensure successful implementation of the NHIS Strategic Plan. The NHISC will supervise implementation of the HIS strategy under overall guidance and leadership of the MOH. The committee will meet quarterly to review programme performance and budgets. Its Terms of Reference (TOR) will be revised so that it has the powers to carry out this function. To foster inclusiveness, membership of the NHIS will be expanded to include representation from the NGO and private sector.

The execution of programme activities will be the responsibility of agencies or organizations identified in the work plan. However, an Administrative Officer will be recruited to coordinate implementation of activities and use of resources. The coordinator will also provide timely feedback to the NHISC where major or unexpected deviations occur during implementation. The MOH will provide office space within its premises for this function.

[15] The MOH has commissioned studies to assess the benefits and costs of the BHIS.

Stakeholders identified factors that could impede the success of the strategic plan and offered suggestions on ways to minimize risk. The following measures address the concerns raised:

1. **Resource Mobilization:** The NHIS strategic plan will serve as the blueprint for HIS development in Belize. It will be used to advocate for additional government financing as well as resource mobilisation from external partners. The government has identified potential donors to finance parts of the strategic plan and will intensify effort in this direction. The extent to which success is achieved in this area will be monitored as one of the key performance indices. It is critical that donors work within the framework of the strategic plan, which indeed, has been developed through broad, consultative process.

2. **Political Support:** Evidence will be required in the short-to-medium term to show how investment in HIS improves clinical and management decision-making and the extent to which these contribute to better performing health services and outcomes of care. This is necessary to sustain political commitment to the NHIS particularly in an era of fiscal restraint. The NHIS strategic will complement activities outlined in the health sector communication strategy that is being developed as part of the health sector reform programme. Advocacy measures will be intensified and case studies demonstrating the benefits that accrue from HIS investments (including evidence of cost savings at various points in the health system) will be undertaken.

3. **Governance and Accountability:** There is a need to ensure that funds allocated to HIS are not diverted to other purposes. Indeed, it is important to ensure that the new funding from HIS (from external partners) does displace current budgetary allocation to HIS. The oversight arrangement proposed above document will minimize that risk by continuously monitoring the level of funding of the programme all through implementation. Besides, donors will likely insist on seeing that resources provided for HIS strengthening achieve stated objectives.

4. **Implementing Capacity:** The freeze on employment and competition from the private sector pose major challenges to the implementation of the NHIS strategic plan. Particularly for IT-related professions, competition from the commercial sector of the economy makes staff retention in the public sector quite difficult. So far, the MOH has succeeded in retaining a team of competent and dedicated IT specialists working on the BHIS. While the development of a comprehensive human resource plan for the MOH is awaited, the following measures can contribute to mitigating the problem:

    a. Set realistic (programme) targets giving due consideration to existing commitments and human resource capacity
    b. Out-source implementation where the private sector demonstrates comparative advantage (e.g. hardware maintenance and support) – this may prove more expensive but would enable MOH staff to focus more on software development and enhancement

c. Use short-term contract staff to boost implementation capacity in the MOH
d. Standardize equipment and processes to conform to Government IT strategy – an effective approach to streamlining costs in multisite operations

The MOH commits to absorbing contract staff at the expiration of their term in order to maintain the integrity of the NHIS and improve the performance of health services.

5. **Stakeholder Buy-In:** It was observed that service providers outside the public sector have so far not shown great interest in linking-up or sharing data with the BHIS. They cite concerns over privacy and security of patient information in addition to possible use of data (by government) for tax purposes. Besides, connecting to the BHIS will entail additional hardware and software costs for which little benefit is perceived. To enhance buy-in, the BHIS would need to demonstrate value to the private sector. To this effect, the NHISC will:

    a. Identify physician champions of EHRs in the private (and public) sector to further advocate on the benefits of EHRs
    b. Leverage the "persuasive" power of the NHI, which has financial/contractual relationship with private sector providers (the relationship is likely to grow stronger as coverage by NHI expands)
    c. Ensure appropriate legislation – to back up request for information; this can enhance compliance where combined with incentives
    d. Provide incentives to private and NGO facilities that collaborate with the MOH on the development of the NHIS – measures to consider include (i) free installation of EHR software (ii) training on use of BHIS modules and dashboards (iii) participation in CME activities via telemedicine
    e. Develop excellent customer relations – private sector providers can be very sensitive to productivity losses that arise from installation of EHRs as well as subsequent system malfunction
    f. Encourage NGO/private sector representation in the NHISC

X. MONITORING AND EVALUATION

Performance Monitoring: For each indicator, baselines and targets have been identified. These will facilitate programme monitoring by the NHISC as outlined in Section IX above. In addition, an indicator that assists BHIS managers to keep track of how fast and how well the unit responds to user complaints will be introduced in 2010. The "Average Resolution Time" will indicate the degree of responsiveness and will be incorporated in management dashboards to be developed.

Financial Management and Audit: Since there are no joint government/donor programming and financial management procedures (like Sector Wide Approach) in Belize, accounting for the funds received from different partners who have different reporting requirements could create

additional workload. To minimise such occurrence, the NHISC will ensure that accounting and financial management procedures adopted under the programme align to the extent possible with GoB procedures. Furthermore, financial audits will be conducted every two years and audit reports reviewed by the NHISC so that accountability is enhanced.

Programme Review and Evaluation: A mid-term review of the NHIS is planned for early 2012. Stakeholder involvement will prove invaluable to this exercise. The review will ensure that the strategic plan is addressing emerging health needs and developments in the field of health IT. An evaluation of the programme will be undertaken at the end of the 5-year period. Lessons learned will feed-back into the re-programming process. Provisions are made in the budget for these activities.

XI. NEXT STEPS

This strategic planning exercise is only a first step to building an integrated, national health information system, one that addresses the needs of diverse stakeholders. The exercise does not capture all HIS strengthening activities that are on-going or planned within health and related sectors. It will necessarily take several years before a fully integrated NHIS evolves. Following ratification of the strategy, the MOH will embark on active resource mobilisation. Sustaining stakeholder involvement in the implementation of the strategy is however, key to building the level of trust that permits free exchange of information and also critical to ensuring accountability in the use of resources.

Annex I

Composition of the National Health Information System Steering Committee

- Ministry of Agriculture
- Ministry of Health
- Ministry of National Development
- Ministry of the Public Service
- Ministry of Natural Resources
- Pan American Health Organization
- Social Security Board (SSB)
- Statistical Institute of Belize (SIB)
- United Nations Children Fund (UNICEF)
- United Nations Development Fund (UNDP)
- United Nations Population Fund (UNFPA)
- University of Belize
- Vital Statistics Unit

Annex II

Belize National Health Information System Strategic Planning Process
List of Participants at Stakeholder Workshop, 20-21 July 2009

Name	Title	Organization
Dr. Peter Allen	Chief Executive Office	Ministry of Health
Dr. Beverly Barnett	PWR (Country Rep.)	PAHO – Belize
Ethan Gough	National Epidemiologist	Ministry of Health
Englebert Emmanuel	Biostatistician	Ministry of Health
Marilyn Pinelo	Statistical Coordinator	Statistical Institute of Belize
Patricia Smith	Data Analyst	Belize Family Life Association
Dennis Jones	Managing Director	BEST
Elvis Requena	Project Coordinator	BEST
Guillermina Heredia	Deputy Regional Health Manager	Ministry of Health
Michelle Vanzie	Health Economist	Ministry of Health
John Bodden	Senior Public Health	Ministry of Health
Pearl Ellis	Regional Manager Western Regional	Ministry of Health
Dwight Gillett	Head, ICT & E-Government	Ministry of Public Service
Michelle Longsworth	Director CITO	Ministry of Finance
Allen Tzul	Software Developer	Police Department
Marcel Belisle	IT Department	Karl Heusner Memorial Hospital (KHMH)
Gabriel Bol	BHIS	Ministry of Health
Sean Sebastian	Manager	Social Security Board
Carlos Perera	Director of Finance	KHMH
Ian Smith	Manager, BHIS	Ministry of Health
Erika Goldson	Assistant Rep., UN Population Fund	UNFPA - Belize
Marilyn Entwistle	Advisor Health System & Services	PAHO – Belize
Kevin Harris	IT Specialist	Ministry of Education
Roberto Guerra	IT Specialist	Ministry of Health
Michelle Cox-Hoare	QA Coordinator	Ministry of Health
Dr. Lesbia Guerra	Health Planner	Ministry of Health
Dr. Ibukun Ogunbekun	Principal Consultant	Connect-To-Health

Annex III

BELIZE: NATIONAL HEALTH INFORMATION STRATEGIC PLAN, 2010-2014

KEY PERFORMANCE INDICATORS

	Programme Objective & Performance Indicator	Baseline (Year)	2010	2011	2012	2013	2014	Frequency of Reporting	Data Sources, Methods of Calculation, Comments
1	Reinforced Policy and Regulatory Framework								
i	Updated HIS legislation disseminated to key stakeholders in public, NGO and private sector (Yes/No)	No (2008)	No	Yes	Yes	Yes	Yes	As soon as published	HIS policy to be reviewed every 5 years. Key stakeholders include SSB, NHI, SIB, UB, BFLA, BMDA and Belize Police.
ii	Percent of MOH budget allocated to BHIS	<1% (2007)	1.3%	1.6%	2.0%	2.5%	2.9%	Annual	Measure of effectiveness of advocacy effort. Value = HIS allocations from MOH budget (including donor funds) / Total MOH budget (including donor funds)
2	**Enhanced ICT Infrastructure**								
i	Percent of core indicators reported nationally within 30 days of end of quarter	5% (2007)	10%	40%	60%	70%	85%	Monthly	Summary reports generated monthly from the BHIS and SLA reports.
ii	Percent of users accessing the virtual private network via secure connections for data and information dissemination	0% (2008)	25%	75%	80%	85%	90%	Monthly	Review of system logs and connections, data flow and information downloads.
3	**Integrated and Expanded National HIS**								
i	Percent of communities mapped and input into the BHIS	0% (2008)	20%	40%	50%	75%	100%	Quarterly	Administrative records. Progression assumed in the following order: Toledo, Stann Creek, Cayo, Corozal, Orange Walk, Belize.
ii	Percent of patient visits in MOH facilities recorded at point of care in the BHIS	60% (2008)	65%	70%	75%	85%	95%	Quarterly	All encounter data are captured in the BHIS either in real time or batch mode. Value = Number of patient visits in facilities connected to BHIS / Total number of patient visits in all MOH facilities.

4	**Improved Data Management**								
i	Percent of public health facilities conducting data quality assessments annually	0% (2008)	0%	15%	30%	50%	65%	Quarterly	Administrative records and reports.
5	**Human Resources and Capacity Building**								
i	Number. of HIS staff at national, regional and health facility level trained in reporting and use of health information	5 (2008)	20	35	50	65	80	Quarterly	15 persons trained annually; training records will be updated annually.
ii	Percent of clinicians using diagnosis and laboratory functions in the BHIS	45% (2008)	60%	70%	90%	100 %	100%	Quarterly	User logs and SLA reporting
iii	Percent of clinicians using e-prescribing function of BHIS	35% (2008)	45%	80%	90%	95%	100%	Quarterly	User logs and SLA reporting
iv	Average resolution time (in days)	TBD	TBD	TBD	TBD	TBD	TBD	Quarterly	New indicator to be measured. Baseline to be based on data from 1st Quarter, 2010. Value = Total number of work days to resolve user / Total number of tickets logged.
6	**Enhanced Dissemination and Use of Health Information**								
i	Percent of trained MOH senior managers and RMT members who use management dashboards at least twice per week.	0% (2008)	30%	45%	60%	75%	90%	Monthly	User logs and SLA reporting
ii	Percent of rural health centers that received quarterly feedback on health statistics	10%	25%	40%	60%	80%	95%	Quarterly	Administrative records and reports
7	**Programme Management**								
i	Number of NHISC meeting held per year	n/a (2008)	4	4	4	4	4	Quarterly	Minutes of quarterly NHISC meetings.
ii	Percent of programme budget mobilised	0% (2008)	24%	60%	86%	93%	100%	Quarterly	Targets are cumulative. Quarterly financial statements; audit reports. Value = A+J12ctual amounts disbursed / Proposed budget for the period. Performance is reviewed at NHISC meetings.