# Guanajuato SINAIS Assessment

Anwer Aqil, MD, MCPS, MPH, DrPH
Juan Eugenio Hernández Ávila, Sc.D,.
Lina Sofia Palacio Mejía, PhD
Alicia Sánchez Parbul, MD
Beatriz Plaza, MPH
Norma Wilson, MS, MPH, DrPH
Jesús Alfredo Sánchez Martínez, MD
Theo Lippeveld, MD, MPH

May 2010

**SR-10-60**

**INDEX**

*ACKNOWLEDGEMENT* ..... 3
*EXECUTIVE SUMMARY* ..... 4
**1. INTRODUCTION** ..... 8
**2. BACKGROUND** ..... 8
**3. GOALS AND OBJECTIVES** ..... 8
**4. METHODOLOGY** ..... 9
**4.1 Conceptual Framework** ..... 9
**4.2 Survey Methodology** ..... 10
**4.2 Survey Methodology** ..... 11
**5. RESULTS** ..... 11
**5.0 Overview of Mexico SINAIS** ..... 11
**5.2. Level of SINAIS Performance** ..... 21
**5.3. Functionality of SINAIS Processes** ..... 24
**5.4. Determinants of Performance** ..... 26
**5.4.1. Technical Determinants** ..... 26
**5.4.2. Behavioral Determinants** ..... 27
**5.4.2.1 Self-efficacy or Confidence Level for SINAIS Tasks** ..... 27
**5.4.2.2 SINAIS Task Competenc***e* ..... 28
**5.4.3. Organizational Determinants** ..... 29
**5.4.3.1 SINAIS Management** ..... 29
**5.4.3.2 Perceived Promotion of a Culture of Information** ..... 31
**5.4.3.3 Activities for promotion of culture of information** ..... 33
**5.4.3.4 Supervision Quality** ..... 34
**5.4.3.5 Availability of Resources** ..... 35
**6. DISCUSSION** ..... 37
**7. RECOMMENDATIONS** ..... 39
**APPENDIX I – METHODOLOGY** ..... 41

## *ACKNOWLEDGEMENT*

*The RHINO team appreciates the leadership and support from Minister of Health of the State of Guanajuato State Health Services, Dr. Jorge Armando Aguirre Torres, for PRISM HMIS assessment.*

*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*

*Special Thank to Jesús Alfredo Sánchez Martínez and Nora Liliana García Guerra for the their committed participation throughout the entire assessment*

*Ms Beatriz Plaza, MEASURE Evaluation, deserves special credit, as she provided financial support for the PRISM assessment fieldwork.*

*We would like to thank Dr. Norma Wilson for editing the manuscript.*

*Many thanks to Ms. Irma Castro Bustos, INSP, for providing excellent administrative support*

Anwer Aqil, MD, MCPS, MPH, DrPH
Juan Eugenio Hernández Ávila, Sc.D
Lina Sofia Palacio Mejía, PhD
Beatriz Plaza, MPH
Norma Wilson, MS, MPH, DrPH
Theo Lippeveld, MD, MPH

# *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

quality, use of information, problem solving, empowerment and sense of responsibility, except for evidence-based decision making which is at 65.5%. The response pattern was similar at the district level.

- *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).

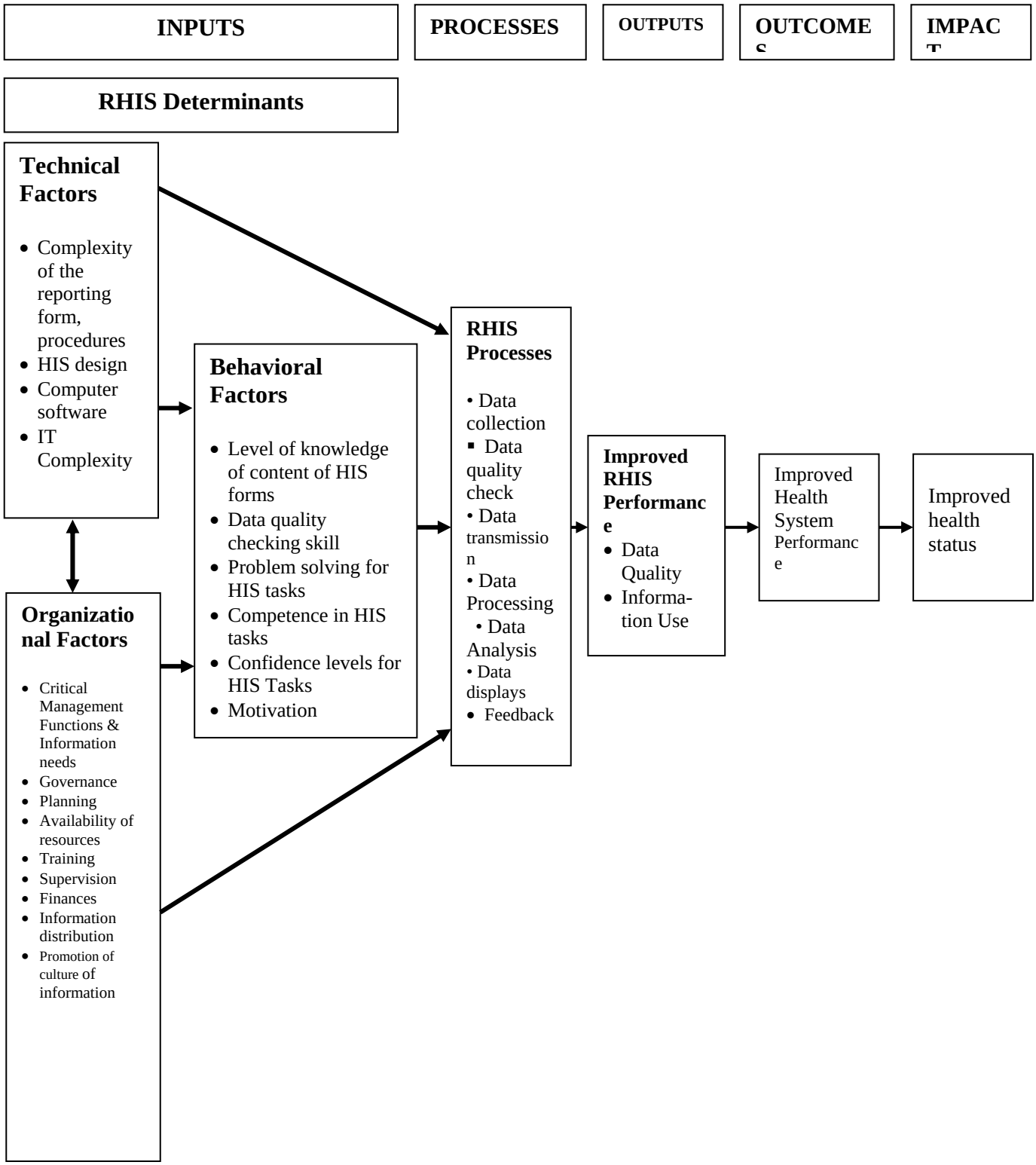
The PRISM framework explores how much the HMIS processes (data collection, transmission, processing, analysis, display and feedback) influence HMIS performance. It also identifies technical, behavioral and organizational determinants (see selected list in Figure 1). Some of the criteria used to shortlist 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.

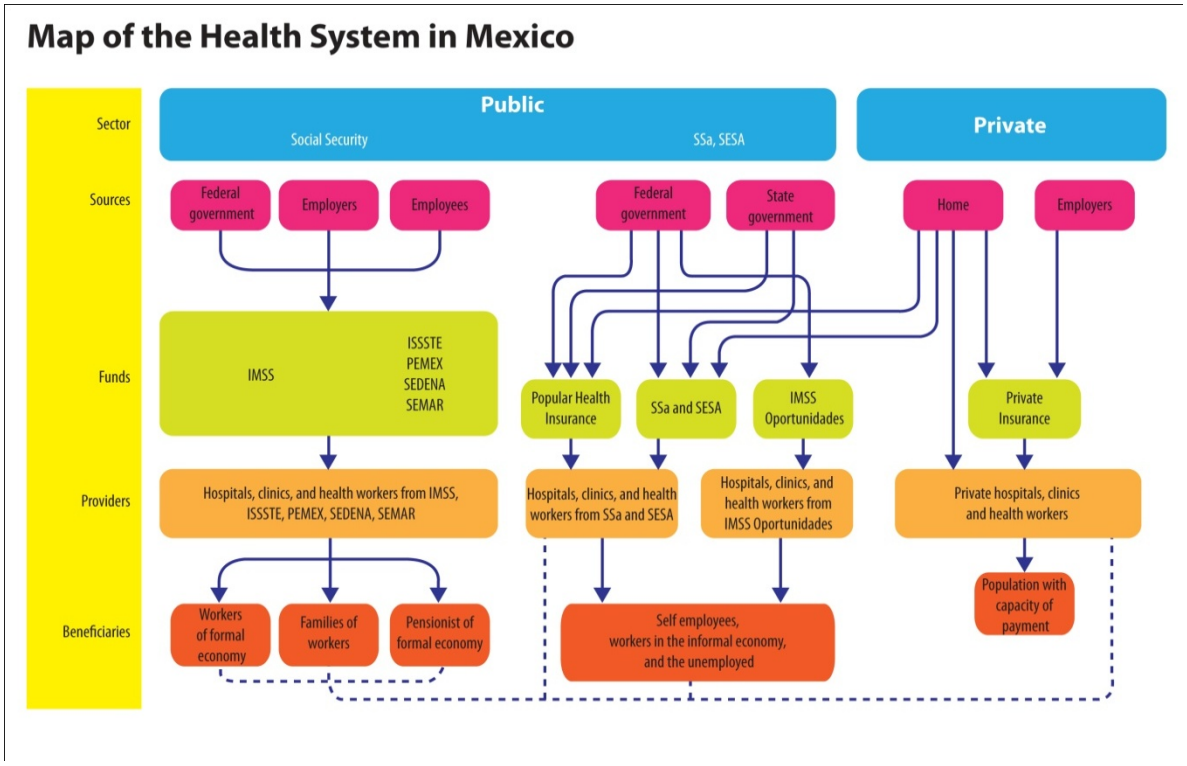



Figure 1. Map of the Mexican Health System. Adapted from the National Health Plan 2000 - 2006

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 |

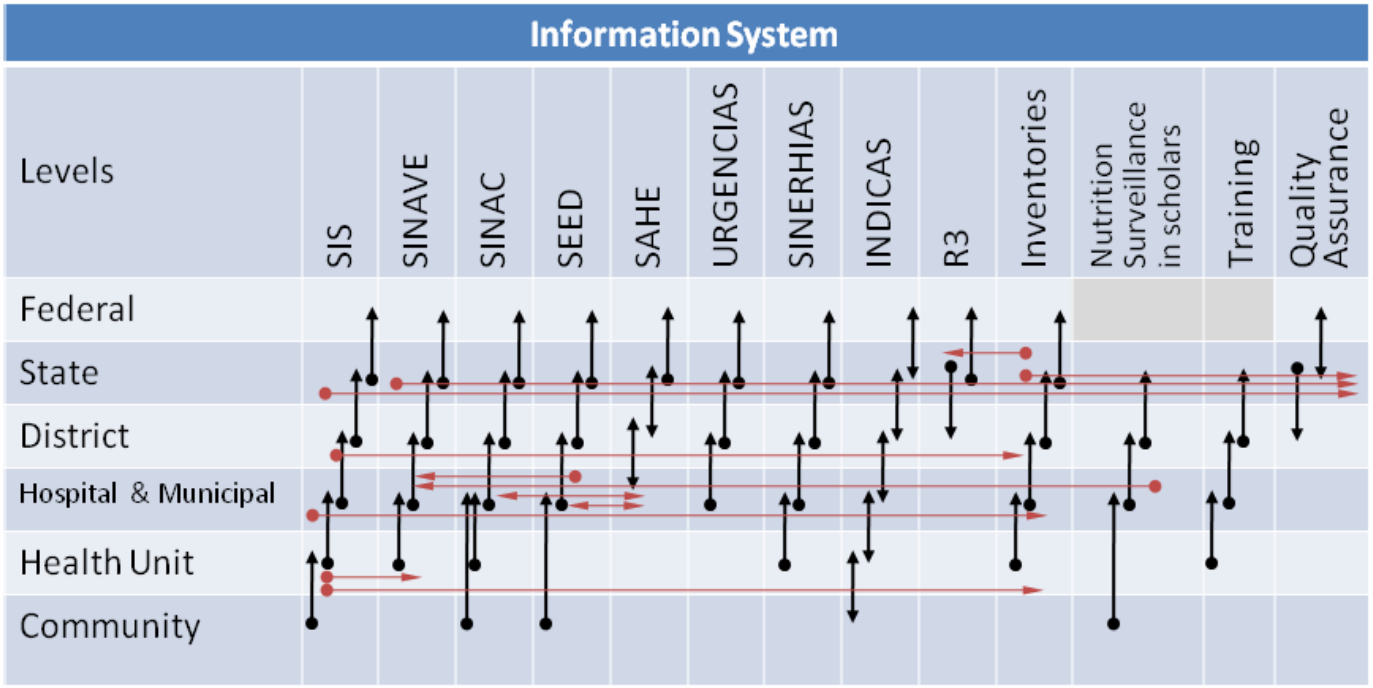



Figure 1. Data flows by organization level and across information system

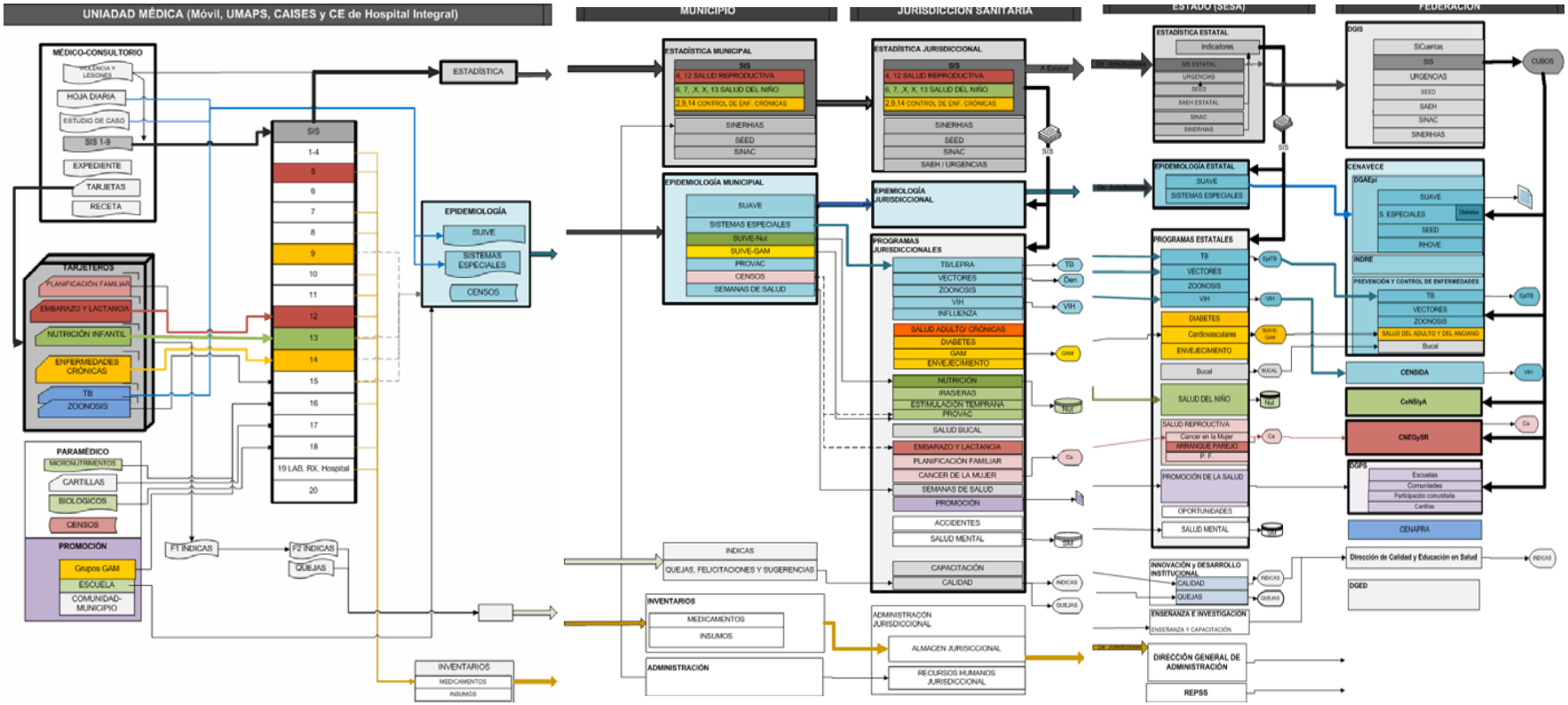



Figure 2. Complete overview of the Health Information system and it relation with the state and federal health programs.

## 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.

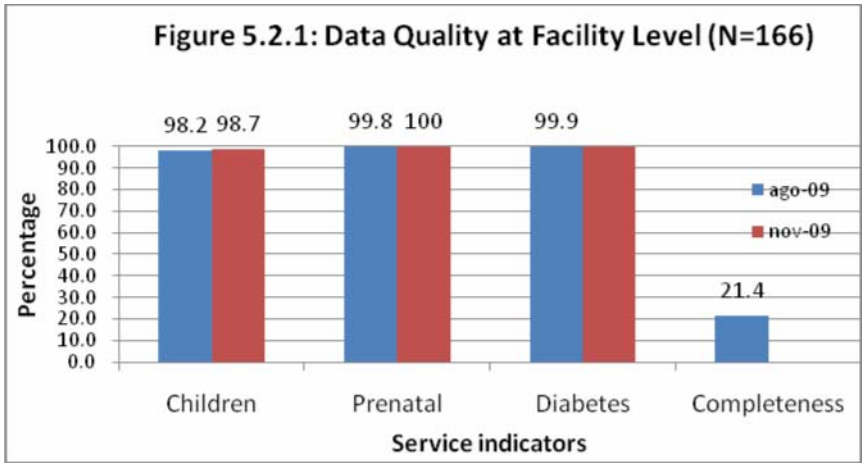
### *a) Data Quality*

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.

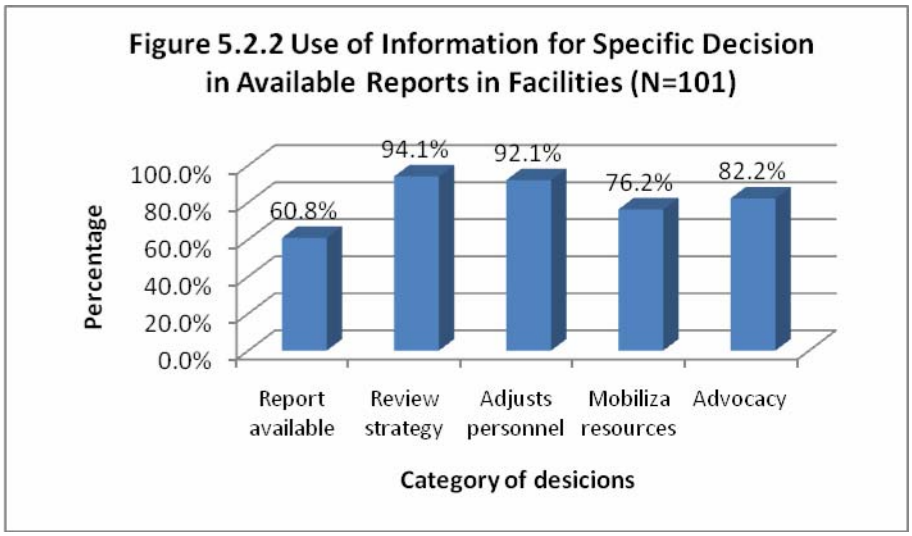
*Timeliness*

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.

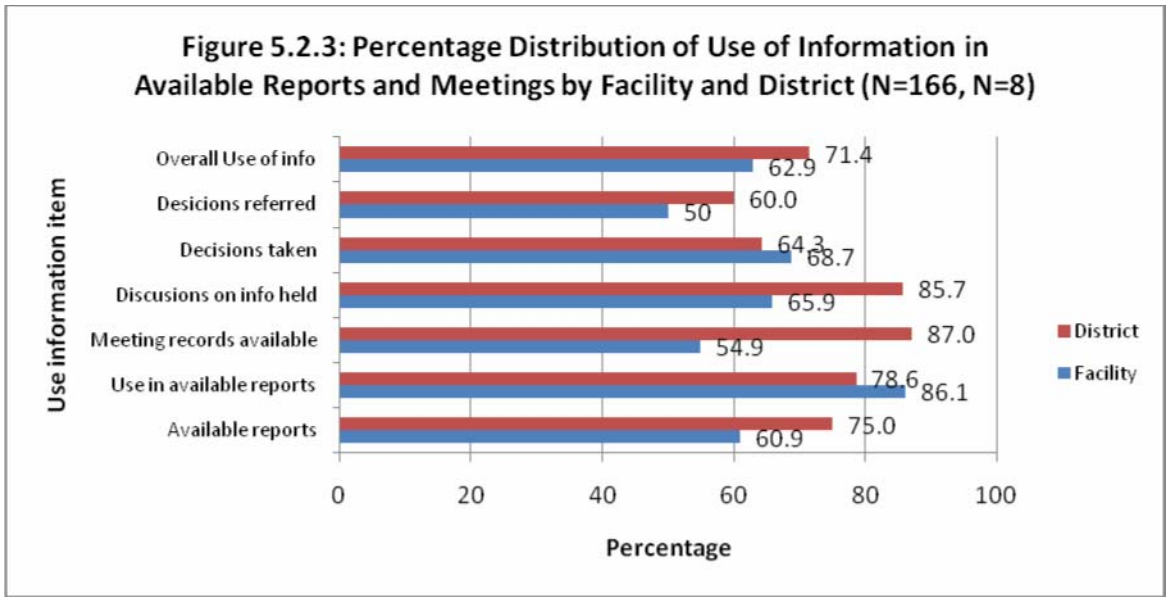
***b) Use of Information***

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.



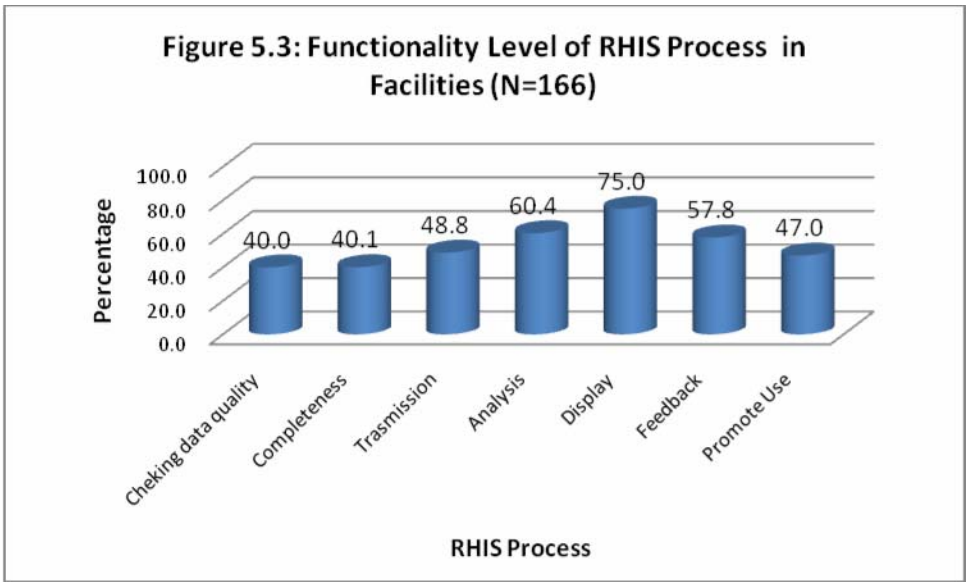

The use of information at the district level meetings was higer (Figure 5.2.3) that found at the facility level, indicating that more information use for decision-making occurs at the district level. However, referral of decisions at the higher level indicates either the

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.

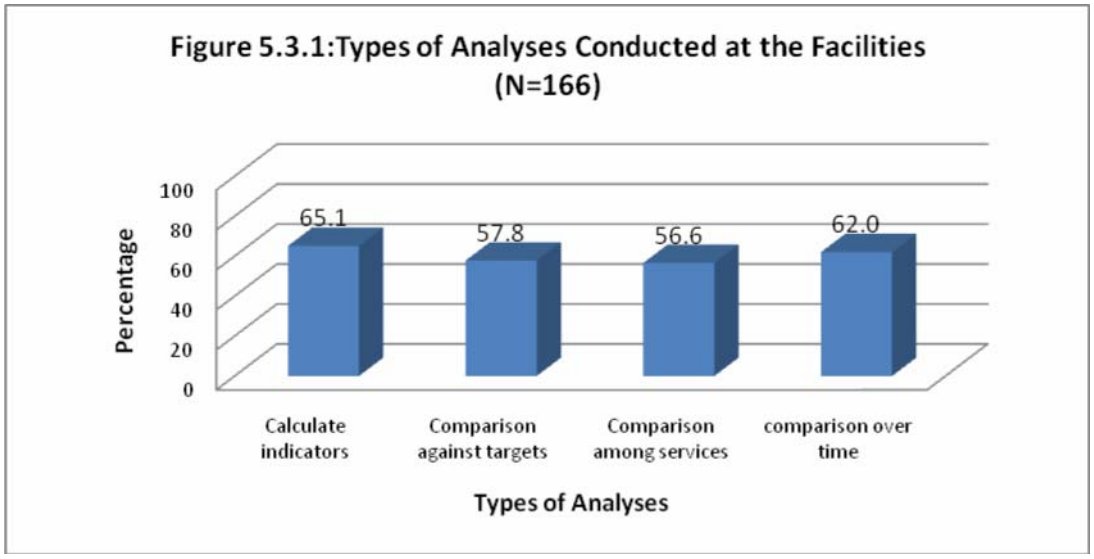
### 5.3. Functionality of SINAIS Processes

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.

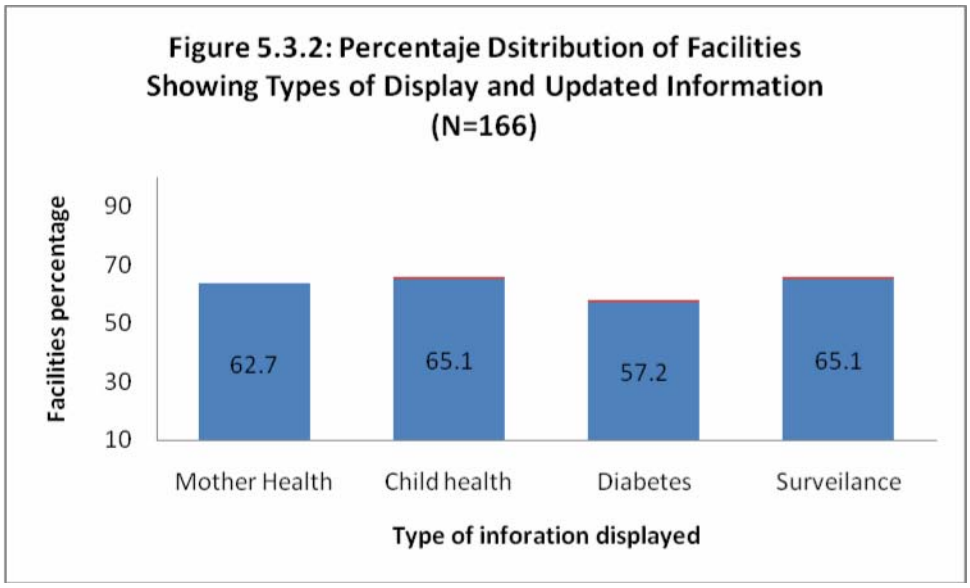



60.4% of the facilities showed (Figure 5.3) that they analyze and 75 % display data. The data analysis process is measured by items such as calculating an indicator, comparisons with district/national targets, comparison among types of services and over time. Further investigation (Figure 5.3.1) showed 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.



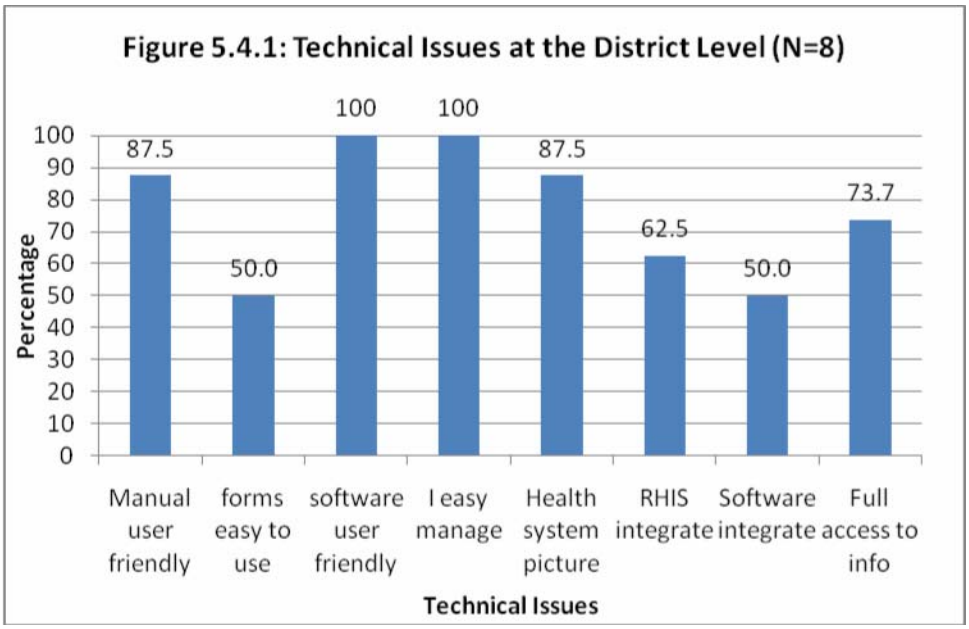
Feedback is an important process through which information flows back to the data collectors. Fifty eight percent of the facilities showed receiving a feedback report (Figure 5.3), indicating that either the current design does not promote the feedback or there is a gap in the feedback loop. However, 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.

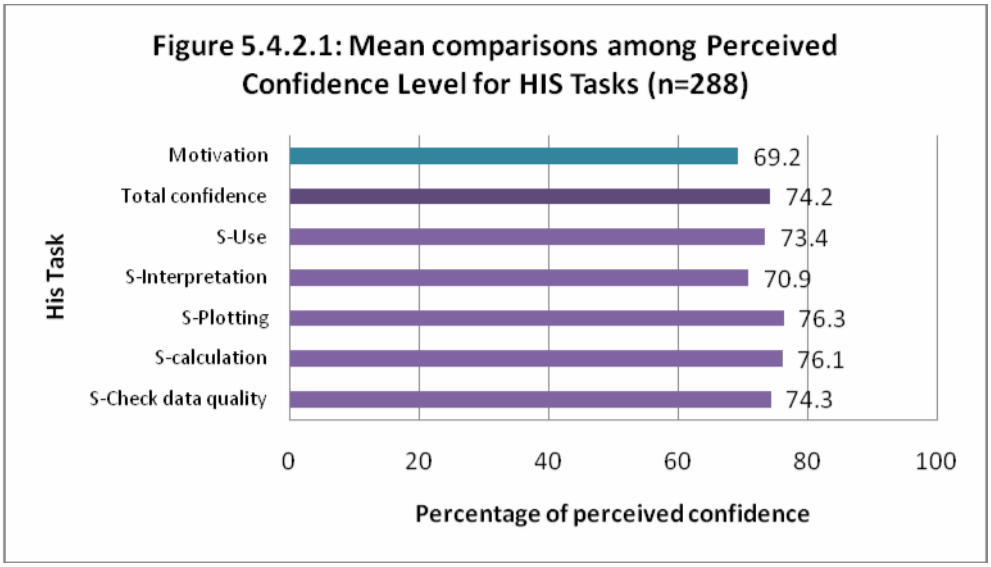


### 5.4.2. Behavioral Determinants

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.

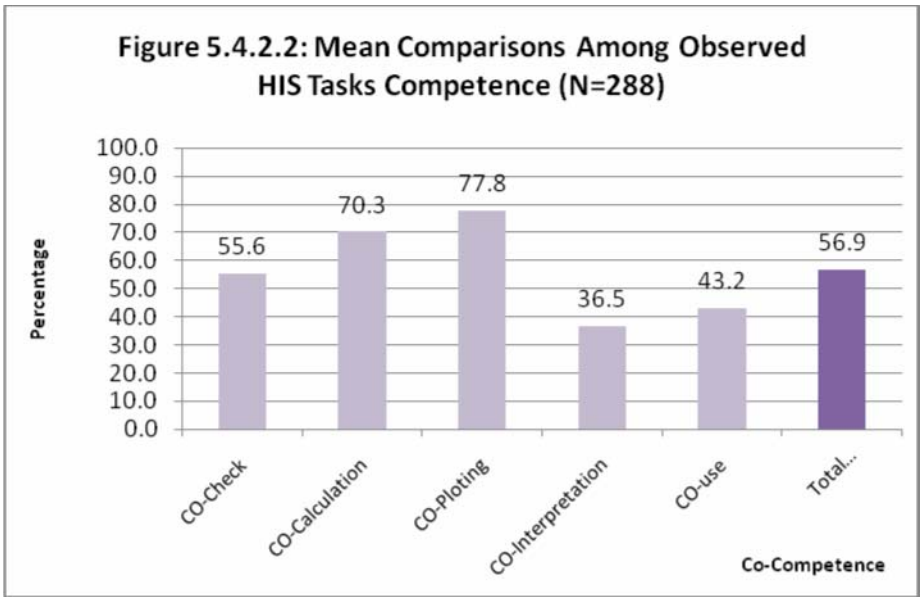
#### 5.4.2.1 Self-efficacy or Confidence Level for SINAIS Tasks

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%).

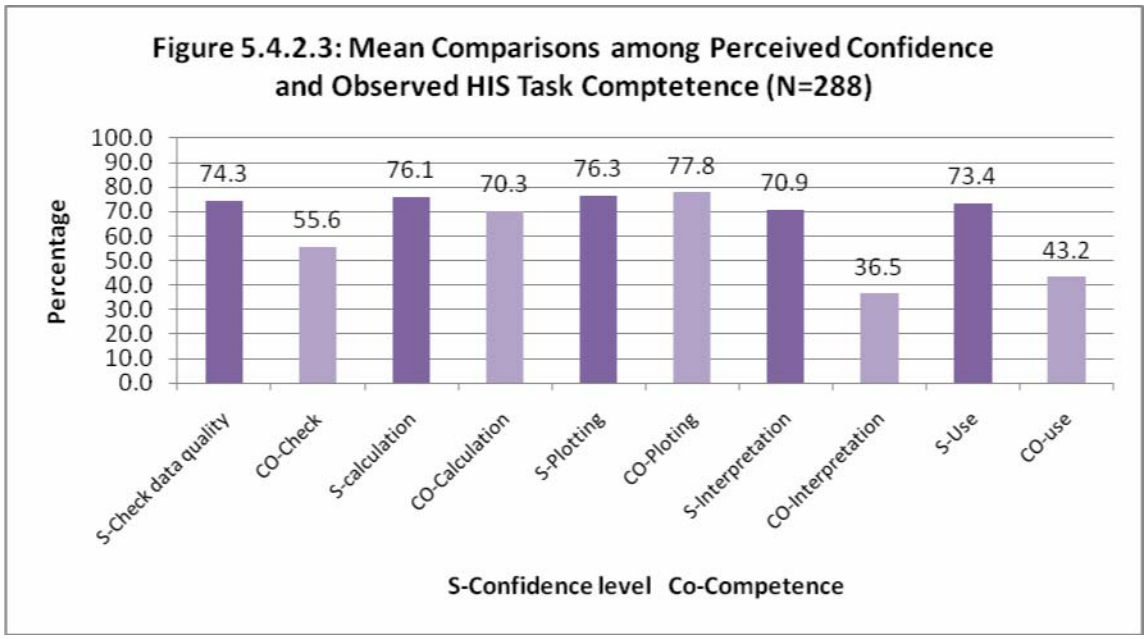


### 5.4.2.2 SINAIS Task Competence

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.

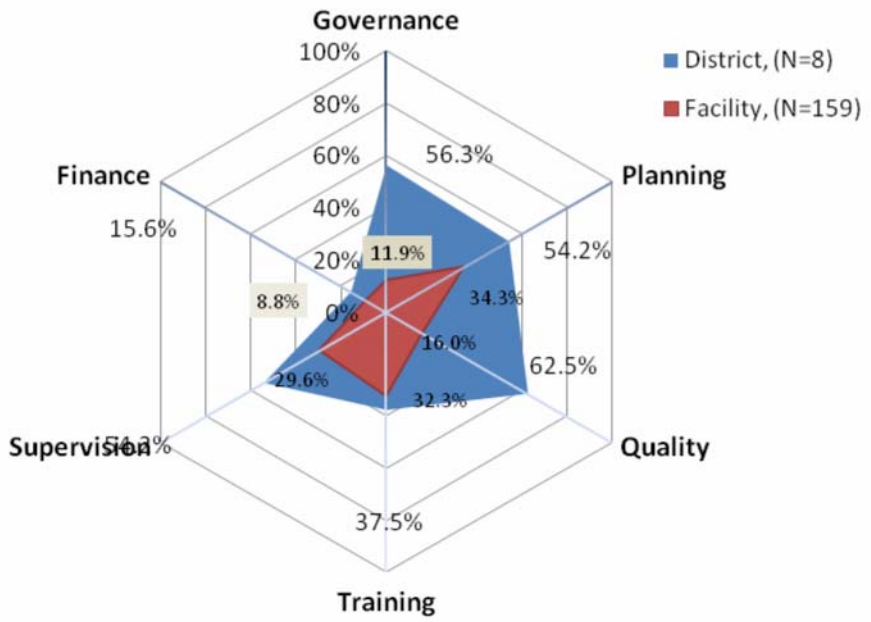
At the facility level, the percentile scores showed that only the criteria for SINAIS planning, training and supervision (Figure 5.4.3.1) were met one-third on average, showing that these functions were weakly performed. However, criteria such as the

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

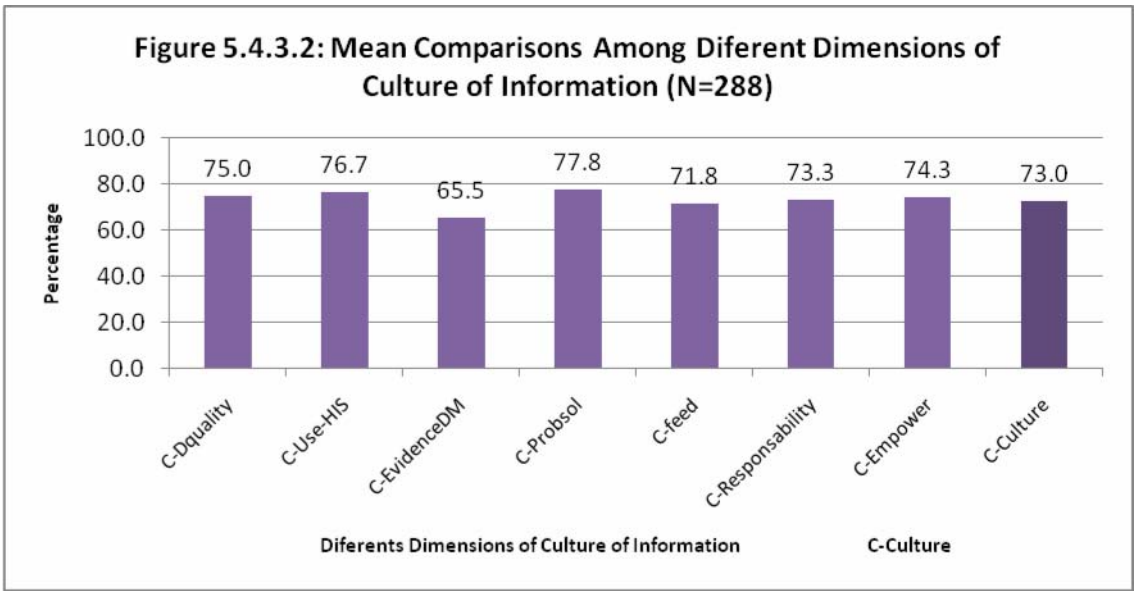
People working within an organization perform tasks and behaviors which they believe the organization values and promote. In other words, organizations create a culture for promoting and sustaining certain values around organizational functions to be performed at optimal levels. When these values are 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:

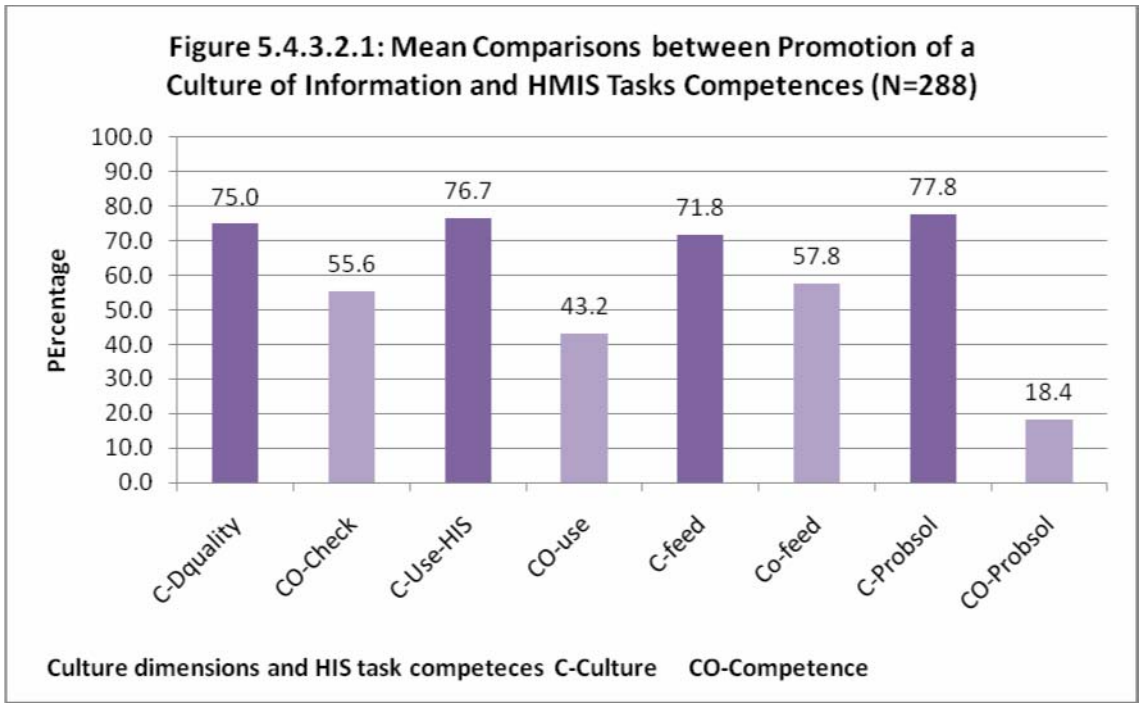
1) Emphasis on data quality (C-Dquality)*
2) Use of SINAIS information (C-UseHinfo)*
3) Evidence based decision making (C-EvidenceDM)*
4) Problem solving (C-Probsol)*
5) Feedback from staff and community (C-feed) *
6) Sense of responsibility (C-Responsibility) *
7) Empowerment and Accountability (C-Empower)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

*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.



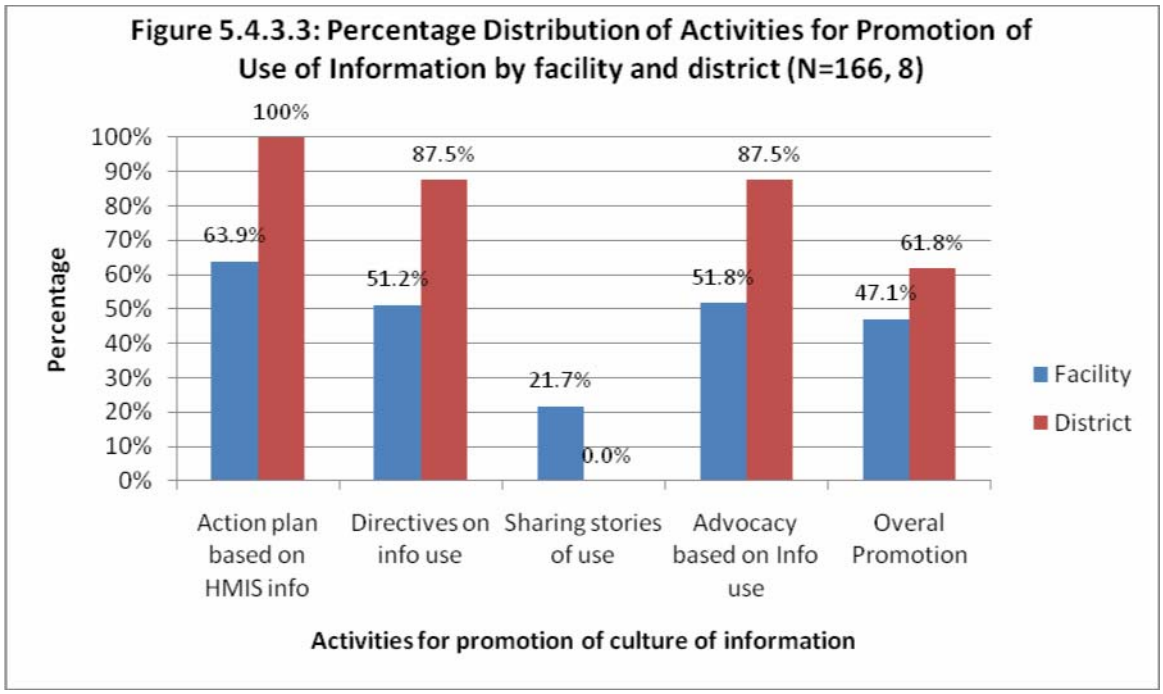

It is hypothesized that a strong culture of information is associated with high SINAIS competence levels. A comparative analysis (Figure 5.4.3.2.1) showed that there are still gaps from 20 to 60 percentual points between perceived promotion of data quality, use of information, feedback and problem solving 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%).

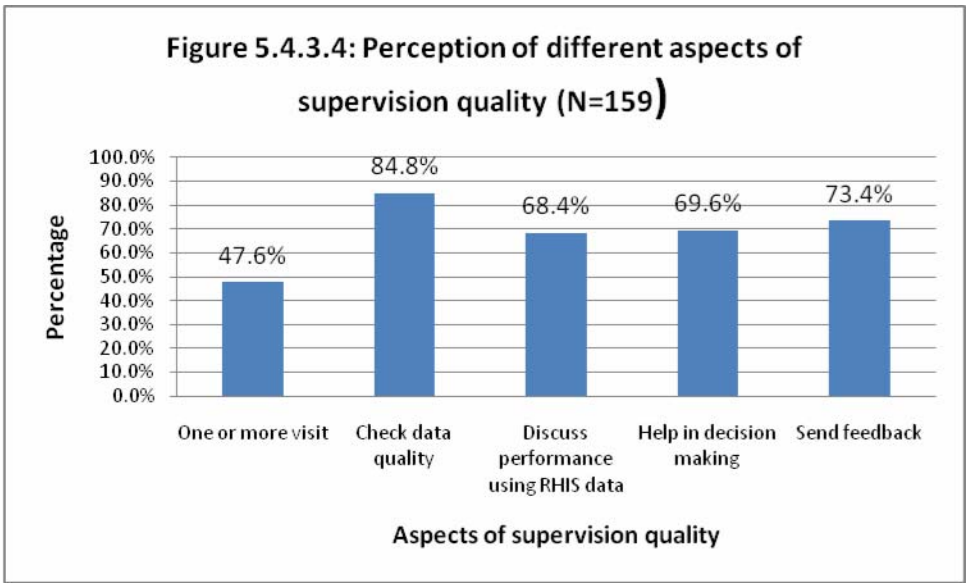
It is assumed that the district or higher level will be more active in carrying out activities for the promotion of a culture of information. This assumption was confirmed (Figure 5.4.3.3) with the exception of sharing stories on the use of information at district level, where was find none.




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

---

[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.

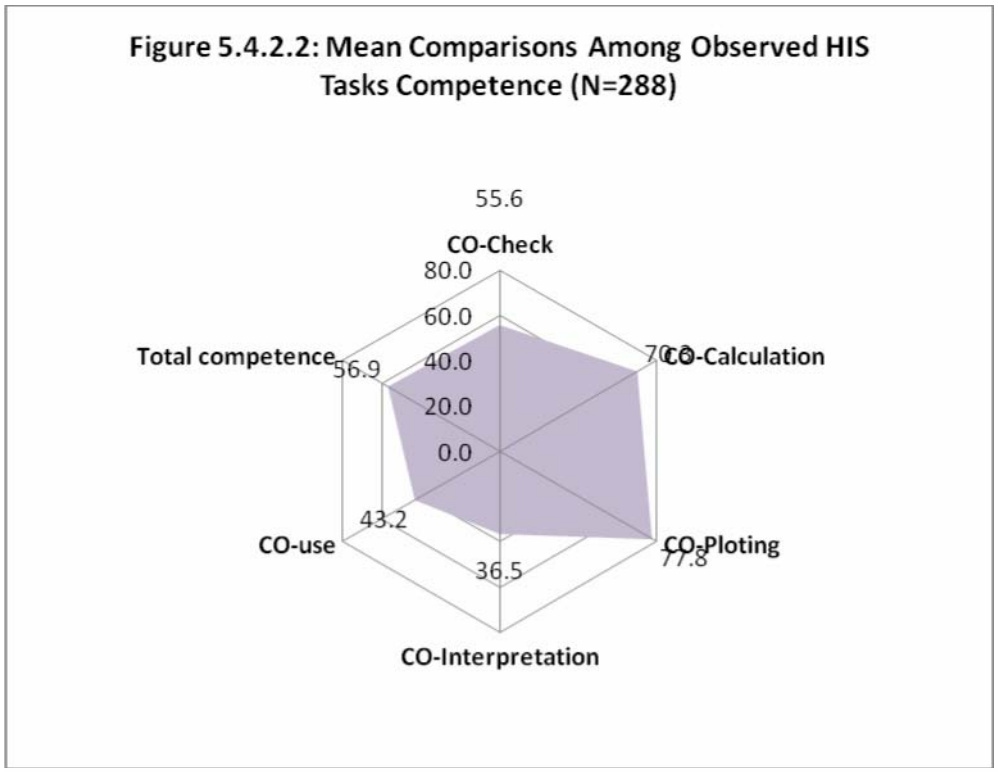
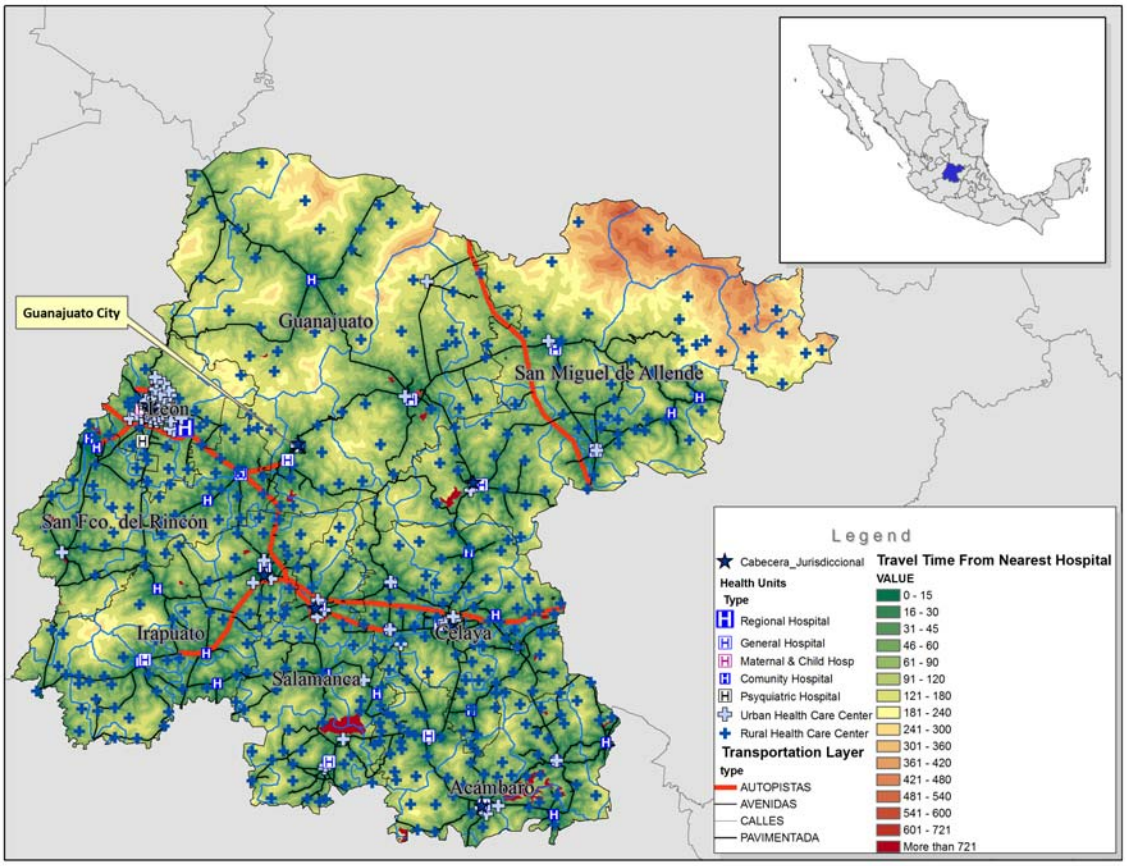



Table 1. Health infrastructure in the State of Guanajuato

| | 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 Rincon
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