Qualcomm Wireless Reach Philippines Partnership

Improving Health Record Systems in Rural Health Units

Initial Project Analysis

Submitted To

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Acronyms and Abbreviations

2.5G..... Second and a half generation wireless communications technology
3G..... Third generation wireless communications technology
AIDS ..... Acquired Immune Deficiency Syndrome
AMPATH..... Academic Model for the Prevention and Treatment of HIV/AIDS
AMRS ..... AMPATH Medical Record System
AOTR..... Agreement Officers Technical Representative
APAMI ..... Asia Pacific Association for Medical Informatics
ART ..... Antiretroviral Therapy
ARV ..... Antiretroviral
BART ..... Baobab HIV Treatment System
BHS ..... Barangay Health Station
BIHC ..... Bureau of International Health Cooperation
CB..... Community Based
CBMS ..... Community Based Monitoring System
CDC..... United States Centers for Disease Control
CEDPA ..... Centre for Development and Population Activities
CHITS..... Community Health Information Tracking System
CHD..... Center for Health Development
CHO..... City Health Officer
CHU..... City Health Unit
CICT ..... Commission on Information and Communications Technology
CIDRZ..... Center for Infectious Disease Research in Zambia
COP..... Chief of Party
CSR..... Corporate Social Responsibility
DDB ..... Dangerous Drugs Board
DILG ..... Department of Interior and Local Government
DOH..... Department of Health
EMR..... Electronic Medical Records
F1 ..... FOURmula ONE for Health
FHSIS ..... Field Health Service Information System
FP ..... Family Planning
GDA..... Global Development Alliance
GPPHI ..... Global Partnership for Public Health Informatics
GPS ..... Global Positioning System
HealthGov..... USAID Strengthening Local Governance for Health Project
HMIS..... Health Management Information System
HMN ..... Health Metrics Network
HOMIS ..... Hospital Operations and Management Information System
HSRA..... Health Sector Reform Agenda
ICD ..... International Classification of Diseases
ICHSP..... Integrated Community Health Services Project
ICT..... Information and Communication Technology
IDTOMIS..... Integrated Drug Test Operation and Management Information System
ILHZ..... Inter-Local Health Zone
IMIA ..... International Medical Informatics Association
IMS ..... Information Management Systems
IR..... Intermediate Result

LCE..... Local Chief Executive
LCP..... League of Cities of the Philippines
LGC ..... Local Government Code
LGU ..... Local Government Unit
LMP ..... League of Municipalities of the Philippines
LPP..... League of Provinces of the Philippines
M&E..... Monitoring and Evaluation
MCH ..... Maternal and Child Health
MDG ..... Millennium Development Goal
MHO ..... Municipal Health Officer
NAPC..... National Anti-Poverty Commission
NCDPC..... National Center for Disease Prevention and Control
NEC..... National Epidemiology Center
NEDSS ..... National Electronic Disease Surveillance System
NEISS..... National Electronic Injury Surveillance System
NHAGIS..... National Health Atlas Geographic Information System
NNC..... National Nutrition Council
NSCB..... Philippine National Statistical Coordination Board
NSO..... National Statistical Office
NThC ..... National Telehealth Center
OIDCI..... Orient Integrated Development Consultants, Inc.
OP ..... Operational Plan
OpenMRS..... Open Medical Record System
OSHCA..... Open Source Health Care Alliance
PEPFAR ..... President's Emergency Plan for AIDS Relief
PHIP ..... Province-wide Investment Plan for Health
PMIS..... Philippine Medical Informatics Society
PHO..... Provincial Health Office
PHIC..... Philippine Health Insurance Corporation (See PhilHealth)
PHSID..... Public Health Surveillance and Informatics Division
PITAHC..... Philippine Institute of Traditional & Alternative Health Care
PhilHealth ..... Philippine Health Insurance Corporation (See PHIC)
PHIN..... Philippine Health Information Network
PNAC..... Philippine National AIDS
POPCOM..... Population Commission
RESU..... Regional Epidemiology Surveillance Unit
RHU..... Rural Health Unit
RHUMIS..... Rural Health Unit Management Information System
PMAC ..... Prevention and management of abortion complications
PNGOC..... Philippines NGO Council on Population, Health and Welfare
RTI..... RTI International
SO ..... Strategic Objective
SOAg..... Strategic Objective Agreement
STI..... Sexually Transmitted Infections (STI)
TA..... Technical Assistance
TAHC..... Traditional Alternative Health Care
TAP..... Technical Assistance Provider
TB..... Tuberculosis
TBD ..... To Be Determined

TWG ..... Technical Working Group
UAB ..... University of Alabama at Birmingham
UMTS ..... Universal Mobile Telecommunications System
UP..... University of the Philippines
USAID..... United States Agency for International Development
TSU ..... Tarlac State University
VAWC..... Violence against women and children
WCDMA..... Wideband Code Division Multiple Access
WHO..... World Health Organization
ZEPRS..... Zambian Electronic Perinatal System

Qualcomm Wireless Reach Philippines Partnership

Improving Health Record Systems in Rural Health Units

1 Introduction and Background

This document builds on a grant awarded by the Qualcomm Wireless Reach Initiative (Wireless Reach) to RTI International (RTI) in conjunction with RTI implementation of the United States Agency for International Development (USAID) HealthGov project. This Wireless Reach project will support USAID HealthGov project results by pilot testing a system to improve health record systems in rural health units (RHU). This system will be designed to improve access to accurate and comprehensive patient information for clinicians, reduce the amount of time required for monthly reporting from RHUs to the Field Health Service Information System (FHSIS), and improve the timeliness and quality of data reporting to the FHSIS. The system will use Qualcomm 3G wireless technology to transmit public health status and services data from each Rural Health Unit (RHU) to the appropriate provincial health office over an existing mobile phone network.

Using Wireless Reach grant funding, RTI technical experts will help a local technical assistance provider, Tarlac State University (TSU), to adapt existing free and open source software to meet the routine patient record-keeping needs of RHUs in the Philippines and to use Qualcomm 3G wireless technology to transmit data over the Smart Communications mobile phone network to meet the routine data reporting requirements of the FHSIS. This approximately one-year pilot project will test this system in a limited number of targeted RHUs and Local Government Units (LGUs)[1] in Tarlac Province. This will be done in partnership with the USAID HealthGov project, the Tarlac Provincial Health Office (PHO), the Philippine Department of Health (DOH), TSU, Smart Communications, and other health information system stakeholders in the Philippines.

The objective of this project is to produce a system that has the official support of the DOH, can be scaled up to additional RHUs in each LGU based on local demand and support, and can be sustained and continually enhanced using local capacity. Our hope is that close collaboration with clinicians[2], the DOH, and other national health information and health informatics stakeholders, careful selection of appropriate technology, beneficial private sector partnerships, and a design that can be replicated, scaled, and sustained by LGUs will make this system attractive to other provinces. Once the approximately one-year pilot project has been completed, project partners will determine the next steps regarding further enhancement and deployment of the system.

The remainder of this section describes how this project supports USAID HealthGov objectives. It also provides background on how the problem was identified, how the solution was conceptualized, why and how RTI obtained funding support from the Qualcomm Wireless Reach Initiative to supplement HealthGov resources. Finally, this section describes what RTI has done to date to engage stakeholders and build momentum for a Wireless Reach Philippines

[1] Municipalities and cities
[2] Physicians, nurses, midwives, and other healthcare workers providing care to patients

Partnership to support this activity, and the importance of getting our project team on the ground to continue the work of engaging partners, further defining partner roles and commitments, and gathering the information needed to complete a detailed work plan for the pilot project.

The following sections of this document provide more detailed information about the Qualcomm Wireless Reach Philippines Partnership project. Sections 2 through 5 provide a more detailed analysis of the problem to be addressed, specific objectives, and the solution being proposed. Section 6 describes other related health information system components in the Philippines and how they relate to the proposed system. Section 7 describes proposed partners and their proposed roles. Section 8 describes other stakeholders and how they will be engaged. Section 9 explains the resource limitations of the activity. Section 10 describes challenges to sustaining the system and how they will be addressed. Section 11 describes how, contingent on the results of the pilot, the system can be scaled up to all RHUs in Tarlac Province, and to other provinces. Section 12 explains how we propose to organized and managed the activity, and introduces members of the project implementation team. Finally, Section 13 explains how this activity will be monitoring and evaluated, and provides an illustrative results framework with indicators and milestones.

1.1 USAID HealthGov Project Objectives

The Strengthening Local Governance for Health (HealthGov) Project is USAID's flagship project designed to strengthen local government units' (LGU) commitment to and support for public health services and their capacity to plan, provide, manage, and finance quality health services, particularly family planning (FP), maternal and child health (MCH), tuberculosis (TB), and HIV/AIDS services, in a manner that can be sustained. The project puts premium on getting local leaders to invest in health. It focuses on empowering LGU staff and developing their capacity to meet the organizational, financial, and systems development challenges to address emerging health needs. The HealthGov Project is implemented by RTI International, in partnership with JHPIEGO, the Centre for Development and Population Activities (CEDPA), the Philippines NGO Council on Population, Health and Welfare (PNGOC), and Orient Integrated Development Consultants, Inc. (OIDCI).

Focusing on sustainable solutions, HealthGov will develop LGU capacity for continuous participatory problem solving to improve health systems, build LGU support for investing in health, and strengthen the participation and advocacy skills of civil society. To accelerate these efforts, HealthGov will develop a network of technical assistance providers or TAPs (e.g., universities, NGOs, consultants, government agencies) that LGUs may engage to provide them with customized training and technical assistance (TA) services to solve key problems. In addition to improved health outcomes, sustainable "success" as a result of HealthGov assistance will be achieved when an LGU can properly identify its health sector problems and practical solutions in a participatory manner, and has access to sufficient resources (financial and technical, internal and external) to solve these problems.

HealthGov will help broker and develop long-term sustainable relationships between the following:

(1) LGUs and local technical assistance provider organizations to help enhance LGU skills and knowledge, and

(2) LGUs and their constituents to improve the quality and accessibility of health services.

HealthGov is focusing on four key activity areas that correspond to the results framework of USAID's SO3, which is as follows:

USAID SO3: Improved Family Health Sustainably Achieved.

The first of these four activity areas corresponds to Intermediate Result 1.1 of the HealthGov project results framework, *Strengthening LGU Management Systems*, which is explained in the following section.

1.2 HealthGov IR 1.1: Strengthening LGU Management Systems

HealthGov activities targeted at achieving this intermediate result are designed to help LGUs to do the following:

(1) effectively integrate health planning and budgeting functions into the overall government system;

(2) improve management systems including inter-local health zone (ILHZ) management, planning and budgeting, financial management, drug/commodity logistics and procurement, and *the use of self-assessment techniques and health management information systems (HMIS) to diagnose priority problems*; and

(3) institutionalize multi-stakeholder coordination mechanisms at the provincial level for participatory planning, leveraging resources, and sharing best practices.

Developing technical assistance providers (TAPs) and public-private partnerships that help LGUs improve their health management information systems is therefore central to achieving HealthGov IR 1.1. The core of the national health management information system in the Philippines is the FHSIS.

1.3 HealthGov Monitoring and Evaluation

The USAID HealthGov project Monitoring and Evaluation (M&E) plan includes performance indicators designed to measure progress towards achieving project objectives. Indicators designed to measure progress towards achieving Intermediate Result 1.1 and are as follows:

1.1B # of LGUs with improved health information system
- a. # of provinces with at least 75% of component LGUs that submitted the last FHSIS quarterly report of the current year on time
- b. # of provinces with an average delay of less than 2 weeks in the submission of the last FHSIS quarterly reports of the current year by component LGUs
- c. # of component LGUs that submitted the last FHSIS quarterly report of the current year on time to the PHO
- d. # of LGUs that have ever conducted CBMS or CB Health and Living Standard Information Survey as of the current year

Three of the four project performance indicators in this category are designed to measure improvements in the timeliness of FHSIS reporting by LGUs.

In addition to HealthGov project performance indicators, the HealthGov project is responsible for collecting data for a large number of USAID Operational Plan (OP) indicators designed to measure progress towards results across USAID programs. Many of these indicators depend directly or indirectly on FHSIS reports to provide the necessary indicator data. This is particularly true in the major areas of maternal and child health, and family planning and reproductive health.

USAID established a Strategic Objective Agreement (SOAg) M&E Technical Working Group (TWG) composed of the M&E specialists and other concerned project staff of the different USAID Cooperating Agencies (HPDP, HealthGov, TB LINC, SHIELD-ARMM, PRISM, A2Z, and HealthPro) to develop and coordinate detailed plans for collecting, analyzing, and reporting individual project performance and USAID OP indicators. TWG members recognize that the FHSIS is a critical source of data for many project performance and OP indicators. Over the period of a year, TWG members repeatedly expressed concerns in TWG meetings about the quality of FHSIS data. As noted in previous sections, improving the health management information system is part of the HealthGov project results framework.

1.4 Examining FHSIS Data Quality Problems in Tarlac Province

In March 2008 the HealthGov team[3] examined FHSIS data flow and quality issues with the Provincial Health Office (PHO) and the data management unit of the DOH Center for Health Development (CHD) representative office in Tarlac Province. PHO staff members explained the flow of data from Rural Health Units (RHUs) to the FHSIS, and demonstrated how and why FHSIS data quality problems originate in Rural Health Units (RHUs.) They also described problems in getting RHUs to submit FHSIS reports on time. They attributed both problems to the time and effort that it takes for RHU personnel to complete routine FHSIS reports from their existing manual patient records systems.

The HealthGov team then met with the Provincial Health Officer to discuss previous and existing efforts to improve the health information system and discuss the feasibility of an electronic medical record system for RHUs. Finally, the Health team visited Tarlac State University (TSU) to determine whether TSU might become an effective local technical assistance provider to support the introduction of electronic records into RHUs.

1.5 Conceptualizing a Solution

RTI developed a draft concept paper and budget based on RTI experience with similar projects in other countries, our findings in Tarlac, and our subsequent research. The proposed solution focused on introducing an electronic medical record system in RHUs that could be used to submit routine FHSIS data reports electronically to the PHO. RTI proposed to adapt ZEPRS, a proven free and open source electronic patient record system that RTI helped to develop in Zambia, to the standards of care in the Philippines. Members of the HealthGov team reviewed the concept paper and provided some input based on HealthGov activities in Tarlac. After consulting with the HealthGov team, RTI decided to apply to the Qualcomm Wireless Reach Initiative for core grant funding to support this activity.

[3] Conrad Castillo (HealthGov Provincial Coordinator), Honorio Alumno (HealthGov Management Information System Advisor), and Gordon Cressman (Senior Management Information System Advisor)

1.6 Engaging the Qualcomm Wireless Reach Initiative for Support

Qualcomm Incorporated (Qualcomm) is a U.S.-based wireless telecommunications research and development company[4]. Qualcomm designs, manufactures and markets digital wireless telecommunications products and services. Qualcomm believes access to advanced wireless voice and data services improves people's lives. The Wireless Reach initiative supports programs and solutions that bring the benefits of connectivity to developing communities globally. By working with partners, Wireless Reach projects create new ways for people to communicate, learn, access healthcare and reach global markets.

RTI worked with Wireless Reach to provide advanced 3G wireless Internet access to schools under the Alianzas Guatemala program. The Alianzas Guatemala program[5], managed by RTI, is arguably one of the most successful USAID Global Development Alliances (GDAs). RTI is also implementing the Wireless Reach Kenya Partnership project[6]. This project uses free and open source software developed by RTI to improve the management of ARV pharmaceutical supplies and ART patient records in health centers in Nairobi. The project is using Qualcomm 3G[7] wireless broadband technology over project partner Telkom Kenya's mobile phone network to enable health centers to submit routine reports and requests for re-supply electronically to the central supply warehouse.

Qualcomm normally provides one year of grant funding to each Wireless Reach project. Qualcomm may provide one or two additional years of grant funding, depending on project progress and available Wireless Reach funds. Qualcomm often engages other partners, including USAID, during the initial project year to lay a firm foundation for subsequent scale-up and long-term sustainability of the intervention. On 15 December 2008 Qualcomm notified RTI that they intended to award grant funding to RTI for implementing the Qualcomm Wireless Reach Philippines Partnership pilot project. RTI and Qualcomm finalized this grant agreement April 1, 2009.

1.7 Forming the Wireless Reach Philippines Partnership

Since being notified by Qualcomm in December 2009 that a grant would be awarded, RTI has worked with the USAID HealthGov team and the Tarlac PHO to establish contacts with TSU, Smart Communications, and the DOH to discuss this activity and begin the work of building a Wireless Reach Philippines Partnership. The purpose of this public-private partnership is to support this activity through the approximately twelve-month pilot project and, contingent on the success of the pilot, over time to extend the benefits of this system to all RHUs in Tarlac Province. Eventually we hope this system will be adopted by other provinces throughout the country. RTI has also continued to gather and analyze information about other health information system efforts in the Philippines and to broaden our contacts with other stakeholders in this sector. For example, we have shared information and engaged in discussions with the Medical Informatics Unit of the National Telehealth Center (NThC), College of Medicine, of the University of the Philippines. This is to ensure that this activity in Tarlac

[4] See www.qualcomm.com for more information.
[5] See www.alianzasguatemala.org for more information.
[6] See www.rtidemo.org/front/node/170 for more information.
[7] Third generation (3G) mobile phone networks enable cellular network operators to offer a wide range of advanced services including broadband wireless Internet connectivity.

builds on and complements other information system efforts, results in a system that can be sustained by LGUs, and has the support of the DOH.

RTI has deployed its project team on the ground to continue the work of building the partnership, and to gather the information needed to develop a detailed work plan. We hope that this document answers many questions concerning the feasibility of the proposed activity, how it relates to other health information system efforts in the Philippines, and how it will be integrated with USAID HealthGov technical assistance efforts in Tarlac Province.

2 Problem Statement

The FHSIS is the major source of data for health sector policy analysis and planning at all levels of the public health system in the Philippines. The system provides information on public health programs including the following:

- Maternal and Child Health
- Nutrition
- Family Planning
- Expanded Program on Immunization
- Dental Health
- Communicable Disease Prevention and Control (TB, Malaria, Schistosomiasis, Leprosy)
- Environmental Health
- Vital Statistics (Natality, Mortality, Population)
- Notifiable Disease Reporting

Exhibit 1 is a diagram showing the relationship between patient-level data, aggregated data reporting for vertical programs, and aggregated data for FHSIS reporting.

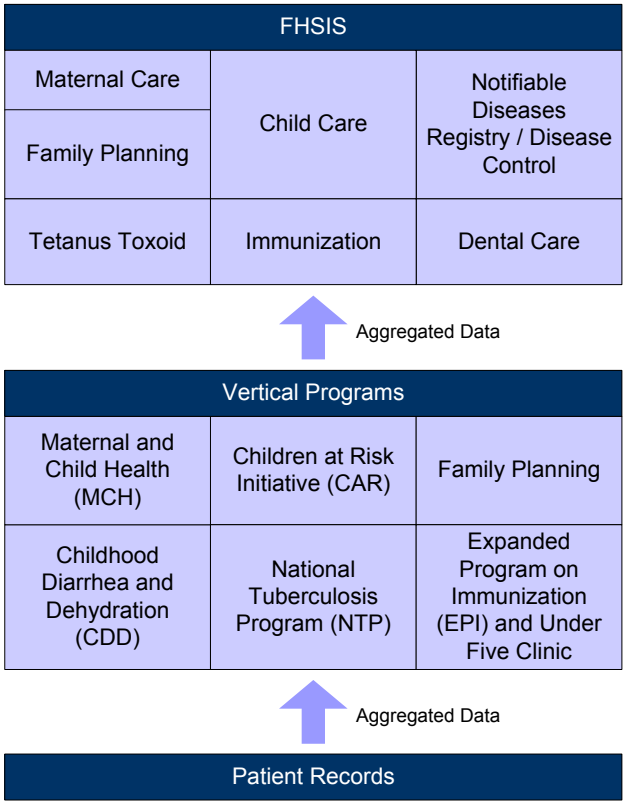
The FHSIS was conceptualized in 1987 to streamline a previous reporting system that nurses and midwives complained was overly burdensome and required time that otherwise was needed for patient care. The FHSIS was implemented nationwide in 1989. In 1991, barely a year after the national implementation of the FHSIS, the Local Government Code (LGC) transferred management and provision of health services to LGUs. In 1998 the Health Sector Reform Agenda (HSRA), carried out by the DOH, implemented the transfer of responsibilities for public health service delivery to LGUs.

Since 1991 the FHSIS has undergone several major revisions to adapt to changes brought about by the LGC and HSRA. In 2007 the FHSIS team, including regional coordinators, initiated a program to further strengthen the FHSIS. This effort included creating an indicator data dictionary, revising FHSIS recording and reporting forms, and drafting new FHSIS implementing guidelines. Efforts also included examining information needs, data transmission and processing, routine data collection, non-routine data collection, and use of information for decision making. A new version of the FHSIS software (FHSIS 2008) has been developed to incorporate changes. This version is now being rolled out to regions and provinces. Key remaining problems noted by the FHSIS team include delayed submission of reports, poor

quality data, and limited utilization by decision makers at various levels of the health care system.[8]

A study of Philippine public health information systems in 1995[9] found that manual production of required reports consumed 40% of the time of field health personnel and resulted in duplicated effort and significant delays in processing. In 2005 a study by Tolentino et al[10] in busy public health centers concluded that manual entry of patient information into multiple and often overlapping vertical program registers, laborious manual reporting procedures, and lack of feedback to clinicians, combined to negatively affect data quality and the timeliness of reporting.

Exhibit 1. Diagram showing the relationship between patient-level data, vertical health program reporting, and FHSIS reporting.



In July 2007 the Philippine Health Information Network (PHIN) published the results of a comprehensive assessment of the Philippine health information system[11], with leadership of the DOH and the support of the World Health Organization (WHO) Health Metrics Network (HMN). The HMN assessment framework uses a top-down, national-level approach based on a series of workshops that use focus group discussions to reach group consensus on scores assigned to a series of health information system assessment criteria.

The assessment identifies the FHSIS as the major source of data for the DOH. Yet nearly 60% of participating nurses and midwives cited a lack of FHSIS form supplies and noted the duplication of entries on different forms. Provincial and regional coordinators noted problems in the timeliness, completeness, and quality of data submitted to the FHSIS.

[8] Philippine Department of Health. Strengthening the Field Health Services Information System, Grand Villa, Laguna, May 16-18, 2007. DOH-NEC-PHSID July 2007.
[9] Jayasuria R. Health informatics from theory to practice: lessons from a case study in a developing country. MEDINFO95 Proceedings. Greenes et.al. (editors). IMIA 1995; pp 1603-1607.
[10] Tolentino H., Marcelo A., Marcelo P., and Marimba I. Linking Primary Care Information Systems and Public Health Vertical Programs in the Philippines: An Open-source Experience. 2005. AMIA Annu Symp Proc. 2005; 2005: 311–315. [PubMed: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1560490]
[11] The Philippines Health Information Network. Philippine Health Information System: Review and Assessment, February – Jul 2007. Health Metrics Network.

The PHIN assessment highlights the general lack of coordination, standards, and interoperability among the multitude of separate, disconnected systems used to collect, manage, and report health information. The assessment calls for a comprehensive plan and national standards to facilitate the integration of system components and reduce duplication of effort. It envisions a decentralized network of harmonized information system components built by different agencies using a common set of standards. It recommends involving LGUs in redesigning the FHSIS to better meet local needs. It emphasizes the importance of increasing the capacity of health workers to use health information. Finally, the assessment notes that few RHUs have computers or Internet connectivity, and emphasizes the need for this infrastructure, but never mentions the use of electronic medical records at the point of patient care.

The remainder of this section provides an overview of FHSIS data collection, processing, and reporting, and examines the specific case of Tarlac Province.

2.1 FHSIS Data Flow

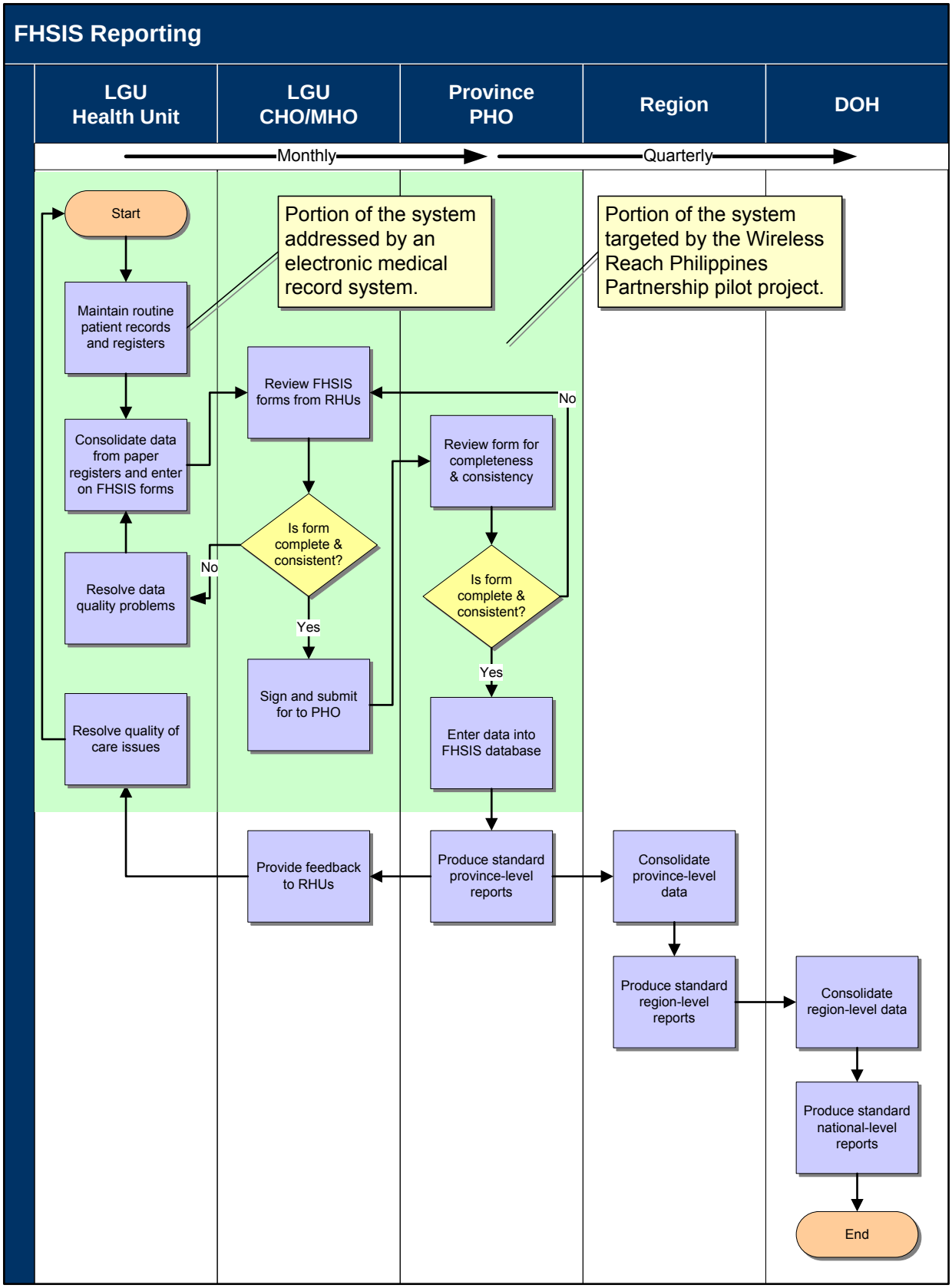
Exhibit 2 is a simplified diagram showing the flow of FHSIS data from health units to the national FHSIS annual report. Health units include barangay health stations, city and rural health units, and hospitals. Hospitals include provincial hospitals, district hospitals, military hospitals, and specialized hospitals. Provincial and district hospitals are under the supervision of the provincial government, while the municipal governments manage the rural health units and barangay health stations.

Barangay health stations and rural health units are the primary health care units in the Philippines and provide the following health care services:

- Information/education/counseling
- Well adolescent services
- Maternal and child health (MCH) services
- Family planning (FP) services
- Reproductive track infections, including HIV/AIDS and sexually transmitted infections (STI)
- Prevention and management of abortion complications (PMAC)
- Violence against women and children (VAWC)
- Mental health services
- Substance use/abuse

Exhibit 2 A simplified diagram showing the flow of data in the Field Health Service Information System (FHSIS).

- Referral to higher level facility for unmanaged cases


FHSIS Reporting
LGU Health Unit
LGU CHO/MHO
Province PHO
Region
DOH
Monthly
Quarterly
Start
Maintain routine patient records and registers
Consolidate data from paper registers and enter on FHSIS forms
Resolve data quality problems
Resolve quality of care issues
Portion of the system addressed by an electronic medical record system.
Review FHSIS forms from RHUs
Is form complete & consistent?
No
Yes
Sign and submit for to PHO
Provide feedback to RHUs
Review form for completeness & consistency
Is form complete & consistent?
No
Yes
Enter data into FHSIS database
Produce standard province-level reports
Portion of the system targeted by the Wireless Reach Philippines Partnership pilot project.
Consolidate province-level data
Produce standard region-level reports
Consolidate region-level data
Produce standard national-level reports
End

A *barangay health station* (BHS) is the smallest point-of-care facility in the public health system. It provides a wide range of primary care services and is staffed by rural health nurses and midwives. Depending on size and location staffing may also include a medical technician, a dentist, and a physician.[12] In 2007, the most recent year for which national statistics are available, there were 16,219 barangay health stations in the Philippines.[13] Each BHS serves from one to five barangays and is under the direction of a designated rural health unit.

A *rural health unit* (RHU) provides additional services beyond those provided by a barangay health station. These include simple out-patient surgical procedures, uncomplicated vaginal deliveries, laboratory services, management of the side effects and simple complications arising from contraceptive use, emergency services for mental / psychiatric cases and more advanced mental health services, and dental services. A *city health unit* (CHU) provides the same services as rural health unit, but is located in a city and may be more fully staffed. Depending on the source consulted, there are between 1,800 and 2,300 rural health units in the Philippines.

Each RHU is normally staffed by one or two doctors, from one to four nurses, a medical technician, a dentist, a dental aid, several midwives, and one or more non-technical support staff.

Each month each RHU aggregates data manually from paper registers and enters the totals onto standard FHSIS forms. RHUs also receive and aggregate data from the barangay health stations that report to them. On average a RHU may supervise twenty barangay health stations. In cities an RHU may supervise many more.

Totals are reported to the FHSIS at the RHU level. Completed FHSIS forms are then submitted to city health officers (CHOs) and municipal health officers (MHOs), where they are reviewed for completeness and consistency. Any problems detected at this level are resolved directly with the RHU. Once FHSIS forms have passed MHO review, they are signed by the MHO and submitted to the PHO. Forms are reviewed again at the PHO. Any problems that are detected at this point are resolved through the relevant MHO. Once FHSIS forms pass PHO review, the data are entered into the FHSIS database application by PHO personnel. Standard province-level and LGU-level reports are produced by the PHO. The consolidated data are then transferred to the Regional Epidemiology Surveillance Unit (RESU) of the Center for Health Development (CHD) office, where they are combined with data from other provinces in the region. Regional data are sent electronically to the DOH national office and are used to produce annual national FHSIS reports disaggregated by region, province, and city/municipality. The following section describes how this system works in practice in Tarlac Province.

2.2 FHSIS Reporting in Tarlac Province

Exhibit 3 Map showing the location of Tarlac Province in the Philippines.

[12] Health Service Protocol, Department of Health, Philippines. Accessed at http://doh.gov.ph/ayhd/htm/bhs.htm on 11 April 2009.
[13] Field Health Service Information System, Annual 2007, National Epidemiology Center, Department of Health, Manila

Exhibit 3 shows the location of Tarlac Province in Region III, Central Luzon. The USAID HealthGov project is carrying out several activities in Tarlac, including providing technical assistance for the development of the Province-wide Health Investment Plan (PHIP). In March 2008 members of the USAID HealthGov project team visited Tarlac Province to begin assessing capacity and conditions at the province and LGU level, as well as data quality and reporting problems of the FHSIS.

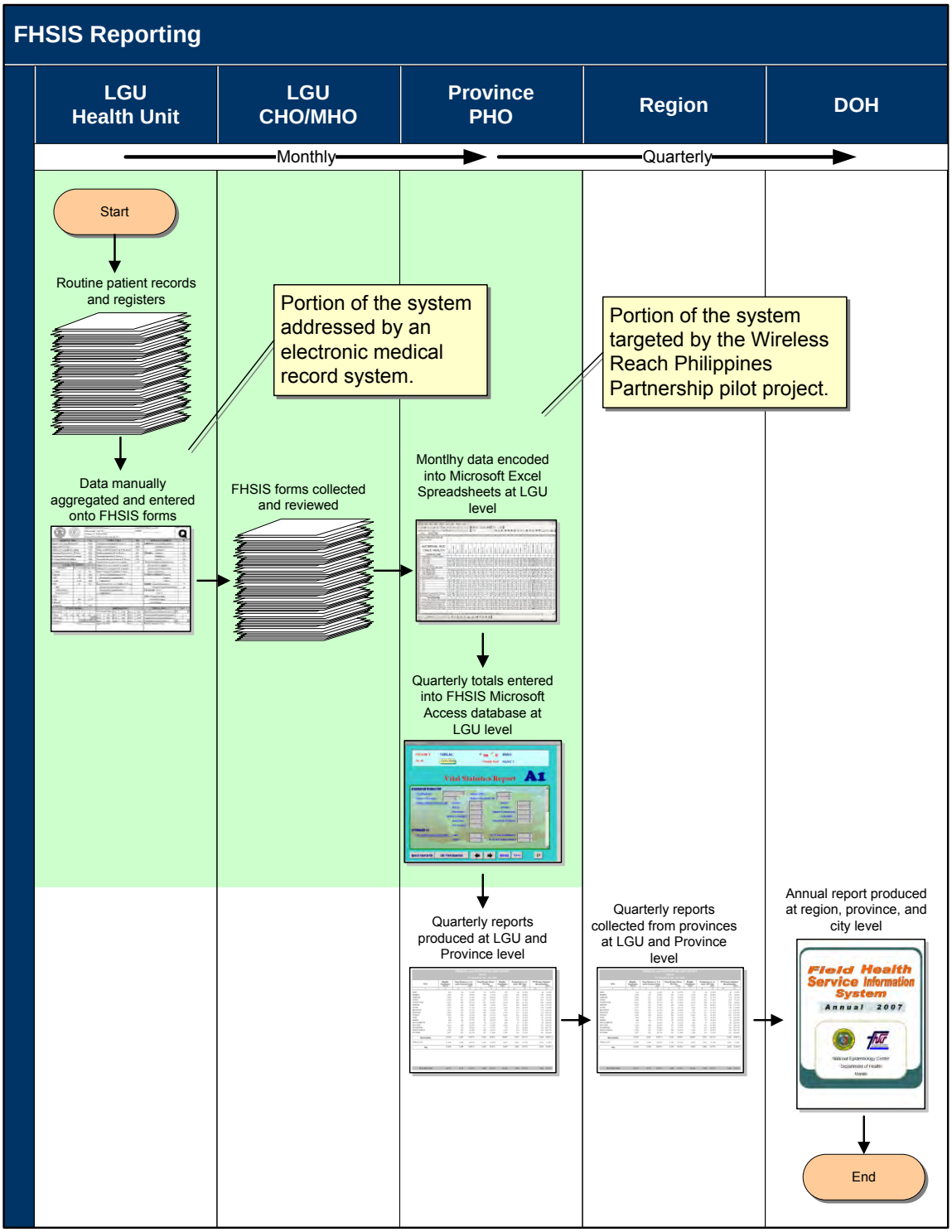
The population of approximately 1.3 million people distributed over 512 barangays is served by 187 barangay health stations[14], 36 RHUs/CHUs, two (2) district hospitals, one (1) community hospital, one (1) army station hospital, and one (1) provincial hospital. On average an RHU supervises five (5) barangay health stations. Eight (8) of the 36 RHUs have birthing rooms. These facilities are staffed by a total of 35 doctors, 27 dentists, 67 nurses, 200 midwives, and other supporting health workers. The average number of persons served by each RHU and its barangay health stations is approximately 37,000. While some RHUs are in mountainous areas far from Tarlac City, most have a fairly reliable supply of electricity and mobile cellular phone service. Nearly all nurses and midwives have cell phones[15].

Exhibit 4 shows the existing flow of data into the FHSIS from Tarlac Province. Each month nurses and midwives in each RHU are responsible for consolidating data manually from RHU paper registers and recording the consolidated monthly figures on FHSIS data collection forms. RHUs also consolidate data from BHSs that report to them. These are submitted to City Health Officers/Municipal Health Officers (CHO/MHO) who submit them to the PHO.

The PHO reports that only 60% to 70% of the 36 RHUs submit completed FHSIS forms on time. The remaining 30% to 40% must be hounded for weeks until they submit their forms. Only 60% to 70% of LGUs submit FHSIS reports to the PHO on time. For municipalities not submitting on time, reports are usually delayed by ten to fifteen days. Large distances between some municipalities and the provincial center cause some reporting delays. Problems with access to a service vehicle, absence of computers for database processing, and insufficient travel allowances seriously affect the timely submission of FHSIS reports. The PHO reports that RHUs are asked to report the same statistic to the FHSIS, to provincial coordinators, and to various vertical health programs, and often submit different values for the same data statistic. The PHO also checks incoming forms for improbable numbers. The PHO must then reconcile these data quality problems with the relevant RHU.

[14] Unpublished data from the 2008 FHSIS. The Field Health Service Information System Annual 2007 report lists 437 barangays and 169 barangay health stations in Tarlac Province.
[15] Source: Dr. Ricardo Ramos, Provincial Health Officer.

Exhibit 4. Pictorial diagram of the existing FHSIS data flow of data into the FHSIS from Tarlac Province.



Once data on FHSIS forms have passed these quality control checks, the PHO enters monthly totals into Microsoft Excel spreadsheets, which are used to calculate quarterly and annual totals for entry into the FHSIS. If FHSIS reports are complete and on-time, it takes only a day for the PHO to encode the data, but reports are incomplete and often contain questionable data. It takes weeks for the PHO to resolve these problems with some RHUs.

Data are encoded into the FHSIS Microsoft Access database application by the PHO. Data on reportable diseases are encoded into the database weekly. Other data are encoded into the database quarterly.

The Microsoft Access database application was originally developed and maintained by the DOH in Manila. It is now maintained by the DOH CHD-3 Region III Regional Epidemiology Surveillance Unit (RESU), since Region III added elements to standard FHSIS. Until March 2008 the Global Fund is paid the salary of the FHSIS data encoder. The data encoder is now paid by the PHO. The PHO uses used or recycled computers. Technical support for these computers is provided by the provincial hospital, which has a computer network. The PHO has an Internet connection that can be used to transmit quarterly FHSIS data and reports to the RESU.

The RESU combines quarterly reports from the provinces and submits quarterly reports from the region to the DOH central office in Manila. The DOH publishes an annual FHSIS report. Delays in reporting at the BHS/RHU level ripple through the system, resulting in a data lag for decision makers. Many decisions are therefore made using data that is at best three months old and at worst more than a year old. The lack of timely access to information is most critical at the point of patient care where decisions directly affect lives. For example, postpartum hemorrhaging accounts for 17%[16] of maternal mortality in the Philippines. RHUs with maternities, and even hospitals that need blood urgently for transfusions, do not have access to current information on available blood bank resources.

Improving the health information system, specifically FHSIS reporting and data quality have been part of discussions between the USAID HealthGov technical assistance team and Tarlac Province concerning the Province-wide Health Investment Plan (PIPH). In consultation with the USAID HealthGov project, the Tarlac PHO has established the objective of creating an electronic health registry for the entire Province. While Tarlac is a pilot site for the Electronic TB Registry Project of Global Fund, the use of information technology to manage health information in the Province is generally low. The USAID HealthGov Year 2 Work Plan includes project assistance to Tarlac Province in identifying tools, processes and other support systems that will help health personnel address problems in delayed reporting, analysis and utilization of health information for planning and monitoring and evaluation.

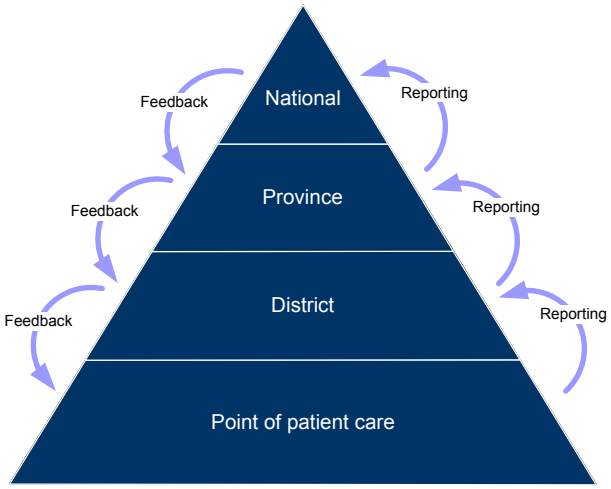
[16] Philippine Department of Health, 12 February, 2008. Accessed at http://www.doh.gov.ph/kp/statistics/maternal_deaths on 8 April 2009.

3 Problem Analysis

3.1 The National HMIS Pyramid

The health management information system (HMIS) problems described in previous sections are not unique to the Philippines. National health management systems are typically designed from the top down to meet the needs of national-level decision makers. Exhibit 5 shows a typical pyramid diagram used to illustrate the increasing aggregation of data as they are reported up through this hierarchy to the national level. Similar diagrams can be found in many HMIS papers and reports. The HMN assessment framework reflects this top-down orientation, since the driving interests are often at the international and national level. In these hierarchical systems data are periodically collected and consolidated at each level, and are then reported to the next higher level in the organizational hierarchy. This is often done quarterly. Data are normally encoded into computerized spreadsheets or databases at the district, or province level. Reporting to decision makers at each level is often very limited, and in many countries results only in a single annual statistical yearbook produced at the national level. Feedback loops in these systems are often minimal and may be limited to quarterly or even annual reports that contain aggregate data, without analysis or interpretation.

Exhibit 5 A typical national health information system pyramid diagram.



3.2 Manual Record Keeping Systems at the Point of Patient Care

Most data in these systems originate in facilities providing patient care. Record keeping systems in these facilities are normally based entirely on paper records. These include individual patient files and a multitude of registers. Unique patient identifiers are often created separately by each facility, and sometimes by different treatment programs within the same facility. Since patient identifiers and records are normally accessible only within each facility, it is nearly impossible to track patients who are treated at different facilities or for clinicians in one facility to access important patient records that may exist in other facilities. Within a facility patient information is scattered across numerous paper registers that are time consuming to maintain and make it difficult to find and cross-reference patient information. As the patient load increases, record keeping systems tend to deteriorate under pressure as clinicians focus on only the most essential tasks. Manual record keeping systems may deteriorate more rapidly than well-designed electronic record keeping systems, since manual systems are normally much less responsive to the information needs of clinicians and require more effort to maintain.

Manually aggregating data from paper records for monthly and quarterly reporting is time consuming and takes time that otherwise could be devoted to patient care. Overlapping data reporting demands from numerous vertical health programs increase the reporting effort. According to the WHO, after about 500 patients paper systems at the clinic level become

unmanageable.[17] Paper records accumulate at the point of patient care. Storage space becomes a problem, records begin to deteriorate, and historical records become difficult and eventually impossible to locate. Simple cross sectional analysis is possible, but longitudinal analysis of trends in health status and the quality of care is virtually impossible.

The information feedback loops indicated in Exhibit 5 are rarely implemented, particularly feedback to the point of patient care. Since there is rarely any feedback to clinicians that would help them improve the quality of care, there is little if any reason for clinicians to be concerned about the accuracy or timeliness of their reporting. Clinicians have been known to "manufacture" data simply to comply with reporting requirements in the least amount of time. In reality the entire pyramid shown in Exhibit 5 rests on a busy rural health nurse who is more concerned with treating patients than in the accuracy and timeliness of required monthly reporting that does not help her in her daily work.

3.3 Electronic Medical Record Systems

Electronic medical records (EMR) have the potential to better meet information needs at the point of patient care while providing higher quality data to higher level decision makers. Using an EMR system, clinicians enter patient data directly into a computerized database. Patient data can therefore be accessed quickly and easily to help improve patient care, can be shared by clinicians working in various departments within the same facility, and, using telecommunications, can even be shared securely among health care facilities. This is useful when patients visit different facilities for care, and can be used to refer patients electronically for special treatment. Since patient records are retained electronically, they take up little physical space, do not deteriorate, can be accessed easily when needed, and can be used easily for health surveillance and longitudinal analysis of the population and the quality of care. They can also be used to by clinical care supervisors to coach clinicians and to monitor the results of changes in policies and protocols.

An EMR system provides direct and immediate feedback to clinicians who are the primary source of most HMIS data. If it meets the daily needs of clinicians, it will be accepted and sustained. Clinicians are therefore motivated to ensure that data they need from the system are complete and accurate. An EMR can also save clinicians time by automating routine reporting and submitting reports electronically. The use of and EMR can therefore result in improved timeliness and quality of routine reporting to the HMIS.

The 2007 HMN-sponsored national assessment of the Philippine health information system makes no mention of electronic medical or patient records at the point of patient care. Ten years ago most public health and development professionals would have considered EMRs to be feasible only in the most developed countries. Today there are several examples at varying stages of maturity. In Sub-Saharan Africa these include the AMPATH[18] Medical Record System (AMRS) in Eldoret, Kenya, the Zambian Electronic Medical Record System (ZEPRS)[19] in

[17] Paper versus Electronic, an Interview of Chris Bailey, World Health Organization. Making the eHealth Connection, Rockefeller Foundation Bellagio Center, 2008. Accessed at http://www.youtube.com/watch?v=d6eub8Lc6Tg on 11 April 2008.
[18] The Academic Model for the Prevention and Treatment of HIV/AIDS (AMPATH) is a project under the auspices of Moi University School of Medicine and Moi Teaching and Referral Hospital.
[19] RTI was instrumental in developing ZEPRS under a subcontract to the University of Alabama Birmingham and with funding from the Bill & Melinda Gates Foundation.

Lusaka, Zambia, SmartCare[20] in Zambia, and the Baobab HIV Treatment system (BART) in Malawi. In the Philippines these include the Community Health Information Tracking System (CHITS). The most mature of these efforts are seven and eight years old. Four are electronic-first[21] systems. Two are implementations of OpenMRS[22], an effort to develop a flexible, community supported EMR using free and open source technology.

These efforts have produced important innovations and lessons in appropriate technology, local capacity building, using EMR data to improve the quality of care, and strategies for sustaining these systems. This project should build on the lessons learned and technologies developed through these existing efforts to ensure that the resulting system has the following characteristics:

- Meets the needs of clinicians
- Can be sustained by LGUs
- Can be interfaced with the FHSIS and other health information system components
- Can be scaled to meet emerging needs
- Has a broad base of national and international support

The following sections review the results of several of these efforts and how they might benefit this project.

3.4 The Zambian Electronic Perinatal Record System (ZEPRS)

RTI worked with the University of Alabama Birmingham (UAB), Lusaka Urban Health District, and Center for Infectious Disease Research in Zambia (CIDRZ) to design and implement the Zambian Electronic Perinatal Record System (ZEPRS). Launched at the beginning of 2006, ZEPRS is used by 24 clinics and one referral hospital in Lusaka to manage care for more than 270,000 perinatal patients and 96% of all births in Lusaka, a city of more than one million people.[23]

ZEPRS was designed with significant input from a team of American and Zambian clinicians. It is designed specifically for perinatal care, but can be modified without reprogramming to adapt to other needs. ZEPRS guides clinicians through clinical protocols and uses intelligent “system-generated outcomes” to alert them automatically to conditions that require special attention, including patient referral. ZEPRS includes an electronic patient referral system.

Perhaps the first and largest electronic-first medical record system in Sub-Saharan Africa, ZEPRS has been used in more than three million patient encounters. It includes a large longitudinal patient record database and an electronic patient referral and tracking system. The

[20] SmartCare was initiated in 2004 with support from the CDC in Zambia.
[21] In electronic-first medical record systems, clinicians retrieve data from and enter data to the electronic system during the course of patient care. In paper-first medical record systems clinicians retrieve data from paper reports and enter data on paper forms during the course of patient care. The data are then entered into the electronic system later, often by dedicated data entry personnel.
[22] AMRS is an implementation of OpenMRS. BART uses the OpenMRS data model, but has its own user interface developed using Ruby on Rails and other technologies. AMRS is the oldest OpenMRS implementation in Africa. BART is the largest implementation of the OpenMRS data model in Africa.
[23] See http://en.wikipedia.org/wiki/ZEPRS and www.rtidemo.org/front/node/113 for more information about ZEPRS.

large shared patient record database has proven invaluable for health surveillance, monitoring the results of health care interventions, and measuring improvements in the quality of care. The patient record database is being used to produce standard reports for the national HMIS and for the US President's Emergency Plan for AIDS Relief (PEPFAR). Exhibit 6 is a photo showing nurses learning to use ZEPRS to refer patients electronically to the University Teaching Hospital in Lusaka.

RTI has continued to enhance the free and open source EMR software developed for ZEPRS. The software, now called zcore[24], is easy to install, flexible, and scalable. It runs on Windows or Linux-based computers and has modest hardware requirements. It can be installed on a single computer and shared among several networked computers in the same facility. It can transmit data to other sites over intermittent connections, including existing mobile phone networks. In addition to being used by the large perinatal system in Lusaka, Zambia, the software, which will remain free and open source, is being used by health centers in Nairobi, Kenya, to manage antiretroviral (ARV) pharmaceutical supplies over the Telkom Kenya mobile phone network. RTI is currently adapting the software to manage treatment and care of rape survivors in South Africa.

Exhibit 6. Nurses in Lusaka, Zambia, using the Zambian Electronic Perinatal Record System to manage patient records.

ZEPRS has proven that an open source electronic-first medical record system can scale up to hundreds of thousands of patients and can be sustained for years. The zcore software that has emerged from ZEPRS offers the following features that may be useful for this project:

- Patient search box and results listing on home page
- Guides clinicians through appropriate procedures automatically
- Alerts clinicians automatically when follow up actions are needed
- Enables clinician to add comments to records
- Standard web interface practices such as automatic input validation for data
- Works in networked and stand-alone[25] mode
- Stand-alone version can synchronize with a data center over intermittent connections
- Easy configuration of forms/fields by non-programmer
- Use of software technologies that help new programmers get up to speed quickly
- Easy installation for non-technical users
- Works on Windows and Linux computers
- Free and open source software

However, in its current configuration zcore uses its own data model. It does not use a data model that has widespread international support. The current version of zcore also includes

[24] See www.rtidemo.org/zcore for more information about zcore.
[25] Can be installed and operated easily on a single computer without requiring a special server.

reports, but does not include a powerful and flexible reporting module. OpenMRS, which is discussed in the following section, offers a widely recognized data model and a powerful reporting tool.

3.5 OpenMRS

OpenMRS is a collaborative open source project to develop software to support the delivery of health care in developing countries. It is the most widely recognized free and open source electronic medical record system. OpenMRS grew out of the critical need to scale up the treatment of HIV in Africa, but was also conceived as a general purpose electronic medical record system that could support the full range of medical treatments. The system is designed for very resource poor environments. New data items, forms and reports can be added without programming. It is intended as a platform that many organizations can adopt and modify avoiding the need to develop a system from scratch.

OpenMRS is based on a "concept dictionary" that describes all the data items that can be stored in the system such as clinical findings, laboratory test results or socio-economic data. This approach avoids the need to modify the database structure to add new diseases for example, and facilitates sharing of data dictionaries between projects and sites. The modular structure of OpenMRS allows the programming of new functions without modifying the core code. OpenMRS is web based but can be deployed on a single laptop or on a large server.

OpenMRS was deployed first in Eldoret, Kenya in February 2006, followed by the Partners in Health hospital in Rwinkwavu, Rwanda in August 2006 and Richmond hospital, South Africa later that year. OpenMRS is in use in at least 14 countries mostly in Africa. Most of these installations are small in terms of numbers of patients, but a few manage more than 10,000 patient records, and the oldest, in Eldoret, Kenya, is used to manage more than 60,000 patient records.

The University of the Philippines is working with the Massachusetts Institute of Technology (MIT) and other partners to pilot test MocaMobile, a mobile phone based remote diagnostic and screening application, in conjunction with OpenMRS.

OpenMRS offers the following features that may be useful for this project:

- A proven data model based on an extensive concept dictionary
- A structure that allows additional modules to be added to the core functionality
- Can be deployed on a single computer or in a networked configuration
- Wide-spread recognition and a broad based international support community
- Works on Windows and Linux computers
- Free and open source software

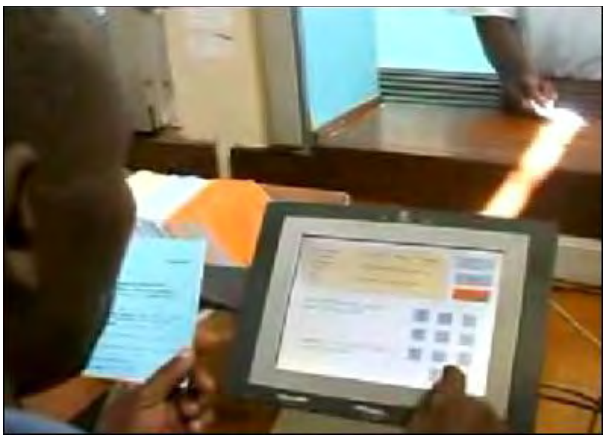
Unfortunately the current version of OpenMRS is difficult for non-technical users to install and configure. It has also been designed for data entry from paper forms. It does not lead users through clinical protocols, alert clinicians automatically to take needed follow-up actions, or enable clinicians to refer patients to other facilities electronically. Like ZEPRS and zcore, the Baobab Health Partnership has also designed an EMR to lead clinicians through health care protocols automatically. They have also demonstrated the value of using touch screen

workstations and bar coding to speed data entry and lower operating costs. This system is discussed in more detail in the following section.

3.6 Baobab Health Partnership

Baobab Health, a Malawi-based non governmental organization, has been addressing the HIV/AIDS crisis in that country for the past eight years by applying medical informatics principles to a resource-poor setting. The core of Baobab's approach is a simple "appliance" model that uses easy-to-use touch screen clinical workstations at the point of patient care. This system efficiently and accurately guides low-skilled health care workers through the diagnosis and treatment of patients according to national protocols. The system also captures timely and accurate data that is used by healthcare workers during patient visits to supplement decision making. The data are aggregated and used at a national level for policy making and analysis. This technology-dependent approach has required both hardware and software innovations, including alternative energy approaches, intuitive touch screen-based user interfaces for users with no computing experience, and low-cost information appliances that are significantly more robust in harsh environments than traditional computers. Exhibit 7 is a photo showing a worker using the touch screen system to register a patient. To date more than 800,000 patients have been registered and over 18,000 receive HIV care facilitated by a Baobab system.

Exhibit 7. Registering a patient using the Boabab touch screen system.



The Baobab system offers the following features that may be useful for this project:

- A proven touchscreen "appliance approach for clinical workstations that is easy to use, speeds data entry, and reduces operating costs
- Use of the widely recognized OpenMRS data model
- Use of bar coding to speed patient identification
- Use of easily produced paper patient "passports" for some record portability
- Innovative alternatives to electrical power from the utility grid
- A proven system for developing local technical development and support capacity
- Free and open source software

At least some of these innovations could be adapted for use in the Philippines. The EMR system discussed in the following section is already in use in the Philippines and can contribute valuable experience and insights into the design of this project.

3.7 The Community Health Information Tracking System (CHITS)

The Community Health Information Tracking System (CHITS) is an electronic-first electronic health record system designed for public health centers in the Philippines. It was developed by a team lead by Dr. Herman Tolentino of the Medical Informatics Unit of the National Telehealth

Center, College of Medicine, of the University of the Philippines. CHITS is the flagship electronic medical records project of the National Telehealth Center.

CHITS was first implemented in 2004 through grants from the Canadian International Development Research Centre: International (IDRC) Panasia ICT Project and the UNDP. After three years CHITS is still working in Lagrosa and Malibay health centers in Manila. While the project appeared to stall after the end of the initial IDRC project in 2005, CHITS has gained increasing interest among LGUs in 2007 and 2008, and the number of deployments is increasing. To date CHITS has been installed in a total of 18 health centers.

Similar to OpenMRS, CHITS has been implemented as an open source web-based application that can be installed on a single computer or used in a networked configuration. The software was built on a framework that makes it easy for programmers to add new modules to the system. The software can be use to generate many of the standard monthly reports required by the FHSIS. CHITS incorporates several international standards, including the WHO International Classification of Diseases (ICD-10)

The National Telehealth Center has developed a system for deploying CHITS in LGUs that includes a readiness checklist. The National Telehealth Center notes that Inter-Local Health Zones (ILHZ) might lower the deployment and operating costs of and electronic medical record system by sharing resources.

The CHITS system offers the following features that may be useful for this project:

- Support of the National Telehealth Center
- A well-developed training and certification system
- Significant experience introducing an EMR into health centers in the Philippines
- At least two reference installations in the Philippines
- An understanding of EMR integration with vertical health programs in the Philippines

The CHITS software is currently being maintained by a single developer. In its current version it is not easy to install and could be improved technologically. It does not guide clinicians through clinical protocols or include intelligent system-generated outcomes or alerts. It also does not include a data transmission or electronic referral system. Like zcore, it uses its own data model rather than a more widely-recognized data model such as OpenMRS. Also, while CHITS has achieved some success and gathered increasing interest and support from LGUs, it still lacks the official endorsement of the DOH.

However, and perhaps most importantly, CHITS has been designed in the Philippines to meet local needs and considering local culture. It incorporates important lessons learned, has been successfully deployed and sustained, is accompanied by a training and certification program, and is a sound technical platform on which to build. Technical upgrades and innovations from other international projects could be incorporated into the software over time.

3.8 Applicability to the Philippines

The examples discussed in previous sections demonstrate the feasibility of electronic records in less developed countries. Each of these examples highlights important innovations and strategies. Since several of these examples are from Africa, it is also important to recognize

unique characteristics of the Philippines that should be considered in developing project strategy. These include the following:

- A landmass consisting of more than 7,000 islands
- A devolved public health care system in which LGUs are responsible for managing and providing local public healthcare services.
- The concept of Inter-Local Health Zones (ILHZ)[26] that enable LGUs to band together to achieve health reforms through integrated governance, management, financing, resource sharing.
- A two-tier primary health care delivery system consisting of barangay health stations and city and rural health units.
- Rapid turn-over of clinicians due to emigration.
- Mobile phone coverage for more than 90% of the population.
- Excellent access to information technology in major cities.

Several of these characteristics suggest that some technologies and strategies that have proven successful in Africa may also be useful in the Philippines. They also suggest that opportunities for scale up and sustainability are better in the Philippines than in many African countries. An approach that builds on the knowledge, experience, and momentum of CHITS, including the training and certification system, and over time injects some of the strongest attributes of zcore, OpenMRS, the Baobab Health Partnership, and other related efforts, could meet the objectives of this project and build a firm foundation for scale-up and sustainability in the Philippines.

3.9 The Roles of National and International Organizations

Efforts to introduce electronic medical records also highlight weaknesses and gaps in interoperability between systems and weaknesses in national standards. This includes whether national governments have developed and maintained essential national coding standards, such as patient and facility identifiers, minimum data sets, and national data codebooks. These examples also raise questions concerning the capacity of national governments to foster effective scale-up, and highlight the failure of donors to support such critical elements that cut across vertical donor assistance programs. The devolution of health services in the Philippines has changed the roles of national and local governments with respect to health information systems.

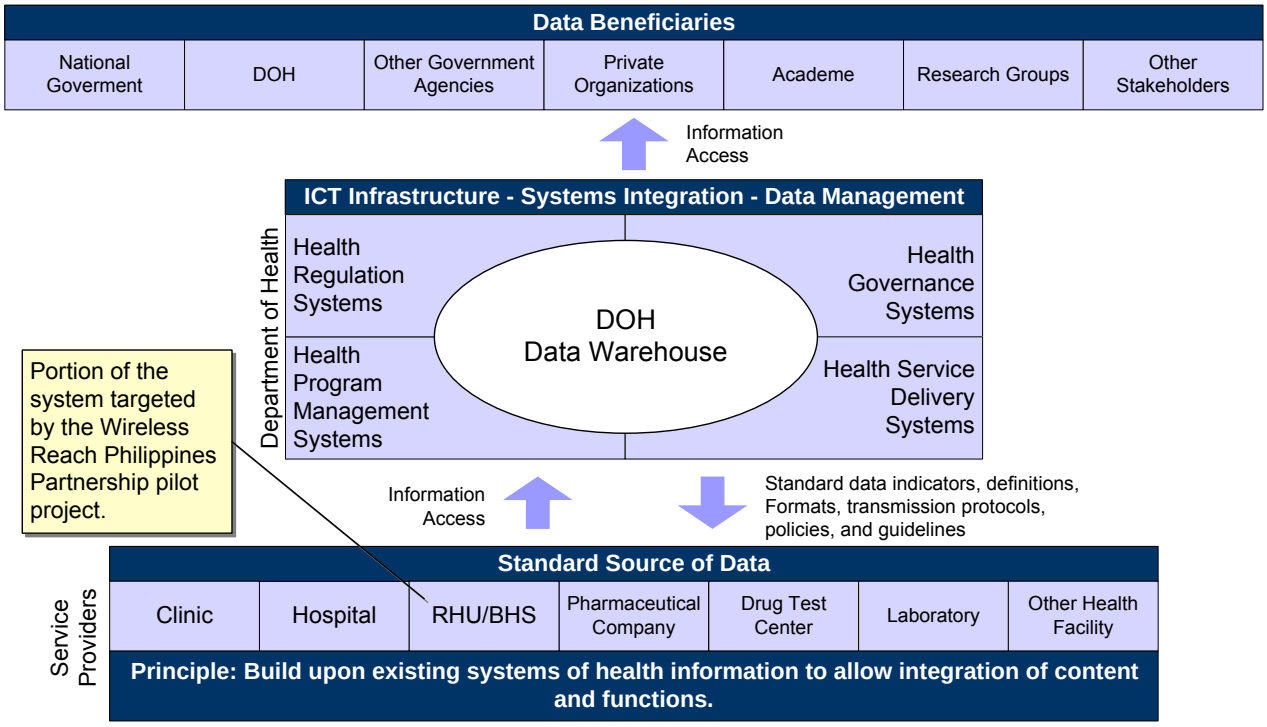
A 2003 study concluded that the devolution of health services in the Philippines resulted in a breakdown in management systems between levels of government and weakening of the patient referral system.[27] The 2007 review and assessment of the Philippine national health information system conducted through the Philippine Health Information Network (PHIN)[28] emphasizes the pivotal role to be played by the DOH, National Statistics Office, and the National Statistical Coordination Board in developing, maintaining, and promoting the use of

[26] An ILHZ is a well-defined geographic area where individuals, communities and all other health care providers participate in providing quality, equitable and accessible health care with inter-LGU partnership as the basic framework.
[27] Gundy J., Healy V., Gorgolon L., Sandig, E., Overview of devolution in the Philippines. The International Electronic Journal of Rural and Remote Health Research, Education, Practice and Policy, 2003.
[28] The Philippine Health Information Network includes national government agencies and international organizations and donors

technical standards that facilitate the interoperation of various health information system components. The need for maintaining such coding systems at the national level becomes apparent as efforts increase to connect various health information system components electronically. The need for such national standards in the Philippines was recognized as early as 1999.[29]

Under FOURmula ONE (F1) for Health, the DOH established a Unified Health Management Information System website to disseminate information concerning health information system components developed by the DOH.[30] Work towards establishing a coherent national level health information system received new emphasis with the establishment of PHIN in 2007. The objective of PHIN is to develop a coherent national health information system road map to guide local stakeholders working to develop health information systems that meet local needs and that could contribute valuate data for use by decision makers at the regional and national level. Exhibit 8 is a DOH diagram of the national health information system strategic framework. In the absence of such guidance and coordination, stakeholders at all levels will continue to develop parallel and overlapping systems that cannot interoperate as components within a coherent national health information system. The diagram in Exhibit 8 appears to imply that the flow of standards is down and the flow of data is up, since all data beneficiaries appear at the top of the diagram. It is important to recognize that beneficiaries also include clinicians in barangay health

Exhibit 8. Department of Health diagram of the Philippine National Health Information System Strategic Framework.



[29] The Standards for Health Information in the Philippines (SHIP-DE1-19990712), The Study Group on Standards for Health Information, National Institutes of Health, University of the Philippines, Program on Computer Research in Information Technology (CRIT), 1999.
[30] Accessed at http://umis.doh.gov.ph/uhmis/index.php?option=com_frontpage&Itemid=1 on 1 May 2009.

stations, RHUs, and other health units shown at the bottom of the diagram. An EMR system is designed to provide useful information directly to these beneficiaries, while also improving the timeliness and quality of data reporting to beneficiaries at higher levels.

Meeting the challenge of treating clinicians as primary data users is essential to providing better quality data to national level decision makers. Meeting the challenge of providing essential interoperability standards and helping to coordinate the work of external health information system developers are necessary to produce an integrated national health information system. Several international organizations have been formed as forums for public health and health informatics practitioners to share information about meeting these challenges.

The Global Partnership for Public Health Informatics (GPPHI)[31] is a global effort to bring theorists and implementers together to meet these challenges internationally. Many GPPHI partners are working to advance efforts to develop and deploy EMRS that have a direct impact on the quality of health care while providing better quality and more timely data to national health management information systems. While the GPPHI has succeeded in sharpening focus on some of these issues, a significant gap remains between high-level theorists and standards bodies, such as the WHO, and those designing and implementing systems on the ground. RTI has joined the GPPHI to help contribute to sustainable solutions to these challenges.

USAID can play an important role in the Philippines by helping to support an effort to develop a scalable and sustainable electronic medical record system that can meet the needs of thousands of barangay health stations and rural health units and be supported by LGUs and the DOH. This system should build on lessons learned and technologies developed in the Philippines and in other countries. It should be used as a catalyst to encourage the development of national coding standards that facilitate the interoperability of health information system components and the secure flow of data between systems. The resulting system should improve the quality of care and dramatically improve the quality and timeliness of data available to decision makers at all levels of the public health care system.

4 Project Objectives

This project will achieve results in support of USAID Strategic Objective 3 (SO3), which is as follows:

> *USAID SO3: Improved Family Health Sustainably Achieved*.

Specially, this project is targeted at producing better quality and more timely information for health planning and budgeting, and will support HealthGov activities designed to better integrate these functions into local governance. It is designed to engage pilot LGUs and at least one local technical assistance provider organization to help improve the quality of public health services. Finally, it aims to institutionalize a multi-stakeholder coordination mechanism at the provincial level for participatory planning, leveraging resources, and sharing best practices.

This project will directly support the following HealthGov Intermediate Result (IR)

[31] http://www.gpphi.org/

IR 1.1: Strengthening LGU Management Systems.

The HealthGov Year 2 Work Plan includes project assistance to Tarlac Province targeted at achieving this intermediate result. This includes helping to identify tools, processes and other support systems that will reduce delays in reporting and improve the analysis and utilization of health information. These measures are needed to help LGUs to improve their ability to use HMIS information to diagnose priority problems. The Wireless Reach Philippines Partnership fits within this component of the HealthGov Year 2 Work Plan. It will contribute to HealthGov IR 1.1 by helping by improving the timeliness and accuracy of data reporting to the FHSIS from barangay health stations and rural health units.

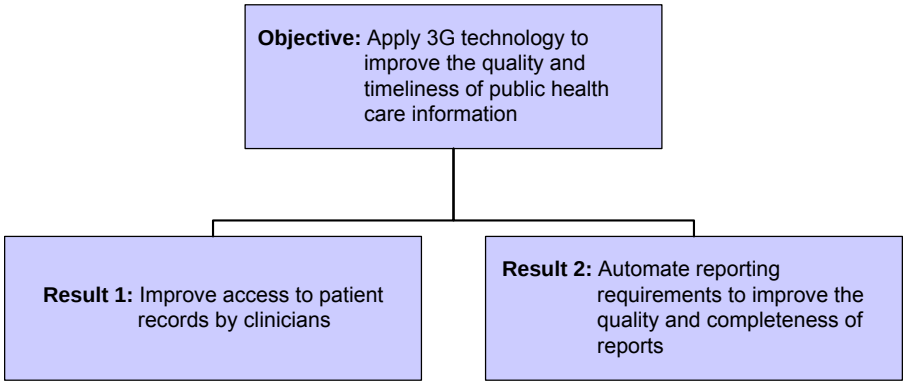
Projects supported by Qualcomm's Wireless Reach initiative must meet the following objectives:

- Showcase Qualcomm technology
- Involve partners including a local 3G operator and a non-governmental organization (NGO) to manage the project
- Meet a community need
- Be in line with the local government's Information and Communications Technology (ICT), education, health care, environmental and/or other relevant policy goals
- Include a sustainability plan for continuation of the project after funding ends

In addition, Wireless Reach projects are intended to enhance Qualcomm's image and strengthen Qualcomm's customer relationships to expand the market for Qualcomm's advanced wireless telecommunication technologies.

This Wireless Reach Philippines Partnership project has been designed to contribute to the results of the USAID HealthGov project and to meet the objectives of the Qualcomm Wireless Reach initiative. Exhibit 9 shows an illustrative project results framework for the Wireless Reach Philippines Partnership.

Exhibit 9 Pictorial diagram of an illustrative project results framework.



The solution developed and pilot tested by this project should contribute to meeting the health information needs of decision makers. If this system is scaled up, it should improve the quality and timeliness of FHSIS data at provincial, regional, and national levels. Time and funding constraints on this project limit it to developing and testing a solution within a few RHUs. However, the project should lay a firm foundation that can be scaled to support improved data

management, use, and reporting from health units throughout the country. Exhibit 10 describes the benefits of such a system to decision makers at various levels

Exhibit 10. Table of project benefits to decision makers.

Decision Makers	Benefit
Clinicians in Barangay Health Stations and Rural Health Units (BHS/RHU)	▪ Clinicians have quick access to patient information ▪ Clinicians are guided through patient care protocols ▪ Clinicians are alerted automatically to conditions that require follow up or referral ▪ Patient referral information can be transferred electronically ▪ Aggregate information from barangay health stations can be entered for analysis and reporting ▪ FHSIS monthly and quarterly reports are generated automatically ▪ Reports are transmitted electronically ▪ Time saved can be reallocated to patient care
City/Municipal Health Officers (CHO/MHO)	▪ Reports are received on time and in electronic form ▪ Data from rural health units do not need to be encoded from paper forms ▪ Data can be preserved and analyzed at the barangay health station level ▪ Data can be analyzed immediately ▪ Data can be analyzed at the barangay level ▪ Data are aggregated automatically for FHSIS reporting ▪ FHSIS monthly and quarterly reports are generated automatically ▪ Reports are transmitted electronically
Provincial Health Office (PHO)	▪ Reports are received electronically and on time ▪ Data from city/municipal health officers do not need to be encoded from paper forms ▪ Data can be preserved and analyzed at the barangay health station level ▪ Data can be analyzed immediately ▪ Data are aggregated automatically for FHSIS reporting ▪ FHSIS monthly and quarterly reports are generated automatically ▪ Reports are transmitted electronically
Regional Epidemiology Surveillance Unit (RESU)	▪ Reports are received electronically and on time ▪ FHSIS quarterly reports are generated automatically ▪ Data can be received and analyzed at more frequent intervals (e.g. monthly) ▪ Reports are transmitted electronically
Department of Health (DOH)	▪ Reports are received electronically and on time ▪ FHSIS reports are generated automatically ▪ FHSIS data can be made available at the LGU level, and even at the health unit level ▪ Data can be received, analyzed, and published at more frequent intervals (e.g. quarterly or even monthly)

Many of the benefits listed in Exhibit 6 will only be realized when most health units are able to manage and report data electronically. Pilot RHUs will benefit directly if this pilot project is successful. The PHO will benefit if the system is subsequently scaled up to most RHUs in the province. The region will benefit if the system is deployed to other provinces in the region, and the DOH will benefit if the system is adapted by most regions of the country. Therefore a strategy that offers LGUs an affordable, locally sustainable system endorsed by the DOH is fundamental to ultimately achieving national-level results. The Qualcomm Wireless Reach Philippines Partnership project is the first step in achieving this goal. This project is designed to demonstrate that this can be done by building on existing open source software and Qualcomm 3G wireless technology. The following section describes the proposed solution in more detail.

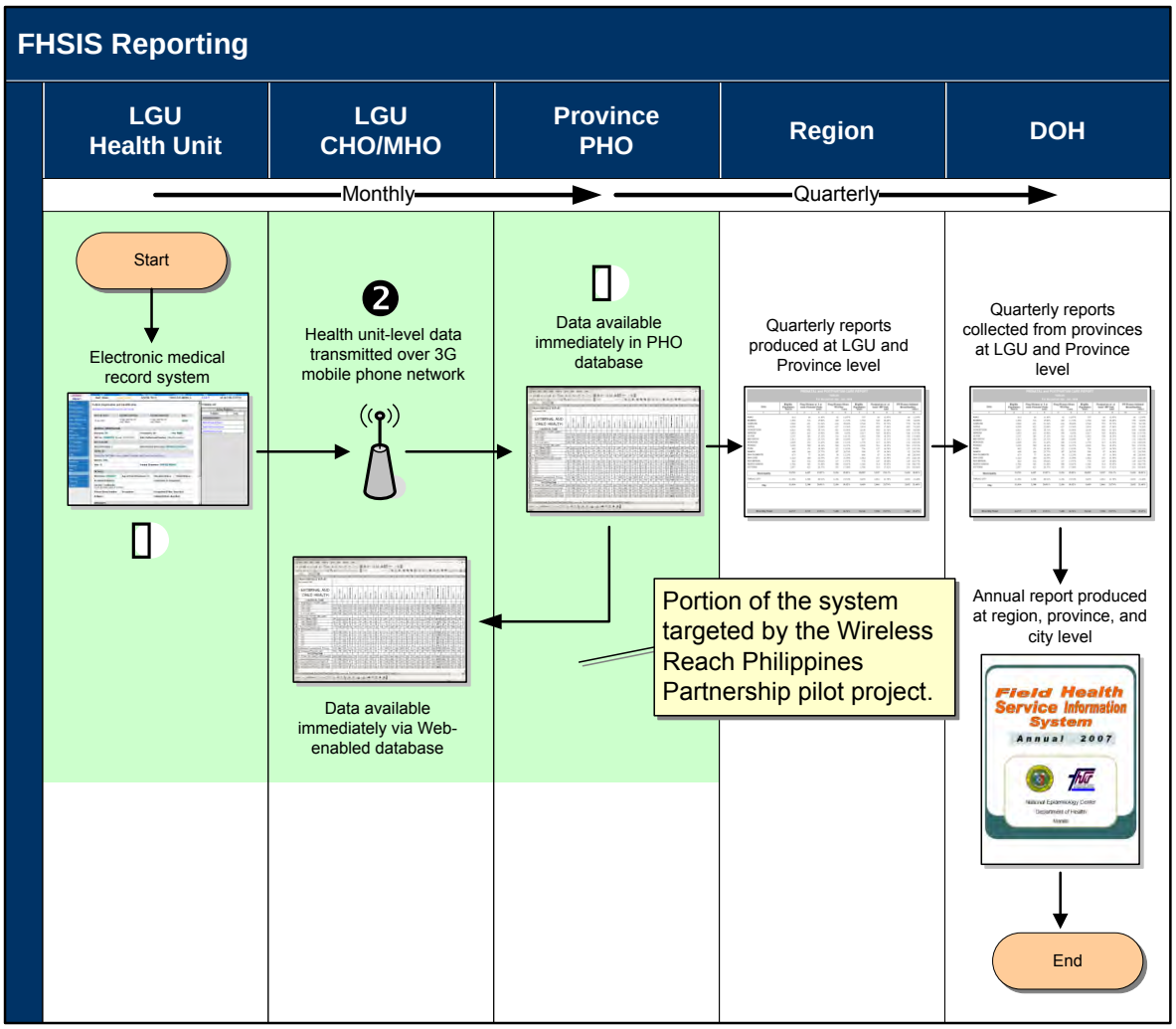
5 Proposed Solution

This project will help a local partner to use existing free and open source software to meet the routine record-keeping needs of RHUs in the Philippines and to use Qualcomm 3G wireless technology to transmit data over an existing mobile phone network from RHUs to the PHO to meet the routine data reporting requirements of the FHSIS. The solution consists of the following three major components:

1. An electronic medical record system for use in RHUs
2. A system for transmitting FHSIS reporting data from RHUs to the PHO
3. A system that enables the PHO to receive data electronically from RHUs for analysis and reporting

Exhibit 11 shows how these three major components relate to and are integrated with FHSIS reporting. Compared with Exhibit 4, which shows the existing FHSIS reporting system in Tarlac Province, the differences shown in Exhibit 11 are significant. Each of the three components of the solution is discussed in more detail below. It should be noted that this general configuration may be modified to meet needs and challenges that emerge during the pilot project.

Exhibit 11. Pictorial diagram showing FHSIS data flow with an electronic medical record system.



5.1 Electronic Medical Record System for RHUs

As shown in Exhibit 11, clinicians in RHUs will maintain patient records electronically using some type of computer.[32] This system will provide immediate and direct feedback to clinicians, guiding them through clinical protocols and alerting them to conditions that require follow up or referral. This system will eliminate most of the problems associated with maintaining this information using paper records, and will eliminate the time consuming, labor intensive task of manually compiling monthly FHSIS reports. This system will not entirely eliminate the need for paper in RHUs Experience on similar projects indicates that a paper patient summary record or "patient passport" may facilitate patient identification, provide some patient portability between facilities, and provide some measure of backup for the electronic system.

[32] The specific type of computer will be selected in the design phase, but could be a low-power computing appliance similar to the approach taken by the Baobab Health Partnership in Malawi. Experience indicates that this could reduce initial costs, electrical power requirements, and operating cost, as well as improve data security.

A good electronic medical record system is designed to guide clinicians through procedures that include the following:

- Locating a patient record
- Registering a new patient, including assigning a unique patient identifier
- Updating patient demographics and contact information
- Reviewing and updating patient medical history, status, and outstanding problems
- Recording patient vital signs
- Maintaining patient information on family planning method acceptance and adherence
- Recording patient data for routine antenatal visits, including procedures, such as ultrasound
- Recording laboratory test requests and results, including HIV/AIDS status and CD4 counts
- Maintaining patient records of disease diagnosis, including diseases that require the notification of higher authorities (reportable diseases)
- Maintaining patient records for antiretroviral therapy
- Dispensing pharmaceuticals
- Recording and verifying immunizations
- Recording and reporting reportable diseases
- Maintaining records for maternity problem and labor visits, including use of the WHO partograph during delivery
- Recording essential post-delivery patient and infant summary data
- Recording other patient treatment, including clinical notes
- Maintaining electronic links between mother and child records
- Maintaining weight and grow records for infants and children
- Managing patient appointments, including appointments for perinatal care and ARV treatment
- Referring patients to another facility
- Generating standard reports for health and health care surveillance, and as required for the HMIS (FHSIS) and special vertical programs, such as HIV/AIDS, malaria, and tuberculosis

Other functions that can be added to such a system include the following:

- An electronic referral system that transmits patient information automatically to referral facilities and tracks patient referrals
- Integration with an electronic laboratory information system, enabling laboratory test results to be entered into patient records automatically
- A patient notification and reminder system using data communication over the mobile phone network
- A system that enables community health workers to collect data using mobile phones and transmit these data to the patient record database using the mobile phone network
- A telemedicine system that enables nurses in remote health units to consult with physicians located in hospitals, and for remote physicians to access patient data
- Point of care testing modules to demonstrate test performance, document test interpretation, and guide post-test counseling.

- Medication adherence modules to guide health providers and their clients through the development of individual adherence plans, and provide visual feedback of biological outcomes.
- Health promotion modules to guide health providers and their clients through brief effective behavior change counseling.

Designing, developing, and testing an electronic medical record system is an enormous task. It includes special considerations, such as patient privacy, data security, and data backup. Clinicians must be involved at every phase of design, development, and testing to ensure the system meets their needs. The resulting system must meet the needs of clinicians or they will actively resist rather than readily adopt it.

5.1.1 Building on Existing Systems

The Qualcomm Wireless Reach Philippines Partnership does not have the resources to develop such a system from the beginning during the twelve-month pilot project. Instead, this pilot project must adapt or build on an existing system. As described previously in this document, there are several existing open source electronic medical record systems that could be adapted to meet the needs of RHUs. Also, this pilot project may not have the resources to implement all of the functions listed above. Functions may need to be prioritized and implemented based on whether the contribute data to the FHSIS. The underlying software architecture, however, should support the implementation of other functions as additional resources become available for development, testing, and deployment. The specific electronic medical record system platform and functions to be implemented under this pilot project will be selected based on information collected and discussions held with stakeholders by the project team during their initial trip.

As described in Section 3.7, significant effort has been invested in developing and adapting CHITS to routine record keeping needs of health centers in the Philippines. To date the system has been installed in 18 health centers. The National Telehealth Center has developed a CHITS training and certification program and a framework for deploying CHITS through LGUs. While the software technology needs to be upgraded, and the system could benefit from many innovations introduced by zcore, OpenMRS, and the Baobab Health Partnership, CHITS is a local foundation on which to build and already has some measure of local support and momentum. As explained later in Section 12 of this document, adopting CHITS significantly reduces the risk that the project will fail due to a major gap between technical conception and the reality in RHUs.

The project will build on the existing CHITS software by adding the necessary data communications module to transmit data over the mobile phone network to the PHO. The project will also help to develop a longer-term roadmap for CHITS development beyond this pilot project. These may include the following enhancements:

- System generated outcomes
- Electronic referrals
- Use of touch screen displays
- Use of bar coding
- Integration of mobile phone data collection for community health workers
- Use of the OpenMRS data model

Adding these enhancements will incorporate innovations from other efforts (OpenMRS, ZEPRS/zcore, Baobab Health Partnership, MocaMobile, ComCare) that will make the system easier and more efficient to use, increase the positive impact of the system on the quality of care, enable the system to interoperate with other health information system components, and broaden sources of technical support. The decision to use an open source software model for this project is consistent with project objectives. The software will not and will never require LGUs or anyone else to pay software licensing fees. Also, local technical assistance providers around the country can collaborate with each other and the DOH to continue to enhance and support the software.

5.1.2 Engaging a Local Technical Assistance Provider

The Medical Informatics Unit of the National Telehealth Center, University of the Philippines, could work with the DOH to coordinate a growing network of local technical assistance providers. . These may be provincial or regional universities with computer science or information technology programs. The CHITS effort has already developed a plan to develop regional CHITS “reference centers” in partnership with regional universities. For this pilot project in Tarlac Province we selected Tarlac State University (TSU), which has a strong College of Computer Sciences. This project will provide grant funding and technical assistance to TSU to upgrade the CHITS software. The most significant enhancement will be the ability to transmit routine FHSIS reporting data to the PHO over the existing mobile phone network. TSU will carry out this work as part of the CHITS open source project and as a learning opportunity for students in the TSU College of Computer Sciences.

5.1.3 Introducing the Electronic Medical Record System into RHUs

In partnership with two (2) LGUs, this pilot project will introduce this electronic medical record system on a single computer in each of four (4) pilot RHUs. The system will be designed so that it can be expanded later within each health unit by adding computers, interconnecting them via a wired or wireless computer network. These computers could be placed at various strategic locations around the facility. For example, one computer might be placed at the point of patient registration, another outside a patient examination area, and another in the pharmaceutical dispensary. These computers would share a common patient record database via the local area network within the health unit.

5.1.4 Collecting Data from Barangay Health Stations

The same system could be implemented in at least some barangay health stations, depending on infrastructure, personnel training, and the ability of the LGU to support these installations. This project focuses on RHUs because they are more likely to have the infrastructure to support an electronic system, they provide more advanced services, including in some cases maternities, and they currently consolidate data from barangay health stations. Also, LGUs are more likely to be able to support the introduction of electronic record keeping systems at this level, since there are far fewer RHUs than barangay health stations.

The collection of data from barangay health stations by RHUs is an issue that needs to be resolved. RHUs currently collect and aggregate these data monthly, adding them to their own in monthly reporting. The PHO therefore does not have access to data at the barangay health station level. The electronic system can improve on this by enabling RHUs to enter data from barangay health stations monthly. The system would retain the link between the data and each

barangay health station. This would enable the LGU and the PHO to analyze and report data at the barangay health station level.

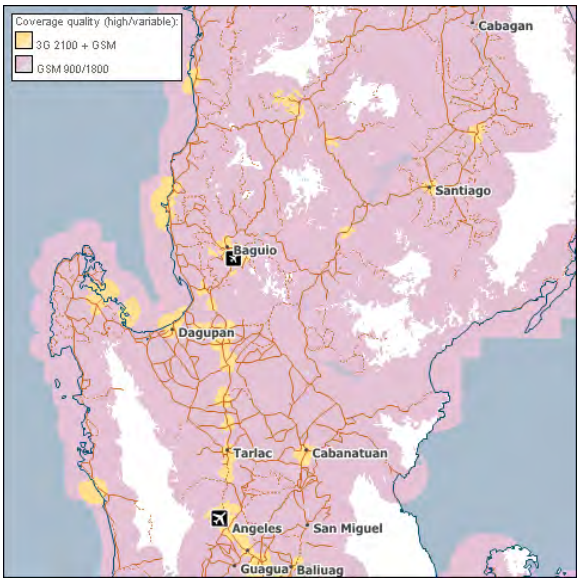
5.2 Transmitting FHSIS Reporting Data to the PHO

As shown in Exhibit 11, clinicians in RHUs will use the electronic medical record system to generate FHSIS reports automatically. This will eliminate the labor-intensive and time consuming task of manually compiling monthly reports. The system will then transmit these reports to a server at the PHO electronically over the existing mobile phone network using 3G mobile phone technology. This will eliminate the need for reports to be transported physically to the PHO. The following section explains 3G wireless technology and why it is important to this project and prospects for scaling this system nation-wide.

5.2.1 3G Wireless Technology

Initially, cellular phone technology simply replicated the traditional telephone experience outside of the home or office. As cellular phone providers added more users to their network they began using digital technology to compress the sounds that were being transmitted wirelessly and realize more capacity from their networks. A byproduct of using digital technology was the ability to send short digital messages (SMS), which soon became a popular method of inexpensive communication. This progression from analog to digital represents the first two major phases of commercial wireless communications. 3G is the next generation (3G stands for Third Generation) of wireless technology, and its focus is the efficient transport of all types of data, as opposed to simply voice communications. This means emails, digital photographs, video - pretty much everything available via the Internet can now be transmitted over a 3G network.

Exhibit 12 Smart Communications mobile phone coverage in central Luzon.[33]



Developing countries, including the Philippines, have embraced 3G technology. It has allowed them to acquire first world communications capabilities without having to build a copper and fiber infrastructure, which is more expensive and complex to roll out. As a result, the Philippines, and many other places like it have effectively leapfrogged this time consuming and costly step. In fact, because the marginal utility of gaining communication capability is so much higher in developing countries than developed, it is commonplace to find developing countries with more advanced wireless networks than more developed countries. This is certainly true in the Philippines, where three competing wireless providers, Smart, Globe, and Sun have already rolled out 3G technology. The United States, meanwhile is still in the process of rolling out 3G, partially because companies like AT&T and T-Mobile had already invested in older technologies and also because "broadband" data infrastructure already existed - even if it was only available to computers and not mobile phones.

[33] GSM Association.

As a result, the Philippines has a robust and capable communications network. For example, Exhibit 12 shows existing Smart Communications network coverage in central Luzon. This network can be leveraged for many things, but this proposal aims to use it to improve reporting from RHUs. By using the 3G wireless network to both capture data at the point of patient care as well as provide data back to the caregiver, the project expects to improve the timeliness, accuracy and use of data at the rural health center level. Specifically the 3G wireless network will enable health data to move quickly and efficiently from health care provider up the provincial level and even back down again when appropriate. Because the 3G wireless network is widely available in the Philippines, and because of the focus improving reporting to the national FHSIS report, we hope the project will be easy to replicate and relevant throughout the country.

5.3 Receiving Data Electronically at the PHO

As shown in Exhibit 11, the Tarlac PHO will receive data transmitted by RHUs. Data transmitted under this pilot project will consist of FHSIS reporting data. In the future data transmissions could include other useful data from and between health units, including, for example, patient referral data. Data transmissions will be received over the existing PHO Internet connection by a database server provided by the pilot project. These data can then be made available to LGU decision makers, imported into the FHSIS database, and used to generate quarterly FHSIS reports automatically.

Exhibit 13. A nurse in Nairobi, Kenya, manages pharmaceutical supplies electronically and transmits reports to the supply warehouse over an existing 3G mobile phone network.

Other countries have shown that even sensitive health data can be transmitted reasonably securely over 3G wireless networks. Exhibit 13 is a photo showing a nurse in a health center in Nairobi, Kenya. She is using a system developed by RTI to manage pharmaceutical supplies and to transmit routine reports to the central warehouse over an existing 3G mobile phone network. This pilot project will demonstrate the feasibility of this data transmission method in the Philippines. This data transmission system could be expanded later to provide real-time infectious disease reporting and electronic patient referrals.

6 Relationships with other Systems

The recent national level assessment of health information systems in the Philippines highlights the need to improve coordination, standards, and interoperability among the multitude of separate, disconnected systems.[34] The electronic medical record system to be pilot tested by the Qualcomm Wireless Reach Philippines Partnership will help improve this situation by developing an electronic medical record system for RHUs that connects to the FHSIS electronically. There are many other separate health-related information systems in the

[34] The Philippines Health Information Network. Philippine Health Information System: Review and Assessment, February – Jul 2007. Health Metrics Network.

Philippines. These have been created at the national level, as well as at the regional and provincial levels.

6.1.1 Information Systems Developed by the DOH

In addition to the FHSIS, the DOH has developed many other separate health information systems to meet various needs. The table shown in Exhibit 14 lists these systems. With the exception of the National Electronic Disease Surveillance System (NEDSS), which has been developed by the US Centers for Disease Control (CDC), these software applications have been developed by the DOH. The FHSIS has been implemented nation-wide. Most of the other systems have been pilot tested at a few sites, and some have not yet been deployed. These systems use a wide variety of software technologies. A few can generate standard reports or transfer data electronically to the FHSIS, but published documents indicate that most of these systems are self-contained.

Exhibit 14. Table of Philippine Department of Health information systems

Name of System	Function	Target Users	Status
Dialysis Licensing Information System	Automate application, inspection, license, and issuance functions for dialysis clinics	Health System Administrative Managers	
Hospital Operations and Management Information System (HOMIS)	Patient medical records, admitting, billing, cashier, PHIC, Medical records, wards, laboratory, pharmacy, outpatient, radiology, emergency. Also personnel info system, Logistics Management info system, and electronic New Government Accounting System (eNGAS)	Hospital Clinicians and Managers	Installed and implemented in forty-two (42) government hospitals. Most implemented only the Patient Management Module only due to insufficient funds for computing infrastructure.
Health Human Resource Information System	Maintains database of HHR skills, training, educational background, matching required competencies to individual's skills. Used to monitor human resource and training needs and to identify gaps.	District Health Officer	
Integrated Blood Bank Information System	Connects network of national blood centers to share a registry of blood donors and blood stock inventory	Hospitals, Red Cross, National Voluntary Blood Services	Not implemented
Infectious Disease Data Management Project	Captures and analyzes data on the incidence of tuberculosis (TB) and rabies in rural health units (RHUs). Uses a Geographical Information System for data visualization and geospatial analysis	District Health Officer	Implemented in 6 pilot RHUs in Cavite

Exhibit 14. Table of Philippine Department of Health information systems

Name of System	Function	Target Users	Status
Integrated Drug Test Operation and Management Information System (IDTOMIS)	Maintain data on accreditation of drug testing centers, testing activities, regulatory oversight, and drug test results	DOH - Bureau of Health Facilities and Services, National Reference Laboratory, Centers for Health Development Drug Test Centers, Rehabilitation Centers, Agency Data Beneficiaries Daily use.	
National Electronic Injury Surveillance System (NEISS)	Captures injury-related data in an electronic format from health facilities (e.g. hospitals, rural health units, and barangay health stations. Can submit data electronically to the HOMIS.		
National Electronic Disease Surveillance System (NEDSS) / National Epidemiological Sentinel Surveillance System (NESSS)	Collects notifiable disease data from local and state stakeholders These case reports include laboratory data, treatment data, and vaccination data.	DOH secretary, national program managers, media, other stakeholders (e.g. academe, researchers, LGU decision makers)	
National Health Atlas Geographic Information System (NHAGIS)	Maps all public health facilities in the Philippines, an initially collected baseline health data on women. Provides profile of facility including personnel and equipment with road contours.	District Health Officer	
Payroll System	Manage payroll records for DOH personnel	Regional / Provincial Health Officer	Implemented in central and regional offices, 9 hospitals, and 4 DOH agencies
Rural Health Unit Management Information System (RHUMIS)	Manage electronic patient records and generate FHSIS reports in RHUs	Facility Chief / Health Officer	Implemented in three RHUs (South Cotabato, Kalinga and Surigao del Norte). No activity since 2005.
Sentrong Sigla Monitoring System	Certification and recognition program that promotes standards for health facilities	Regional / Provincial Health Officer	
Traditional Alternative Health Care (TAHC)	Tracks various modalities and their experts in traditional and alternative health care	Health System Administrative Managers	
Work and Finance System	Monitors planned activities and work and financial accomplishments of DOH offices, services and regional offices.	National Planning and Information Officer	

6.1.2 The Community-Based Monitoring System (CBMS)

In addition to the DOH systems listed in Exhibit 14, in the early 1990s the Philippines National Economic Development Authority developed a Community-Based Monitoring System (CBMS) to help monitor poverty and track progress towards achieving the Millennium Development Goals (MDGs). The CBMS is designed to provide disaggregated data for planning, program

formulation, policy impact, and poverty monitoring at the local level. The CBMS has been adopted by the National Anti-Poverty Commission (NAPC) and the Department of Interior and Local Government (DILG) as the local poverty monitoring system and a tool for localizing the MDGs.

The core CBMS indicators include several health indicators as follows:

- Proportion of child deaths aged 0-5 years
- Proportion of women deaths due to pregnancy related causes
- Proportion of malnourished children aged 0-5

Data for these indicators originate in health units, including barangay health stations and RHUs.

By May 2007 the CBMS had been implemented in twenty (29) provinces, (15 of which were province-wide), 347 municipalities, 24 cities, covering 9,116 barangays.[35] The CBMS Network and the Working Group on MDGs and Social Progress of the Philippine Development Forum both envision that the entire Philippines will be covered by CBMS by 2010.

The following sections describe what we know about existing information systems related to health services delivery and how they may be related to the proposed electronic medical record system for RHUs.

6.2 Hospital Operations and Management Information System (HOMIS)

The Hospital Operations Information Management Information System (HOMIS) is a Microsoft Windows-based computerized hospital information system for government hospitals. It has been developed by the DOH through the National Center for Health Facilities Development and Information Management Service. HOMIS is designed to support improved hospital management for effective and quality health care. The development and implementation of HOMIS is a defined information systems development strategy under Hospital System Reforms of the DOH.

HOMIS consists of three (3) modules as follows:

1. Patient Management
2. Services Provision
3. Administration

The Patient Management Module supports outpatient and emergency room consultations, admission, discharge, billing, payment (Cashier System), medical records, Philippine Health Insurance Corporation (PHIC/PhilHealth) claims processing, medical social services and referral system requirements.

The Services Provision Module ensures the efficient provision of clinical services to the patient throughout the hospital stay. This includes nursing care or ward, pharmacy, laboratory, radiology, dietary, central stock room and other ancillary services.

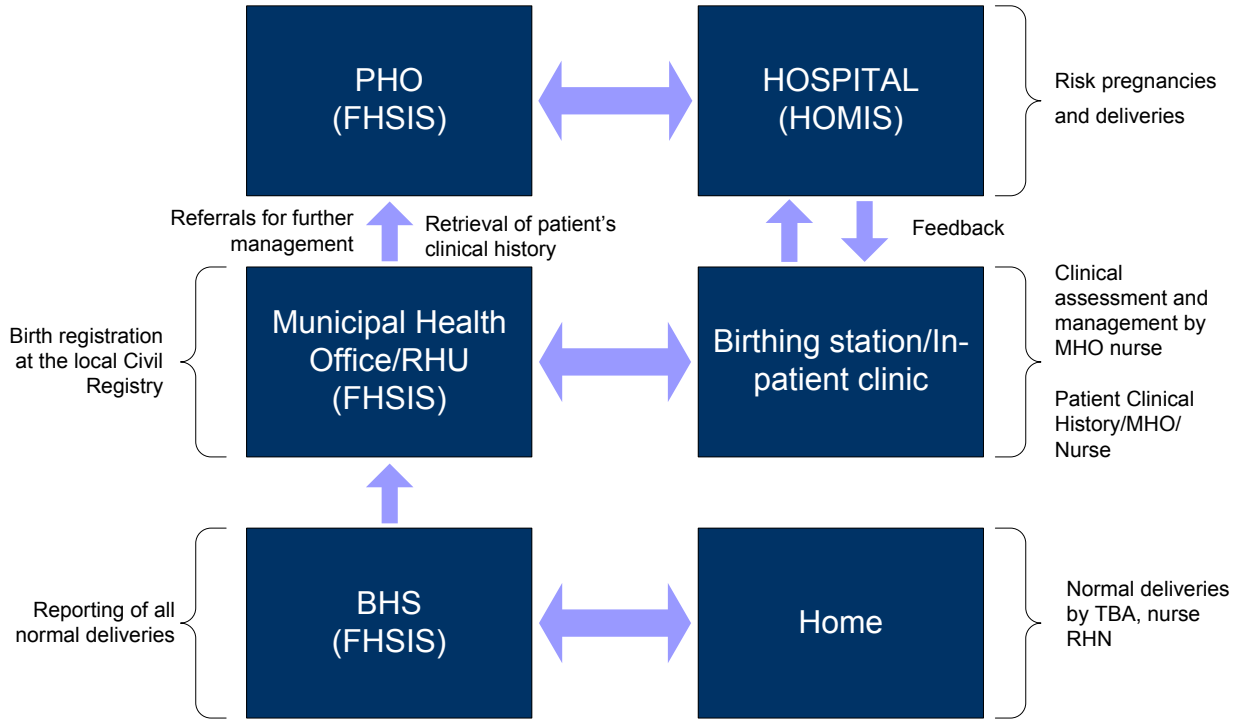
[35] Capones E. Institutionalizing the Community-Based Monitoring System (CBMS) in the Philippines. 6th PEP Research Network General Meeting, Lima, Peru, 2007.

The Administration Module includes budgeting, obligations accounting, procurement management, human resources management, materials management, fixed assets management, general ledger, accounts payable, and other financial and administrative systems.

HOMIS is designed to provide standard reporting data to the FHSIS. Exhibit 15 is a conceptual diagram showing the flow of information regarding births from the HOMIS to the FHSIS.

By August 2006 HOMIS had been installed and implemented in forty-two (42) government hospitals. Most of these hospitals had implemented the Patient Management Module, but were unable to implement the remaining two modules due to insufficient funds for the required computing infrastructure. Depending on the size of hospital, HOMIS requires an investment of between four and eight million Pesos for a server, client computers, networking equipment, and software licenses.[36]

Exhibit 15. Diagram showing the flow of information regarding births from the HOMIS to the FHSIS.[37]



6.3 Rural Health Unit Management Information System (RHUMIS)

The Rural Health Unit Management Information System (RHUMIS) is a computerized public health information system designed for the RHUs. The system is a tool to efficiently and effectively monitor patient cases in the rural health units. The system was developed in Microsoft Access by the Integrated Community Health Services Project (ICHSP) of the DOH and was designed to be used by health facility managers (Facility Chief or Health Officer). The system can be linked to HOMIS and generates FHSIS reports.

[36] HOSPITAL INFORMATION MANAGEMENT SYSTEM (HOMIS), IMPLEMENTATION PROCESS, DOH
[37] Based on a diagram prepared by Teresita R. Cacdac of the Tarlac Provincial Health Office.

Development of the RHUMIS began in 2002 and was implemented in three RHUs (South Cotabato, Kalinga and Surigao del Norte) by 2005.[38] Scale-up was hampered due to lack of necessary computing hardware, a full-time administrator, and standard operating procedures.[39] The DOH has not published new information concerning the status of the RHUMIS since 2005.

7 Proposed Partners and their Roles

The success of this project depends on the commitments and successful collaboration of the following partners:

- DOH Center for Health Development, Region 3, Central Luzon (CHD-3)
- DOH Information Management Service (IMS)
- DOH National Center for Disease Control and Prevention (NCDCP)
- DOH National Epidemiology Center (NEC)
- Health Unit Personnel/Municipal Health Officers (MHO)
- Local Government Units (LGUs)
- National Telehealth Center (NThC), University of the Philippines (UP)
- Qualcomm Wireless Reach
- RTI International (RTI)
- Smart Communications Inc. (SMART)
- Tarlac Provincial Health Office (PHO)
- Tarlac State University (TSU)
- USAID HealthGov Project

Exhibit 16 is a table of proposed project partners and their respective roles. The following sections describe the proposed role and contribution of each project partner in further detail. Partners are listed in alphabetical order. This partnership is not exclusive, and additional partners may be identified during project implementation. In the table below, *in-kind* contributions include staff time and technical expertise, donation of equipment and wireless network services, use of partner facilities for project activities, and direct funding of project activities, such as meetings, workshops, and training. The following sections describe the proposed role and contribution of each project partner in further detail.

Exhibit 16. Table proposed partners, possible roles, points of contact, and suggested type of contribution.

Partner	Type of Partner	Possible Roles	Points of Contact	Contribution
DOH Center for Health Development, Region 3, Central Luzon (CHD-3)	Government	Provide support and leadership for local stakeholders meeting. Provide guidance on project design. Ensure compatibility with FHSIS standards and integration with FHSIS. Participate on Technical Implementation Team.	Dr. Rio Magpantay, Director, CHD-3 Ms. Luz Campos, FHSIS Coordinator CHD-3	In-kind

[38] Philippines National Economic Development Authority. Accessed at http://www.neda.gov.ph/progs_prj/ICT/ProjectDetails.asp?ProjID=65 on 24 April 2009.
[39] Global Health Information Network. Accessed at http://www.tghin.org/node/158 on 24 April 2009.

Exhibit 16. Table proposed partners, possible roles, points of contact, and suggested type of contribution.

Partner	Type of Partner	Possible Roles	Points of Contact	Contribution
DOH Information Management Service (IMS)	Government	Provide guidance concerning the relationship and interoperability of health information systems, such as interoperability with HOMIS and other systems developed and supported by IMS.	Ms. Crispinita A. Valdez, Director III	In-kind
DOH National Center for Disease Control and Prevention (NCDCP)	Government	Provide guidance on project design. Ensure compatibility with DOH requirements and standards. Participate on Technical Implementation Team.	Dr. Yolanda E. Oliveros - Director IV	In-kind
DOH National Epidemiology Center (NEC)	Government	Provide guidance on project design. Ensure compatibility with FHSIS standards and integration with FHSIS. Participate on Technical Implementation Team.	Dr. Eric Tayag,,Director IV Dr. Marlow O. Niñal, Division Chief, Public Health Surveillance and Informatics Division Dr. Vikki Carr de los Reyes, Surveillance Officer, National FHSIS Coordinator, Public Health Surveillance and Informatics Division	In-kind
Health Unit Personnel/ Municipal Health Officers (MHO)	Government	Nurses, midwives and doctors providing care at the Barangay Health Station (BHS)/RHU/CHU level will be the backbone of this system. They will participate in defining software enhancements/design to ensure the system works for them. They will also assist in testing the system and in reporting any issues to the software development team.	TBD	In-kind
Local Government Units (LGUs)	Government	Participation of chief executives and other personnel in stakeholder meetings, project launch activities; participation of Municipal Health Officers in project training activities, including transport to and from the training site.	Local Chief Executives	In-kind

Exhibit 16. Table proposed partners, possible roles, points of contact, and suggested type of contribution.

Partner	Type of Partner	Possible Roles	Points of Contact	Contribution
National Telehealth Center (NThC), University of the Philippines (UP)	University	Collaboration on enhancements to CHITS, orientation of TSU and RTI team on CHITS, design of training for RHU/CHU personnel, and packaging of CHITS as an affordable service for local government units.	Dr. Alvin Marcelo, Director	In-kind
Qualcomm Wireless Reach	Private Sector	Grant funding for project implementation by RTI International, including sub-grant funding for software enhancement, testing, and technical support; liaison with SMART; overall project oversight.	Linda Lee, Manager, Government Affairs, Wireless Reach Mantosh Malhotra, Qualcomm Country Manager, Philippines Julie Welch, Senior Government Affairs Manager, Qualcomm	Grant funding for project implementation by RTI International
RTI International (RTI)	Non-profit non-governmental organization	Project strategy, planning, and implementation; technical assistance and oversight of software development, testing, and training programs; project status reporting to Qualcomm and through Qualcomm to other project stakeholders.	Eileen Reynolds, Project Manager Michael McKay, Technical Lead Gordon Cressman, Senior Director, Center for Information, Communication, and Technology	NA
Smart Communications Inc. (SMART)	Private Sector	Provide computer and connectivity hardware, services and technical support for data transmission between RHUs and central database and participate on the Technical Implementation Team.	Darwin Flores, Senior Manager for Community Partnerships, Public Affairs Group	In-kind
Tarlac Provincial Health Office (PHO)	Government	Lead project in cooperation with local government units; Municipal Health Officers; and the Department of Health representative office and Center for Health Development office for Region 3 (CHD-3); assist in developing software requirements and testing software.	Dr. Ricardo Ramos, Provincial Health Officer	In-kind

Exhibit 16. Table proposed partners, possible roles, points of contact, and suggested type of contribution.

Partner	Type of Partner	Possible Roles	Points of Contact	Contribution
Tarlac State University (TSU)	University	Software development, testing, deployment, and technical support; training of clinicians; use of TSU facilities for software development and possibly project partner and stakeholder meetings, workshops, and training.	Dr. Priscilla Viuya, University President	In-kind
USAID HealthGov Project	Bilateral donor	Advise on project strategy and implementation; liaison with the Department of Health; ensure project activities are integrated with USAID HealthGov objectives and activities; advise concerning stakeholders and public health sector finance; assist in planning and making logistical arrangements for some project activities; temporary use of office facilities in Manila for visiting RTI personnel.	Maria Paz de Sagun, Agreement Officer's Technical Representative (AOTR) Harry Roovers, Chief of Party, Easter Dasmarinas, Deputy Chief of Party	In-kind

7.1 DOH Center for Health Development, Region 3, Central Luzon (CHD-3)

The Center for Health Development (CHD) is responsible for DOH field operations in each administrative region. CHD regional offices are charge with providing efficient and effective medical services; implementing laws, regulations, policies, and programs; and coordinating with regional offices of the other government agencies as well as with LGUs. The CHD Region III (CHD-3) office in San Fernando City houses the Regional Epidemiological Surveillance Unit (RESU). This unit receives and processes routine FHSIS data reports from the Tarlac PHO. A total of seven (7) personnel from the CHD-3 office are assigned to the CHD representative office in Tarlac City. A total of 17 personnel from the CHD-3 office are assigned to various vertical health programs in Tarlac province.

The proposed role of the CHD-3 office includes the following activities:

- Serving on the Stakeholders Advisory Board and Technical Implementation Team
- Providing guidance concerning the application of FHSIS technical standards and guidelines and FHSIS data collection, validation, consolidation, and use at the regional level
- As a member of the Technical Implementation Team, participating in software development and integration with the existing FHSIS
- Reviewing and approving electronic reporting standards
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

7.2 DOH Information Management Service (IMS)

The Information Management Service (IMS) within the DOH Central Office is responsible for ensuring access to knowledge for evidence-based decision making. The IMS seeks to accomplish this by optimizing the use of information technologies through dynamic, responsive, and integrated information systems. Specifically, the IMS does the following:

- Formulates and implements plans, programs and standards for management information technology development within the DOH
- Develops and manages health and management information systems for the DOH
- Develops and manages DOH information system infrastructure, including corporate databases and telecommunications services
- Develops tools to utilize intellectual capital of DOH
- Ensures IT knowledge and skills transfer within the DOH
- Advises the Secretary of Health on matters pertaining to information management.

Provides IT-related technical assistance to DOH offices
The IMS develops and supports several important related health information system components, including HOMIS.

The proposed role of IMS includes the following activities:

- Serving on the Stakeholders Advisory Board
- Providing guidance concerning interoperability with HOMIS and other IMS developed and supported information system components that may be related to the proposed solution.
- Providing guidance concerning DOH technology standards
- Contributing to the development of a scale up strategy and plan contingent on the success of the pilot project

7.3 DOH National Center for Disease Control and Prevention (NCDCP)

The National Center for Disease Prevention and Control (NCDPC) was established as part of the DOH Central Office in 1999. The NDCPC is the national technical authority responsible for disease prevention and control, including surveillance and response systems. NCDPC disease control programs include HIV/AIDS, Tuberculosis, and Malaria.

The USAID HealthGov works with the NCDPC to pilot of new approaches to service standards and quality improvement, service delivery performance analysis. The NCDPC is a key user of FHSIS data at the national level.

The proposed role of the NCDPC includes the following activities:

- Serving on the Stakeholders Advisory Board
- Providing guidance concerning the needs of the NCDPC with respect to FHSIS reporting and other data reporting needed from barangay health stations and RHUs
- Advising the project concerning the timeliness and quality of data reporting with respect to NCDPC needs

- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

7.4 DOH National Epidemiology Center

The DOH National Epidemiology Center (NEC) is responsible for developing national disease surveillance systems and other health information systems that collect, analyze, and disseminate information on the public health status. The NEC also investigates disease outbreaks and other threats to public health. The NEC maintains a network of public health laboratories in support of epidemiological and surveillance activities. The NEC Public Health Surveillance and Informatics Division (PHSID) is responsible for coordinating with stakeholders throughout the public health system to establish and promote standards and guidelines for the FHSIS. The PHSID uses FHSIS reports from regional epidemiology surveillance units to produce an FHSIS annual report.

The proposed role of the NEC includes the following activities:

- Serving on the Stakeholders Advisory Board and Technical Implementation Team
- Providing technical standards and guidelines with respect to FHSIS data reporting requirements
- As a member of the Technical Implementation Team, participating in software development and integration with the existing FHSIS
- Reviewing and approving electronic reporting standards
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

7.5 Health Unit Personnel/Municipal Health Officers (MHO)

Clinicians (nurses, midwives and doctors) providing care at the BHS/RHU/CHU level will be the primary users of the EMR system. These include barangay health workers and midwives who visit households in their barangays to follow up patients and provide health care services, midwives responsible for consolidating patient data for monthly FHSIS reporting, and physicians serving as MHOs who are responsible for reviewing and approving these reports. These clinicians will participate in defining software enhancements/design to ensure the system works for them. They will also assist in testing the system and in reporting any issues to the software development team.

The proposed role of clinicians in includes the following activities:

- Potentially visiting existing CHITS installations to see the system in use and to discuss experiences with current users
- Participating in orientation and consultative workshops to understand and contribute to the design of the system
- Participating, as needed, in training, including computer literacy training
- Testing the software and providing feedback to the Technical Implementation Team concerning problems, functions, and features
- Reviewing, testing, and providing feedback on user guides, manuals, and training materials to the Technical Implementation team

- Participating in the project launch ceremony and potentially other public relations events to make the public aware of the system and its potential benefits

7.6 Local Government Units

LGUs are responsible for managing public health care delivery through barangay health stations and RHUs. As explained in section 2.1, City Health Officers and Municipal Health Officers receive and review routine FHSIS reports from RHUs before submitting them to the PHO. Any electronic medical record system designed for RHUs must have the full political and funding support of the relevant LGU. The LGU must understand and appreciate the value of the system as well as all training and technical support costs and arrangements. LGUs in the same geographical area may also pool support resources through an ILHZ. The proposed role of LGUs that participate in this pilot project is as follows:

- Participating in meetings to discuss project objectives and strategy
- Participating in meetings to evaluate technical alternatives and the sustainability of operating costs
- Encouraging the participation and cooperation of city/municipal health officers
- RHUs,
- Providing supervisory support through city/municipal health officers
- Providing second-tier technical support for hardware and software installed in RHUs

7.7 National Telehealth Center, University of the Philippines

The Health Informatics Unit of the National Telehealth Center developed and continues to develop CHITS. The Health Informatics Unit As described in Section 5.1, this project will build on the CHITS effort by adding a data transmission module for FHSIS data reporting as part of the CHITS open source software project. The proposed role of the University of the Philippines is as follows:

- Serving on the Stakeholders Advisory Board and Technical Implementation Team
- Sharing information and providing guidance to TSU in becoming a CHITS reference site
- Providing TSU with access to CHITS training materials and other information related to local capacity building
- Coordinating CHITS software enhancement with TSU
- Sharing lessons learned from previous CHITS implementations

7.8 Qualcomm Wireless Reach

As mentioned in Section 1.6, Qualcomm is a U.S.-based wireless telecommunications research and development company founded in 1985. Qualcomm designs, manufactures and markets digital wireless telecommunications products and services. Examples include advanced 3G mobile wireless products and integrated circuits that add Global Positioning System (GPS) capabilities to mobile phones. The Wireless Reach Initiative is part of Qualcomm Corporate Social Responsibility (CSR). Qualcomm hopes that this project will help increase awareness of the full potential of their 3G technology, strengthen their relationship with Smart Communications, present a positive image to the Government of the Philippines, and expand Qualcomm's share of the growing 3G market in Asia.

Qualcomm's proposed role includes the following:

- Coordinating and leading meetings of the Stakeholders Advisory Board
- Helping to mobilize and secure the commitments of project partners and to manage communications with project partners
- Managing the overall relationship with Smart Communications
- Working closely with the RTI project team to monitor project strategy and implementation
- Coordinating public communications about the project with the Tarlac PHO and other project partners
- Providing support to the Tarlac PHO to arrange a formal project launch event
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

Qualcomm Wireless Reach participation will be lead by the Qualcomm Government Affairs Manager. Qualcomm's Philippines Country Manager and regional staff will participate in assisting with public communications and the overall relationship with the other partners.

Qualcomm Wireless Reach has provided grant funding to RTI to implement this project, and is currently the only partner who has made a funding commitment to the approximately one-year pilot project.

7.9 RTI International

RTI International is a U.S-based not-for-profit research organization. RTI has a cooperative agreement with USAID to implement the USAID HealthGov project, and has received a grant from Qualcomm Wireless Reach to implement this pilot project. The role of RTI is as follows:

- Developing and communicating overall project strategy
- Developing and communicating the project work plan
- Managing and coordinating project activities and the project budget
- Selecting, hiring, and managing a fulltime local project coordinator
- Providing expert technical assistance in health informatics, including a thorough understanding of international experience, trends, and stakeholders
- Providing expert assistance in technology transfer and change management strategies
- Contributing expert international knowledge and experience
- Providing expert technical assistance to TSU in open source software development and data transmission
- Providing quality assurance of the software, software documentation, and training materials
- Informing all partners of project risks and communicating realistic expectations
- Keeping all partners will informed of project status through routine reporting
- Serving on the Stakeholders Advisor Board and Technical Implementation Team

7.10 Smart Communications Inc.

Smart Communications will provide connectivity hardware, services, and technical support for 3G data transmission between RHUs and the PHO. Smart BRO is Smart Communication's high-speed broadband Internet service. It uses the Smart Communications mobile phone

network to wirelessly connect computers to the Internet. Smart BRO is based on Qualcomm 3G WCDMA/UMTS technology. As of the end of June 2007 Smart BRO was available from 1,071 sites spanning 165 cities and towns in the Philippines. Exhibit 13 is a map of Smart Communications network coverage in central Luzon. In Tarlac Province Smart BRO is available in Capas, Gerona, Moncada, Paniqui , and Tarlac City. Smart Communications has placed a network tower on the TSU campus and has collaborated with TSU to improve their education program in telecommunications.

Smart Communications has a corporate social responsibility program. Launched in 2003, the Smart Communities Program is the umbrella for Smart's community service and employee volunteerism initiatives. In 2009 Smart Communications donated 16 computers and Internet connectivity to Pasay City through the UP National Telehealth Center to support the CHITS effort.

This project will ask Smart Communications to provide connectivity hardware, services, and technical support for data transmission between four (4) pilot RHUs and the PHO as an extension of Smart Communications support for expanding the use of CHITS.

The proposed role of Smart Communications includes the following:

- Serving on the Stakeholders Advisory Board and Technical Implementation Team
- Conducting a site survey to verify and measure Smart network coverage at each of 36 RHUs within Tarlac Province
- Providing computer equipment and wireless broadband routers for four (4) pilot health centers, at least one (1) wireless broadband router to the PHO, and at least two (2) wireless broadband routers to TSU for research and development
- Providing data transmission services over the Smart Communications network for the duration of the one-year pilot project
- Installing wireless broadband routers and providing related technical support for the one-year pilot project
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

It is anticipated that project partners, including Smart communications, will develop a plan for scaling up the system that will keep telecommunications costs for participating LGUs at sustainable levels.

7.11 The Tarlac Provincial Health Office (PHO)

The Tarlac PHO is responsible for supervising the provincial and district hospitals in the Province, and for collecting, reviewing, and encoding all routine FHSIS data reports received from RHUs through municipal health officers. The PHO is the focal point for public health data in the Province.

The proposed role of the PHO includes the following activities:

- Serving on the Stakeholders Advisory Board and the Technical Implementation Team
- Leading the effort to coordinate and arrange a public project launch event
- Helping to engage the support of Local Chief Executives (LCEs) in the province.

- Encouraging the participation and cooperation of municipal health officers.
- Providing standards and supervisory support for municipal health officers.
- Managing relationships with the data management unit of the DOH Center for Health Development (CHD) representative office
- Managing the relationship with the Region III Regional Epidemiology Surveillance Unit with respect to FHSIS reporting requirements
- Helping to gather baseline assessment and M&E data for RHUs and to select four (4) pilot RHUs total in two (2) LGUs for the pilot project
- Helping to gather system requirements and develop project technical strategy
- Helping to liaison with the two (2) LGUs selected for the pilot project
- Helping to design and implement a communication program designed to inform all LGUs in Tarlac Province about the pilot project, and its potential for scale up, and to solicit and analyze input from LGUs into the design of the project
- Providing second- or third-tier technical support to RHUs in the deployment and use of the electronic medical record system and the electronic data reporting module
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

It is expected that the PHO would coordinate all of these activities with other USAID HealthGov activities through the USAID HealthGov Provincial Coordinator.

7.12 Tarlac State University (TSU)

TSU in Tarlac City is a chartered state university with 100 years of educational service to the people of Tarlac and Central Luzon Region. TSU has an enrollment of 11,000 and offers bachelors degrees in some 21 disciplines, including computer science; masters degrees in six disciplines, including information technology; and doctorates in three. In addition to the main campus in Tarlac City, the TSU Villa Lucinda Campus is about 3 km away, and the San Isidro Campus, which houses the College of Technology, is about 1 km away.

The College of Computer Studies includes a Cisco Networking Academy program and programs in hardware and software engineering and information system management. Facilities include several computer labs. Bachelors and post baccalaureate degree candidates of the College are required to complete a thesis project. These may include developing a proof-of-concept for an innovative device or system. Students are required to identify a “customer” for the system and are given guidance in investigating, developing, and testing the concept and documenting the results in their thesis. Previous thesis projects have included at least one use of mobile phone networks to transmit data.

TSU will become the local technical assistance provider for this one-year pilot project. RTI will conclude a subgrant agreement with TSU for the following activities:

- Serving on the Stakeholders Advisory Board and Technical Implementation Team
- Helping to gather baseline assessment and M&E data for RHUs and to select four (4) pilot RHUs total in two (2) LGUs for the pilot project
- Helping to ensure the selected LGUs and RHUs meet the basic requirements for CHITS implementation
- Helping gather system requirements and develop project technical strategy

- Becoming a CHITS reference center for Tarlac Province, participating in CHITS software development, training, and technical support to LGUs
- Developing a CHITS electronic reporting module to transmit routine FHSIS data reports electronically from each pilot RHU to the Tarlac PHO over the Smart Communications mobile phone network
- Developing server software for the PHO to receive and process routine FHSIS data reports transmitted by the CHITS electronic reporting module
- Conducting unit tests, load tests, usability tests, and other standard software tests to ensure software quality and usability
- Serving as local liaison with Smart Communications for project implementation
- Working with the PHO and Smart Communications to install the necessary hardware and software in four (4) pilot RHUs
- Providing computer literacy and skills training for clinicians in four (4) pilot RHUs
- Providing computer literacy training and CHITS training for clinicians in four (4) pilot RHUs
- Helping to support and monitor testing in four (4) pilot RHUs over a minimum three (3) month pilot testing period
- Helping to collect M&E data and analyze pilot test results
- Contributing to the final pilot test project report
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

This one-year pilot project will also seek to develop a sustainable program that will enable TSU to continue serving as a CHITS reference center to support the scale up of the system within Tarlac Province. Developing TSU in this role as a local technical assistance provider is essential to successfully sustaining and scaling up the results of this one-year pilot project.

TSU participation will be coordinated through the TSU Vice President of Research, Extension, and Development.

It is anticipated that TSU will provide some in-kind contributions to this project through some use of existing TSU facilities and student labor in connection with student internships and thesis projects.

7.13 USAID HealthGov

Close collaboration and coordination with the USAID HealthGov project is essential. This Qualcomm Wireless Reach Philippines Partnership project was designed to further USAID HealthGov project objectives and to support other USAID health projects by focusing on the root cause of FHSIS data quality problems. As explained in Section 4, this project is consistent with the USAID HealthGov Year 2 Work Plan for Tarlac Province, and will be an integral part of USAID HealthGov technical assistance in the Province. It is anticipated that USAID will play a prominent role in the Partnership and would participate on the Stakeholders Advisory Board.

The proposed role of the USAID HealthGov project includes the following activities:

- Serving on the Stakeholders Advisory Board
- Providing logistical and technical assistance during project start-up to ensure integration with USAID HealthGov technical assistance

- Playing a leading role in liaison with the DOH to ensure project alignment with DOH strategy and programs and to help gain DOH endorsement
- Playing a leading role in LGU engagement strategy and activities
- Helping to develop a scale up strategy and plan contingent on the success of the pilot project

RTI will work with USAID/Philippines to formulate this project according to the USAID Global Development Alliance (GDA) framework. It is anticipated that the contributions of other Alliance partners, including Qualcomm Wireless Reach, would meet or exceed the resource leveraging requirements of a USAID GDA.

Subject to the approval of the USAID HealthGov Agreement Officers Technical Representative (AOTR), it is expected that overall strategic coordination of USAID HealthGov activities will be through the Project Management Group lead by the Chief of Party. Day-to-day coordination activities are expected to be coordinated through the USAID HealthGov Provincial Coordinator for Tarlac Province.

In addition to the USAID HealthGov project, USAID has several other important projects in the health care sector. These projects are also important stakeholders and are listed in the following section.

8 Engaging Other Stakeholders

In addition to the project partners described in the previous section, there are other government, private sector, and international donor stake holders in health information in the Philippines, and others may emerge during the course of this project. For example, in addition to the NEC many other departments and attached agencies of the DOH that have a stake in the national health information system. As the principal health agency in the Philippines the DOH is responsible for ensuring access to basic public health services to all Filipinos through the provision of quality health care and regulation of providers of health goods and services. It is both a stakeholder in the health sector and a policy and regulatory body for health. The DOH is a technical resource, a catalyst for health policy and a political sponsor and advocate for health issues in behalf of the health sector.

The DOH is a large and complex organization consisting of the following three major divisions:

- Central Office
- Center for Health Development
- Attached agencies

The Central Office consists of the following bureaus and centers:

- Bureau of Food and Drugs
- Bureau of Health Devices and Technology
- Bureau of Health Facilities and Services
- Bureau of International Health Cooperation
- Bureau of Local Health Development
- Bureau of Quarantine and International Health Surveillance

- Finance Service
- Health Emergency Management Staff
- Health Human Resource Development Bureau
- Health Policy Development and Planning Bureau
- Information Management Service
- National Center for Health Facilities Development
- National Center for Disease Prevention and Control
- National Center for Health Promotion
- National Epidemiology Center
- Procurement and Logistics Service
- Research Institute for Tropical Medicine

The Information Management Service, National Center for Disease Prevention and Control, National Epidemiology Center, and Center for Health Development in Region III (CHD-3) are particularly relevant to this project. These have been described in more detail previous sections of this report.

Agencies attached to the DOH include the following:

- Dangerous Drugs Board (DDB)
- National Nutrition Council (NNC)
- Philippine Health Insurance Corporation (PHIC or PhilHealth)
- Philippine National AIDS Council (PNAC)
- Philippine Institute of Traditional & Alternative Health Care (PITAHC)

Of these, PhilHealth and the PNAC are perhaps most relevant to this project.

In 2007 the DOH sponsored the formation of the Philippine Health Information Network (PHIN), an organization of stakeholders with a critical stake in health information. Also in 2007 PHIN completed a national review and assessment of the Philippine health information system. This project should remain acutely aware of PHIN policies and activities through the DOH, the DILG, and other PHIN member organizations.

Exhibit 17 is a table listing these and other stakeholders who will be considered in developing project strategy and may be included in the project communications and promotion plan.

Exhibit 17. Table of national and international project stakeholders.

Stakeholder	Domain	Description
Bureau of International Health Cooperation (BIHC)	National	The Bureau of International Health Cooperation (BIHC) was established as part of the DOH Central Office to coordinate the implementation of the Philippines Sector Development Approach in Health (SDAH) in cooperation with international partners, DOH offices, and other key stakeholders. One of the objectives of the Bureau is to mobilize and coordinate the contributions of development partners. The USAID HealthGov project works with the BIHC to coordinate support for the implementation of Health Sector Reform and FOURmula ONE for Health. Remedios V.S. Paulino, Director Florente E. Trinidad, Head, International Relations Division
Commission on Information and Communications Technology (CICT)	National	The Commission on Information and Communications Technology (CICT) is the primary policy, planning, coordinating, implementing, regulating, and administrative entity of the executive branch of Government that promotes, develops, and regulates integrated and strategic ICT systems and reliable and cost-efficient communication facilities and services. The CICT seeks to develop the Philippines as a world-class ICT services provider, provide government services to stakeholders online, provide affordable Internet access to all segments of the population, develop an ICT enabled workforce, and create an enabling legal and regulatory environment. Ray Anthony Roxas-Chua III, Secretary, Chairman
Department of the Interior and Local Government (DILG)	National	The Department of Local Government and Community Development (DLGCD) was established by Executive decree in 1972. In 1982 the DLGCD was renamed Ministry of Local Government (MLG), and in 1987 it was further reorganized and renamed Department of Local Government (DLG). The DILG was established to empower LGUs to deliver effective and efficient public service, The DILG provides general supervision of LGUs, advises the government on local government legislation, and establishes policies, plans, and programs to strengthen the administrative, technical, and fiscal responsibilities of local government offices and personnel. DILG supervision and assistance is provided through regional offices. Ronaldo V. Puno, Secretary The USAID HealthGov project coordinates closely with the DILG on a wide range of activities designed to strengthen the capacity of local governments to manage public health services efficiently and effectively.

Exhibit 17. Table of national and international project stakeholders.

Stakeholder	Domain	Description
Inter-Agency Committee on Health Statistics	National	Formed under the leadership of the NSCB, the Inter-Agency Committee on Health Statistics was formed under the leadership of the NSCB to 1) formulate measures that will improve the system of data collection and reporting of national and local health statistics; 2) recommend improvements in the methodology of compilation of the PNHA or any of its components and formulate measures to ensure that the data requirements of the PNHA are being generated by all concerned agencies; 3) Identify and recommend statistical policies to the NSCB Executive Board for the generation of data support on health issues; 4) Identify and develop key health indicators and standard health parameters and recommend measures for the institutionalization of the generation and use of these indicators; 5) Monitor the over-all development of health statistics in the country. Dr. Mario C. Villaverde, Undersecretary, Sectoral Management Coordination Team and PSDT for Service Delivery, Department of Health (DOH)
LGU leagues (LPP, LMP, LCP)	National	Local government leagues in the Philippines include the following: • League of Provinces of the Philippines (LPP) • League of Municipalities of the Philippines (LMP) • League of Cities of the Philippines (LCP) These three leagues provide a powerful forum for exchanging ideas and sharing information. The USAID HealthGov project coordinates activities with all three organizations.
National Statistical Office (NSO)	National	The National Statistics Office (NSO) is the major statistical agency responsible in collecting, compiling, classifying, producing, publishing, and disseminating general-purpose statistics as provided for in Commonwealth Act (CA) No. 591. NSO has also the responsibility of carrying out and administering the provisions of the Civil Registry Law as provided for in Act No. 3753 dated February 1931. Carmelita N. Ericta, Administrator, Civil Registrar General
Open Source Health Care Alliance (OSHCA)	International	The Open Source Health Care Alliance (OSHCA) is an international non-profit organization. It provides the collaborative platform and forum to promote and facilitate Free/Open Source Software in Health Care. OSHCA membership is a community of people, civil societies and professional bodies in health care and informatics industries that promotes the Free/Open Source Software Concepts in Health Care. OSHCA helps policy makers, commercial enterprises, and users take advantage of the benefits of Free/Open Source Software.
Philippine Health Information Network (PHIN)	National	The Philippine Health Information Network (PHIN) is an interagency body composed of agencies that have critical stakes in health information. PHIN was established in 2007 as an initiative of the DOH Information Management Service (IMS) to engage stakeholders in a national effort to harmonize and rationalize the health information system. PHIN was

Exhibit 17. Table of national and international project stakeholders.

Stakeholder	Domain	Description
		established to play a critical role in defining policies on health information, developing a comprehensive health information strategic plan, and identifying data source for specific public health indicators. The DOH sought to rationalize and restructure existing technical working groups and inter-agency committees as part of the PHIN. The DOH sought the participation of the Department of Interior and Local Government (DILG) to ensure that LGU concerns were addressed. PHIN members include the following government, education, professional, and donor organizations: • Department of Health (DOH) • Department of the Interior and Local Government (DILG) • National Statistical Office (NSO) • National Statistical Coordination Board (NSCB) • Philippine Council for Health Research and Development (PCHRD) • Population Commission (POPCOM) • National Nutrition Council • Food and Nutrition Research Institute (FNRI) • University of the Philippines College of Medicine (UPCM) • Other academic organizations • Medical societies • World Health Organization (WHO) • Die Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) • Japan International Cooperation Agency (JICA) In 2007 PHIN conducted a review and assessment of the Philippine health information system using the HMN assessment framework.
Philippine Health Insurance Corporation (PHIC or PhilHealth)	National	The Philippine Health Insurance Corporation (PHIC or PhilHealth) is a DOH-attached agency. PhilHealth is government corporation designed to ensure sustainable, affordable and progressive social health insurance which endeavors to influence the delivery of accessible quality health care for all Filipinos. As a financial intermediary, PhilHealth aims over time to develop a sustainable national health insurance program that leads towards universal coverage, ensures better benefits for its members at affordable premiums, establishes close coordination with its clients through a strong partnership with all stakeholders, and provides effective internal information and management systems to influence the delivery of quality health care services. PhilHealth is governed by a board chaired by the Secretary of Health.
Philippine National AIDS Council (PNAC)	National	The Philippine National AIDS Council (PNAC) is a DOH-attached agency and is the central advisory, planning and policy-making body for the comprehensive and integrated HIV/AIDS prevention and control program in the Philippines. PNAC was created through Executive Order 39 signed by the President Fidel V. Ramos on December 3, 1992. PNAC serves as a venue for intensive policy discussion between government and NGOs.

Exhibit 17. Table of national and international project stakeholders.

Stakeholder	Domain	Description
Philippine National Statistical Coordination Board (NSCB)	National	The National Statistical Coordination Board (NSCB) was created under Executive Order No. 121 issued on January 30, 1987 as the policy-making and coordinating agency on statistical matters in the Philippines. The objective of the NSCB is to develop an orderly Philippine statistical system capable of providing timely, accurate, relevant, and useful data for the government and the public for planning and decision-making. The NSCB is the highest policy making and coordinating body on statistical matters has put in place coordinating mechanisms to ensure generation of quality statistics for planning and policy making. Estrella V. Domingo, Assistant Secretary General
Population Commission (POPCOM)	National	The Population Commission (POPCOM) is a DOH-attached agency established through Executive Order No. 233 in 1970. POPCOM was mandated to serve as the central coordinating and policy making body of the government in the field of population. On October 10, 2006, President Gloria Macapagal-Arroyo issued guidelines and directive for the DOH, POPCOM, and local government units to take full charge of the implementation of the Responsible Parenthood and Family Planning Program. POPCOM is governed by a Board of Commissioners and managed by Executive Director Mr. Tomas M. Osias.
Philippine Medical Informatics Society (PMIS)	National	The Philippine Medical Informatics Society (PMIS) was incorporated in 1996 with the mission of promoting the use of information technology in medicine. Since then, it has organized and participated in various activities in medical informatics. Among these were seminars by international medical informatics experts, seminars on use of online bibliographic databases, handheld devices, electronic health records, and security of electronic health information. The PMIS is a proponent of open source software development for health. The PMIS is a strong partner in the Standards for Health Information in the Philippines project as well as the BuddyWorks Telehealth Project and the upcoming Philippine National Health Information Infrastructure. The Society encourages the deployment of health information systems in support of national development and poverty alleviation through the full implementation of the Primary Healthcare Approach. Among the beneficiaries of its technical seminars are community health workers, government midwives, and private practitioners. PMIS is the official organization representing the Philippines at the Asia Pacific Association for Medical Informatics (APAMI) and subsequently, the International Medical Informatics Association (IMIA).
USAID Cooperating Agencies	National	In addition to HealthGov, USAID Philippines has several other important programs designed to help improve public health in the Philippines. These include the following: ▪ Sustained Health Improvements through Empowerment and Local Development (SHIELD)

Exhibit 17. Table of national and international project stakeholders.

Stakeholder	Domain	Description
		▪ Linking Initiatives and Networking to Control Tuberculosis (TB LINC) ▪ The Maguindanao Tuberculosis Control Project (MTCP) ▪ Maximizing Access to Child Health (MATCH) Program ▪ Health Promotion and Communications (HealthPro) ▪ Private Sector Mobilization for Family Health (PRISM) ▪ A2Z: The USAID Micronutrient and Child Blindness Project ▪ Health Policy Development Program (HPDP) The projects are being implemented by several Cooperating Agencies (CA) directed by USAID. Many of these projects have activities in Tarlac Province that may be affected by or may affect this pilot project.

9 Project Resources

It is important for this pilot project to set appropriate expectations and achieve success for all partners with the limited available resources. Qualcomm Wireless Reach has awarded a grant to RTI to implement this pilot project over a period of approximately 12 months. In addition to RTI's role as the project implementer, as described in Section 7.9, this grant includes a sub-grant to TSU. These resources are designed to achieve project results in four (4) pilot RHUs in two (2) LGUs and to lay a foundation for scaling up the system. The system will not have a significant positive impact on the timeliness or quality of FHSIS reporting to the PHO until the system has been deployed to most of the RHUs (currently 36) in Tarlac Province. Therefore it is important for this pilot project to demonstrate feasibility, measure results, develop a practical technical and organization system for scale-up, and build a partnership that can continue to provide support for scaling up the system after the end of Qualcomm Wireless Reach funding.

As described in Section 7 this project also depends heavily on in-kind contributions of labor, materials from other partners. It may be necessary to reallocate grant resources and reduce project scope if one or more project partners do not provide the expected in-kind contributions, or do not provide them in time to keep the project on schedule. It will be important for all project partners to have a clear mutual understanding of project scope, expected results, the commitments of each partner, the project work plan, and current project status. Equipment contributions from partners could free some grant resources for additional project activities.

10 Sustaining the Solution

Sustainability issues can be grouped into the following major categories:

- Adoption of the medical record system by clinicians
- Official acceptance of the electronic reporting system
- The operating cost of the computing hardware, software, and networking services
- The effectiveness and affordability of the technical support system

Each of these issues is addressed in more detail in the following sections

10.1 Adoption

Willing adoption of the medical record system by clinicians is a fundamental requirement for long-term sustainability. To be accepted, the system should do the following:

- Accurately reflect and respond to the flow of clinical protocols
- Meet the daily information needs of clinicians
- Save clinicians time by automating reporting and other routine tasks
- Be responsive and reliable
- Include a well-structured and sustainable training and support system

In general the system should provide a positive return on the time clinicians spend entering and maintaining the data and maintain that performance consistently over time. To achieve this, the system should be developed in partnership with clinicians and under the supervision of physicians to reflect both the reality of clinical operations and accepted standards of clinical practice. This fosters local ownership and minimizes the gap between technical conception and clinical reality. A well-structured training and support system positively engages clinicians not involved in system development and helps to mitigate the impact of staff turnover.

The project has taken the first step in addressing this issue by proposing to build on CHITS, an existing electronic medical record system designed with local clinicians to meet Philippine standards of care. The CHITS program also includes a tested user training and certification system. Building on CHITS minimizes the gap between technical conception and local reality, reducing project risk while providing a foundation for further enhancement. CHITS will need to be enhanced to meet the needs of this pilot project in collaboration with clinicians, the PHO, TSU, the National Telehealth Center, and the DOH. This effort should help to create a collaborative free and open source software development community in the Philippines that can sustain the electronic medical record system software.

The selection of Smart Communications as a telecommunications partner provides access to a wireless network with national coverage and 3G data transmission capability. Smart Communications is the leader in 3G wireless broadband coverage and services in the Philippines. The Smart Communications network should provide the speed and reliability necessary for data transmission and the potential for national scale up.

10.2 Official Acceptance

Official DOH acceptance of electronic reporting is necessary to support electronic reporting form the PHO to the RESU, and from the RESU to the NEC central office. While it is possible to transmit paper facsimile reports in electronic form, more efficient electronic formats could enable data to flow directly into databases, avoiding data re-entry errors. While DOH and PHIN policy supports this principle, it will be important to work with the DOH to develop acceptable and officially approved electronic formats.

The project will address this by working closely with DOH stakeholders, demonstrating the feasibility of electronic reporting, and demonstrating the advantages of alternative electronic formats.

10.3 Operating Costs

Operating costs of the system will include the following costs:

- Consumable supplies
- Software licensing costs
- Technical support and maintenance for computer and networking equipment
- Telecommunication services necessary to transmit data over the Smart Communications wireless network

Most of these costs will need to be incorporated into LGU budgets. Sustainability and scalability will depend on minimizing these costs and an open dialogue with LGUs and other project partners concerning affordability. This dialogue should also address the challenge of planned equipment replacement, an issue frequently ignored. Participation of the USAID HealthGov project will be essential to understanding public health care financing and identifying stakeholders, resources, and mechanisms for funding local operating costs. The USAID HealthGov project can help to integrate these costs into the Province-wide Investment Plan for Health (PIPH).

The project strategy described in this document helps to address this issue by using free and open source software. It also describes a technical solution that can be effective with minimal infrastructure and scaled up as local carrying capacity increases. The project will need to pay close attention to balancing the cost, reliability, and local sources of support for the necessary computer equipment.

The continuing cost of the Smart Communication services necessary for electronic reporting is a significant concern. Smart Communications has already contributed computers, network connection equipment, and network services to the CHITS project and will also be asked to provide network connection equipment and network services to this pilot project. The project will work with Smart Communications and other project partners, including LGUs, to develop a sustainable solution for providing network connection equipment and connectivity to additional LGUs as part of the scale-up plan.

10.4 Technical Support

The project will also need to develop a simple but well-structured technical support system capable of responding to the needs of remote RHUs. The selection of TSU as a local technical assistance provider is designed to provide LGUs with a cost-effective source of continued technical support for the software, and potentially for the hardware. To be responsive to needs in RHUs, the system is likely to be arranged in tiers, with specially trained clinicians providing the first tier of support by diagnosing and resolving the most common problems on site. The second tier of support may be trained City/Municipal Health Officers, while the third and final tier may be a contracted private sector support provider or university-based technical support program. This technical support system will be developed in collaboration with local stakeholders at these various levels in Tarlac Province.

11 Scaling Up the Solution

As described in Section 4, the electronic medical record system developed and pilot tested by this project should contribute to meeting the health information needs of decision makers. The pilot project should benefit clinicians in the four (4) selected pilot RHUs. The electronic medical records system will have a significant impact on the timeliness and quality of FHSIS data reporting to the PHO only if the system can be implemented and sustained in most RHUs in Tarlac Province. Similarly, results cannot be achieved at regional and national levels unless the system can be implemented and sustained in most RHUs in the Philippines. The technical approach described in this document should be scalable technically, but deployment of the system in RHUs will depend on awareness and demand from LGUs, affordable costs, a well developed support system, and the official endorsement and support of the DOH.

This one-year pilot project will seek to draft a framework that will help LGUs to replicate and sustain the system. This draft framework will include the following:

- A support and certification system to help LGUs to understand and realize the potential of the system to improve health care services, and to encourage them to meet the infrastructure, human capacity, and financial requirements of the system
- A well-developed training and certification system for RHU clinicians to help them to understand the benefits of the system in their work, enable them to use the system effectively, and to reward them for this achievement
- A local technical assistance system based around a system of regional reference centers, using the example of TSU, that collaborate to maintain and enhance the open source software and provide continuing support to LGUs
- Engaging and collaborating with the DOH to develop electronic reporting standards for FHSIS data and gain DOH endorsement and PHIN recognition of the system as part of the Unified Health Information Management System

Contingent on the results of this pilot project, project partners will discuss the potential for scaling up this system in Tarlac Province, and providing the system to other LGUs around the Philippines. The draft framework for replicating the system will provide an important basis for this discussion. USAID HealthGov is anticipated to play a leading role in developing a scale-up strategy consistent with the USAID HealthGov work plan. Risks and Mitigation
Heeks[40] and other researchers have noted that most health information system projects fail. Heeks points to significant gaps between technical conception and reality as the primary cause of failure. These gaps fall into three major categories:

- Gaps that can occur between the formal, rational way that an information system is conceived and the behavioral realities of health care organizations.
- Gaps that can occur when private sector solutions are applied in a public sector context
- Gaps that can occur when an application from one country is applied to another country without being sufficiently adapted to the local context.

[40] Heeks, R., D Mundy, A Salazar (1999) 'Why Health Care Information Systems Succeed or Fail', IDPM Information Systems for Public Sector Management Working Paper no.9 , 0. Accessed at http://www.sed.manchester.ac.uk/idpm/research/publications/wp/igovernment/ on 6 May 2009.

Heeks suggests that risks to health information system projects can be reduced significantly by minimizing gaps across the following seven dimensions:

- Information
- Technology
- Processes
- Objectives and values
- Staffing and skills
- Management and structures
- Other resources: money and time

Information and communication technology (ICT) projects in international development have also had a dismal track record of success beyond the pilot phase. RTI has developed a simple framework for success in ICT-for-development projects based on many years of experience. This framework, called "the ICT three-legged stool," requires a project to successfully address the following three major components:

- **Access**: Access encompasses language, knowledge, skills, language, and telecommunications
- **Useful content and services:** Information and services that are useful to users
- **Communication and promotion:** Communicating and promoting the availability, value, and effective use of the system

The strategy for the Qualcomm Wireless Reach Philippines Partnership project addresses both the Heeks framework and the ICT three-legged stool by doing the following:

- Building on CHITS, an existing system designed in the local context with the participation of health center clinicians
- Engaging a local university as a technical assistance provider
- Developing a public private partnership that engages key local and national stakeholders
- Coordinating the activity with the broader package of USAID HealthGov technical assistance activities, which are based on a thorough understanding of health governance in the Philippines

12 Management and Staffing

This project will be a USAID HealthGov activity in partnership with Qualcomm, Inc. and with support from RTI Headquarters staff and a consultant. The HealthGov team, led by Mr. **Harry Roovers**, COP, will lead reporting and ultimately management of this activity to USAID/Philippines.

RTI Project Manager Ms. **Eileen Reynolds** (approximately 59 days over the first 12 months of the project) will lead reporting to Qualcomm, in liaison with Mr. Roovers and Ms. **Easter Dasmarinas**, USAID HealthGov Deputy Chief of Party. Ms. Reynolds has more than ten years of experience managing projects and providing technical assistance in M&E and ICT applications and assessments. Ms. Reynolds managed RTI activities for the Zambia Electronic Perinatal System (ZEPRS) project and is currently managing RTI activities for the Qualcomm Wireless Reach Partnership – Kenya.

RTI consultant **Mike McKay** will serve as lead Technical Advisor for the project with 153 days of labor over the first twelve months of the project. He will work closely with the PHO, Municipal Health Offices and RHU staff as well as DOH, TSU, and the University of the Philippines Medical Informatics Unit to design the system. Mr. McKay was the Country Director for the ground-breaking Baobab Health Partnership in Lilongwe, Malawi, from 2006 through 2008, and is a consultant to the WHO in electronic health data standards. Prior to his position with the Baobab Health Partnership Mr. McKay worked for five years as a software engineer and technologist in the private sector.

Mr. **Gordon Cressman**, Senior Director of RTI's Center for Information, Communication, and Technology, will serve as Senior Technical Advisor, providing overall management and technical guidance and oversight for the project.

RTI will recruit, hire, and manage a fulltime **Local Project Coordinator** to coordinate project activities with the USAID HealthGov project in Tarlac Province, to carry out, manage, and oversee project activities locally to keep the project on schedule, to keep other members of the RTI project team well informed, and to help ensure that short term technical assistance is carried out as efficiently as possible.

In addition, a Local Governance and Health Advisor, Conrad Castillo, will serve as part time consultant to assist with the project in Tarlac. Mr. Castillo recently served as Provincial Coordinator for Tarlac with the HealthGov project.

Exhibit 19 is a table of individual project team members involved in this activity and their roles.

Exhibit 18 Table of individual project team members and their roles.

Project Team Member	Role
Harry Roovers, HealthGov COP	▪ Oversight of the activity as a part of HealthGov ▪ Assist in scale up strategy ▪ Lead liaison with USAID/Philippines regarding this activity
Easter Dasmarinas, Deputy COP, HealthGov	▪ Oversight of the activity as a part of HealthGov ▪ Assist in scale up strategy
Alex Herrin, LGU Governance Team Leader, HealthGov	▪ Oversight of the activity as a part of HealthGov ▪ Liaison and coordination with DOH, Local and Provincial Governments ▪ Assist in scale up strategy
Provincial Coordinator, Tarlac, HealthGov	▪ Ensure integration of activity into HealthGov technical assistance plan for Tarlac ▪ Meet regularly with local project coordinator and local partners to provide oversight and support ▪ Assist in scale up strategy ▪ Assist with local government relations
Regional Coordinator, Luzon, HealthGov	▪ Meet regularly with the HealthGov Provincial Coordinator to provide oversight and support ▪ Assist in scale up strategy ▪ Assist with local government relations

Exhibit 18 Table of individual project team members and their roles.

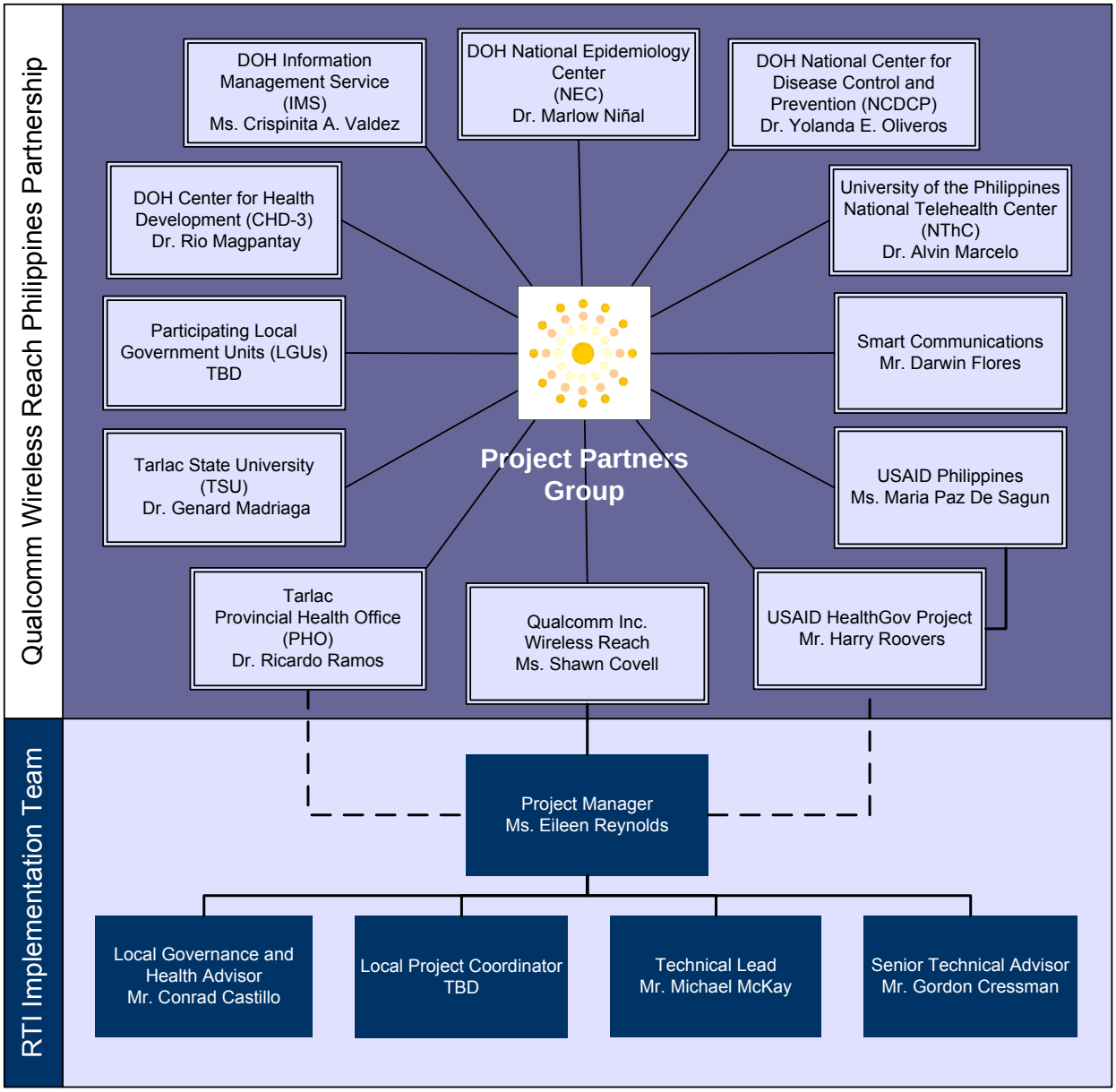
Project Team Member	Role
Eileen Reynolds (59 days over 12 months), RTI Home Office Technical Manager	▪ Provide regular updates on project progress to Qualcomm and USAID ▪ Lead communications with the HealthGov team ▪ Lead communications with the PHO, TSU, Smart Communications and other potential partners ▪ Lead the development of the project work plan and oversee project implementation ▪ Lead the development of the project M&E plan and oversee implementation of the M&E plan ▪ Supervise and provide support to full time local project coordinator based in Tarlac
Mike McKay (RTI consultant, 153 days over 12 months) Lead Technical Advisor	▪ Lead in crafting technical strategy for the system in partnership with stakeholders ▪ Lead in developing software requirements ▪ Select, configure, and manage the use of team development tools for team coordination, including task management, bug tracking, and software version control ▪ Lead in working with TSU to test software, including leading the development of software unit, regression, and integration testing. ▪ Lead strategy to ensure local software support in cooperation with Tarlac State University (build capacity of TSU to support the system developed), the PHO and other local partners and RTI team members. ▪ Lead strategy to build a sustainable IT support system for RHUs/MHOs/PHO for this system, lead in implementing this strategy with local partners ▪ Work with RTI team and local partners to develop a training strategy and implement a training program for RHU personnel and others who will use this system. ▪ Provide software development expertise and capacity building to TSU as needed within the parameters of the project and budget to enable them to support the system developed.
Local Project Coordinator (fulltime) based in Tarlac	▪ Work closely with the Project Manager to ensure that the project strategy, budget, and timeline reflect local realities ▪ Work closely with the USAID HealthGov Provincial Coordinator for Tarlac Province to ensure the integration of activities with the USAID HealthGov project ▪ Keep the RTI Project Manager and other members of the RTI project team well informed through regular routine reporting and frequent pro-active communication ▪ Manage local project activities according to the project timeline ▪ Coordinate with and keeping all project partners well informed ▪ Help gather and analyze software requirements, and coordinate software testing ▪ Help create training materials and to coordinate and deliver training; ▪ Assist with travel and meeting arrangements and providing logistical support for RTI project team members on short-term technical assistance assignments for this project in Tarlac Province ▪ Arrange workshops and manage workshop logistics ▪ Gather information from RHUs and other sites as needed ▪ Manage finances and tracking invoices for local procurement ▪ Assist with the installation of computer hardware in RHUs, PHO and MHO ▪ Lead data collection for project monitoring and evaluation and draft quarterly project reports

Exhibit 18 Table of individual project team members and their roles.

Project Team Member	Role
Conrad Castillo, Local Governance and Health Advisor	▪ Providing guidance to the project team on local governance and health in Tarlac ▪ Discussing with LGUs and providing an evaluation of what LGUs in Tarlac can afford in terms of sustaining the electronic medical records system ▪ Working with the team and stakeholders to design a package of services around the electronic medical records system so that it could be easily adopted and/or adapted by LGUs who are interested. This would include the equipment, training and maintenance required. ▪ Keeping the RTI Project Manager and other members of the RTI project team well informed on his activities and on developments through regular routine reporting and frequent pro-active communication ▪ Assisting in the consultative processes to gain LGU and barangay level inputs into the system. This could include assistance in the design and delivery of consultative workshops and other type activities. ▪ Helping to gather and analyze software requirements ▪ Helping to identify and help to establish communications with pilot LGUs/RHUs
Gordon Cressman (11 days over 12 months), Director of the Center for Information, Communication and Technology in RTI's International Development Group	▪ Serve as senior technical advisor providing oversight and guidance to the project team on system design and project implementation.

Exhibit 20 is a proposed organizational chart, showing the members of the partnership, the members of the RTI technical assistance team, and direct reporting relationships. It should be noted that this chart lists only the chief executive for each partner. Chief executives may designate on or more members of their staff as contacts and participants in partnership activities. It should also be noted that additional partners may be added during the course of the project to ensure inclusion of stakeholders.

Exhibit 19 Proposed project organizational chart.



12.1 Project Coordination

The RTI Project Manager and RTI Technical Lead will hold weekly conference calls with the PHO and members of the Technical Implementation Team, and bi-weekly calls with Qualcomm Wireless Reach.

The RTI Project Manager will hold monthly project update calls with the USAID HealthGov COP and senior leadership to ensure close coordination. The HealthGov COP will in turn keep USAID informed of project status on a regular basis during project implementation.

The Local Project Coordinator will meet bi-weekly with the USAID HealthGov Provincial Coordinator for Tarlac Province to coordinate project strategy and activities.

The project will form three overlapping groups to ensure that project strategy and activities are coordinated among project partners, stakeholders, and implementers. These three groups are as follows:

- Project Partners
- Stakeholders Advisory Board
- Technical Implementation Team

The **Project Partners** group shall consist of those organizations who have committed funding or in-kind contributions to the project as well as divisions of the DOH responsible for the FHSIS and LGUs and MHOs participating in the pilot project. Proposed project partners and their roles have been described in Section 7. RTI and Qualcomm Wireless Reach will sign a separate memorandum of understanding (MOU) with each partner. Including a project kick-off meeting, the Project Partners will be meet approximately four times at critical points during the project to help ensure that the project is on track to achieve the desired results.

The **Project Stakeholders Advisory Board** shall include the Project Partners as well as key project stakeholders that have not committed any funds or in-kind contributions. These may include many of the organizations described in Section 8, as well as organizations not yet identified. The list of stakeholders and specific stakeholder representatives to be engaged will be developed with the USAID HealthGov project. Project stakeholder meetings may be held quarterly. The frequency of project stakeholder meetings will be developed with the USAID HealthGov project.

The **Technical Implementation Team** shall consist of members of partner and stakeholder organizations directly involved in technical implementation issues that include the following:

- Developing TSU as a CHITS regional reference site
- Developing a CHITS software development roadmap prioritizing upgrades and enhancements
- Developing and testing software upgrades and enhancements
- Integrating electronic reporting with the FHSIS
- Developing and end-user training system and training materials
- Developing a technical support system for hardware and software

Members of the Technical Implementation Team are likely to include technical representatives of the following organizations:

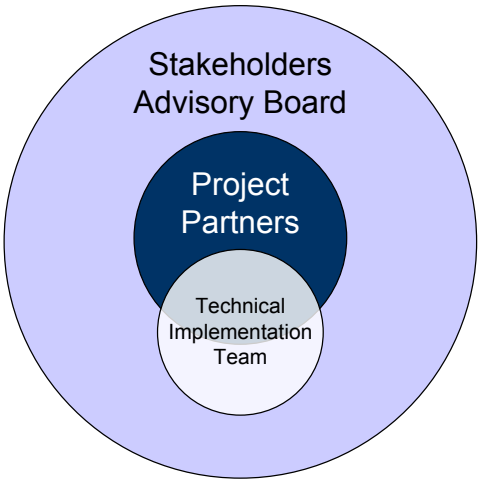
- USAID HealthGov
- Tarlac PHO
- CHOs/MHOs
- TSU

- National Telehealth Center, University of the Philippines
- Center for Health Development representative office in Tarlac
- Regional Epidemiology Surveillance Unit (RESU), San Fernando City
- National Epidemiology Center (NEC)
- RTI International

The Technical Implementation Team meetings will take place monthly using a combination of in-person and remote participation via the Internet.

Exhibit 21 is a Venn diagram depicting the overlaps among these thee project coordination groups.

Exhibit 20. A Venn diagram depicting overlaps among the project coordination groups.



13 Monitoring and Evaluation

The RTI project team includes an M&E team with deep experience in designing effective M&E systems. The RTI project team will develop an M&E plan that focuses on results, develop performance indicators that measure results achievement, include detailed indicator definitions, and specify in detail how data will be collected (Exhibit 24).

Exhibit 21. Illustrative Results Framework and Indicators

Objective: Apply 3G technology to improve the quality and timeliness of public health care information	
Result 1: **Improve access to patient records by clinicians**	
1.A:	Number of RHU clinicians who have been trained in the use of the electronic patient records system
1.B:	Time spent by RHU clinicians in participating RHUs to complete monthly FHSIS data entry forms • Disaggregated by paper forms and electronic patient record system
1.C:	Percentage of RHU clinicians who have reported that access to patient records has been improved
Result 2: **Automate reporting requirements to improve the quality and completeness of reports**	
2.A:	Number of provincial health office personnel who have been trained to create reports from the electronic patient records system
2.B:	Time spent by provincial health office personnel to enter monthly routine data reports • Disaggregated by paper forms and electronic patient record system
2.C:	Percentage of participating RHUs that have reported that they were able to submit monthly FHSIS forms on time
2.D:	The percentage of monthly FSHIS reports submitted by participating RHUs that are missing data

Data will be collected for indicator baselines and for quarterly M&E status reports to Qualcomm. The draft M&E plan will be submitted to Qualcomm for review within the first two months of the

start of the project. It is essential for the RTI team to carry out its initial field work in Tarlac Province during this period to gather the information necessary to develop a feasible and effective M&E plan. The following proposed Results Framework illustrates project results with associated performance indicators that are used to measure progress towards achieving project results.

In addition to M&E indicators, the RTI project team will propose a set of project milestones. Exhibit 25 is list of illustrative project milestones based on the preliminary project work plan. This list will be revised consistent with revisions to the project work plan.

Exhibit 22. Illustrative project milestones.

Milestone		
1	♦	Revised project strategy and work plan submitted to Qualcomm and USAID/HealthGov
2	♦	Sub-grant agreement signed with TSU
3	♦	MOU signed with Smart Communications
4	♦	MOU signed with the National Telehealth Center, University of the Philippines
5	♦	Partners kick-off meeting completed
6	♦	M&E plan finalized
7	♦	M&E baseline data collected
8	♦	Hardware/software platform finalized
9	♦	Local chief executives engaged and informed
10	♦	MOUs signed with pilot LGUs
11	♦	Final draft technical support strategy and plan completed
12	♦	CHO/MHO workshop completed
13	♦	Training modules and documentation completed
14	♦	Clinicians in pilot RHUs trained
15	♦	Computer and communications hardware installed in pilot RHUs
16	♦	Software feature set 1 installed in pilot RHUs
17	♦	Software feature set 2 installed in pilot RHUs
18	♦	Technical support system strategy and manual completed
19	♦	Pilot testing iteration cycle 1 completed
20	♦	Public project launch event completed
21	♦	Pilot testing iteration cycle 2 completed
22	♦	Public event to celebrate completion of pilot testing cycle 2
23	♦	Sustainability and scale-up plan endorsed by project partners
24	♦	Final report submitted to Qualcomm