



Rwanda HMIS Assessment Report



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The author's views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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Abbreviations

ARV	Anti Retro-Viral [drugs]
ART	Anti Retro-viral Therapy (or Anti Retro-viral Treatment)
ASP	Application Service Provider
BUFMAR	Bureau des Formations Médicales Agréées au Rwanda
C&T	Counseling and Testing (replacement term for VCT)
CAMERWA	Centrale d'Achats de Médicaments pour Rwanda (Central Drug Purchasing Agency for Rwanda)
CHU	Centre Hospitalier Universitaire de Kigali
CNLS	Commission Nationale pour la Lutte contre le SIDA (GoR National AIDS Commission)
CWIQ	Core Welfare Indicators Questionnaire
DEHP	Département d'Epidémiologie et de l'Hygiène Public (GoR Department of Epidemiology and Public Hygiene)
DHS	Demographic and Health Survey
DOTS	Directly Observed Treatment Short course (tuberculosis)
FOSA	Formation Sanitaire (Health Facility)
GESIS	Gestion du Système d'Information Sanitaire
GESPER	GoR Human Resources Management System
GF; GFATM	The Global Fund to Fight AIDS, Tuberculosis, and Malaria
GoR	Government of Rwanda
HIV/AIDS	Human Immuno-deficiency Virus/Acquired Immuno-deficiency Syndrome (see SIDA)
HMIS	Health Management Information System
HSSP	Health Sector Strategic Plan (GoR)
ICT	Information and Communication Technology
IMCI	Integrated Management of Childhood Illnesses
IS	Information Systems
IT	Information Technology
LNR	Laboratoire National de Référence (National Referral Laboratory)
MCH	Maternal and Child Health
MINALOC	Ministry of Local Government, Community Development and Social Affairs
MINISANTE	Ministère de la Santé (GoR MoH)
MoH	Ministry of Health; see MINISANTE
NGO	Non-Governmental Organization
NHA	National Health Accounts
PEPFAR	The (US) President's Emergency Plan For AIDS Relief
PLWHA	People Living with HIV and AIDS
PMTCT	Prevention of Mother to Child Transmission (of HIV)
PNILP	Programme National Intègre de Lutte Contre le Paludisme
PNILT	Programme National Intègre de Lutte Contre le Tuberculoses
RH	Reproductive Health
RTI	Research Triangle Institute (RTI International is a trade name of the Research Triangle Institute)

SI	Strategic Information, PEPFAR term for M&E and planning and reporting information
SIDA	(see HIV/AIDS)
SIS	Système d'Information Sanitaire (GoR Health Data System)
STI	Sexually Transmitted Infection
SWAp	Sector Wide Approach
TOR	Terms of Reference (Termes de Référence, TDR)
TRAC	Treatment Research and AIDS Centre [GoR]
TRACnet	Integrated HIV/AIDS Information System
USAID	United States Agency for International Development
USG	United States Government
VCT	Voluntary Counselling and Testing (see C&T)
WHO	The World Health Organization

Glossary

Facilities In the context of this document, « Facilities » or « Health Facilities » refer to hospitals, health centers or dispensaries.

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Executive Summary

In 2005, the Government of Rwanda (GoR) Ministry of Health (MoH), through the donors' Health Cluster, requested analysis of health information needs and structures in Rwanda and recommendations to optimize national health information structures. The GoR and its partners saw a vital need for detailed understanding of the information needs of different actors, the existing systems and the extent to which they meet key actors' needs, and priority actions and decision areas critical to improve and strengthen Rwanda's health information systems.

The request for assessment of Rwanda's Health Management Information Systems (HMISs) also arose from the GoR's and donors' awareness of the need to better understand and coordinate a multitude of ongoing and planned activities in the area of health information systems, which presently often are not integrated or well coordinated. To ensure a strong technical perspective would drive the Assessment findings, the Health Cluster Mapping Technical Working Group solicited analysis of health information systems to be executed by an independent agency. RTI International (RTI), through its role in the USAID-funded Twubakane Decentralization and Health Program, fielded an expert team to fulfill this Assessment request.¹ This report presents the HMIS Assessment Team's findings. (See Appendix J for a list of team members.)

Assessment of existing HMIS structures and processes operating throughout Rwanda's health sector is a necessary first step toward the purposes of improving data management, data validity and reliability, and informed health care planning and decision-making at all levels. The HMIS Assessment Team studied information systems in Rwanda that support the MoH and its dependent institutions, decentralized HIV/AIDS coordination entities and non-facility-based HIV/AIDS activities, decentralized health structures such as hospitals and other health facilities, and related health donor projects. While HIV/AIDS is a significant, urgent issue in the health sector and indeed in the HMIS context, this Assessment studied information systems and flows throughout the country for both HIV/AIDS and the wider range of health information topics of general concern in contemporary Rwanda.

The HMIS Assessment Team methodology included structured focused interviews (see Section 4 for further details) with stakeholders at all levels, including GoR officials and decision-makers, information technology specialists, donors and project staff, and health care providers involved in recording, reporting, and/or using information at facilities around the country. The Assessment included in-depth interviews with staff at 54 health

¹ This activity was supported through the Twubakane Decentralization and Health Project, with additional funding from USAID, including funding from the US Government's President's Emergency Plan for AIDS Relief (PEPFAR). The Twubakane project is funded by USAID and implemented through IntraHealth, RTI, and Tulane University. PEPFAR is funded by the US Government. Additional funding was provided by USAID through the IntraHealth Capacity Project.

service delivery sites to ensure that findings and recommendations for improving Rwanda's health management information systems would incorporate current experience on the front lines and intermediate levels of data collection, aggregation, and use as well as the formal information management chain (see Section 4 and Appendix K for further details). Detailed information and observations about field-level information system operations and related challenges strengthen the quality and utility of this analysis.

The HMIS Assessment Team recommends the GoR act on the following concerns in order to move health information management in Rwanda toward stronger systems. *Critically, the GoR must devote appropriate resources and staffing at central levels to manage these reforms.* The GoR needs to address the following areas:

- human capacity and appropriate technology related to developing sustainability of information approaches and supporting systems for Rwanda
- coordination of changes to complete ongoing decentralization in conjunction with efforts to work toward national HMIS goals
- interoperability, technical capacities, and information limits of existing systems

These themes run throughout the HMIS Assessment Team's findings. Current staffing and capacity must be expanded; in order to strengthen Rwanda's systems, the GoR must take actions and develop strategies that will sustainably support efforts to improve relevant information access, content, and use. Specific key recommendations from this HMIS Assessment include the following action priorities:

1. For Immediate Action: Coordinate District, Facility, and Central HMIS Approaches

i) Clarify Roles and Responsibilities

Communicate current correct policies on health center supervision throughout the health sector, including documentation and education to ensure health professionals and supporting personnel understand health information linkages and pathways.

ii) Communicate New Reporting Procedures

Communicate with district supervisors, district administrative health directors, and health center directors and nurses on the correct current systems and related responsibilities.

iii) Re-establish Monthly Coordination Meetings

These meetings can be a crucial mechanism for disseminating clear and consistent policies or guidelines and instructions, for instance during the first week of the month, and for sharing information across health sector levels.

2. For Immediate Action: Strengthen District, Facility, and Central Information Systems

i) Determine Champions for Strengthening Information Systems

The GoR must find Rwandan champions who fully appreciate the challenges of strengthening the national HMIS and empower them to mobilize and raise awareness of technical realities, required capacities, and benefits of strengthened systems.

ii) Integrate Community-Based Data

Community health workers (agents de santé) need to understand data collection and information systems to support more complete information from the community.

iii) Train Supervisors

A formal curriculum must be developed and former supervisors should be involved to support training for newly appointed supervisors, including data quality, reliability, and verification.

3. For Immediate and Ongoing Action: Emphasize Data Quality for Use

Clear messages must communicate the importance of data quality, with policies and procedures to support improved quality. All levels of staff, supervisors, administrators, officials, donors, and projects must strengthen data quality to strengthen Rwanda's HMIS. Data that strengthens understanding and improves decision-making can occur only when the information used is reliable, accurate, complete, and comparable.

4. For Near-Term and Ongoing Action: Improve Data Systems to Strengthen Data Use

Coordination and communication responsibilities must be assigned to GoR staff at central and district levels, with appropriate training, support, and adjustment to other workloads. GoR policies should outline in detail the processes controlling shared access to health data, minimizing bureaucratic obstacles with clearly defined guidelines and with protocols to handle legal and privacy issues. Systems to encourage and support feedback on quality, relevance, and utilization of HMIS data must be developed or strengthened for all stakeholders in Rwanda's health sector. Systems must be developed and resources devoted to strengthen local capacity for data use—skills and tools to interpret, analyze, compare, and integrate data into decision processes—including informal education for health sector personnel. Systems to ensure that not only are current vertical databases, for instance for HIV/AIDS programs, reconciled to reduce data collection burdens and other barriers to information use, but also that new and future database applications are built with interoperability and harmonization as prime considerations.

5. For Near-Term Action and Critical Ongoing Investment: Develop Strategic Plans to Strengthen and Support the National HMIS

Careful, thoughtful long-term strategic planning must be initiated by the GoR as soon as possible in order to develop appropriate HMIS policy, approaches, and to begin working toward sustainable change and improved health management information systems. Strategic planning, based on a rational and agreed policy framework, is the only way to ensure that information systems and applications that are being put into place throughout Rwanda will be able to exchange data easily and export data in meaningful and useful forms. The GoR must devote resources to generating consensus around realistic plans and goals that thoughtfully support commitment to the right personnel in well-defined positions at central and district levels and at facilities that have the capacity to handle coordination, dissemination, training, and management of ongoing demand for quality data and utilization of the data. The GoR must maintain that commitment over time.

1. Introduction

Routine health information forms a critical backbone of strong health systems, and strengthening routine health information systems is a challenging task currently being confronted by countries throughout the developing world. A national health management information system (HMIS) should collect, integrate, and produce system and component performance indicators—financial, operational, governance, and health status—that help stakeholders at all levels throughout the health system plan and take appropriate action. Data must be collected, processed and transformed, communicated, and used to inform decisions on resource allocations, policies, staffing, service delivery, cost-recovery, supportive supervision, and other elements working toward improved health outcomes. An assessment of routine health information systems and recommendations for priority actions to improve their usefulness should contribute greatly toward health systems strengthening.

Collaborative discussions to develop understanding of Rwanda’s HMIS needs have included the Government of Rwanda (GoR), international and bilateral donors or development partners, and other in-country stakeholders. The Ministry of Health (MoH), through one of its Health Sector Cluster Technical Working Groups, HMIS/Mapping, formally requested assessment of Rwanda’s health information systems in 2005 as a step toward health systems strengthening. Terms of Reference (TOR) for this work included analysis of existing systems, structures, and flows for collecting and using health information; consideration of major health sector actors’ information needs; and recommended improvements to better meet information needs and strengthen the health system generally. The general health system as defined in the TOR includes the MoH and its dependent institutions, *formations sanitaires* (FOSAs or health facilities), organizations coordinating and implementing HIV/AIDS interventions, and other health projects. Major actors include the MoH and other ministries with health-related responsibilities, program coordinating bodies, development partners, private sector healthcare entities, and stakeholders at all levels.

The request for the HMIS Assessment grew out of shared recognition of the necessity to base health systems strengthening on sound understanding of current reality. Stakeholders agreed that current knowledge about the status of key elements and processes must inform accurate identification of priority areas for improvement in national health information needs, flows, and processes. While HIV/AIDS is a significant, urgent issue in the health sector and indeed in the HMIS context, this Assessment studied information systems and flows for all health topics of greatest concern in contemporary Rwanda. Particular concern among stakeholders focused on understanding and working toward greater harmonization with parallel, complementary, or competing information systems exclusively focused on capturing HIV/AIDS data.

HIV/AIDS donor and national programs all carry heavy reporting burdens, and many countries with the most serious HIV/AIDS epidemics face similar challenges.

RTI International (RTI) fielded an expert HMIS Assessment Team to assess the health management information systems (HMISs) in Rwanda, to analyze existing information structures and processes operating throughout the health sector towards improving data management, data validity and reliability, and health care planning and decision-making at all levels. The scope of the Assessment covers analysis of existing structures and flows for collecting, storing, and using health information, along with technology supporting these processes; consideration of major health sector actors' information needs; gaps analysis; and opportunities for improvement to be targeted, with specific recommendations for system and/or process improvements that would better meet information needs and support information use in the context of integrating general health and HIV/AIDS systems to strengthen Rwanda's health sector overall.

The HMIS Assessment Team used several methods to collect a wide range of primary and secondary data on information systems in the health sector in Rwanda, including direct interviews and secondary source reviews (published and unpublished documents, presentations, and spreadsheets) related to health information systems in Rwanda and best practices in the field. The interview methodology that the HMIS Assessment Team used facilitated the collection of rich information about system operations and challenges in the field, which is critical to the quality and utility of this Assessment's findings. Structured focused interviews with stakeholders at all levels included in-depth interviews with staff at 61 health centers, district hospitals, reference hospitals, military hospitals, private facilities, and District Offices (See Annex B for complete list of sites visited). Information gathering continued throughout the Assessment to ensure that findings and recommendations based on those findings would fully incorporate and respond to current experience on the front lines and all levels of data collection, aggregation, and use as well as the formal information management structures and processes.

This report presents the Team's analysis and conclusions.

2. Best Practices

Internationally recognized HMIS best practices establish useful benchmarks for assessing existing systems. Three essential, interlocking principles inform best practices in information systems:

- *content* that is timely and relevant for users at all levels
- *access* that fosters ownership and ongoing use and learning
- *communication and promotion of data use* in evidence-based decisions

Endorsing and applying these three principles creates a virtuous cycle that reinforces effective stakeholder engagement, supports data quality assurance, and facilitates sustainable institutionalization of effective information management systems that support informed decision-making at all levels.

A national HMIS should integrate the information that stakeholders need to use to make decisions and take appropriate actions throughout the health sector. Relevant data must be collected, processed, and transformed; communicated (through reporting and dissemination); and used to inform the decisions of policy makers, program implementers, service providers, and the population toward improved health outcomes. Processes that must be iterated and institutionalized for best HMIS practices include the following:

- determining what should be measured at which level(s), and how often
- understanding the current state of the health sector being measured, including capacity and resources
- implementing appropriate methods to collect, process, and transform data, with appropriate quality assurance at each step
- interpreting and using information in health sector decision-making, including assessment of the extent to which the national HMIS is meeting health sector stakeholder needs through these four processes

International HMIS best practices can be studied through many sources. Additional detail can be found in supporting documents found in Appendix A—Resources for HMIS Best Practices.

3. Ongoing Changes during the Assessment

3.1 Decentralization Reforms and Their Impact on Rwanda's HMIS

This HMIS Assessment began in November 2005. At that time, processes for health data collection and transmission for the existing national health data system (*Système d'Informations Sanitaires*, SIS) were in place and, in principle, understood by data collectors and compilers at health centers and district hospitals. Facility staff was responsible for initiating the SIS information flow by recording patient information on paper in registers maintained at the points of contact with patients. Heads of nursing, chiefs of services, and nurses collected or aggregated data from the registers on paper forms to compile periodic SIS reports. Health center directors or assistant directors had responsibility for reviewing the reports to ensure correct data were submitted to the health district level (*district sanitaire*). Standard schedules included monthly reports due by the fifth of the following month, with forms hand-delivered to health district supervisors. Supervisors were responsible for entering data from all reports into the GESIS (*Gestion du Système d'Information Sanitaire*), the database application managing Rwanda's national information system. Supervisors hand-delivered diskettes from their copies of the GESIS to the MoH by the 15th of each month.

In late 2005, the GoR announced that planned decentralization reforms and restructuring would become effective in January 2006. The Government of Rwanda is in the midst of a multi-year transition to a more decentralized government and the administrative changes taking place in the health sector are part of this overall reform effort.² Changes included the consolidation of 106 administrative districts and 33 health districts into 30 new districts. Rwanda also consolidated at the provincial level, reducing from 12 to 4 provinces plus Kigali Ville, with plans to eliminate provinces after 2 years. Hospitals, pharmacies, and *mutuelles* are administratively and financially autonomous from districts.³ The rapid pace and scale of the reform has been a major challenge for the GoR, donors, and implementing partner organizations. The Team found that, even in March 2006, there were many uncertainties about new staffing, responsibilities, and lines of authority (or autonomy).

Based on information provided by the MoH, the Assessment Team understands the interim process for SIS reporting to be as follows:

- From January to June 2006 the health centers should send their data to the district hospitals.

² See Rwanda's "Five-Year Decentralisation Implementation Program 2004-2008" for more details on this reform: http://www.minaloc.gov.rw/dl_documents/dec_5year_dip_uk.pdf.

³ Decentralisation du Secteur Sante, MoH.

- From July 2006 the health centers should send their data to the administrative district.

While the MoH has held some meetings with staff at the district level, the Team noted during many site visits that facility staff is confused about how to proceed with the submission of SIS reports since the administrative changes took place. Staff at facilities visited by the HMIS Assessment Team reported they are continuing to record data according to prior instructions. In many instances, data are aggregated and prepared per prior routines, but facility staff and management have yet to receive clear instruction on where, how, and when to submit reports within the new administrative structures. In addition, the GESIS has not been updated to reflect the new administrative structures. The reforms also reduced the MoH's central-level staff by roughly two-thirds, leaving them with limited human resources to provide assistance or even to cope with the reports that should come from the health centers and districts. As the Assessment drew to a close, practices evolving at the field level included maintaining reports at district hospitals, the new district administrative offices, or both.

3.2 Staff Strength and Capacity

The HMIS Assessment has been conducted within a framework of ongoing change in structures and processes affecting Rwanda's health sector at all levels. Relatively sudden decentralization decisions and rapid processes have introduced changes to the roles and responsibilities understood by health center, hospital, and district-level personnel, and have affected information production, processing, and needs at all levels.

Central and district staff levels and capacities have been altered significantly by reforms during the Assessment period. One goal of the administrative reform is to empower districts by providing more qualified personnel at that level. For example, when the reform is complete there will be a new position at district level—a person in charge of epidemiology/statistics. This person will be in charge of supervision for health information at this level.

Accompanying the change in staffing at district level has been a drastic reduction in personnel within the Planning and Research Unit of MoH. This unit has been responsible for managing the SIS. In 2005, at the start of the Assessment, the central MoH staff responsible for HMIS operations, maintenance, support, and related decision-making consisted of nine persons with varying levels of skills and technical expertise. By the end of the Assessment, only one person remained at the central MoH with HMIS oversight responsibilities.⁴ (See Appendix L for the position description of the person remaining with HMIS management responsibility.)

⁴ In 2004 the MoH reduced the staff of the Planning and Research Unit from 12 to 9.

The Team has received different information regarding the staffing of the health team at the new administrative offices. The most recent information indicates there will be a team of three individuals:

- health director
- health and hygiene coordinator
- manager of epidemics (HIV/AIDS, malaria, and tuberculosis) and statistics

Other health related positions at the district level are pharmacist and manager of *Mutuelles* program.

In many cases, people whose positions were eliminated at the central level by decentralization reforms have moved to fill new positions in the new districts. Former district health supervisors in many cases were reassigned to district hospitals to resume health care provision, with new district supervisors appointed to the new district health department. According to several site visit reports, new district health staff in several positions are to begin work in June/July 2006.⁵

While many of these changes are rooted in overarching strategy determined by the GoR and related reform efforts that are affecting all sectors throughout Rwanda, these changes have created new challenges to efficient and useful operations of Rwanda's HMIS. These changes have happened quickly, so that many people in new positions have received no training or capacity building and little guidance to support their ability to perform HMIS-related tasks such as data verification and reporting supervision.

Responsibility and lines of authority have become unclear in the new district system, particularly as it relates to the revised central level of the MoH. Of the district health representatives who were interviewed by the Team over the January-March period five out of six seemed to understand at least at a high level the new reporting structure for SIS. However, personnel at health centers that the Team spoke with seemed much less clear about procedures under the new structures. Facilities may send monthly reports according to their interpretation of the remnants of former structures, to a district office or to the district hospital to which their former supervisor has been reassigned. Most new district health supervisors have not received sufficient guidance or training on procedures for collecting, processing, or reporting information. In some districts, the hospitals and district offices work closely together. In others, there appears to have been a redistribution of resources without consideration of current needs. For example, in one district the personnel have taken from the district hospital the one computer with GESIS, but no one at the district office has been trained to use the computer or the software.

In general, reports are not being submitted from the district level to the central MoH. As of the end of April only 37% of health centers and 34.3% of hospitals have submitted

⁵ The team was unable to clarify if these positions beginning June/July 2006 are the same for each District or if some of these positions have already begun as of January 1, 2006. Two of the Administrative districts office' personnel confirmed that the following three new personnel would begin in July: SIS director, epidemiologist, and health insurance coordinator.

their SIS Monthly reports for March 2006. As noted above, there is also insufficient capacity remaining at the MoH to aggregate, analyze, or report national level SIS data. Weekly epidemiological reports have also been disrupted by elimination of the epidemiological unit at the MoH in January 2006. Our understanding is that the MoH expected that TRACplus, a new expanded system (tied to the Training and Research AIDS Center [TRAC] instead of the MoH), would soon be in place for collecting and using epidemiological data. As far as the Assessment Team is aware, this system is not yet operational. The HMIS Assessment Team found that many facility staff are unclear about new procedures for submitting epidemiological reports under the new structures.

3.3 Level and Scope of District Autonomy

The large scope of the decentralization reform is impacting management of health information at the district level. New personnel are taking positions, new positions are being created, and responsibilities are evolving. During this time it has been difficult for the central government to manage the process and keep stakeholders at district and facility levels informed. Due to the reduction in personnel at central level, the government will likely continue to face issues with managing the health information system. To the extent this gap persists, Rwanda's national health information systems will be affected by decisions made by district-level actors and stakeholders. Districts may develop independent information management approaches. Some district health information management may become erratic or fall into disuse if they have little or no central guidance and support. Given that a core value for any national HMIS is to provide national-level information to help inform leaders as they make health policy and other decisions affecting the sector and the population's health outcomes, health systems strengthening in Rwanda requires at a minimum that districts coordinate their systems. Coordination requires resources, especially to align data standards, measurement methods, content, and technology; these issues constitute existing challenges in Rwanda today. To the extent that decentralization reforms create increasing opportunities for districts to diverge on these issues or develop numerous inconsistencies across simpler components such as forms or reporting periods, the challenges of strengthening national information systems in Rwanda will multiply in number and complexity.

4. Assessment Methodology and Stakeholders

The HMIS Assessment Team used several methods to collect a wide range of primary and secondary data on information systems in the health sector in Rwanda:

- structured interviews with personnel responsible for health information collection, reporting, analysis, and usage in a cross section of different types of health facilities and administrative district offices
- interviews with representatives of central-level MoH units responsible for Rwanda's health information system
- interviews with key MoH and GoR entities involved in the collection, analysis and use of health data
- interviews with representatives of major donor programs and their implementing partners involved in the collection, analysis, and use of health data at facility level
- review of secondary sources (published and unpublished documents, presentations, and spreadsheets) related to health information systems in Rwanda, and best practices in the field

The HMIS Assessment Team referred to existing tools on HMIS assessment in structuring the Assessment activity.⁶ These include:

- RTI's experience with HMIS assessment in Egypt and ongoing HMIS strengthening in Iraq
- PEPFAR tools for assessing country health information systems
- WHO and its Health Metrics Network tools and documents on HMIS assessment and best practices
- Routine Health Information Systems Network (RHINO) methods for analysis of HMIS

Primary data was collected at site level and in Kigali through interviews. The site visits and networks of relationships helped the Team develop a contextualized understanding of the realities of current information systems as they operate in the Rwandan health sector today. Appendix K provides the interview guide.

The Team also used secondary data sources. See Appendix I for a list of secondary documents consulted. Assessment Team members studied secondary sources to plan this Assessment and to prepare for field data collection. The Team discovered and collected additional documents throughout the Assessment as ongoing developments in Rwanda brought existing reports, analyses, or other relevant documents to light. These resources were mined for information to increase the Team's understanding of context and to enhance Assessment findings.

⁶ See Appendix I for list of these references.

4.1 Facility and District Office Interviews

The HMIS Assessment Team developed, tested, and refined tools⁷ used in developing the field assessment (interview) strategy and methods. These tools, methods, and strategies were used to ensure that site visits gathered complex and meaningful information about real practices at the facility level. Assessment methods included active listening, analytical thinking during the course of the interview, probing and investigative follow-up, and data capture and appropriate recordkeeping. The HMIS Assessment Team used investigative skills to uncover unanticipated information representing field realities rather than relying on central or formal expectations.

The four-member field team began site visits in January 2006 accompanied by Assessment Team leaders. A Rwandan physician joined the field team in March. Site visits continued through February and March. The field team visited 61 health facilities and district offices, with multiple interviews per site wherever feasible. Data collection interviews were conducted with health center and hospital directors; heads of nursing; PMTCT, VCT, and ARV nurses and doctors; and laboratory managers. In addition, the HMIS Assessment Team gathered further field data from former district-level supervisors, newly appointed supervisors, and health directors. (See “Appendix B—List of Facilities Visited” for a full list).

Criteria for any facility-level data collection strategy depend on the answers being sought—in this case, all aspects of information systems, structures, and processes—and country-specific relevant features. The cost of carrying out a randomized or statistical sampling strategy would be prohibitive for this Assessment and therefore the Team sought an alternative but valid method of sampling. In November and December the HMIS Assessment Team developed criteria to guide the selection of facilities to visit for data collection purposes: region, type, and level of services. These criteria were developed through data collection in Kigali (interviews, documents) on the nature of the health sector and its salient features, preliminary visits to selected sites, and consultation with experts.

Due to the rapidly changing nature of the situation in Rwanda, the Team also balanced the variety of facilities visited throughout the Assessment to develop in turn a balanced picture of the evolving situation. Visits to different categories of facilities were ongoing throughout the period, instead of grouping visits to one type of facility in the beginning, for instance, and leaving others until the end.

Members of the HMIS Assessment Team visited sites representing each geographic area of Rwanda: north, south, east, west, and Kigali Ville. Types of facilities visited included a cross-section of public, religious affiliated and private health centers. Levels of services included hospitals, health centers, and dispensaries. Two of the three reference hospitals were visited, and the two military hospitals.

⁷ See Appendix K for the Site Visit Guide used by our Assessment Team in conducting interviews at health facilities and district offices.

Figure 1. HMIS Assessment Sites Visited, by Geographic Location

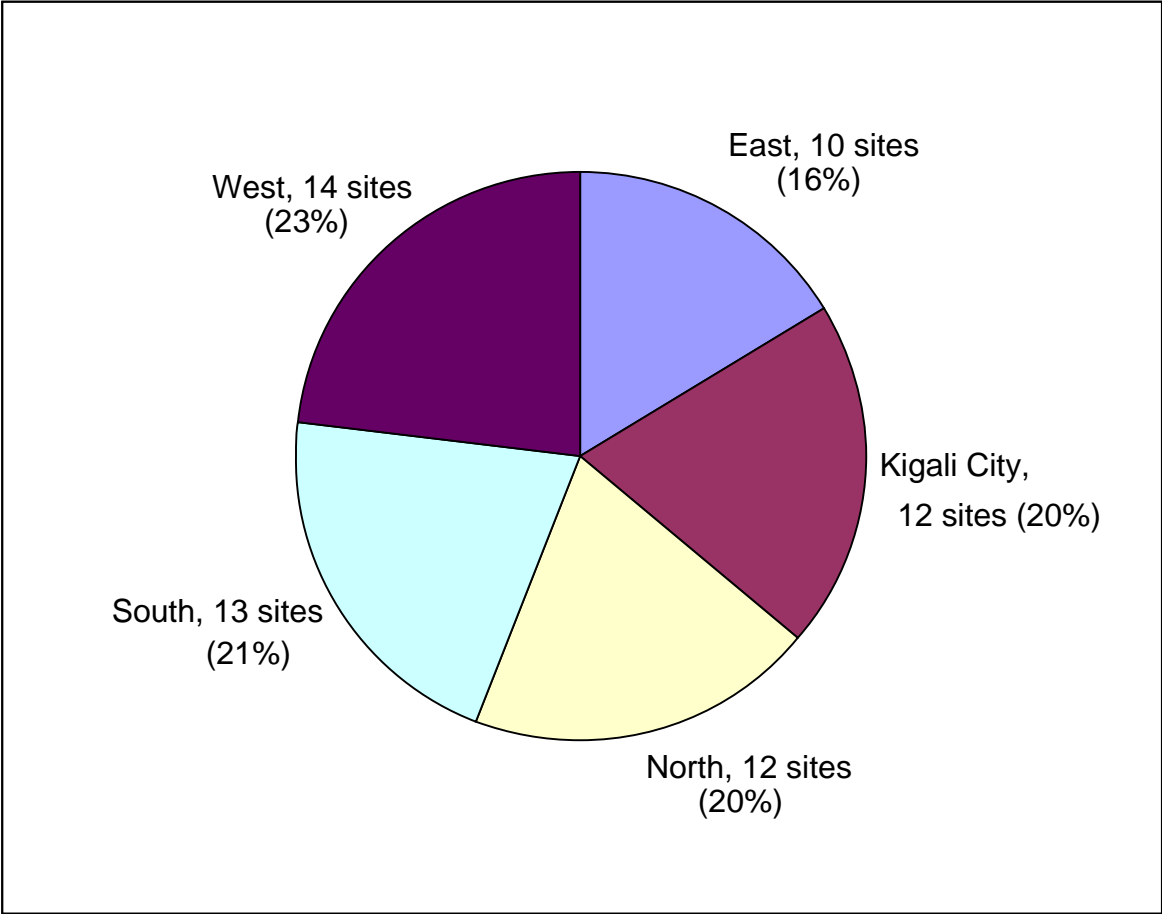


Figure 2. HMIS Assessment Sites Visited, by Type

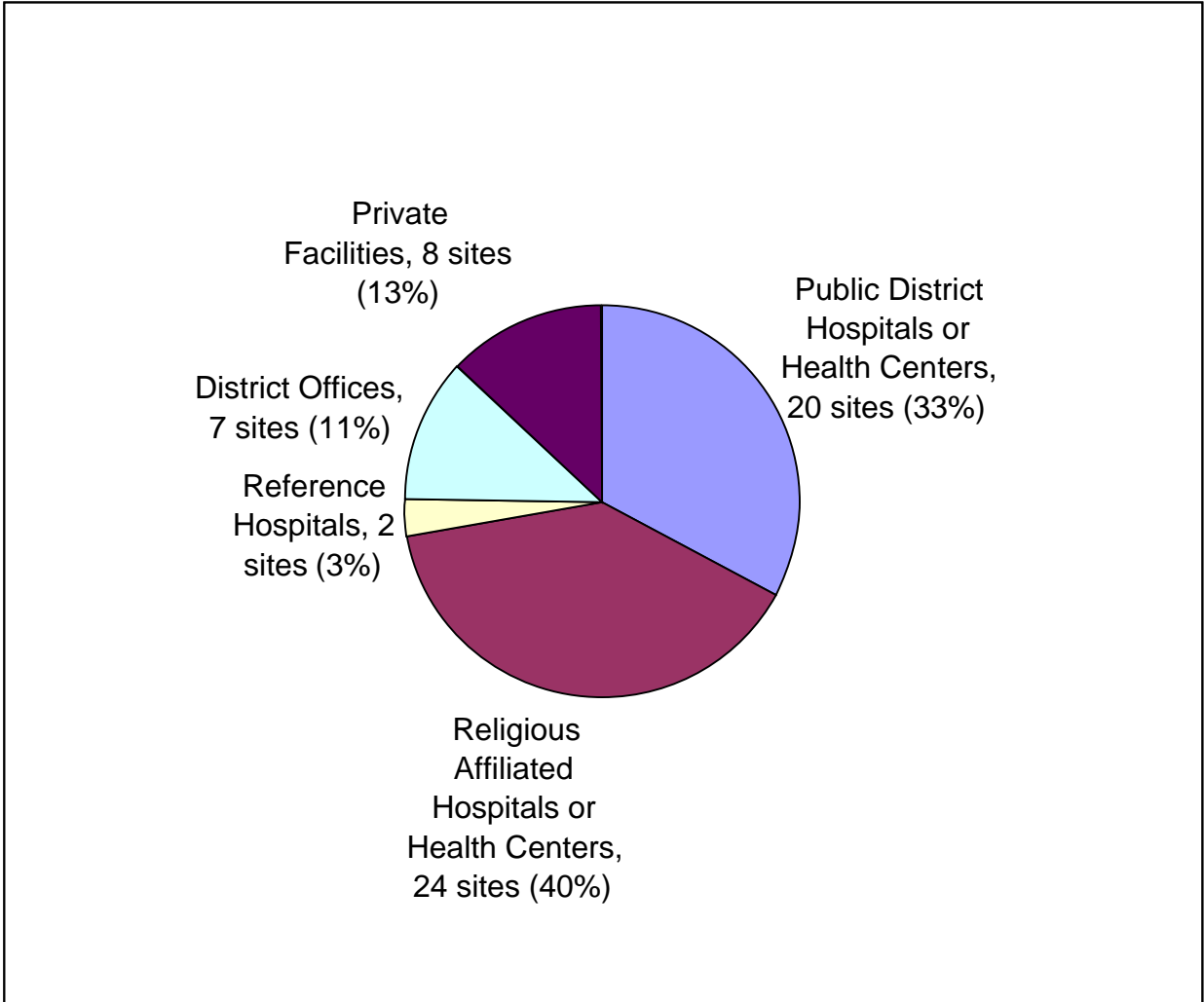
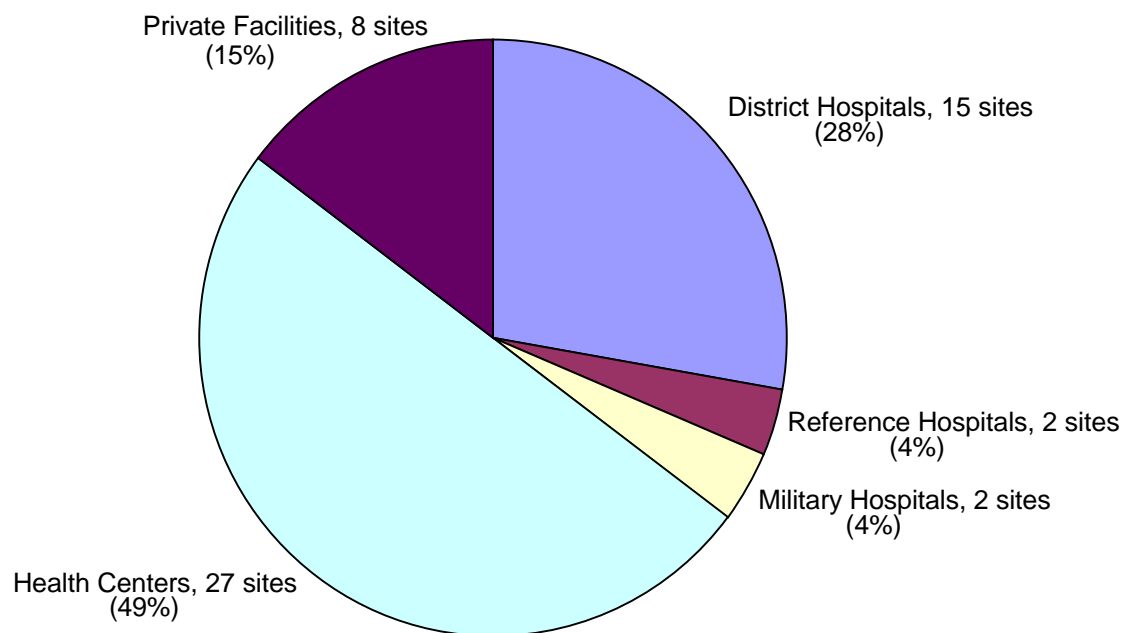


Figure 3. HMIS Assessment Sites Visited, by Level of Services



Donor, Implementing Partner and GoR Central Level Interviews and Networking

Stakeholder interviews included policymakers, donors, program implementers, health care providers, and GoR central-level personnel. Relationships were developed through multiple meetings with key GoR officials, employees, and agency representatives; partner, donor, and parastatal personnel. These included MoH, TRAC, CNLS, USAID, and CDC.

Secondary Resources

The Team drew on reports and analytical documents produced in recent years on Rwanda that related to health, information, or the ongoing reforms. Some resources were specific and technical while others were more comprehensive, qualitative, or even speculative. Contacts in Rwanda and internationally helped the Team discover potentially useful items and then to locate copies. These preexisting documents constituted data sources for cost-effective information gathering, and were also useful to raise questions, explore

under-analyzed issues, suggest enhancements to the context-specific relevance of the Assessment, and inform useful or effective approaches to support systems strengthening.

Reports and documents covered information on Rwanda's health sector; development and assistance interventions related to health; specific topics such as HIV/AIDS or supply and pharmaceuticals management; strategies, policies, or plans. Document types ranged from informal drafts, data collection forms and information systems reports, and internal presentations to organizations' Web materials and published journal articles.

5. Existing Systems

The GoR's Health Sector Strategic Plan 2005–2009 outlines Rwanda's Health Sector performance indicators and the sources of data for the monitoring and evaluation of the sector. These are the "HMIS, sentinel site surveillance systems, household surveys (DHS, MICS, and CWIQ), health facility surveys, supervision reports, specially commissioned surveys, citizen report cards, and disease program reports."⁸ All of these sources make up Rwanda's health information system. The document states that "the HMIS is an integral component of the overall monitoring, review and evaluation system and its reinforcement is regarded as a priority in the strategic plan." Review of the Health sector performance indicators shows that six of the 23 national level indicators depend on SIS data. Furthermore, districts and facilities will depend to a large extent on SIS data (routine health information reporting) to monitor progress against their individual indicators. This Assessment focuses specifically on the routine health information system (including community-level and facility-level data) which includes the SIS, TRACnet, and other systems for data collection, analysis, and use.

5.1 Community Level Health Information System

Most of the component systems discussed in this report rely at least in part on computers and other information technology components for their operations. Community-level health information is, in theory, collected, aggregated, and used primarily using paper and oral reporting. Rwanda has a low rate of utilization of formal health facilities, however, so this information system is critical to understand the national health sector and the health services and status that ordinary citizens experience.⁹ Community health information captures important health data not captured at the facility level. Ideally, this information would be appropriately integrated with higher levels of the HMIS.

The community-based health information system in Rwanda is comprised of a network of community health volunteers, including the following categories:

- *agents de santé communautaire, ASC* (community health workers) that work with health centers and other structures
- traditional birth attendants
- Red Cross volunteers
- malaria volunteers
- volunteers for other specific programs, such as the PEV (*Programme Elargi de Vaccination*) or the nutritional surveillance program
- traditional healers

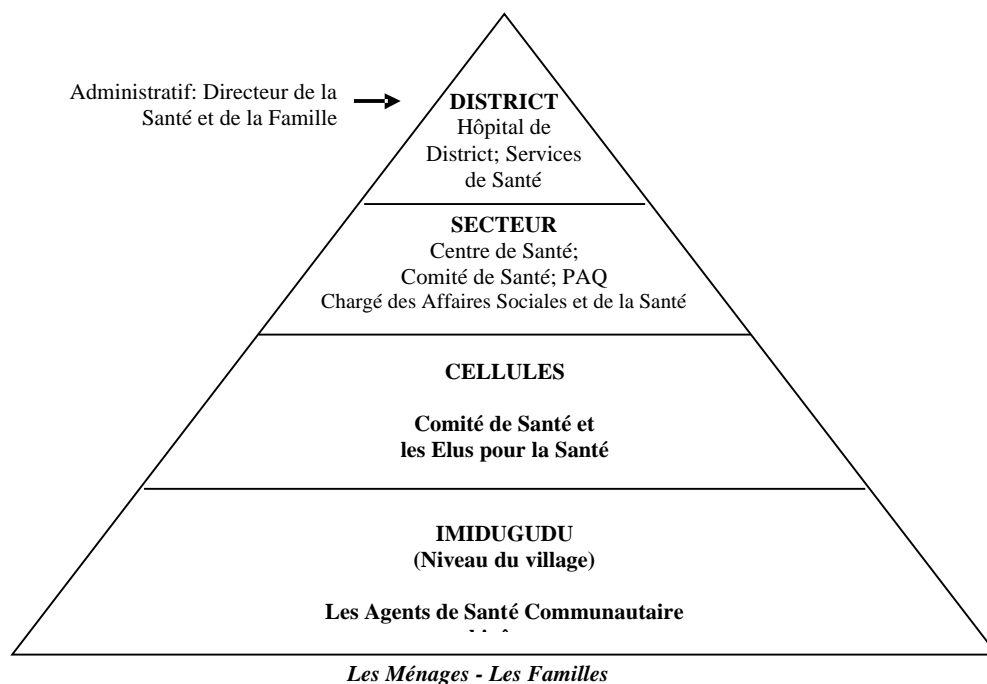
⁸ Health Sector Strategic Plan 2005–2009.

⁹ This is due to variety of factors; an important one is the ability to pay for health services.

This Assessment focuses on the ASCs since they work with their local health facility, whether it is a health center or a district hospital, and have a role in disease surveillance and reporting on community health issues. ASCs are chosen by their communities. Their role is to promote good health practices and educate the community about health issues, and to monitor health and nutrition and report on epidemic diseases. They are supposed to receive training at least every 2 years though in reality this has been irregular.

Figure 4¹⁰ describes the structure of the community-based health information system flowing from the ASCs to the facility level.

Figure 4. Structure of the Community-Based Information System



ASCs are found throughout Rwanda and are supposed to meet on a monthly basis with their affiliated health centers once a month to provide their reports and receive feedback and information. The health centers provide supervision of their activities. There are approximately 12,000 trained ASCs in Rwanda.

ASCs work with households in their own or neighboring villages and have been informally collecting the names and numbers of women of reproductive age and in a different list the names of children under 5 in small notebooks (there are currently no standard registers for this purpose, but there is an effort to develop these currently in

¹⁰ From GoR, « *Politique Nationale de Santé Communautaire* », February–March 2006.

process¹¹). The objective of this data capture is to ensure that no family is excluded from the health system.

The ASCs report to their partner health facility on a monthly basis. The ASCs provide their monthly report data to their *chef des animateurs de santé*, who then compiles the data into the monthly report for the health center, which is provided at the monthly meetings.

The current flow of community-level health information from ASCs is as follows: ASC to *Chef des Animateurs de Secteur* (compiles the data from all ASCs) to *Centre de Santé* to District.

During a visit to one health center, the Assessment Team examined the monthly green data tabulation sheet for community health data that is a monthly compilation from the sectors/cells covered by the health center. Data collected includes the following:

- number of births
- indicators on maternal/child health
- disease data
- availability of potable water, latrines, and a table to place clean dishes on in households, etc.

There are a total of 35 indicators on this report. The head of this health center says they have been using this form since before he arrived 3 years ago.

A variety of Health Information Tools are used at the community level in Rwanda:

- Children's health card (*carnet de santé de L'Enfant*)—kept by the family, it contains a growth curve graphic to enable nutritional surveillance as well as vaccine records of the children in the family.
- PEV vaccination "*fiche de pointage*" for vaccinations and vitamin A distribution
- « *fiche maîtresse* » for the PNBC program for community diagnostic of nutritional status of children

The Assessment Team has observed the following issues related to Rwanda's community health information system:

- There is a lack of equal partition of households per ASC—they can currently cover anywhere from 20 to 170 households. At times the reporting burden is unrealistic for a volunteer.
- There are no standardized tools for data collection, corresponding manuals, etc.

¹¹ During the Assessment, a parallel study was taking place to further develop and reform the community health information system. See Twubakane project for copy of project report/information regarding this effort. We refer to materials presented by Drs. Gretchen and Warren Berggren (consultants for Twubakane project) during a presentation in March 2006 as well as the GoR « *Politique Nationale de Santé Communautaire* », February–March 2006.

- Indicators collected on the community-level SIS monthly report need to be revisited. For example, it is not necessary to collect the number of households having latrines on a monthly basis. This might be the subject of an annual report, but this data will not change very much from month to month. In addition, the monthly report for ASCs contains too much data for the ASCs to realistically complete. One health center director reported that he only submitted community data for 5 months out of the 3-year period that he has worked at his health center. Often the reason is that he doesn't trust the data.
- ASCs rarely receive feedback on data reported.

5.1.1 Current Reform/Planning for Community-Level Health Data

The MoH has developed a national policy on community health published in March 2006 which intends to help improve community health services in Rwanda. Under the current decentralization reform the MoH has put responsibility for community-level health in the hands of the “program planning and capacity building unit” (*“l’unité planification des programmes et renforcement des capacités”*) through its office of “traditional medicine and community health” (*“la médecine traditionnelle et santé communautaire”*). This unit is supposed to develop a national policy on community health, a strategic plan, and an annual budget. The unit is also supposed to develop norms and to ensure that all other programs (PNILP, PEV, PNILT, etc.) conform to these norms. This unit also is in charge of supervision planning, standardization of reports, and relationship to the SIS.

Table 1 describes the roles and responsibilities for health actors at the community, cell, sector, district hospital and administrative district levels.

Table 1. Responsabilités des services de santé au niveau des districts

Services	Level	Responsibilités
« agent de santé bénévole » (ancien animateurs de santé) **	Villages	<ul style="list-style-type: none"> • sensibilisation de la population sur les bienfaits des mutuelles de santé, PF, hygiène, prévention du SIDA et du paludisme; • approvisionnement en moustiquaires, les méthodes contraceptives, et produits de lutte contre la déshydratation des enfants en cas de diarrhée • distribution des anti malarieux, antipyrétiques, infections respiratoires et diarrhéiques • sensibiliser les femmes enceintes pour les CPN et les accouchements dans les FOSA et les vaccinations des enfants • faire les rapports sur les naissances, les décès surtout des femmes qui meurent suite à l'accouchement et les enfants qui meurent en dessous de 5 ans
Les élus chargés de la santé	Cellules	<ul style="list-style-type: none"> • Représenter la population dans les comités de gestion des centres de santé; • Faire le plaidoyer au niveau des structures communautaires qui prennent des décisions sur les activités de santé; • Collecter les données chiffrées sur les activités en rapport avec la santé
Centre de santé	Secteurs	<ul style="list-style-type: none"> • Suivre les activités des AS et les aider à bien travailler • Sensibiliser la population sur les mesures de prévention des maladies, la PF, et les mutuelles de santé • Fournir les services du paquet minimum d'activités des soins de santé primaires • Compiler et utiliser les données chiffrées en • Rapport avec la santé
Hôpital	Districts administratifs	<ul style="list-style-type: none"> • Sensibiliser la population sur les mesures de prévention des maladies, la PF, et les mutuelles de santé • Superviser les activités des centres de santé et les aider à bien travailler • Appuyer les médecins pour aller soigner dans les centres de santé • Fournir les services de soins du paquet complémentaire minimum d'activités/soins hospitaliers généraux • Compiler et utiliser les données chiffrées en rapport avec la santé
Unité santé, promotion de la famille et des droits de l'enfant	Districts	<ul style="list-style-type: none"> • Suivre la mise en oeuvre de la politique et du programme de santé, promotion de la famille et des droits de l'enfant • Prévention des épidémies, hygiène publique, bonne nutrition • Compiler et utiliser les données chiffrées en rapport avec la santé • Appuyer le district dans la mise en place des comités de gestion des établissements de santé (hôpitaux, pharmacies, mutuelles de santé, CDLS, etc.) • Suivre la gestion des services de santé dans le district

The GoR’s policy document on community health includes plans for the following:

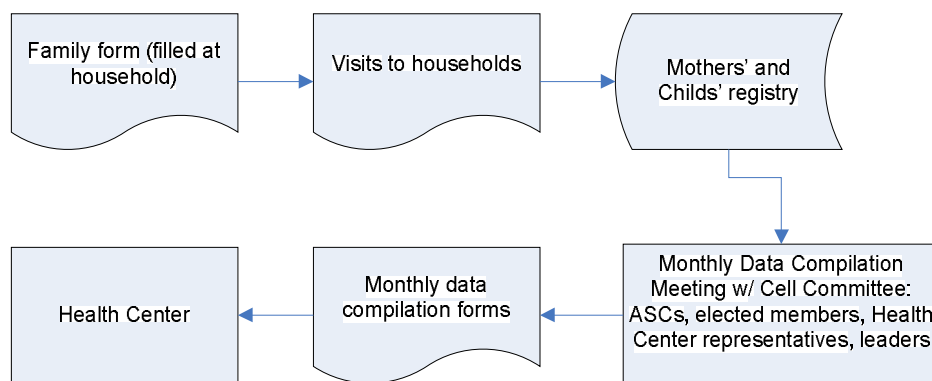
- installing a community-level health information system in villages and cells that is compatible with the GESIS system, permitting data analysis at the community level by the members of the health committees who will be trained in this area
- increasing the participation of cells and villages in community health by increasing the data analysis skills of ASCs and health committees (to enable them to compile and transform data collected at the community level into charts and graphs that could help increase understanding of progress against health objectives)
- increasing the number of ASCs for a more comprehensive coverage of all communities

Ultimately, the reformed community health information system will consist of the following data collection activities:

- Registering families (fill out the « *fiche de famille* » at the household)
- Filling out registers of children 0–5 years and women 15–49 years
- Updating registers during visits to household (vital events, last vaccinations etc.)
- Filling out the monthly “*fiche de compilation*” for the cell monthly during cell committee meetings
- Creating graphs/charts to provide analysis and feedback for informing communities

The following diagram demonstrates the envisioned reformed community health information system data flow.¹²

Figure 5. Community Health Information System



¹² Diagram from GoR “*Politique Nationale de Santé Communautaire*,” February–March 2006).

5.2 The SIS

5.2.1 Background

The *Système d'Information Sanitaire* (SIS or Health Information System), includes structures, processes, and information flows set up and managed by the GoR to collect and provide national information on health in the country. The MoH is responsible for implementation and administration of the SIS, which includes paper records at facility levels, paper and electronic reporting to district and central levels, and electronic aggregation at the central (MoH) level. The GESIS (*Gestion du Système d'Information Sanitaire*), is a database application designed and implemented by AEDES (*Agence Européenne pour le Développement et la Santé*) in 1997, with funding from the CTB (*Coopération Technique du Belgique*). The GESIS was developed to provide the MoH with a tool to support SIS data gathering, data entry, and queries. Data reported to and maintained in the GESIS tracks national health indicators for the country, determined at the central level, and constitutes the main operational component of the SIS.¹³

The GESIS was developed entirely in Microsoft Access 2.0, and has been updated once since its initial implementation in 1996. The update brought the GESIS data entry screens and preprogrammed reports into alignment with changes that had been made to the set of data that is periodically requested from the facilities. These two updates did not address information flows but covered data structure (for capture and reports) and outputs (reports) and was implemented by AEDES consultants in 2000. Another update to the SIS was begun in 2005, to include recommendations from the “SIS Conference on Data Collection” in October 2005 where stakeholders identified revised or additional data to be collected in SIS processes. Moving forward with changes to the SIS will require another round of matching updates to the GESIS.

The GESIS does not run in a computer network environment. It is a standalone database, very portable, which can be easily installed on any computer running Microsoft Windows and a copy of Microsoft Access 2.0.¹⁴ The distribution of copies of this database, sometimes together with the database system itself, has been the main way of distributing information related to health statistics from the MoH to other organizations.

5.2.2 Information Flows

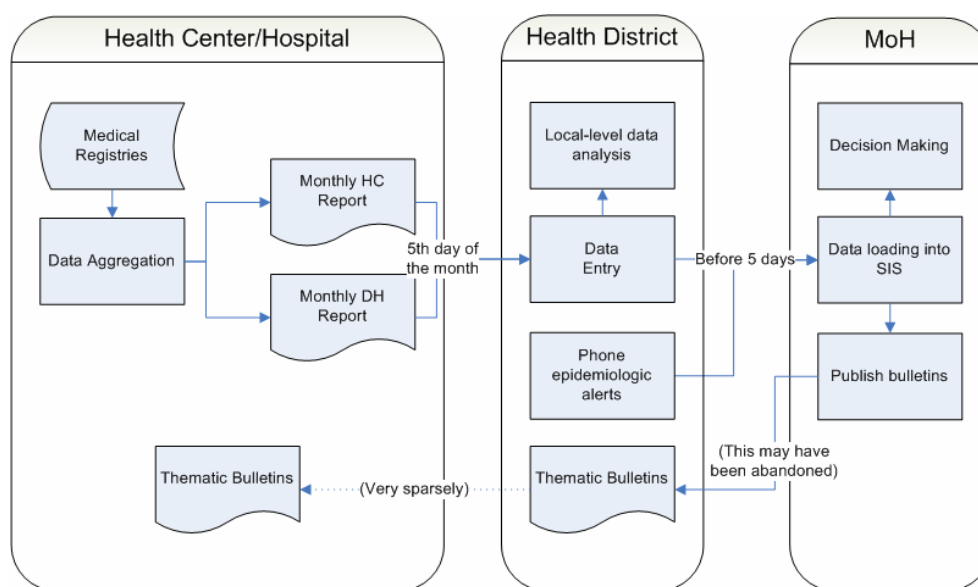
GESIS data comes ultimately from the health facilities. Site-level information is recorded on an ongoing basis in facility registers and aggregated monthly in each facility's paper-based reports. Aggregation and reporting requires facility personnel at each site to scan the ledgers manually in order to compile figures capturing service statistics and other information related to site activity over the last month, complete the required SIS forms and then typically hand-carry them to the health district office (or its equivalent in the

¹³ In some circumstances, SIS and GESIS have been used interchangeably. The GESIS is properly understood as the computer-based component of the SIS, which does not include the full spectrum of SIS data reported by facilities for the MoH.

¹⁴ This version of Access is outdated (released in 1994). See the recommendations for further comments.

new administrative structure) for submission before the fifth day of the month. All monthly reports from district facilities are collected at the district level, where one of the supervisors enters the information into the district-level copy of the GESIS. The national reorganization started in January 2006 has created confusion as to who is responsible for compiling and submitting these reports to the central level.

Figure 6. GESIS Information Flow



The SIS was designed to collect broad and extensive data on the country’s health sector. The MoH requires that the facilities compile reports from the information entered on their registries, a purely manual and tedious task.

The regularity of SIS reporting has taken a sharp decline since the beginning of the administrative reforms in Rwanda. As of the end of April 2006 only 37% of health centers and 34.3% of District Hospitals have submitted their SIS monthly reports for March 2006.

Table 2. Performance of Health Facilities in Submitting Monthly SIS Reports¹⁵

Year	Health Centers	District Hospitals
2003	96.5%	74%
2004	98.5%	88.2%
2005	93.3%	77.5%
January–March 2006	47.3%	35.3%

¹⁵ Data from MoH

Table 3. Reports Required from Health Centers

Report Name	Number of pages	Registers to be consulted to complete this report
Weekly Report on epidemiological diseases	1	Register of Patient Consultation (<i>Registre de consultations curatives</i>), Daily Report Form (<i>Fiche de dépouillement journalier</i>) for alert diseases and vaccination
Monthly Report for GESIS ¹⁶	11	Daily Report Form (<i>Fiche de dépouillement journalier</i>), Register of Patient Consultation (<i>Registre de consultations curatives</i>), Hospitalization registry, (<i>registre de hospitalisation</i>), Maternal Register, Register of Prenatal Consultations, Vaccination Register, Daily Scorecard (<i>fiche de pointage journalier</i>)
Monthly Report for vaccination	1	Vaccination Register
Quarterly Report	2	Information on TB ¹⁷
Annual Report	8.5	

In addition to these reports facilities must submit a variety of reports according to programs they are affiliated with. Table 4 – “Other reports submitted by the facilities” illustrates a few of these. For a full list of reports submitted by facilities visited during the assessment see Appendix C.

Table 4. Other Reports Submitted by the Facilities

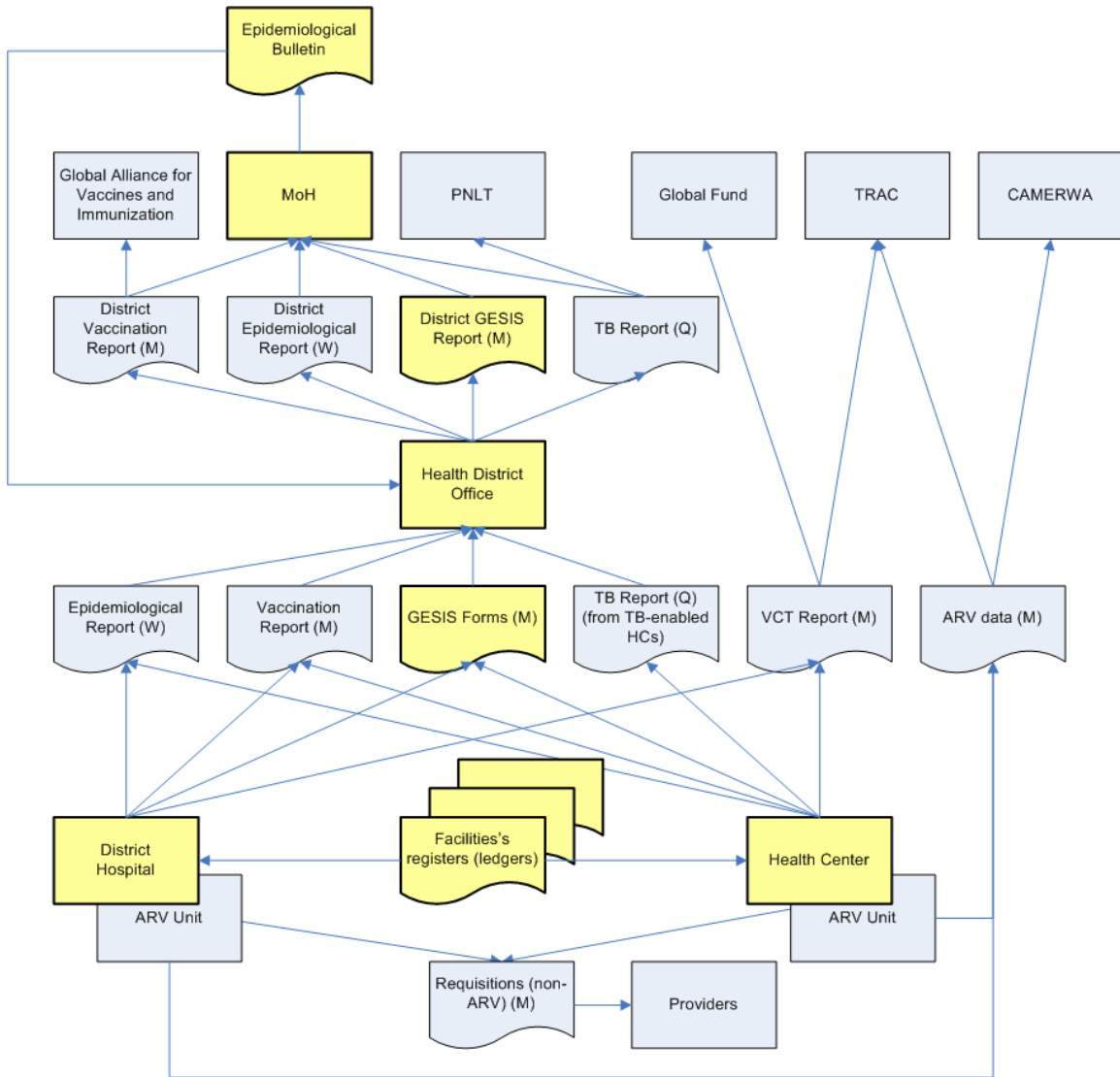
Report Name	Submitted To
6-month narrative activity report (HIV/AIDS)	FHI Impact, District
PAQ Report	District
Nutrition Report (PNBC)	IRC, World Food Program
Health Insurance Report	District
Voluntary counseling and testing (VCT) report	Global Fund
Family Planning Report	District
Donor/Implementing Partner activity reports	Various depending on which partners a facility works with

¹⁶ Main source of information for the GESIS, the data contained in this report used to be entered into the GESIS system at the former health district offices.

¹⁷ Only for the health centers that are enabled to provide TB treatment.

The SIS monthly report represents a significant portion of the facilities' reporting burden. Key information recorded by health center staff includes the name, age, demographic information (cell, head of household, zone, etc.), exams performed, diagnoses, treatment, etc. into the consultations register each time they care for a patient (i.e., when some consultation or treatment is given). This information is the basis for parts of the monthly reports. The hospitalization register is another key source of information for the monthly reports.

Figure 7. The flow of Reports from GESIS within Rwanda's HMIS



The following “Monthly Report Data Categories” for the GESIS will give the reader a sense of the amount of data that the facilities need to gather and report on a regular basis:¹⁸

- remarks
- population
- patient consultations, broken down by specific condition/disease and disaggregated by age group
- numbers of new cases
- follow-up of people living with HIV/ number of malnourished patients cared for divided into over 5 years and under 5 years of age
- number of births
- PMTCT data
- newborns data
- consultations for children under 5
- follow-up of children of HIV+ mothers
- prenatal consultations
- family planning
- numbers of health education sessions
- community participation
- laboratory data
- HIV/AIDS
- pharmacy management
- supervisions
- accounting/treasury
- recording of gifts received from GoR, donors, or communities

When the health center or hospital refers a patient, they are supposed to complete a patient referral form that contains the name, sex, age, address, name of referring facility, file name, and reason for referral; the patient takes the form to the referral facility. The referral facility is then supposed to complete the lower half of the form with the diagnoses and treatment provided, and send this back to the referring facility. In reality, during the Assessment, the Team found that in the vast majority of cases the referring facility does not receive this information back or receives it back months after the patient is referred.

¹⁸ Even if there are slight differences on the forms used by health centers and dispensaries and hospitals, they are similar enough for the purposes of this example. See Appendix D for the complete contents of the monthly SIS reports from district hospitals and health centers.

Very few facilities have computers¹⁹ and a local installation of GESIS. With appropriately trained staff, these facilities could compile their own statistics for use at the facility level.²⁰

Authorization to enter changes was informal and interpreted locally; monthly information in the local GESIS was usually updated by the supervisor, but sometimes by a nurse or another staff member familiar with the system. The data consist of figures as they are recorded and submitted on paper forms monthly, as noted above. Once updates have been entered, the information is physically conveyed to the central level on USB drives or floppy disk (hand-carried to the MoH).

5.2.2.1 Downstream Flow of Information

There is no regular or reliable flow of national or disaggregated GESIS information from the central GESIS back to districts or facilities, and no regular flow of information from the district level back to the district’s facilities. Since SIS information that is compiled electronically at the central level is not redistributed to lower levels of the pyramid, even facilities that have computers, skills, and a local copy of GESIS into which they can enter their own data cannot compare their performance with other facilities, districts, or national data.

Figure 8. Report from the MoH to the Districts

Targeted reports, or “Thematic Bulletins,” are produced occasionally at the central level in paper format and compiled by different groups at the central level to cover health topics of particular interest. Publication of these Bulletins depends on the initiative of technical offices within the MoH, (e.g., Malaria, Vaccinations, Tuberculosis, Prophylaxis), with some support provided from SIS personnel at the central level. SIS staff at the MoH, however, has been tasked mainly with providing the raw data, that’s later analyzed by the aforementioned technical offices.

The SIS staff at the MoH has had the responsibility for distributing these Bulletins upon receiving them from the technical offices. They are distributed by the MoH only to health districts, and rarely reach the health facility level.

The decentralization reforms of early 2006 affected some of the existing GESIS processes. Some computer equipment has been relocated and changes in the administrative structure have shifted personnel on GESIS-related positions to new



¹⁹ Estimated in less than 15% of the total number of facilities present in Rwanda.

²⁰ This is not the only limitation faced by the facilities, as some facilities even lack a reliable source of electricity.

physical locations. At the time of writing this report, facilities visited by the Team that used to submit SIS information before the reforms were continuing to do so in the new structure. However, the information reported was not going from district offices to the national level. In some instances, the system breakdown was due to lack of equipment to perform data entry. In others, the obstacles seemed to be lack of trained staff and/or the lack of clear directives.

5.2.3 Data Use

Information contained in the GESIS is intended for use at central and district levels. The main tools supporting data use are reports included in the application. The system has been designed with a fixed set of preprogrammed reports. Some of them may allow setting or altering some parameters, but they do not provide an easy interface to perform advanced queries. The information is readily accessible using Access or any other database tool (if converted into the new format), but currently the MoH does not have personnel with the necessary technical skills.

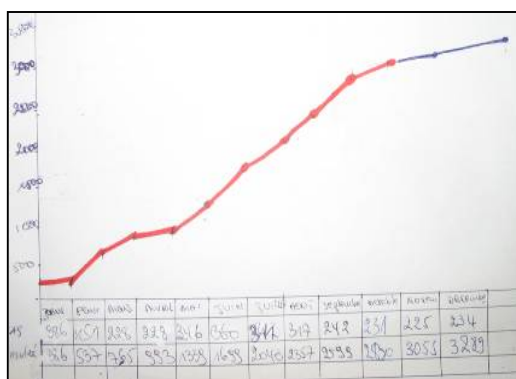
The main preprogrammed reports in GESIS cover the following areas:

- anemia, by age group
- Obstetrics and gynecology, consultations
- malaria, consultations and confirmed cases
- number of cases, by disease and health facility
- number of cases, by disease, compared with hospitalization
- HIV, confirmed, by age group
- cases, by clinical sector (obstetrics, trauma, etc)
- newborns, by center
- different constable reports
- diabetes, by age group
- laboratory, number of analysis performed
- population, by health facility
- vaccinations, by vaccine and health facility
- malnutrition cases, by facility
- stock available at the pharmacy

These reports cannot be customized by the users; although the MoH and AEDDES have an agreement that the MoH is allowed to modify the application's source code.²¹

²¹ This information was obtained from AEDDES, and has not been confirmed through examination of the contract.

Figure 9. Example of Basic Data Use at a Health Facility



Most of the cases of data use detected in the HMIS Assessment Team’s interviews and visits were circumscribed to small groups of users. Their data use has a very limited reach outside of those groups, and generally there is little useful analysis or graphing of the information stored in GESIS, or exploration of any novel way of understanding or applying the stored information for use in making site, district, or central decisions.

These reports cannot be customized by the users; although the MoH and AEDES have an agreement that the MoH is allowed to modify the application’s source code.²²

Users needing reports on indicators face limitations in the GESIS. In order to report on indicators, a user must not only know the indicator’s name but also the frequency with which it has been reported to the SIS. With that information the user can then locate the indicator and generate a report on it. The addition of a catalog of indicators would simplify this task greatly, make the data use more user-friendly, and provide for more consistency.

5.2.4 Technical Aspects of the GESIS

Platform: The selected platform (Microsoft Access 2.0) has proven adequate as a desktop database engine, and this technical choice (when structuring the GESIS) allowed for initial quick development, easy distribution, and low installation requirements. Those same choices will make GESIS face increasing constraints over time. The Microsoft Access platform is now over 10 years old, and the GoR lacks trained local resources in the MoH to improve or maintain the GESIS. MoH does not have the internal capacity to analyze GESIS problems, develop solutions, and find other ways to utilize the system to its full potential. The MoH is dependent on outside sources to perform even basic modifications to reports or data entry procedures.

Data Distribution: Currently, when data needs to be provided to other organizations or departments, the complete GESIS database application must be copied. The MoH currently lacks the capacity to automate and customize a data publishing process, either

Pros and Cons of Using Microsoft Access

The Pros of Use of Microsoft Access:

1. It is readily available in most organizations using MS Windows
2. It is inexpensive compared to enterprise-grade database products
3. It has simple to use query and reporting capabilities
4. It is easy to export data from Microsoft Access to other applications
5. It can be used to develop good, reasonably secure database quickly in many situations

²² This information was obtained from AEDES, and has not been confirmed through examination of the contract.

to restrict the set of data to be published or to publish it in other formats, such as publishing reports to the Web. To circumvent this limitation, the whole database is passed on to the requesting entity so the requesting entity can query the database directly to produce the needed reports.²³

Since we've mentioned that the information on the GESIS is freely distributed, it's important to note that this information is mainly aggregated data, without any patient-level data included that may allow tying a particular person with a treatment of any kind.

Although GESIS information is freely distributed, this information is aggregated data, without any patient-level data included that would allow tying a particular person with a treatment of any kind.

Security: Access is unrestricted to the application, databases, and tables within the database. Any user can add or modify information that resides in the database. There are no auditing capabilities on the system, so it is not possible to determine with any certainty who made changes to the database and when those changes were made.

Support: Because the GESIS application is simple and has been constructed using a desktop-oriented database, computer and support requirements are low. The original support team (assembled in 2002) had 12 persons supporting the GESIS in 12 provinces (under the old administrative organization).

While technicians were able to travel to the facilities, most commonly the district-level users brought their computers to Kigali whenever they experienced a problem. To date, this support system has been reasonably effective, albeit not without delays²⁴. The sustainability of this approach has begun to concern MoH staff, given the upcoming addition of 500 computers to SIS operations.

Pros and Cons of Using Microsoft Access

The Cons of Use of Microsoft Access:

1. It is often used in unskilled, untrained, and experienced hands, resulting in databases that encourage poor quality data and that are completely insecure
2. It's more expensive than other more powerful alternatives, i.e MySQL
3. It ties the implementation to one operating system (MS Windows) and one development framework (VBasic and .Net)
4. It takes much more effort to develop a good quality Microsoft Access database than many people realize
5. If used with the Microsoft SQL Server database engine in to improve capacity and reliability, the development, installation, and configuration becomes more complicated
6. The native database engine has capacity and reliability limitations, leading to the following general guidelines:
 - networked use of an Access application can be problematic, and may support no more than 5 to 15 users
 - depending on anticipated data capacity needs, it may be appropriate at the facility or district levels, but it may not be appropriate at the national level.
 - it cannot realistically be transformed into a web-enabled database application without converting to another database platform and redeveloping the user interface.

²³ In some cases, the SIS staff at the MoH must install Access 2.0 on the target computers; either for compatibility reasons between Access 2.0 and current versions of the product or due to the lack of any database at the target computer. This generates license-infringement issues.

²⁴ There are no records of the time it may take to receive, repair and return a computer, this is completely dependant on the amount and priorities of the tasks the ICT units has at the time

Lack of funding available for GESIS, has reduced the initial support group to a team of four at the MoH in early 2006, and by the time of writing this report, the GESIS support team in Kigali consists of only one remaining staff assigned to oversight functions.

Currently no information is kept on support incidents, so the HMIS Assessment Team cannot judge the number and complexity of the incidents, nor if they have resulted in data loss.

5.2.5 Key Findings

- There is a clear need to update the application and its framework (database, programming environment).
- There are insufficient personnel trained in Information Technologies at the MoH.
- Lack of clear guidelines and standards
- The application is distributed in an informal but working fashion.
- While there is some structure in place to provide feedback to the health facilities, it needs to be formalized to be effective.
- Lower levels—even when lacking training—show initiative and eagerness to learn.
- A catalog of indicators on the existing application will facilitate the production of reports.

5.3 TRACnet

5.3.1 Background

TRACnet is an HIV/AIDS-focused health information system developed and operated by Voxiva for the GoR's Treatment and Research for AIDS Center (TRAC) with the support of the USG Centers for Disease Control and Prevention (CDC). The TRACnet system captures selected aggregate HIV/AIDS information in three areas: (i) management of ARV drugs; (ii) laboratory results (CD4 tests); and (iii) program indicators. The license for this system was acquired with CDC funding. The CDC also funded the software customization by Voxiva; TRAC has provided local support for implementation and data use; while Voxiva provided on the ground and remote technical and management support, particularly for the Interactive Voice Response (IVR) and the web application framework. TRACnet operates under an Applications Service Provider business model, whereby the GoR pays for the use of the system, but its ownership (software and hardware) rest with the vendor, Voxiva. All technical aspects of software development, application hosting and maintenance are performed by the Voxiva.

TRACnet is designed to link health facilities providing certain HIV/AIDS services, CAMERWA (*Central d'Achats de Médicaments pour Rwanda*, Central Drug Purchasing Agency for Rwanda), and laboratories providing HIV/AIDS test results to a national-level repository of HIV/AIDS program information. Users of TRACnet data include the

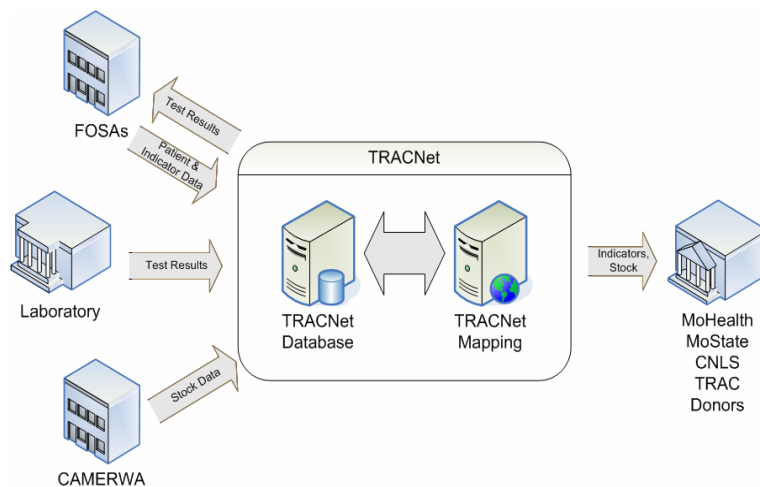
MoH, CNLS (*Commission Nationale pour la Lutte contre le SIDA* or National AIDS Commission), TRAC, and the GoR's development partners or donors. TRACnet operates as a national-level repository of HIV/AIDS-related program information, which is intended to deliver up-to-date data to inform national program decision-making.

From an initial set of 21 clinics entering information into TRACnet in 2005, the system has grown to incorporate 84 ARV-providing clinics by early 2006; 95 clinics were providing data over TRACnet by the time this report was compiled and TRAC plans to reach 160 by the end of the year 2006.

5.3.2 Information Flows

TRAC receives information from participating health facilities on a monthly basis (see Table 6 for a list of reports for TRAC), using TRACnet as a phone and web-based tool to collect anti-retroviral (ARV) program and client data. Facility staff reports a set of 40 ARV indicators monthly, directly into the TRACnet system by cellular phone, for instance. An estimated 90% of facilities submit this monthly data via cell phone, with an estimated 10% entering their data directly into TRACnet through the web-based application. In addition to these reports TRAC receives paper reports on PMTCT, VCT, and other program information. Currently, health facilities collaborating with TRAC generate an upstream information flow (from sites to the central level) but receive little feedback. The only regular feedback is test results, retrievable by phone or web (when available) for those sites using the TRACnet lab module. Given this limitation, most sites have access only to their own data on paper forms maintained at the facility.

Figure 10. TRACnet Information Providers and Consumers



The two ways to submit TRACnet reports directly are data entry using a web-based application over the internet and data entry through a touch-tone phone using an IVR application. Internet connections are generally not available in Rwanda's rural areas and tend to be problematic even in most urban clinics, so data entry or submittal over the Internet is used only by a small minority (around 10%) of participating facilities. Data entry using phones and IVR capitalizes on the widespread availability of cellular phones in Rwanda, although the mountainous topography across

the country means signal reception varies. Access tends to be acceptable even if it can be quite poor in some places, depending on the terrain.²⁵

The Web-based TRACnet system can use the reported information to produce a dashboard of indicators, supply status map, inventory levels , shortage and inventory alerts, and CD4 test results. The system maintains an online database of the reports received from participating health facilities.²⁶

²⁵ Access may be so limited that TRACnet users must travel to another location in order to place a cellular call. It is estimated that, at the time of this report, 70% of the territory of Rwanda is covered by some cellular network.

The HMIS Assessment Team visited some facilities located are outside any coverage area.

²⁶ This database reflects the format of reports with forty (40) HIV/AIDS indicators sent by the health facilities.

Table 5. Reports Received by TRAC

Report	Details	Data-entry mode
VCT, PMTCT, and Test Results information (Fiche de Recueil de Données Mensuelles—CDV)	Paper form. Records service statistics for the past month, such as clients who were tested and counseled, by age group. Also number of condoms distributed	Typed in. Current plans are to expand IVR capacity to allow reporting these data over the phone.
ARV Indicators (Fiche de Collecte d'Indicateurs ARV)	Covers 40 indicators related to clients in anti-retroviral (ARV) programs, including number of clients by age and treatment, influx, numbers of hospitalized and deceased clients, and other diseases contracted	This information is usually entered into TRACnet using a touch-tone phone; a Web-based interface can be used by the facility if Internet access is available.
Patient Information (Fiche d'Information sur les Patients)	This form records the number of existing and new patients by age group and the number of existing and new patients by drug regime	
Opportunistic Infections	Breakout of cases by gender, age group and infection. Also informs if the patient had received condoms.	Completed manually and hand-carried
ARV Drugs Request (Fiche de Réquisition et de Livraison des ARV)	Specifies the quantity of each ARV drug in stock, from a list of 31, and the re-supply quantity requested from CAMERWA	Completed manually and hand-carried
Test Results	Laboratory tests (blood samples) are hand-carried to laboratories, with results recorded and retrieved using TRACnet. Participating labs enter test results into TRACnet using touch-tone phones and associating a CD4 count result with the client's dossier number, assigned on entry into a relevant HIV/AIDS program. ²⁷ Health care providers or staff at the testing site retrieves the results by phone for analysis and reporting to the client.	Hand carried, and accompanying sheet is manually completed

The preparation of the monthly ARV report to be sent to TRAC requires the manual compilation of data at each site, scanning the ARV registry if one is available, or going through patient records to compile the month's totals to record them on the paper form.

The ARV registry is a handwritten ledger, and combing and summarizing the records can easily require two days of one person's time to complete.²⁸

The ARV data included in the report covers the whole catchment area for the ARV unit; the staff at district hospitals, where the volume of ARV patients and data is higher, repeatedly mentioned the need for a reduction in the amount of information collected on the forms to reduce the amount of time they must devote to prepare and complete the monthly reports.

²⁷ Dossiers are initialized for patients on ARV treatment.

²⁸ According to the team's observations and the comments from the personnel performing this task.

Figure 11. TRACnet, from Handwritten Paper Registries to the Web



Each health facility provides TRACnet with monthly indicator reports near the last day of each month. Information is summarized on 40 indicators plus information on the health facility, and then transmitted into the TRACnet system using a touch-tone phone. TRAC has an agreement with the cellular provider MTN (Mobile Telephone Networks, Ltd.) to use a toll-free access number for these calls. The estimated time to enter the information into the system, 15 minutes, is in line with field observations

done by the assessment team, with variations depending on the experience of the individual entering the data. The system can be queried online through the Web-based interface. The Web application allows a user to specify search criteria (dates, geographical areas and filters based on the collected indicators). It is not possible to request a custom graphical representation of data from the Web interface (even if some graphical presentation of information is built in), or to compare information from two or more sites or from a particular site against given baselines. Custom graphics require users to move data to Excel (the Web application includes this function) and then model and graph it using the spreadsheet or another compatible application. The GIS functionality is included, and its maps show a distribution of shortages and low inventory levels the country.

Although TRACnet's Web interface is clear and relatively simple to use, most sites lack any capacity to connect to the internet. They may lack computers, phone lines, and/or reliable electricity. Even cybercafés, when they exist near the facility, will have only limited bandwidth.²⁹ This restricts the access to the data in non-urban locations.

5.3.3 Data Use

As noted, TRACnet data is available at the central level and to a limited subset of facilities with access to the Web-based interface. TRACnet information is used by most organizations working in ARV-related programs. TRAC usually provides a login to these partners for them to access the system through its Web interface.

The main use for TRACnet's information is performing the high-level follow up of the whole national ARV program, working with aggregated data by health facility.

The clear dashboard view of the indicators identified to track the program and the current stock levels provide a quick overview of the current situation of the program and a quick

²⁹ See "Appendix E – TRACnet's traffic analysis."

comparison with values for previous periods.³⁰ For more complex data analysis, data subsets are exported to Excel spreadsheets and handled using that application.

While the program indicators are less time sensitive, the speed by which the information on stock shortages for ARV drugs arrive at the central level should allow for quick decisions to restock the clinics and assure a continuous drug supply. Processes to react to these alerts have not been implemented, however, and thus the value of this information is quite limited.

As the decentralization program moves forward, the districts may need to be empowered to take some of these decisions, probably by rerouting supplies within a district or across neighboring districts. To allow for this, broader access to TRACnet will be required.

As it was mentioned previously, the dependency on online Internet access limits the amount and breadth of sites that can access the information in TRACnet.

Some TRACnet data overlaps with information collected by or through other systems. The clearest redundancy occurs with Quantimed, a CAMERWA-focused drugs logistics system developed and supported by Management Sciences for Health (MSH). Much of the data collected via forms and related to drug consumption (Quantimed) and shortages is very similar in both systems and hints that some kind of unification would be possible.

As mentioned previously, TRACnet inventory database (and also Quantimed and SIMPLE, the systems produced by MSH and discussed below) only deals with ARV related drugs; this implies that—for the facilities with computerized inventory management, mainly district hospital—two separate systems will manage the same *kind* of data, thus forcing the users to use two separate platforms and methods to process the same tasks.

The inventory system used for non-ARV products is called Saari, from the French firm Sage and it was being used, at the time initial Team visits³¹ currently installed at the former Health District offices in Ruhengeri, Gitare, and Gatonde, and at the district hospital in Ruhengeri.³²

5.3.4 Technical Aspects of TRACnet

Platform: The system works on top of Windows 2000 Server and MS SQL Server; it is composed of the main VoiceXML framework provided and customized by Voxiva for the TRACnet application. The system is currently being migrated to a .NET framework.

The system runs on three servers hosted at Terracom's facilities in Kigali. By using separate servers for critical functions and keeping one stand-by server ready at all times, TRAC can expect a very high uptime for TRACnet.³³ The voice traffic is currently

³⁰ This is limited to "Last Month," "Year-to-Date," and "Start-of-Program to Date."

³¹ January, 2006.

³² This system is installed on a standalone basis. No information is reported or shared outside the center.

³³ There is no historical data available at this time to provide a real-world figure.

handled by three E1 channels. The IVR system can accommodate up to 8 simultaneous calls.

Security:³⁴ Access to TRACnet via the Web occurs through a standard username/password prompt. The entire system, including password-protected login, however, is running over a non-encrypted connection. Internally the system uses a role-based security model. This allows system administrators to define certain profiles and assign registered users to a specific profile, depending on the user's TRACnet functions and responsibilities. No particular searches for security-related vulnerabilities³⁵ have been performed on the system at this time.

Support: Training in use of TRACnet is provided by one-time initiatives or through on-the-job training. Training may be oriented to the use of the system as a data gathering tool or to the use of the system as a data retrieval tool. Most site-level staff using TRACnet were observed by the HMIS Assessment Team to be very proficient in using the telephone-based systems to enter data and indicators required by TRAC protocols. Some sites do have Internet access and could be provided with additional training on data use.

The creation and distribution of a field manual for data use, with clear examples, would help perpetuate and sustain the impact of the initial training and help existing employees train newcomers.

TRACnet users expressed eagerness to receive further training on the system and on data analysis, either using a Web-based system or sourcing the data from paper forms.

Browser compatibility. TRACnet seems to work well under MS Internet Explorer 6.0 and Mozilla Firefox 1.5; screen formatting is correct and the code tested by the HMIS Assessment Team provides similar functionality and results on both browsers. Necessity to install additional components on the client side is limited to SVG (Scalable Vector Graphics)³⁶ support, and that's the only incompatibility found. Adobe, the publisher of the add-on, has only support MS Internet Explorer. Users without access to Internet Explorer will not be able to see the SVG-generated graphics, although they can access the other information on the site.

Scalability: TRACnet staff members report that the overall requirements of processing power or storage are not excessive and that the system's capacity to deal with simultaneous client connections through incoming telephone calls can be easily scaled by adding additional lines, this scaling will be directly related to the number of users.

³⁴ A brief security evaluation of TRACnet was performed on a demonstration version Voxiva made available to the HMIS Assessment Team. The Team did not have access to the live version installed on Terracom's servers, so not all observations may apply in that context.

³⁵ Commonly referred as penetration or exploitation testing.

³⁶ Scalable Vector Graphics (SVG) is a text-based graphics language developed by Adobe that describes images with vector shapes, text, and embedded raster graphics. SVG files are compact and provide high-quality graphics on the Web, in print, and on resource-limited handheld devices. In addition, SVG supports scripting and animation.

Different load distribution tactics, like staggering data entry dates for the clinics through the month, will help serve more users without increasing the number of available lines as the number of users increase.

The current installation is working on three servers located at the Terracom office in Kigali. The HMIS Assessment Team was not able to acquire reliable information regarding the level of utilization of those servers since their implementation in 2004, but the personnel with access to current data can compare that with the deployment roadmap for the system and be able to estimate future capacity requirements.

5.3.5 Key Findings

- Very clear high-level data representation
- Appropriate data-entry technology for the country's technical resources; with limitations on data retrieval
- There are complaints from the health facilities regarding the time and effort it takes to prepare the data requested by the SIS³⁷
- Little or no feedback provided to lower levels
- Probable upgrade underway to deal with malaria, TB (TRACplus), to allow the system to be extensible and to incorporate other diseases and forms
- Dependency on one provider; no local capacity developed for the maintenance and customization of the system.
- Some ARV data in TRACnet overlaps with other data found in Quantimed and SIMPLE systems (see page 52)

5.4 Quantimed/SIMPLE³⁸

5.4.1 Background

Quantimed and SIMPLE (*Système d'Information pour le Monitoring des Produits Pharmaceutiques pour la Lutte contre les Endémies/Epidémies*) have been developed by MSH (Management Sciences for Health). Quantimed is a pharmaceutical quantification and cost estimation tool that is currently used by CAMERWA to track and forecast drug needs and supplies nationwide based in morbidity and consumption rate; SIMPLE, deployed initially in 2004, is a facility-level system to track the dispensing of drugs per patient and keep an updated stock record. It also includes a module to track each patient's missed appointments, a PEPFAR requirement.³⁹

³⁷ The reader should consider this statement in the context of data collection for multiple systems.

³⁸ Since both systems are complementary, were developed by the same organization, and cover a similar set of information and the same sector (ARV drugs distribution), they are described together here.

³⁹ http://www.usaid.gov/our_work/global_health/aids/pepfar.html.

MSH is currently working with 70 ARV drugs distribution centers across Rwanda,⁴⁰ and plans to reach 150 by the second half of 2006.

5.4.2 Information flows

Figure 12 shows how these two systems will be integrated in the process of tracking and forecasting ARV drug usage and provisioning in Rwanda.

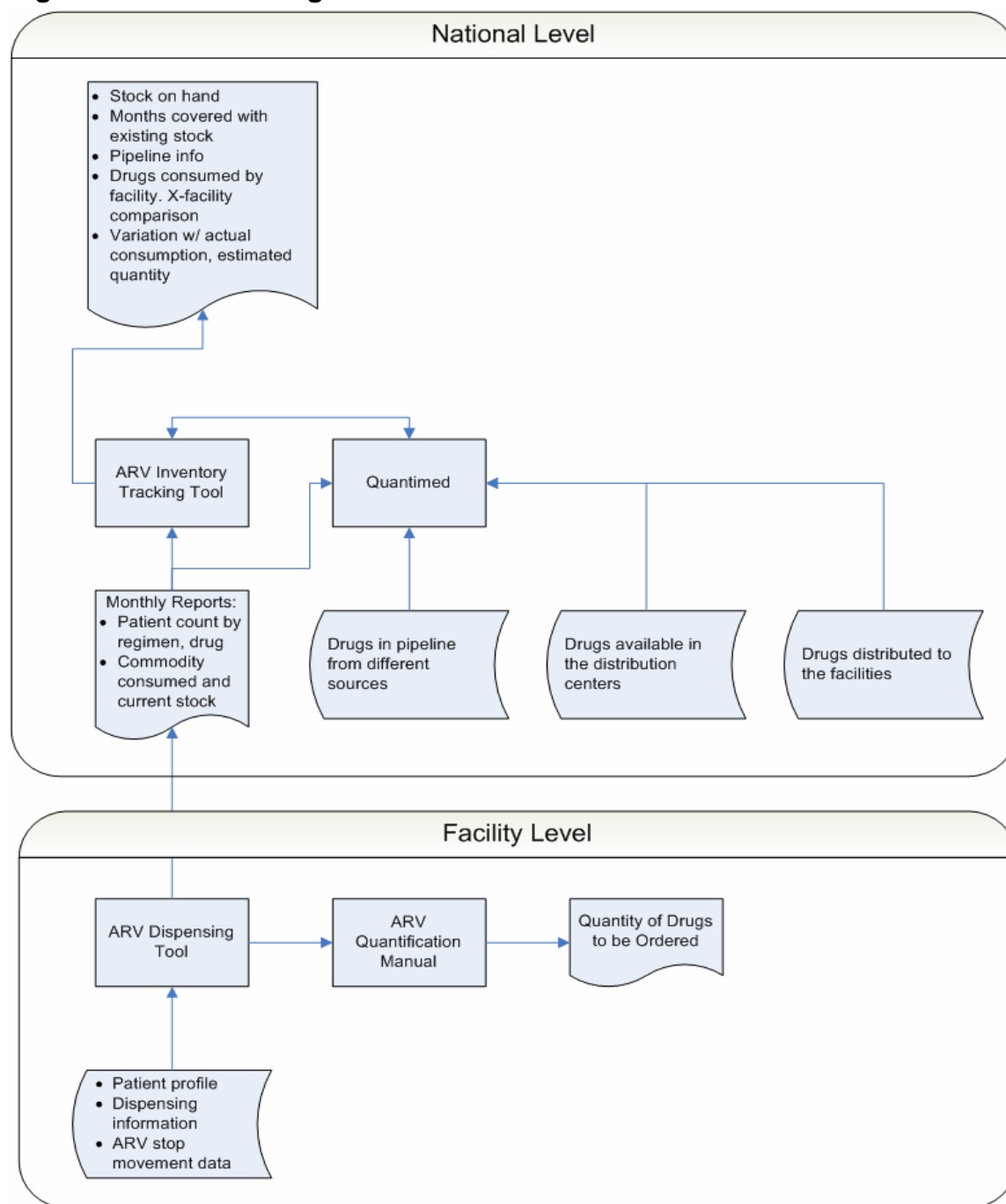
The ARV dispensing tool (SIMPLE) collects information in real-time, based on the drugs that are delivered to the patients through the facility's pharmacy. This information is kept as part of the stock tracking log and is also included in the patient's profile. The resulting consumption reports are then used by the staff in charge of the pharmacy to prepare the ARV drugs reports and requisitions forms.

The ARV drugs report is done using the dispensing tool database. This is a monthly report that should be transmitted at the latest on the fifth of the following month by every facility dispensing ARV drugs. Though the report is prepared using the SIMPLE program, the final report is filled out by hand and copies are sent to CAMERWA and TRAC with a third copy kept at the pharmacy unit.

Usually the head of pharmacy completes the report and sends it to the facility's director for approval. The report is then sent by fax or delivered by hand to CAMERWA to request the drugs for the hospital. CAMERWA should inform the facility by telephone when the order is complete; which depends on the availability of working phone lines.

⁴⁰ Represented by health facilities with active ARV programs.

Figure 12. Monitoring ARV Status



Data for SIMPLE is compiled on the following forms: (i) Monthly Consumption Report (*rapport mensuel de consommation*), (ii) Patient Information Form (*fiche de information sur les patients*), and (iii) Request and Delivery Form (*fiche de réquisition et de livraison*). Consumption and Patient forms (i and ii) are completed monthly at the facilities while the request for ARV drugs (iii) is completed quarterly, based on a calendar year.

Once the forms have been completed, they are faxed or hand-carried directly to CAMERWA's office in Kigali. Facility staff members visits CAMERWA frequently to re-supply their sites with drugs. The HMIS Assessment Team found during its field visits that staff members does not perceive this manual submission method as a problem. Reorganization of the health districts in 2006 and changing standards may alter their experience, as the information may be collected first at the district level and transmitted from there to the central level.⁴¹

The HMIS Assessment Team observed and staff in charge of pharmacies also reported, that when the system is down due to power outages, data on drug movements is collected on paper, but this information is seldom entered afterward into the system when power is restored. This was also reported by personnel in charge of the pharmacies. Stock checks are done regularly, but they only update the quantities in the system. There is no control or record of who perform the updates, when, what was the discrepancy, and so on. In this regard the system is very prone to abuse.

The situation is the same for non ARV-related products tracked by other systems.⁴²

The data in the monthly reports produced by the facilities based on the data collected by SIMPLE (see the diagram "Figure 12. Monitoring ARV Status") is moved into Quantimed by MSH.

Quantimed's inputs include the information from SIMPLE and data on the drugs being provided to CAMERWA such as stocks available at the distribution centers and drugs that have been distributed to the facilities. Some of this information may be⁴³ provided by the "Exact Global" system, used by CAMERWA for the tracking of accounting records and warehouse operations.

The output from Quantimed is composed of quantification reports with consumption-based data—by direct or proxy data- and morbidity-based data at the program or national scale.

Some overlaps between the information collected for Quantimed and SIMPLE and that collected for TRACnet are evident. Interviews revealed that the makers of both systems are aware of this, and that efforts have been made to work toward simplifying reporting tasks for the facilities, including building a single dataset (if not a single system). Talks involving Voxiva, TRAC, and MSH were carried on in an attempt to simplify and unify the forms, but issues relating to the length of the forms and the lack of authenticating signatures (to provide non-repudiation assurance if entered using TRACnet's phone-based interface) have stalled this process.

⁴¹ It will be difficult to predict what the new information flows will be until standard procedures are set in place for the district offices under the new administrative organization.

⁴² See the Saari system.

⁴³ During the evaluation of these systems, the assessment team had very limited access to the information stored in Exact Global and Quantimed, and to the software itself.

5.4.3 Data Use

The information reported by SIMPLE is used for the following activities:

- feeding data into Quantimed, where it can be later aggregated
- performing patient-level and facility-level tracking of drug regimes
- performing tracking of adherence to ARV treatments
- tracking available stock at the facility level

Quantimed provides data at a higher level that is oriented for the most part to forecasting and national-level reporting, as previously mentioned.

One of the uses for Quantimed is providing the supporting data for the creation and operation of a common basket of drugs; this should reduce the overall acquisition costs of the drugs by allowing for purchasing in greater quantities and centralizing the administration of the purchasing. This project has been requested by the GoR.

5.4.4 Technical Aspects of Quantimed and SIMPLE

Platform: All of MSH's systems are developed using MS Access. As noted in the discussion of the GESIS, while this platform provides good development times, the caveats of working under that platform are considerable, particularly as the need to store greater amounts of data and demands for publishing this information to the web become more common.

Data Distribution: The HMIS Assessment Team did not have enough information on this topic for this system. However, all the comments on this issue with respect to the GESIS should apply also to this system.

Security: The Team did not have access to information on this topic for this system; no copies of Quantimed or SIMPLE were available for evaluation purposes.

Support: The Team did not have access to information on this topic for this system.

5.5 Other Information Systems

5.5.1 FUCHIA

The FUCHIA system is a self-contained project management tool for collecting patient-level HIV/AIDS and TB data. The system, produced by Epicentre and implemented by MSF (*Médecins sans Frontières*, Doctors without Borders) and other organizations, is currently used in a small number of facilities in Rwanda

The FUCHIA system has been deployed in Haiti, Peru, Russia and the Philippines; in Rwanda it has been used since November 2002 by Lux-Development at the Rwamagana district hospital. MSF also uses it for collecting data at the two health centers they work with; the Assessment Team found another installation of FUCHIA in use at the Ruhengeri district hospital.

According to Lux-Development, PSF (Project San Francisco) also uses the system.⁴⁴

FUCHIA is not currently a web-based or integrated system, and each installation is (in the ways of the GESIS and SIMPLE) a separate database. The systems allows to export data into Excel, produce standard reports (on ARVs and on HIV clinical data in general) and it has a statistics program called “R” that supplies different lists of patients to perform, for example, retracing of lost appointments for follow up.

The inclusion of TB data is new in version 1.5 of FUCHIA.

The system tracks (for each patient) its clinical details, demographics and visits to the clinic. The FUCHIA interface is simple, and it consists of four main screens:

- patient form
- patient tracking form
- tuberculosis (TB)
- maternity (delivery)

The system is fed with the data collected through the following formularies:

- Patient form
- Patient tracking form
- Maternity (Delivery) form
- Laboratory form: clinical analyses
- Laboratory form: research analyses

Reports are meant to be used by clinicians and counselors for a follow up, but also to provide information to TRACnet, with FUCHIA providing information for TRACnet for the follow up of the whole national ARV program.

Lux-Development made an evaluation in 2004 to see if the development of FUCHIA should be continued or efforts should be redirected to work with a stronger database product. These conversations lead to start working on FUCHIANet, later renamed to CESAR.

CESAR is meant to be a web-based database, related to TRACnet for reporting and still providing reports for the clinicians and counselors for the follow up of patients.

Work on CESAR was halted when TRAC concluded in their evaluation that the PIH database should be used by all partners. FUCHIA is still being used in a handful of centers, but it will probably be phased out by the time the Electronic Medical Registry from PIH is implemented.⁴⁵

⁴⁴ There's no authoritative information available regarding the number of installations of PSF.

⁴⁵ No tentative date for this rollout has been informed yet

Platform: FUCHIA has been developed using Microsoft Access, and its continuing development continues using that platform. As noted in the discussion of the GESIS, caution with respect to Access should be considerable⁴⁶.

FUCHIANet (CESAR) was developed using PostgreSQL, and is designed to function in either online or offline modes.⁴⁷

5.5.2 Information Systems at the CNLS

The CNLS (*Conseil National de Lutte contre le SIDA*, National Council of the Fight against AIDS) is currently using a MySQL database in which they collect information related to the following:

- identification of implementing agencies (CARE, etc.)
- sectors of activities (public or private)
- domains of intervention (health, agriculture, education, etc.)
- donors
- locations where donors and implementing agencies work
- beneficiaries (target groups)

By March 2006, the CNLS staff members in charge of the system had already initiated the restructuring of their database to comply with the new administrative reform in Rwanda.

The main function of the CNLS is to monitor the activities of the different donors and implementing agencies in terms of initiatives, indicators, period of performance, and funds expended related to the fight against the AIDS pandemic.

The plan for the near future, once the updates triggered by the administrative reform are completed, will be to deploy one CNLS employee to each of the 30 Administrative Districts, where they will be responsible for the reporting to the central level. It was not clear at the time of this Assessment whether employees will be reallocated from current positions or new employees will be hired.

It is unusual in Rwanda for an organization to assign additional personnel to deal with data handling needs. In this respect CNLS could provide a good example to other agencies of the impact of dedicating personnel to data preparation and reporting tasks.

Approximately a 30 percent of indicators used by CNLS are imported from data already in the GESIS and TRACnet. It's is not difficult to get information from GESIS, even if the process is entirely manual. CNLS staff members pointed out how difficult it will be to perform this in the opposite direction (from the CNLS database to the GESIS), given the limited capabilities of the system and technical resources available to the MoH.

⁴⁶ See the insert on the GESIS technical details for pros and cons of using a MS Access database

5.5.3 Electronic Medical Registry (EMR) by Partners in Health

Working mainly with private funding, Partners in Health (PIH) undertook the development of a new EMR to be used in Rwanda to track patient-level information for individuals undergoing ARV treatment. Currently, the system has been installed in a pilot phase in six clinics around the country, where electricity problems have slowed down the progress of this phase. This EMR will initially cover only HIV data, and may extend later to TB and Malaria.

The main modules for PIH's system are:

- Patient information
- Lab results
- PMTCT
- Pharmacy and drugs

EMR v1.0 is a web-based system. It was designed to run in an open source environment; however, since one of the components uses MS InfoPath, the initial testing was being done on a MS Windows environment. The system can run on any operating system that supports Apache Tomcat and MySQL.

Ideally the system should be able to provide some offline functionality, storing data in a temporary local space while repeatedly looking for a connection to the Internet. This design allows the system to continue operating during network outages. It is not intended to permit the system to operate indefinitely without an Internet connection

It is technically possible to configure this kind of system to operate as a stand-alone database application on a typical PC without any Internet connection. However, support for this setup may bring complications in an environment where advanced technical skills are scarce.

The pilot sites are connected with the central servers in PIH headquarters in Boston, USA, using Very Small Aperture Terminal (VSAT) links, and the same setup is planned for additional sites in an eventual rollout. The utilization of permanent, dedicated links for the health facilities brings the question of area coverage and sustainability. At this point, beyond the use of some sites as “data collection and transmission points”, there are no plans to implement any other alternative way of communications.

PIH is making great efforts on the reporting interface of the version 2 of its application⁴⁸; the application will allow users to self-generate a variety of reports, clicking and selecting values from menus and thus greatly reducing the need of IT specialist to support the utilization of the system.

⁴⁸ No specific release date has been informed yet

5.6 Systems Under Development or in Planning Stages

5.6.1 Human Resources Management System

The Assessment Team learned that IntraHealth Capacity Project is working with the MoH to develop a new human resources management database.

Due to this project's early stage of development, the information available is still very limited and not enough to provide an in-depth description of the proposed system. Nevertheless, the Team considers it appropriate to mention this project as a future part of Rwanda's health information system.

5.6.2 Mutuelles System

The MoH has recently issued a request to provide the Rwandan HMIS with a system to manage the Mutual Benefit Societies within Rwanda. These *Mutuelles* depend on the MoH and have the purpose of raising funds from its members, which can then be used to provide common health care services to all members of the *mutuelle*. The participation of the citizens of Rwanda in this scheme is becoming mandatory through new legislation.

This system will cover the organization and management of the activities and processes related to the *Mutuelles*, at the level of the health center, hospitals, districts, and the technical cells in charge of supporting the *mutuelles*. A central component of this system needs to be the ability to track the movement of patients amongst different centers, including their medical records to make them available to healthcare personnel receiving the transfers. A small pilot initiative is being discussed along these lines but has not been fully designed or funded.

The management of payments and expenditures is the other main component of the *mutuelles* system; this includes the payments made by the population, services requested and delivered, and the ongoing costing Assessment needed to keep the system functioning. The system will be able to report at the district and national level.

This system will be deployed nationwide across the health centers, district hospitals, district offices, and reference hospitals.

To date there is no information on how this development will be started or the degree of automation sought for it. Given the fact that it is intended to be distributed to all the health centers, and knowing the degree of technological penetration at said level, it is expected that some sort of mixed manual-automated system will be implemented.

The MoH has requested a training plan to introduce the departments and staff members involved on the project to the operation of the new systems. At this point is not clear if its ICT unit is planning to perform any kind of internal training on the system's architecture, or if it plans to educate its staff on how to maintain and update the system.

At the time of writing this report, the initial TOR from the MoH was released. No information was available regarding possible donors or implementers.

6. Gaps Analysis

An information system's design should be driven by users' information demand and uses. Certain kinds or specific pieces of information should be demanded and used by decision makers at each level that the information system is designed to serve. Demand and use should determine the data elements that will be collected, their form and frequency, mechanisms for data quality control, processing, synthesis, extraction, and dissemination and/or other use at all levels. Data providers and information users should be as aligned (or identical) as possible, and it is their interests and capacities that should serve as the standard for judging the extent to which the resulting system is managing information that is complete, accurate, and timely.

The sustainability of information systems will be enhanced by data providers who are also information users. For example, medical personnel in a health center maintain patient records and supply records that they themselves use to manage day-to-day services. In aggregated form, these same records provide information needed at the district level and higher levels for monitoring and evaluation to improve health service delivery over time, and that also should be fed back to the facility level to help providers and site managers better understand their own performance from comparative perspectives. Final critical criteria for information systems quality, strength, and sustainability are access, content, and use appropriate to local capacity and local constraints. This section analyzes the extent to which Rwanda's HMIS meets the needs of its various users.

Key strengths of Rwanda's HMIS include the following:

- Health workers express strong commitment to collecting data and providing reports while striving to provide quality patient care.
- Some health center and district hospital directors show leadership and are taking local initiative in terms of data quality, analysis, and use.
- There is an information system designed to collect maximum information from all formal levels that has been in place for a number of years.
- The Government of Rwanda has recognized the importance of a strengthened HMIS and has set out ambitious goals for improving it.⁴⁹

Gaps are discussed through the rest of this section under information system "best practices" principles of content, access, and data use.

⁴⁹ The Government of Rwanda has outlined in its Health Sector Strategic Plan 2005–2009 the following output "Health Management Information system is fully functional in public and private sectors" and accompanying performance indicators: (1) percentage of monthly health facility reports returned to central level on time, (2) availability of all stakeholders of quarterly HMIS bulletin, and (3) availability of data and analysis of private sector and national referral hospitals. (GOR Health Sector Strategic Plan 2005–2009) See Annex for full list of HMIS capacity-related indicators in the Strategic Plan.

6.1 Content: timely and relevant for users at all levels

6.1.1 Content Gaps: Omission of Important Data Sources

Rwanda's national HMIS content would be improved by collecting health information throughout the health sector more comprehensively. Rwanda's current national system does not include data from some important sources:

- national reference hospitals
- private sector facilities
- military hospitals

Lack of integration of these constituencies into the overall HMIS means that there is currently no complete picture available of the state of health in Rwanda.

Rwanda's reference hospitals do not report routine data to the MoH through the SIS. The current SIS also does not collect systematic data from private health facilities, which number approximately 325 in Rwanda (mainly in Kigali Ville).⁵⁰ According to a presentation from the MoH, an estimated 40% of the population of Kigali uses these private health facilities, generating health data that the GoR and donors could use to improve their understanding the health situation in the country, make policy and plans, and take action on health improvements and interventions. The HMIS Assessment Team visited eight private dispensaries and found in the majority of cases that they do not report any health data through the SIS and do not receive health information or statistics from the GoR. In addition, internal data collection, analysis, and usage was less routine or systematic than in public and religious-affiliated health centers, although systems were in place for reporting data among private dispensaries in the southwestern region where Cordaid has been involved in collecting and verifying the quality of data for performance-based financing.

The MoH has made one recent effort to integrate private dispensaries into the SIS. In September 2005, the MoH trained personnel from private health dispensaries in the Kigali area on completion of the monthly SIS forms. However, the forms were not immediately available at the training and in some cases facilities report they subsequently never received any SIS forms. Many of the private facilities that report having submitted SIS reports expressed frustration with the lack of feedback on data submitted. If there is a national policy for the collection of health data from private dispensaries and clinics, there seems to be no consistency in the communication of these policies.

The HMIS Assessment Team visited Rwanda's two military hospitals and found that they do not submit routine SIS reports to the MoH. Civilians can also receive care at these facilities. Staff at these hospitals reported that they do submit Quarterly TB reports to

⁵⁰ Department of Health Care, Ministry of Health (GoR), cited in Health Sector Strategic Plan 2005-2009 (English version), p. 10.

PNILT, and ARV reports to TRAC and CAMERWA. They also collect insurance data that is submitted to the Ministry of Defense.

6.1.2 Content Gaps: Collection, Quality Issues and Site-Level Reporting Burdens

HMIS content would be improved by regular procedures to check data quality, reliably applied, and regular review of information collected and needed, at each level of the health sector. At sites reporting to the SIS, health workers at the facility level bear a significant burden in time and resources to meet the demands of collecting data for local use and/or reporting for the SIS and for specialized and often vertical programs and other projects. In most cases, data must be collected to report to SIS, TRACnet, the Global Fund, and a set of other implementing partners and/or donors. (See Appendix C – Reports Submitted by Health Centers Visited During Assessment and Appendix M – Site-Level Reporting Required by Partners, by Facilities Visited.) Staff at 7 of 27 health centers visited reported inadequate human resources to complete their reports, which translates to incomplete or tardy reports or high numbers of errors in the submitted reports. One-third of the health centers visited reported some anomaly in the data collection process and one-fourth of them admitted they “skip” some reports or do not send them at all. At the same time, facility staff and others have reported that the SIS needs to be updated to capture data they report they need (for example, deaths disaggregated by sex, or an updated list of drugs used).

Site-level procedures to detect and correct errors that may be introduced when recording or aggregating data are not documented and even irregular validation procedures are not in place at every facility. Almost 40% of the health centers visited, and more than half of the district hospitals visited, reported that no one verifies the data recorded, compiled, and reported or that there are no systems or requirements for doing so regularly nor in a consistent way.

Health information systems in Rwanda have not been designed or tailored to target efficient collection of the minimum amount of information that is necessary to support data-based management decisions and policy at local, district, or central levels. The reporting burden includes redundant reporting to different data systems aggregating the same or similar information. Few health centers have staff dedicated to information or administrative duties, which increases the social cost of the reporting burden by taking providers away from time that could otherwise, for instance, be spent on patient care, clinical skills and information updates, or improving the quality of health information. The GoR should lead programs reporting on similar data to improve their coordination with each other in order to reduce the burden as much as possible on health facility personnel. In some cases, the donor or implementing partner simply requires a copy of the SIS monthly report; in other cases, they have their own reports. Even when only a copy is required, health center staff often must copy the report by hand -- lacking a computer, printer, or photocopier (or sometimes electricity). Rationalization of data

collected, aggregated, and shared should focus on relevant content of the information systems for data use at each level where records are generated.

In addition to the burden on facility level workers, volunteer community health workers have an unrealistically high burden of reporting to health centers on a monthly basis. There are a total of 35 indicators on their monthly report, many of which could be equally useful if reported less frequently. Given that health workers can cover anywhere from 20 to 170 households, it is unrealistic to expect all of them to gather and report high volumes of data accurately on a monthly basis.

The additional time that must be taken to compile and produce multiple reports has quality implications as well. Without regular review and attention to the content of the data required, and a well-designed minimum data set to be required, reports can become irrelevant to data users at the level of production. Errors are introduced, overlooked, and left uncorrected when the information has little meaning or utility for those recording and reporting it. The HMIS Assessment Team found, in addition, that reports often are not submitted on time, which leaves little time for heads of services or health center or hospital directors to verify the data and provide feedback or follow up with questions. In several facilities visited by the Team, supervisors did not perform regular data quality checks.

6.1.3 Content Gaps: Data Quality and Lack of Feedback

Content would be improved by providing site-level incentives for reporting quality data, for example through feedback of site trends, comparative statistics, and other information (including supportive supervision). An estimated 90% of the health centers and district hospitals visited by the HMIS Assessment Team reported they did not receive feedback or regular supervision.⁵¹ Feedback to the data collectors and recorders at service delivery sites in terms of analyzed data and its usage was nearly entirely lacking. The most consistent form of feedback previously came at the monthly coordination meetings held at the district level for health center directors, district hospital directors, and supervisors, but these have been interrupted or discontinued since the GoR reforms went into effect in January of 2006. Also prior to January, data quality checks or verification might be performed periodically at sites by an experienced supervisor who had a trained eye for gross errors in the data. Former supervisors are no longer in data supervisory roles since the reform, and newly-appointed supervisors may not have relevant experience nor have they received training to help them learn to provide constructive, corrective feedback.

6.1.4 Content Gaps: Data Quality, Guidelines, and Training to Support Site-level Information Processes

HMIS content would be improved through dissemination of and instruction in structured, clearly written guidelines supporting data quality, analysis, and use. Building capacity in these areas is key to creating a national HMIS that is useful and used -- either through

⁵¹ Sites connected to MEMISA do report receiving feedback, and funding levels are tied to reporting.

structured courses, widely-available written materials, and/or supportive supervision, ideally designed to improve national, district, and facility approaches to data collection, registration, compilation, verification, transmission, supervision, analysis, feedback, and utilization. All of these processes must be consistent throughout the country in order for the HMIS to provide valid and reliable information at all levels that can be used to make well-informed policy, management, and program or facility-level decisions.

Although the MoH provided the HMIS Assessment Team with two sets of guidelines for facility staff on how to complete the SIS reports, the Team did not find guidelines to be widely available for facility staff with data collection and reporting duties. These MoH guidelines define SIS terms and the correct way to calculate figures (indicators) to report for each question on the SIS monthly report. Site-level interpretation of terms and metrics in the current system greatly reduces confidence in the quality of data collected in the SIS, with no systematic way to assure that sites are reporting accurately or even comparably across sites – an essential element of HMIS data quality. Site-level data quality is also impaired by lack of clear and written guidelines or instruction, since different staff may interpret terms or data demands differently, or the same person may calculate indicators differently over time.

Almost no health workers and directors at the facility level reported having received adequate -- or any -- training on data quality, analysis, or use for management. Training needs to occur on all levels beginning in the community with the community health workers and health center nurses who collect data. People at all levels need to understand the importance of collecting quality data and its implications, ideally through improvement in data use at local and district levels as well as relevant, useful, and timely feedback across levels. Without appropriate incentives, such as professional stake in generating useful quality data, individuals responsible for spending extra time or taking pains at the end of long workdays to be thorough in collecting and recording data are unlikely to be reliably careful and accurate. In addition, personnel shifts require more than a single training effort; sustainable quality HMIS content requires strong training and mentoring programs available on an ongoing basis to train and re-train workers.

6.1.5 Content Gaps: Site-Level Information

Content and quality of health information used for management in Rwanda would be improved by more coherent and consistent systems at the site of service delivery. At the site level, the main instrument for recording patient information is the register. Registers are used for virtually every aspect of recording patient information. While in general paper registers work relatively well for capturing data that the site needs to report periodically, multiple ledgers for various services prove unwieldy for local use of data and comparative statistics or trends. In addition, the registers sites use vary according to services offered, and for a given service there is no standard design. Some sites use blank sheets of paper to tally up the number and types of medications that were distributed each day, for instance. These numbers are then transferred to a reporting form.

Information use to improve quality of care is not facilitated by reliance on registers, which cannot be used to provide the health care provider a longitudinal perspective or to track on-going health concerns or history for each patient. Rwanda's current HMIS allows no way to track patient care comprehensively – every diagnosis, lab test, medication etc. that a patient has received in a single file that a provider can reference to inform medical care at any point in time. The only patient-oriented record is the individual's notebook (*carnet*) listing health care visits and procedures, maintained by the individual and presented on any visit to a health facility.

Referrals and patient transfer information systems are incomplete and underutilized, leading to quality of care issues as well as gaps in the information systems. The MoH designed transfer forms, used primarily because the patient needs to bring it to the referral site. The bottom half of the form should be returned by the health facility (district or a reference hospital) to the referring health center, but the Team found evidence of this feedback in less than 2 % of the sites visited. Quality of care would be improved by closing this information loop for the health care provider at the health center level, providing data on the accuracy of the original diagnosis and opportunities for learning.

Ideally, each health facility would maintain written records classifying diagnostic data. Although there are categories for certain diagnoses in existing monthly SIS forms, there is no coding or use of international definitions that could serve as a useful tool in classifying morbidity data, for the indexing medical records, medical care review, ambulatory and other medical care programs as well as for basic health statistics.⁵² The HMIS Assessment Team found little evidence in site visits of use of any consistent terminology for procedures or diagnosing disease, which affects both the content and quality of Rwanda's health information.

Areas of the country have begun using performance-based financing (PBF), correlated with improved completeness and quality of data collection (since payments are based on monitoring and verification of the data at the health facility level). PBF has been successful in pilot areas partly because external support has ensured proper training, supervision and follow through of monitoring and verification, raising concerns that human and financial resources may not be adequate for PBF success on a national scale.

⁵² ICD -9-CM, International Classification of Diseases, 9th Revisions Clinical Modification 6th Edition, 2001, PMIC

6.2 Access: ownership to build quality, ongoing use, and learning

6.2.1 Access Gaps: Insufficient Communication on Current HMIS Procedures

Access to relevant information at all levels to make informed health sector decisions based on evidence would be improved by clear procedures post-January 2006 regarding national HMIS systems, and supervisory support for implementation of those procedures. Given the recent decentralization reforms, the HMIS Assessment Team found considerable confusion about who is responsible for what activities at all levels regarding health information, verification, and supervision and reporting. Even those closest to the policy decision-makers were unclear as to who is responsible for which specific activities. Although some of these decisions might already be made, there was no evidence that they were communicated to all the people who are affected by these decisions. At a few administrative districts that the Team visited, there was a list of duties for which the person in charge was responsible. However, it was not clear that these people knew how to go about fulfilling the tasks. For example, during the Assessment period many facilities reported a problem submitting weekly epidemiological reports due to confusion over where to report following reform and lack of availability of central-level staff to receive the data by phone. In addition, during an early February site visit one district reported they no longer receive weekly epidemiological data reports by e-mail from MoH.

6.2.2 Access Gaps: Logistical Challenges in Report Submission

Access to relevant and representative HMIS information could be improved through correcting logistical procedures at all levels. Even prior to the reform, the MoH had challenges getting SIS data from some districts and facilities; reporting was often incomplete and/or the data came in months late. Many facilities face difficulties transmitting their SIS monthly data due to the fact that they must submit a hard copy (there is no Internet access at most facilities) and most do not have vehicles. In these cases each monthly report must be personally delivered by someone (usually via taxi). The distance to the district office can be long and require travel over difficult roads.

6.2.3 Access Gaps: Information System Resources and Management

Access to information requires resources and capacity to manage information systems. The MoH has several ambitious plans to strengthen its systems, but while the HMIS Assessment Team was unable to obtain budget details for the SIS, for example, recent administrative reforms cut central budgets and personnel (including staff reduction from 12 to 1). While currently there is a strong push for more management to take place at the district level, even within the MoH in Kigali, it is difficult to locate personnel with skills or experience in information technology in areas critical for MoH in order to manage its HMIS. Some of these skills include database development and management, systems integration, programming, and networking.

The Assessment Team found that staff at district and central levels lack database management skills. No current MoH staff is able to manage the GESIS software, for instance, to update the database. The MoH currently depends on external consultants to make any changes to its GESIS software. The MoH may make a decision to outsource its software management to an external company or consultant in the short term but for the longer term it would be much better for MoH to have this capacity within the organization and available to work with the staff as needed.⁵³

The lack of skilled information systems professionals in Rwanda means the MoH has difficulty competing with the private sector for the most qualified individuals. Lower salaries, benefits and, in some cases, less desirable working conditions are characteristic of most public sector information system jobs in any country, not just the developing world. The MoH must develop a strategy that combines selection of appropriate technologies, tactics for attracting and retaining personnel with the necessary raw capacity, and sustainable programs for continuing to develop capacity and replace expected personnel losses. Targeted recruiting and training, use of National Service volunteers, internship programs with local universities and vocational education programs, and other strategies can help. The crucial element to correct is ensuring that technologies selected are not too far in advance of local capacity.

6.2.4 Access Gaps: Information System Technology and Communications

Access to information to inform decisions being made at every level would be improved by HMIS technology and communications infrastructure that is flexible and responsive to user needs. Strengths of the current GESIS system include:

- the database and the application running on it
- the existence of clear policies and the staff members' adherence to them
- the availability of (external) personnel trained on information technologies and able to support and modify the system

Limitations on Rwanda's national HMIS imposed by the GESIS in its current form, however, are also clear: Microsoft Access 2.0 is not suited for the task of managing health information for an entire country, even if an updated version of the database (i.e., Microsoft Access 2003) might meet core reporting needs at the district level, given that proper training and policies are in place.⁵⁴ Updates and redesign of GESIS will not expand its capacity as long as fundamental system decisions remain unchanged. Lack of internal MoH technical capacity to maintain and improve the GESIS means that over time it will increasingly become a tool that does not serve the MoH's evolving information needs. (See Appendix E and Section 7.3.2.)

⁵³ AEDES, the company that developed GESIS, confirmed to the Assessment Team that MoH has permission to alter the software and update it, so to the Team's knowledge the lack of updates to the GESIS does not stem from the company preventing the GOR from making its own changes.

⁵⁴ See the insert on the GESIS technical details for pros and cons of using a MS Access database

Most administrative districts and hospitals lack vehicles and/or fuel to visit health facilities for regular supervision. Information flows are impeded by transportation barriers that hinder supervisors from visiting facilities to conduct routine data quality checks, answer questions, and provide guidance on data analysis and use.

Given the changing technological environment in Rwanda, cost-effectiveness must be analyzed before rolling out a solution based on any given technology. Rwanda is in the midst of many efforts by donors and the GoR to build IT infrastructure in every district of the country, including Internet access. At the same time, however, many facilities lack reliable power supplies, telephone or radio phones, and running water. Without a reliable power supply, use of computers will be challenging for most health facilities. Certainly Internet access at the district level could help facilitate communications among districts and between districts and central-level institutions. The availability of cellular packet data networks, either CDMA- or GSM-based, may prove a reliable and cost-effective technology. Mid-distance wireless links can also serve as a last-mile solution to connect sites with a planned fiber-optics network. Given the changing technological environment in Rwanda, a cost-effectiveness analysis needs to be conducted before rolling out a solution based on a given technology.

6.2.5 Access Gaps: Information System Personnel, Management, and Resources

6.2.5.1 Personnel to Manage the HMIS

Even in Rwanda's newly decentralized system the central-level MoH needs the capacity to manage the health information system in terms of policies, national standards, updating data collection forms and procedures, analyzing and distributing national level data and providing feedback and guidance to the districts. In addition, if the GoR wants to integrate private facility and reference hospital data into the national HMIS, this is a significant amount of work in terms of coordination and follow-up. The Team found that there is insufficient human resource capacity remaining at the MoH to manage the HMIS. This includes handling aggregation or centralization of SIS data, whether considering paper forms or the GESIS technology.

6.2.5.2 Investment Choices: Vertical versus Integrated Information Systems

In Rwanda over the past 2 to 3 years, a great deal of funding and attention has been directed toward vertical health information systems with a parallel lack of significant investment in the national HMIS. The contrast is stark between TRACnet, with its state of the art cell phone reporting application, and the GESIS, built on a Microsoft Access 97 database that Rwanda relies upon for its routine health information. The reasons donors and the GoR invest in these vertical systems vs. investment in strengthening or adding on to SIS are various:

- the need to rapidly scale up HIV/AIDS care and treatment programs due to the goals of GoR and donors to address this health crisis in a dramatic way (resulting in a large infusion of funding for this particular health issue)

- the belief that it would be faster and more efficient to build a system separate from the SIS
- the GESIS software platform being neither flexible nor robust enough to handle the volume of data, and lacking the functionality that was required by the users of systems like TRAC, such as the ability to access data via Web browser (Web-based application) and to enter data via phone, etc.
- lack of trust in the quality of data in SIS
- SIS data not being timely—facilities and districts have often been late reporting data and have sometimes not reported at all. The lack of timeliness of SIS data is an important issue that has strengthened the case for development of vertical information systems.

The result of strengthening the vertical health information systems in parallel with the lack of investment in the routine health information system (SIS) is that the SIS becomes even further discredited in a downward cycle. The ***SIS remains the backbone of routine health data in Rwanda***; while it cannot meet the needs of every health program in the country, it can be strengthened to better respond to the needs of users from the facility and community levels to the central-level program planners. Parallel development of these systems should not preclude the integration of the systems. Every health information system will have multiple data sources. The key is that data can be shared across systems and organizations.

6.2.5.3 Donor, Partner, and GoR Agency Cooperation

While many efforts are being made to coordinate donors and partners, and even GoR agencies' activities, there is still much work to be done on this level. The Health Sector Cluster group participation needs to be strengthened and would benefit from the inclusion of representatives of implementing partners (not just donor representatives). Rwanda's health sector has a large number of activities, donors, and partners and it is a challenge for the GoR to coordinate, but so important. For the health information system, the efforts of the lack of donor coordination are felt most at the facility level where health workers are tasked with reporting sometimes on similar information to different partners and donors. Even within the MoH there does not seem to be a good deal of information sharing amongst staff in terms of activities being carried out.

In many cases, the lack of coordination or agreement on common indicators combined with the GoR's lack of oversight in curbing the reporting burden on facilities results in more reporting for health workers. One example of how the competing interests of the different health programs can increase the reporting burden is the effort of MoH to update the SIS. In 2005 the MoH held a series of workshops with different health stakeholder groups, for example, nutrition to revise the SIS forms to capture more appropriate data/improve the data collection forms. This culminated in a workshop held in October 2005 to validate the changes made by the various groups. It was not clear to the HMIS Assessment Team whether or not a goal of this exercise was to reduce or scrutinize the

reporting burden, but the net effect of the workshops was a revised SIS form that had more questions than before (although some had been removed, more had been added).

6.2.5.4 Information System Design to Meet Data Needs at All Levels

The information system needs to meet the needs of different actors at different levels of the health systems. These need not be mutually exclusive. Currently, FOSAs collaborating with TRAC generate an upstream information flow (from sites to the central level) but receive little feedback. The only regular feedback is test results, retrievable by phone for those sites using the TRACnet lab module. Given this limitation, most sites have access only to their own data on paper forms maintained at the facility. The tools for data analysis seem to exist only for the central levels (or for hospitals or districts with Internet access to access Web-based TRACnet system). GESIS has a similar orientation in that there is a lack of tools for data analysis easily accessible at facility and district levels.

6.3 Promotion of Data Use

Personnel at all levels need training on data analysis and use for decision-making. Even with proper training, however, other factors need to be considered to improve data analysis and usage. One is that the organizations themselves need to value the analysis and use of data, and reward it. The other is that staff must have time to perform this activity. Do higher levels of the health system use information for accountability; do they reward personnel and facilities who perform well in terms of data collection, reporting, quality, analysis, and use? If not, it will be difficult to change existing behavior toward more cost-effective information systems supported by analysis and use of relevant data at all levels for improved decision-making.

6.3.1 Data Use Gaps: Data Analysis and Use at Facility Level

Health facilities generate and report a large volume of data but rarely have the time, resources, or capacity to analyze or use their own data or track their own indicators. During site visits to facilities, the Team noted a significant lack of data analysis. They have the data, but in effect their ability to use data is constrained by the reporting burden and other factors mentioned above. Most data use detected in the HMIS Assessment Team's interviews and visits was by single users or small groups of users. Their data use has a very limited reach or effect outside of those "islands," and generally, there is little useful reporting or graphing of the information stored in GESIS, or exploration of any novel way of understanding or applying the stored information for use in making site, district, or central decisions. Several factors constrain data analysis:

- lack of training
- lack of time
- lack of incentives to analyze and use data

There must be organizational incentives and leadership for data analysis and use.

6.3.2 Data Use Gaps: Central- and District-Level Data Analysis and Use

The Planning and Research Unit of MoH used to issue a regular bulletin of statistics based on GESIS that was a tool for analysis. However, the Team found that this had been discontinued and during the period of the assessment uncovered no information on any similar products generated by MoH based on GESIS data that might suggest evidence of active analysis.

The HMIS Assessment Team finds from written sources and interviews that capacity in statistical analysis needs to be strengthened at both district and Central levels in order to make better use of the data available.⁵⁵

Data analysis is also hampered by the GESIS software limitations that make it more challenging for users to analyze the data captured:

- not providing an easy interface to perform advanced queries of the data
- limited number of pre-programmed reports

6.3.3 Data Use Gaps: Policies and Enforcement of Data Sharing

The HMIS Assessment Team found that Rwanda not only lacks the ability to exchange data electronically through a common format (like XML) between systems, but has many users who find it difficult to access data in the various systems. There appears to be a lack of strong policy or enforcement on data sharing and availability across organizations within the GoR and also across donors. New systems are funded and built without enforcement of common standards, definitions, or data dictionaries. Granting appropriate access to data (with attention to privacy of patient data) to more people would work against some of the problems of the development of vertical information systems. TRACnet, for example, already has role based access for different users, so providing appropriate levels of access to more individuals would be very useful.

⁵⁵ LE SYSTEME D'INFORMATION SANITAIRE (SIS), undated PowerPoint presentation provided by MoH in 2005.

7. Recommendations and Next Steps

The HMIS Assessment Team recommendations include immediate, short-term and critical strategic decisions and planning phases. Illustrative costing of some recommended tasks can be found in Appendix G.

7.1 Immediate Priority Actions (June–September 2006)

The HMIS Assessment Team recommends the GoR act on the following priorities immediately in order to move health information management in Rwanda toward stronger systems. *Critically, the GoR must devote appropriate resources and staffing at central levels to manage these reforms.* In light of ongoing decentralization reform, and in consideration of the commitment to strengthening the collection, analysis, and use of reliable, quality health information for informed decision-making, the GoR needs to make and implement policy decisions and long-term strategies that work together to support sustainable reform and a stronger national HMIS.

7.1.1 Coordinate District, Facility, and Central HMIS Approaches

A core value for any national HMIS is to provide national-level information to help inform leaders as they make health policy and other decisions affecting the sector and the population's health outcomes. Health systems strengthening in Rwanda requires at a minimum that districts coordinate their systems. Coordination requires dedicated resources, especially to align data standards, measurement methods, content, and technology, which are lacking in Rwanda today.

7.1.1.1 Clarify Roles and Responsibilities

The GoR must communicate the current correct policies on health center supervision to all levels throughout the health sector. Roles and responsibilities must be documented, communicated, and acknowledged by hospital and administrative health district employees who at present may be unsure or insecure due to system changes. Clarification could begin with a letter from the MoH specifying tasks associated with each role, but must be followed up with shared information, education, and communication to ensure health professionals and supporting personnel understand the linkages and information pathways.

7.1.1.2 Communicate New (2006) Reporting Procedures

The GoR must communicate the current correct reporting procedures to district supervisors, district administrative health directors and health center directors and nurses to know where and how to submit weekly epidemiological reports, compiled monthly reports, trimester reports for TB, and annual reports. Specific individuals should be clearly instructed on their responsibility to convey the correct procedures to staff.

Instructions must outline formats and means of submission. Deadlines must be specified and need to be enforced by district supervisors.

7.1.1.3 Re-establish Monthly Coordination Meetings

Monthly coordination meetings should be held at the district on a regular schedule. These meetings can serve as a reliable and consistent mechanism for disseminating and discussing information such as policies and procedures, data collection methods, comparative data analysis, and feedback on all changes and their implementation processes. Attendees could include all of the health center directors (*Titulaires*) of the district, supervisors, and the district hospital director. Community health workers should also hold monthly meetings at the health center with the nurse or health coordinator responsible for community health workers.

7.1.2 Strengthen District, Facility, and Central Information Systems

Transparent systems connecting stakeholders who are involved simultaneously in decentralization reforms and health information management are an essential element for success in either effort. Transparency and communication are necessary to discourage localized and diverging decisions by district-level actors and stakeholders, and independent or inconsistent approaches that could otherwise develop, making information increasingly erratic, unreliable, and increasingly unused even at a local level. In order for districts to coordinate their systems, GoR and donor leadership of all types and at all levels must engage the challenges, understand the issues, and work together to align data standards, measurement methods, content, and technology to support sustainable reform and a stronger national HMIS.

7.1.2.1 Determine Champions for Strengthening Information Systems

The challenges of ongoing change as the GoR continues decentralization must be met with leadership as well as participatory feedback and consensus-building. The GoR must find Rwandan champions who fully appreciate the challenges of strengthening the national HMIS across all elements, and empower them to mobilize and raise awareness of technical realities, required capacities, and benefits of strengthened systems. This champion or these champions would work within the MoH central and district structures to operationalize HMIS strengthening through clarification, coordination, compliance, and in general would ensure that appropriate actions are first initiated and then followed through to successful and sustainable improvements. Additional work is required to ensure that donor efforts that directly or indirectly impinge upon health management information are kept within standardized guidelines of interoperability, data dictionaries, indicator standards, and other technology and process issues.

7.1.2.2 Integrate Community-Based Data

Health Center staff responsible for the community health workers (*agents de santé*) need to explain data collection procedures to these volunteer health workers and train them in

data collection and use. This is critical for getting more complete information into Rwanda's health management information systems, as community health agents have the potential of capturing data from the community (cell level) that would otherwise go undocumented and unreported.

7.1.2.3 Train Supervisors

The central level needs to organize and execute a coordinated countrywide training effort that will draw on the experience of former health supervisors to inform and strengthen the capacities of supervisors for the new districts. The curriculum should include skills and tools for supervising data quality, identifying errors in data, and sampling registers or other records to verify the reliability of the data. Supervisors should also receive written guidelines and manuals during the training, which should include follow-up from the central level within 3 months for feedback and supportive supervision.

7.1.2.4 Align the GESIS with New Districts

The GESIS table must be updated to align health centers within their new districts. The MoH needs to decide whether to invest in modifying the GESIS according to proposals made at the October 2005 SIS conference (in Ruhengeri), or to build those changes into a new or replacement system to strengthen Rwanda's national HMIS. The MoH will require outside technical resources to implement any changes, but could also use the opportunity to begin building internal information systems capacity.

7.1.3 Emphasize Data Quality

Central and district leadership must disseminate information and train health center directors regarding procedures for reliable data collection and registration. All of those contributing to or using health management information systems need correct, specific, consistent tools such as written procedures and steps for reviewing reports, referring to registers to verify the data, and doing other periodic data quality checks. Health center directors need to learn and share these procedures and processes with their staff.

7.2 Near-Term and Ongoing Priority Actions: Improve Data Systems to Strengthen Data Use (June-December 2006)

7.2.1 Assign Capable Staff to HMIS Systems Coordination

Central staff and at least one person at each district office must be responsible for understanding, communicating, coordinating, and supporting compliance with countrywide policies regarding the specifications and implementation of relevant health information systems to ensure integrated and efficient data exchange. The GoR must develop and promulgate simple guidelines for all related processes and procedures, along with activities to build capacity, share skills and tools, gather feedback, and support compliance. Coordination and communication responsibilities must be assigned to GoR staff at central and district levels, with appropriate training, support, and adjustment to other workloads. The GoR must allocate the MoH resources sufficient to fulfill all the

responsibilities that need to be included in managing a HMIS that serves all stakeholders—not only the MoH, and all donors and partners, but most significantly the country’s citizens as a whole.

7.2.2 Make Information More Accessible

GoR policies should outline in detail the processes controlling shared access to health data, minimizing bureaucratic obstacles with clearly defined guidelines and with protocols to handle legal and privacy issues. Central decision-makers must develop policies for transparent management of access to health data, which must be integrated into every new system or application that may become part of the national HMIS. Making needed information accessible to stakeholders via transparent procedures will in turn discourage individual donors and partners from creating yet another vertical—parallel, competing, or even inconsistent—system. Data should ideally be found in one location to save time, energy, and money on all levels. Any bureaucratic process for access to data should be minimized, but all components must include clearly defined, shared guidelines and protocols that ensure legal and privacy issues are addressed appropriately.

7.2.3 Emphasize and Use Feedback

Systems to encourage and support feedback on quality, relevance, and utilization of HMIS data must be developed or strengthened for all stakeholders in Rwanda’s health sector. Central, district, and local stakeholders identified urgent needs for more meaningful, frequent, and valued feedback, including the vertical HIV/AIDS systems. Feedback at the district level from supervisors and other personnel must be a job requirement; referral records and feedback must be mandatory. Providers need to know referral outcomes to improve their diagnostic skills and thus quality of care. Health center directors and community health agents need to be trained in effective skills and tools for offering feedback and for using and sharing it when others provide feedback to them. District and central levels need supportive and user-friendly systems that facilitate feeding back transformed and comparative data to provide health facility managers and care providers a sense of where they stand in comparison to other centers/hospitals within the same district and within the country.

7.2.4 Support Data Analysis and Utilization, including Curricula

Systems must be developed and resources devoted to strengthening local capacity for data use—skills and tools to interpret, analyze, compare, and integrate data into decision processes, including informal education for health sector personnel. All levels throughout the health sector, with specific emphasis on the health center and community levels, need to know how to analyze and utilize the data that they collect. In addition to separate training sessions, data analysis and utilization mini-training need to be a part of the monthly coordination meetings so that health center directors can take back the information to their staffs and begin to use it as soon as possible. Data analysis and data

utilization courses need to be incorporated into educational programs so that those students coming out of the educational institutions and training centers understand the importance and necessity for quality data and its usages. Building HMIS capacity and providing students with the necessary tools to fulfill these tasks can be addressed, for instance, in courses at the following institutions:

- schools of public health
- Kigali Health Institute
- Kigali Institute for Science and Technology
- schools of nursing
- ICT and IT schools and training centers
- schools of management

7.2.5 Coordinate HIV/AIDS Vertical Systems

Central leadership is required to establish systems to ensure that not only are current vertical databases, for instance for HIV/AIDS programs, reconciled to reduce data collection burdens and other barriers to information use, but also that new and future database applications are built with interoperability and harmonization as prime considerations. Stakeholders need to agree upon the least number of indicators that can serve the purposes of the majority of users. Determination of shared donor priorities and maximum reasonable data collection burdens can be led by the MoH, with a strong priority throughout on data use and the importance and usefulness of data serving different needs. Upon reaching consensus, a comprehensive single list of data elements to be included in unified forms or other data collection instruments (registers) to be used at facilities, for example.

7.3 Near-Term Actions and Critical Ongoing Investments: Policy and Strategic Action Plans (June 2006–December 2007)

7.3.1 Develop Strategic Policy to Strengthen and Support the National HMIS

Careful, thoughtful long-term strategic planning must be initiated by the GoR as soon as possible in order to develop appropriate HMIS policies, approaches, and to begin working toward sustainable change and improved health management information systems. Strategic planning, based on a rational and agreed policy framework, is the only way to ensure that information systems and applications that are being put into place throughout Rwanda will be able to exchange data easily and export data in meaningful and useful forms. The GoR must devote resources to generating consensus around realistic plans and goals that thoughtfully support commitment to the right personnel in well-defined positions at central and district levels and at facilities who have the capacity and support to handle coordination, dissemination, training and management of ongoing demand for quality data and utilization of the data. The GoR must maintain that commitment over time.

7.3.2 Develop Systems to Record and Use Patient Information

The MoH must plan and implement a system to support unique patient information, recording diagnostic and health data for each individual. Patient information records are a critical element in improving the quality of health care delivery. Records must allow the health care provider access to patient histories to diagnose effectively and prescribe the most appropriate medications or treatments for each individual.

7.3.3 Improve the National HMIS

If the GESIS is to remain at the center of Rwanda's national HMIS, investment in system improvements is absolutely essential. If not, analogous recommendations would apply to any national HMIS application. The database architecture and development framework must be aligned with modern development and data analysis approaches. The existing application and its contents must be ported to a modern development environment, taking care to consider the existence or availability of local resources to support system growth in the short to medium term. Addition of a reporting tool is strongly recommended, whether integrated into new development or added on from a third party, in order to simplify report production, Web publication, and more automated and more flexible representations of existing data.

HMIS contents must be critically examined for relevance to stakeholders, then structured and shared in a methodical and regular fashion to encourage scrutiny and use of the information system by stakeholders. The MoH and partners must reach consensus on a minimum set of indicators and frequencies that efficiently serve the purposes of key stakeholders, even if specialized programs require additional forms for their targeted indicators. Prioritization of cross-system data sharing should result in no duplication of any data collection. Strict controls should be implemented for information uploads, including tools to detect and report facilities that are not sending data or missing reporting deadlines. Data quality issues can be addressed in system components but also supported through data quality checks.

Additional training for GESIS or any other database application is essential. Staff at central and district levels who are responsible for report production require training in the design of the system's data storage, its data collection tools and procedures, and a good set of resources (computer-based and otherwise) to produce and publish reports based on the raw data. Training should cover the system infrastructure level, including the system's code, database, and interfaces. Local resources need to be fully competent and allowed to change or adjust the system with little or no intervention required from external consultants. A minimum set of staff competencies includes the following:

- development of new modules (with initial help from other consultants)
- maintenance of existing modules
- database maintenance
- interaction with other applications

- information publishing
- support to the computer systems already installed

To ease implementation of a new improved system and to provide ongoing support to HMIS users, a help desk should be established at the MoH. Answers to technical and data use questions will generate a repository of problems, solutions, and data use examples that can be used to improve the system. A help desk will also provide a single point of support for system-related issues raised by internal and external customers. The help desk should be staffed by the same personnel participating in the system's rollout, and can be scaled up according to the support demands and the available resources at the MoH.

7.3.4 Improve TRACnet and Other Systems

Access to TRACnet information should be simplified to reduce the data collection burden and allow new development efforts to focus on strengthening the system rather than creating new redundant, parallel, or competing systems. This change requires definition and implementation of a common data format and commitment to creating a central repository for the data collected. Current and potential users of TRACnet and other systems require training and support, including field guides or manuals along with access to reference materials (e.g., a virtual or live help desk). Targeted topics should include ways to access and utilize health information.

New and existing support plans need to be updated to include knowledge transfer to local employees on operations and maintenance. Staff responsible for operating and maintaining TRACnet, for example, must be able to monitor and troubleshoot the application at the local user and intermediate levels without requiring vendor services or support. Policies must support sustainable development of a local knowledge base; three essential steps are competitive salaries, proper documentation, and distribution of responsibilities over a larger group of people. This change will lower costs, build local ownership, and contribute to development of the country's base of IT workers.

Redundancies between TRACnet, Quantimed, and SIMPLE must be rationalized and streamlined. Ideally tracking efforts should be consolidated; at a minimum these systems should be rationalized and/or integrated, including the forms that each system requires. This change would directly reduce staff burdens at health facilities. A common data repository should be created, with broad stakeholder access. Staff at health facilities need proper written procedures and training to ensure that information related to stocks is properly recorded, whether or not a computerized system is available. Systems must also track the inventory adjustments performed by facility staff.

7.3.5 Adopt Classification of Disease Data and Current Procedural Terminology

The GoR should consider adopting the International Classification of Diseases, 10th Revision, adopted by the World Health Organization. Use of this classification tool will facilitate standardization across the health sector in understanding and terminology for

procedures and diagnosing diseases. MoH should consider using Current Procedural Terminology (CPT) to standardize definitions as used in international health.

Appendices

Appendix A: Resources for HMIS Best Practices

WHO Health Metrics Network
www.healthmetricsnetwork.org

Routine Health Information Systems Network
www.rhinonet.org

WHO. 2000. *Design and Implementation of Health Information Systems*,

WHO. June 2005. *Developing Health Management Information Systems: A Practical Guide For Developing Countries*.

WHO. *Issues in Health Information: National and Subnational Health Information Systems*.

WHO Health Metrics Network (HMN). January 2006. *A Framework and Standards for Country Health Information System Development, Version 1.65*.

WHO Health Metrics Network (HMN). *Situation Analysis and Monitoring Tools*.

Appendix B: List of Facilities Visited

Rwanda HMIS Assessment
Site Visits to Health Facilities and Administrative Districts
January - March 2006

Date	Province	Administrative District	Facility or District Office Name	Statute	Type of Facility
7/3/2006	North	Gakenke	Janja Health Center	Religious Affiliated	CS
7/3/2006	North	Gakenke	Nemba Hospital	Religious Affiliated	DH
23/02/2006	North	Gakenke	Ruli Hospital	Religious Affiliated	DH
16/02/2006	North	Gakenke	Rushashi Health Center	Public	CS
8/2/2006	Kigali City	Gasabo	Gasabo Administrative District	District Office	DIS
8/2/2006	Kigali City	Gasabo	Gikomero Health Center	Public	CS
9/2/2006	Kigali City	Gasabo	Imuhira Dispensary	Private	DPY
29/3/2006	Kigali City	Gasabo	King Faisal Hospital	Reference Hospital	RH
14/3/2006	East	Gatsibo	Cyabayaga Health Center	Public	CS
13/3/2006	East	Gatsibo	Kiziguro Hospital	Religious Affiliated	DH
14/3/2006	East	Gatsibo	Nyagahita Health Center	Public	CS
22/02/2006	North	Gicumbi	Byumba Hospital	Public	DH
13/2/2006	North	Gicumbi	Gicumbi Administrative District	District Office	DIS
13/02/2006	North	Gicumbi	Rwesero Health Center	Religious Affiliated	CS
22/3/2006	South	Gisagara	Kibirizi Health Center	Public	CS
21/3/2006	South	Huye	Rango Health Center	Religious Affiliated	CS
27/03/2006	West	Karongi	Kibuye Hospital	Religious Affiliated	DH
27/3/2006	West	Karongi	Mubuga Health Center	Public	CS

Date	Province	Administrative District	Facility or District Office Name	Statute	Type of Facility
2/1/2006	East	Kayonza	Kabarondo Health Center	Public	CS
2/2/2006	East	Kayonza	Kayonza Administrative District	District Office	DIS
17/3/2006	Kigali City	Kicukiro	Clinique Carrefour	Private	PC
26/1/2006	Kigali City	Kicukiro	Kicukiro Administrative District	District Office	DIS
26/01/2006	Kigali City	Kicukiro	Kicukiro Health Center	Religious Affiliated	CS
10/1/2006	North	Musanze	Ruhengeri Hospital	Religious Affiliated	DH
8/3/2006	North	Musanze	Ruhengeri Medical Dispensary	Private	DPY
20/02/2006	South	Ngoma	Kibungo Hospital	Public	DH
30/01/2006	South	Muhanga	Gitarama Health Center	Public	CS
30/1/2006	South	Muhanga	Muhanga Administrative District	District Office	DIS
8/3/2006	North	Musanze	Nyakinama Health Center	Religious Affiliated	CS
27/3/2006	West	Ngororero	Nyange Health Center	Religious Affiliated	CS
6/3/2006	West	Nyabihu	Rambura Health Center	Religious Affiliated	CS
9/3/2006	East	Nyagatare	Nyabwishongezi Health Center	Religious Affiliated	CS
13/3/2006	East	Nyagatare	Nyagatare Hospital	Public	DH
15/3/2006	East	Nyagatare	Rukomo Health Center	Public	CS
1/3/2006	South	Nyamagabe	Cyanika Health Center	Religious Affiliated	CS
1/3/2006	South	Nyamagabe	Dispensaire Umushumba	Private	DPY
2/3/2006	South	Nyamagabe	Kaduha Military Hospital	Public	MH
1/3/2006	South	Nyamagabe	Kigeme Hospital	Religious Affiliated	DH
16/3/2006	West	Nyamasheke	Dispensaire Kabeho	Private	DPY
21/3/2006	West	Nyamasheke	Kibogora Hospital	Religious Affiliated	DH
20/3/2006	West	Nyamasheke	Nyamasheke Health Center	Public	CS
27/02/2006	South	Nyanza	Nyanza Hospital	Public	DH
21/2/06	Kigali City	Nyarugenge	Centre Hospitalier de Kigali	Reference Hospital	RH
15/3/2006	Kigali City	Nyarugenge	Clinique Harmonie	Private	PC
9/3/2006	Kigali City	Nyarugenge	Muhima Hospital	Public	DH

Date	Province	Administrative District	Facility or District Office Name	Statute	Type of Facility
28/02/2006	Kigali City	Nyarugenge	Polyclinique le Médicale	Private	PC
2/3/2006	South	Nyaruguru	Coko Health Center	Public	CS
2/3/2006	South	Nyaruguru	Ruramba Health Center	Religious Affiliated	CS
8/3/2006	West	Rubavu	Dispensaire Giraneza	Private	DPY
6/3/2006	West	Rubavu	Gisenyi Hospital	Religious Affiliated	DH
8/3/2006	West	Rubavu	Nyundo Health Center	Religious Affiliated	CS
23/01/2006	South	Ruhango	Ruhango Health Center	Religious Affiliated	CS
15/02/2006	North	Rulindo	Murambi Health Center	Religious Affiliated	CS
15/2/2006	North	Rulindo	Rulindo Administrative District	District Office	DIS
20/3/2006	West	Rusizi	Bugarama Health Center	Public	CS
20/3/2006	West	Rusizi	Gihundwe Hospital	Public	DH
28/3/2006	West	Rutsiro	Congo - Nil Health Center	Religious Affiliated	CS
28/3/2006	West	Rutsiro	Murunda Hospital	Religious Affiliated	DH
25/01/2006	East	Rwamagana	Munyaga Health Center	Religious Affiliated	CS
25/1/2006	East	Rwamagana	Rwamagana Administrative District	District Office	DIS
22/2/2006	Kigali City		Kanombe Military Hospital	Public	MH

Key

CS	<i>Centre de Santé/ health center</i>
DIS	<i>Administrative District</i>
RH	<i>Reference Hospital</i>
MH	<i>Military hospital</i>
DH	<i>District hospital</i>
DPY	<i>Dispensary (limited services, no beds)</i>
PC	<i>Private Clinic</i>

Appendix C: Reports that Public Health Centers Visited During Assessment Reported as Having to Submit

Report Name	Submitted To
Weekly Report on epidemiological diseases	District Hospital or District, then to MoH
Monthly Report for GESIS ⁵⁶	District Hospital or District, then to MoH (some facilities give copies to other organizations, for example, Caritas, EGPAF, MEMISA, UNICEF, FHI Impact)
Monthly Report for vaccination	District Hospital or District, then to MoH
Quarterly Report (TB)	District Hospital or District, then to PNILT
Annual Report (SIS)	District Hospital or District, then to MoH, sometimes a copy is given to others such as Diocese, Caritas (depends on facility), one facility submits report only to MEMISA ⁵⁷
6 month narrative activity report (HIV/AIDS)	FHI Impact, District
PAQ Report	District
Monthly Nutrition Report (PNBC)	IRC, World Food Program
Health Insurance Report	District
Monthly reports on malaria	PNILP (some facilities submit copies to District Hospital and Diocese)
Family Planning Report	District
MEMISA monthly report	MEMISA
PSP Quarterly Report	PSP (for consumables)
monthly PLWHA report	CARE International
ARV Report	MCAP

⁵⁶ Main source of information for the GESIS, the data contained in this report used to be entered into the GESIS system at the former health district offices

⁵⁷ It is not clear if that is the same annual report used by SIS

Report Name	Submitted To
Narrative Quarterly Report	Global Fund
VCT, PMTCT and Test Results information (<i>Fiche de Recueil de Données Mensuelles – CDV</i>)	Hard copy forms to District, TRAC and Global Fund, CAMERWA (some facilities submit copies to other organizations, for example National Reference Laboratory, Caritas, EGPAF, Diocese, IntraHealth Capacity, MSH)
ARV Indicators (<i>Fiche de Collecte d'Indicateurs ARV</i>) Covers 40 indicators related to clients in anti-retroviral (ARV) programs	This information is usually entered into TRACnet using a touch-tone phone; a Web-based interface can be used by the facility if Internet access is available
Patient Information (<i>Fiche d'Information sur les Patients</i>)	This form records the number of existing and new patients by age group and the number of existing and new patients by drug regime
ARV Drugs Request (<i>Fiche de Réquisition et de Livraison des ARV</i>)	Completed manually and hand-carried (Specifies the quantity of each ARV drug in stock, from a list of 31, and the re-supply quantity requested from CAMERWA)
Laboratory Test Results	Hand carried, and accompanying sheet is manually completed. Blood samples are hand-carried to laboratories, with results recorded and retrieved using TRACnet. Participating labs enter test results into TRACnet using touch-tone phones and associating a CD4 count result with the client's dossier number, assigned on entry into a relevant HIV/AIDS program. ⁵⁸ Health care providers or staff at the testing site retrieves the results by phone for analysis and reporting to the client.

⁵⁸ Dossiers are initialized for patients on ARV treatment

Appendix D: SIS Reports' Contents

Monthly GESIS report from the Hospitals, version 2005

- Narrative section for remarks on epidemiological data, cold chain and pharmaceuticals, transportation, and personnel
- Population data (population in the rural zone, population in the *mutuelles*, population broken down by age -0-11 yrs, 1-4 yrs, 5-14 yrs, 15 yrs +, pregnant women, women of reproductive age)
- Patient Consultations broken down by specific condition/disease and disaggregated by age group
- Numbers of new cases, and whether they are in the zone of the FOSA, number of clients members of *mutuelles*, number of indigent or non paying clients
- Hospitalizations (number of beds; newly admitted patients, patients discharged, those healed, deceased, or who were referred to other facilities, number of those hospitalized who are members of *mutuelles*, breakdown of new hospitalized patient cases by disease/condition and disaggregated by age group)
- Number of Births (in the FOSA and outside the FOSA, maternal deaths, number found HIV+)
- Newborns data (number weighing under 2.5 kg, deaths (*in utero* and at birth)
- PMTCT data: pregnant women that took ARV, infants that took ARV)
- Family planning
- Report of activity for the operations room, by type of operation and area (general surgery, orthopedics, OBGyn). Includes data on the type of anesthesia used.
- Laboratory data (numbers of different tests performed and positive and negative outcomes)
- Information on transfusions made
- X-Rays, quantifying by X-Ray target (lungs, abdomen, etc.)
- Pharmacy Management (medicines in stock, medicine consumed, number of stock out days, laboratory products number of days of stock outs, cold chain number of days of stock outs)
- Community participation (number of meetings of health committee and number of meeting minutes done)
- Accounting/Treasury (Funds incoming—medicines and mosquito nets sold, curative/lab services sold, preventive health services sold, *mutuelles* payments, grants/funding from external sources (the GoR or donors); Funds expended (for medicines, consumables, medical materials, personnel, fuel, maintenance, office supplies, building maintenance, communication, energy, etc.)

Monthly GESIS report from the Health Centers, version 2005

- Narrative section for remarks on epidemiological data, cold chain and pharmaceuticals, transportation, and personnel
- Population data (population in the rural zone, population in the *mutuelles*, population broken down by age -0-11 yrs, 1-4 yrs, 5-14 yrs, 15 yrs +, pregnant women, women of reproductive age)
- Patient Consultations broken down by specific condition/disease and disaggregated by age group
- Numbers of new cases, and whether they are in the zone of the FOSA, number of clients members of *mutuelles*, number of indigent or non paying clients
- Hospitalizations (number of beds; newly admitted patients, patients discharged, those healed, deceased, or who were referred to other facilities, number of those hospitalized who are members of *mutuelles*, breakdown of new hospitalized patient cases by disease/condition and disaggregated by age group)
- Follow up of People living with HIV/AIDS divided by age group (persons living with AIDS on ARV, persons treated for opportunistic infections, persons with HIV/AIDS treated for STDs, persons treated for TB)
- Number of malnourished patients cared for divided into over 5 yrs and under 5 yrs of age
- Number of Births (in the FOSA and outside the FOSA, maternal deaths, number found HIV+)
- PMTCT data: pregnant women that took ARV, infants that took ARV)
- Newborns data (number weighing under 2.5 kg, deaths (*in utero* and at birth))
- Consultations for children under 5 (this is divided into services provided by the health center and those provided by a community volunteer) Data categories include: (vaccinations, growth monitoring disaggregated by age groups, and looking at cells covered, children seen, children weighed, children's status according to standard growth chart formula, malnutrition rate, number of children referred to district hospital, number of children who died, number of does of vitamin A, etc.)
- Follow up of children of HIV+ mothers
- Prenatal consultations (new patients, 1st trimester visits, 2nd trimester visits, 7-8 month visit, 9th month visit, number of women with 4 prenatal visits, number of at risk pregnancy patients detected, number of women and their partners tested for HIV, numbers of patients vaccinated for tetanus, etc.)
- Family planning
- Numbers of Health education sessions (vaccination, HIV/AIDS, STDs, malaria, nutrition, birth, family planning, hygiene, etc.)

- Community participation (number of meetings of health committee and number of meeting minutes done, number of meetings of community health workers and number of meeting minutes done, number of meetings of traditional birth attendants and number of meeting minutes done, number of households with latrines, number of households with access to water, number of households members of *mutuelle*, number of visits to a household reported by comm. health worker, number of home births, number of live home births and number of children who died in childbirth, number of child deaths under 1 month old, number of child deaths under 5 years old, number of households using MII (?),
- Laboratory data (numbers of different tests performed and positive and negative outcomes)
- HIV/AIDS (numbers of clients seen for HIV/AIDS by age and sex, etc.)
- Pharmacy Management (medicines in stock, medicine consumed, number of stock out days, laboratory products number of days of stock outs, cold chain number of days of stock outs)
- Supervisions (number of supervisions received from the District, provincial (now defunct) or central level, including number of feedback (retro info) and number of feedback written)
- Accounting/Treasury (Funds incoming—medicines and mosquito nets sold, curative/lab services sold, preventive health services sold, *mutuelle* payments, grants/funding from external sources (the GoR or donors); Funds expended (for medicines, consumables, medical materials, personnel, fuel, maintenance, office supplies, building maintenance, communication, energy, etc.)
- Recording of gifts received from GoR, donors, or communities and by type of gift

Appendix E: Improving the Existing Systems

Suggested Improvement to the Rwanda's HMIS Software

Limitations imposed by the GESIS in its current form are clear: Access 2.0 is not suited for the task of managing health information for an entire country. Updates and redesign will not expand its capacity as long as fundamental system decisions remain unchanged. Lack of internal technical capacity at the MoH to help maintain and improve the GESIS means that over time it will become a tool that does not serve the MoH's evolving information needs.

Determination of a new technical development framework and selection of a modern database engine would allow Rwanda's HMIS software to grow beyond existing limitations and become more useful to all stakeholders. A SQL-compatible database system, for instance, would allow reshaping of the system in critical areas, for instance providing better security, a standardized format for queries, improved information sharing, and scalability features that cannot be retrofitted to the current system. Simple SQL queries allow users to retrieve even highly complicated combinations of data from a database quickly and efficiently. SQL databases flexibly handle very large volumes of data with faster processing compared to non-SQL databases.

Well-defined and established standards exist for this class of databases, making portability from one SQL database to another a trivial matter; using a new HMIS software developed using SQL would be a critical but straightforward step toward open information exchange between organizations, which HMIS users in Rwanda at all levels are seeking. Further, an SQL database conforming to set standards can also be easily accessed using third-party products and application tools. This feature will facilitate the development of quality applications and flexible solutions around the database as Rwanda's health sector and information needs change over time.

We recommend steps in this direction instead of additional investment in maintaining the current GESIS⁵⁹.

A modern reporting tool -integrated to the system on its design or in the form of a third-party product- will also simplify the generation of reports, the publication of information directly on the Web, and will allow a more flexible representation of the existing data; even partial automation of publications like the "Thematic bulletins."

The development of a new HMIS software must include adequate investment into local capacity to support training or otherwise sustainable resources to maintain and continue moving the new HMIS software forward as times change without dependence on external resources, or at least requiring only expert technical guidance.

⁵⁹ With the possible exception of a very well-defined set of ad-hoc changes needed to adjust the system to the new organizational structure.

A salary infrastructure must be developed that will allow the MoH to retain the existing staff, or, as a complementary alternative, to work towards the development of the private sector within Rwanda to provide local, qualified support to the MoH's IT needs. Programmers that the Assessment team spoke with reported that a competitive salary for a highly skilled database programmer is approximately 800,000 Rwandan Francs per month not including taxes.

Adding the capacity to display geographical information together with the health data will enable data users to perform their analysis with another dimension, weighing factors as location, road availability, altitude, demographics, etc on the analysis of existing data. The utilization of GIS (Geographical Information Systems) to represent health-related data has proven useful in the case of TRACnet.

Opportunities for Improvement to TRACnet

A more open data-sharing model could be promoted with the new procurement for the next stage of TRACnet development. Overlapping and redundant reporting burdens could more easily be reconciled with systems that could share information in a more native and automated way. While this recommendation could apply to all of Rwanda's HMISs, in the current context TRACnet is one of the dominant or leading-edge systems. That is, accessing this information without having to resort to the Web-based interface will facilitate the comparison of indicators and the level of data reuse across the country. Opening not only the data structures but the way in which the data is collected and spearheading an "information sharing" initiative within the HMIS community could be a very positive move to avoid some of the redundancies in data collection and reporting that are currently observed in the field.

This won't only help reduce the data collection efforts, but will also allow new developments to focus on missing points, rather than creating new systems completely from scratch, from the software development to the data gathering mechanisms.

Another major opportunity is related to training at the different levels where the application is used. This will include the data gathering and use at the facility level, incorporating some of the ideas previously discussed as field guides and manuals, together with CBT.

The training should not stop at the user level, but it needs to be done at the administrative level too, ensuring that the people in charge of operating and maintaining the application can monitor and troubleshoot the system, at least as a first and second line before resorting to the vendor's services for help. The opportunity here will allow not only to lower costs, but to provide the local organizations and personnel of a heightened sense of ownership over the solution, and to assist in the development of the country's base of IT workers, an idea much-sought by the GoR's "Vision 2020" plan.

So far access to the application over the Internet has been good, always depending however on the quality of the connection available. Analysis of the data traffic generated

by this application (see Appendix F) shows that, depending on the speed by which the country can implement faster and/or more affordable links, considerable improvement in performance could be achieved by providing alternate ways of requesting the information. Examples would be e-mail (which TRACnet already uses for alerting purposes) and static or text-only Web pages. Given the amount of data (even text-based data) that the reports carry, utilization of SMS technology for all data communications is not feasible.

Regarding security, it was observed that the entire system, including password-protected login, is running over a non-encrypted connection. It should be simple to provide the site with SSL encryption and even a site certificate to certify its authenticity.

By using separate servers for critical functions and keeping one stand-by server ready at all times, TRAC can assure a very high uptime for the TRACnet application. Given the system's architecture, it would be possible to locate another parallel system to deal with the queries sent over the Internet and to process the incoming calls, given that the local telephone operator is still able to re-route calls to this redundant installation. Once the calls are routed through a VoIP gateway, the only limitation to the location of the redundant site would depend on the capacity and latency of the existing links.

The Future of TRACnet

Voxiva's contract for TRACnet support and software maintenance and oversight expired 31 March 2006. The CDC was expected to issue a Request for Proposals (RFP) in April 2006 soliciting competitive bids prior to awarding the next contract for TRACnet and related system development (TRACplus). This procurement will be for the technical components only, in terms of making TRACnet more adaptable, flexible, and enable the GoR to eventually handle the system. CDC representatives have expressed a clear desire to have the next iteration of the system include greater capacity development and support for data analysis and use.

The extent to which current investments in technology (hardware, software) and training (provided and self-acquired by the staff all over the country) in TRACnet may be reused if a new partner takes Voxiva's position will be determined according to proposals received and negotiations with the CDC. Considering that the servers currently installed on Terracom's premises and the software itself belong to Voxiva (the application is sold as a service, not as a product), chances are that a significant development effort will have to be done by the new contractor, if chosen. This will surely have an impact on the implementation times, not to mention on training, data consistency and the general perception of the HMIS in Rwanda.

Suggestions for Quantimed and SIMPLE

In the context of the Rwandan HMIS, there are several systems providing inventory control and tracking, together with MSH's systems is TRACnet and Saari, another system that installed in a standalone fashion in some hospitals to track the inventory of non-ARV

drugs and general consumables. This panoply of systems increases the workload of the staff at the health centers, which in turn fail to report information in a timely and precise fashion.

As we've seen with SIS, the lack of a central data repository and an open data interchange interface makes it difficult for other partners to have access to the information collected by Quantimed; currently it is not possible to access the system over the Web, and the distribution of the software itself is rather limited.⁶⁰

Much of the information contained in Quantimed and other systems could be of great use to CNLS and others, and it may be as simple as publishing regular updates on the information captured, together with information on the structures used to store it.

It seems to be at some level of misinformation at the facility level on how to perform the stock tracking, particularly during times when the system is not available (i.e. due to power shortages), and the lack of clear guidelines leaves every facility to its own wits to find a solution. This may not be consistent with the goals of the system.

Together with this, another problem reported by the facilities was the lack of time of the people responsible to use the system to train additional users on how to use the system. Both problems could be alleviated by designing and distributing a procedures manual, and some form of CBT (Computer-based training) material.

The system also needs a way to track the inventory adjustments performed by the local staff at the facilities; this level of auditing will ideally be paired with a user-level security model.

⁶⁰ The team was unable to acquire a copy of Quantimed to perform an evaluation of the software and its data structures.

Appendix F: TRACnet's traffic analysis

To evaluate the traffic load for the TRACnet site the Team's experts used Internet Explorer 6.0⁶¹ and measured the traffic to and from the Web server using Ethereal⁶² 0.10.8. Three figures were compared for the most relevant pages: traffic without any caching at the browser level (IE configured to "Check for newer versions of stored pages on every visit to the page"), full caching done at the browser level (IE set to "Never check for newer versions of the stored pages"), and with automatic cache settings.⁶³

The results with full caching enabled were very similar to results found with the "automatic" settings. This is due to the fact that most of the traffic is composed of dynamic graphics (like the occurrence of drug shortages plotted on the map of Rwanda) and application code needed to support the SVG⁶⁴ graphics engine which is never cached locally.

Most if not all of the JavaScript code, together with all the GIF files used in the header and footer of the Web pages were cached. In average, the savings from caching these files is of 20-40KB.

On average, the main portion of code for each page (in ASP) adds nearly 50KB of traffic, each SVG graphic adds 24KB of traffic and the application code to support the graphic files contributes slightly more than 100KB.

The traffic generated by some pages can be seen on the next table (IE using "automatic" caching):

⁶¹ Actual version: 6.0.2900.2180.xpsp_sp2_gdr.050301-1519

⁶² Ethereal is a popular traffic analyzer, see www.ethereal.com

⁶³ For a complete description of IE's cache settings, please view "How Internet Explorer Cache Settings Affect Web Browsing" (<http://support.microsoft.com/kb/263070/en-us>)

⁶⁴ The SVG engine is published by Adobe, for more information please visit www.adobe.com/svg

Table 1. Load Times for Web Pages on TRACnet

Page Accessed	Size	Load Time @ 33.6Kbps	Load Time @ 128Kbps
Main dashboard	440KB	107"	28"
Drug supply dashboard	230 KB	56"	15"
Lab Results	120 KB	29"	8"
View one result from the list	100 KB	24"	6"
Program Reports	166 KB	40"	10"
Consumable Report	110KB	27"	7"
ARV Inventory Report	120KB	29"	8"
Access one ARV Inventory Report	63KB	15"	4"

While the load times with a 128Kbps connection are acceptable, there is a clear delay for dialup and shared connections, around the 33.6Kbps mark. Once we consider the quality of Internet links currently available in Rwanda and their contention ratio,⁶⁵ is taken into consideration, it becomes clear that a VSAT connection will fall (with some exceptions) between the two figures listed, while a dialup connection will reach, under good conditions, the 33.6Kbps figure.

According to these tests, the origin Web server does not appear to be using data compression, even when requested from the client side. The addition of data compression and of a low-bandwidth option to the Web site may improve the quality of the user's experience while using the site.

⁶⁵ "Contention ratio" indicates how many people are sharing a connection, this applies at the customer's premises and also at the ISP and upstream ISP level.

Appendix G: Rwanda HMIS Assessment Illustrative Tasks and Associated Costs for Recommended Actions for Year 1

G.1 Immediate Priority Actions (June–September 2006)

MoH Central Level Staffing⁶⁶

Staffing needs to be increased and capacity strengthened at central level to manage Rwanda's HMIS. We recommend these illustrative additional positions at a minimum.

Table 1: Illustrative Additional Staff Needed at Central Level MoH

Item	Rate	Unit Type	Units	Subtotal	Responsibilities
Training Coordinators (2)	\$700	Per month	24	\$16,800	train Districts, train other entities in use of SIS online
Database Manager/Programmer	\$1500	Per month	12	\$18,000	manage SIS database and provide technical support to Districts and Facilities
Database assistant	\$800	Per month	12.00	\$9600	data entry, quality control, help desk
Subtotal - Labor				\$44,400	

G.1.1 Coordinate District, Facility, and Central HMIS Approaches

G.1.1.1 Clarify Roles and Responsibilities

G.1.1.2 Communicate New (2006) Reporting Procedures

Illustrative Task: The MoH needs an interim solution to get the SIS functioning again. The MoH needs to consult with District Health teams, District Hospitals, former supervisors and Health center directors to draft a roles and responsibilities document that can be used at least in the interim until further changes are implemented. The document needs to be done in consultation with stakeholders and needs to take into account current realities on the ground. This document needs to be distributed to all Districts and Health Facilities.

Note: assumes a 5 page document with 5 copies to each District, 2 copies to each Health Center, and 5 copies to each District Hospital

⁶⁶ Specific staffing needs should be addressed as part of the MoH and GoR HMIS strategic planning

Table 2: Estimated Cost of Printing and Distributing New Reporting Procedures

Item	Unit Cost	Unit Type	Quantity	Total
Printing of document	\$0.25	/copy	449	\$112.25
Transportation costs for Distributing	\$5.00	/copy	449	\$2,245.00
Total Cost for Document				\$2,357.25

Illustrative Task: Plan and design training workshops for District health team and health facilities personnel to review roles and responsibilities and reporting procedures.

Illustrative Task: Implement 1 day Training Workshops for District health team and health facilities personnel to review roles and responsibilities and reporting procedures

Table 3: Estimated Costs for 1 day Training Workshops on Roles & Responsibilities

Item	Unit Cost	# days	#/Participants	Total
Participant materials	\$8	1	2045	\$16,360
Refreshments	\$5	1	2045	\$10,225
Participant transportation reimbursement	\$5	1	2045	\$10,225
Facility/equipment rental	\$25	1	30	\$750
Workshop materials/supplies	\$25	1	30	\$750
Total Workshop cost				\$38,310

G.1.1.3 Re-establish Monthly Coordination Meetings at District Level

Illustrative Task: re-establish monthly coordination meetings at District Level. The SIS Manager/ and training coordinators should attend one meeting per month and rotate around the country to stay in touch with issues. This does not include time for District health personnel to plan and prepare for meetings or materials for meetings (handouts).

Table 4: Monthly Coordination Meetings Illustrative Costs

Item	Unit Cost	Unit Type	Quantity	Total
Transport for central level staff to Districts	\$150	/month	30	\$4,500.00
Transport for HCs to Districts	\$7.25	/Health center	385	\$2,789.86
Total Monthly Cost				\$7,289.86

G.1.2 Strengthen District, Facility, and Central Information Systems

G.1.2.1 Determine Champions for Strengthening Information Systems

MoH needs to strengthen health management information system staffing and leadership.

7.1.2.2 Integrate Community-Based Data

In order to strengthen community based health information the MoH needs to train health workers, develop standard data collection, quality control, and analysis tools, and organize a management structure that will provide on-going supervision to community health workers. The following task is only one small (but important) part of what needs to be done to strengthen the community health information system. In addition, to integrate community health information more effectively into SIS, the central level MoH team needs to work with community level information system stakeholders.

Illustrative Task: Monthly Meetings with Community Health Workers at each Health Facility. This budget assumes average number of community health workers per health center is 50. The unit cost presented is the monthly national cost for per diem.

Table 5: Annual Cost for Community Health Worker Meetings

Item	Unit Cost	Unit Type	Quantity	Total
per diem for health workers	\$17,436.59	/mo	12	\$209,239.13

G.1.2.3 Train District Level Supervisors

Illustrative Task: Training for District Level Supervisors. This budget assumes this training can be added on to workshop for roles/responsibilities and reporting procedures.

Table 6: Estimated Costs for Training for District Level Supervisors

Item	Unit Cost	# days	#/Participants	Total
Participant materials	\$8	1	68	\$544.00
Refreshments	\$8	1	68	\$544.00
Participant transportation reimbursement	\$50	1	68	\$3,400.00
Participant per diem	\$25	1	68	\$1,700.00
Facility/equipment rental	\$250	2	0	\$500.00
Workshop materials/supplies	\$200	2	1	\$400.00
Total Workshop cost				\$7,088.00

G.1.3 Emphasize Data Quality

Illustrative Task: Create training materials, tools and strategies to improve data quality and disseminate these to Districts and Facilities

Table 7: Estimated Costs for Training Materials

Item	Unit Cost	Unit Type	Quantity	Total
Training materials	\$500.00	/district	30	\$15,000.00

G.2 Near-Term and Ongoing Priority Actions: Improve Data Systems to Strengthen Data Use (June-December 2006)**G.2.1 Assign Capable Staff to HMIS Systems Coordination**

Illustrative Task: Hire consultants to strengthen capacity of MoH personnel charged with managing SIS. MoH staff need capacity building and working with the right outside consultants is one way of obtaining this support. The consultants should be tasked with assisting the current staff to perform their duties and not in taking on their own set of responsibilities.

Table 8: Estimated Costs for Consultant to Build Capacity in MoH

Item	Unit Cost	Unit Type	Quantity	Total
Expert consultants to build capacity within MoH in managing SIS	\$450.00	/day	100	\$45,000

7.2.2 Make Information More Accessible

Illustrative Task: Launch a participatory policy making process to begin development of appropriate structures and processes for information sharing and mechanisms for cooperation and enforcement for any health information systems operating in Rwanda

Table 9: Estimated Costs for Participatory Policy Making Process

Item	Unit Cost	Unit Type	Quantity	Total
Expert consultant to assist in developing policy framework for information systems	\$450.00	/day	15	\$6,750
Special Stakeholder Meetings on cooperation mechanisms				\$10,000
Monthly HMIS technical working group coordination meetings				0

G.2.3 Emphasize and Use Feedback

Illustrative Tasks:

- District health teams analyze and review data with health center directors at monthly meetings
- Supervisors discuss data collection, data quality, analysis and use with health facility personnel and provide specific guidance in areas needed during monthly meetings

Table 10: Estimated Costs for Some Monthly Meeting and Supervision Costs

Item	Unit Cost	Unit Type	Quantity	Total
fuel for supervisors to get to each health facility monthly	\$50.00	facility	385	\$19,250
communications costs	\$100.00	district/month	30	\$3,000
meeting materials for monthly meetings	\$40.00	district/month	30	\$1,200
Total Monthly cost				\$23,450
Annual Cost				\$281,400

G.2.4 Support Data Analysis and Utilization, including Curricula

Illustrative Tasks:

- develop data analysis and utilization mini training curricula that District health teams, supervisors and health center directors can use to train others
- assumes 385 facilities + 68 District hospitals + 60 District participants
- Training follow up phone calls and visits to participants to reinforce material, answer questions, and provide further support and information

Table 11: Estimated Costs for Training Activities to Support Data Analysis and Use

Item	Unit Cost	Unit Type	Quantity	Total
Production of training materials	\$10	/participant	513	\$5,130
Training of Trainers in how to use materials for District/facility levels				\$3,000
Training of Trainers for Educational Institutions				\$3,000
Follow up after Trainings	\$75	/participant	513	\$38,475
Total				\$49,605

G.2.5 Coordinate HIV/AIDS Vertical Systems

Illustrative Tasks:

- put into place policies designed to ensure health workers are not overburdened with reporting for different projects and donors
- monitor and ensure that reporting requirements are not excessive for facilities (determine how many person hours for reporting of overall work is acceptable)
- Put regular mechanisms into place to examine routine data collected and consolidate where possible.
- Where the same report must be delivered to two or more different organizations have the District scan and email or fax the document where possible to reduce hand copying burden on health workers
- Central level policy developed enforcing interoperability standards for systems for ease of exchange of data
- HMIS Steering Committee should work with existing structures working to consolidate indicators

G.3 Develop Strategic Plans to Strengthen, Support the National HMIS (June 2006–December 2007)

Illustrative Tasks: Develop Strategic Plan to Strengthen the National HMIS

Cost estimates and actions are taken from Rwanda's proposal to the Health Metrics Network in September 2005

Table 12: Estimated Costs to Develop Strategic Plan to Strengthen the National HMIS

Item	Unit Cost	Quantity	Total
Stakeholder review and adoption of HMIS assessment preliminary findings	\$25,000.00	1	\$25,000.00
development and drafting of HMIS strategic framework	\$40,000.00	1	\$40,000.00
Stakeholder review of HMIS strategic framework	\$25,000.00	1	\$25,000.00
Incorporation of stakeholder feedback, writing of HMIS 5 year strategic plan	\$70,000.00	1	\$70,000.00
presentation of HMIS 5 year strategic plan	\$25,000.00	1	\$25,000.00
donor conference to secure financial commitments for implementation of strategic plan	\$100,000.00	1	\$100,000.00
finalize implementation plan based on financial commitments obtained	\$70,000.00	1	\$70,000.00
Total Strategic Planning costs			\$355,000.00

G.3.1 Improve the National HMIS Software ⁶⁷

Illustrative Task: Develop a country-wide information system to replace the actual implementation of GESIS software. Based on the ease of use of GESIS, provide a simpler and easier to modify system for the next decade, creating together with the system the local capacity to maintain it.

⁶⁷ Please see page 65, section 7.3.3 which discusses the need to make major system improvements. This report is not advocating any specific software solution as this needs to be evaluated carefully and thoroughly through a detailed process which was outside the scope of the assessment. Whether the best solution is to add on to an existing system or to develop a stand alone system there will be a significant investment needed. The cost estimates here are for illustrative purposes only.

Table 13: Estimated Costs to Develop HMIS Software

Items	Unit Cost	Unit Type	Quantity	Total
Perform the new system design attending at existing and future data collection and reporting needs	\$7,000.00	/mo (expat)	2	\$14,000.00
	\$1,500.00	/mo (local)	4	\$6,000.00
System development	\$7,000.00	/mo (expat)	14	\$98,000.00
	\$1,500.00	/mo (local)	4	\$6,000.00
Pilot implementation in 10 centers	\$7,000.00	/mo (expat)	2	\$14,000.00
	\$1,500.00	/mo (local)	5	\$7,500.00
Full implementation, including non-computerized centers	\$7,000.00	/mo (expat)	6	\$42,000.00
	\$1,500.00	/mo (local)	30	\$45,000.00
Development of system procedures and training material	\$7,000.00	/mo (expat)	3	\$21,000.00
	\$700.00	/mo (local)	4	\$2,800.00
Training for data use at the district level	\$7,000.00	/mo (expat)	1	\$7,000.00
	\$1,000.00	/mo (local)	2	\$2,000.00
Training for system administrators	\$7,000.00	/mo (expat)	1	\$7,000.00
Software costs (30 offices)	\$30,000.00	Total	1	\$30,000.00
Hardware costs for district offices (30 offices)	\$30,000.00	Total	1	\$30,000.00
Estimated yearly communications costs/district office	\$6,000.00	1 Year	30	\$180,000.00
Total for GESIS2 development, training and implementation costs				\$512,300.00

Table 14: Summary of Year 1 Cost Estimates for Illustrative Tasks

Additional MoH Central Level Staffing	\$44,400.00
Draft roles and responsibilities and reporting procedures document for distribution to Districts and Health Facilities	\$2,357.25
Implement 1 day Training Workshops for District health team and health facilities personnel to review roles and responsibilities and reporting procedures	\$38,310.00
Re-establish Monthly Coordination Meetings at District Level	\$87,478.26
Monthly Meetings with Community Health Workers at each Health Facility	\$209,239.13
Train District Level Supervisors	\$7,088.00
Improve data Quality by creating and distributing training materials	\$15,000.00
Expert consultant to build capacity in MoH for managing HMIS	\$45,000.00
Expert consultant to assist in developing policy framework for information systems	\$6,750.00
Stakeholder Meetings on Cooperation Mechanisms	\$10,000.00
Emphasize and Use Feedback: annual cost for District Health Teams to provide monthly feedback	\$281,400.00
Support Data Analysis and Utilization, Including Curricula	
production of training materials	\$5,130.00
Training of Trainers in how to use materials for District/facility levels	\$3,000.00
Training of Trainers for Educational Institutions	\$3,000.00
Follow up after Trainings	\$38,475.00
Develop Strategic Plan to Strengthen the National HMIS	\$355,000.00
Develop New SIS Software, training and support costs	\$512,300.00
TOTAL	\$1,663,927.64

Notes on Cost Calculations:

SIS Costing Notes:

- does not include cost for District or Facility level staff labor or expenses
- Transport costs assume vehicles and drivers are available and transport cost would include fuel and maintenance

- The hardware costs for GESIS2 assumes that part of the donated computers will be used to provide access to the system

Roles and Responsibilities document Cost

Per page cost	Quantity	Unit Price per Document
\$0.05	5	\$0.25

Other Cost Calculations

Item	Rwanda Francs	US Dollars
Transport to district from Health Center on Average	4000	\$7.25
Average Transport cost from MoH to District		\$50.00
Community Health worker Per Diem	500	\$0.91
Average number of community health workers per HC	50	
Per Diem cost for health workers per HC		\$45.29
Monthly cost to hold health worker meetings at each health facility		\$17,436.59

Notes on Illustrative Task: Implement 1 day Training Workshops for District health team and health facilities personnel to review roles and responsibilities and reporting procedures

	Per Facility	Number of Facilities/Districts	Total
HC Participants for workshop	5	385.00	\$1925
District Participants for workshop	4	30.00	\$120
Total Number of workshop participants			\$2045

Exchange Rate used: 552 Rwanda Francs to US dollar

Health Structures in Rwanda	
Health Centres	385
District Hospitals	34
District Offices	30
Total	449

Appendix H: List of Individuals Interviewed/ Organizations Consulted

Dr. Jean Bosco Ahoranyezu, Malaria Program, WHO

Samir Ajmi, consultant to Ministry of Health ICT Unit

Dr. Anita Asimwe, Director General, TRAC

Robert Banamwana, CNLS

Augustin Bashabe, ICT Unit, Ministry of Health

Moses Bayingana, Director of Private, education and communities sectors, RITA

Drs. Gretchen and Warren Berggren, consultants, Twubakane Decentralization and Health Project

Dr. Agnès Binagwaho, Director, Commission Nationale De Lutte Contre Le SIDA (CNLS)

Bosco Bucyana, ITS Manager, King Faisal Hospital

Gege Inez Buki, Program Associate, RPM plus, Management Sciences for Health, Rwanda

Mr. Butare, Mme. Claire, National Reference Lab

JMV Buzizi, Twubakane Decentralization and Health Project

Olivier Byicaza, Twubakane Decentralization and Health Project

Sara Casey, Columbia University, Rwanda

Khaled Chebat, consultant to RITA for NICI plan, Microsoft

Matt Chico, USAID, Rwanda

Shabani Cishahayo, ICT & Applied Statistics Unit Chief, TRAC

John Dunlop, USAID Rwanda

Kyung Endes, consultant to CHF for community-based health services

Dr. Nancy Fitch, USAID Rwanda

Dr. Gyuri Fritsche, Health Care Financing Specialist, MSH

Dr. Leon Fundira, CAMERWA

Dr. Richard Gakuba, ICT Director, King Faisal Hospital

Emmanuel Gatera, Information Management Systems Director, National Institute of Statistics of Rwanda

Antoine Gatera, MSH, Rwanda

Dr. Michel Gasana, PNILT

Emmanuel d'Harcourt, Senior Child Survival Technical Advisor, International Rescue Committee, New York

Felix Hitayezu, MSH/RPM Plus, Rwanda

Laura Hoemeke, Twubakane Decentralization and Health Project

Dr. Andreas Kalk, Health Sector Coordinator, GTZ

Hertilan Inyarubuga, Twubakane Decentralization and Health Project

Darius Jazayeri and Christian Allen, Partners in Health

Heidi Jugenitz, CDC, Rwanda

Dr. Jean Claude Karasi, MoH

Dr Ben Karenzi, Permanent Secretary, Ministry of Health

Eddie Kariisa, Voxiva, CDC Rwanda

Jean-Loup Khayat, Consultant to RITA, Dataflow

Valerie Koscelnik, Chief of Party, CDC/GAP Rwanda

Etien Koua, TRAC

Sheryl Martin, USAID Rwanda

Meade Morgan, CDC Global AIDS Program, Atlanta

Rigobert Mpendwanze, Ministry of Health

Ben Mundia, Technical Advisor, GTZ

Diane Muhongerwa, Health Economics Program, WHO

Dr. Denis Bakunzi Muhoza, Columbia University, Rwanda

Louis Munyakazi, PhD, Ir, MSc, Director General, National Institute of Statistics of Rwanda,

Solomon Mugirakamaro, ICT Director, Ministry of Health

Lazare Ndazaro, Twubakane Decentralization and Health Project

Nepo Rugemintwaza, MINALOC

Jacquie Nachtigal, Economic Consultant to Ministry of Health

Dr. Daniel Ngamije, Ministry of Health, PNILP

Dr. Emilien Nkusi, HMIS, Ministry of Health

Claude Nuanga, MSH

Dr. Bernard Nzigiye, Belgium Technical Cooperation

Christine Omes, Lux-Development

Kareem Oweiss, DPCG Officer, Aid Coordination Unit, UNPD

Jessica E. Price, PhD, Country Director, FHI Rwanda

Gregory Roche, Technical Consultant, JSI Deliver

Jennifer Rubin, HIV/AIDS Clinical Health Specialist, USAID Rwanda

Dr. Charles Rudakubana, Military Health

Dr. Rugumire, Kanombe Military Hospital

Beadjo Rwisumbura, CNLS

Mr. Salvator, Rwanda Information Technology Authority (RITA)

Karen Schmidt, Columbia University, New York/Rwanda

Tom Scialfa, Tulane University

Guy de Scorraille, Public Finance expert, consultant to MoH

Emile Sempabwe, Twubakane Decentralization and Health Project

Anatole Sentabire, Twubakane Decentralization and Health Project

Donald S Shepard, PhD, Brandeis University

Vanessa Spann, Intrahealth, Chapel Hill

Kate Spring, UNAIDS, Rwanda

Martina Ssebagala, Icons Kigali

Dean Swerdlin, Twubakane Decentralization and Health Project

Belen Tarrafeta, MSH

Nicolas Theopold, Economist, Unit of Planning and Research, Ministry of Health, Rwanda

Dr. Jean-Marie Tromme, Belgian Technical Cooperation

Françoise Twahirwa, Twubakane Decentralization and Health Project

Mr. Vedaste, Pharmacy Unit, Ministry of Health

Interviewees at Health Facilities (in alphabetical order by administrative district, name of site followed by district)

Janja Health Center, Gakenke: UHUMUHAZA Jackline, Janja Health Center director, Immaculee, in charge of VCT department; Joselyne INGABIRE, in charge of ARV

Nemba Hospital, Gakenke: Jean Baptiste HABIMANA ,Director; Valens NSENGIYUMVA, André MUNYANZIZA (District SIS), Jules NIZEYIMANA

Ruli Hospital, Gakenke: Jean Claude NTAGARUKANWA (Hospital director), Supervisors: Josephine N.BABIRIGI; Denis NIYOMUGABO, head of nursing; Nyagatare JMV, head of ARV unit; Godelive Uwantege

Rushashi Health Center, Gakenke: Kamunazi Juliet Rushasi, Health Center Director and Assistant Director Theophile Dukuzumuremyi

Gasabo Administrative District, Gasabo: Ellen Nyiranyamibwa, Health Director

Gikomero Health Center, Gasabo: Louise Uwimana (Health Center Director), Mukadepite Théophile (Pre-natal nurse)

Imuhira Dispensary, Gasabo: Emmanuel Bajyimbere, Asst. Director/ Nurse

King Faysal Hospital, Gasabo: Dr. Richard Gakuba, ICT Director; Bosco Bucyana, ITS Manager,

Cyabayaga Health Center, Gatsibo: Kabasha Charles, Director; Marie Clarie, Pharmacy Head

Kiziguro Hospital, Gatsibo: Alexis MUCUMBITSI (ex. Supervisor, now in charge of statistics in the hospital: Sister Beatrice TWAGIRAMARIYA (Administrator), Francine MUKAMANA (A2 nurse pharmacist), John MUNIMBA (PMTCT and VCT responsible at the health center level), Jeanne INTARAMIRWA (ARV nurse)

Nyagahita Health Center, Gatsibo: Phocas HABIMANA, Director; Jean D’Arc, head of PMTCT and Théophile Lab. Technician

Byumba Hospital, Gicumbi: Dr. Diocres Mukama (Hospital director), Jean Bosco (Head of SIS.), Supervisors: Pastor Nsabimana, Théophile Seruheri, Rwinikiza Josué Head of nursing Butare Bonaventure , Mukamurisa collette (head of ARV unit)

Gicumbi Administrative District: Kibamba Thaddé, Director of the Health Unit

Rwesero Health Center, Gicumbi: Dr. Diocres Mukama, District Doctor who was there for monthly visit and consultations; Sister Verneranda Mukankundiye, Director

Kibirizi Health Center, Gisagara: Uwipmuhwe Jean d’Arc, Assistant director, Mukabayire Angélique

Rango Health Center, Huye: Butera Gérard acting director (has been serving for two days), Immaculate head of PMTCT. Ireene Umutoni CARE, international staff

Kibuye Hospital, Karongi: Byabarabandi Anastase, Ex-supervisor; Uwingabire Marie goreti and Kamurerwa Noel, ARV Department.

Mubuga Health Center, Karongi: Sister Anastasie Uwamagira Health Center director, VCT head Therese Uwimana.

Kabarondo Health Center, Kayonza: Sister Agnes (Director), Lilian (Head of VCT,PMTCT/ Nurse)

Kayonza Administrative District: Eric Rubyutsa, Health director at administrative district level and head of child protection and family

Clinique Carrefour, Kicukiro: Dr.Gatsinga Clinic director, Emerthe DAF (Director of Finance and administration)

Kicukiro Administrative District: Emmerance Gatera, Health Director

Kicukiro Health Center, Kicukiro: Sister KATUNGU Euphrasie (Director/ Nurse), Etienne Simugomwa (ARV and SIS), Celestine H. (In charge of consultation unit), Spécoise Mukabutera (ARV distribution pharmacy)

Gitarama Health Center, Muhanga: Atanasie Nyamarere, Director, Magaritte Mukamajoro (Dept head of Pharmacy), Pelagie Twagiramaria (Asst director, head of VCT/PMTCT)

Muhanga Administrative District: Joel SERUCACA, Health director at administrative district level and head of family planning

Nyakinama Health Center, Musanze: Sister Elisabeth CZAJKONSKA (head of Nyakinama orphanage) Ayingeneye Alphonsine assistant director

Ruhengeri Hospital, Musanze: Mr. Félix Kayigamba (Director), Dr. Félix Kadeye (Chief of Nursing), Mr. Jean Damason (Responsible for the Health Center), Mme. Chantelle (Nurse)

Ruhengeri Medical Dispensary, Musanze: Mr Gakuba JMV (dispensary director)

Kibungo Hospital, Ngoma: Dr. Hakizamana JMV (Hospital director), Gashugi Augustin (Head of nursing), Nyiramuganza Patience (Head of VCT unit), Hategekimana Jean baptiste (head of ARV unit)

Nyange Health Center, Ngororero: John RUHIMBURA, Director

Rambura Health Center, Nyabihu: Gilbert Manishimwe assistant director, Epiphanie Benihirwe Head PMTCT + VCT, and Ndundiye JMV chief accountant

Nyabwishongezi Health Center, Nyagatare: Constance director; Muhoracyeyo Agathe, Head of VCT and PMTCT, Makali Onesphore Lab. Technician

Nyagatare Hospital, Nyagatare: Desire Rwabukwisi (Chief of nursing) Justin Rwagasore Ex-supervisor, Joseph head of VCT and ARV

Rukomo Health Center, Nyagatare: Sister Director Berthilde Mapendano Sister Anne Marie Yarara, Head of ARV, Mutegwaraba Egidia head of mutual health insurance

Cyanika Health Center, Nyamagabe: Sister Marie Béatrice Mukankusi, Health Center Director; Mukayigire Francine, Head of mutuelle; Mujawamariya Godeberthe, Head of nutrition department

Umushumba Dispensary, Nyamagabe: Theoneste Kanyerara, Dispensary Director

Kaduha Military Hospital, Nyamagabe: Marc Nyirintwaza (Medical director) been serving for only 1 month, Supervisor (cordinator) Ezeherie, Administartor Charles Gatare, and Secretary Cyrille Ngarukiye (who has been working with MOH for 30 yrs)

Kigeme Hospital, Nyamagabe: Samuel MURASANDONYI (been in the position for one month: Administrator), Former District Supervisor: Lambert BENEDATA, Head of nursing: UWIMANA Emmanuel, Head of ARV unit; INGABIRE Françoise and Emerthe Musabyimana, nurses, ARV.

Kabeho Dispensary, Nyamasheke: Nurse Noelle

Kibogora Hospital, Nyamasheke: Emmanuel Nsengimana (Chief of nursing), Aimé Jerome Rugira (Ex-supervisor), Hitimana Oscar (head of VCT), Julienne Nyiransabimana (Assistant head of VCT)

Nyamasheke Health Center, Nyamasheke: Dieudonné Director, Triphine Deputy director, Albert Head VCT

Nyanza Hospital, Nyanza: Thassien BUCYANA (Hospital director), Supervisors: Francoise KAYIRAGWA (been in the position for the past 6 years) Head of nursing: Kizito SHIMIYIMANA, DAF: Pascale IYAMUREMYE, Head of ARV unit: Daphrose, VCT unit: Marie Rose and Marie Claire

Centre Hospitalier de Kigali, Nyarugenge:

Clinique Harmonie, Nyarugenge: DR Theodore Ntihinyurwa Muhabura (clinic director), Rubunga Bakomipasi (Head of Labo)

Muhima Hospital, Nyarugenge: Dr. SENGORORE Athanase Hospital Director, Myriam DUSHIMIMANA Chief of nursing; UMULISA Yvonne, head of pharmacy

Polyclinique le Medicale, Nyarugenge: : Dr KANIMBA Pierre Celestin (Director), Dr KABERUKA Jean Bosco

Coko Health Center, Nyaruguru: Gentile Nyiramazayire, Health Center Director ; Nzeyimana Innocent, CARE International Case Manager and head of Pharmacy; Libinyange Claudette, head Mutuelle department

Ruramba Health Center, Nyaruguru: Sister Petronille MUKASUGIZA, Director; Sister Médiatrice, head of finance department

Giraneza Dispensary, Rubavu: Faustian Bazagwera, Director

Gysenyi Hospital, Rubavu: Jean Baptiste KAYISIRE, former SIS manager at the District; Brigitte MUKAKIMENYI, Chief Nursing; John KAMUZINZI, administrator, Scolastique MUKARUGEMA.

Nyundo Health Center, Rubavu: Félicitée NTAHOMPAGAZE, Director; Winnifried NYIRAMUTUZO (Head of PMTCT department)

Ruhango Health Center, Ruhango: Sister Dorothy (Director), Marie Grace (Asst. Director/ Nurse), Odette (Health center and VCT labs), Dr. Lambert (responsible for HIV + patients/ARV perscriptions), Ellen (nurse of VCT/PMTCT), Apollinaire (nurse of ARVs and Prophelaxie)

Murambi Health Center, Rulindo: Asst. Director, Epiphanie Nyirangabe

Rulindo Administrative District: Marc Ndayambaje, Health Director; Richard Kayiranga, in charge of public health and hygiene

Bugarama Health Center, Rusizi: Twagiramariya Judith Director and Esther Nyitezimana VCT head.

Gihundewe Hospital, Rusizi: Virginie Uwagilinka (Chief of nursing), Mélane Mporanzi Ex-supervisor

Congo-Nil Health Center, Rutsiro: Sister Valérie DUSABE (Vice director), Thérèse UWIMANA, VCT nurse

Murunda Hospital, Rutsiro: Mujawayezu Felicité, Ex-supervisor; Ndahimana Landuald, Assistant Head of Nursing and Head of ARV department

Munyaga Health Center, Rwamagana, Sister Hyacintha (Asst. Director/ Nurse), Philbert Ahishakiye (VCT counseling of VCT/PMTCT)

Rwamagana Administrative District: Emile Gasore, Director of the Health Unit, Noel Kabundi, District Supervisor

Kanombe Military Hospital, Kanombe: Dr. Rugumire, Director

Organizations Consulted

Government of Rwanda/Parastatal Organizations

CAMERWA
CNLS
Institute of Statistics
Ministry of Health
National Reference Laboratory (NRL)
PNILP
PNILT
RITA
TRAC
Voxiva

US Government

USAID/Rwanda
CDC/Rwanda and US GAP Program

Other Donors/International Agencies

Belgian Technical Cooperation
Clinton Foundation
UNAIDS
UNDP
WHO
World Bank

Implementing Partners

Management Sciences for Health (MSH)
Tulane University
Columbia University
GTZ
Lux-Development
Partners in Health (PIH)
Family Health International (FHI)
International Rescue Committee (IRC)
John Snow Inc. (JSI)
CHF International

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Appendix J: HMIS Assessment Team

Name	Expertise	Role	Education
Andrea Chitouras	Workflow, processes, needs analysis	Team Leader, leads and coordinates team in Rwanda	MBA, International Management
Pablo Destefanis	MIS, Networking, Telecommunications	Analysis of technical capacity of organizations in terms of databases, communications and use of ICT for information systems; cost of upgrading systems	B.S., Information Systems
Catherine Elkins	Health Monitoring and Evaluation	Advisor, quality data collection, analysis, interpretation, use, and results reporting	PhD, Political Science
Dr. Angelique Kanyange	Rwandan medical expertise	Conduct site visits, assist team to consolidate findings and write reports based on site visits, conduct research and advise team	MD
Francois Myandagara	Local knowledge of Rwanda health infrastructure and projects	Provide local knowledge, conduct interviews and gather data; assist with analysis and report writing	Public health
Evariste Nkunda	Local knowledge of Rwanda health infrastructure and projects	Provide local knowledge, conduct interviews and gather data; assist with analysis and report writing	Public health
Eileen Reynolds	User needs analysis, assessment, research, analysis, PEPFAR – HIV/AIDS related information needs	Interviewing, data gathering, analysis of existing assessments and documentation, report writing	M.A. International Development
Joseph Rubagumya.	Local knowledge of Rwanda health infrastructure and projects	Provide local knowledge, conduct interviews and gather data; assist with analysis and report writing	Political Science

Appendix K: Assessment of Health Management Information Systems: Site Visit Guide

Executive Summary

The goal of site visits is to add facility-level perspectives to build a comprehensive picture of how information is gathered, managed (processed, disseminated, stored), and used throughout the health sector. We are not doing a quantitative facility survey but are investigating components participating in health information systems in order to develop an accurately representative understanding of overall HMIS design and performance in Rwanda.

Themes for Site Visit Conversations

The information gathered at each facility may follow different paths. The method of investigation is to open information system themes with appropriate staff and listen very actively to what they say, spot the things they leave out, and encourage new ideas for investigation to emerge through their responses. There should be an accumulation of understanding as more and more sites are visited; debriefing after site visits will often suggest new avenues to explore in subsequent conversations that team members may have at other sites.

Conducting a valid site assessment requires paying thoughtful attention to conversations with staff, covering the following themes over the course of each visit:

I. Health Information Needs in Rwanda

What site-level information do staff feel is needed at the site? What information do site staff think the district or national levels should be getting from service delivery sites? What other information (e.g., from other levels) does the site need?

II. Existing Systems for Health Data Collection and Information Use

What are the procedures for gathering, managing, using information at the facility level? What is the understanding of site staff of their roles and responsibilities in Rwanda's health information systems? Are there timeliness or quality concerns?

III. Current Health Management Information Approaches

What works well, what is redundant, what are the gaps, and what are the challenges?

IV. Current Health Sector Information Tools

What tools and systems do staff use for internal information, for providing information to others (government, donors, national laboratory, etc.), and receiving information from others?

V. Current Information Flows

How does information move within the facility, to different health sector levels or the community, and from other levels or systems and the community? What are the site capacities, standards, and habits of organizing information, and are these well-matched to existing infrastructure, and current roles/responsibilities, or activities?

VI. Gaps and Recommendations

What other strengths, weaknesses, and gaps are perceived by site staff with respect to HMIS strategy, infrastructure, harmonization, and human capacity in Rwanda? What do staff see as the critical priorities for action? What needs to happen for decisions on priorities to translate into meaningful change?

Appendix L: Table Listing Positions in ICT Unit which Supports HMIS at Central Level Ministry of Health

Unité ICT	Directeur	<ul style="list-style-type: none"> - Identifier et prévenir les pannes éventuelles des logiciels et des équipements informatiques ; - Identifier le besoin en matière d'applications informatiques et en planifier l'approvisionnement ; - Former le personnel du Ministère à l'utilisation des nouvelles applications acquises et leur prodiguer des conseils pour la manipulation performante d'outil informatique; - Gérer le réseau informatique du Ministère ; - Mettre en place le mécanisme de sécurité des données et de réseau ; - Donner des avis techniques aux autorités du Ministère sur l'acquisition des consommables et pièces de rechange. 	Directeur de l'ICT	A0 Informatique
	Mise en place et suivi des systèmes ICT	<ul style="list-style-type: none"> - Surveiller les nouveaux développements technologiques d'ICT, - Administrer le réseau - Assurer régulièrement la maintenance du logiciel propre au Ministère ; - Responsable de la sécurité physique des systèmes - Rectifier les défauts de fonctionnement pour les utilisateurs d'ordinateurs - Préparer et programmer les rapports de la maintenance de Hardware - Assister les utilisateurs en cas de difficultés techniques 	Professionnel chargé du système de la mise en place et suivi des systèmes ICT	A0 Informatique

	<p>Informations Sanitaires et Statistique</p>	<ul style="list-style-type: none"> - Produire le bulletin de rétro information du Système d'Information Sanitaire (SIS); - Assurer le secrétariat de la revue médicale Rwandaise et du bulletin de rétro-information du système d'information sanitaire (SIS); - Elaborer et tenir à jour le dispositif de collecte des statistiques sur la santé; - Centraliser les données statistiques du Ministère; - Collecter, traiter et diffuser l'information dans le secteur de la santé à tous les niveaux; - Appuyer le système d'information sanitaire à tous les niveaux de la pyramide sanitaire - Tenir l'inventaire des infrastructures et constituer une banque de données sur les infrastructures; - Tenir et exploiter les fiches de projets; -Vérifier la mise en application des stratégies d'exploitation; - Traiter et diffuser les résultats des études; - Mettre en place et suivre le dispositif national de récolte des données statistiques intéressant le ministère. - Elaborer les indicateurs socio- démographiques en matière de santé au Rwanda et leur mise à jour périodique. 	<p>Professionnel chargé du système d'information sanitaires intégrés</p>	
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Appendix M: Site-Level Reporting Required by Partners, by Facilities Visited (as Reported by Facility Personnel)

Site	Partners/ Donors															
	FHI Impact	CTB	GTZ	IntraHealth Capacity	IntraHealth Twubakane	WFP	IRC	CARE	WB MAP	UNICEF	Global Fund	Diocese	Caritas	Medicus Mundi	MCAP	EGPAF
Bugarama HC																
Byumba Hospital																
Coko HC																
Congo-Nil HC																
Cyabayaga HC																
Cyanika HC																
Gihundwe hospital																
Gikomero HC																
Gisenyi Hospital																
Gitarama HC																
Janja HC																
Kabarondo HC																
Kaduha Military Hospital																
Kanombe Military Hospital																
Kibirizi HC																
Kibogora Hospital																
Kibungo Hospital																
Kibuye Hospital																
Kicukiro HC																
Kigeme Hospital																
Kiziguro Hospital																
Mubuga HC																

Site	Partners/ Donors															
	FHI Impact	CTB	GTZ	IntraHealth Capacity	IntraHealth Twubakane	WFP	IRC	CARE	WB MAP	UNICEF	Global Fund	Diocese	Caritas	Medicus Mundi	MCAP	EGPAF
Muhima Hospital																
Munyaga HC																
Murambi HC																
Murunda hospital																
Nemba Hospital																
Nyabwishongezi HC																
Nyagahita HC																
Nyagatare Hospital																
Nyakinama HC																
Nyamasheke HC																
Nyange HC																
Nyanza Hospital																
Nyundo HC																
Rambura HC																
Rango HC																
Ruhango HC																
Ruhengeri Hospital																
Rukomo HC																
Ruli Hospital																
Ruramba HC																
Rushashi HC																
Rwesero HC																

Partner/Donors Working with Health (Part b) Facilities Visited (as Reported by Facility Personnel)

Site	Partners/Donors											
	EU	UNFPA	Handicap Int'l	Cordaid/MEMISA	CAHO	Methodist church	Concern	HealthNet	PSP	MSH	Chinese Cpn	8 th FED
Bugarama HC				■								
Byumba Hospital												
Coko HC												
Congo-Nil HC									■			
Cyabayaga HC												
Cyanika HC												
Gihundwe hospital			■	■							■	
Gikomero HC												
Gisenyi Hospital												
Gitarama HC												
Janja HC											■	
Kabarondo HC												
Kaduha Military Hospital												
Kanombe Military Hospital												
Kibirizi HC												■
Kibogora Hospital				■	■	■						
Kibungo Hospital											■	■
Kibuye Hospital									■			
Kicukiro HC												
Kigeme Hospital												
Kiziguro Hospital		■										
Mubuga HC									■			
Muhima Hospital												

Site	Partners/Donors											
	EU	UNFPA	Handicap Int'l	Cordaid/MEMISA	CAHO	Methodist church	Concern	HealthNet	PSP	MSH	Chinese Cpn	8 th FED
Munyaga HC												
Murambi HC												
Murunda hospital												
Nemba Hospital												
Nyabwishongezi HC												
Nyagahita HC												
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Nyanza Hospital												
Nyundo HC												
Rambura HC												
Rango HC												
Ruhango HC												
Ruhengeri Hospital												
Rukomo HC												
Ruli Hospital												
Ruramba HC												
Rushashi HC												
Rwesero HC												

CTB = Belgian Technical Cooperation; MCAP = Program of Columbia University; CAHO = Central Africa Hospital Organization; MEMISA = MEMISA is a Spanish NGO that works with support of CORDAID; PSP = Projet Santé Publique; EU = European Union; HC = Health Center

