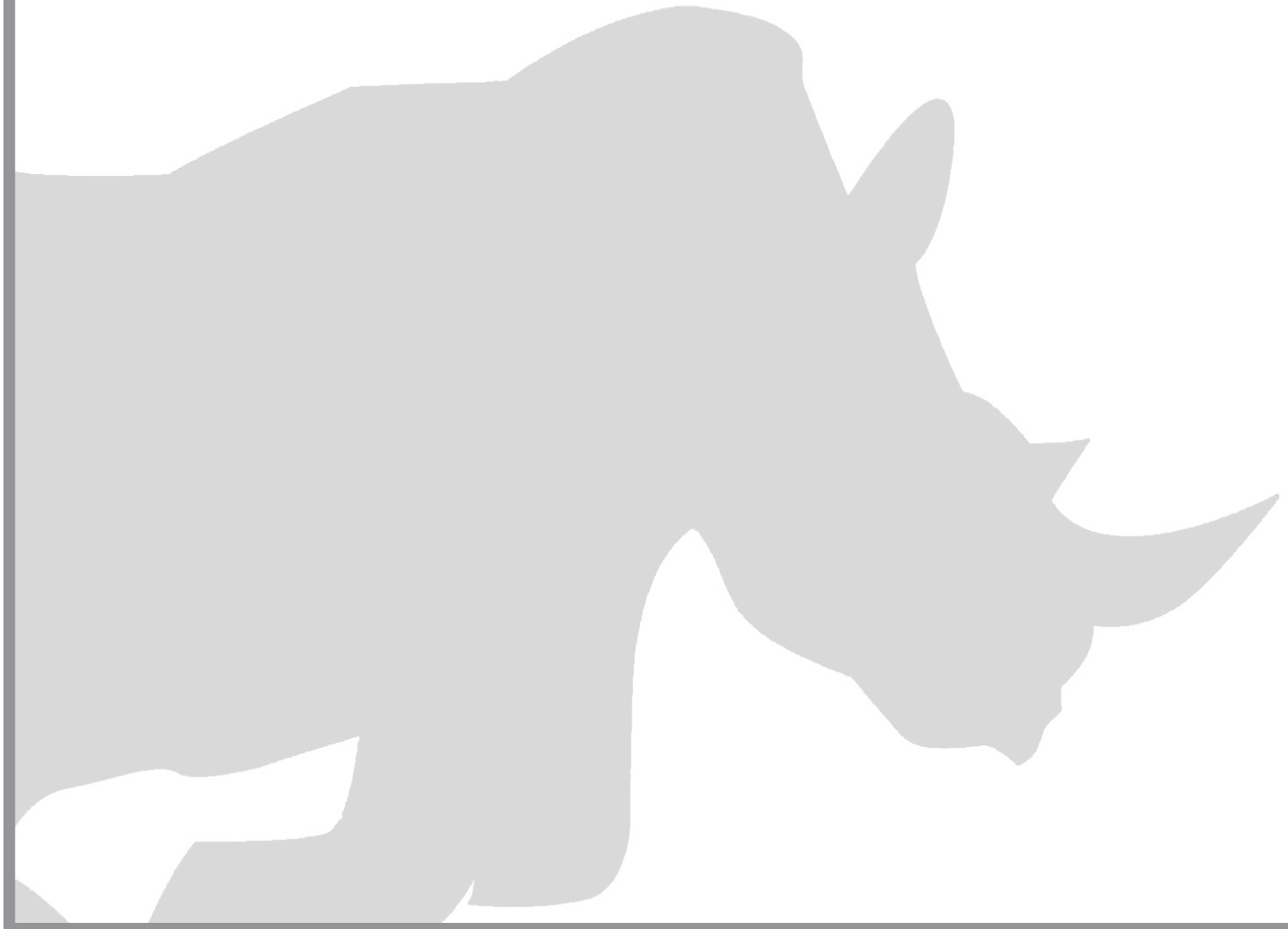
Measuring and Improving RHIS Performance

March 8-12, 2010 | Guanajuato, Mexico



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MEASURE Evaluation

FOURTH INTERNATIONAL RHINO WORKSHOP

MEASURE Evaluation is funded by the United States Agency for International Development (USAID) through Cooperative Agreement GHA-A-00-08-00003-00 and is implemented by the Carolina Population Center at the University of North Carolina at Chapel Hill, in partnership with Futures Group International, ICF Macro, John Snow, Inc., Management Sciences for Health, and Tulane University. The views expressed in this publication do not necessarily reflect the views of USAID or the United States government. WS-10-17 (6/11/10).

Acknowledgements

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We would like to acknowledge the tremendous support and guidance we received from the Mexican Federal Ministry of Health (MOH), the Guanajuato State MOH, the Instituto Nacional de Salud Publica (INSP), and the Pan American Health Organization (PAHO). Specifically we would like to thank Dr. José Ángel Córdova Villalobos, Minister of Health of México, Lic. Juan Manuel Oliva Ramirez, Constitutional Governor of the State of Guanajuato, México, Dr. Jorge Armando Aguirre Torres, Minister of Health of the State of Guanajuato, México, Dr. Mario Henry Rodriguez López, Director General of INSP and Dr. Fatima Marihno, Health Information and Analysis Coordinator, PAHO. We would like to acknowledge the kind hospitality shown by the state of Guanajuato and the health facilities we visited. Without their partnership our field visits would not have been a successful learning experience for our participants.

We thank our main sponsors MEASURE Evaluation/ United States Agency for International Development (USAID) and the RHINO institutional members. RHINO has received a large amount of support in kind including countless hours of labor and time from members of both the TAC and BoD. Organizations which offered work in kind were the following: PAHO; INSP, Cuernavaca; Mexico's and Guanajuato State's Ministry of Health; Abt Associates Inc., John Snow Inc., University Research Corporation, and the Health Metrics Network.

We would like to thank the team of workshop facilitators lead by Beth Gragg and Juan Eugenio Hernandez Avila, comprising Anwer Aqil, Upama Khatri, Lina Sofia Palacio, Beatriz Plaza, Michael Rodriguez,Tisna Veldhuyzen Van Zanten, and Timothy Williams. We would like to acknowledge the concurrent sessions coordinators—Lincoln Moura, Jorn Braa, David Boone, Angela Self, David Randolph Wilson, James Setzer and Jesus Tellez Tellez. Thank you to Leah Gordon, our knowledge management specialist, who helped document workshop proceedings and events through written notes and lively interviews with participants.
Special thanks goes to Irma Castro Bustos and Matthew Parker who have been available day and night to ensure administrative and logistics support to the workshop organizers and participants.

Last but not the least, we would like to thank our workshop participants for traveling from all parts of the world and participating with enthusiasm and for their unyielding commitment to the cause of routine health information systems (RHIS).

RHINO stomp and greetings,
The RHINO Secretariat

- Theo Lippeveld, President
- Norma Wilson, Executive Director
- Natasha Kanagat, Treasurer
- Matthew Parker, Manager

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Acronyms

BoD	Board of Directors
CESAG	Centre Africain d'Etudes Supérieures en Gestion
DM	Data Management
DQ	Data Quality
EA	Enterprise Architecture
HIS	Health Information Systems
HR	Human Resources
HRIS	Human Resource Information Systems
HSS	Health Systems Strengthening
ICT	Information, Communication, and Technology
INSP	Instituto Nacional de Salud Publica
M&E	Monitoring and Evaluation
MOH	Ministry of Health
NGO	Non-governmental Organization
RHINO	Routine Health Information Network, Inc.
PAHO	Pan American Health Organization
PBF	Performance-Based Financing
PRISM	Performance of Routine Information Systems Management
RHIS	Routine Health Information System
TAC	Technical Advisory Committee
USAID	United States Agency for International Development

Executive Summary

Workshop participants.

RHINO organized its fourth international workshop from March 8–12, 2010 in Guanajuato, Mexico. The previous three RHINO workshops had been held in three different continents (North America, Africa, and Asia), and RHINO was eager to collaborate with and encourage a high level of participation from the Latin American continent. This workshop was the first to be organized by the RHINO NGO,[1] with support from USAID through MEASURE Evaluation and collaborating partners, the Mexican Federal MOH, the Mexican Guanajuato State Secretariat for Health, PAHO, and INSP. INSP and RHINO have collaborated closely over the past eight years on RHIS issues.

The workshop was conceived at the RHINO TAC meeting in Washington, D.C., in May 2009. The TAC discussed options for the workshop topics and proposed that the main theme of the fourth workshop would focus on RHIS performance. RHIS performance was defined as the production of relevant and quality information and continued use of information for data management (DM) at all levels. Empirical evidence has showed that availability of relevant and quality information does not necessarily mean that the information is used to inform policy, programmatic, and service delivery decisions. Thus, there was a need for better understanding of factors influencing RHIS performance. The Performance of Routine Information Systems Management (PRISM) framework[2] is well suited to explain the drivers of RHIS performance. It broadens the analysis of RHIS to include three key categories of determinants for RHIS performance—technical, organizational, and behavioral determinants.

The workshop was attended by 99 participants from 29 countries. Not surprisingly, a majority of participants (63%) came from the American continent, but Africa (28%) was also well represented. Participant backgrounds were a combination of information producers and users. Around 60% were HIS professionals while 40% represented various categories of information users. Finally, around 50% of the participants came from non-governmental organizations (NGOs) in the public health field, 25% came from governmental agencies, and the remainder represented the academic and donor community.

One of the objectives of this workshop was to expose the participants to the PRISM framework and tools. For this purpose, a PRISM assessment was undertaken in January 2010 by the Guanajuato Health Department and a case study was developed to help participants at the workshop to examine ways to measure and improve RHIS performance. In addition, the workshop provided opportunities, using on-site visits and "real-life" case study methodology, to measure and analyze RHIS

1. RHINO achieved 501 c (3) status in 2008. For details on the 501 c 3 filing, kindly refer to www.irs.gov/charities/charitable/article/0,,id=96099,00.html

2. Aqil, A., Lippeveld, T., Hozumi, D. (2009). *PRISM Framework: A Paradigm Shift for Designing, Strengthening and Evaluating Routine Health Information Systems. Health Policy and Planning 2009.* 24(3), 217-228.

performance, develop needed interventions, and learn from a variety of country experiences how these interventions achieve the desired results.

While measuring and improving RHIS performance was the main theme of the Guanajuato workshop, the workshop agenda also included two-hour interactive sessions on six RHIS cutting-edge topics selected by workshop participants through a pre-workshop survey:

- information, communication, and technology (ICT) innovations
- improving data quality (DQ)
- human resources and RHIS
- performance-based financing
- enterprise architecture
- RHIS policy and regulatory framework

Based on the exchanges of experiences during the workshop between the participants and the Guanajuato Health Department, the following conclusions emerged from the final session:

- The PRISM framework and tools complement the Health Metrics Network framework and tools
- The PRISM framework and tools, while originally developed for assessment of institution based data sources, can be used for assessment of other data sources and more specifically by community organizations to assess, design, monitor, and evaluate their information system.
- Efforts to improve RHIS performance can largely benefit from the PRISM assessment, more particularly, the organizational and behavioral assessment can facilitate the development of interventions for the production of quality data and for the use of information to improve access to and quality of the health services.
- Culture of information can be strengthened through simple interventions such as better role modeling and dissemination of success stories of use of information for decision-making
- The development of Enterprise Architecture (EA) can be of major help in harmonizing HIS and more specifically in improving RHIS performance.
- Performance-Based Financing (PBF) as a method to improve health system performance will benefit largely from strong RHIS
- The backbone of a well performing RHIS is a solid legislative and regulatory framework
- Major efforts are needed to build human resource capacity for sustainable RHIS. For that purpose comprehensive RHIS courses have been developed and are being taught in centers of excellence such as the INSP in Cuernavaca, Mexico; the Free University of Brussels, Belgium; and the Centre Africain d'Etudes Supérieures en Gestion (CESAG), Dakar, Senegal.
- RHINO needs to break through the language barriers. Concrete plans are underway to establish a hispanophone Latin American network. The francophone participants committed to a similar effort for francophone Africa.

NEXT STEPS

- Several countries have planned to undertake PRISM assessments in the near future (e.g., in Senegal as a collaboration between the MOH and CESAG)
- RHINO will maintain contact with INSP and the Guanajuato Health Department to learn of concrete steps taken to strengthen the RHIS based on findings and recommendations in the PRISM assessment.
- RHINO will maintain communication with representatives of organizations that are potential RHIS advocacy partners and specifically with its own institutional members
- This workshop report will be used as an advocacy document for RHIS investment and for increasing RHINO NGO membership.

Introduction

RHINO organized its fourth international workshop from March 8–12, 2010 in Guanajuato, Mexico. The previous three RHINO workshops had been held in three different continents (North America, Africa, and Asia), and RHINO was eager to collaborate with and encourage a high level of participation from the Latin American continent. This workshop was the first to be organized by the RHINO NGO,[1] with support from USAID through MEASURE Evaluation and collaborating partners, the Mexican Federal MOH, the Mexican Guanajuato State Secretariat for Health, PAHO, and INSP. INSP and RHINO have collaborated closely over the past eight years on RHIS issues.

The workshop was conceived at the RHINO TAC meeting in Washington, D.C., in May, 2009. The TAC discussed options for the workshop topic and proposed that the main theme of the fourth workshop would focus on RHIS performance. The RHINO BoD approved the workshop topic and budget at a board meeting in June 2009.

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TABLE 1: GEOGRAPHIC REPRESENTATION

Region	# of countries	# of participants	% of participants
AFRO	14	28	28.28%
EURO	3	3	3.03%
SEARO	1	1	1.01%
WPRO	2	4	4.04%
PAHO	8	32	32.32%
US/CANADA	1	30	30.30%
Totals	29	99	100%

TABLE 2: PROFESSIONAL REPRESENTATION

Position	#	%
HIS professional	61	61.61
Program Advisor	14	14.14
Statistics	4	4.04
Public Health Managers	5	5.05
Epidemiology	3	3.03
Academic	3	3.03
ICT	3	3.03
Others	6	8.08
Total	99	100%

TABLE 3: ORGANIZATIONAL BELONGING

Organization	#	%
Government agencies	25	25.25
Public health NGOs	48	48.48
Universities/Educational Institutions	17	17.17
Donors	7	7.07
Others	2	2.02
Total	99	100%

Background

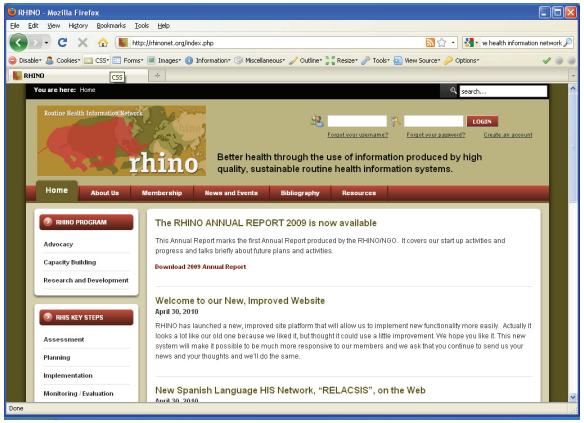
RHINO was created in 2001 under MEASURE Evaluation, a project funded by USAID and that focuses on improving the use of information for evidence-based decision making. RHINO's mission is to advance the state of the art in RHIS, as well as to improve the practice of RHIS design and implementation worldwide through cross-fertilization of lessons learned and of best practices from various countries and organizations.

Since 2001, USAID has generously continued to support RHINO with annual financial resources under MEASURE Evaluation. However, in order to reduce dependency on USAID and to broaden RHINO services, it became desirable to recruit additional sources of funding. By expanding funding to include other international agencies, foundations, and NGOs, RHINO could recruit a broader base of international support, improve the services it provides, ensure continuity of services, and expand its network of contacts.

It was decided to create a new organization, the RHINO NGO. RHINO was incorporated in December 2006 in the state of Massachusetts (USA). The key documents governing RHINO are the Articles of Organization which state the purpose of the organization, and the By-laws which specify the rules for operating the corporation. The RHINO governing, administrative and technical guidance structure consists of an international BoD, a Secretariat, and a TAC. In April 2008 RHINO finally obtained the 501 (c) (3) status that will allow it to receive tax-exempt donations and funds from other donor agencies. The RHINO board passed a membership policy in October, 2008, which enables RHINO to seek support from its own membership through a scaled membership fee.

Since 2001, RHINO has held three international workshops. The first took place in Potomac, Maryland, in March 2001. That workshop investigated the rationale for investing in RHIS in developing countries, the role of RHIS in facilitating and monitoring health sector reform, and the restructuring and strengthening of RHIS. A major output was the "Potomac Statement on Investment in Routine Health Information in Developing Countries." This document specified three roles for RHINO:

- coordinate investment and learning in RHIS development
- analyze and disseminate best practices in routine health information collection and use
- promote research, technical meetings, and pilot projects



Home page of the RHINO website.

The second RHINO workshop was held in South Africa in October 2003 and focused on enhancing the quality and use of routine health information at the district level. The workshop offered participants a unique program that wedded field-based learning with a residential program that included presentations, discussions, and an informal exchange of experience. Based on first draft of the PRISM framework, the participants examined the factors that influence the production of high-quality data and the use of routine health information in district health settings, and they shared experiences and techniques for building capacity for information use at the district level. As a direct result of the workshop, and drawing on the recommendations of the participants, MEASURE Evaluation staff members fine-tuned the PRISM framework and developed a set of PRISM tools to assess and propose interventions that will improve district RHIS.

The third RHINO workshop was held in Chiang Rai, Thailand in Februrary 2006. The workshop focused on data collection and information use at community and facility levels of the health care system. Community and facility levels together represent the service delivery interface of the health system, meaning the level "where action takes place." The workshop objectives were to examine lessons learned and best practices to advance the production of quality data at community and facility levels, as well as to advance the use of the information for evidence-based decision-making that is related to individual and community health interventions; and to reinforce RHINO as a network that advances RHIS development on a continuous basis via the sharing of knowledge and experiences. The outputs of the workshop included documentation of best practices for health information systems (HIS), an action agenda, a research agenda and a RHINO agenda to inform its advocacy and networking goals. Finally, various country and regional groups came together at the end of the workshop and drafted action plans for the short-term improvement and the long-term development of facility and community HIS.

Based on the lessons learned from these workshops as well as from various other knowledge management activities and state-of-the-art work, this fourth RHINO workshop focused particularly on measuring and improving RHIS performance.

Workshop Objectives and Conceptual Approach

The following objectives had been set out for the Guanajuato workshop:

- State the evidence that RHIS can contribute to health systems strengthening (HSS)
- Describe the characteristics of high performing RHIS
- Field test and discuss the PRISM tools to measure and evaluate RHIS performance
- Discuss the design of interventions to improve RHIS performance
- Advocate for strong RHIS in support of improved health system performance and therefore improved health outcomes

The Guanajuato workshop addressed the critical role of the RHIS in improving health system performance. A well-functioning HIS provides specific information support to the decision-making process at each level of the health system. Presently, most HIS are fragmented and centralized with poor DQ. Consequently, there is poor use of information at all levels and an increased reliance on more expensive data collection methods; this data is applicable at national and global levels.

Evidence from the field has indicated that successful RHIS reform is linked to strong leadership in the country, a standardized business and data generation architecture, the availability of resources adapted to the country setting, and the definition of RHIS performance criteria which should include the production of relevant and quality information and continued use of information for DM at all levels. Empirical evidence has showed that availability of relevant and quality information does not necessarily mean that the information is used to inform policy, programmatic, and service delivery decisions. Thus, there is a need for better understanding of factors influencing RHIS performance. The PRISM framework is well suited to explain the drivers of RHIS performance (see Figure 1). It broadens the analysis of RHIS to include three key categories of determinants for RHIS performance:

- Technical determinants— ICT and data collection processes, forms, and methods.
- Organizational determinants—information culture, structure, resources, roles, and responsibilities of the health system and key contributors at each level.
- Behavioral determinants—knowledge, skills, attitudes, values, and motivation of the data collectors and users.

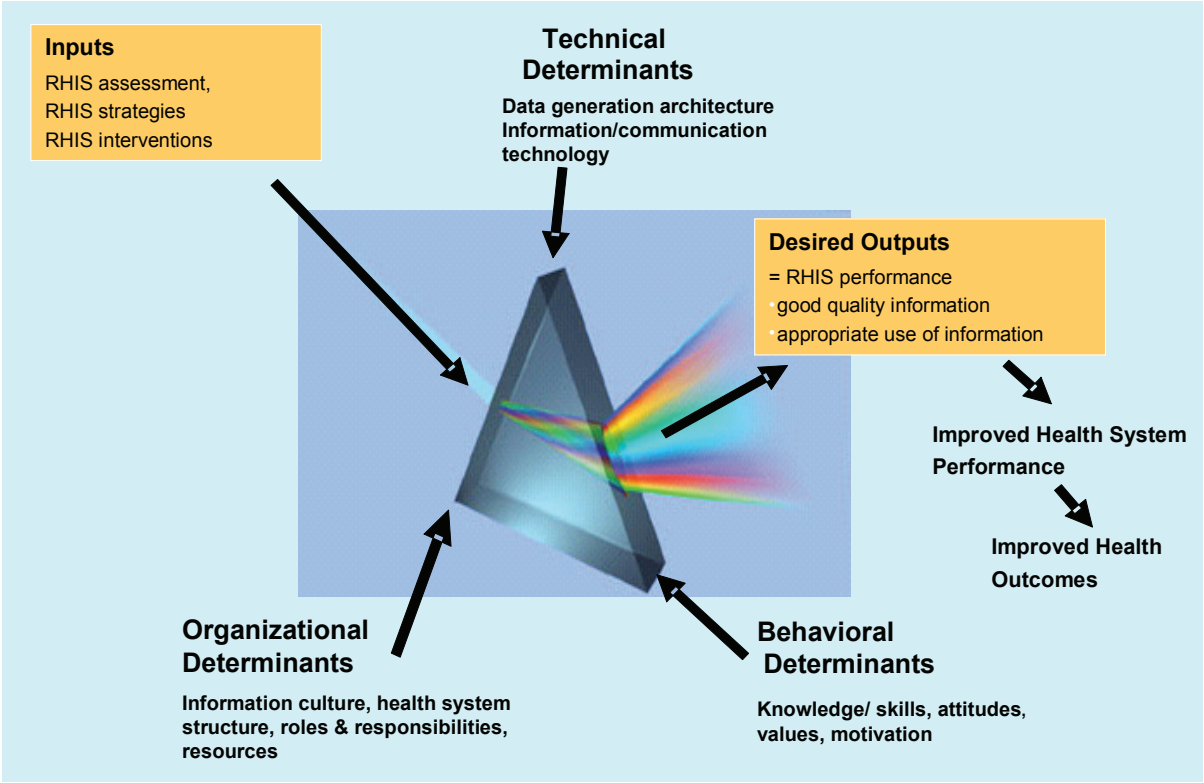


Figure 1: PRISM Framework for Understanding RHIS Performance

The PRISM conceptual framework and tools identify strengths and weaknesses in these areas, and also correlations among the areas. This assessment aids in designing and prioritizing interventions to improve RHIS performance—which in turn improves the performance of the health system.

The PRISM toolset includes four tools for assessment, design, monitoring, and evaluation. These tools—a combination of questionnaires, data collection meth-

ods, and processes—serve the following key purposes:

- to assess the performance of an RHIS.
- to identify technical, behavioral, and organizational factors that affect RHIS performance.
- to aid in designing and prioritizing interventions to improve performance.
- to support ongoing efforts to monitor and evaluate DQ and use in decision-making.

One of the objectives of this workshop was to expose the participants to the PRISM framework and tools. For this purpose, a PRISM assessment was undertaken in January 2010 by the Guanajuato Health Department (see Annex 9) and a case study was developed to help participants at the workshop to examine ways to measure and improve RHIS performance. In addition, the workshop provided opportunities, using on-site visits and "real-life" case study methodology, to measure and analyze RHIS performance, develop needed interventions, and learn—from a variety of country experiences—how these interventions achieve the desired results.

While measuring and improving RHIS performance was the main theme of the Guanajuato workshop, the workshop agenda also included two-hour, interactive sessions on six cutting-edge RHIS topics selected by workshop participants through a pre-workshop survey. Participants were asked to list their top three choices in cutting-edge RHIS issues which they would like to discuss at the workshop out of a suggested 10 topics. These sessions were held on the third, fourth, and fifth days of the workshop. The sessions were designed for maximum interaction and included an introductory presentation followed by discussions and next steps.

TABLE 4: TOPICS AND FACILITATORS

Topic	Facilitator	Position	Organization	Country
Innovations in ICT hardware and software	Jørn Braa	Associate Professor	Department of Informatics, University of Oslo	Norway
Improving DQ	David Boone	Epidemiologist, Health Informatics Advisor	MEASURE Evaluatio, JSI	USA
Human resources and RHIS	Angela Self	Human Resources Information System Advisor	Capacity Plus Project, IntraHealth	USA
PBF	Randy Wilson, James Setzer	Senior Advisor HIS Senior Associate	Ministry of Health Abt Associates Inc.	Rwanda USA
EA	Lincoln Moura	President	Zilics eHealth	Brazil
RHIS policy and regulatory framework	Jesús Tellez Tellez	Director for Health Information Systems	Ministry of Health	Mexico

Workshop Proceedings

Workshop registration took place on Sunday evening, March 7, 2010, until Monday morning, March 8, 2010. The workshop was inaugurated on Monday morning by Dr. Jorge Armando Aguirre Torres, Minister of the Health of the State of Guanajuato followed by a keynote address by Dr. Sally Stansfield, Executive Director, Health Metrics Network. Dr. Mario Henry Rodriguez Lopez, Director General of INSP explained INSP's efforts in ensuring the production and use of timely and quality health information for decision-making.

Juan Eugenio Hernandez, Director of the Information Center for Decisions in Public Health, National Institute of Public Health, Mexico, provided an overview of Mexico's health system. Dr. Theo Lippeveld, president of RHINO, provided an orientation to the PRISM framework and emphasized the relationship between RHIS and HSS. In the afternoon, a session on PRISM tools was held in preparation for the field visits the next day. RHIS experts presented the PRISM tools along with sample data collection records which participants would work with at their health facilities. The day ended with a welcome reception which included a Mariachi band.

Tuesday was spent in the field. The 99 participants were divided into 10 groups of approximately10 people. They visited 10 separate health facilities in the Mexican state of Guanajuato ranging from general hospitals to community-level facilities. Accompanied by a representative of the State of Guanajuato Public Health System, each group received a general overview of the facility's RHIS, went on tours of the facilities and briefly assessed the current state of RHIS using the PRISM tools.

On Wednesday, the participants re-grouped in plenary session to provide feedback on HIS in the facilities they visited and the ability of the PRISM tools to assess HSS performace with an emphasis on areas of improvement. Participants were also asked to interpret findings from the Guanajuato case study conducted in January 2010 using the PRISM tools. Following this session, participants attended the concurrent sessions on various RHIS topics. A tools fair and poster session was organized in the evening to encourage participants to share their work with each other.

Field visit to Hospital General Celaya.

On Thursday morning, Stephen Settimi, Senior Global Health Advisor for HIS at USAID/Washington, opened the plenary session and emphasized the relevance of leadership and country commitment to RHIS. Theo Lippeveld presented potential technical, organizational, and behavioral interventions based on the PRISM assessment. Dr. Chen Jie, director of the Guangxi Provincial Health Department, presented the China case study on RHIS assessment using technical, organizational, and behavioral interventions. In the afternoon, participants proposed interventions based on the results of the Guanajuato case study. The Guanajuato MOH invited workshop participants to share their recommendations with them. A closing dinner and dance was held in the evening at a hacienda.

Friday morning was spent on cutting-edge topic sessions. In the afternoon there was an RHIS resource panel comprising one representative from each of the following organizations: USAID, MEASURE Evaluation, PAHO, MOH/Mexico and RHINO. Each representative explained briefly their organizations' role in furthering the cause of RHIS in global health, and how country government agencies and NGOs could access their resources. The final session was on "Action Planning and Advocacy: Improving RHIS for Better Health System Performance Improvement." During this session, an "action planning guide" was handed out so participants—working individually or in-country teams—could develop an advocacy agenda for their countries. Once the participants completed their action plan, a moderated plenary discussion followed.

Workshop Outputs

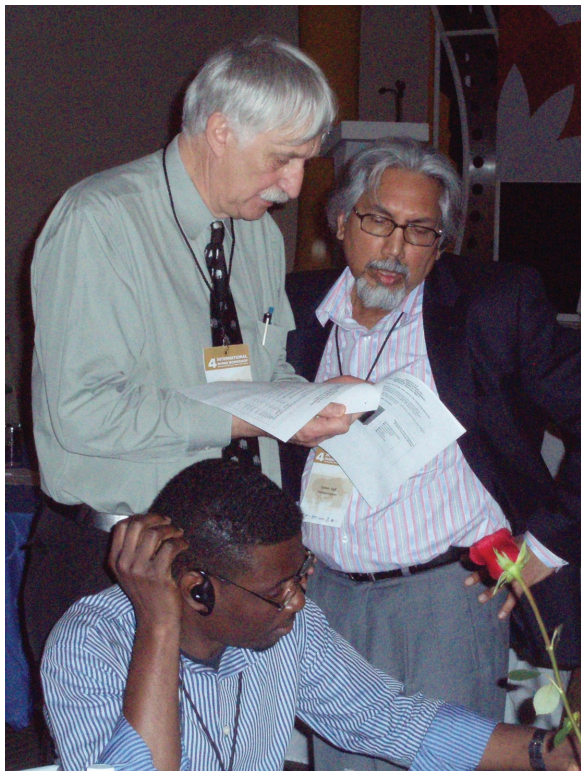
The outputs of the workshop have been organized into two main areas:

- PRISM Framework and Tools
- Cutting-Edge Session Reports

PRISM FRAMEWORK AND TOOLS

Summarized comments from participants

- The PRISM framework is comprehensive and easy to understand.
- PRISM tools measure RHIS performance and help to identify factors that influence the HIS and consequently health system performance as a whole.
- The PRISM framework is unique in bringing different components of the information system together to create a holistic picture of how these components are working in harmony, or disharmony, to produce HIS performance.
- The application of the PRISM tools is easy but requires some practice.
- The tools are based on different sources of information (people and records) and collection methods (interview, record review, observation, and pencil paper test) and therefore triangulate information to increase validity of the collected information
- The tools operationalize many constructs such as RHIS processes and performance, self-efficacy or confidence for RHIS tasks, RHIS data demand, motivation for RHIS tasks, and the culture of information
- The PRISM framework and tools, while originally developed for assessment of institution-based data sources, can be used for assessment of other data sources and, more specifically, by community organizations to assess, design, monitor, and evaluate their information system. They were also used in Uganda to assess the Educational Management Information System.
- Efforts to improve RHIS performance can largely benefit from the PRISM assessment, more particularly, the organizational and behavioral assessment can facilitate the development of interventions for the production of quality data and the use of information for health services improvements. China's example was enlightening and showed the these interventions are doable



Workshop coordinators in problem-solving mode.

Recommendations to Guanajuato State on PRISM Assessment and Interventions

The Guanajuato MOH invited participants to provide feedback based on their analysis of the findings of the Guanajuato state assessment conducted in January 2010. These recommendations will be officially handed over to the Guanajuato MOH and have been summarized:

National HIS Policy

- Disseminate national HIS policy for data sharing and coordination among all stakeholders.
- Include HIS policy guidelines in standardized HIS training programs.

Harmonization

- Conduct a stakeholder consultative meeting to identify ways to harmonize the RHIS to avoid vertical, fragmented systems.
- Explore the interoperability of systems that focus on the exchange of information and also achieve data integration while allowing independent organizations to collaborate and express their strengths and creativity.
- Integrate and harmonize reporting forms at the facility level.
- Integrate and harmonize reporting systems at the facility level.
- Develop and implement procedure guidelines for RHIS processes.

Data Completeness

- Develop a process for checking data completeness at facilities.
- Increase supervisory visits and include standardized method (checklist) for checking completeness of data.

Data Accuracy

- Conduct rapid assessments to determine issues with data accuracy.
- Strengthen data processes at the district leve.l
- Develop tally sheets or registers to assist with data validation.

Data Use

- Make DQ checks a priority.

- Enable districts to review organizational processes for in-service training and supervision in data use.
- Prioritize data use and evidence-based decision-making.
- Develop a training manual on assessing DQ and use of information for continuous improvement of health system performance.

Capacity Building
- Develop capacity and support systems to translate data into actionable information.
- Conduct periodic in-service and pre-service training to ensure staff are skilled in data use and analysis.
- Strengthen technical capacity for systematic implementation of a supervisory and monitoring system.

CUTTING-EDGE SESSIONS REPORTS

1. Innovations in ICT

Moderator: Jørn Braa, Associate Professor, Department of Informatics, University of Oslo, Norway

Key Messages
- ICT can play a key role to improve integration of parallel and/or siloed information.
- Interoperability and standards are a foundation for achieving data integration at multiple levels.

Issues and Challenges
- Poor and uneven infrastructure within (particularly) and across countries impedes the uniform implementation of solutions.
- Two conflicting trends with mobile health applications exist: (1) push toward further decentralization of the data capture; and (2) reporting function against the (perceived) Western company imperialism/colonialization of the data control mechanism
- Conflict between building capacity for sustainability through training and mobilizing staff or human resources (HR) to move to new opportunities, frequently outside of their current facility, department, ministry, or program area (particularly in the HR-constrained countries).

Suggested Solutions
- Emphasis on building the policy and legal framework within countries to ensure data ownership by countries.
- Standardized list of facilities with unique identifiers is a key component to building larger management of the RHIS.
- Limited and effective essential indicators set across programs will improve RHIS functioning.

2. Improving Data Quality

Moderator: David Boone, Informatics Advisor, MEASURE Evaluation

Key Messages
- Importance of DQ
- Key threats to DQ
- Current practices, opportunities and challenges
- How to improve DQ to strengthen RHIS

Issues and Challenges
- The importance of DQ to RHIS for planning, evaluation, progress towards targets.
- Tools to assess DQ as an indicator of system performance.
- Confidence in accuracy and reliabilty of data sources.
- Opportunities and methods to build capacity.
- Presentation of variety of DQ tools.
- Presentation of country experience assessing DQ and system performance using the Routine Data Quality Assessment Tool. Countries are: Mozambique, Nigeria, South Africa, Kenya, Swaziland, and Democratic Republic of Congo.
- Challenges to improving DQ—lack of standards (tools, forms, indicators definition, procedures, etc.), lack of resources (human, financial, and technology); and lack of adequate supervision.
- State-of-the-art DQ assessment/assurance: Country Health Systems Surveillance initiative
  - » Assessing national level data for annual health sector reviews.
  - » Making data more useful by making adjustments to correct for biased or missing data.
  - » Tools to assist in DQ assessment, data analysis and communication of results.

Suggested Solutions
- Monitor DQ indicators (accuracy, timeliness, and completeness) over time to understand the trend in performance and limitations in the data.
- Use standard methods for assessing DQ for wider acceptability of results.
- Strive for standards in indicators and data collection tools to ensure comparability or results.
- Make adjustments to biased or missing data using established methods.
- Augment the profile of RHIS data by expanding the user base—publish RHIS data and information and feedback results to lower levels (region, district, facility, and community).
- Persistent advocacy on the importance of DQ to the performance of RHIS.

3. Human Resources and Workforce Capacity Building

Moderator: Angela Self, HRIS Advisor, Capacity Plus Project, IntraHealth

Key Messages
- There is a need to identify the roles and needed skills in HIS based on the HIS functions—collection, transmission, processing, analysis/interpretation and use.
- The role and skills must be identified also in relation with the health system levels—at higher levels, use and the production of information are implemented by distinct persons and involved specialization; at the level of the facility, the staff must be able to assume all roles.
- At the highest level, there will be a need for staff assigned to data/information processing and analysis to present the information in an easy manner to the decision-makers.

- Electronic records at the lowest levels is not always possible but records management and information organization is always a fundamental need.
- From the mapping of roles and skills, capacity building strategies and plans can be elaborated.
- Training on health information and statistics must be adapted and must better address the use of information and problem solving techniques.

Issues and Challenges
- How to get the right person at the right place: information related jobs are most of the time disregarded.
- How to insure a continuity of training from the lowest to the highest level.
- How to maintain skilled staff in place.
- Human resource information systems (HRIS) tend to be paper-based, inefficient, laborious to produce reports.
- Lack of HR capacity is the top challenge for adoption and use of eHealth.

Suggested Solutions
- Building a matrix taking into account the HIS functions and levels in the health system may help identifying roles and needed skills of HR for HIS.
- At the level of the health facility, one must be very careful of not deteriorating a system which works when envisaging the introduction of computer-based solutions. Non-computerized record management, such as "tickle files system," are still very relevant.
- In the training programs, a bigger place must be devoted to "problem solving" as the link between analysis and use of information for decision-making.
- Developing incentives for use of information other than cash, e.g., official recognition (diploma certificate), contest and prices (piece of equipment, scholarship), etc.
- iHRIS suite: this open source software is internet-based, includes sample reports, can accept data from different sources, and can model interventions.

4. Performance-Based Financing: Case study of PBF in Rwanda

Moderators
- Randy Wilson, Senior HIS Advisor to Ministry of Health, Rwanda, MSH
- James Setzer, Senior Associate, Abt Associates Inc.

Key Messages
- PBF is also known as P4P (Pay for Performance) and PBC (Performance Based Contracting).
- Financing has historically been exclusively done on the input side. PBF aims to supplement the input side by paying for good performance on the output side.
- Key principles of PBF:
  - » Should complement input financing, not replace it.
  - » It creates incentives to improve people's performance.
  - » It is a balancing act between the purchasers, providers, and controllers of health care.
  - » PBF funding does not cover cost of services—just incentivizes it.

PBF and RHIS Link
- Success of PBF relies on our ability to use the RHIS.
- PBF indicators should be subset of indicators already collected by RHIS: numbers of service outputs or coverage rates.
- Reward only positive indicators (i.e., don't incentivize number of malnourished children diagnosed because you want this number to be low).

Issues and Challenges
- Lack of coordination at all facility levels of the country: national, state, district, and community.
- Lack of political will and leadership.
- Heavily centralized health care: limited engagement by local health managers and providers.

Suggested Solutions
- An essential element for success in Rwanda was the "roll-out plan."
- Strong and consistent leadership at the highest level in the MOH.
- Clarify obligations of the government (the controllers), developing partners (the purchasers) and health care facilities (the providers).
- Integrated framework of evaluation, supervision, training, and health infrastructure management.
- Access to data monitoring and verification systems.

5. Enterprise Architecture

Moderator: Lincoln Moura, President, Zilics eHealth

Key Messages
- Our mission is to build HIS that are useful, lasting, flexible, interactive, incremental, and, most of all, sustainable.
- EA describes the current or future structure for an organization's processes, information systems, personnel, and organizational subunits so they align with core organizational goals and strategic direction. This is achieved by applying a comprehensive and rigorous methodology. Although often associated strictly with information technology, EA actually relates more broadly to business optimization by addressing business architecture, performance management, and process architecture.

Issues and Challenges
- Lack of standard business architecture—limited understanding of processes.
- Existence of vertical programs and vertical HIS.
- Absence of comprehensive guidelines.
- Low HR capacity for health informatics.
- Unappreciative of complexity of eHealth infrastructure.

The guests of honor during the opening ceremony.

Suggested Solutions: Improved EA/eHealth can increase information quality, reduce costs, and optimize use of resources.

- Four pillars of EA/eHealth:
  - » ICT infrastructure.
  - » Methods for specifying systems and extracting knowledge; standards.
  - » HR.
  - » Organizational resources (who owns the system and what's the decision-making process?).
- Four main axes of eHealth include:
  - » Health system organization (e.g., no standards to handle referrals consistently at different levels).
  - » Management of overall services network.
  - » Focus on integration of individual and community health.
  - » Electronic health records.
- Basic ideas that can help favor successful EA/eHealth:
  - » Build and use conceptual models—consider state-of-the-art architecture.
  - » Say "no" to siloed systems. Comply with standards (especially data dictionaries, communications, security).
  - » Demand interoperability (no one system can meet all needs of a health enterprise—different such sub-systems may have different data but they must be able to talk with each other).
  - » Build unique identifiers (clients, providers, health facilities, and relationship between them).
  - » Ask for web-based design and use software engineering tools.

6. RHIS Policy and Regulatory Framework

Moderators

- Jesús Téllez, Director for Health Information Systems, MOH/Mexico
- Beatriz Plaza, HIS Advisor, MEASURE Evaluation

Key Messages

- Highlight the importance of having institutional normative frameworks within each country to support a well-functioning national HIS.
- Establish a priori, the specific roles and action items that a national HIS should develop as well as the importance of having these be aligned to the existing institutional normative framework.
- Present the existing institutional normative framework for HIS in Mexico.

Issues and Challenges

- Lack of a well-formulated policy for the interoperability of HIS data.
- Existence of numerous vertical HIS.
- Under developed ICT systems.
- Lack of culture of information.

Suggested Solutions

- Support the establishment and recognition of an institutional normative framework that will sustain a national HIS.
- Projects that focus on the improvement of RHIS should be able to feed into the national institutional normative framework for HIS.
- Provide continuity to the specific action plan for the national HIS.

Conclusions and Next Steps

The Fourth RHINO International Workshop brought together a rich variety of experts and advocates of RHISs to focus on the issue of improving RHIS performance. We can say with confidence that the objectives of the workshop were achieved, although further work is needed to produce evidence that RHIS can contribute to HSS. For this purpose, Health Metrics Network and RHINO jointly produced an initial set of case studies in 2009 demonstrating the impact of RHIS on health service improvements. These case studies are available on both the Health Metrics Network and RHINO websites.

Based on the exchanges of experiences during the workshop between the participants and the Guanajuato Health Department, the following conclusions emerged from the final session:

- The PRISM framework and tools complement the Health Metrics Network framework and tools.
- The PRISM framework and tools, while originally developed for assessment of institution based data sources, can be used for assessment of other data sources and more specifically by community organizations to assess, design, monitor. and evaluate their information system.
- Efforts to improve RHIS performance can largely benefit from the PRISM assessment and, more specifically, the organizational and behavioral assessment can facilitate the development of interventions for the production of quality data and for the use of information to improve access to and quality of the health services.
- Culture of information can be strengthened through simple interventions such as better role modeling and dissemination of success stories of use of information for decision-making
- The development of EA can be integral in harmonizing HIS and, more specifically, in improving RHIS performance.
- PBF as a method to improve health system performance will benefit largely from strong RHIS

RHINO greetings.

- The backbone of a well-performing RHIS is a solid legislative and regulatory framework.l
- Major efforts are needed to build HR capacity for sustainable RHIS. For that purpose comprehensive RHIS courses have been developed and are being taught in centers of excellence such as INSP, the Free University of Brussels, and CESAG.
- RHINO needs to break through the language barriers. Concrete plans are underway to establish a hispanophone Latin American network. The francophone participants are committed to a similar effort for francophone Africa.

NEXT STEPS

- Several countries have planned to undertake PRISM assessments in the near future (e.g., in Senegal as a collaboration between the MOH and CESAG)
- RHINO will maintain contact with INSP and the Guanajuato Health Department to learn of concrete steps taken to strengthen the RHIS based on findings and recommendations in the PRISM assessment.
- RHINO will maintain communication with representatives of organizations that are potential RHIS advocacy partners and specifically with its own institutional members.
- This workshop report will be used as an advocacy document for RHIS investment and for increasing RHINO NGO membership.

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Annex 1: Workshop Agenda, March 8–12, 2010

SUNDAY, MARCH 7

5:00–7:00 p.m. **Participants arrive**
Registration

MONDAY, MARCH 8

Theme: Identifying linkages between health system performance and RHIS performance

8:00 a.m. **Registration**

9:00 a.m. **Welcome and Inauguration**

Guests

- Dr. José Ángel Córdova Villalobos, Minister of Health of Mexico
- Lic. Juan Manuel Oliva Ramirez, Constitutional Governor of the State of Guanajuato, Mexico
- Dr. Jorge Armando Aguirre Torres, Minister of Health of the State of Guanajuato, Mexico
- Dr. Mario Henry Rodriguez López, Director General, INSP
- Dr. Sally Stansfield, Executive Director, Health Metrics Network

10:00 a.m. **Break**

10:15 a.m. **Plenary Session: Laying the Groundwork for the Workshop**

- Overall Quality and Data Systems in Mexico
- Structure of Mexico's Health System

Facilitator: Juan Eugenio Hernandez Ávila, Director of the Information Center for Decisions, INSP

10:45 a.m. **Plenary Session: Laying the Groundwork for RHIS**

- Relationship between RHIS and Health Systems Strengthening
- Characteristics of RHIS Systems
- Orientation to PRISM Framework

Facilitator: Theo Lippeveld, Vice President, International Division, John Snow, Inc.

12:45 p.m. **Lunch**

2:00 p.m. **Small Groups: Presentation on PRISM Tools**

The workshop revolves around on-site assessments of health facilities in Guanajuato State conducted by workshop participants using PRISM Tools. This session sets the stage for the following day's field visits by having experts present the relevant PRISM Tools along with the data collection records they will find at the health facilities.

3:45 p.m. **Plenary Session: Preparing for Tomorrow's Field Visits**

Facilitators:

- Juan Eugenio Hernandez Ávila
- Lina Sofia Palacio, INSP

4:45 p.m. **Evaluate and Close the Day**

Facilitator: Beth Gragg, Senior Training Advisor, World Education

6:00–8:00 p.m. **Welcome Reception**

TUESDAY, MARCH 9

Theme: Measuring and evaluating RHIS performance in actual settings

8:00 a.m. **Field Visits: Assessing RHIS Performance**
Ten groups of participants will visit ten separate health facilities to assess their current state of RHIS, using the PRISM Tools. Each group will be accompanied by a facilitator and a representative of the State of Guanajuato Public Health System.

12:00 p.m. **Lunch**

1:00 p.m. **Field Visits: Assessing RHIS Performance** *continued*

3:30 p.m. **Break**

3:45 p.m. **Plenary Session: Quick Lessons Learned from Field Visits**
Facilitators
- » Juan Eugenio Hernandez Ávila
- » Beth Gragg

5:00 p.m. **Evaluate and Close the Day**

WEDNESDAY, MARCH 10

Theme: Understanding how PRISM tools can measure RHIS performance and identify influencing factors

8:30 a.m. **Plenary Session: Review and Preview**

8:45 a.m. **Plenary Session and Small Groups**
- » Reflect on Field Visits and Lessons Learned

Facilitators
- » Anwer Aqil, Senior HIS Advisor, John Snow, Inc.
- » Lina Sofia Palacio

10:30 a.m. **Break**

10:45 a.m. **Small Groups: Analyze Case Study Data to Assess Actual RHIS in Guanajuato**

1:00 p.m. **Lunch**

2:15 p.m. **Cutting Edge Sessions: Interactive, peer-led presentations on topics of interest to RHINO constituency**
- » Innovations in ICT
  Facilitator: Jørn Braa, Associate Professor, Department of Informatics, University of Oslo
- » Human Resources and Workforce Capacity Building
  Facilitator: Angela Self, Human Resources Information System Advisor, Capacity Plus Project, IntraHealth
- » PBF
  Facilitators
  - Randy Wilson, Senior Advisor HIS and Data Use, MOH Rwanda
  - James Setzer, Senior Associate, Abt Associates Inc.

4:30 p.m. **Evaluate and Close the Day**

7:00–9:00 p.m. **Tools Fair and Poster Session**
Open to all participants who want to share their work with colleagues.
Coordinators
- » Timothy Williams
- » Upama Khatri

THURSDAY, MARCH 11

Theme: Designing interventions to improve RHIS performance

8:30 a.m. **Plenary Session: Review and Preview**

8:45 a.m. **Plenary: Leadership and Country Commitment to RHIS**

Presenter: Stephen Settimi, Senior Global Health Advisor for HIS, eHealth, Office of HIV/AIDS, Global Health Bureau and USAID

9:30 a.m. **Technical, Organizational and Behavioral Interventions**

Presenter: Theo Lippeveld

Facilitators

- Dr. Chen Jie, Deputy Chair of the HIV/AIDS Working Committee, MEASURE Evaluation
- Lina Sofia Palacio

10:30 a.m. **Break**

10:45 a.m. **Proposing Interventions for Guanajuato Case Study**

Facilitators

- Anwer Aqil
- Lina Sofia Palacio

12:30 p.m. **Lunch**

1:30 p.m. **Cutting Edge Sessions: The second set of interactive, peer-led presentations on topics of interest to RHINO constituency.**

- Enterprise Architecture
  Facilitator: Lincoln Moura, President, Zilics eHealth
- RHIS Policy and Regulatory Framework
  Facilitator: Jesús Téllez, Director de Sistemas de Informacion, MOH/Mexico
- Innovations in ICT
  Facilitator: Jørn Braa
- Improving Data Quality
  Facilitator: David Boone, Epidemiologist/Health Informatics Advisor, Measure Evaluation

3:30 p.m. **Evaluate and Close the Day**

7:30 p.m. **Dinner and Entertainment**

FRIDAY, MARCH 12

Theme: Action planning & advocacy: Improving RHIS for better health system performance improvement

8:30 a.m. **Plenary Session: Review and Preview**

8:45 a.m. **Cutting-Edge Sessions: The third, and last, peer-led presentations on topics of interest to RHINO constituency.**

- » Enterprise Architecture
  Facilitator: Lincoln Moura
- » RHIS Policy and Regulatory Framework
  Facilitator: Jesús Téllez
- » Human Resources and Workforce Capacity Building
  Facilitator: Angela Self
- » PBF
  Facilitators
  - Randy Wilson
  - James Setzer

10:45a.m. **Break**

11:15 a.m. **RHIS Resource Panel: Panel will contribute perspectives on their respective organization's interest in continued support for RHIS**

Moderator: Michael Rodriguez, Senior Monitoring and Evaluation Advisor, John Snow, Inc.

Panelists

- » Siân Curtis, Project Director, Measure Evaluation
- » Stephen Settimi
- » Sergio Muñoz, Biostatistician, PAHO
- » Norma Wilson, Executive Director, RHINO/NGO
- » Jesús Téllez

12:30 p.m. **Lunch**

1:45 p.m. **Country Teams and Other Small Groups**

- » Action Plans: Applying Lessons from Workshop

Facilitator: Tisna Veldhuyzen, Vice President and Director, International Development Group, University Research Corporation

3:45 p.m. **Plenary: Results of Country Teams' Action Plans**

Participants will summarize lessons learned, making concrete plans for the way forward for strengthening RHIS in their respective contexts

Facilitator: Tisna Veldhuyzen

4:30 p.m. **Evaluate and Close the Workshop**

Facilitator: Juan Eugenio Hernandez Ávila

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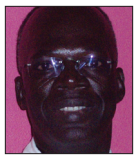

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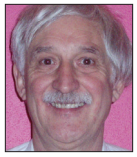

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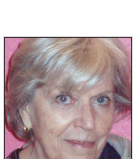

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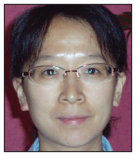

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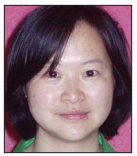

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Annex 3: Evaluation of Workshop by Participants

Session and workshop evaluations were a key component of the RHINO workshop. The feedback was aligned with the agenda and covered the following areas:

- organization and management of sessions
- technical content of the workshop and the networking experience

The feedback surveys were designed to elicit information from participants on their understanding of the technical issues covered, knowledge gained and skills learned as well as their confidence in applying this knowledge within their own country settings. Feedback questions were administered after each individual workshop session and an overall workshop evaluation was conducted on the final day. The response rate for the feedback forms was 60%.

The participants evaluated the workshop on a five point scale with a score of one as very disappointing and score of five as very satisfied on four evaluation domains (workshop organization and management, understanding of how to influence RHIS within their environments, acquired relevant information regarding new developments for RHIS, development and established valuable contacts to further their work in RHIS). Participants provided the following ratings:

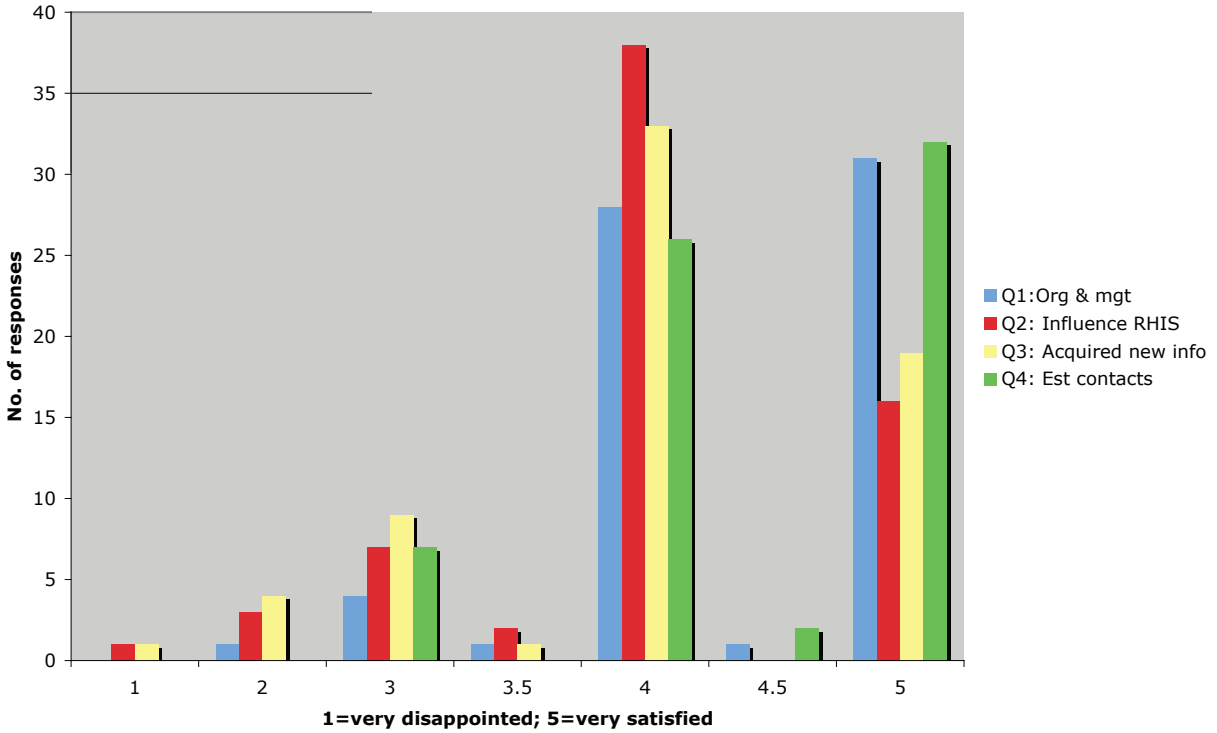

Figure 2: Summary Questions 1–4

Participants shared written clarifications to explain their scores and other observations.

The following strengths were emphasized:

- Relevant technical content which was explored through the PRISM tool and its application in the field visits.
- The PRISM framework is unique in bringing different components of the information system together to create a holistic picture of how these components are working in harmony, or disharmony, to produce health information system performance
- The knowledge is useful for health systems performance management
- The workshop provided necessary capacity building in HIS
- Smooth logistics and planning
- Helpful support staff
- Tremendous opportunity for networking which is a vital activity at a global workshop where professionals appreciate the prospects of exchanging country experiences

Some suggested areas of improvement were:

- RHINO can focus its advocacy on setting national RHIS standards
- The cutting-edge topics sessions, though useful could have been expanded to include more topic areas.
- It would have helped to spend more time orienting oneself towards PRISM tool use before applying them at the field visits
- Would like to see increased attendance of participants from governmental organizations

Annex 4: List of Coordinators and Facilitators

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Annex 5: Tools for Improving RHIS

MEASURE Evaluation has developed tools to help RHIS produce timely and quality information about what is happening in health sectors. The information is used to guide day-to-day operations of the health system, track performance over time, learn from past results, improve continuously, and strengthen transparency and accountability.

MONITORING AND EVALUATION (M&E) SYSTEMS TOOLS

http://www.cpc.unc.edu/measure/tools/monitoring-evaluation-systems

- PRISM Framework and Tools
  http://www.cpc.unc.edu/measure/prism
  - » Performance Diagnostic Tool
  - » Overview and Facility/Office Checklist
  - » Management Assessment Tool
  - » Organizational and Behavioral Assessment Tool

- Data Quality Assurance Tools
  http://www.cpc.unc.edu/measure/dqa
  - » Data Quality Assurance Tool for Program-Level Indicators
  - » Data Quality Audit Tool
  - » Routine Data Quality Assessment Tool
  - » Multi-Indicator Routine Data Quality Assessment
  - » M&E Systems Strengthening Tool

MEASURE EVALUATION NETWORKS

http://www.cpc.unc.edu/measure/networks

- International Health Facility Assessment Network (IHFAN)
  http://ihfan.org
  - » IHFAN was developed to promote communication among professionals interested in exchanging information, sharing published works and materials, and communicating notable news in health information systems data development and use

- Routine Health Information Network (RHINO)
  http://rhinonet.org
  - » RHINO is a MEASURE Evaluation partner whose purpose is to strengthen the role of evidence-based decision-making by engaging organizations and professionals in promotion of effective collection and use of routine health information.

VIRTUAL LEADERSHIP DEVELOPMENT PROGRAM (VLDP)

http://www.cpc.unc.edu/measure/approaches/organizational-development

MEASURE Evaluation offers VLDP to strengthen the leadership skills of health managers and their teams. The blend of online and on-site learning enables the participation of those who seldom have the opportunity to attend off-site programs.

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Annex 8: List of Tools and Posters

TOOLS FAIR: RESOURCE TABLE MENU

- Kenya Master Health Facility List
  - » MoPHS
  - » MoMS Kenya
- Transition from HMIS to DHIS in Pakistan
  - » MoH Pakistan
- Enhancing Strategic Information
  - » ESI
- HIS Budgeting Tool
  - » Abt Associates Inc.
- Organizational Capacity Assessment Tools: Monitoring Capacity Building
  - » NuPITA
- MEDISTOCK: Using Tools to Deliver Essential Medicines
  - » URC
  - » PISAF
- Eritrea Decision Support System
  - » Eritrea MoH
  - » MEASURE Evaluation
- HIV/AIDS Program Monitoring System (KePMS)
  - » APHIA-II Evaluation Project
  - » MEASURE Evaluation

POSTER PRESENTATION MENU

- Development of a Basic Laboratory Information System for Service-Delivery Labs in Resource-limited Settings
  - » CDC
- MEDISTOCK: Using Tools to Deliver Essential Medicines on Time in Benin
  - » URC
  - » PISAF
- Applying Technology to Improve Routine Health Information Systems
  - » URC
- HIS Budgeting Tool
  - » Abt Associates Inc.
- HMN Tools and their Contributions to Paraguay's National HIS
  - » Ministerio de Salud Publica
  - » Bienestar Social, Paraguay
- Evaluation of the Peruvian HIS
  - » MoH, Peru
- Case Studies Showing the Impact of Use of RHIS Information on Health Systems and Outcomes
  - » John Snow Inc.
  - » Health Metrics Network
- The PAIMAN project: HMIS Information to Improve Maternal Health and Save Lives in Upper Dir, Pakistan
  - » John Snow Inc.
  - » Health Metrics Network
- Use of RHIS information in Côte d'Ivoire leads to new VCT strategies and policies, resulting in increased VCT utilization nationwide
  - » John Snow Inc.
  - » Health Metrics Network
- Use of HMIS information leads to interventions that result in dramatic increases in vaccination coverage in Hadiya Zone in Ethiopia
  - » John Snow Inc.
  - » Health Metrics Network
- Data from a new Community Based Information System in Haiti showed high levels of dropouts from an HIV/AIDS care and support program, leading to a policy of household visits, and resulting in improved program coverage
  - » John Snow Inc.
  - » Health Metrics Network
- Developing a Model for Using HIS data for strengthening M&E Reporting in Health Systems in a Low Resource Setting
  - » ESI, South Africa
- Improving the Quality of Data to Inform Smart Decision Making in Health Programmes
  - » ESI, Swaziland
- Rapid HMIS Assessment of Lesotho
  - » ESI, Lesotho

Annex 9: Guanajuato SINAIS Assessment

The Guanajuato SINAIS Assessment was presented at the Fourth International RHINO Workshop. The document is available on the following pages exactly as it was presented at the workshop.

Guanajuato SINAIS Assessment

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Special thanks to all members of the survey team, without their professional work, this study would not have been possible.

We appreciate the support and assistance provided by all eight District Directors of Health Services (DDHS), MIS district focal persons, and the facility director and staff for completing the surveys

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EXECUTIVE SUMMARY

The National Health Information System (SINAIS, by its Spanish acronym) assessment in Guanajuato State was conducted in January 2010 to provide information on the SINAIS situation of the Guanajuato State Department of Health. The findings from this assessment are going to be used by the Guanajuato State health officials as an integral part of their HMIS strengthening plans, and agreed to share these results to develop a case study for the Routine Health Information System Network (RHINO) 4th International Workshop. The case study illustrates how SINAIS assessment in general and specifically how the PRISM framework and its tools could help policy makers and SINAIS managers to identify strengths and weaknesses of the system and develop interventions for strengthening the SINAIS.

The following report provides the findings of the baseline assessment of SINAIS in Guanajuato State. The report also includes discussion of the methodology, the systems areas of strengths and recommendations to strengthen identified areas requiring improvement.

Goals and Objectives of the Baseline Assessment

Goal

- To provide information on the strengths and weaknesses of the existing SINAIS in Guanajuato State Ministry of Health for better monitoring and evaluation of health system performance

Objectives

- To estimate the level of SINAIS performance in the State of Guanajuato (measured by data quality and use of information)
- To assess the behavioral, technical and organizational determinants affecting SINAIS performance
- To build the capacity of the Instituto Nacional de Salud Pública (INSP) and the Guanajuato State Health Services to conduct periodic SINAIS performance assessment
- To develop recommendations for interventions to strengthen the areas needing improvement identified in this baseline assessment.

METHODOLOGY

The Performance of Routine Information System Management (PRISM) framework and its tools were used for the assessment. The rationale for using the PRISM framework is that the framework not only defines and measures information system performance but also explores the determinants of performance. Thus it creates opportunities for improvements by identifying the strengths and weaknesses of the information systems.

Lot Quality Assurance Sampling (LQAS) was used to calculate the sample size for this study. All eight districts (jurisdictions) were chosen and twenty facilities per district were selected randomly. A total of 158 facilities of a possible 160 were surveyed and 241 persons were interviewed. Facilities and staff not surveyed were lost to the study due to unavailability of staff or closure of the facilities. The facilities surveyed provided multiple services. A total of 8 district offices and 15 persons were interviewed and the provincial office were visited and 32 persons were interviewed. The PRISM tools were used to collect data on information system

performance, processes and the organizational, technical and behavioral determinants of information system performance.

MAJOR FINDINGS

Overview

- The Mexico health system has many health institutions, in both the public and private sector responsible for providing health care.
- The National Health Information System (SINAIS, by its Spanish acronym) run by the Ministry of Health (MoH) consists of four subsystems: (1) Population and coverage subsystem; human resources, (2) facilities and equipment subsystem; (3) health utilization and services delivered subsystem; and (4) epidemiological surveillance subsystem. Of these, the only one covering the entire health system is the epidemiological surveillance subsystem.
- Although, there is a regulatory and normative framework for the routine health information system (human resources, facilities and equipment subsystem, services subsystem), it does not explicitly specify the data collection and flow and only states that aggregated data must be shared with the Ministry of Health. Because of this, the routine health information systems managed by the Ministry of Health collect data mainly on MoH managed health related facilities.
- Among the most common causes that impede data sharing between specific program oriented information systems are the software and database incompatibility; the lack of common identifiers (population ID, health facility ID, geographic ID); and access over a network or the internet. The result is a fragmented health information system which makes it very difficult to integrate the data from the different subsystems and programs to produce intelligence and evidence to improve the performance of the health system.

SINAIS Performance

- *Data accuracy:* Data accuracy at the facility level was above 95% for all indicators such as Antenatal care first visit (ANC1), malnutrition in children<1, and diabetes cases. The accuracy at the district level was found to be 85%, 75%, and 75% for (ANC1), malnutrition in children < 1, and diabetes cases respectively. Four of the districts had no data to determine accuracy , while another two of four district have 50% accuracy
- *Completeness:* Completeness for filling the monthly report at the facility level was only 22% while at the district level it was found to be 100% for three districts; five other districts had no data on completeness
- *Timeliness:* Two out of eight districts did not have records to measure timeliness. The six districts that had records showed 62.7% timeliness, indicating in those districts 62.7% of facilities met the deadline.
- *Use of information: 61% of the* facilities showed documentation on holding meetings. Of those facilities, of those facilities 41% discussed and made decision using SINAIS information, while in 27% of the facilities, decisions were referred to a higher level for action. Sixty four percent of the facilities had reports (feedback, monthly, quarterly, others). Out of those facilities, reports showed decisions for strategy review (94%), adjust personnel (92%), advocacy (84%), and mobilizing resources (76.2%). The district level showed a better use of data than the facility level when making decisions. However, the referral to the higher level raises questions on their ability or decision power.

SINAIS processes:

- *Data collection*: 51% of the facilities reported having a data collection procedures manual.
- *Data quality check*: 40% of the facilities reported having a mechanism for checking data quality.
- *Data completeness*: 40.1% of the facilities reported having a process for checking data completeness.
- *Data transmission*: 48.8% of the facilities showed meeting all criteria for data transmission process.
- *Data analysis*: 60.4% of facilities perform data analysis, but with less emphasis on comparisons among types of services.
- *Data display*: 75% of the facilities exhibited some types of data, mostly for maternal and child health and more than 90% of these facilities have updated them in last three months.
- *Feedback*: 57.8% of the facilities showed documentation of having received feedback reports, while eight districts (100%) stated that they send feedback, indicating a gap in feedback communication.

Technical Determinants:

- More than 87.5% of the district respondents felt that the procedure manual, information technology and HIS software are user-friendly.
- 87.5% of the staff believed that the SINAIS software program provides a comprehensive picture of the health system performance.
- 50% of the respondents believed that the various information systems are integrated or existing software could integrate vertical program information.

Behavioral Determinants:

- *Perceived confidence level on SINAIS tasks*: the average confidence level for collecting data, checking data quality, calculation was above 74.2%, but the average confidence level was low for data interpretation 70.9% and use of information 73.4%.
- *Motivation:* 69.2% of respondents believed that SINAIS tasks bring about positive outcomes.
- *SINAIS task competence:* When given SINAIS tasks to perform, 76.1% and 76.3% of respondents were able to calculate two or more of the given three calculations on percentages/rates and plot data respectively. However, the mean competence level dropped for interpretation to 36.5%, use of information 43.2% and checking data quality 55.6%.

Organizational Determinants:

- *SINAIS Management:* At the facility level, the percentile scores showed that on average half of the criteria for SINAIS governance functions were met, while only one third of the supervision, quality standards, training and planning criteria were met, indicating a need for improvement. The finances were centrally managed. District findings were similar except that they have more financial decision power.
- *Promotion of a culture of information:* overall the facility respondents strongly believe (mean score 73% or above) that the health department promotes an emphasis on data

- *Activities for promotion of a culture of information:* activities observed at the facility level were: communication about targets 63.9%, directives to use information 51.2%, sharing of success stories 28%, and the presence of advocacy using SINAIS information 51.8%. These activities were more often observed at the district level but the response pattern remains the same at facility level. Only that of sharing stories of information differed which was half at the facility level.
- *Supervision:* 47.6% of the facilities reported having one or more supervisory visits in last three months. Of those facilities visited, 84.8% reported that supervisor checked data quality, 68.4%, discussed facility performance using SINAIS information, 69.6% helped them make a decision, and 73.4% stated supervisors sent feedback in the last two months.
- *Availability of resources*: 85% of the facilities surveyed have computers, printers and calculators while 40% have regular telephone line and internet. Access to an electricity and water supply is very high (89.2%).
- *Stock out of SINAIS supplies: 86.3*% of the facilities showed that a stock out occurred for the data collection or reporting forms over the past year.

RECOMMENDATIONS

Overall the Guanajuato SINAIS have good performance levels and are well-managed with adequate human and in-kind resources. However, there is room for continuously improving the information system for optimal performance. The following recommendations are categorized under short-term, intermediate and long term recommendations.

Short-term Recommendations:

- Improve SINAIS skills in data interpretation, the use of information and problem solving, and increase use of performance improvement tools,
- Improve feedback/supervision systems, which focus on checking data quality, use of information and comparison among facilities on service indicators.
- Improve the sharing of success stories on the use of information (promoting a culture of information).
- Include SINAIS as part of the Department of Health Strategic Management and Monitoring and Evaluation Framework.

Intermediate Recommendation:

- Develop a data-warehouse to integrate the various health related information systems, linked to the national health information system.

Long-term Recommendation:

- Integration of the various information systems within the private sector, social security institutions and the Ministry of Health.

1. INTRODUCTION

This report starts by providing the background and goal and objectives of the assessment. It provides information on the assessment methodology and the PRISM framework. The chapter on results provides detailed assessment findings at facility and district levels. The discussion section presents arguments that support the findings, as well as differences and similarities in relation to PRISM assessments conducted in other countries and SINAIS assessments in general. Lastly, some recommendations are made to strengthen the existing system.

2. BACKGROUND

A Health Management Information System (SINAIS) assessment in Guanajuato State was conducted in January 2010 to provide information on the SINAIS situation of the Guanajuato State Department of Health. Are going to be used by the Guanajuato State health officials as an integral part of their HMIS strengthening plans, and agreed to share these results to develop a case study for the Routine Health Information System Network (RHINO) 4th International Workshop. The purpose of this case study is to illustrates how SINAIS assessment in general and specifically how the PRISM framework and its tools could help policy makers and SINAIS managers to identify strengths and weaknesses of the system and develop interventions for strengthening the SINAIS.

3. GOALS AND OBJECTIVES

Goal

- To provide information on the strengths and weaknesses of the existing SINAIS for better monitoring and evaluation of health system performance in the State of Guanajuato.

Objectives

- To estimate the level of SINAIS performance (measured by data quality and use of information).
- To assess the behavioral, technical and organizational determinants affecting SINAIS performance.
- To build the capacity of the INSP and Guanajuato State Health Department to conduct periodic SINAIS performance review.
- To develop recommendations for interventions to improve the performance of the HMIS in the State of Guanajuato (data quality, completeness and timelines and use of information in decision making at all levels of the health system).

4. METHODOLOGY

4.1 Conceptual Framework

The Performance of Routine Information System Management (PRISM) framework and its tools were used for the assessment. The rationale for using the PRISM framework is that the framework not only defines and measures information system performance but also explores determinants of performance. Thus, it creates opportunities for improvements by identifying the strengths and weaknesses of the information systems and the determinants of their performance.
The PRISM framework defines information system performance as improved data quality and continuous use of information for decision-making. It hypothesizes that improved performance leads to better health system performance which consequently affects the health status of the population (Fig 1).

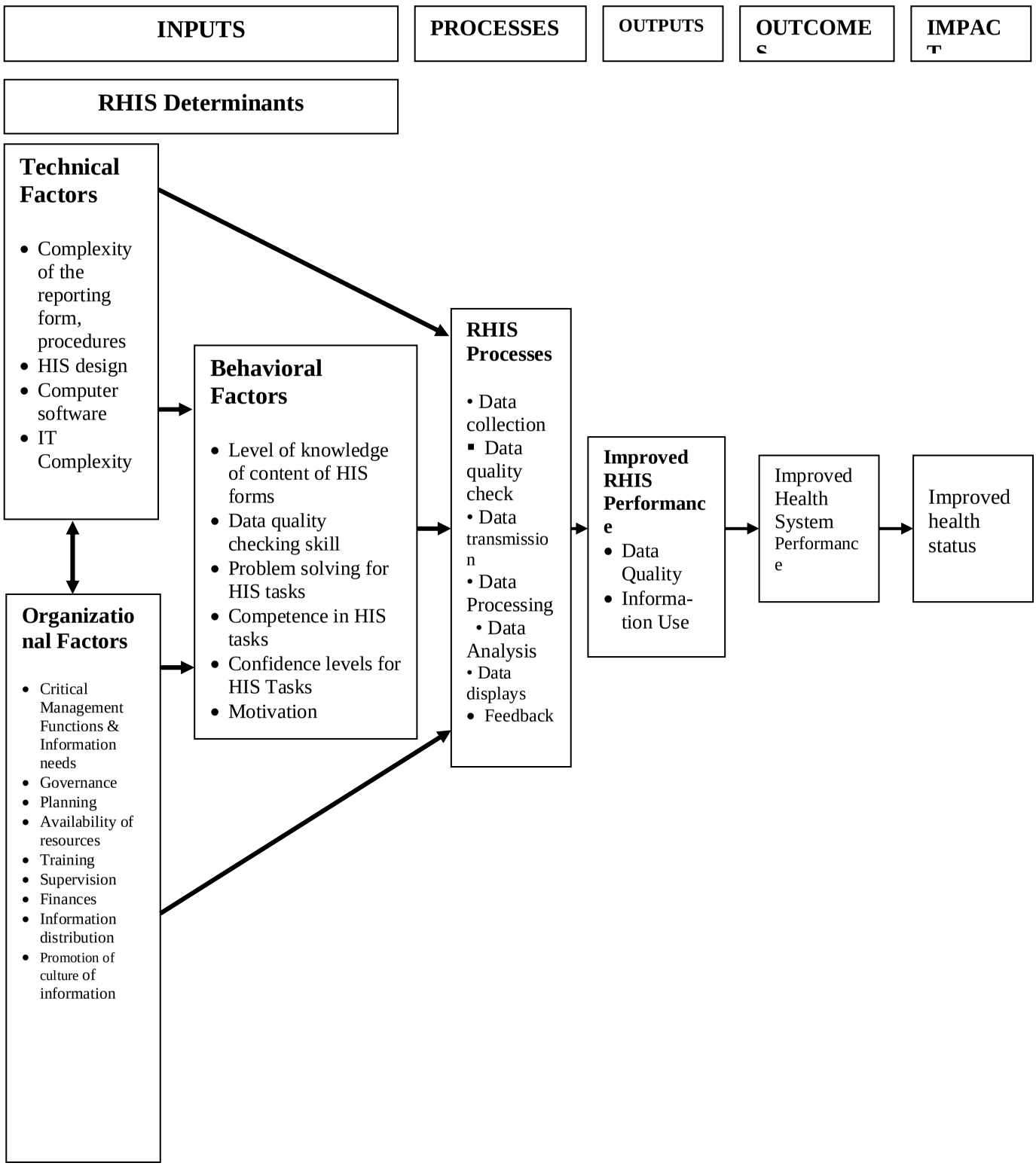
The PRISM framework explores how much the HMIS processes (data collection, transmission, processing, analysis, display and feedback) influence HMIS performance. It also identifies technical, behavioral and organizational determinants (see selected list in Figure 1). Some of the criteria used to shortlist the technical, behavioral and organizational determinants of performance include: how much control HIS designers and implementers have to change the determinants; the closeness of their relationship to performance, the urgency to handle them, and their perceived importance and feasibility.

The PRISM framework is unique in developing operational definitions of 1) RHIS performance, 2) self-efficacy or confidence level for RHIS Task, 3) competence level of RHIS tasks, 4) transmission, completeness and accuracy processes, 5) RHIS data demand, 6) problem solving skills, and 7) a culture of information.

The PRISM framework is the first of its kind to empirically test the relationships among technical, behavioral and organizational determinants on HMIS process and performance. It creates opportunities to identify whether these determinants act directly or indirectly through behavioral determinants or processes or in interaction with each other to influence RHIS performance.

There are four tools – Overview and Facility Checklist, Diagnostic, Management Assessment Tool, Organizational and Behavioral Assessment Tool – developed to capture information under PRISM framework. These tools assess performance and explore direct and indirect relationships of technical, behavioral and organizational determinants as described in PRISM framework (Fig 1) and provide opportunities for developing intervention(s) to bridge identified gaps.

Figure 1: Applying PRISM Framework for Evaluation



4.2 Survey Methodology

Lot Quality Assurance Sampling (LQAS) was used to calculate sample size for this study. All eight districts (jurisdiction) were chosen and twenty facilities per districts were selected randomly. A total of 158 facilities of a possible 160 were surveyed and 241 persons were interviewed. Facilities and staff not surveyed were lost to the study due to unavailability of staff or closure of the facilities. The facilities surveyed provided multiple services. A total of 8 district offices and 15 person were interviewed and the provincial office were visited and 32 persons were interviewed.

PRISM tools were used to collect data at the facility and district level. Four tools – Overview and Facility Checklist, Diagnostic, Management Assessment Tool, Organizational and Behavioral Assessment Tool – were used.

The data was entered using the PRISM data entry and analysis tool and analyzed in SPSS. A detailed description is provided in Appendix A.

5. RESULTS

The findings from this assessment are presented in three different sections. The SINAIS overview describes the various existing information systems and their overlap/ relationship with other health related information systems. This section also highlights the strengths and weaknesses of the SINAIS. The second section is a description of the levels of SINAIS performance measured by data quality and information use followed by description of the existence of various processes under the SINAIS processes section. Lastly, we provide information on the technical, behavioral and organizational determinants of SINAIS performance.

5.0 Overview of Mexico SINAIS

The Mexican Health System (MHS) is comprised of a public sector and a growing private market. The public sector includes health services provided by the MoH to the uninsured population, both at state and federal levels, and social security institutions that provide health services to the population employed in the formal economy (Instituto Mexicano del Seguro Social, IMSS) and governmental employees (Instituto de Servicios y Seguridad Social para los Trabajadores del Estado, ISSSTE). Together the MoH and IMSS-Oportunidades (a branch of IMSS that provides health services to eligible uninsured rural population in 17 States) provide most of the services in rural areas where the majority of people are not insured (Figure 1).

The Mexican Health System (MHS), as the health systems in many countries in the world, is a fragmented system; in spite of the efforts to achieve functional integration in the public sector, the institutions are still vertically organized with practically no interaction between them. The same pattern is also replicated in the Health Information System, in which information is not easily shared among institutions.

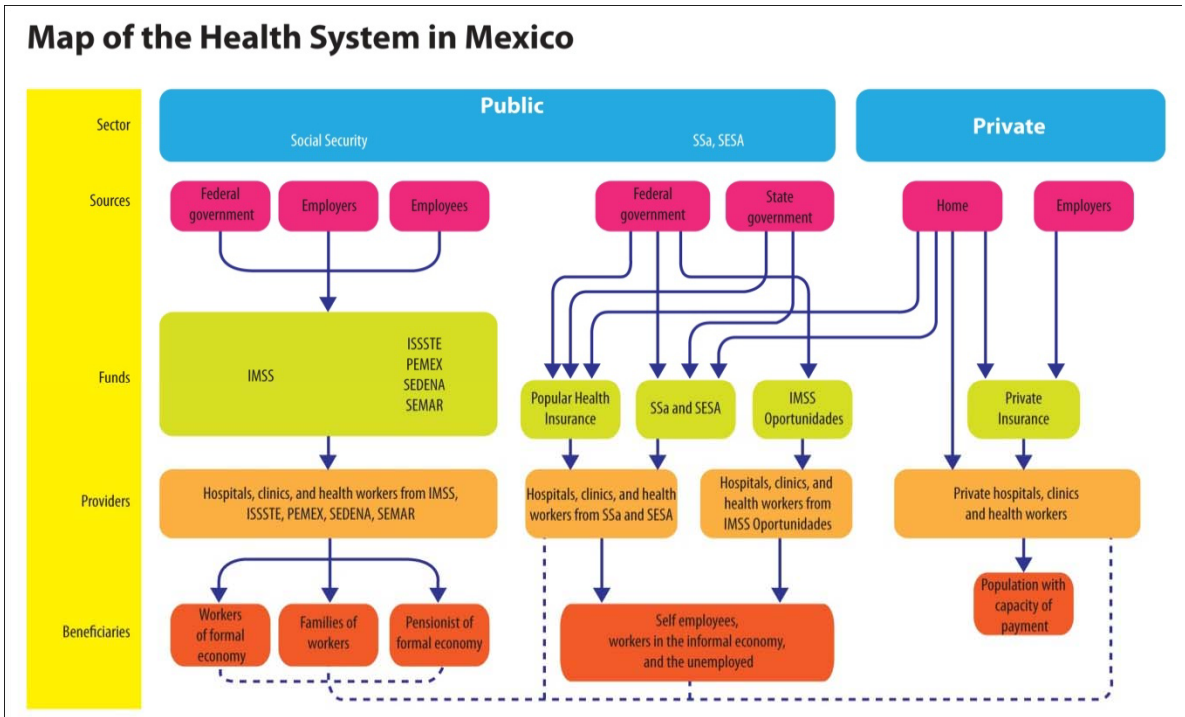


Figure 1. Map of the Mexican Health System. Adapted from the National Health Plan 2000 - 2006

The National Health Information System (SINAIS, by its Spanish acronym) run by the Ministry of Health (MoH) consists of four subsystems: (1) Population and coverage subsystem; human resources, (2) facilities and equipment subsystem; (3) health utilization and services delivered subsystem; and (4) epidemiological surveillance subsystem. Of these, the only one covering the entire health system is the epidemiological surveillance subsystem; this is because it has a normative and regulatory support in the "Norma Oficial Mexicana NOM-017-SSA2-1994" which states that the National Center for Epidemiological Surveillance and Disease Control (CENAVECE) of the Ministry of Health is the institution in charge of surveillance and specifies the data collection and flows for all infectious and chronic diseases subject to notification, it also serves as the base for all special surveillance programs such as vector borne diseases, TB, HIV/AIDS, Influenza, etc. Although, there is also a regulatory and normative framework for the routine health information system (human resources, facilities and equipment subsystem, services subsystem), it does not explicitly specify how the data collection and flow must be and only states that aggregated data must be shared with the ministry of health, that is why the routine health information systems managed by the Ministry of Health collect data mainly on MoH managed health related facilities. Information on the rest of the health sector is received in aggregated files both, by state and national.

As most of the routine health information systems in the ministry of health were independently developed in response to the needs of particular health programs, they

became silos like subsystems in which, often, the same data is collected but seldom shared between different information systems. Among the most common causes that impedes data sharing between specific program oriented information system are the software and database incompatibility; the lack of common identifiers (population ID, health facility ID, geographic ID); and access over a network or the internet. The result is a fragmented health information system which makes it very difficult to integrate the data from the different subsystems and programs to produce intelligence and evidence to improve the performance of the health system.

The population and coverage subsystem include the census data as well as a set of periodic national health and population dynamics surveys which provide information on the socio-demographic characteristics and a panorama of the health status of the population, the main data sources are the National Institute of Statistics and Geography (INEGI) and the Population Council of Mexico, as well as other institutions in the health sector such as the National Institute of Public Health.

The information subsystem of Equipment, Human Resources and Infrastructure for health services delivery, it is intended to collect all relevant information about available resources to provide health services. It is an online information system that gets updated every six months.

The health utilization and services delivered subsystem collects data on hospital discharges (SAEH by its Spanish acronym) and service delivery and utilization (SIS by its Spanish acronym). The hospital discharge information system is a nominal registry with all relevant information about the patient, the medical condition diagnosed and the medical procedures performed. SIS on the other hand is a numerical registry that collects data on the number of services provided by health program. It includes data on maternal and child health, vaccination chronic diseases, child nutrition among others. Both of these systems report with a monthly periodicity.

The epidemiological surveillance subsystem includes vital events and monitors births since 2007 by a birth certificate form filled up at the moment of birth. This information system collects data on the mother and child and is intended to serve as the base upon which to evaluate vaccination programs coverage. The death registry is also a part of the epidemiological surveillance system; it is jointly operated and administered by the CENAVECE and INEGI. This is also a nominal registry which collects demographic data and the cause of death. The lack of unique population id's make very difficult to perform record linkage with hospital discharge data for example.

Morbidity surveillance is carried out by integrating data from the hospital discharge data, as well as the report form for diseases both, chronic and infectious, subject to notification. Notifiable diseases are entered weekly unless immediate notification is required. Disease surveillance systems include a numerical web based information system for the most common diseases and a set of nominal registries for the special surveillance programs such as malaria, dengue, HIV/AIDS, TB, congenital neural tube defects, maternal mortality, cancer, etc.

The quality assurance program also has an information system which collects data on quality of care in its different dimensions: technical, interpersonal provider/client relation, user satisfaction, proportion of prescriptions fully supplied. As seen in figure 1 this is the information system that provides most feedback to all levels of the MoH.

Table 1 shows a mapping of the Health Information system in which we present the name of the different health programs and the specific information system associated with it and the kind of information it produces. It can be seen from this map that similar pieces of information are collected by different systems. Figure 1 shows the data flows throughout the organization levels of the MoH starting with those that collect information in the community (SIS), mostly on public heath actions such as that produced by prevention programs. Most of the information flows are in an upward direction with little feed back to the lower levels of the organization. Cross program data sharing is limited between specific programs/information systems. Most often data integration cannot be fully automated due to the lack of unique identifiers or the lack of standards.

Table 1. Mapping of the Health Information System.

	2. Types of information										
Information System	**2.1 Specific name**	**2.2. Utilization of services**	**2.3. Incidence of selected diseases**	**2.4. Disease outbreaks of immediate notification**	**2.5. Finance information**	**2.6. drugs, contraceptives and vaccine inventories**	**2.7. Human Resources**	**2.8. Equipment and Infrastructure**	**2.9. Vital events**	**2.10. Other**	**2.11. Other**
Routine health Information System	**SIS**	x								x	
	SAEH	x	x				x	x	x	x	
	Urgencias	x	x				x	x	x	x	
Epidemiological sueveillance: Infectiuos diseases of obligatory notification	**SINAVE-SUAVE-SUIVE**		x	X						x	
	SINAVE-RHOVE		x	X					x	x	
Information System for Special programs: PAI/EPI	**PROVAC**	x	x							x	
	SIS	x	x							x	
	SINAVE-VEED/ERA´s	x	x	X						x	
Information System for Special programs: Tuberculosis	**SINAVE-Micobacterias: EPI TB**	x	x							x	
Information System for Special programs: Malaria	**SINAVE-ETV and zoonosis**		x	X						x	
Information System for Special programs: HIV/AIDS	**SINAVE-VIH/SIDA ITS**	x	x							x	
Information System for Special programs: Maternal and child health	**SIS**	x	x	X					x		
	SAEH	x	x			x	x	x	x	x	
	SINAC	x	x				x	x	x	x	
	Censos	X								x	

	2. Types of information										
Information System	**2.1 Specific name**	**2.2. Utilization of services**	**2.3. Incidence of selected diseases**	**2.4. Disease outbreaks of immediate notification**	**2.5. Finance information**	**2.6. drugs, contraceptives and vaccine inventories**	**2.7. Human Resources**	**2.8. Equipment and Infrastructure**	**2.9. Vital events**	**2.10. Other**	**2.11. Other**
	INDICAS	x								x	
	SINAVE		x	X						x	
	SEED	x	x				x		x	x	
Information System for Special programs: Influenza	**SINAVE-Influenza**		x							x	
Information System for Special programs: Diabetes											
Information System for Special programs: Heart diseases	**SUIVE-GAM**										
Oral health											
Breas cancer											
Nutrition in scholars	**SUIVE-s/n**	x	x							x	State Sytem
Community health information system	**SIS-fuera de la unidad**	x								x	
Finance and administrative information system	**R3**				x					x	
Human resources	**SINERHIAS**						x	x		x	
Training	**DETECTAEVANO**						x			x	
Logistics and supplies	***Inventarios***				x	x		x		x	sin nombre

	2. Types of information										
Information System	**2.1 Specific name**	**2.2. Utilization of services**	**2.3. Incidence of selected diseases**	**2.4. Disease outbreaks of immediate notification**	**2.5. Finance information**	**2.6. drugs, contraceptives and vaccine inventories**	**2.7. Human Resources**	**2.8. Equipment and Infrastructure**	**2.9. Vital events**	**2.10. Other**	**2.11. Other**
	De empresa contratada	x			x	x				x	sin nombre
Infrastructure, equipment and vehicles	**SINERHIAS**						x	x			
	Inventarios-RM					x		x			sin nombre
vital statistics	**SEED**	x	x				x	x	x	x	
	SINAC	x	x				x		x	x	
other systems											
other systems: Mental health										x	State Sytem
other systems: Performance	***Indicadores***	x			x		x	x		x	
	Caminando a la exclenecia	x	x	x			x	x		x	
Health Promotion	***Cartillas***	x								x	Paralel System
Quality assurance	**INDICAS**	x								x	
	Congratulations Complaints and suggestions	x								x	State Sytem

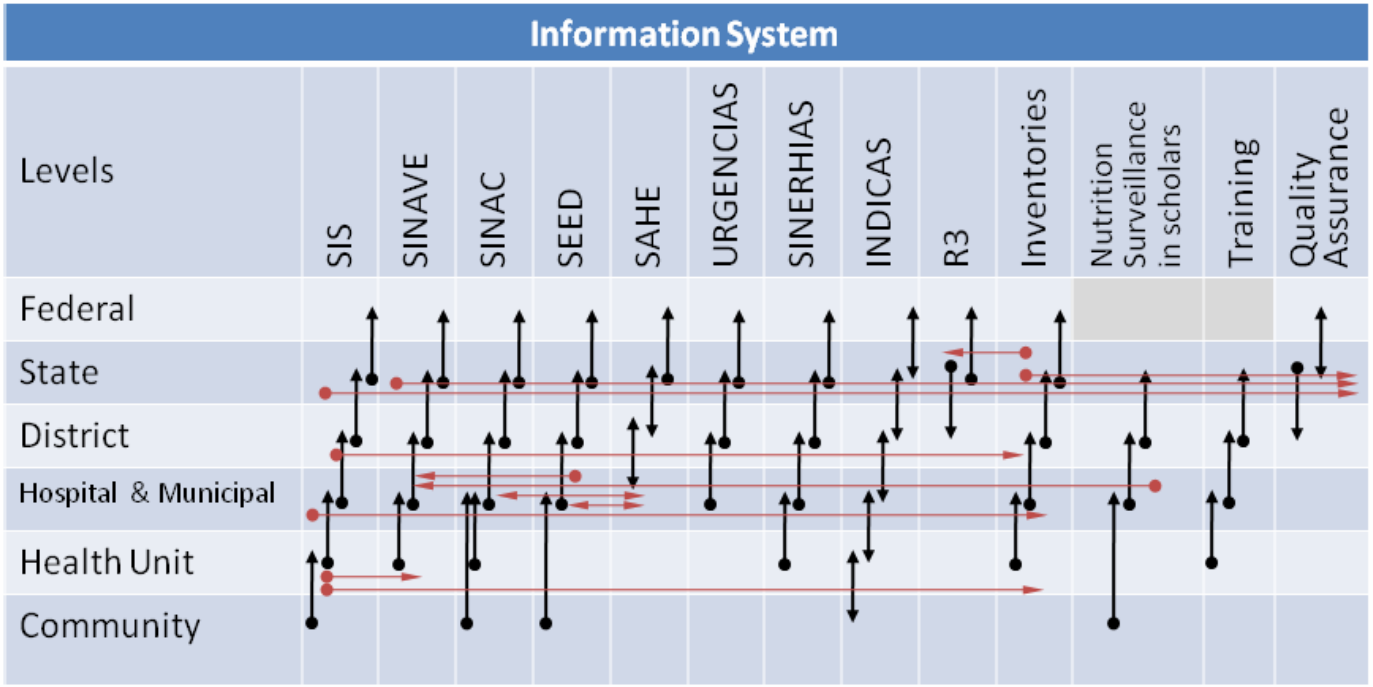


Figure 1. Data flows by organization level and across information system

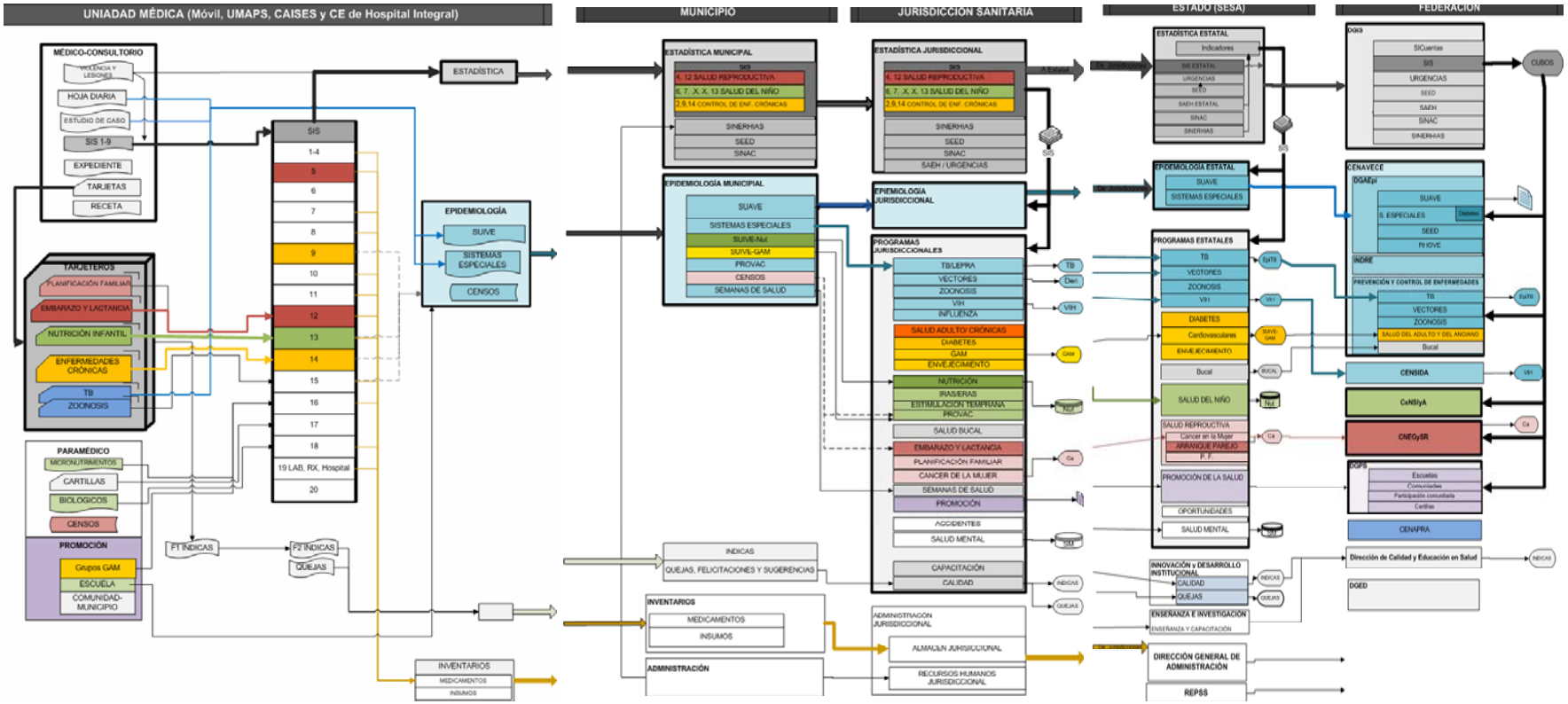


Figure 2. Complete overview of the Health Information system and it relation with the state and federal health programs.

5.1. Respondents' Socio-demographic Characteristic

A total of 241 respondents from facilities and 15 respondents from eight districts and in the Guanajuato State, Health Services, 32 were interviewed. All of the respondents were involved in health information system activities. Either they were the person in charge of the facility, SINAIS focal person or director or Head of Divisions of these Departments.

The respondents' age ranged from 21 to 65 years with average of 36 years (Table 5.1). On average, the respondents had 8.6 years of experience in the Health Department. Seven tenth of the participant were holding position in the facilities other than facility head. Similarly, More than 68% of the respondents had a bachelor or higher university degree indicating a highly qualified human resource in the Guanajuato State Health Services.

The 40% of the respondents stated that they had training in SINAIS activities in last six months, indicating a need for more SINAIS training activities for the staff.

Table 5.1_ Respondents´ Socio-demographic Characteristic (N=288)

1. Age of the person	Mean	Median	Min-Max
	36.0	**34**	**21-65**
2. Years of employment	**8.6**	**5**	**0-43**
3. Sex	**Freq.**	**Percent**	
1. Male	**97**	**33.7%**	
2. Female	**185**	**64.2%**	
Total	**282**	**97.9%**	
4. Title of the person			
1. Provincial Director	**0**	**0**	
2. Provincial SINAIS focal person	**32**	**11.1%**	
3. District Health Officer	**7**	**2.4%**	
4. District SINAIS focal persona	**8**	**2.8%**	
5. Facility in charge	**33**	**11.5%**	
6. Other facility staff	**208**	**72.2%**	
Total	**288**	**100%**	
5. Education			
1. 9 years	**2**	**0.7%**	
2. Intermediate /12)	**44**	**15.3%**	
3. Bachelor (16-17)	**197**	**68.4%**	
4. Master/Post grade (19-20)	**38**	**13.2%**	
Total	**281**	**97.6%**	
6. Training in SINAIS related activities in last six months			
Yes	**114**	**40%**	
No	**174**	**60%**	

Total	**288**	**100%**

5.2. Level of SINAIS Performance

SINAIS performance, the output of the information system, is measured by two criteria. They are: a) levels of data quality and b) use of information.

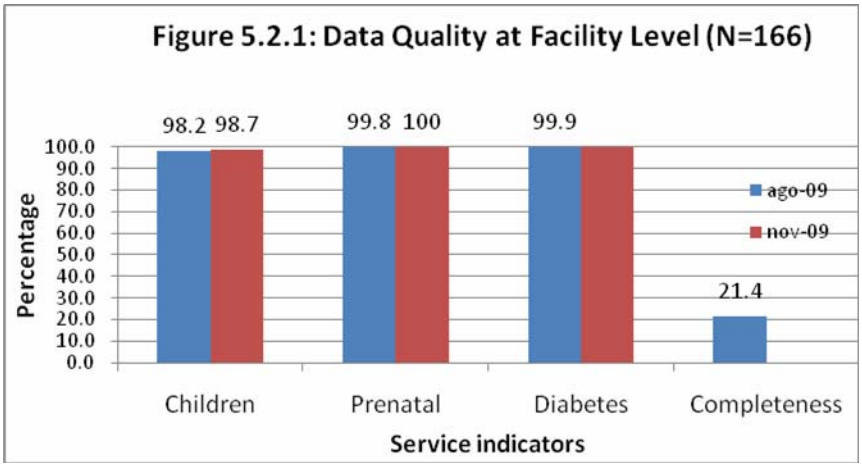
a) Data Quality

Data quality is measured on dimensions of data accuracy and completeness at the facility level while at district level is measured by timeliness, data accuracy and completeness.

Data Accuracy

Data accuracy was observed by counting numbers in the registers and matching it with what was reported in the monthly report. The selected data elements were: a) number of reported diabetes cases, b) new cases registered for antenatal care, c) moderate malnutrition in children <1year.

Figure 5.2.1 shows that data accuracy was more than 95% for all selected service indicators, indicating an exceptionally high level of accuracy. These levels are comparable to China, other developed countries, and are unlike most developing countries.



The data accuracy at the district level could be checked by counting selected data elements in the submitted paper reports and comparing it with what is available in the computer database. One of the advantages of the software is that reports are aggregate automatically at the district level from de facilities of each municipality, resulting in a accuracy of 100% consistent over time. This let the problem of recoding data and submitted manual reports at the facility levels that don't count with resources to the automatically data entry. The availability of paper, resources and technology could be something that change the ways of who district and facilities display or carry data. Only 4

districts kept paper reports for both months at the moment of the survey and 5 districts could get the required data from a computer.

Completeness

The completeness of the monthly report is measured by how many data elements were filled against those total data elements that the facility was supposed to fill. It was observed that only 22% of the facilities dismiss filling the monthly form before reporting.

The completeness of the report at the district level is assessed by how many facilities who were supposed to report are actually reporting to the district. Out of eight districts, two districts did not have a record to know how many facilities were reporting. Out of those 6 districts, where a record was available, 100% of the facilities were observed to be reporting.

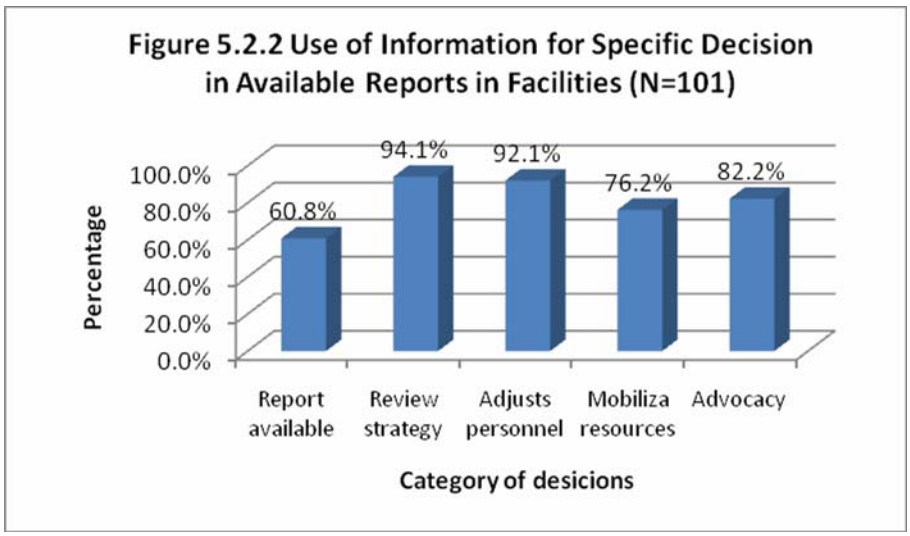
Timeliness

Another dimension of data quality is timeliness. Timeliness is measured by the district receiving facilities' reports by the deadline set forth by the districts. Two out of eight districts did not have records to measure timeliness. The six districts that had records showed 62.7% timeliness, indicating in those districts 62.7% of facilities met the deadline.

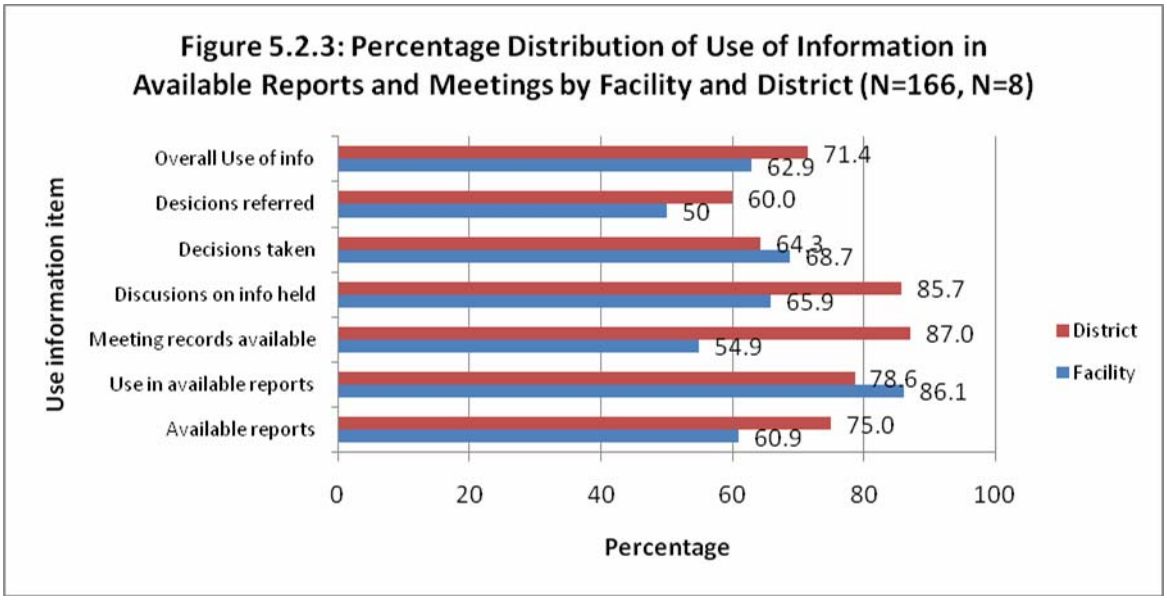
b) Use of Information

The use of information, another aspect of SINAIS performance, was assessed using two criteria. First, the availability of any kind of report (feedback, quarterly, health services etc.) and reviewing them for use of information. Second, by observing records of facility meetings on discussion of SINAIS findings and decisions made based on those discussions.

A review of the reports (feedback, monthly, quarterly, others;) available in 61% of the facilities, showed (Figure 5.2.2) that 94.1% of the reports described that a strategy was reviewed by examining services and an adjustment in personnel, 92% was decided. 76.2% and 84% of the available reports also showed decisions about mobilizing resources and advocacy respectively, indicating an overall 86.1% use of information for various decisions in available reports. Review of the use of information in available reports at district level showed that 78.6% or more of the reports described appreciation for good SINAIS work, resource mobilization and advocacy, and consistency with reports at facilities.



About 55% of the facilities had meeting records of the meetings held in the last three months. The records from those facilities showed (Figure 5.2.3) that 65.9% of the facilities have discussed SINAIS findings and the 68.7% made decisions after discussion of the findings. It also showed that 50%% of the facilities referred some select problems to higher levels for assistance. This could mean that they are trying to solve most problems at the local level and frequently request assistance for problems for which they have no control.



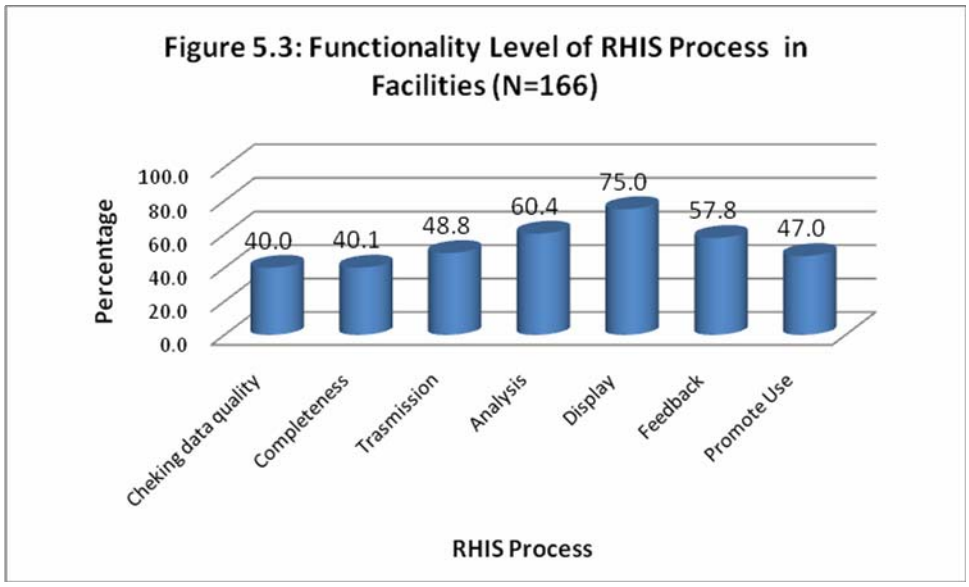
The use of information at the district level meetings was higer (Figure 5.2.3) that found at the facility level, indicating that more information use for decision-making occurs at the district level. However, referral of decisions at the higher level indicates either the

decisions are of a kind that needs approval from a higher level or the district does not have much decision power thus, referring more decisions to a higher level.

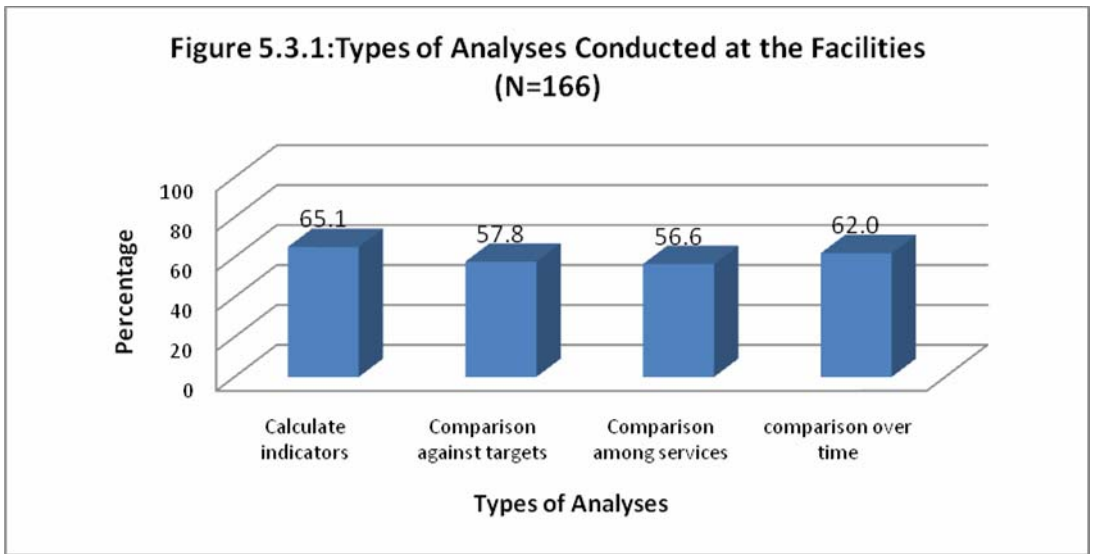
5.3. Functionality of SINAIS Processes

SINAIS processes are essential for an information system to run smoothly in order to produce quality data and facilitate the use of information. The SINAIS processes include: data collection, data quality check, data transmission, data processing, data analysis, data display, feedback and promotion of use of information.

Forty percent of the facilities reported (Figure 5.3.1) having a reminder mechanism for checking data quality or indicated that either checking data quality is less emphasized or has reached such a high level that no reminder is needed. Regarding the reminder for meeting a deadline for submitting monthly reports (data transmission process) and consequences for not implementing it, 48.8% of the facilities showed that both criteria were met and a 40% was observed for the data completeness process.

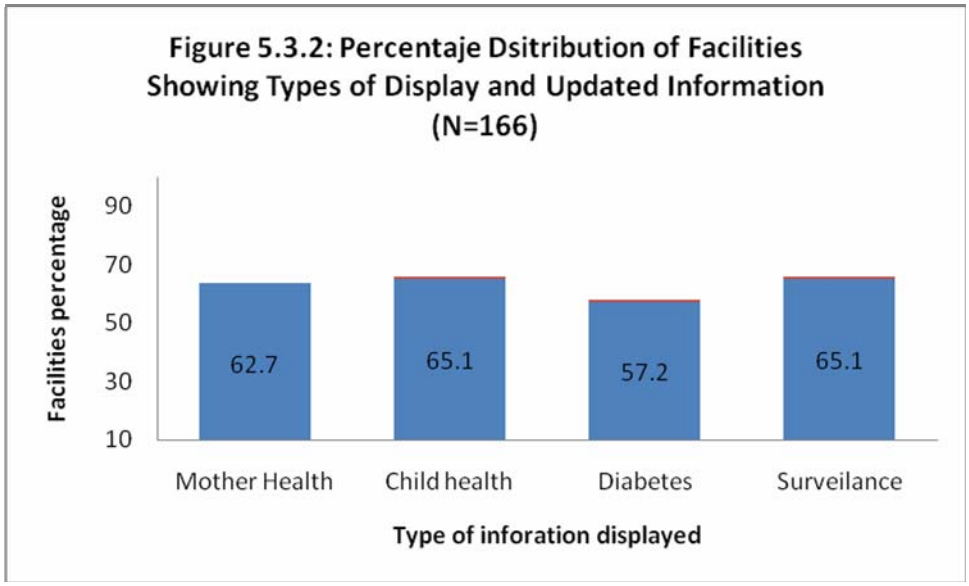


60.4% of the facilities showed (Figure 5.3) that they analyze and 75 % display data. The data analysis process is measured by items such as calculating an indicator, comparisons with district/national targets, comparison among types of services and over time. Further investigation (Figure 5.3.1) showed that 55% or more facilities can calculate indicators, making comparisons with district/national targets, among services and data over time are also common in two third of the facilities



Existence of analysis processes at district level is measured by checking various types of analyses. All districts reported having all selected analyses, except 50% of the districts did not make comparisons against district/national targets, demonstrating that there is less attention to that aspect.

Data display is an important process for showing progress over time. Overall, 71 % of the facilities exhibited selected data display (Figure 5.3) and there was not much difference between the selected indicators displays (Figure 5.3.2). What is interesting to note is that those facilities that displayed the data, 97% or more were showing rates updated by the past three months, indicating that they were using data to monitor their progress.



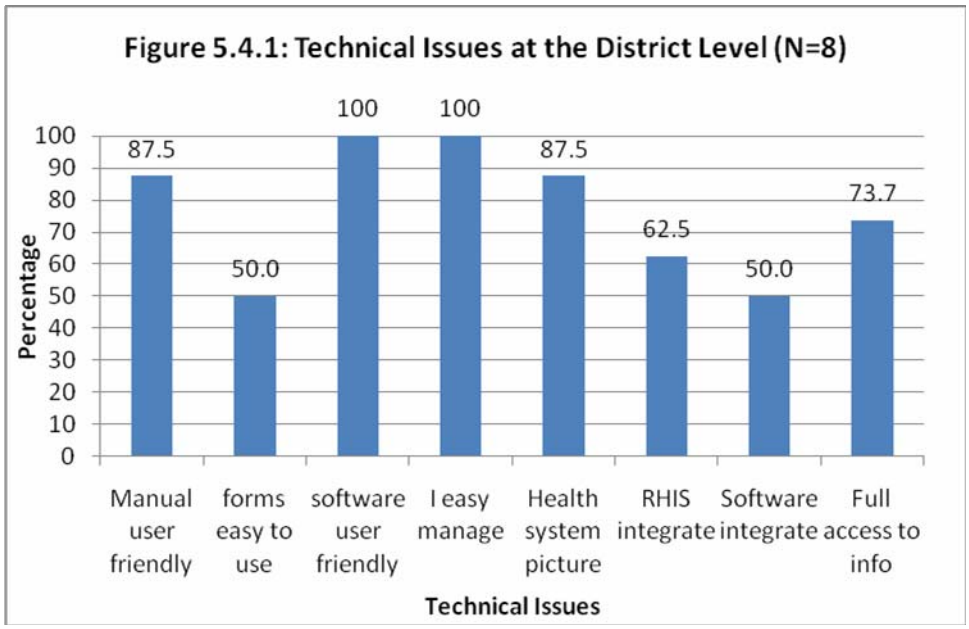
Feedback is an important process through which information flows back to the data collectors. Fifty eight percent of the facilities showed receiving a feedback report (Figure 5.3), indicating that either the current design does not promote the feedback or there is a gap in the feedback loop. However, 5 district offices (78%) stated that they have sent a feedback report to the facilities in the last three months, indicating a gap between what was stated by the district and observed at the facility level.

5.4. Determinants of Performance

5.4.1. Technical Determinants

The PRISM tools identify many technical issues which can affect SINAIS performance. The technical issues include: the user-friendliness of the procedure manual, data collection forms, software, management of information technology, software integrating information from other information systems, providing a comprehensive picture of a health system performance and use of information technology to create access to information for senior managers.

Figure 5.4.1 shows that 87%, 100%, 100% and 87% of the district respondents felt that the procedure manual, information technology and software are user-friendly and a comprehensive picture of the health system performance is captured by the SINAIS respectively. 50% percent of respondents said that the reporting forms are easy to fill out, while 50% believed that the software integrates information from different systems or the SINAIS gathers information from vertical programs. These results indicate that reporting forms and software need to be upgraded. Lastly, 74% of the respondents stated that the available information technology provides full access to district and senior managers, indicating that it is possible to share data electronically.

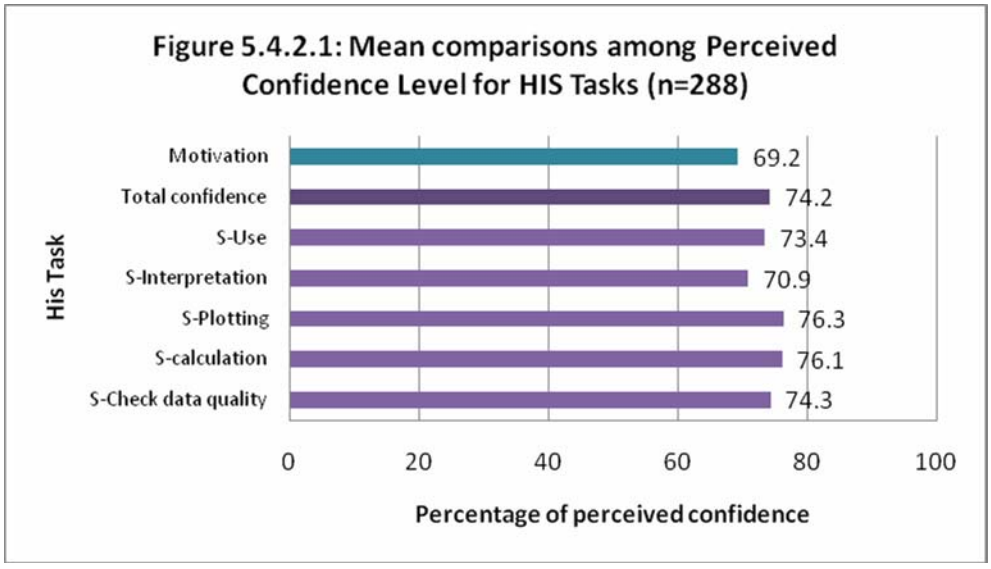


5.4.2. Behavioral Determinants

The PRISM framework hypothesizes that behavioral factors are important determinants of SINAIS performance. High self-efficacy or confidence levels to complete a task ensure that the task will be done, and done correctly. Similarly, if one feels that performing a task will bring about a positive outcome, one is more likely to perform that task. The assessment team used the assessment of positive outcomes as a measure of determining the level of motivation. The competence or ability to perform a task is an important behavioral factor. We also measure the understanding for the rationale for including certain types of information on data collection forms. Understanding why some information/data is collected illustrates the level of data demand for SINAIS information. There is empirical evidence that people perform more those behaviors which are meaningful and have value for them. Problem solving is another skill that is necessary to using data for identifying and solving the problem.

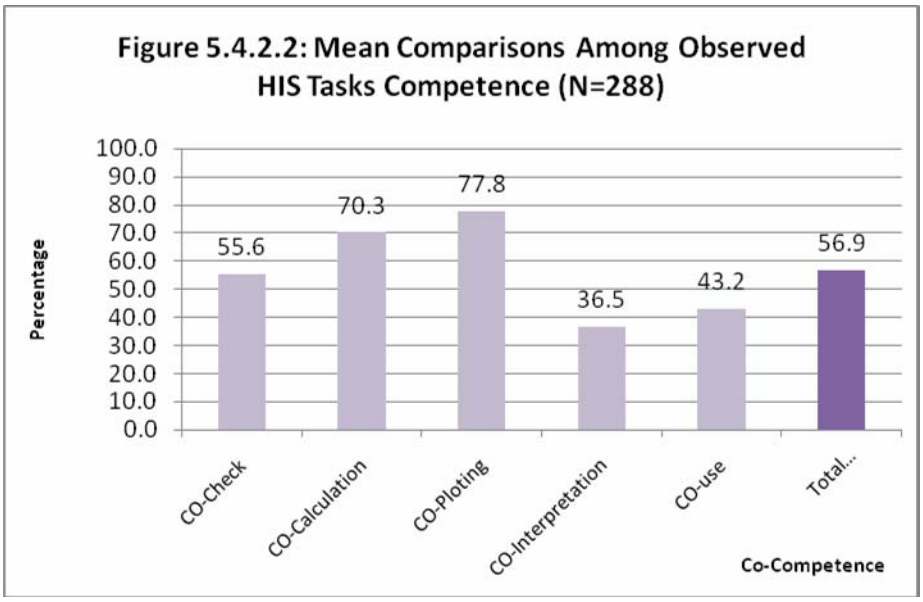
5.4.2.1 Self-efficacy or Confidence Level for SINAIS Tasks

Confidence levels are assessed on scale of 0 to 100 from no confidence to full confidence in performing a particular SINAIS task. The results showed that the average confidence level for checking data quality, calculation and data plotting was betwen 70 and 76% (Figure 5.4.2.1), being data interpretation the lowest with 70.9%. In general respondents also believed that performing SINAIS tasks bring about positive outcomes, (average motivation level was 69.2%).

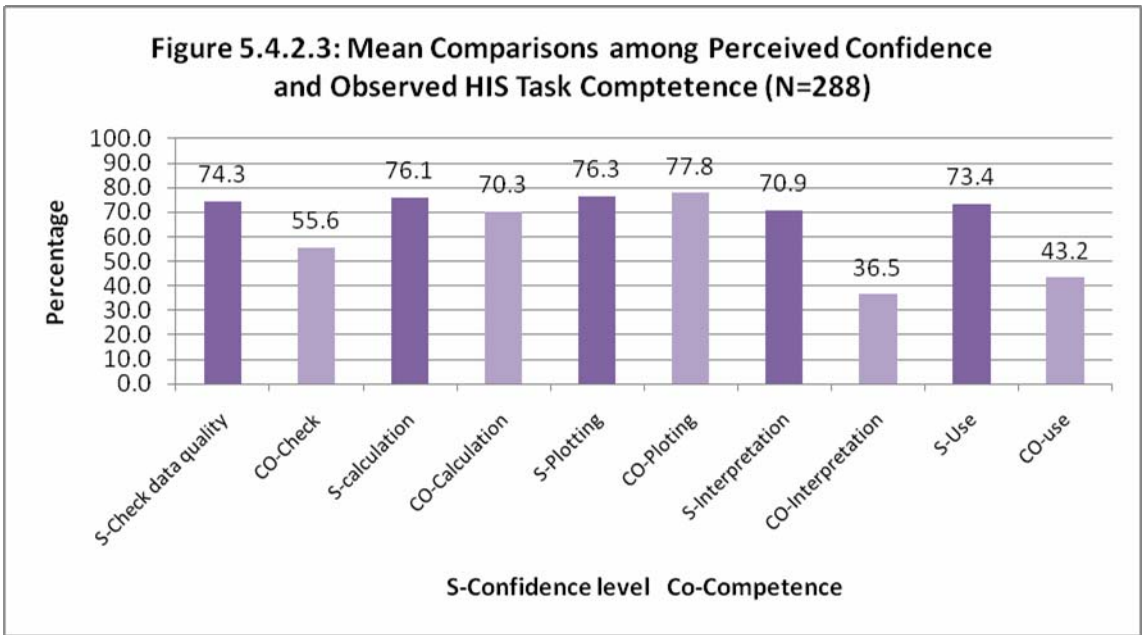


5.4.2.2 SINAIS Task Competence

SINAIS task competence was measured by asking the respondent to solve a problem in a pencil-paper test. Seventy-five of the respondents were able to calculate at least two percentages/rates at facility level (Figure 5.4.2.2) and a slightly higher numbers were able to plot the given data, 77.8%, The respondents however had lower scores in , interpretation, 36.5%, use of information, 43.2%, and knowledge of methods of checking data quality, 55.6%, indicating that they were not proficiently enough in those tasks. The respondents also showed low knowledge of the rationale for including diseases, immunization and population data in the information systems, 60.5%, indicating that they are collecting data without understanding completely why they are collecting that data and its utility has no being explored and thus probably create little appreciation for collecting it.



High confidence level for SINAIS tasks is supposed to be associated with high level of SINAIS task competence. Comparing average confidence level of SINAIS tasks with average level of SINAIS tasks competence showed that there is consistency between the two for calculation and plotting (Figure 5.4.2.3). However, there were important gaps found between confidence and competence levels for checking data quality, interpretation, and use of information, indicating that respondents perceived high confidence in checking data quality, interpretation and use of information but could not perform in practice.



5.4.3. Organizational Determinants

5.4.3.1 SINAIS Management

Managing a system is about managing resources and functions to produce better outputs. SINAIS management is no different in that regard. Thus, we have defined SINAIS management as, "presence of mechanisms for managing SINAIS functions and resources effectively for better SINAIS performance". SINAIS management functions comprised of SINAIS governance, planning, training, supervision, finances, and use of quality/performance improvement standards.

The governance functional level of SINAIS management is measured by the presence of a mission statement, management structure, updated organizational chart, involvement of information system managers in senior management meetings, and distribution list of information report. The planning functional level was measured by availability of a recent SINAIS situation analysis report, SINAIS long term plan and targets. The quality standards functional level was assessed by use of quality/performance improvement tools, availability of SINAIS standards at facilities and higher levels. The training functional level was assessed by the presence of training manuals, on-job training and schedule of planned trainings. The supervision functional level was measured by the presence of supervisory checklist, schedule and supervisory reports. The financial functional level was measured by the presence of an SINAIS expense register, mechanism for generating funds, financial report and long term financial plan.

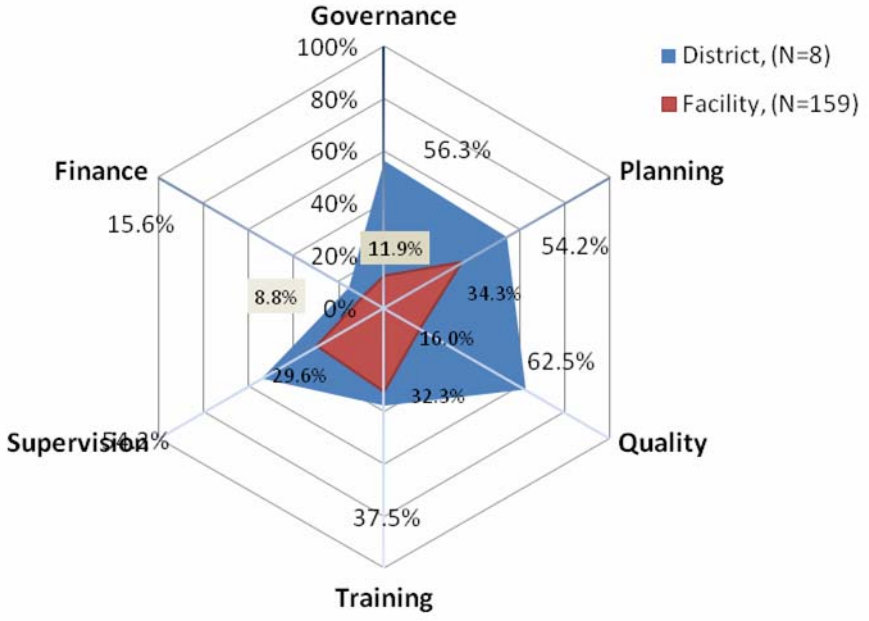
At the facility level, the percentile scores showed that only the criteria for SINAIS planning, training and supervision (Figure 5.4.3.1) were met one-third on average, showing that these functions were weakly performed. However, criteria such as the

presence of performance improvement tools and a SINAIS supervisory checklist were mostly missing. Under planning, most facilities did not have a copy of a situation analysis for planning or a long term SINAIS plan, while the majority of the facilities lacked a training manual or a schedule for training.

At the district level, the governance functional level was on average 56.3%, indicating that at least half of the criteria for governance were met, although room for improvement exists. Major weaknesses were found in non availability of the distribution of list of data and SINAIS management structure.

With an average financial score of 15.6% for districts and 8.8% for facilities (Figure 5.4.3.1) most of the financial management criteria were not met at facility level, such as presence of a budget, expense register, financial report or a long term financial plan for SINAIS sustainability. However, it appears that finances are managed at a higher level and facilities are given a limited role in financial management of the SINAIS. Thus, the limited financial management at the facility is consistent with the existing financial management system.

Figure 5.4.3.1: Mean Level of RHIS Management Functions



5.4.3.2 Perceived Promotion of a Culture of Information

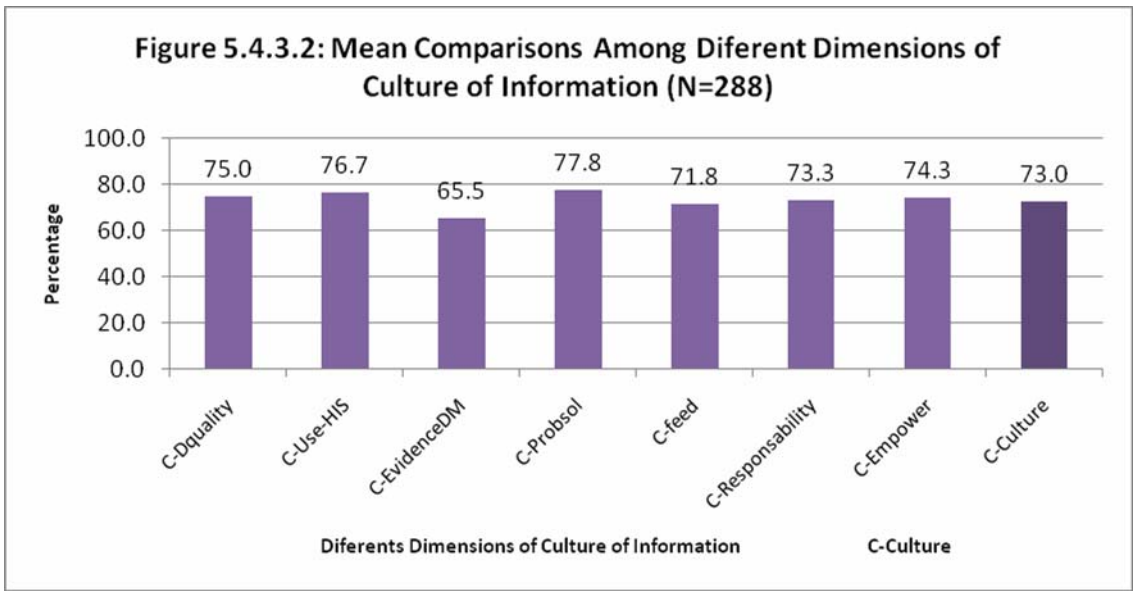
People working within an organization perform tasks and behaviors which they believe the organization values and promote. In other words, organizations create a culture for promoting and sustaining certain values around organizational functions to be performed at optimal levels. When these values are about the way the information systems function, we say that the organization is promoting a culture of information. Operationally, the culture of information is defined as, "the capacity and control to promote values and beliefs among members of an organization for collection, analysis and use of information to accomplish its goals and mission."

The PRISM framework assesses a culture of information by determining how strongly people believe that the health department promotes values like:

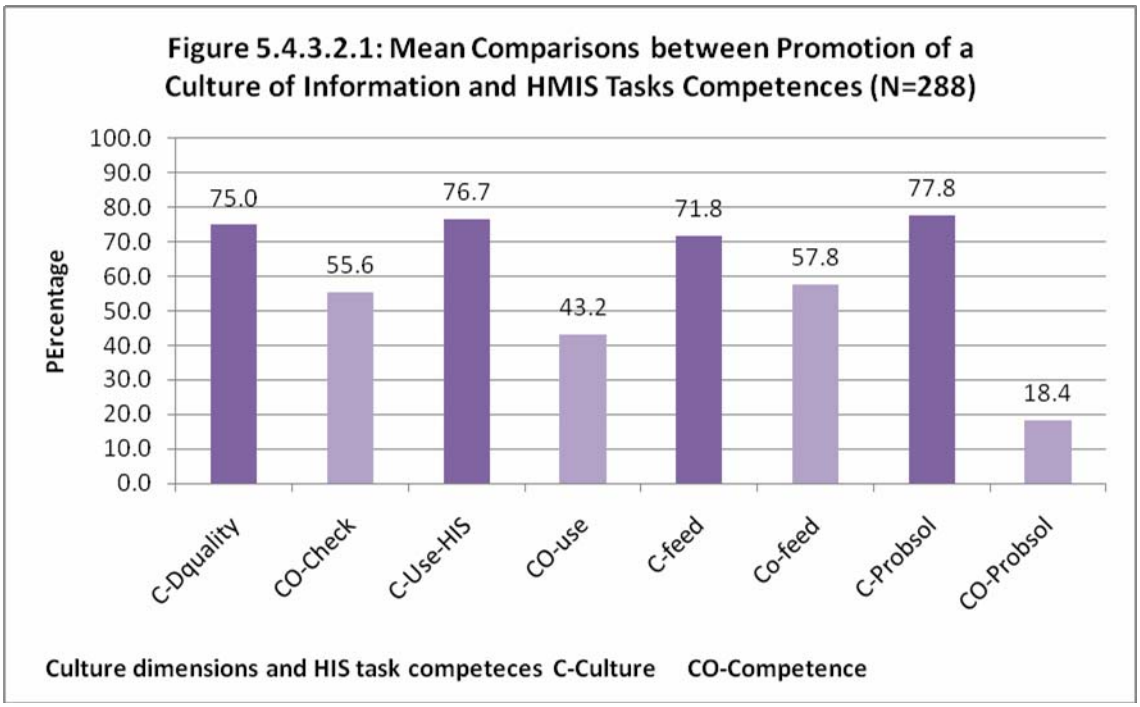
1) Emphasis on data quality (C-Dquality)*
2) Use of SINAIS information (C-UseHinfo)*
3) Evidence based decision making (C-EvidenceDM)*
4) Problem solving (C-Probsol)*
5) Feedback from staff and community (C-feed) *
6) Sense of responsibility (C-Responsibility) *
7) Empowerment and Accountability (C-Empower) *

*the identification codes of the variables cited in Figure 5.4.3.2

The assessment results showed that overall the respondents strongly believe (score 72% or above) that the health department emphasizes data quality, promotes use of SINAIS information, problem solving, feedback, sense of responsibility and empowerment. The only exception was for the indicator "evidence-based decision making" where average perception dropped to 65.5% (Figure 5.4.3.2). This indicator may be lower than the rest as a result of political interference and/or superiors' directives which could affect evidence-based decision-making.



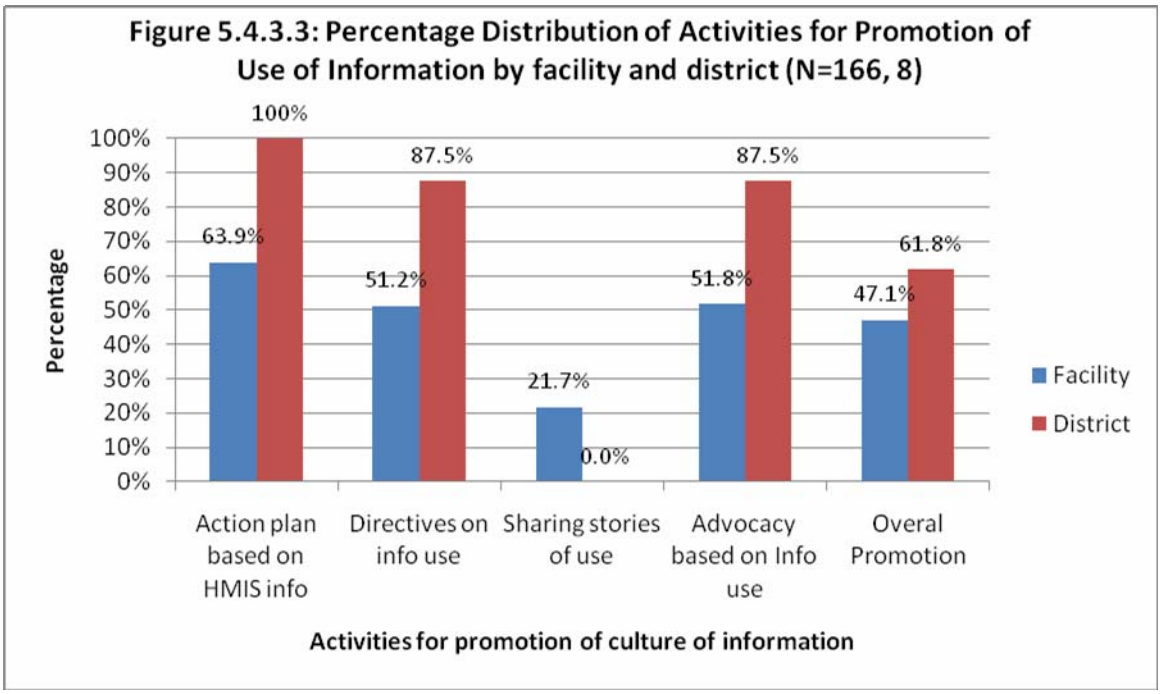
It is hypothesized that a strong culture of information is associated with high SINAIS competence levels. A comparative analysis (Figure 5.4.3.2.1) showed that there are still gaps from 20 to 60 percentual points between perceived promotion of data quality, use of information, feedback and problem solving and observed SINAIS task competence. There are many possible reasons for this gap. First, the respondents might have exaggerated perceptions of the promotion of an information culture by the health department. Second, they might be unaware of the existing situation or tried to paint a better picture of the department than the reality. On the other hand, competence is measured objectively through a pencil-paper test thus reducing the possibility of over estimation. However, it is assumed that the health department will create some minimum level of SINAIS task competence in alignment with the promotion of a culture of information, leading to less discordance between perceptions of a culture of information and the objective assessment of existing SINAIS task competences. This assessment showed that perception and reality are not aligned. There is a need to improve this gap to improve SINAIS performance further.



5.4.3.3 Activities for promotion of culture of information

The activities for promotion of a culture of information are an important organizational determinant. It is promoted by different activities such as communication about targets, directives to use information, sharing of success stories and advocacy by using SINAIS information. Communication about targets was observed for 64% of facilities and a similar percentage of facilities showed directives on the use of information (65%) and advocacy (52%), and sending directives on info use (Figure 5.4.3.3). However, there seems to be less communication on use of information, demonstrating that there are limited procedures of sharing success stories on use of information (22%).

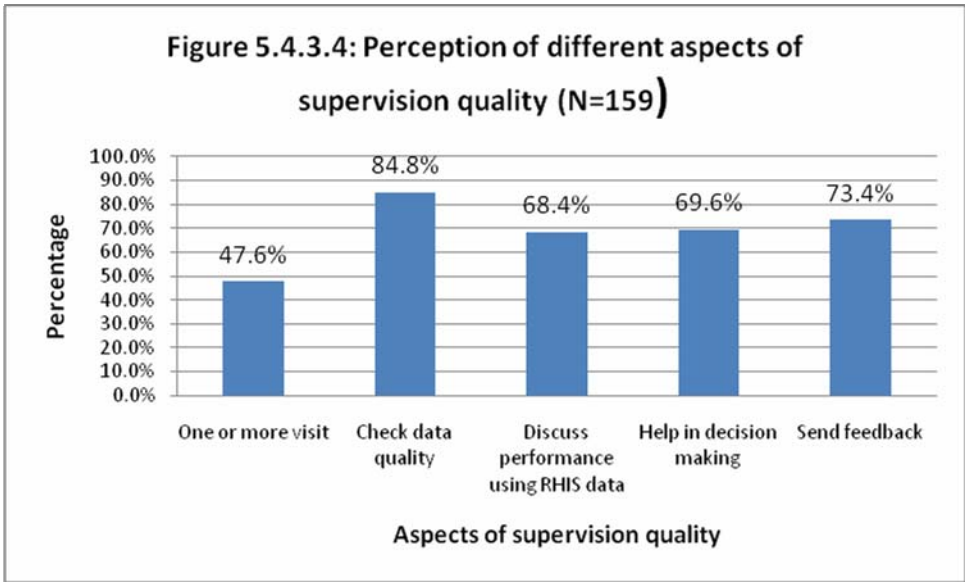
It is assumed that the district or higher level will be more active in carrying out activities for the promotion of a culture of information. This assumption was confirmed (Figure 5.4.3.3) with the exception of sharing stories on the use of information at district level, where was find none.



Upon review of documents at the facility and district levels, it was revealed that 49% of facility director stated that they attend meetings at district level to discuss SINAIS information, while 75% of the district records showed that facility director attend meetings. The facility director attendance not only shows the importance of their involvement but also that facility heads could replicate the messages and values at the facility level for promoting a culture of information. There is a lack of agreement in the records available at the district and facility on the promotion of a culture of information. This gap should be bridged.

5.4.3.4 Supervision Quality

Supervision is very important for providing support to staff and it is also a means for on-job training. The results show that 50% of the facilities reported receiving one or more supervisory visit in the last three months (Figure 5.4.3.3). Of those facilities reporting one or more supervisory visit in the last three months, 85%, 70% and 68% reported that the supervisor checked data quality, helped them make a decision, and discussed facility performance using SINAIS information respectively. However, 73% of the facilities reported that the supervisors sent feedback from their supervisory visit. These findings indicate SINAIS supervisory function is working well but with a need to improve feedback. This finding is consistent with other receiving feedback reports.



5.4.3.5 Availability of Resources

The availability of resources to perform SINAIS tasks is crucial. Eighty-five and seventy-one percent of the facilities surveyed have computer and calculators respectively while only 40% have a regular telephone line and 43% internet (Table 5.4.3.5a). These greatly contribute to SINAIS performance.

Access to the electricity and water supply is very high (89.2%) and 55.6% of the facilities report back-up generators to continue electricity coverage (Table 5.4.3.5b), therefore availability of utilities is not problematic. The finding is substantiated by the fact that only 8.8% of the facilities reported having electricity interruptions weekly or daily.

86.33 or more percent of the facilities showed that the selected registers, forms and monthly reports are available (Table 5.4.3.5c) while 13% or less showed stock-out in forms in the last 12 months, indicating that supplies for SINAIS are quite good.

Table 5.4.3.5a: Availability of Resources			
	Equipment availability*	**Number**	**Percent**
a. Computer	0	25	16.4
	1	38	25.0
	≥2	89	58.6
b. Data backup	Yes	103	67.3
	0	24	15.9
c. Printer			
	1	47	31.1
	≥2	80	53.0
d. UPS	0	82	55.0
	1	53	35.6
	≥2	14	9.4
e. Generators	0	65	43.3
	1	27	18.0
	≥2	58	38.7
f. Regular telephone	0	88	58.3
	1	50	33.1
	≥2	13	8.6
g. Mobile telephone	0	67	44.1
	1	29	19.1
	≥2	56	36.8
h. Radio phone	0	124	82.1
	1	21	13.9
	≥2	6	4.0
i. Internet	Yes	67	43.5
j. Calculator	0	46	31.1
	1	19	12.8
	≥2	83	56.1

- 0=no equipment, 1=one, ≥2=two or more equipment

Table 5.4.3.5b: Utilities		**Number**	**Percent**
a. Electricity		137	89.27
b. Electricity Interruptions			
	Never/occasionally	102	68.0
	once a month	25	16.7
	Twice a month	11	7.3
	weekly	9	6.0
	daily	3	2.0
c. Air-conditioner		37	24.8
d. water		137	90.7

Table 5.4.3.5c: Availability of forms, registers	**Number**	**Percent**
Monthly Report in children health under 5	138	86.23
Monthly Report Reproductive Health	139	86.33
Monthly Report Chronic diseases	139	86.33

6. DISCUSSION

Guanajuato SINAIS data accuracy is above 95% which is comparable to China[1]. However, Guanajuato State surpasses many developing countries such as Cote d' Ivore[2], Haiti[3], South Africa[4], Pakistan[5,6] or Uganda[7,8] where data accuracy was found to be less than 60%. The same pattern holds true for data reporting and timeliness. These findings are consistent with the PRISM framework hypotheses that the existence of SINAIS processes, high availability of SINAIS resources, and high level of computerization of the information system, good governance and appropriate finance are associated with better SINAIS performance. Unlike many developing countries where resource availability, management and organizational issues remain major impediments for good performance of information systems, Guanajuato State has these contributors well under control.

Unlike high data accuracy, the limited use of information in Guanajuato State is more similar to that of a developing country. This finding is consistent with a limited competence in data analysis, interpretation and problem solving at the lower levels of the organization, which hinders use of information.

Another unique finding is that respondents were quite objective in the SINAIS self-assessment and the data exhibited little discord between the subjective and objective assessments. There was almost no gap between perceived confidence and actual competence for calculation and plotting data, while gaps were found between perceived confidence and observed interpretation and use of information. The high level of education among respondents might account for less discord between perceptions and objective assessment. This explanation also accounts for low average confidence levels

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[1] Aqil, A. Lippeveld, T. Yokoyama, R. (2007) "HMIS Baseline Assessment in Yunnan Province using PRISM Tools", MEASURE Evaluation, Yunnan CDC, China, USAID; Aqil, A. Lippeveld, T. Yokoyama, R. (2007) "HMIS Baseline Assessment in Guangxi Province using PRISM Tools", MEASURE Evaluation, Guangxi CDC, China, USAID

[2] Gnassou L, Aqil A, Moussa T, Kofi D, Paul JKD. 2008. HMIS Evaluation Report. HIS Department, Ministry of Health, Cote d'Ivoire; MEASURE Evaluation, USAID.

MEASURE Evaluation, (2006) RHIS Course, Institute of National Health, Cuernavaca, Mexico, MEASURE Evaluation, USAID, Fieldwork during RHIS Course

[3] Boone, D., Aqil, A. (2008) Evaluation of Haiti HMIS, MEASURE Evaluation, USAID, Ministry of Health Haiti , March 2008.

[4] MEASURE Evaluation, (2005) RHIS Course, Pretoria University, South Africa, MEASURE Evaluation, USAID, Fieldwork during RHIS Course

[5]Hozumi, D., Theo Lippeveld, T. Aqil. A., (2002) HMIS Situation analysis, Pakistan, MEASURE valuation

[6] JICA HMIS Study Team. (2004) "Situation Analysis of Health Information systems," The study of Improvement of Management Information Systems in Health Sector in Pakistan" JICA/SSC/MOH

[7] Aqil, A., Hotchkiss, D., Lippeveld, T., Mukooyo, E., Asiimwe, S. (2008); Do the PRISM Framework Tools Produce Consistent and Valid Results? A Uganda Study; Working Paper Draft; National Information Resource Center, Ministry of Health, Uganda, MEASURE Evaluation, USAID, March 2008

[8] Aqil, A. (2004) Situation Analysis in HMIS and EMIS, UPHOLD Project, National Information Resource centre, Ministry of Health, USAID.; Mukooyo, E., Orobaton, N., Lubaale, Y., Nsabagasni, X., Aqil, A. (2005) Culture of Information and Health Services, Uganda, (2005) Global Health Council Conference June 2005, Washington DC

for interpretation and use of information, as compared to some countries where PRISM tools were used and respondents showed high confidence level for all types of SINAIS tasks.

Despite having low average confidence levels for interpretation and use of information, there were still gaps found between perceived confidence and observed skills for interpretation and use of data. The reasons for this discord could be how interpretation and use of information are defined in the Mexican context and how well the questions were translated. Since there is consistency between various questions and responses, the Mexican context or translation of the questionnaires most likely does not play a big role in explaining this discrepancy. A better explanation, is that there is limited training on data interpretation and use of information, which does not allow respondents to self-assess their perceived confidence level, and their actual data interpretation and use skills properly, creating the gap. This explanation is consistent with a previous PRISM assessment, carried out in Mexico in 2006[9], which reported limited skills in data analysis, interpretations and use of information.

The low skill level of in data interpretation and use of information is also consistent with findings that less than 20% of the respondents could describe at least one reason for collecting data on diseases, immunization and target population. Similarly there was low knowledge of methods for checking data quality. The problem-solving skills were also low. This indicates that more importance is placed on how to collect data rather than why to the collect data. This is a good approach if the data collectors are part of a supply line with no other responsibilities. However, this approach is limited when data collectors are the facility managers, responsible for the health of the catchment area population, and information is needed and useful to fulfill that responsibility.

Use of information is affected by the limited information feedback to facilities in Guanajuato State. Feedback does not occur on a routine basis. There is also limited feedback given to facilities about SINAIS performance or comparing SINAIS performance among the facilities within a district or comparing existing performance against targets. Displays of information serve different purposes. The purposes range from creating a visual image of the work, demonstrating progress made to comparisons against targets, strengthening transparency, and others. One third of the facilities did not display information. However, of those who did, almost 100% also showed data updated from the last three months, indicating that they were using data to monitor their progress.

Training is limited to data collection and web-based data entry. There are no institutionalized mechanisms for planned training and training usually occurs on an adhoc needs basis, curtailing opportunities for continuous improvement. Similarly, supervision is not specifically geared towards SINAIS tasks, but is part of the general supervision. There is no specific supervisory checklist for SINAIS tasks, particularly for checking data quality of use of information.

[9] Mexican health information system diagnostic 2006**,** Mexico Health Information System: Review and Assessment, Center for Health Information Systems, Ministry of Health, Mexico, WHO

Promotion of a culture of information is an important aspect of the information system because it strengthens sustainability, self-reliance and creates an enabling environment to make evidence-based decisions leading to better transparency and accountability. Although there is a strong emphasis on data quality, there is less attention paid to serving as a role model for use of information or sharing success stories regarding use of information through newsletter or other means of communication.

The technical aspects of SINAIS such as simplicity of data collection tools, user friendliness of software are well-established as is the availability of a procedure manual. However, the various health information systems stand alone and there is no data warehouse to combine these information systems' data for producing a comprehensive picture of the health system performance at district or higher levels.

Information systems in general are based on the ways the various components of the health system are organized and communicate to each other vertically and horizontally. Mexico is no different, as information systems cater to individual services and do not provide linkages between services. In other words, the health system is fragmented and therefore so is its information system.

This baseline survey is a cross-sectional survey. The main limitation of a cross sectional design is that no causality statement can be made from these results, except for comparative analyses and exploring associations. The findings are in line with the PRISM framework and internally consistent, indicating high reliability and validity. The results of the weak data analysis and interpretation skills are also consistent with the HMN assessment, giving further credibility to this baseline assessment. The data was collected by an external organization, giving more credibility to assessment because of no conflict of interest.

7. RECOMMENDATIONS

Overall, the Guanajuato SINAIS has good performance and is well-managed with adequate human and in-kind resources. However, there is always room for improving the system for optimal performance to improve health system performance. The assessment team makes the following recommendations, dependent upon what is in the State's realm of control, and cost considerations. These recommendations are categorized under short-term, intermediate and long-term recommendations.

Short-term Recommendations:

- Improve SINAIS skills in data interpretation, use of information and problem solving, and performance improvement tools (such as cause and effect analysis, flow chart, priority matrix, control chart etc.).

Activities include: developing SINAIS training curriculum, training of master trainers and conduct training of two staff per facility and all district staff of the selected provinces.

- Improve the feedback/supervision system, focusing on checking data quality and use of information and comparison among facilities on health services indicators.

Activities include: Prepare feedback guidelines for districts, develop a supervisory checklist for checking data quality and information use, and train all district supervisors on checklist use and activities.

- Improve sharing of stories on the use of information and role modeling (promoting a culture of information)

Activities include: Select existing channels of communication for sharing success stories on the use of information. Examples include providing a feedback report, sending directives, producing newsletter, etc. Create mechanisms to publish at least one story every month or every second month in official publications or other means.

- Include health information systems as part of the Strategic Management and Monitoring and Evaluation Framework.

Activities include: Create consensus regarding key SINAIS information to become part of the M&E system and include it under Strategic Management of Health System Performance.

Intermediate Recommendations:

- Develop a data-warehouse to integrate various health service related information systems linked to the national health information system.

Activities include: Dependent upon the availability of funds, start the process of developing a data ware house for integrating health services information.

Long-term Recommendations:

- Integration of various health information systems within the private sector, social security institutions and the Ministry of Health

- Activities include: This recommendation requires reform of the existing information systems and the normative and regulatory framework. To achieve integration it will be necessary to involve the other Ministry of Health and the social security institutions, departments and services which own the various information systems as well as the private sector. This is a long term process starting by building consensus among the owners of these systems and key stakeholders.

APPENDIX I – METHODOLOGY

Methodology

1. Study Design

The study design was an observational cross-section survey. Qualitative methods were used to collect data from key informants.

2. Study Setting

The study was conducted in Guanajuato State

3. Sampling Technique and Sample size

Sampling method and sample size

To provide overall SINAIS performance and making comparison among different regions, it was decided to use Lot quality assurance sampling (LQAS). The sample size is small for determining performance (measured by data quality and use of information). Since there was no baseline estimate available for SINAIS performance, the evaluators used objects of interest with 50% probability for finding the maximum sample size, 95% significance and margin of error of 10%[10], which gave us sample size of 95. Under LQAS, 8 regions having a sample size of 20 each would give the total sample size of 160. Eight district offices in Guanajuato province were surveyed to connect with immediate supervisory level.

4. Sources of data

The sources of data were found at:

- Facility level:
  - District, township and MCH hospitals, health centers
    - Interviewed the facilities 'in charge and at least one other staff involved in data collection
    - Review and observation of facility records, information system data/equipment, software
- District level:
  - District director
  - District information system officer
    - Interview
    - Observation and review of facility records, information system data/equipment, software

[10] Sample size N= $(z^2pq)/d^2$; Where p=0.5, q=1-p, d=10%, z=1.96 (95% significance) =96

- Provincial level:
    - At least 3 relevant staff persons

5. Survey Instruments

The study used the following PRISM tools for the survey:

1. Diagnostic Tool – to assess performance (measured by data quality and use of information) and technical determinants
2. Facility Checklist – assess availability of equipment and other resources
3. Management Assessment Tool – measure the management of information system
4. Organizational and Behavioral Assessment Tool – assesses the organizational and behavioral determinants of performance such as perceived self-efficacy for SINAIS tasks, assess perceived knowledge and skills about rationale of including specific information on monthly reporting form, checking data quality, and problem solving skills, perceptions about promotion of culture of information, and others.

These tools have been translated and adapted for Mexico.

6. Surveyors

The survey was conducted by external consultants. The survey was supervised by the INSP and MEASURE Evaluation teams to keep high quality of data collected..

7. List of health facilities

We withhold the name of the facilities for the sake of confidentiality and only provide the sampling frame which used to select 20 facilities randomly per districts.

The State of Guanajuato is located to the Northwest of Mexico City, it neighbors the States of Queretaro, Michoacán, Jalisco, and San Luis Potosí. The state is divided into eight Sanitary Jurisdictions which function as Local Health Areas (Figure 1). There are 521 health units in the state of Guanajuato distributed in 8 Sanitary Jurisdictions (Table 1), 483 health care centers and 38 hospitals.

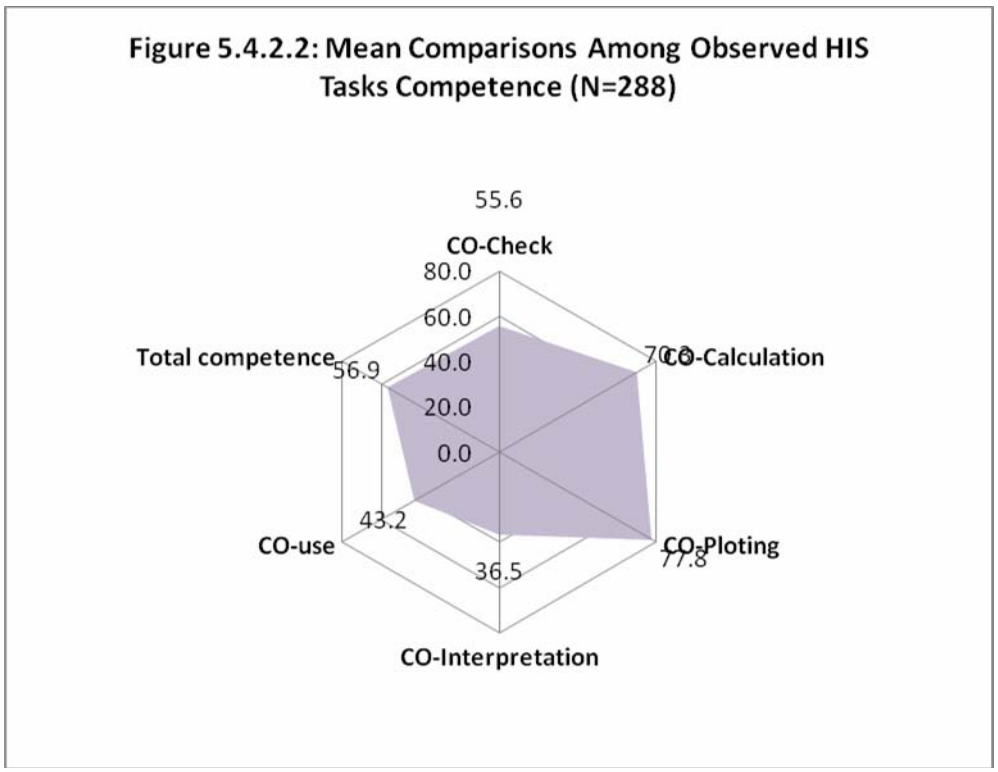
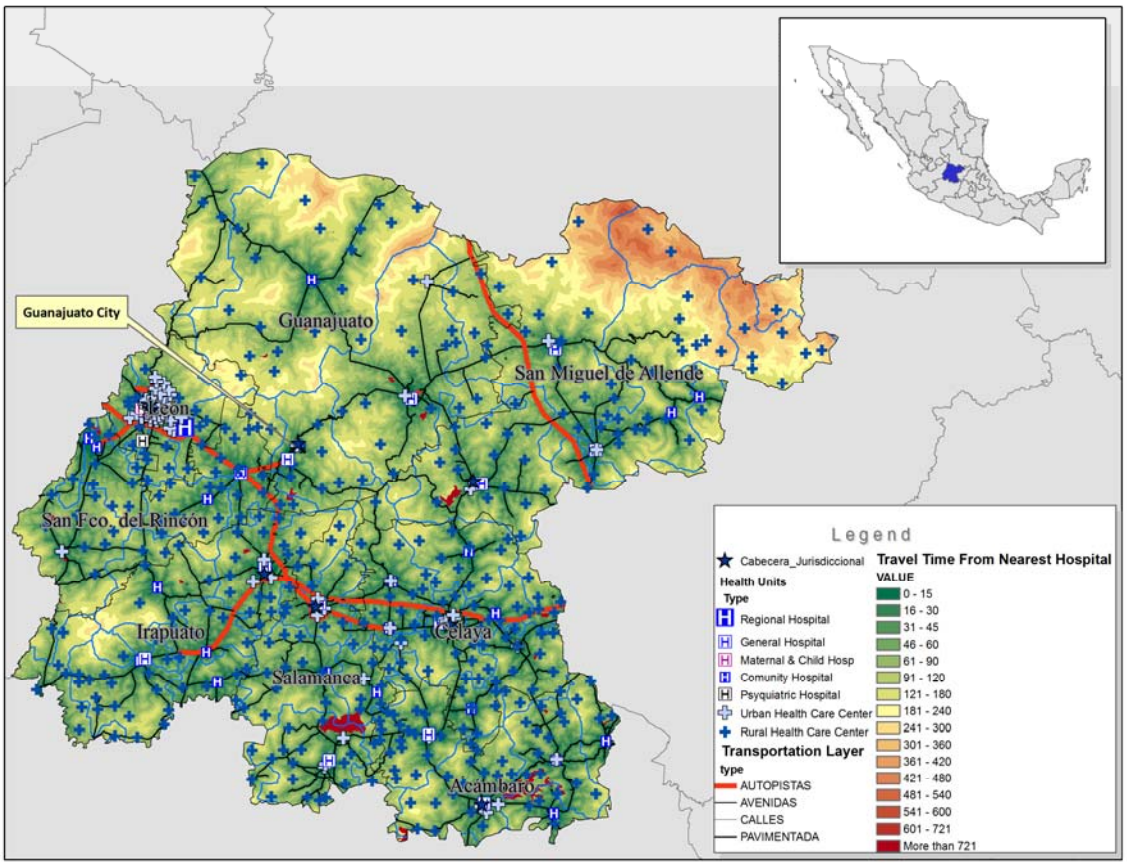


Table 1. Health infrastructure in the State of Guanajuato

	Health Care Centers			Hospitals						
Sanitary Jurisdiction	Rural	Urban	Sub-total	Comunity	General	Psyquiatric	Regional	Mother & child	Sub-total	Total
Acámbaro	56	5	61	3	2	0	0	0	5	66
Celaya	69	8	77	5	1	0	0	0	6	83
Guanajuato	55	3	58	1	2	0	0	0	3	61
Irapuato	58	4	62	4	2	0	0	0	6	68
Acámbaro	17	42	59	0	0	1	2	1	4	63
Salamanca	47	8	55	2	2	0	0	0	4	59
San Fco. del Rincón	41	1	42	4	1	0	0	0	5	47
San Miguel de Allende	66	3	69	2	3	0	0	0	5	74
Total	409	74	483	21	13	1	2	1	38	521


Guanajuato City
Guanajuato
San Miguel de Allende
Rincon
San Fco. del Rincón
Irapuato
Celaya
Salamanca
Acámbaro
Legend
Cabecera_Jurisdiccional
Health Units
Type
Regional Hospital
General Hospital
Maternal & Child Hosp
Comunity Hospital
Psyquiatric Hospital
Urban Health Care Center
Rural Health Care Center
Transportation Layer
type
AUTOPISTAS
AVENIDAS
CALLES
PAVIMENTADA
Travel Time From Nearest Hospital
VALUE
0 - 15
16 - 30
31 - 45
46 - 60
61 - 90
91 - 120
121 - 180
181 - 240
241 - 300
301 - 360
361 - 420
421 - 480
481 - 540
541 - 600
601 - 721
More than 721

http://rhinonet.org