Regional Initiative in Health Information Systems Strengthening

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Acronyms

ASI	Area Information Systems Paraguay
IADB	Inter-American Development Bank
CELADE	Latin American Demographic Center
ECLAC	Economic Commission for Latin America and the Caribbean
ICD	International Classification of Diseases
CRAES	Regional Advisory Committee on Health Statistics
DD / AIS	Area Health Situation Analysis and Health Information
DEIS	Department of Health Information and Statistics
DGE	Directorate General of Mexico Epidemiology
DGIS	Directorate General of Health Information of Mexico
DGIS-SSA	General Management Health Information of the Secretariat of Health of Mexico
DIES	Statistics Training Division of the Dominican Republic
DIGIES	Directorate General of Strategic Health Information Paraguay
DIRESA	Health Regions and Directorates of Health in Peru
EEVV	Vital Statistics
HMN	Health Metrics Network
HSD / HA	Health Analysis and Information—Area of Health Surveillance and Disease Prevention and Control, Information and Analysis Project of Health (Health Surveillance and Disease Prevention and Control / Health Information and Analysis) in its acronym in English)
IDSS	Dominican Social Security Institute
IMS	Health Mesoamerican Initiative
IMSS	Social Security Institute of Mexico
INEC	National Institute of Statistics and Censuses
INEGI	National Institute of Statistics, Geography and Informatics of Mexico
INSP	The National Public Health Institute of Mexico
IPS	Institute of Social Welfare of Paraguay
ISFA	Health Armed Forces of the Dominican Republic
JBG	Guayaquil Welfare Board
LAC	Latin America and the Caribbean
MAT	Management Assessment Tool
MSP	Ministry of Public Health in Ecuador
BIOSIS MSP	Biostatistics and Information Systems of Health, Mexico
OBAT	Organizational and Behavior Assessment Tool
MDGs	Millennium Development Goals
EPI	Expanded Programme on Immunization
PEVS	Regional Plan for Strengthening Vital and Health Statistics
PN	Dominican Republic National Police
UNDP	United Nations Program for Development
PRISM	Performance of Routine Information System Management
RC	General Directorate of Civil Registry and Identification

RD	2005–2005 Directors Meeting
RELACSIS	Latin American Network for Strengthening Health Information Systems
RHINO	Routine Health Information Network
RMS	Health Metrics Network
SAFH	Financial Management System for Hospitals Honduras
SENPLADES	National Secretariat of Planning and Development in Ecuador
SESPAS	Ministry of Public Health of the Dominican Republic
SIEVIS	Epidemiology Information System and Health Surveillance Honduras
SIGAF	Administrative Management Information System Financial Honduras
SIRE	Regulatory Information System of Honduras
SIRS	Routine Information System Health
SIS	Health Information System
NHS	National Health System in Ecuador
SSA	Secretariat of Health of Mexico
SSISS	Information Subsystem Health Services
TB	Tuberculosis
TCC	Project for Technical Cooperation among Countries
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
USAID-LAC Bureau	United States Agency for International Development Latin America and Caribbean

Executive Summary

Latin America and the Caribbean (LAC) is a large and diverse region, ranging from tropical to polar climates, which includes over 20 countries with 560 million people, speaking mostly Spanish and Portuguese.

Within this spectrum, Health Information Systems have performed inadequately because, among other things, there is less emphasis on improving data quality and continuous use of information; too little use of performance improvement tools, more emphasis on use of information technology for improving performance rather than looking at why staff cannot remain motivated or retain the skills learned; and less emphasis on empowerment and decision-making.

There is also insufficient promotion of a culture of information by senior management, lack of dissemination of success stories on data use and a lack of role models or champions of data use.

Coupled with the issues mentioned above, the traditionally disjointed and unstructured activities among donor agencies to strengthen HIS in the LAC Region have contributed to poor performance.

MEASURE Evaluation has been strategically collaborating with the Pan-American Health Organization (PAHO) with financial support from the USAID–LAC Bureau since 2004. This partnership has yielded precise and tangible results including the documentation and dissemination of best practices, provision of technical assistance to use Health Metrics Network (HMN) Framework and Tools and technical support in the use of Performance of Routine Information System Management (PRISM) framework and tools. The objective of the regional health information systems activity is (broadly) to encourage "low tech" improvements to routine health information systems in LAC. For example—rather than focusing on expensive high tech solutions to health information needs—we want countries to focus first on how information flows, how it is coordinated, etc., so that policy makers at all levels of the health system can make use of that information.

Furthermore, the collaboration between MEASURE Evaluation and PAHO and the associated results has attracted new partners which have widened the scope of technical expertise available to countries of focus and also extended the technical assistance for HIS assessment and strengthening provided under the previous collaboration with new countries.

GOAL

To provide information on the strengths and weaknesses of the existing health information systems of Mexico, Brazil, Honduras, Paraguay, Dominican Republic, Peru and Ecuador through the use of standardized frameworks and tools.

OBJECTIVES

1. Introduction and establishment of an assessment and monitoring process as best practices for strengthening and developing HIS, based on Health Metrics Network (HMN) framework and tool and Performance of Routine Information System Management (PRISM) framework and tools in order to support health situation analysis and evidence-based decision-making in public health;
2. Documentation and dissemination of successful experiences, key processes and lesson learned of the implementation of national health information systems.
3. Develop strategic plans and recommendations for interventions to strengthen the areas identified in the baseline assessments.

METHODOLOGY

The conceptual frameworks and tools used for carrying out the HIS assessments and later for developing a national strategic HIS strengthening plan are based on the conceptual and methodological approaches found in PRISM, the HMN framework and tools, and to some extent, those of PAHO, Guidelines for the Analysis of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas.

The HMN framework provides a useful outline for looking at health systems as well as describing fundamental requirements of health information systems and has led the way in strengthening country HIS and promoting country ownership of their HIS. The Assessment Tool developed by the HMN is called *Health Information System Assessment and Monitoring Tool*.

The *PRISM Conceptual Framework* is an innovative approach for analyzing routine health information systems (RHIS) by paying special attention to the organizational, technical and behavioral determinants and processes that influence RHIS performance. The framework analyzes the role of each of these determinants and identifies appropriate interventions to address the determinants that negatively influence RHIS performance. The PRSIM tools were used to collect data on information system performance, processes and organizational, technical and behavioral determinants of information system performance.

The contents of the PAHO Guidelines are based on the experiences of international organizations, particularly the UN Statistics Division, PAHO, and other agencies such as UNFPA, UNICEF, and the World Bank; selected countries that have implemented vital and health statistics evaluation programs; international recommendations on this matter; and methodological documents on techniques to evaluate the coverage and quality of statistics.

MAJOR FINDINGS

The integration of the above-mentioned conceptual frameworks and tools enabled countries to achieve the following:

» definition of the different stages of the HIS data production process, describing—for each level (local, intermediate, and central)—the processes, inputs, and products for each data source and thus, identifying data-related problems for each phase;
» identification of the determining factors for each problem and establishing the required interventions to minimize their impact;
» acquired knowledge of the performance of the HIS resources (technological and, essentially, human resources) with the aim of developing HIS strengthening plans; and
» generation of qualitative and quantitative information about processes, inputs, and results that support decisions and prioritizing of the national and regional strengthening strategy.

ASSESSMENT FINDINGS

HMN Assessment

An overview of results from assessments conducted by 11 Latin American and Caribbean countries is included in the table on page 4. Given the methodological characteristics of the HMN tool mentioned in this document (qualitative nature, different methodological strategies used by countries to select samples and participants, index development) it is not possible to compare results from different countries. The purpose of including results from different countries in the same table is not to compare countries against each other but, rather, to observe how each country has conducted the assessment considering the cultural characteristics, idiosyncrasies, and level of development of their HIS, which are reflected in their decisions regarding methodologies.

The results are presented on the six HIS components comprising the tool (HIS resources, indicators, data sources, information management, information products, and dissemination and use of information) and in a manner consistent with results presented in the Health Information System Assessment and Monitoring Tool, the colors corresponding to each quintile have been maintained. Country results are presented in bar graphs in the report.

Key conclusions from the country assessment reports are: Considering the differences in percentages for each sub-component, the information management component obtained the lowest score in all countries, that is, **Inadequate**. On the contrary, the indicators and information products component achieved the highest score, that is, **Adequate**. None of the components was assessed as **Highly Adequate**, but we believe that countries now have a basis to strengthen their HIS and work toward generating more adequate information.

In general terms, different performance levels can be observed between countries. This is a chance to continue promoting regional cooperation to exchange best practices and successful experiences, with the aim of achieving a more homogeneous level of development in the Latin American region.

Assessments Results Conducted by 11 Latin American and Caribbean Countries

	Insufficient	Inadequate	Present but not adequate
Resources			
Planning (Legal Framework and Context)		BEL ELS NIC PER DOR	ECU HON PAN PAR
Institutions, Human Resources, Financing		ELS PAR PER DOR	BEL ECU HON NIC PAN
Infrastructure		ELS PAR	BEL HON NIC PER DOR
Indicators			COR ELS PAN PAR
Data Sources			
Censuses			ELS PAR
Vital Statistics			BEL ELS PER
Surveys			BEL
Health Status			BEL ECU ELS HON PAN PER DOR
Health Facilities		ELS	BEL HON NIC PAR PER DOR
Administrative Records		BEL COR ELS NIC PAN	ECU HON MEX PAR PER DOR
Information Management	NIC	BEL COR ELS	ECU HON MEX PAN PAR PER DOR
Information Products			
Health Status Indicators			ELS
Health System Indicators		ELS	HON PAR PER DOR
Risk Factor Indicators		ECU ELS	HON PAR PER DOR
Global Quality Indicators			
Dissemination and Use			
Analysis and Use of Information		BEL	COR ELS PER DOR
Planning Policies and Advocacy		PER	COR ECU ELS PAR DOR
Priority-Setting		COR PAR	BEL ELS DOR
Resource Allocation	COR	ELS NIC PER DOR	BEL ECU HON PAR
Implementation and Action		BEL ELS NIC PER	COR ECU HON PAR DOR

PRISM Assessment

Some common aspects in the results from applying the PRISM Tool (see the *Use of PRISM Tools* table on page 6) in the different countries are as follows:

» It has been observed that the two components of performance—data quality and use of information—show varying behaviors. Use of information has consistently achieved fairly high scores in all countries, while data quality shows low percentages. This could indicate that information use is not always linked to data quality. Appropriate use of information does not guarantee high quality of data. This confirms that other aspects such as the determining factors measured through the PRISM tools have an impact as well. The same is true for the opposite situation—higher quality of data does not necessarily mean that information is used appropriately.

» Behavioral factors also have a direct impact on the performance of the system and processes such as data collection, filling out forms, data integration, capturing, transmission, processing, analysis, presentation, and feedback are affected by the gaps between real competencies and perceived competencies of health care professionals. Furthermore, in most countries, the limited knowledge about the usefulness of data has been the primary factor linked to low quality of data and use of information. These and other identified gaps relating to knowledge of methods and skills to verify the quality of data and interpret data, problem solving skills, and the capacity or skills to implement processes, have been incorporated into these countries' strategic plans as priority elements in improving the HIS.

» With respect to the organizational factors, the absence or promotion of a culture of information directly affects the performance of the RHIS in most countries where assessments have been conducted. That is, if a working environment where key attitudes, values (evidence-based decision-making, empowerment, problem solving, accountability, and rewarding good performance, and activities related to the RHIS are emphasized) do not exist, health workers do not internalize the values required to generate, maintain, and change the information system. Moreover, in regards to the administrative functions of the HIS, the primary weaknesses in terms of governance and training have been observed to be related to evidence-based decision-making, rewarding good performance, and quality of supervision visits and feedback

» An analysis of the technical factors has revealed that deficiencies in most countries lie within components related to information technologies, development of software for data processing and analysis, development of indicators, design of data collection forms, and development of procedure manuals. The majority of countries that have carried out assessments have included relevant improvement plans or interventions in their strategic plans, for future development related to these issues.

» Lastly, routine health information systems interventions are complex and therefore difficult to detect their direct and immediate impact on health systems. The changes in technical and behavioral components are easier to gage in the short run but it takes a significant period of time for organizational interventions to achieve performance gains.

Use of PRISM Tools

Country	Tool	Year
1. Costa Rica	OBAT V. 2.0	2009
2. Ecuador	PRISM V. 2.0	2010
3. Honduras	OBAT V. 2.0	2006
4. Mexico	OBAT V. 1.0	2005-2006
5. Paraguay	PRISM V. 2.0	2006-2007
6. Peru	PRISM V. 2.0	2008-2009
7. Dominican Republic	PRISM V. 2.0	2008-2009

Source: Country Assessment Reports.

RESULTS AND IMPACT

For the Project and the Countries Themselves

The primary objectives that have been achieved are: to establish a standardized reference framework, methods, and instruments to monitor performance of the HIS; to identify, document, and disseminate successful experiences, key processes, and lessons learned in assessment processes; and to design strategic plans to strengthen the HIS in selected countries.

Participating countries have taken absolute ownership and leadership of the assessment process through use of the HMN, PRISM, and PAHO assessment tools, developing and implementing their own strategies to strengthen their HIS. This is done in compliance with one of the primary objectives of the 2005 Paris Declaration in which countries agreed to be in charge of their own development processes.

Clearly, implementing the HMN and PRISM tools has contributed to the following: strengthening, improving, and promoting the development of HIS; greater investment in management and staffing of the HIS and the health system; improving the quality of information production processes; improving policy-making, planning, management, decision making, and monitoring of programs; developing and implementing strategic plans to guide strengthening processes; and incorporating HIS in public policy.

The project has increased its potential by integrating three current efforts in the region: the HMN initiative; the PRISM initiative; and the PAHO initiative, through their Health and Information Analysis Project, particularly the Regional Plan to Strengthen Vital and Health Statistics (PEVS).

The project has promoted technical assistance through South-South cooperation. The integrated contribution of conceptual frameworks and tools has enabled the countries and the project to achieve the following: defining the different stages of the HIS data production process; describing for each level—local, intermediate, and central—the processes, inputs, and products for each data source and, thus, identifying data-

related problems for each phase; identifying the determining factors for each problem and establishing the required interventions to minimize the impact of these factors; and learning about the performance level of HIS resources (technological and, essentially, human resources) to assist development HIS strengthening plans.

HIS Assessments have been conducted and strategic plans developed in six countries (the Dominican Republic, Ecuador, Honduras, Mexico, Paraguay, and local plans in Peru). Other countries in the region have developed HIS strengthening plans with the assistance of the HMN, the Mesoamerican Health Initiative or on their own (Belize, El Salvador, Nicaragua, Panama, Argentina, Brazil, Chile, and Cuba).

In addition to the findings relating to HIS performance, efforts implemented under the project include a critical analysis of the assessment tools that have been used, making them suitable for the process of monitoring and evaluating outcomes in these countries.

For the Region

The RELACSIS (Latin American Network to Strengthen HIS) was created in order to exchange, disseminate, implement, monitor, and learn from practices in different countries. RELACSIS was officially launched in Lima, Peru in April 2010. This was the culmination of five years of the HIS strengthening and improvement cycle as well as a strategic alliance between USAID, PAHO and MEASURE Evaluation but most importantly an alliance with all the countries involved in this process. The purpose of the RELACSIS network is to develop a mechanism to coordinate regional efforts aimed at contributing to the ongoing improvement of HIS in countries included in the Network. The overall objective is to contribute to HIS strengthening, dissemination, and use of information.

Lessons Learned

Finally some achievements occurred in this Project that were critical to its success and which are applicable to other countries and regions. Touched upon briefly earlier in the document they deserve to be highlighted now as a summary statement of the Project.

Country Ownership of the Frameworks and Process

Individuals, institutions and countries supported the HIS strengthening process at its onset and evolved into taking ownership of the process as it progressed. This was one of the most important factors leading to the Project's success. The opportunity for the countries to adapt and adopt the Frameworks and tools to their country's own particular situation and culture was significant in bringing about this sense of ownership.

Creating South-to-South Technical Assistance

One part of the Project strategy was to encourage South-to-South assistance. As the countries became partners, owners, and actors in the process, professionals and institutions in the participating countries became aware of existing expertise present

in their countries which could be helpful to others. As the Project advanced this South-to-South technical assistance was made available throughout the Region. Now, through the RELACSIS Network they have created a mechanism in which this expertise can be accessed and the knowledge made available throughout the Region beyond the life of the Project.

Using the Information Strategically

An outcome of the Project was country understanding and buy-in of the Framework and methodology, documenting the results of the assessments and country plans, and strategically channeling and disseminating the results to decision makers which enabled them to take ownership of the process. This led to the decision makers working within and between their countries and helping to mobilize resources for HIS strengthening.

Synthesizing the Frameworks into a New Collaborative Model

Each of the frameworks and tools (PAHO, HMN, PRISM) share similarities and each has its own "sphere of interest, purpose and action." This Project has demonstrated in a very pragmatic and fruitful way that they complement one another and that together they are more powerful than any one tool alone in accomplishing the tasks of strengthening HIS. Looking to the future, it is a task for the organizations that developed these tools to continue to work on their further development and use and to encourage their use in strengthening and maintaining health information systems.

Section 1 Background

Over the past decade the international health community has paid significant attention to the quality of health system operations and their impact on the health of the population. The existence of consensus, objectives, and international agreements such as the United Nation's Millennium Development Goals (MDG) highlights the need to monitor advances, the degree of compliance, or the gap that countries need to close to be able to reach these goals. There is also recognition of the unmet need to analyze the impact of health policies on the health of the population.

To determine the health system and health policy impact on the health of the population with data and information generated through the country health information systems (HIS), there exist three key elements:

1. the importance of valid, reliable, and timely information, disaggregated by geographic area and topic as much as possible;
2. compliance with standards that ensure the quality of available data in the country; and
3. the capacity for countries to take action on their own to improve their respective health information systems and, ultimately, improve available data.

In recent years, these elements have become more apparent and the need to achieve them has become more pressing. Simultaneously there is increasing interest to study, determine, and analyze the characteristics of health information systems in order to use them in a measurement tool for assessing health information systems.

In the Americas, MEASURE Evaluation for the United States Agency for International Development Latin American and Caribbean Bureau (USAID-LAC), and the Pan American Health Organization (PAHO) identified problems relating to the lack of appropriate information in terms of accuracy, completeness, and timeliness that needed to be resolved at a country level. Based on results of country HIS assessments it appears very few countries have escaped this situation. In fact, it could almost be said that every country faces some kind of data quality issue that needs to be resolved.

To address this problem, since 2004 PAHO and MEASURE Evaluation have executed a joint technical cooperation project oriented toward strengthening HIS in selected countries in the Americas' Region using the HMN and PRISM models. The Health Metrics Network (HMN) was established in 2005 as an international network to increase the availability and use of timely and accurate health information from a variety of data sources (HMN, 2006). Included in its mandate was the development of a framework and standards for country health information systems.

Around this time, MEASURE Evaluation developed a conceptual framework, *Performance of Routine Information System Management (PRISM)* for designing, strengthening, and evaluating the performance management of routine health information systems (RHIS), paying special attention to the organizational,

behavioral, and technical determinants and processes that influence the performance of RHIS. Concurrently, PAHO was responding to the need for strengthening vital health statistics through its Regional Plan for Strengthening Vital Statistics (PEVS).

This document contains a summary of the joint efforts of the regional initiative for HIS strengthening of PAHO[1] and MEASURE Evaluation with financial support from the USAID-LAC Bureau. The primary objectives of this joint effort have been to use and promote standardized frameworks, methodologies, and instruments to monitor HIS operations; to identify, document, and disseminate successful experiences, key processes, and lessons learned relating to assessment processes; and to design strategic plans to strengthen HIS in selected countries.

This document also includes a summary of the conceptual frameworks and assessment tools that have been used for the HIS strengthening process since 2005, as well as the results from implementing these tools in selected countries. Specific uses of results in each country are mentioned, as well as the scope and limitations of the tools in contributing to the monitoring and development processes of the country strategic plans to improve their HIS.

The HMN *Health Information System Assessment Tool* has been used in 11 Latin American countries: Belize, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, and Peru. The complete set of PRISM tools has been used in the Dominican Republic, Ecuador, Paraguay, and Peru. Costa Rica, Honduras, and Mexico have used one of the PRISM tools, the Organizational and Behavioral Tool (OBAT). Country assessments were carried out from 2005 to 2010. The tool developed by PAHO for assessing vital and health statistics has been used in 25 countries as shown in Table 1.[2]

[1] Health Surveillance and Disease Prevention and Control/Health Information and Analysis (HSD/HA) Project.

[2] To facilitate access to original materials, hyperlinks have been included in the electronic version of the document. Nevertheless, the printed version includes bibliographic references and the links to these documents.

Table 1 Agency Tools Applied by Each Country

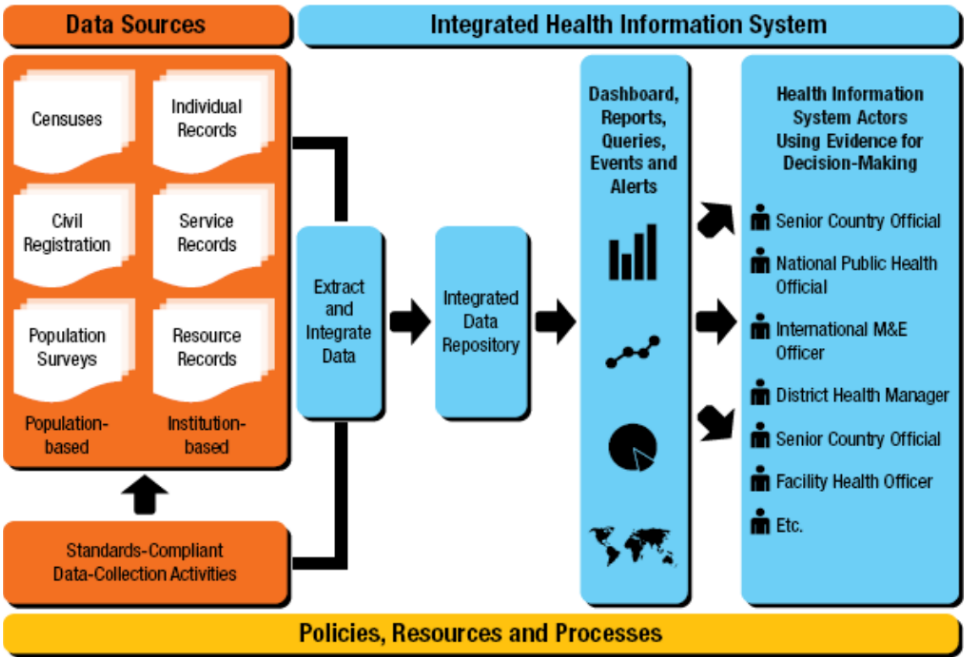
Country	Tool	Year	Country	Tool	Year
Argentina	PAHO	2005	Guatemala	PAHO	2005
Bahamas	PAHO	2005	Honduras	PAHO HMN OBAT (PRISM)	2005 2006 2006
Barbados	PAHO	2005	Mexico	PAHO HMN OBAT (PRISM)	2005 2005–2006 2005–2006
Belize	PAHO HMN	2005 2008	Nicaragua	PAHO HMN	2005 2007
Bolivia	PAHO	2005	Panama	PAHO HMN	2005 2006
Brazil	PAHO	2005	Paraguay	PAHO HMN PRISM	2005 2006–2007 2006–2007
Chile	PAHO	2005	Peru	PAHO HMN PRISM	2005 2008–2009 2008–2009
Colombia	PAHO	2005	Bolivarian Republic of Venezuela	PAHO	2005
Costa Rica	PAHO HMN OBAT (PRISM)	2005 2009 2009	Dominican Republic	PAHO HMN PRISM	2005 2008–2009 2008–2009
Cuba	PAHO	2005	St. Vincent & the Grenadines	PAHO	2005
Ecuador	PAHO HMN PRISM	2005 2009–2010 2009–2010	Trinidad Tobago	PAHO	2005
El Salvador	PAHO HMN	2005 2008	Uruguay	PAHO	2005
United States	PAHO	2005			

Section 2 Conceptual Frameworks and Tools Used for HIS Assessment and Development of National Strategic Plans

The conceptual frameworks and tools used for carrying out the HIS assessments and later for developing a national strategic HIS strengthening plan are based on the conceptual and methodological approaches found in PRISM, the HMN framework and tools, and to some extent, those of PAHO. Three aspects are common to all approaches: the concept of the health information **system**, data production as a **process**, and the **phases** of the HIS strengthening process.

Health information systems involve complex processes and relationships which go beyond the individual responsibility of any single government institution or agency. Information systems must be viewed in a holistic manner, they must not only include routine information processes and provide data on health status, behaviors, interventions, and resources but also incorporate data and analyses from other institutions that generate and use health information. These institutions could include civil registers providing vital statistics; institutions outside the health sector generating relevant information about health determining factors (social, environmental, economic, etc.); central statistics offices through censuses and surveys (many of them specifically health surveys); central banks; the public and private sector; civil society organizations; donors; and development agencies. Figure 1 shows these dynamics.

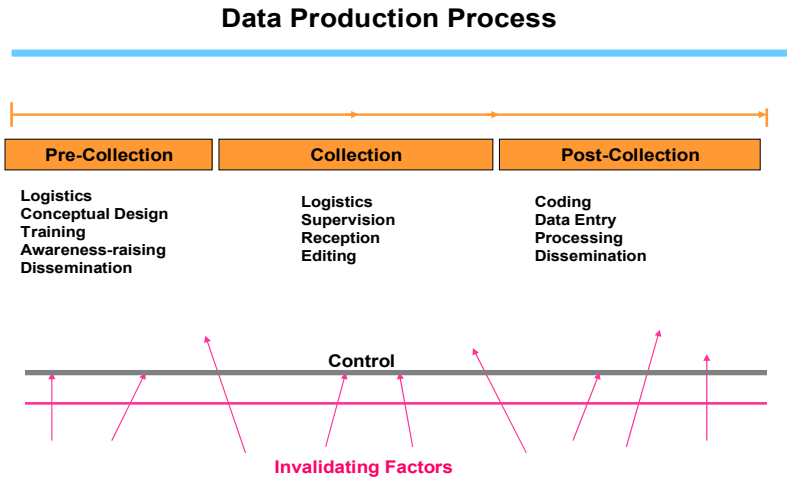
Figure 1 Dynamics of Health Information Systems



Source: HMN Conceptual Framework, 2008.

Statistical information is visualized as the product of a production process. The actions implemented in each phase throughout the process determine the quality and coverage of the data, shape the data, and establish their conceptual and empirical nature. This process can be influenced by factors, called determining factors, which have an impact on the quality of the data. These determining factors, also known as invalidating factors, have an impact from the occurrence of the event that is being recorded until the moment when data are entered into a register, either manually or electronically (Figure 2), analyzed and used by stakeholders and those requiring the information. Examples of determining factors are the accuracy of data recording, availability of recording and reporting forms, and the staffs' capacity to analyze and report data. The determining factors shape the data and define their validity, reliability, accuracy, and timeliness. Knowing these factors and controlling them through specific strategies is a common principle in the conceptual frameworks of this project.

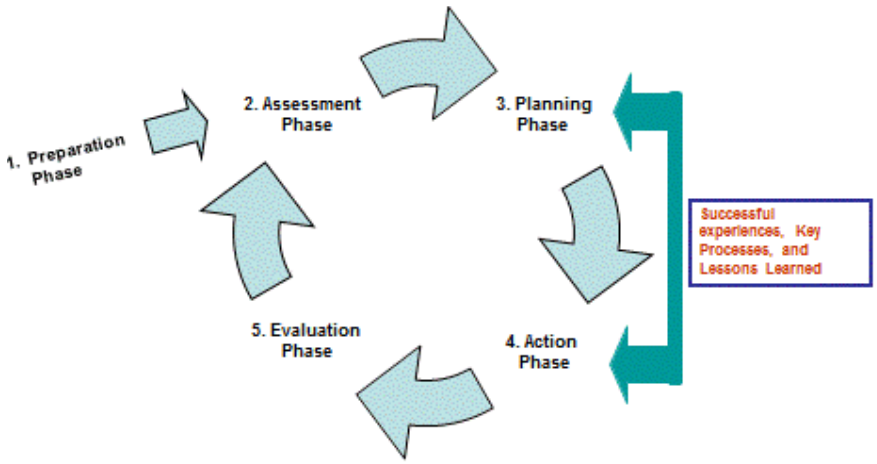
Figure 2 **Factors that Invalidate Data Quality Within the Context of the Information Production Process**



Source: OPS, 2006.

HIS strengthening efforts develop in various phases. The phases include assessing the status and operations of the HIS, establishing priorities, developing a strategic plan, implementing the plan, and carrying out an ongoing HIS monitoring and evaluation process, as shown in Figure 3.

Figure 3 HIS Strengthening Phases



Source: Conceptual Framework, 2008.

- The **preparation phase**: The organization ensures that it is prepared and ready to improve the system; the appropriate people are involved; beneficiaries and their interests have been identified; and teams have been established to take on the HIS reform.
- The **assessment and situation analysis phase**: The assessment results are analyzed and information is interpreted; findings are documented and disseminated; consensus is reached among beneficiaries on the current status of the HIS performance and the actions that need to be implemented to improve it.
- The **strategic plan development phase**: A strategic plan to strengthen the HIS is developed based on the findings from the assessment; clear goals are established and agreed upon; strategies are developed to meet these goals; objectives are established to meet these goals; responsibilities and timelines are established for each goal and objective; and a document of the plan is prepared and disseminated.
- The **implementation phase**: Using the strategic plan, activities are implemented based on the proposed goals, objectives and time frame.
- The **evaluation phase**: The evaluation and monitoring of the HIS is a continuous process. The HIS assessment is an opportunity to identify critical steps in the data production process which strongly influence the data quality. Rather than ending with the assessment, it is the beginning of a never ending quality control and feedback process.

In the following sections, the conceptual frameworks and tools used by the Regional Initiative Project to strengthen the HIS in selected countries in the Americas are described.

2.1 THE PAHO APPROACH TO HIS STRENGTHENING

In recent years, following recommendations from the Regional Advisory Committee on Health Statistics (CRAES),[3] PAHO as the WHO sectorial technical health organization of the United Nations in the Americas has led an initiative to develop and maintain a regional plan to strengthen HIS and has joined the other above-mentioned initiatives, with the purpose of assisting countries in the production of improved statistics.

PAHO's approach draws on the experience of the United Nations Statistics Division; incorporates the conceptual framework of HMN and the dynamics of the relationships between determining factors and their impact as outlined in the Performance of Routine Information System Management (PRISM) Framework; and adopts its own vision regarding information production processes.[4]

The PAHO approach focuses on processes and results,[5] that is, establishing how information is produced in the HIS and the consequences and results of this data production. It includes three dimensions:

1. information production as a sequence;
2. differentiating between HIS problems and needs and HIS solutions and best practices; and
3. intervention levels of the system on which a HIS strengthening plan should focus.

The two former aspects oriented the design of an assessment guide that provided the information reflected in the assessment of the status of the HIS at a regional level.

2.1.1 Production as a Sequence

Statistical information is visualized as a product which is the result of a production sequence where the actions implemented during each phase and place throughout the process determine the conceptual and empirical nature of the data, define the levels of validity, reliability, accuracy, and timeliness, and are ultimately reflected in what is called the level of data coverage and quality. Determining factors can have a positive or negative effect on data quality at any point in time and place throughout this process. Therefore, the data production activity should consider mechanisms to avoid or at least minimize the negative impact of the determining factors.

Information users do not always understand this when faced with the evidence they are seeking and are tempted to analyze and interpret data without considering the uncontrolled effects of the determining factors. Definitions, concepts, implementation modes, training and logistical aspects related to data production all

[3] For more detailed information, see PAHO (2004). Report on the II Meeting of the PAHO/WHO Regional Advisory Committee on Health Statistics. Washington, September 10–12, 2003. Washington.

[4] Consults with international agencies and technical initiatives (such as UNICEF, UNFPA, UNDP; ECLAC, ECLAC/CELADE) and financing organizations (IADB, World Bank, Global Fund); and implements actions to promote HIS strengthening within the framework of the PAHO/ECLAC agreement.

[5] For more detailed information, see PAHO/WHO (2004).Reunión de Buenos Aires 2005 (RD-2005). Plan de Fortalecimiento de las Estadísticas Vitales y de Salud de los países de las Américas (PFEVS). Conceptual aspects of the design of the plan.

shape the data that are ultimately used, analyzed, and interpreted. Ignoring these can bias data analysis, interpretation and worse of all, health and population policy development decisions.

2.1.2 Differentiating between HIS Problems and Needs, and HIS Solutions and Best Practices

Health information at a regional level is generated and used not only by individual countries but also regionally by groups of countries as well as by PAHO and other international agencies. By identifying the determining factors affecting the data production process, the problems and needs of countries are defined at different points in time and stages of the process. Upon determining the factors a list of solutions and best practices implemented in a given country or in a group of countries can also be developed. This information contributes to the development of a regional HIS strengthening plan, with the objective of disseminating and sharing problems as well as solutions in order to avoid duplication of efforts in terms of human, material, and financial resources and enables better use of these resources.

2.1.3 Levels of Intervention for HIS Strengthening

An HIS strengthening plan should focus on the following levels of intervention: First level of intervention is within a country, defining the country component of the Regional Plan; second level is in a group of countries, defining the group of countries component; third level is in the regional organization, defining the corporative component; and finally, the component of multilateral agencies, that is, the global component of the regional plan (PEVS)[6] established by directive bodies of PAHO.

The country component points to identifying and addressing the resolution of specific problems identified in each country and is based on a particular assessment and work plan proposal developed by each country. It includes specific activities which, given their nature, cannot be shared with other countries in a common effort. In addition, solutions and best practices that are implemented in a given country emerge from this component and can be made available to the region as a whole.

The inter-country or group of countries component considers actions that are common to a group(s) of countries with common issues to resolve. Some examples of this type of activity are developing regional training efforts and designing harmonized software. Furthermore, solutions and best practices may exist that have been designed in a group or sub-regional context and that can also be useful at a regional level.

The corporative component channels the requirements of the PAHO units and teams that are in charge of data coverage and quality and informs countries about efforts to strengthen statistics that are being implemented by the teams and units of the organization at a country level. The problems and practices at an organization level will be integrated into the PEVS.

[6] http://www.paho.org/english/gov/cd/cd48-09-e.pdf and http://www.paho.org/english/gov/cd/cd48.r6-s.pdf. For more detailed information about the Strategy, see http://www.paho.org/english/gov/csp/csp27-fr-e.pdf.

Finally, the global component establishes the common needs of agencies, on one hand, and harmonization of relevant technical assistance projects and programs and financing agreed upon between international agencies involved in implementing actions relating to the topic in question at a country level, on the other hand.

2.1.4 PAHO Guidelines

Based on this conceptual foundation, the Health Information Analysis Team (DD/AIS)[7] initiated the process of developing a tool named *Guidelines for the Analysis of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas*[8] (hereafter, the guidelines) in 2004 to assess the status of these statistics based on the above-mentioned dimensions.

The contents of the guidelines are based on the experiences of international organizations, particularly the UN Statistics Division, PAHO, and other agencies such as UNFPA, UNICEF, and the World Bank; selected countries that have implemented vital and health statistics evaluation programs; international recommendations on this matter; and methodological documents on techniques to evaluate the coverage and quality of statistics.

The guidelines were discussed at meetings held in Cuernavaca (June 6–11, 2004), Tampa (August 3–6, 2004), and Buenos Aires (August 16–20, 2004). Furthermore, the guidelines were tested and validated in Paraguay (November 1–5, 2004) by PAHO representatives. The English version of the guidelines was reviewed in Trinidad and Tobago (August 22–27, 2005).

The guidelines address the data production situation from a qualitative perspective (through six questionnaires) and a quantitative perspective (two applications) that complement each other in assessing the status of each type of statistics.

Five of the questionnaires cover the characteristics of each stage of the information production process, with the aim of identifying the determining or invalidating factors of data quality through an analysis to be carried out later on. Identifying these factors enables countries to develop an assessment or complement an existing assessment and to focus strengthening actions on those parts of the information production sequence upon which these factors have an impact. A sixth questionnaire (named Scale) is oriented toward health information users, who express their opinions about the particular status of vital statistics in the country.

The two applications, which include 13 exercises geared toward identifying coverage levels and the quality of health statistics, were developed for time series analysis and for the second administrative geographical level in each country. The standardized guidelines resulted in information that can be used to avoid needlessly costly and unproductive efforts when individual countries and regional or sub-regional groups

[7] Currently HSD/HA.

[8] For more detailed information, see PAHO (2005). Guidelines for the Analysis of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas. PAHO/WHO.

embark on HIS strengthening design and activities. The guidelines were used by countries through participation of the two organizations in charge of the production of most health statistics in each country (the central statistics office and the sectorial health office). This enabled developing a data base and preparing a preliminary assessment[9] which made it possible to classify countries into three groups[10] according to selected coverage and quality indicators' results. The three groups are group 1: HIS in Better Condition, Group 2: HIS in Intermediate Condition, and Group 3: Significant Information Problems.

The above-mentioned assessment was presented at the Meeting of Directors-2005[11] (RD-2005) held in Buenos Aires in November 2005. In addition, group work was carried out at the meeting based on relevant materials to guide discussions. The primary recommendation made as a result of this effort was the need to design a regional HIS strengthening plan to facilitate developing national assessments and preparing a plan of future follow-up actions to the HIS strengthening plan. This constituted the basis for the resolutions to be considered and approved by PAHO directive bodies.

2.2 THE HMN APPROACH TO HIS STRENGTHENING

The HMN framework provides a useful outline for looking at health systems as well as describing fundamental requirements of health information systems and has led the way in strengthening country HIS and promoting country ownership of their HIS. The HMN Framework and Standards of a Country Health Information System (the HMN Conceptual Framework[12]) is divided into three parts:

1. **rationale, approaches, and vision**—a new approach to health information systems strengthening is described and specific solutions proposed to the problems identified;
2. **components and standards of a HIS** as described in the left hand column of Figure 4; and
3. **HIS strengthening**—principles, processes, and tools which are the guiding principles for HIS development and implementation.

On the right hand side of Figure 4 as part of the "Processes" of HIS strengthening, the three implementation phases that are always accompanied by continuous evaluation and improvement are identified.

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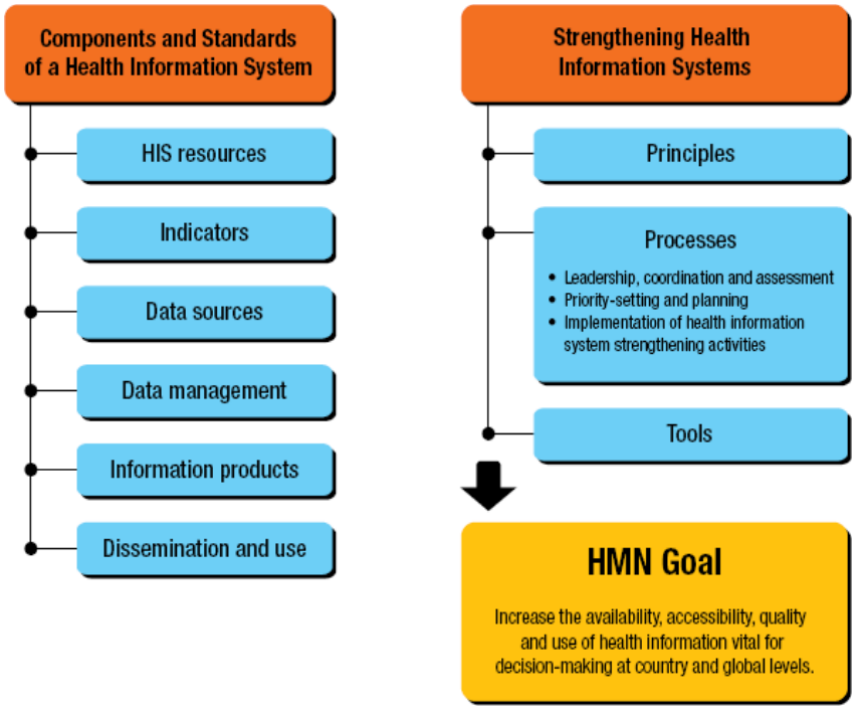
[9] For more detailed information see PAHO (2007). Síntesis de las estadísticas vitales, de morbilidad y de recursos y servicios en salud de los países de las Américas. Summary of the Regional Report.PAHO/WHO. November 2007.

[10] Group 1, HIS in better conditions, included Argentina, Chile, Costa Rica, Cuba, United States, and Uruguay; Group 2, HIS in intermediate conditions, included Brazil, Colombia, Ecuador, Mexico, Panama, and Venezuela; and Group 3, Significant information problems, included Bolivia, the Dominican Republic, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, and Peru. Given that the information from the English-speaking Caribbean countries was received later on, and since they share a common language, these countries were temporarily included in Group 4 until the information was analyzed. United States and Canada were also included in this group, even though the US had been included in Group 1. Haiti, a country that participated at the meeting as well, is considered in an individual manner given the complex situation of its statistical information.

[11] For more detailed information see PAHO (2005). Reunión de Directores Nacional de Estadística y Directores de Estadística de Salud de los países de las Américas (RD-2005). Final Report. Buenos Aires, November 21–22, 2005.

[12] For more detailed information see WHO (2008). Framework and Standards for Country Health Information Systems. Second Edition. June 2008.

Figure 4 The HMN Framework



Source: HMN Framework, 2008.

The HMN approach involves improving the quality, availability, and use of health information and includes a comprehensive assessment of the HIS to measure quality but also, to measure evidence of use of information. Improving the HIS involves interventions relating to factors which determine its performance and have an impact on information use activities. These factors include technical factors as well as data collection instruments and processes, information technologies and data analysis, environmental, organizational, and behavioral factors such as motivation, perceptions regarding the HIS, competencies, and organizational culture. Furthermore, the framework facilitates a unifying approach that involves multiple institutions including producers and users of health data such as ministries of health, data generating entities, and the private sector as well as international donor agencies, to jointly address the complex processes of reforming HIS.

2.2.1 Components and Standards of a Health Information System

The HMN approach analyzes six components of the HIS and how these components interact with each other to produce better information. They can be divided into three groups: inputs, including HIS resources; processes, including data management, how data sources are used, and how indicators are selected; and outputs, including information products, dissemination and use.

Inputs include those HIS resources that must be in place for the HIS to function properly such as:

» **information policies**—existing legislative and regulatory framework for public and private providers, use of standards;

- **financial resources**—investment in the processes for the production of health information (e.g., collection of data, collation, analysis, dissemination, and use);
- **human resources**—adequately trained personnel at different levels of government;
- **communication infrastructure**—infrastructure and policies for transfer and management or storage of information;
- **coordination and leadership**—mechanisms to effectively lead the HIS and use the data generated by the system; and
- **utilization across the health system**—all sectors of the health system should collect and report consistent minimum data standards.

Processes involve how data sources are used and how indicators are selected. A well-functioning HIS should be able to provide a minimum set of health indicators and these should be defined by the users of information at different levels in the consensus building process. The following aspects are analyzed: population data collection sources (vital events, civil registration, censuses, and surveys), institutional data sources (from administrative and operative actions such as service provision), research needs, data management guidelines, including data entry, processing, quality control, and even data destruction and aspects of accessibility and confidentiality.

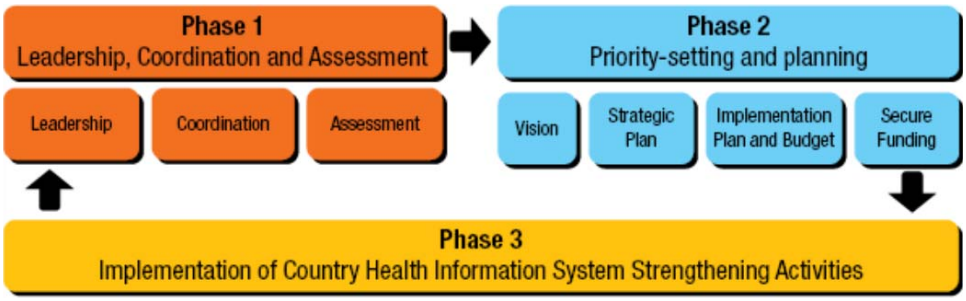
Outputs concern the products of the processes—the information produced by the system. However it does not stop with reviewing the information produced, it also includes the level of dissemination and use of the information. The measurement of the quality of information and the level of information dissemination and use are indispensible for a culture of information.

2.2.3 Strengthening Health Information Systems

Every country should draft and implement a national strategic plan for HIS. The plan should outline goals for streamlining and improving existing reporting mechanisms, roles and responsibilities of stakeholders, funding for HIS strengthening, including maintenance strengthening of the current HIS system, and improving integration of data at national and sub-national levels.

Finally, the guiding principles for the establishment/strengthening of a HIS are described and specific actions for the HIS strengthening process are proposed. The guiding principles that each country should comply with are: leadership and ownership in meeting national needs and demands based on existing efforts and systems; wide consensus and involvement of stakeholders; and development of a gradual and incremental process with a long-term vision. The characteristics of the HIS strengthening processes depend upon the context in each country. The process should include coordination, establishment of objectives, a situational assessment, implementation, follow-up, and dissemination actions to ensure that the plan is comprehensive (Figure 5).

Figure 5 Phases of the HIS Strengthening Process



Source: HMN Framework, 2008.

During Phase 1, the specific results of HIS strengthening efforts depend to a great extent on the personal commitment and involvement of individual actors, particularly high-level decision-makers such as country Ministers or Directors. This is referred to as leadership and ownership.

A comprehensive coordination mechanism should be established at the beginning of the process in order to maintain links with relevant ministries, research institutions, NGOs, technical support organizations, and donors. This should be a specific institution in charge of using the basic guidelines to implement the HMN framework and develop and monitor a national plan.

This phase includes carrying out an HIS assessment through the use of the assessment and monitoring tool. Results from the assessment can then be used as a baseline for the development of a strategic plan that is continually monitored.

Phase 2 begins immediately after the initial assessment. During this phase, priorities are set and a strategic plan is developed and translated into specific actions which can be monitored over time. This plan should consider the securing of financial and human resources required to be able to implement the strengthening process as well as determining the commitment of relevant actors involved in implementing the plan.

Phase 3 involves the actual implementation of interventions oriented toward strengthening the HIS. This phase includes a review of the capacity and resources of the system, implementation of activities, and ongoing evaluation and reprogramming, which enables measuring advances and documenting experiences.

2.2.4 The HIS Assessment and Monitoring Tool

As mentioned, the Assessment Tool developed by HMN is called *Health Information System Assessment and Monitoring Tool*[13]. It is implemented through interviews and focal discussion groups involving various actors in the HIS. The activity has an average duration of three hours. Interviewees are asked to assign a numerical score to the level of progress of the HIS for each analyzed category. The assessment tool considers the following dimensions:

[13] For more detailed information see HMN (S/F). HMN Tool.

» Health information context and resources includes the context in terms of current policy, legislation, regulations, and finances as well as the required infrastructure and resources, including human resources, technology, and coordination mechanisms.
» Identifying basic health indicators involves establishing basic health indicators under key categories to be monitored: determining factors of health, contributions and results of the health system, and health status.
» Data sources and data collection methods refer to key data sources, their role in generating health information, and potential links. Sub-systems include censuses, vital events, health facility statistics, public health surveillance, population surveys, and follow-up on resources such as health infrastructure and human resources.
» Information management processes involve optimum processes for data collection, sharing, and storage, data flows, and information loops.
» Data availability and quality refers to criteria to evaluate the quality of data and their transformation into information and knowledge to be used for health system and health information system management.
» Use and dissemination of data involves the value of health information insofar as the information is available and accessible to decision makers, and insofar as attention is paid to the organizational and behavioral aspects that restrict use of this information.

The assessment tool includes 244 items in its Spanish version 2.0 (subsequent versions include a few minor changes) under the following dimensions: resources (23 questions); indicators (5 questions); data sources (83 questions); data management (5 questions); information products (108 questions); dissemination and use of information (20 questions).

The different items are formulated as statements of the desired situations addressed by the dimension. Guided by a facilitator, each participant assigns a score to each question in a Microsoft Excel spreadsheet. The scores may be assigned by individual informants or groups. The spreadsheet version of the assessment tool includes spaces to record scores from up to 14 informants. The total score is the average of the scores for all answers.

The different answers are scored through numerical values (4–0), and then an index is developed which summarizes the situation of the category being evaluated. Values equal the following:
4 = highly adequate
3 = adequate
2 = somewhat adequate
1 = present, but not adequate
0 = inadequate

Indexes are calculated by comparing the scores obtained with the maximum score for each category. Results are expressed in quintiles which, in turn, are expressed through colors.

1st Quintile (< 20%)	Inadequate
2nd Quintile (20–40%)	Present but Not Adequate
3rd Quintile (40–60%)	Somewhat Adequate
4th Quintile (60–80%)	Adequate
5th Quintile (> 80%)	Highly Adequate

In addition to the score, comments or explanations of a dimension may be provided that can be analyzed when the results are being consolidated.

The population to be interviewed includes national and sub-national level information users and producers from leading health information generating institutions, such as the ministry of health, social security, institute of statistics, and public and private health service providers. The HMN recommends including national, regional, and local public policy-makers; staff from management and administration levels of institutions in charge of or li nked to the HIS; external users of health information (such as sectors with related activities: heads of social programs, universities, regional-level civil society, etc.); internal users of health information for management (planners, managers, heads of human resource departments, etc); internal users of health information for health service provision; HIS operating staff at a regional level (directors, experts, and statistics and epidemiology staff); and staff from the vital event register (directors, experts).

The group of stakeholders interested in strengthening the HIS should establish a committee to supervise, guide, and coordinate the HIS assessment and subsequent strengthening efforts in an ongoing manner, including planning and implementation of the evaluation. Not all stakeholders need to actively participate in the committee, but it is recommended that authorities from the health ministry lead this committee.

The survey is conducted in a participatory manner similar to that which is used in qualitative research through focal groups. Given the length of the tool, several working groups need to be established and each group should include a facilitator. Facilitators and, to the extent possible, participants should be familiarized with the survey in advance. Workshops should be held throughout the assessment process to reach consensus among key stakeholders and establish leadership of actors, in accordance with the following three phases: beginning of the assessment project; use of the tool; and the moment when information is shared and existing weaknesses are discussed to establish the direction of the planning process in agreement with involved actors.

The spreadsheet facilitates data entry, establishing indicators, and data analysis through descriptive statistics, indicators, tables, charts, and graphs.

Results are analyzed by all participants in a plenary session, which should include those participants who were not able to participate in the sub-groups, with the aim of improving the opportunity to make comments and reach consensus on how each component is evaluated.

Phase 1 is completed with the development of a report that systematizes the process of convening and holding meetings. The report describes the organizational aspects and technical processes of the categories addressed by the tool. Final scores are analyzed and participants' comments are discussed. The report seeks to summarize the aspects identified as problems and needs and HIS development opportunities that participants established during the work sessions. These contributions will help identify the next steps and bridge the gap between evaluation and strategic planning. It is considered important to submit the reports to relevant institutions, civil society, and the general public, with the aim of raising awareness about the importance of strengthening the HIS.

In 2009, HMN developed a checklist[14] standardizing the sections of the evaluation reports. The checklist establishes the following sections to be included in assessment reports: context or background, methodology, results from applying the tool, discussing key results, recommendations on next steps, and an evaluation of the findings. Some countries have used these standards in their reports: Belize, Nicaragua, and El Salvador.

The funding required for the implementation of Phase 1 was approximately U.S. $50,000 for each country. The activities that generated costs included hiring a consultant; technical planning meetings; training workshops for facilitators; inputs for coordination; implementation of the HMN assessment; technical meetings to systematize results; submitting results; and developing a strategic plan, in some cases. Strategic plans should include an activity schedule and budget, to be used as the basis for mobilizing resources for implementation.

The HMN framework and the assessment tool have been through various versions. As a result, HMN has incorporated contributions from the work carried out in different countries (Table 2). Mexico was the first country in the Americas region that used version 1.0. After translating it from English to Spanish, adjusting it to Latin American Spanish, and implementing it, Mexico provided feedback to the HMN team and helped develop version 1.65 and subsequently, version 2.0.[15]

[14] For more information see WHO (2009).Health Metrics Network Technical Support Partnership. Assessment Report Checklist. Version 3. Lista de verificación de informes de evaluación. In Spanish. March 2009.

[15] Version 4.0 is currently available but has not been translated into Spanish.

Table 2 Implementation of the HMN Conceptual Framework and Financing in Countries

Country	Conceptual Framework	Year	Financed by
1. Belize	HMN V. 2.0	2008	HMN
2. Costa Rica	HMN V. 2.0	2009	MHI
3. Ecuador	HMN V. 2.0	2010	PAHO/USAID
4. Honduras	HMN V. 1.65	2006	PAHO/USAID
5. Mexico	HMN V.1.0	2005-2006	HMN and PAHO/USAID
6. Nicaragua	HMN V. 2.0	2007	HMN
7. Panama	HMN V. 1.65	2006	HMN
8. Paraguay	HMN V. 1.65	2006–2007	PAHO/USAID
9. Peru	HMN V. 2.0	2008–2009	Health Policy Initiatives/ PAHO/USAID
10. Dominican Republic	HMN V. 2.0	2008–2009	PAHO/USAID
11. El Salvador	HMN V. 2.0	2008	HMN

Source: Assessment Report from each country in the region.

Each country, when using the tool, made adjustments to the tool according to the characteristics of each HIS and the terms commonly used in each country. Panama used version 1.65 in 2006, being the only country in the region that received the first round of financing from the HMN. This country played a central role in disseminating the tool to other countries in the region. In late 2006, Honduras and Paraguay received financing through the PAHO/MEASURE Evaluation regional initiative project to carry out their HIS assessments.

In 2007, Nicaragua used version 2.0 financed by the HMN (second round). Belize and El Salvador, also financed by the HMN, used the same version in 2008. In 2008, PAHO and MEASURE Evaluation initiated the process in the Dominican Republic and Peru. Guatemala received financing from the HMN in 2009 to carry out their assessments; Costa Rica with financing from the Mesoamerican Health Initiative (MHI) completed its assessment in 2010. Ecuador, with financial support from PAHO and MEASURE Evaluation began the assessment process in late 2009 and completed it in September 2010.

In the above-mentioned countries, the process was led and executed by a national technical team, with the ministry of health as the main leader. PAHO and MEASURE Evaluation provided financial support for hiring regional consultants with prior knowledge and experience in applying the tools and carrying out assessments in other countries. The south to south technical collaboration helped in adjusting the tools to reflect the reality of each country. In each country training personnel to use the tools and facilitate carrying out subsequent assessments was made a priority.

The sample size varies among countries; therefore it is not possible to compare information from different countries. Participants were selected by institution or geographic area. Some countries, such as Panama, used the criterion of selecting essential actors from key institutions that generate health information. In Mexico, Costa Rica, and Paraguay, participation of institutions providing health services was prioritized. Peru, Belize, and Paraguay, decided to involve different actors according to their role or level of education, decision makers, operators, or users. Other selection criteria used are selection between the public and private sector; different territorial levels (national, regional, or local); or urban and rural areas. As for the number of participants, a specific number cannot be established for each country since this depended on the profile of potential participants and the characteristics of each country.[16]

Other differences between countries are the manner in which a value is assigned to items included in the tool. In some countries (Mexico and Costa Rica) the final value was agreed upon through consensus and others (Honduras and Paraguay) calculated averages from individual answers. Countries such as Peru and Paraguay collected comments and others such as Nicaragua did not.[17]

2.3 THE PRISM APPROACH

2.3.1 PRISM Conceptual Framework

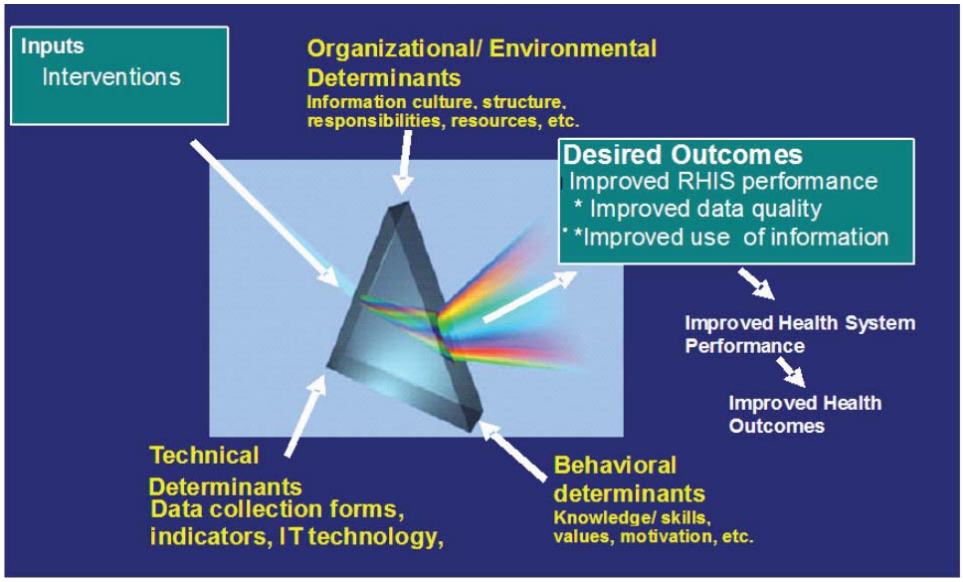
The PRISM Conceptual Framework[18] is an innovative approach for analyzing routine health information systems (RHIS) by paying special attention to the organizational, technical and behavioral determinants and processes that influence RHIS performance. The framework analyzes the role of each of these determinants and identifies appropriate interventions to address the determinants that negatively influence RHIS performance (Figure 6).

[16] Annex 1, Table 1 shows detailed information about HIS Assessment participants by country.

[17] For more information on implementation and methodological variations in applying the HMN Tool in each country, see Annex 1, Table 1.

[18] For more information see USAID–MEASURE Evaluation (2009). PRISM User's Manual, June 2009.

Figure 6 **PRISM Framework, Dynamics of the Determining Factors and their Impact on HIS Production Processes**



Source: PRISM Conceptual Framework, 2005.

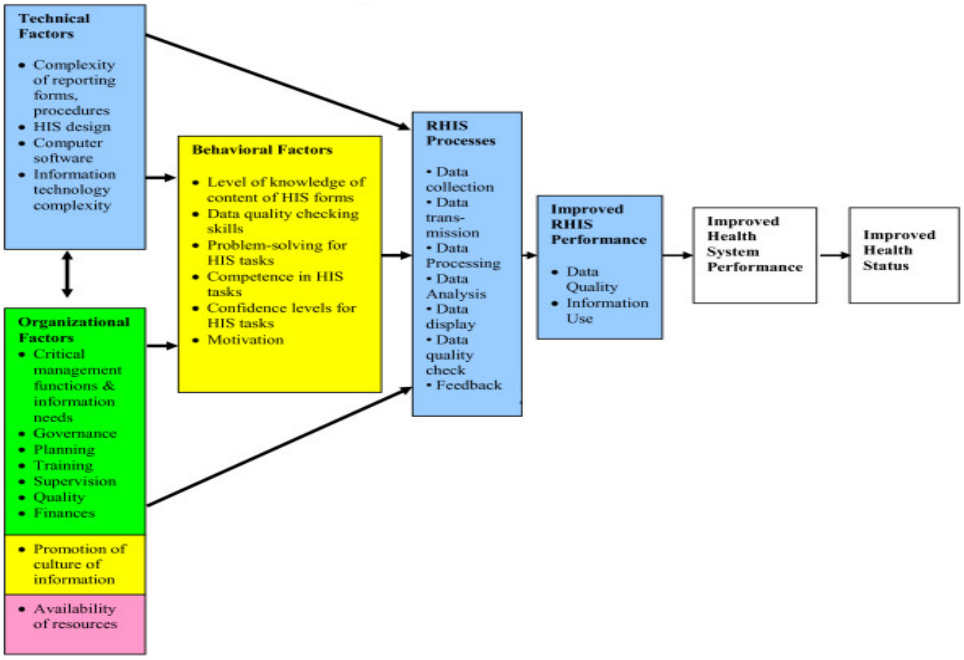
Historically HIS assessment has concerned the technical determinants. The PRISM Framework introduces the concept of two additional groups of determining factors, organizational/environmental and behavioral. These three groups of determining factors include:

1. **technical determining factors**—design, technology, methodologies, procedures, tools, and instruments of the system;
2. **organizational/environmental determining factors**—structure, roles, functions, and responsibilities, as well as the culture of information of key actors and users at each level of the health system; and
3. **behavioral determining factors**—knowledge, skills, attitudes, values, and motivation of the individuals that collect and use data.

Within this context, the objective of the framework is to identify these determining factors with the aim of improving the performance of the RHIS and thus, increase data quality (precision, veracity, comprehensiveness, and timeliness) and promote the use of information in decision-making.

The quality of the information generated through the RHIS and its use in decision-making is analyzed for all administrative levels of the health system in connection with the determining factors. Figure 7 shows the impact of the determining factors on the quality of data produced through the RHIS.

Figure 7 PRISM Conceptual Framework



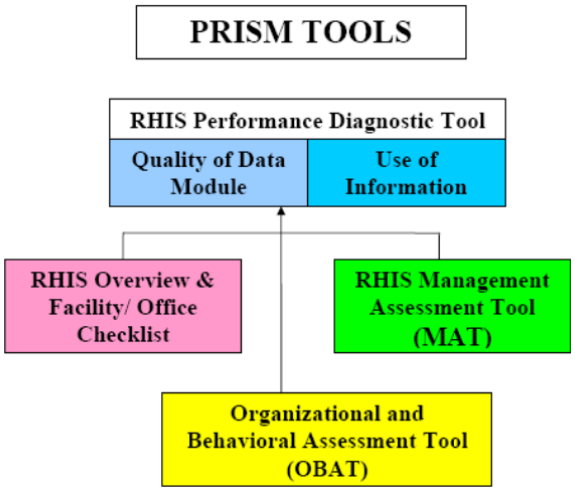
2.3.2 The PRISM Tool

The PRISM framework underlies a set of four assessment tools that have been designed to measure RHIS performance, processes and determinants and their inter-relationships as described in the PRISM framework. The PRISM tools[19] consist of the following:

» the RHIS performance diagnostic tool specifically looking at: 1) quality of data and 2) use of information
» the RHIS overview and facility/office checklist, which includes a comprehensive list of the RHIS and a comprehensive facility checklist
» the Management Assessment Tool (MAT)
» the Organizational and Behavioral Assessment Tool (OBAT).

[19] For more information see USAID–MEASURE Evaluation (2008). PRISM: Performance of Routine Information System Management. PRISM Tools for Assessing, Monitoring, and Evaluating RHIS Performance. 2008 Version.

Figure 8 PRISM: RHIS Performance Diagnostic Tools



Source: PRISM Conceptual Framework, 2005.

RHIS Performance Diagnostic Tool (Quality and Use)

The quality of data is described in more detail in four dimensions: relevance, completeness, timeliness, and accuracy (Lippeveld, 2000). Relevance is assessed by comparing data collected against management information needs. Completeness is measured not only as filling in all data elements in the facility report form, but also as the proportion of facilities reporting in an administrative area (e.g., province or district). Timeliness is assessed as submission of the reports by an accepted deadline. Accuracy is measured by comparing data between facility records and reports, and between facility reports and administrative area databases, respectively. The purpose of this tool is to determine the current performance level of the RHIS. In addition, the tool is used for ongoing monitoring of the performance of the RHIS. The use of information depends on the decision-making power of individuals and the importance of other considerations, regardless of the availability of information (Sauerborn, 2000; Grindle and Thomas, 1991).

However, if the use of information is not assessed it is difficult to know if a given RHIS is achieving its established objectives; in addition, it is difficult to improve evidence-based decision making and, therefore, improve the performance of the health system (MEASURE Evaluation, 2005; HISP, 2005). The PRISM framework defines use of information through criteria such as the use of information to identify problems, to consider or decide among various alternatives, and for building support for HIS and health system issues. Based on this definition, a diagnostic tool was developed to measure the performance of RHIS.

RHIS Overview and Facility/Office Checklist

A comprehensive list of the RHIS provides a profile of the system; helps understand the structure of existing information systems, information flows, and interactions between different information systems. This tool is used at a national and regional level to make an inventory of all the existing RHIS in the country or region. It enables understanding the types of health sector information that are included

in information systems and identifying duplicities and omissions in the system. The facility checklist is used to learn about the available resources and the status of the information system in the RHIS units and offices. It helps document the situation regarding requirements for operating the RHIS. Information is collected in health facilities and administrative offices about the availability and conditions of: equipment; basic services; information register; information technology and communications (ITC); quantity and quality of supplies (printed forms, paper and pencils, etc.); existing regulations for system operations; time allocated for report writing.

Management Assessment Tool (MAT)

The MAT combines the knowledge and experiences of key stakeholders relating to RHIS management practices. This tool measures the level of maturity of the RHIS management structure, identifying the areas that need to be improved. The practices measured relate to different functions such as governance, planning, training, supervision, finance, and use of performance improvement tools.

Organizational and Behavioral Assessment Tool (OBAT)

The OBAT provides information about behavioral and organizational factors that affect the performance of RHIS. Behavioral factors include knowledge, skills, problem-solving skills, level of confidence, and motivation to carry out actions related to the RHIS. The organizational component refers to perceptions regarding the question if an organization is promoting a culture of information. Comparing these factors against the performance of the RHIS enables identifying the gaps or deficiencies that need to be overcome.

The PRISM tools may be applied in any health sector institution or other types of organizations, such as ministries of health, health districts, NGOs, private sector organizations, education sector organizations, etc. It is recommended to include the following persons from health facilities: staff from primary health care and referral levels, facility managers, and at least one additional staff member involved in data collection. At a district level: district health official and at least one supervisor, and an HIS focal person. At a central level: at least three relevant staff members. In addition, a sample of staff members should be included from the regional level or provinces, if these levels exist between the district and central levels.

To conduct the surveys, a strategic team including relevant actors and a technical team including supervisors and interviewers are established. The technical team is in charge of adjusting the tools to meet the needs of the country, developing a list of health facilities, generating the sample, and training interviewers.

The tools include the use of interviews, register reviews, observation, and written evidence. Applying the complete set of tools at each health facility takes approximately 90 to 120 minutes.

The sample is established from the list of existing health facilities (hospitals, health centers, etc.) in the country, state, or department; the list should include information on the level of each institution. All federal, state, or department health directorates

are included, as well as all highly complex hospitals, since few facilities of this type exist and therefore, can be covered. In addition, health service records for the past few months are reviewed at the health facilities. For the survey sample selection of health centers and other facilities, either Lot Quality Assessment Sampling (LQAS)[20] (recommended in the standard methodology) or simple or stratified random sampling[21] is used; the latter has been used in several country assessments.

The selection of records from each health facility (hospital or health center) to be included in the sample is carried out as follows: daily ambulatory patient record forms for the past months are requested and the forms can then be classified into groups, according to the national and local relevance of the programs, such as ambulatory patient consultations, growth and development, family planning, antenatal care.

In regard to data processing, after implementing the PRISM questionnaires, each questionnaire receives an identifying code to enable linking of analyses later on. For the OBAT questionnaire, a different method should be used. A variety of programs can be used to record information. The tool designers have developed data entry programs in Microsoft Access and Microsoft Excel. Other countries have developed their own data entry programs in Microsoft Excel, Microsoft Access, or online. To analyze the information, indicators are established based on the data from each questionnaire:

» **RHIS Performance Diagnostic Tool**: This tool collects information on the quality of data and the use of information. The data quality indicators are for data accuracy, integrity, and timeliness (data collection, quality control, integrity process, data transmission). The use of information indicators measure the percentage of information use, data analysis, presentation, and feedback.

» **Information Systems Overview and Facility/Office Checklist**: This tool provides an overview of the RHIS and its resources. The indicators include information for RHIS mapping, data collection and transmission (includes tools and forms used) and an information flow chart. Resource data includes presence of or access to equipment, (computers, printers, telephones, etc.), utilities, registers and forms and staffing.

» **Management Assessment Tool**: This tool looks at the RHIS governance, supervision, training and performance functions. The MAT indicators measure the presence of policies, standards, regulations, organizational structure, performance improvement tools and reports, supervision tools, and financial plan and reports.

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[20] This is a type of sampling that is used in studies on quality. It is carried out by establishing homogeneous lots and estimating a success ratio. To do this, a ratio measure is calculated where "n" equals the required size of the sample of a N population, given an alpha error, a ratio, and an accuracy percentage. One of the advantages of this method is that it requires a smaller sample, thus reducing the costs and time required to carry out the study.

[21] Simple or stratified random sampling: In this method each unit is selected randomly. Random sampling considers the population, probabilities for success (P), and if this probability does not exist, (P=0.5) is assumed with a 95% confidence level for estimates.

» **Organizational and Behavioral Assessment Tool**: OBAT has 25 indicators for five analysis dimensions: promoting a culture of information; organizational factors; perceived self-efficacy; observed competence in carrying out HIS tasks; and competencies relating to the importance of HIS-related tasks.

At this point, results are presented as graphs (mainly as circular or spider graphs) and a report is prepared.

On average, the financing provided by the PAHO/MEASURE/USAID Project was about U.S. $50,000 for each country. In most countries, this also included implementation of the HMN tool. Activities that generated implementation costs include the following: hiring a consultant; technical planning meetings, training workshops for interviewers; hiring a group of interviewers, supervisors, facilitators, advisors; field work; logistics; digitalizing interviews; technical meetings to systematize results; submitting the results from the assessment.

In regard to the different versions that were used in the countries, Mexico was the first country in the region that used PRISM. Of the five questionnaires, OBAT version 1.0 and its manual were initially translated into Spanish, the questionnaire was adjusted to the language and cultural context of Mexico, and a pilot test was carried out which enabled improving the applicability of the questionnaire. Subsequently, Mexico translated the remaining four questionnaires into Spanish, adjusted the language, and conducted pilot tests in the state of Morelos within the framework of a training workshop on Improving Performance of RHIS Management that was held at the National Institute of Public Health (INSP) of Mexico in Cuernavaca, Morelos, September 4–15, 2006.

The workshop was financed by MEASURE Evaluation. Participants from 13 Latin American countries attended the workshop, with the aim of transferring this methodology to the other countries. The workshop led to the development of OBAT version 2.0. Paraguay was the first country to implement all PRISM tools, followed by the Dominican Republic, Peru and Ecuador. Furthermore, the tools have been widely adjusted to the language and culture in all four countries.

The members of the technical teams of Mexico, Brazil, Honduras, and Paraguay held a meeting in Brazil in 2006,[22] with the purpose of exchanging information and discussing and disseminating successful experiences, key processes, and lessons learned relating to the RHIS of Brazil and Mexico. In 2010, the tools were shared at the 4th Routine Health Information Network (RHINO) International Workshop on Measurement and Evaluation of Health Information Systems.[23] The importance of using PRISM at an international level was addressed, and relevant recommendations and comments were made which led to the development of PRISM version 3.1.

[22] A workshop named "Intercambio y difusión de las experiencias de los Sistemas de Información en Salud de Brasil y Mexico", June 27–28, 2006. Río de Janeiro.

[23] Organized by RHINO, MEASURE Evaluation, USAID, INSP of Mexico, and the Health Secretariat of Guanajuato. Carried out in Guanajuato, Mexico, March 8–12.

2.3.3 Country Experiences

Mexico applied the OBAT in 2005–2006 and Honduras in 2006. Paraguay applied all the PRISM tools in 2006, followed by Peru and the Dominican Republic in 2008–2009. In 2009, Costa Rica applied OBAT[24] with financing from the Mesoamerican Health Initiative, and Ecuador applied the tools in 2009 and 2010 (Table 3) financed by PAHO and MEASURE Evaluation.

Table 3 Use of PRISM Tools

Country	Tool	Year	Financed by
1. Costa Rica	OBAT V. 2.0	2009	MHI
2. Ecuador	PRISM V. 2.0	2010	HA/MEASURE/USAID
3. Honduras	OBAT V. 2.0	2006	HA/MEASURE/USAID
4. Mexico	OBAT V. 1.0	2005–2006	HA/MEASURE/USAID
5. Paraguay	PRISM V. 2.0	2006–2007	HA/MEASURE/USAID
6. Peru	PRISM V. 2.0	2008–2009	MEASURE/USAID Regional Governments
7. Dominican Republic	PRISM V. 2.0	2008– 2009	HA/MEASURE/USAID

Source: Country Assessment Reports.

In regard to fieldwork, most countries established a coordinating team for the strategic and operative work relating to the interviews. The team reviewed questionnaires and adjusted them to the context in each country, developed the list of health facilities, established the sample, and convened and trained a team of interviewers.

The PRISM tools were applied at health facilities, prioritizing the type of health service provider, geographic level (national or sub-national), and health service provision level (basic, intermediate, or highly specialized). Key health service providers in each country included public services, social security systems, military and police health, private service providers, and other service providers that exist in smaller numbers in each country.

The sample that was used in each country included different health service providers in each health care level, from primary levels to hospitals or specialized institutions. In addition, administrative institutions and central offices were assessed in some countries. Lot sampling was used in Ecuador, while the other countries (Paraguay, Peru, and the Dominican Republic) used two-stage random sampling.

In regard to data recording and analysis, different systems were used. Mexico used Access and the majority of countries used Microsoft Excel. In addition, Mexico and Peru developed systems through web pages that enabled validating information and reducing errors in data entry. Subsequently, databases were analyzed through

[24] For more information see Ministry of Health of Costa Rica (2009). Diagnóstico del Sistema de Información de Salud. Draft. Costa Rica. September 2009.

statistics software, and circular graphs were developed in Microsoft Excel for the final presentation of the collected information. The differences in applying the tools in different countries are primarily related to the selection of institutions to be interviewed through each questionnaire and the geographic level of representation.[25]

2.4 ACHIEVEMENTS: CONTRIBUTIONS OF THE CONCEPTUAL FRAMEWORKS AND TOOLS

The integration of the above-mentioned conceptual frameworks and tools enabled countries to achieve the following:

- definition of the different stages of the HIS data production process, describing—for each level (local, intermediate, and central)—the processes, inputs, and products for each data source and thus, identifying data-related problems for each phase;
- identification of the determining factors for each problem and establishing the required interventions to minimize their impact;
- acquired knowledge of the performance of the HIS resources (technological and, essentially, human resources) with the aim of developing HIS strengthening plans; and
- generation of qualitative and quantitative information about processes, inputs, and results that support decisions and prioritizing of the national and regional strengthening strategy.

[25] For more information on implementation of the tools in each country, see Annex 1, Table 2; Variations in methodologies used by countries in applying PRISM.

Section 3 Country Situation Analysis: Key Results from Applying the Tools[26]

3.1 PAHO: UNDERSTANDING INPUTS, PROCESSES, AND RESULTS THAT DETERMINE THE QUALITY OF DATA

In 2007, PAHO published a regional report[27] on the status of vital, morbidity, and health resources and services statistics in the countries of the Americas. In addition, PAHO prepared national reports[28] for the following countries: Argentina, Bahamas, Barbados, Belize, Bolivia, Brasil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Vincent, Trinidad and Tobago, United States, Uruguay, Venezuela.[29] Given that the regional report contains abundant information on processes and results, a summary of the report is presented here. In Development Goals, this document highlights the data sources and factors that could affect their coverage and quality of information.

The countries of the Americas have shown significant heterogeneity in regard to health statistics. This is reflected in their differences in coverage and quality, with great disparities even within sub-national contexts. However, results from the assessment have also confirmed that wide experience and knowledge exist in the region which will enable countries to collaborate and share best practices.

Figure 9 clearly shows that nine of the 25 countries were in a relatively better situation (more than 90%) in terms of coverage of vital events (births and deaths) in the entire national territory. In contrast with this, eight additional countries reflected registration levels as low as 50% at a national level. This result shows that these countries were not only registering just one out of every two births or deaths but in addition, analyses of the levels and profiles of mortality and health risks and their determining factors were biased. The situation is further aggravated since it is known that this incomplete registration of vital events seems to especially affect the most vulnerable population groups—rural, marginalized urban, and indigenous populations, just to mention a few.

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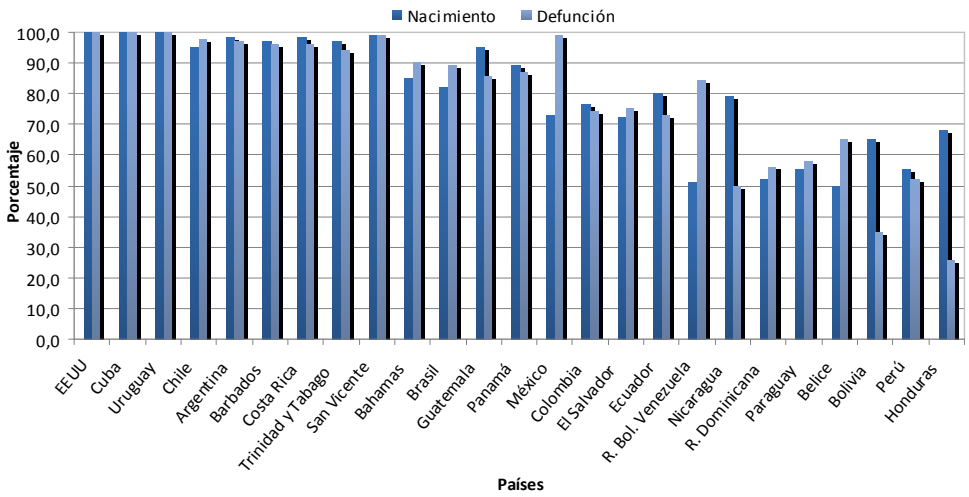
[26] This document maintains the format of the figures and graphs of the original reports. Therefore, differences can be observed in some cases.

[27] For more detailed information see PAHO (2007). PAHO/WHO. Status of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas Regional Report and Annexes. November 2007.

[28] For more information see PAHO (2007). Status of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas. Status of Vital and Health Statistics of the Country in 2005.Draft, subject to revision, November 2007.

[29] For more information see PAHO (2007). Status of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas. Status of Vital and Health Statistics of the Country in 2005 of the following countries: Argentina, Bahamas, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, United States, Guatemala, Honduras, México, Nicaragua, Panamá, Paraguay, Peru, Barbados, Belize, DominicanRepublic, Trinidad &Tobago, Uruguay, St. Vincent, Venezuela. For more information see PAHO (2007). Status of Vital, Morbidity, and Health Resources and Services Statistics in the Countries of the Americas.Status of Vital and Health Statistics of the Country in 2005.Bahamas. Draft, subject to revision, November 2007.

Figure 9 Coverage of Births and Deaths by Country in the Americas: Approximately 2005



Source: PAHO, based on information provided by the countries.

The countries that were able to assess coverage and information quality at the sub-national level observed significant differences within the national territory. These findings enable defining the areas that should be strengthened in a more specific and effective manner (at a geographic level, sectorial level, processes associated to health care, vital event registration, etc.), thus minimizing expenses relating to the human, technological, and financial resources required for implementation.

In fact, Figures 10–16 show significant differences in coverage of births and deaths in sub-national-level jurisdictions, regardless of the country in question.

Figure 10 Honduras: Births—Coverage According to Available Estimates, by Jurisdiction, 2002

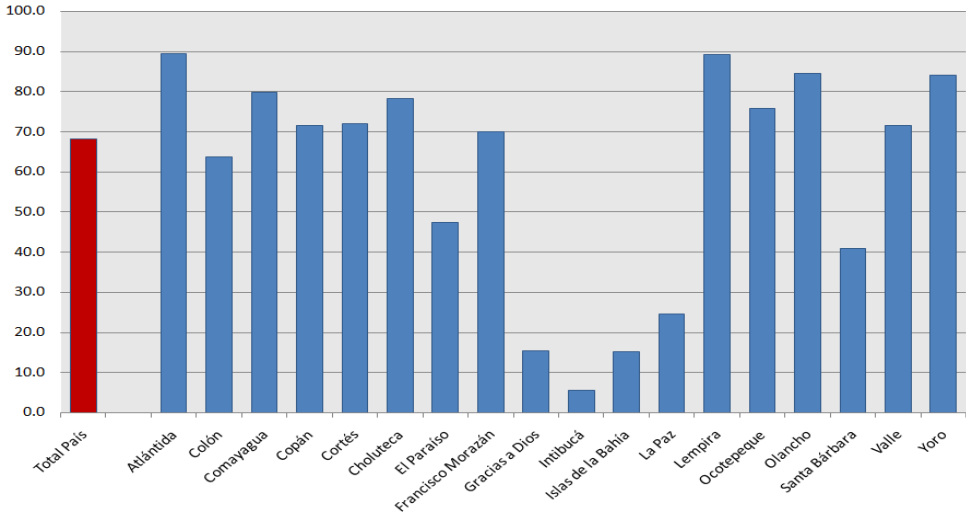
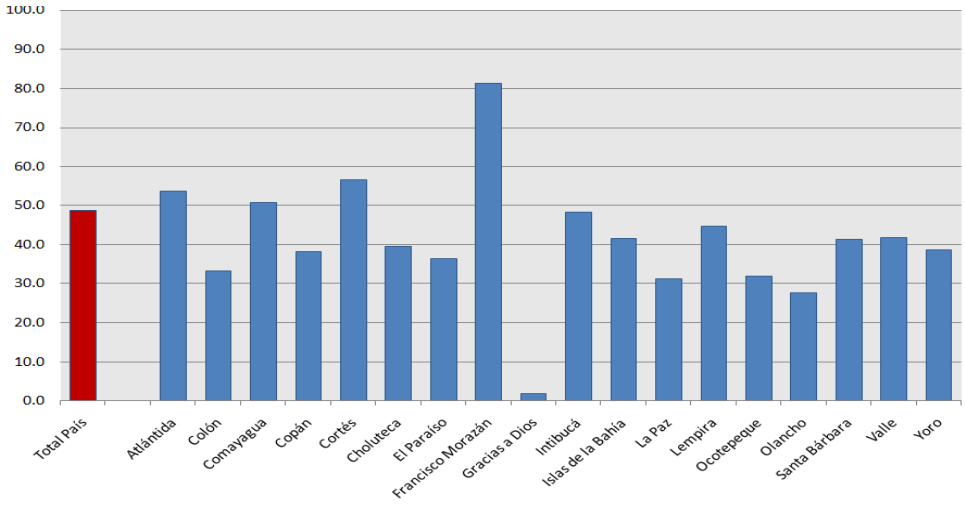


Figure 11 Honduras: Deaths—Coverage According to Available Estimates, by Jurisdiction, 2002



Source: PAHO, based on information provided by the countries.

Figure 12 Mexico: Births—Coverage According to Available Estimates, by Jurisdiction, 2003

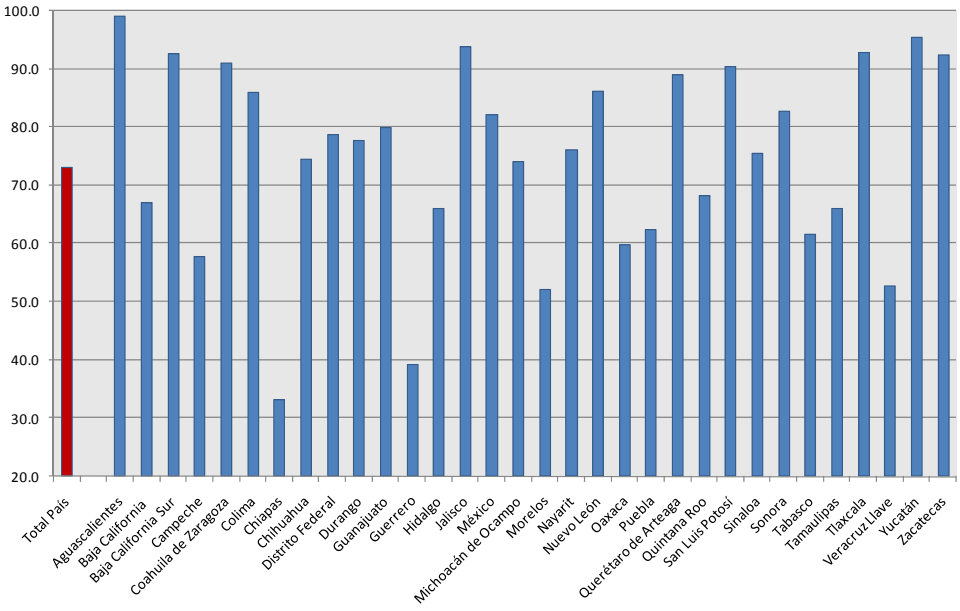
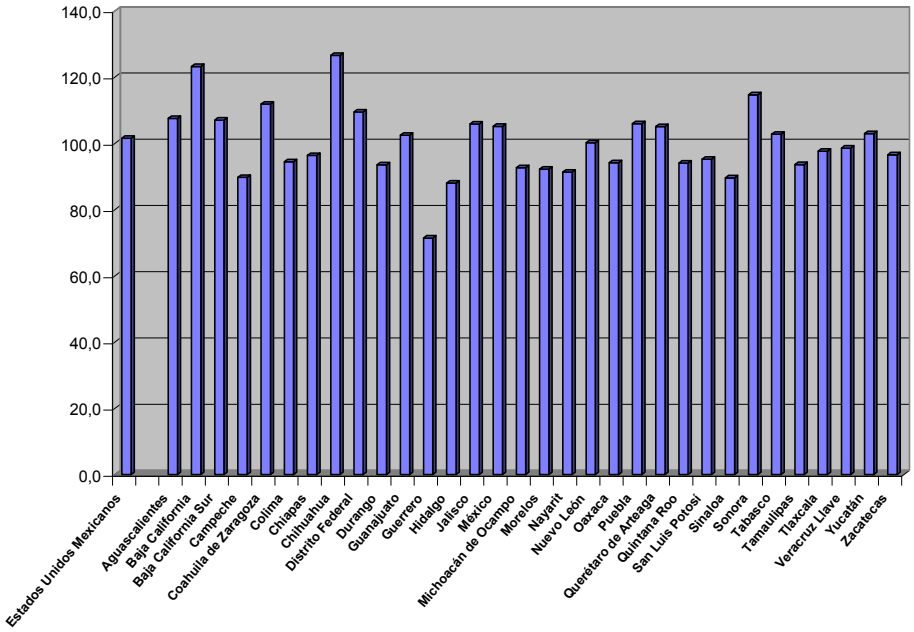


Figure 13 **Mexico: Deaths—Differences between the Ongoing System and Available Estimates, by Jurisdiction, 2005**



Source: PAHO, based on information provided by countries.

Figure 14 **Nicaragua: Deaths—Differences between Registers and Estimates, by Jurisdiction, 2003**

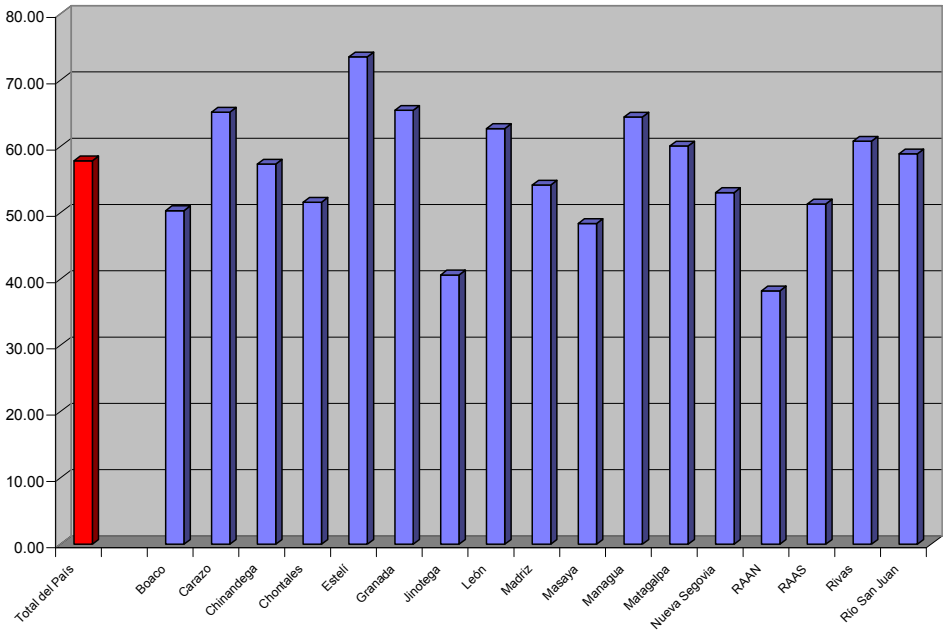


Figure 15 **Panama: Deaths—Coverage According to Available Estimates, by Jurisdiction, 2004**

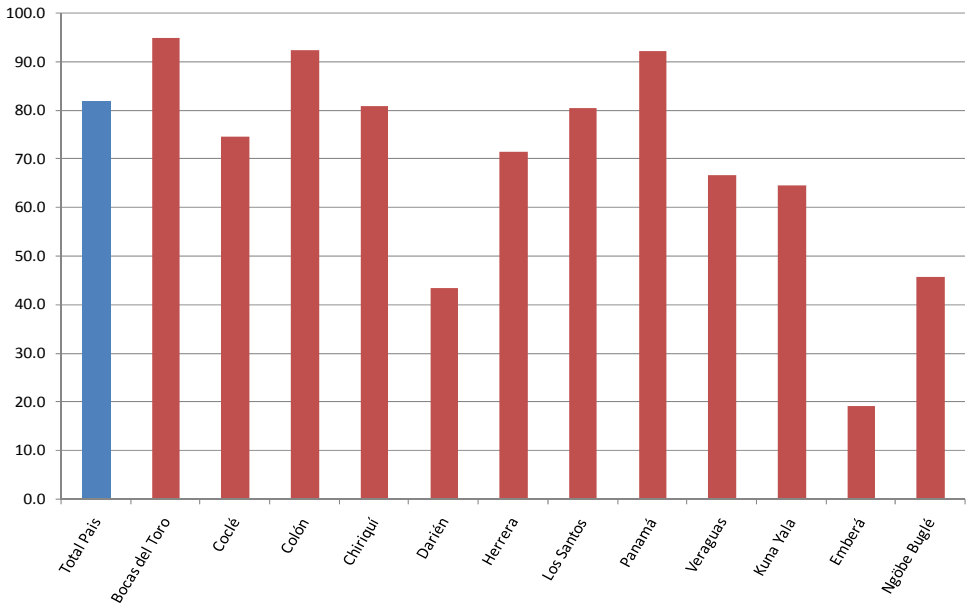
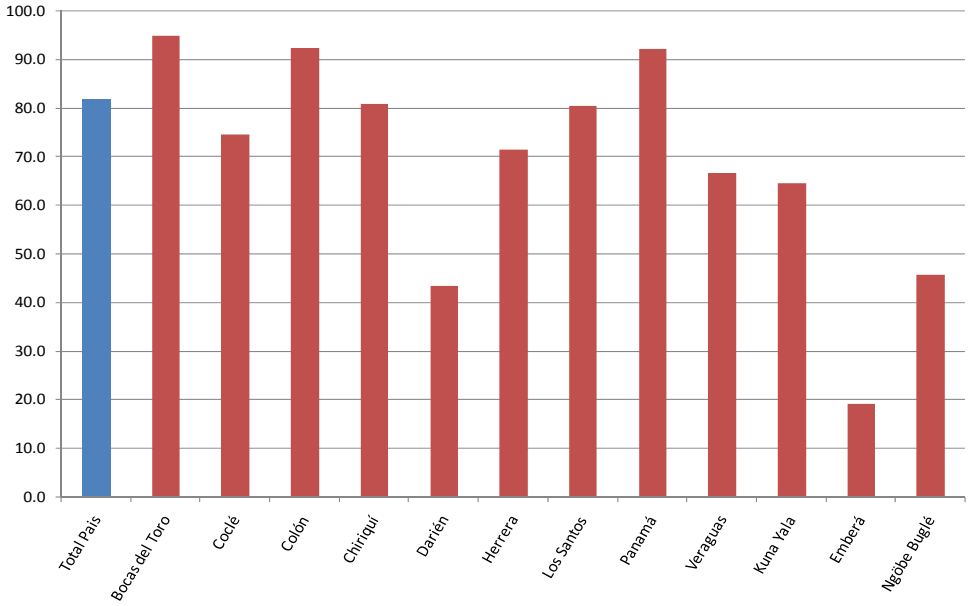


Figure 16 **Paraguay: Births and Deaths—Coverage According to Available Estimates, by Jurisdiction, approximately 2005**



Source: PAHO, based on information provided by countries.

Table 4 shows that information on the quality of vital statistics was available in very few countries. The assessment enabled identifying the future challenge for the region in promoting a culture of evaluating the generated information. In countries where information on the quality of vital statistics was available, the indicators with more significant problems were lack of information about the age of the mother (for children under 1 year of age) and the birth weight for children under 1 year of age. This lack of information has a negative impact on the assessment, development, and monitoring of health policies.

Table 4 Selected Vital Statistics Quality Indicators for Selected Countries in the Americas, Approximately 2005

Country	Only for children under 1 year of age		Ill-defined Causes (%)
	Age of the mother not specified (%)	Birth weight not specified appropriately (%)	
ARG	26.5	15.6	7.6
BAH	NA	> 90	< 5
BAR	NC	NC	NC
BEL	NC	NC	NC
BOL	NA	NA	NA
BRA	35.7	35.1	13.7
CHI	0.5	0.6	2.8
COL	21.63	22.53	1.75
CRI	4.5	22.8	0.7
CUB	0.3	0.2	0.8
ECU	NC	NC	NC
ELS	NC	NC	NC
EUA	<0.0	3.9	1.2
GUT	NC	NC	NC
HON	NC	NC	NC
MEX	NC	NC	2.1
NIC	NR	NR	3.6
PAN	28.6	32.4	1.9
PAR	37.7	34.7	21.4
PER	NC	NC	NC
RDO	32.0	26.9	15.0
SVC	NC	NC	NC
TRI	NC	NC	NC
URU	7.9	10.3	8.7
VEN	34.4	32.5	0.48

Note: NA: Not Available/Not Consolidated/Not Calculated. NC: Not Complete. NR: Not Recorded/Not Applied.

Source: Developed by the authors based on PAHO (2007).

Similarly as with the levels of coverage of statistics on births and deaths, differences exist within each country regarding vital statistics quality indicators (Figures 17–19).

Figure 17 **Mexico: Percentage of Ill-Defined Causes of Death, by Jurisdiction, 2003**

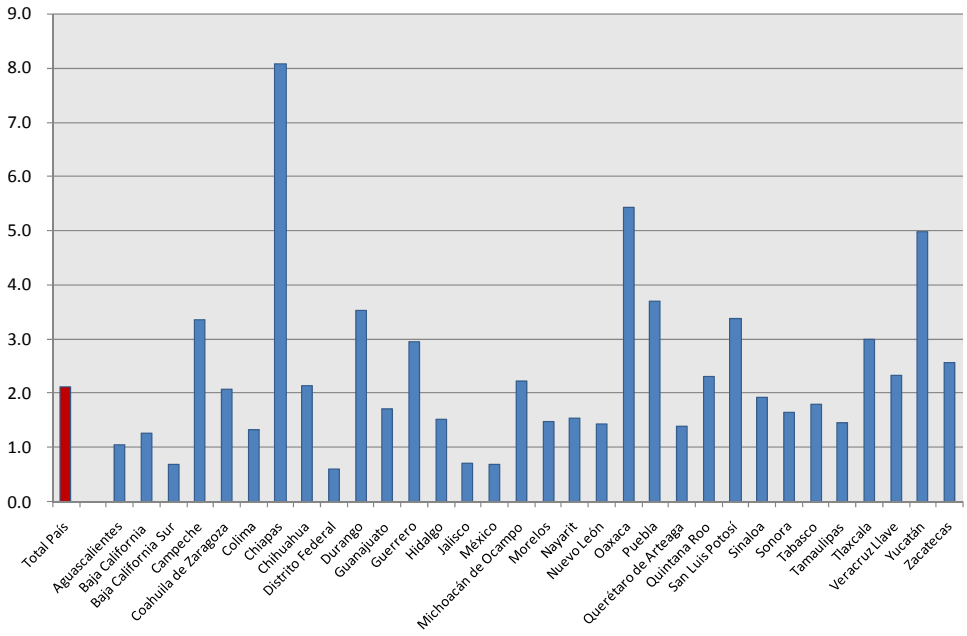
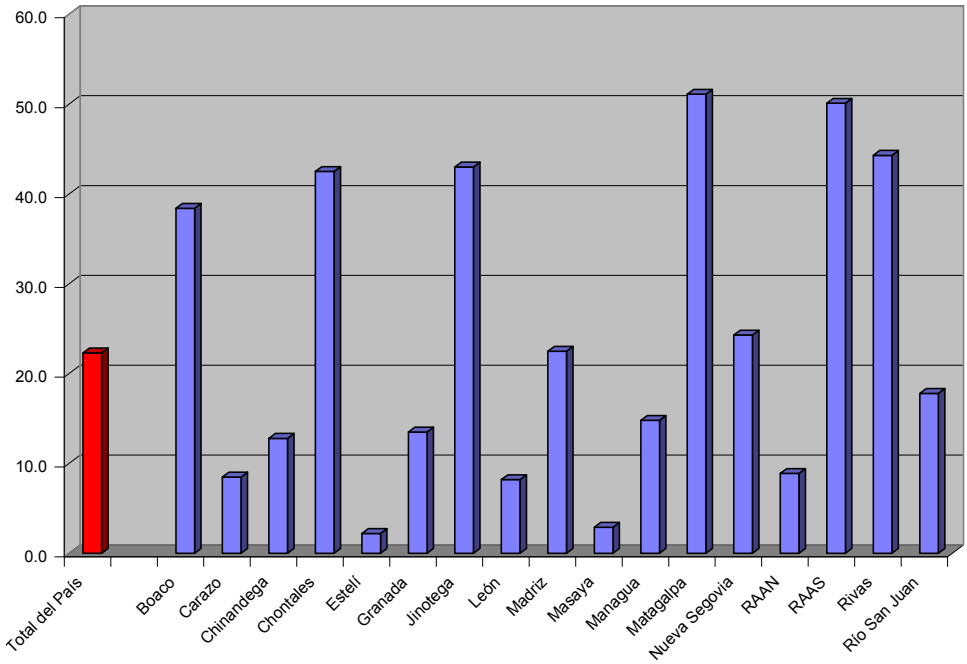
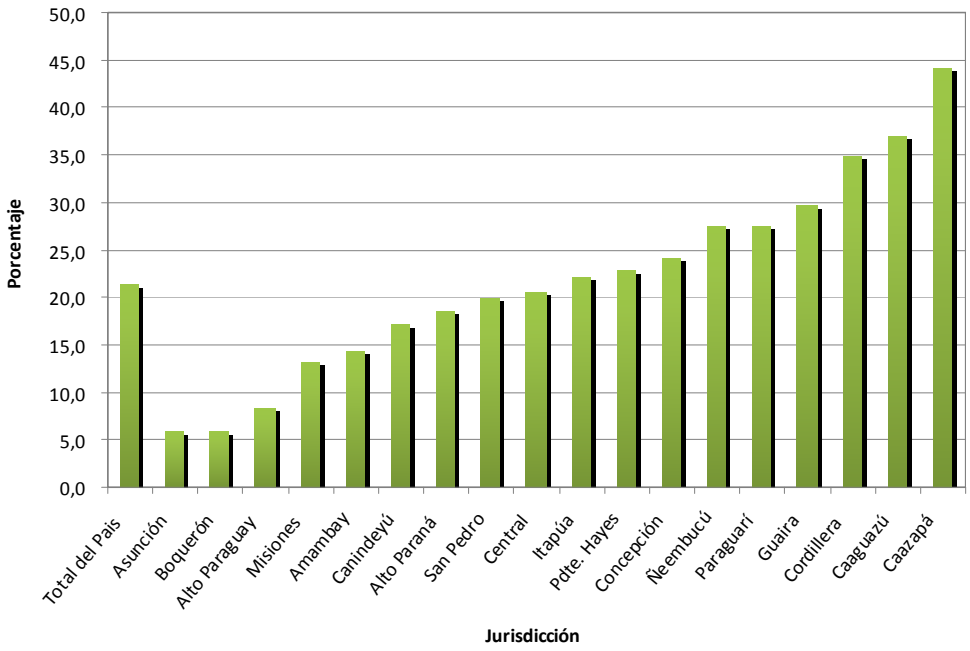


Figure 18 **Nicaragua: Births—Birth Weight of the Child Not Specified Appropriately, by Jurisdiction, 2003**



Source: Developed by the authors based on PAHO (2007).

Figure 19 **Paraguay: Proportion of Deaths with Ill-Defined Causes of Death, by Jurisdiction, Approximately 2005**



Translated text of Figure 20: Percentage, Jurisdiction, Country, Total

Source: Developed by the authors based on PAHO (2007).

The results show the existence of significant awareness, in multiple spheres, of the importance of improving actions to verify information quality. In addition, a remarkable solidarity and willingness exists to share and disseminate best practices throughout the region.

The type of health system (centralized, decentralized, or mixed) that is in place in each country has an impact on the manner in which the HIS operates. Established mechanisms to collect, transfer, verify consistency, validate, process, and analyze data need to be identified in order to understand the nature of the problems and find solutions. This is highlighted in the regional report, providing detailed information on the inputs, processes, and results at different geographic levels—local level, second level, and national level.

In countries with centralized data production systems, statistics offices from the local and the second administrative level report to the central office at the national level. The system operating rules and procedures are generated at the central level and are implemented at the other levels. This method has shown to be more effective in controlling processes but, in addition, it has revealed the need for human and financial resources for monitoring, which were not available in most of the assessed countries. In countries with decentralized data production systems, statistics offices from the local and second levels report to their respective geographic administrative institutions (provinces, departments, states, etc.) which operate under their own legal structures.

In regard to vital statistics, the level of reporting plays an essential role from the moment of data production and transmission. Civil registers take place at this level and are usually in charge of vital event registration. The civil register was in charge of generating statistical reports in 11 of the assessed countries and health offices were in charge of this task in nine countries; in 6 other countries this task was carried out by more than one institution or area. In the majority of countries (16) an office also existed at the second administrative level that reported to the second administrative level of the Ministry of Health in some countries (6) and to the central level in others (8). In the remaining countries, where this level does not exist, information was transferred directly from the local to the central level.

Results reveal the complexity and the numerous factors that need to be considered in establishing a HIS strengthening plan. The description in the Regional Report showed the need to prioritize, reach consensus at a national level, and exchange experiences at a regional level. This is the basis of the regional HIS strengthening plan, as defined by PAHO directive bodies.

In regard to morbidity statistics, it was observed that local offices received forms in the majority of assessed countries (21). In some cases, the offices reported to the local level (7) and in others, to the second administrative level of the Ministry of Health (6), and in five of them to the central level of the Ministry of Health. The existence of offices at the second level was established in 19 countries; these offices are in charge of receiving information and transferring it to the central level. Information quality is further aggravated by the problem of unequal coverage, overlapping systems, separation between sub-systems, powerful social security systems that do not communicate with the national level, and a private sector that, in some cases, establishes its own information production policy without communicating or coordinating with the national level.

Results also revealed that the existence of a regulatory framework does not ensure appropriate operations of the HIS. However, the importance of the presence of such frameworks should not be minimized. In order to strengthen the production of statistics, adjustments could be made to the HIS based upon the existing regulatory frameworks. Regulatory frameworks for all types of health statistics are not in place in all the countries in the region. For vital statistics, which are linked to highly important events and connected with human rights, specific legislation relating to the Civil Register exists in the majority of assessed countries, although specific reference to the statistical component of the system is not always made, Specific regulations for morbidity, resources, and services statistics are in place in a much smaller number of countries, except when such regulations are mentioned in the general statistics legislation established in the National Statistics System.

The existence of one or more data generating institutions was observed, with the resulting difficulties in using and harmonizing data from the different data sources. On the other hand, 15 of the assessed countries had only one institution generating data on vital statistics, 16 countries with only one institution on morbidity statistics, and 11 countries having only one institution on health resources statistics.

Another aspect that could have a negative impact on the quality and coverage of data was related to the forms that were used, particularly when an excessive number of copies existed and were filed and transferred between different offices in an inappropriate manner. It was observed that most countries use only one form with two or more copies to record vital statistics (one copy for the Civil Register and one for the statistical report). Contrary to this, most countries use only one form without a copy for morbidity, health resources, and service statistics. Despite the official regulations on the use of forms, the majority of countries admitted that various different instruments exist simultaneously for recording the same event. This clearly shows the negative impact this could have on comparing data and on the quality of the data that were being generated.

Finally, another result obtained from this study was the assessment of the reliability of data production systems used by the institutions that generate statistics. Of the total number of countries covered by the study, only four expressed that the vital statistics system is very reliable; others stated that it is good, and 8 countries thought that the system required significant improvement.

Based on the Regional Report, it was possible to formulate recommendations on the development of a regional HIS strengthening strategy to be implemented together with agencies and organizations such as USAID and MEASURE Evaluation. This topic was addressed almost simultaneously with the Meeting of Directors held in 2005. In addition, as mentioned above, countries gave the mandate for PAHO to develop the Regional Plan for Strengthening Vital and Health Statistics (PEVS) for two consecutive years. The PEVS is currently fully operational.

3.2 HMN: USE OF THE HIS ASSESSMENT AND MONITORING TOOL

This section describes the adaptation, use, and results from applying the HMN tools in eleven countries, the Dominican Republic,[30] Ecuador,[31] Honduras,[32] Mexico,[33] Paraguay,[34] Peru,[35] and Panama,[36, 37] who completed assessments and strategic plans,

[30] For more information see Secretariat of State of Public Health and Social Welfare of the Dominican Republic (2008). Resultados del Diagnóstico del SIS. Aplicación de la Herramienta de Análisis y Monitoreo de la Red Métrica de Salud. August 2008.

[31] For more information see OPS (2010). Proyecto Fortalecimiento del Sistema de Información en Salud (SIS). Ecuador. Final Report. November 2010.

[32] For more information see Secretariat of State in the Health Office (2006). Plan Estratégico para el Fortalecimiento del Sistema de Información en Salud 2007–2011. Tegucigalpa, Honduras. December 2006.

[33] For more information see HMN and Health Secretariat of Mexico (2009). Diagnóstico del Sistema de Información de Salud. Mexico. Versionupdated in 2009.

[34] For more information see Ministry of Health of Paraguay (2006). Aplicación de la Herramienta de Análisis y Monitoreo de la Red Métrica de Salud y Lineamientos Estratégicos para un Plan de Fortalecimiento del Sistema de Información de Salud. November 2006.

[35] For more information see Ministry of Health (2008). Evaluación del Sistema de Información en Salud del Perú, 2008. June 2008.

[36] For more information see HMN andMinistry of Health ofPanama (2007). Diagnóstico del Sistema de Información de Salud de Panama. September 2007.

[37] For more information see HMN andMinistry of Health ofPanama (2007). Plan EstratégicodelSistema de Información de Salud. September 2007.

while Belize,[38, 39] Costa Rica,[40] El Salvador,[41] and Nicaragua[42] completed assessments only.[43] As mentioned, HMN establishes standards, capacities, and processes that are required to strengthen the national HIS; these standards and guidelines assist in identifying a country's strengths, weaknesses, and areas of opportunities. The use of this information is useful in creating a map for the design of the HIS strengthening program; monitoring and evaluating HIS; and developing a course of action to obtain investment in information systems.

An overview of the most significant results from assessments conducted by 11 Latin American and Caribbean countries is included below. Given the methodological characteristics of the HMN tool previously mentioned in this document (qualitative nature, different methodological strategies used by countries to select samples and participants, index development) it is not possible to compare results from different countries. The purpose of including results from different countries in the same graph is not to compare countries against each other but, rather, to observe how each country has conducted the assessment considering the cultural characteristics, idiosyncrasies, and level of development of their HIS, which are reflected in their decisions regarding methodologies. The results are presented on the six HIS components comprising the tool (HIS resources, indicators, data sources, information management, information products, and dissemination and use of information) and in a manner consistent with results presented in the HMN Assessment and Monitoring Tool, the colors corresponding to each quintile have been maintained and country results are presented in bar graphs. In addition, key conclusions from the country assessment reports are included.

3.2.1 HIS Resources

The resource component considers the areas of planning (legal and regulatory framework) that ensure full operation of the HIS and coordination mechanisms; available resources, (human resources, logistics support, and financial resources), and infrastructure, (existence of lists of service units, public and private, supplies, information and communications technology).

Figure 20 shows that Costa Rica and Mexico consider their level of development in terms of resources to be Adequate, while a second group (Ecuador, Panama, Honduras, Belize, Nicaragua, and Paraguay) think that the development level for

[38] For more information see Ministry of Health of Belize (2008). Diagnostic Study of the National Health Information System of Belize. June 2008.

[39] For more information see Ministry of Health of Belize (2009). Belize. National Health Information System Strategic Plan 2010–2014. October 2009.

[40] For more information see Ministry of Health of Costa Rica (2009). Diagnóstico del Sistema de Información de Salud. Borrador. Costa Rica. September 2009.

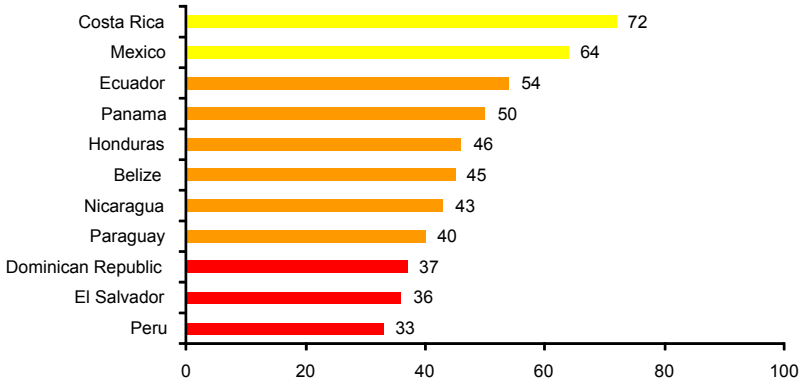
[41] For more information see Ministry of Public Health and Social Welfare. Republic of El Salvador (2008). Resultados del Diagnóstico del Sistema de Información en Salud. September 2008.

[42] For more information see Ministry of Health of Nicaragua (2007). Diagnóstico de Situación. Sistema de Información en Salud. Nicaragua. November 2007.

[43] For more information see Ministry of Health ofNicaragua (2008). Plan Estratégico. Sistema de Información en Salud (PESIS) 2008–2010. (Draft for discussion). January 2008. Managua, Nicaragua.

this component is low; in fact, they define it Somewhat Adequate. The Dominican Republic, El Salvador, and Peru consider that the available resources for the development of their HIS are Present but Not Adequate.

Figure 20 Countries that Applied the HMN Framework and Tools: Resources



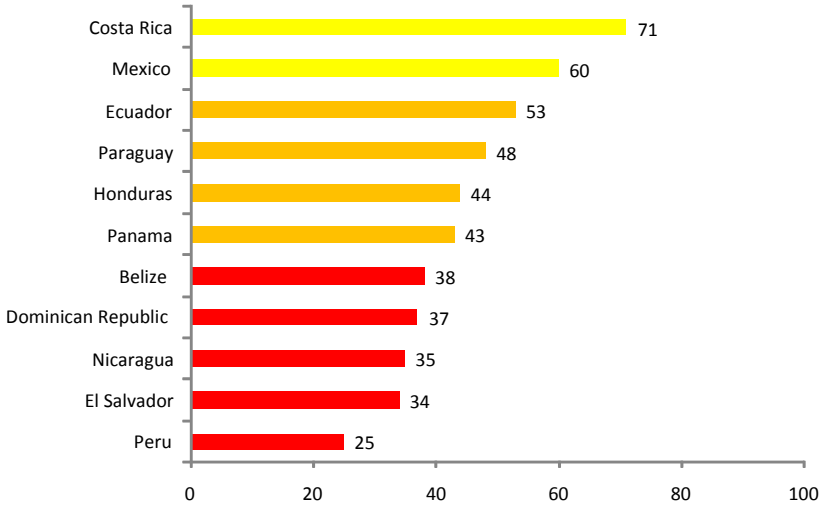
Source: Developed by the authors based on country reports.

In addition, the countries consider improvements based on the assessment of each resource sub-component. The sub-components are: planning (legal and regulatory framework); institutions, human resources, and financing; and infrastructure. The following figures show country results for the sub-components.

Resources: Planning (Legal and Regulatory Framework)

Figure 21 shows that Costa Rica and Mexico's legal and regulatory framework as Adequate. Ecuador, Paraguay, Honduras, and Panama need to adjust their respective frameworks which are Somewhat Adequate. Belize, the Dominican Republic, Nicaragua, El Salvador, and Peru seem to need to improve the planning aspects that they assessed as Present but Not Adequate.

Figure 21 Countries that Applied the HMN Framework and Tools: Planning (Legal and Regulatory Framework)



Source: Country reports.

Costa Rica states that some aspects need to be strengthened. A health information policy or a decree that regulates the information system is not in place, thus leading to fragmented institutional plans. For Mexico, recent legislation is in place as a framework for data collection, processing, and integrated use of information, as well as for planning and development of HIS infrastructure. However, this framework does not integrate different laws and regulations on health information in a coherent manner. A legislative framework needs to be incorporated.

In Paraguay, the legal framework is outdated and does not apply. Independent laws exist which are not connected to each other. In Honduras a legal framework is in place that only considers some aspects and that does not apply in other cases. A committee in charge of HIS coordination exists; however, the committee does not analyze all the health problems but rather, operates ad hoc. Nicaragua considers their legislation, policies, plans, and regulations to be Inadequate, mainly due to inconsistencies between regulations, standards, and concepts that are used.

Panama stated that various parallel statistical information systems exist that do not communicate with each other, reporting independently to the Office of the Comptroller General of the Republic (CGR). In addition, data collected by public sector health facilities are not submitted to the Ministry of Health but received directly by CGR. Belize, on the other hand, does not have a current legal framework that includes health information on vital event registration and notifiable diseases that includes data from the private sector and the social security system and complies with confidentiality and fundamental statistics principles.

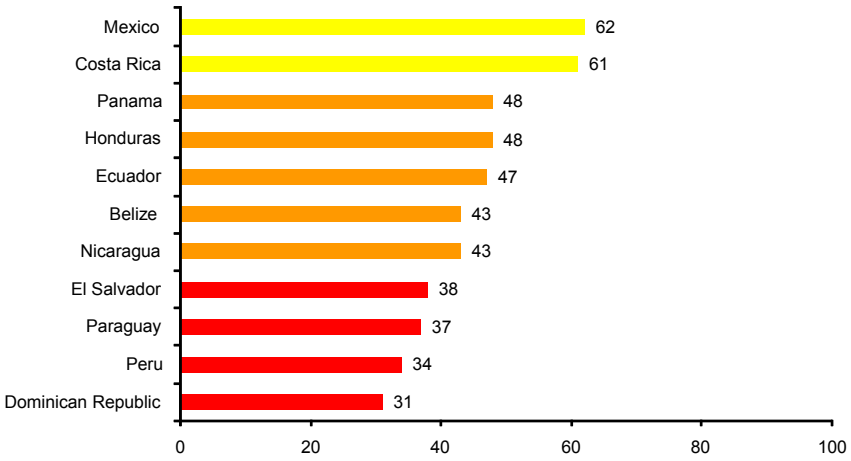
In El Salvador, legislation is Inadequate for establishing mechanisms in different institutional sub-systems to promote the integration of specific components (vital registration, notifiable diseases) or data from the national health system and the private sector.

Finally, the assessment conducted in Peru shows that the HIS is highly fragmented. This limits resources and technical capacities since it leads to an inefficient use of resources due to frequent duplication of information.

Resources: Institutions, Human Resources, and Financing

Figure 22 shows that the resource component is one of the least developed areas. In fact, Mexico and Costa Rica place themselves at the limit but qualify this component as Adequate. Furthermore, five countries assessed this component as Somewhat Adequate (Panama, Honduras, Ecuador, Belize, and Nicaragua), while El Salvador, Paraguay, Peru, and the Dominican Republic assessed this component as Present but Not Adequate and Peru stated that institutions, resources, and financing are Present but Not Adequate.

Figure 22 **Countries that Applied the HMN Framework and Tools: Institutions, Human Resources, and Financing**



Source: Country reports.

In Costa Rica, the most significant problems were identified in the quality of administrative records and human, material, and financial resource allocation. In general, HIS staff members are motivated and satisfied with their job, but the number of staff is insufficient and further training is required.

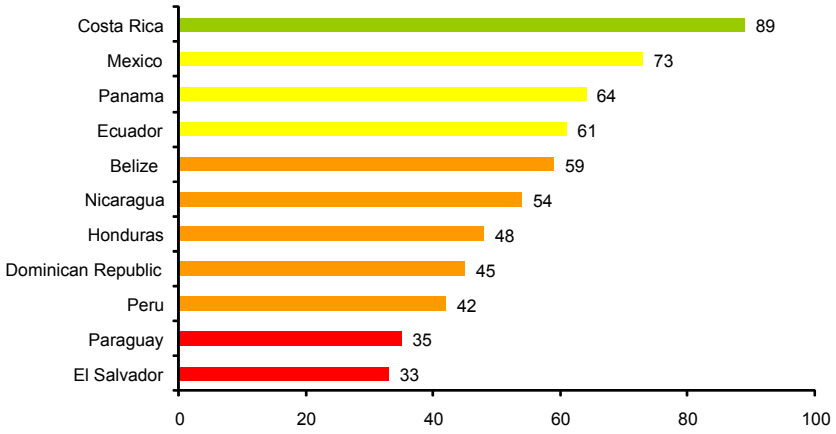
In regard to human resources in Mexico, a critical problem is providing appropriate training for staff in general and at a state level in particular. Continuing training is not a part of the HIS-related prioritized actions, even though a high turnover exists in some institutions. Training should be focused on institutions with no turnover because it is thought that a lack of turnover leads to inappropriately qualified staff remaining in their positions.

In the other countries, human resource issues have been observed to be more critical at a sub-national level, due to high turnover levels and the absence of a program to provide training on health statistics. It should be highlighted that in Peru, the instability of human resources involves frequent turnover of staff in charge of generating statistics. This leads to the need to implement ongoing training processes involving higher costs and affects the quality of data.

Resources: Infrastructure

Figure 23 shows that Costa Rica has achieved a high level of development (qualified as Highly Adequate), followed by Mexico, Panama, and Ecuador that assessed this component as Adequate. The infrastructure that is in place in Belize, Nicaragua, Honduras, Dominican Republic and Peru Somewhat Adequate, while assessments from Paraguay and El Salvador show that their infrastructure is Present But Not Adequate.

Figure 23 Countries that Applied the HMN Framework and Tools: Infrastructure



Source: Country reports.

However, Costa Rica identified problems in their capacity to communicate and available computer equipment; efforts are being made to resolve this problem. Mexico, on the other hand, considers that basic infrastructure in terms of computer equipment and telecommunications is required in different jurisdictions to achieve the goal of Highly Adequate. The availability of such infrastructure will expedite the data collection process and data repositories could be developed at a national and local level. In Panama data repositories containing relevant and compatible data are not available, nor are appropriate technology applications to systematize information on operations, resources, or morbidity. In Ecuador, the score could be improved if standardized software, a computer network with ongoing technical support, and appropriately operating telecommunications systems would be available at different levels of the system to support the management of statistics and make timely information available.

In the other countries, apparently the existing ICT infrastructure is insufficient, especially in countries with an assessment of Inadequate in terms of infrastructure (Paraguay and El Salvador) where the technological capacity is insufficient and where in some cases, the existing equipment is obsolete. In addition, these countries are facing serious difficulties in regard to communications, access to online systems, and deficient infrastructure to appropriately maintain the equipment at many facilities.

3.2.2 Indicators

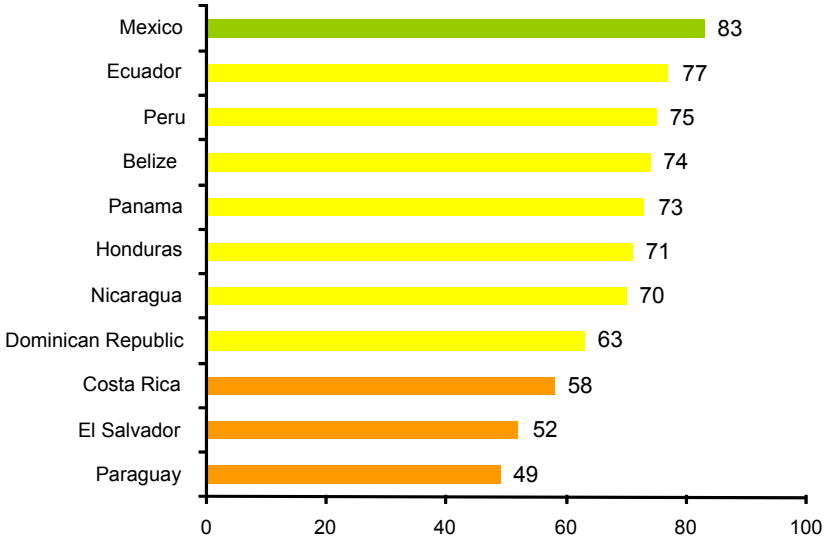
This component assesses a basic set of selected indicators for the three areas of information required by the national health system:

1. the determinants of health;
2. the health system inputs, process, outcomes; and
3. the population health status.

Much of this information may be provided by agencies and ministries other than the ministry of health.

Mexico assessed this component as Highly Adequate. Ecuador, Peru, Belize, Panama, Honduras, Nicaragua, and the Dominican Republic assessed it as Adequate, while in Costa Rica, El Salvador, and Paraguay these indicators were assessed as being Present but Not Adequate. It is important to mention that of these countries, Costa Rica at 58% is very close to being in the Adequate quintile (60–80%).

Figure 24 Countries that Applied the HMN Framework and Tools: Indicators



Source: Country reports.

A set of health indicators are in place in Mexico that are systematically published in the newsletter of the Health Secretariat each year. However, comments were made on the fact that some indicators still need to be identified at a national level, and clarification on the periodicity of reports and follow-up is required. In Ecuador, the National Institute of Statistics (INEC) and the Ministry of Public Health (MSP) agreed on a methodology to establish indicators, and production of statistics is consolidated in yearly reports published by INEC and MSP, as well as informative brochures published with support from PAHO. In Peru, the key problem is related to delays in disseminating information on the indicators. In addition, many private institutions do not report information regularly because most do not have epidemiology units. Belize reports regularly on a minimum set of basic indicators. However, indicator analysis levels and use of information in planning and interventions vary in different health regions and program areas. In Honduras, a definite number of indicators does not exist, and indicators are not standardized. The Nicaragua HIS generates unrequired information and the indicators are adjusted to the health service model and the objectives of the health system; indicator reports from the private sector doe not exist.

Costa Rica reports on a basic set of indicators, established jointly with other Latin American countries with support from PAHO. However, it was observed that this document has not been widely disseminated and each institution continues to use its own indicators. In El Salvador, as a result of significant differences that exist between institutional sub-systems generating information at a national level, substantive

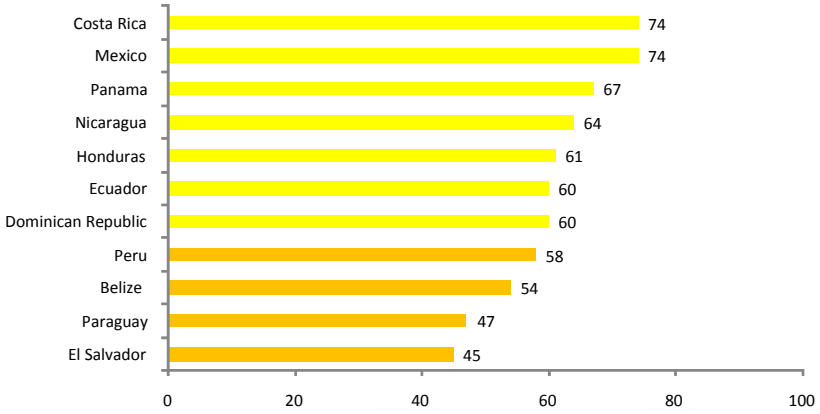
problems exist in dissemination and consistency of data on program coverage indicators, service production, and quality of services. In Panama, appropriate coordination exists to establish the list of basic indicators, however regular reviews are not carried out to adjust the list to the information needs of national planning efforts and to prepare reports for international organizations. In Paraguay, a formal national strategy is not in place, the indicators based on the MDGs are not updated, and delays occur in disseminating information.

3.2.3 Data Sources

This component considers two types of data sources: those that generate indirect or direct estimates at a population level (censuses and home surveys, and vital registration) and those that are related to health service provision and administrative records (disease surveillance, records from health facilities, administrative records, and health facility surveys).

Figure 25 shows that overall, Costa Rica, Mexico, Panama, Nicaragua, Honduras, Ecuador, and the Dominican Republic assessed data sources as Adequate and Peru, Belize, Paraguay, and El Salvador assessed them as Somewhat Adequate.

Figure 25 Countries that Applied THE HMN Framework and Tools: Data Sources



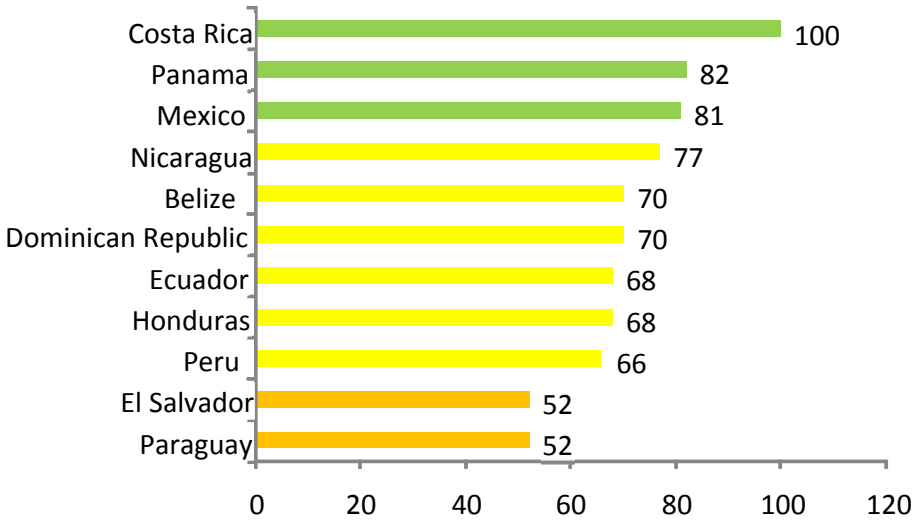
Source: Country reports.

The perception is very different for each of the data sources when they are assessed independently rather than averaged as a whole. Some of them, such as censuses, achieved a higher score and others, such as administrative records, achieved very low scores.

Data Source: Population Censuses

Population censuses are rated Highly Adequate in Costa Rica, Panama, and Mexico, as shown in Figure 26. Nicaragua, Belize, the Dominican Republic, Ecuador, Honduras, and Peru assessed this data source as Adequate, while El Salvador and Paraguay were more critical and assessed it as Somewhat Adequate.

Figure 26 **Countries that Applied the HMN Framework and Tools: Data Sources—Censuses**



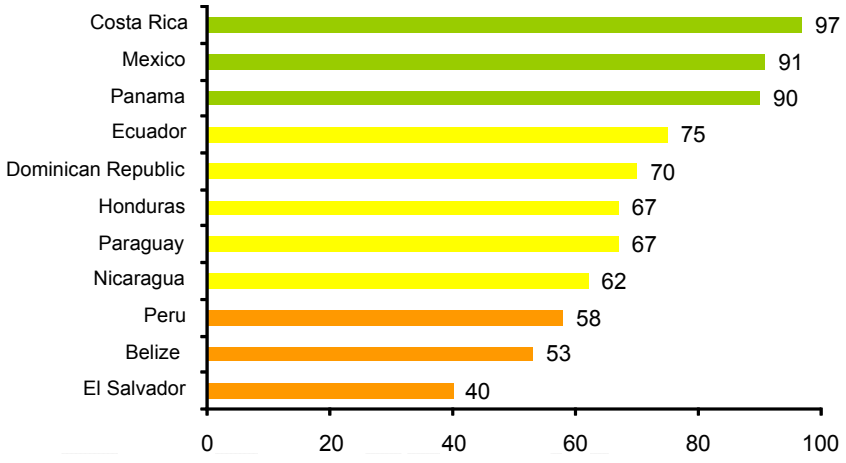
Source: Country reports.

Costa Rica gave the highest score for health indicators to this data source. In general, countries believe that adequate capacities exist to collect, process, and analyze data from censuses, and results are published within a period of two years. The data are used to make adjustments in population projections.

Data Sources: Vital Statistics

Vital statistics as a data source were assessed as Highly Adequate by Costa Rica, Mexico, and Panama. Ecuador, the Dominican Republic, Honduras, Paraguay, and Nicaragua assessed them as Adequate, while Peru, Belize, and El Salvador assessed them Somewhat Adequate, as shown in Figure 27.

Figure 27 **Countries that Applied the HMN Framework and Tools: Data Sources—Vital Statistics**



Source: Country reports.

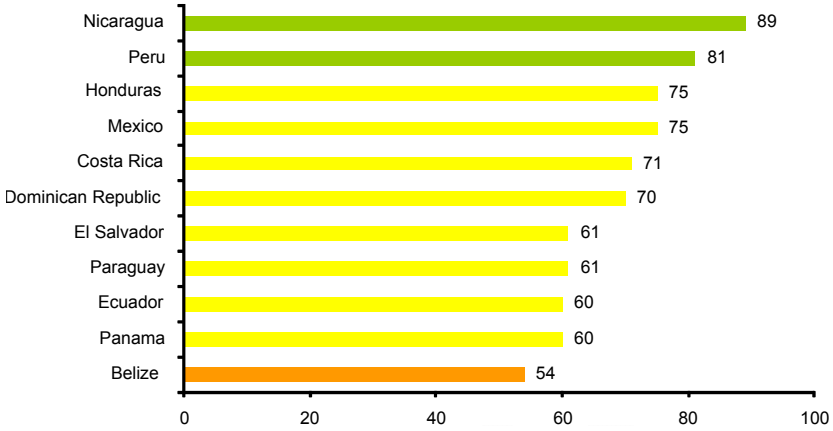
Costa Rica considers that aspects relating to data collection, management, and analysis capacities need to be improved. Mexico needs to improve some aspects to obtain more adequate information to estimate mortality, since insufficient relevant data are being collected in rural areas and in some sectors of the population are highly marginalized. Panama stated a lack of coordination in the area of vital statistics. A National Inter-institutional Committee on Vital Statistics was established and was active for some time, but is currently not functioning.

The primary problem mentioned in the majority of countries is insufficient vital event registration, mainly in regard to deaths. In addition, the quality of information is limited in many cases. In Peru, birth data bases are managed by the National Institute of Statistics and death data bases are managed by the Ministry of Health. As a result, access to data is difficult for various institutions and users in general. In El Salvador, only the Statistics Compendiums developed by the National Statistics Office publish the data; the Ministry of Health has its own records, which mainly include data on births and deaths that occurred in public health facilities.

Data Sources: Population Surveys

Population surveys were assessed as Highly Adequate in Nicaragua and Peru (Figure 28). In Honduras, Mexico, Costa Rica, the Dominican Republic, El Salvador, Paraguay, Ecuador, and Panama they were assessed as Adequate, while Belize assessed them as Somewhat Adequate.

Figure 28 Countries that Applied the HMN Framework and Tools: Data Sources—Population Surveys



Source: Country reports.

In Nicaragua, surveys generate appropriate estimates, metadata are available, and coordination to establish periodicity, key variables, and financing is appropriate. The problems are related to the lack of homogeneity in criteria to carry out a comparative analysis of the variables from each survey, and the lack of disaggregation of data at a municipal level. Peru has made improvements relating to contents, methodologies, and periodicity; however, interventions to improve data analysis still need to be carried out with the specific aim of identifying vulnerable groups and inequalities. In Honduras, a coordinating unit is not in place for design, analysis, and subsequent

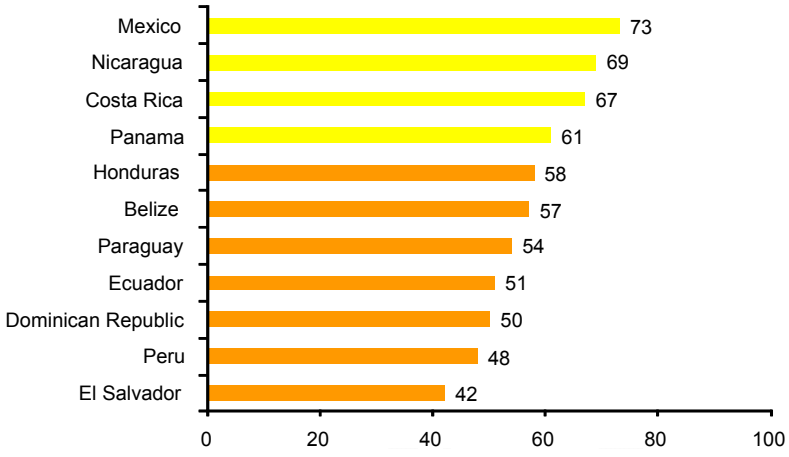
use of data from population surveys. Mexico regularly carries out an appropriate variety of health and population surveys; however, topics such as disabilities need to be included in the surveys, and data bases made more available in a timely manner.

Costa Rica needs to improve survey contents, data integration, and use capacities and practices. In Paraguay, appropriate capability exists to ensure the quality of population surveys, but surveys on risk factors have not been carried out and different sectors of society need to be involved in the surveys. Panama underscored the need to continue improving the planning and implementation process, and to conduct surveys on quality of life and health. In Belize, qualified human resources are not available to analyze data and develop special reports in a timely manner. Additionally collaboration between the Ministry of Health and the Institute of Statistics needs to be strengthened to facilitate the design and implementation of surveys, analysis, and use of data.

Data Sources: Health Status Results

Health Status Results need to be analyzed in regard to their inclusion in data sources on health service provision and administrative records. Figure 29 shows that Mexico, Nicaragua, Costa Rica, and Panama assessed these aspects as Adequate, while Honduras, Belize, Paraguay, Ecuador, the Dominican Republic, Peru, and El Salvador assessed them as Somewhat Adequate.

Figure 29 Countries that Applied the HMN Framework and Tools: Data Sources—Health Status Results



Source: Country reports.

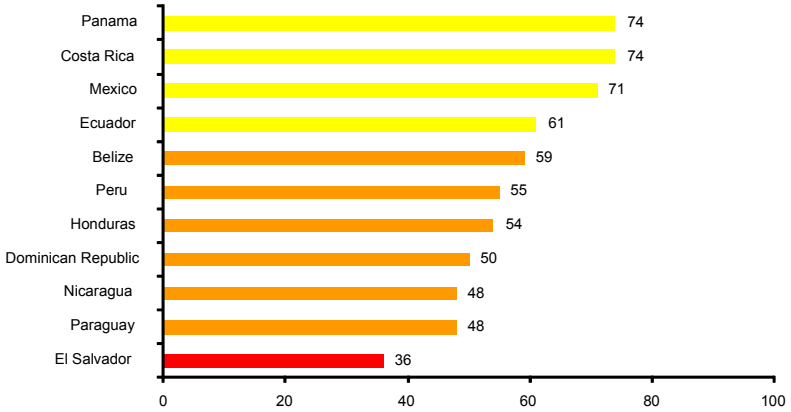
In Nicaragua, morbidity health records are not integrated, even within each institution, and ICD-10 coding coverage for the other health sub-sectors is lacking in mortality records. Costa Rica expressed the need to improve the timeliness of event notification and the completeness of information. In Honduras, a mandatory disease notification system is in place but with little capacity to identify outbreaks, take relevant actions, and integrate reports on diseases subject to mandatory notification with the other health programs.

Belize, identified weaknesses in all four areas: mapping populations at risk, lack of training to enable primary health care workers to appropriately report identified cases of notifiable diseases, lack of confirmation by laboratories for outbreaks relevant to public health, and insufficient dissemination of published epidemiological newsletters in the health regions. Paraguay identifies populations at risk on maps under the Expanded Immunization Program (PAI), but the maps are not disseminated to other sectors and programs. Epidemics are usually detected at a regional level and the proportion of outbreaks that are researched are based on laboratory samples.

Data Sources: Health Facility Records

In regard to health facility records, Panama, Costa Rica, Mexico, and Ecuador assessed them as Adequate, while Belize, Peru, Honduras, the Dominican Republic, Nicaragua, and Paraguay assessed them as Somewhat Adequate and El Salvador as Present but Not Adequate.

Figure 30 Countries that Applied the HMN Framework and Tools: Data Sources—Health Service Records



Source: Country reports.

Costa Rica mentioned the need to improve contents, capacities and practices relating to data use and integration, and use of health service records. In Mexico, an updated national data base is in place but some information from the private sector is missing. In addition, an updated database for health training institutions does not exist. Belize faces deficiencies in information because reporting is not mandatory for private health service providers; therefore the country only reports data on notifiable diseases and mortality. Honduras also recognized the lack of information from private health service providers, the absence of a mechanism to monitor the performance of staff in charge of registers, and that data from surveys and censuses are not used to verify the validity of data from health facilities.

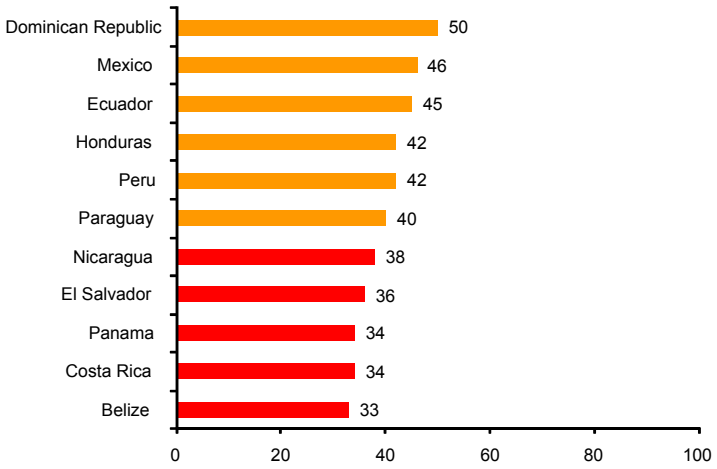
In Nicaragua, no updated data are available for private health facilities or nongovernmental, for-profit organizations. Furthermore, a systematic method does not exist for assessing the service quality provided by health facilities. In Paraguay, epidemiological data for some programs are incomplete and are only produced by the Ministry of Public Health. Moreover, no quality control exists and trained staff

do not perform according to their job descriptions. In addition, information is not integrated.

Data Sources: Administration Records

Figure 31 shows that administrative records are the least developed within the data sources component. In fact, the Dominican Republic, Mexico, Ecuador, Honduras, Peru, and Paraguay assessed them as Somewhat Adequate, while Nicaragua, El Salvador, Panama, Costa Rica, and Belize assessed their respective administrative records as Present but Not Adequate.

Figure 31 Countries that Applied the HMN Framework and Tools: Data Sources—Administrative Records



Source: Country reports.

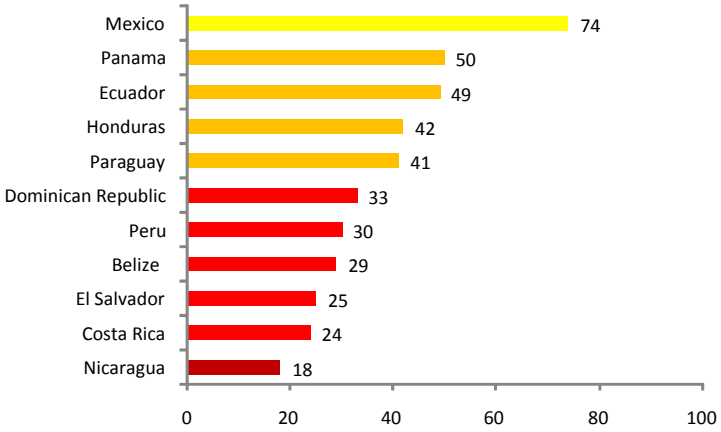
Honduras lacks infrastructure administrative records, an adequate system to control inventories of consumable goods, and a national data base on human resources. In Peru, financial information is available but it has not been integrated into the national health accounts. In Paraguay, the database on health professionals is incomplete and sometimes inaccurate in terms of specific professional degrees. In addition, a scientific society exists but it is not active. Nicaragua lacks information on the network of laboratories and pharmacies, and data for this indicator. In addition, a directory and geo-references of health facilities are not available. In Panama, financial information is available but it does not follow the national health account methodology. In Costa Rica, inventories of public health service providers are not updated and are only partially updated for private health service providers. Furthermore, health service providers and human resources are not identified on maps and no staff is available to maintain data bases for administrative information.

3.2.4 Information Management

The fourth component addresses aspects relating to data management, such as the existence of written procedures to transfer, store, analyze, and present data; availability of infrastructure and computer equipment to store data; and a metadata dictionary and access to all health facilities (public, private, and social security) to integrate data.

Figure 32 shows that Mexico is the only country that considers this component to be Adequate. Information management was assessed as Somewhat Adequate in Panama, Ecuador, Honduras, and Paraguay, while the Dominican Republic, Peru, Belize, El Salvador, and Costa Rica assessed it as Present but Not Adequate. In Nicaragua, this component obtained the lowest possible score, Inadequate.

Figure 32 Countries that Applied the HMN Framework and Tools: Information Management



Source: Country reports.

Mexico reported an absence of an explicit policy on information flows and information is disseminated mainly within health sector institutions. In addition, dissemination is deficient and statistics are generated with insufficient interpretation. Panama needs to develop an information archive to harmonize data from different institutions. Honduras lacks a data bank to consolidate the different HIS data sources. In Paraguay, each health program generates its own data, which usually differ from those of other programs. No control unit is in place and training is required. In Costa Rica, standardized procedures manuals are not available in all institutions. In addition, a data repository does not exist that enables identifying all the HIS indicators. Nicaragua needs to simplify forms and registers, designing them in accordance with objectives and available resources. In addition, Nicaragua needs to strengthen inter-institutional coordination and communication, expedite data collection, standardize data coding and capture, and implement a model for HIS sustainability.

3.2.5 Information Products

The fifth assessed component includes three main areas:

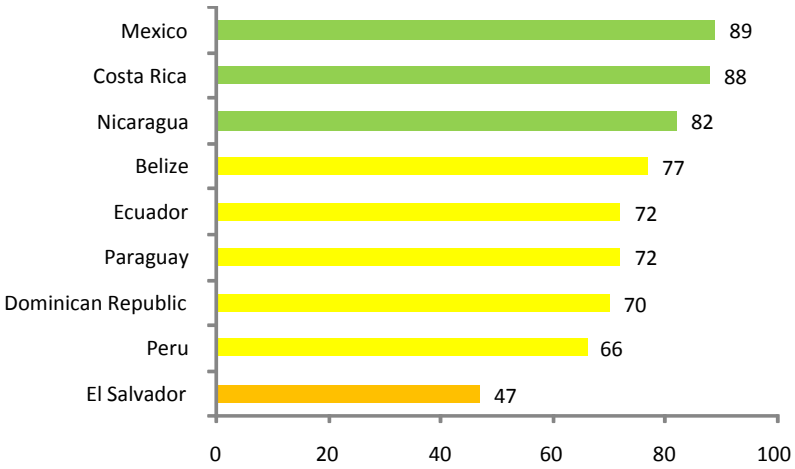
1. Health status indicators including mortality (children under 5 years of age, adult, and maternal) and morbidity (HIV prevalence, low weight in children under 5 years of age).
2. Health system indicators including health services for ambulatory patients, coverage of immunization against measles, qualified birth assistance, successful tuberculosis treatment, government health expenditure per capita, private expenditure, number of health workers available for each 1000 persons.

3. Risk factor indicators including aspects relating to prevalence of tobacco use, condom use in high-risk populations, and homes with access to potable water.

Information Products: Health Status Indicators

In analyzing health status indicators, Figure 33, averages of the values for mortality and morbidity were calculated. Mexico, Belize, Costa Rica, and Nicaragua assessed this component as Highly Adequate, while Ecuador, Paraguay, the Dominican Republic, and Peru assessed it as Adequate, and El Salvador as Somewhat Adequate.

Figure 33 Countries that Applied the HMN Framework and Tools: Information Products—Health Status Indicators



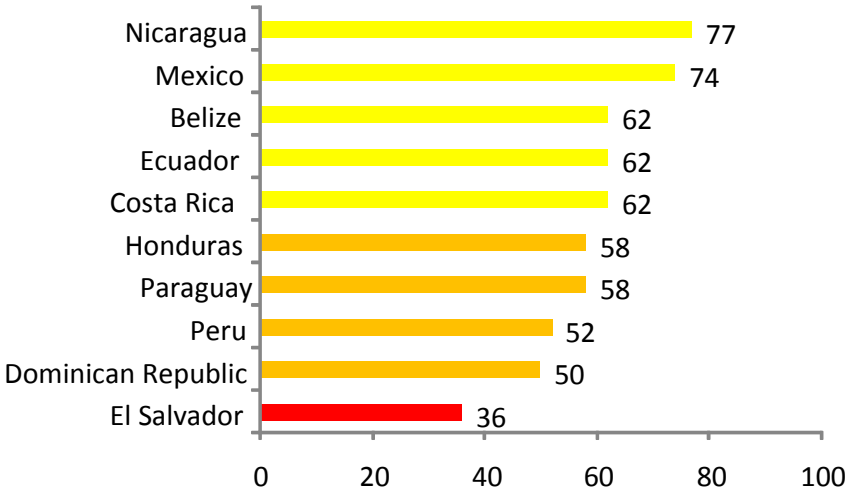
Source: Country reports.

Problems relating to data sources, coverage, and quality affect indicator validity, timeliness, and reliability. The assessment carried out in Nicaragua revealed that limited data on adult and maternal mortality were available. Ecuador obtains information on mortality from several data sources that use different methods to collect data. Statistical reports on deaths are not prepared appropriately, staff need to be trained on how to complete forms, and internal and external coordination is weak in institutions. In regard to morbidity, a standardized system to collect data from the public and private level is not in place. Paraguay generates incomplete data on mortality, as a result of incomplete registration of deaths. In addition, a reluctance has been observed to report cases of maternal mortality.

Information Products: Health System Indicators

Figure 34 shows the results from assessing the health system indicators in the countries included in the study. Nicaragua, Mexico, Belize, Ecuador, and Costa Rica assessed them as Adequate, while Honduras, Paraguay, Peru, and the Dominican Republic assessed them as Somewhat Adequate. El Salvador is the country that assigned the lowest score to this sub-component, Present but Not Adequate.

Figure 34 **Countries that Applied the HMN Framework and Tools: Information Products—Health System Indicators**



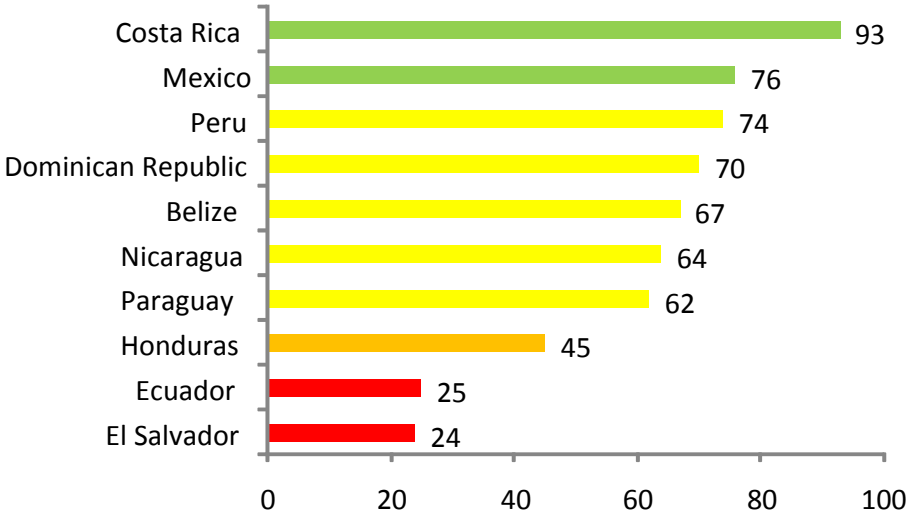
Source: Country reports.

Nicaragua provided a general report on information products that shows an insufficient quality and coverage of data. In addition, inconsistencies exist in information and no estimates are available in cases where insufficient data are collected; information is not sufficiently representative. Mexico expressed the need to identify, at an inter-institutional level, some national-level indicators, prepare reports, and follow up regularly. In addition, a process to assess indicators at a national level needs to be implemented. Ecuador does not guarantee the consistency of its health system indicators due to lack of feedback by data producers and the limited contributions of the private sector to the HIS. Peru considers that most indicators are based on empirical data sources.

Information Products: Risk Factor Indicators

Figure 35 shows that Costa Rica considered the risk factor indicators to be Highly Adequate. Mexico, Peru, the Dominican Republic, Belize, Nicaragua, and Paraguay, on the other hand, assessed their level of development as Adequate. Honduras assessed their indicators as Somewhat Adequate while Ecuador and El Salvador assessed these indicators as Present but Not Adequate.

Figure 35 **Countries that Applied the HMN Framework and Tools: Information Products—Risk Factor Indicators**



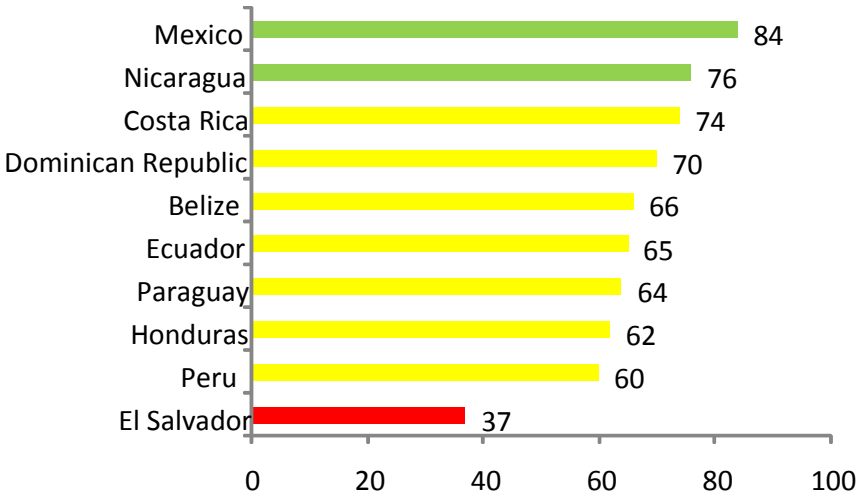
Source: Country reports.

Peru considered that, except for health status indicators, standards had not been established for the other indicators which would enable having an appropriate data repository for analysis. Nicaragua stated that risk factor indicators were limited. Honduras identified deficiencies in data collection methods, timeliness, periodicity, representation, and disaggregation levels. Ecuador reported that a data collection system was not in place to measure risk factor indicators. The results highlight the lack of knowledge by respondents of the existence of risk factor indicators within the HIS.

Information Products: Global Quality Indicators

To summarize information products, with the aim of assessing their quality, global quality indicators are depicted in a graph. Thus, Figure 36 reveals homogeneous results for the majority of countries. Nicaragua, Costa Rica, the Dominican Republic, Belize, Ecuador, Paraguay, Honduras, and Peru assessed the quality of information products as Adequate, while Mexico assigned the highest score (Highly Adequate). On the other extreme, El Salvador assessed its information products as Inadequate.

Figure 36 Countries that Applied the HMN Framework and Tools: Information Products—Global Quality Indicators



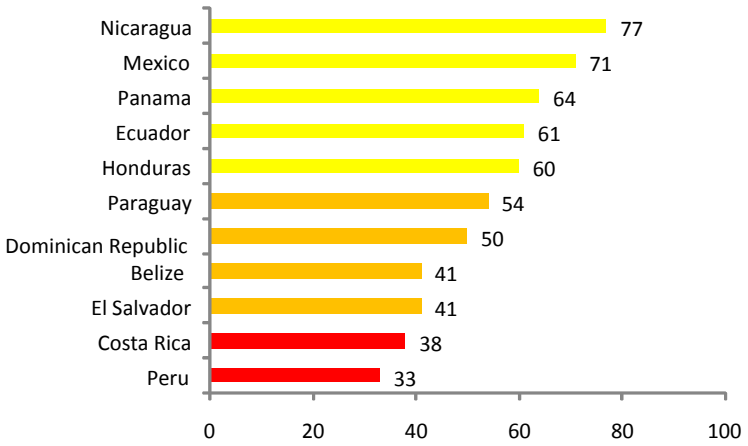
Source: Country reports.

3.2.6 Dissemination and Use of Information

The value of health information increases to the degree that it is available and accessible to decision makers and that importance is given to organizational and behavioral factors that limit its use. This component was assessed through five aspects.

Figure 37 shows the global assessment of dissemination and use of information. Nicaragua, Mexico, Panama, Ecuador, and Honduras assessed this component as Adequate; Paraguay, the Dominican Republic, Belize, and El Salvador considered it to be Somewhat Present; and Costa Rica and Peru assessed it as Present but Not Adequate.

Figure 37 Countries that Applied the HMN Framework and Tools: Dissemination and Use of Information

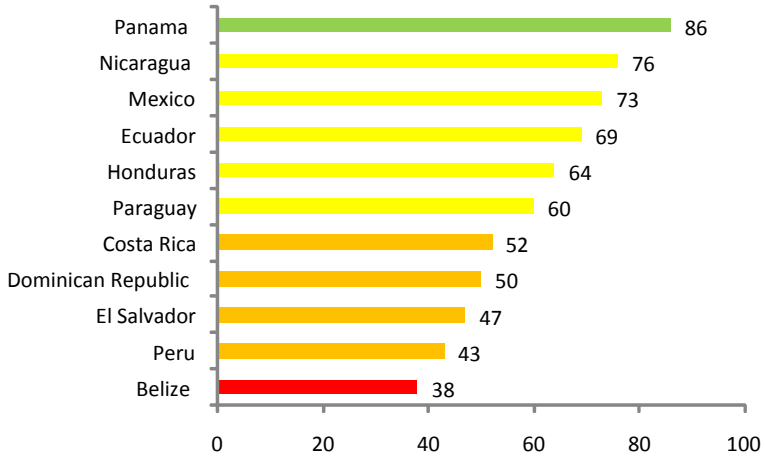


Source: Country reports.

Dissemination and Use: Analysis and Use of Information

Figure 38 shows the results for analysis and use of information, related to demand, presentation, analysis, and use of information. Results place Panama at a Highly Adequate level; on the other hand, Nicaragua, Mexico, Ecuador, Honduras, and Paraguay considered the level of analysis and use of information to be Adequate. Costa Rica, the Dominican Republic, El Salvador, and Peru assessed this component as Somewhat Adequate, and Belize as Present but Not Adequate.

Figure 38 Countries that Applied the HMN Framework and Tools: Information Analysis and Use



Source: Country reports.

While a Department of Statistics exists in Panama, it does not perform functions similar to the HIS. Information is used for local and regional planning and regular assessments but is only partially analyzed, and decisions are not based on this information. Nicaragua identified limited use of information and the need to improve systematic production in generating information. In addition, information is not

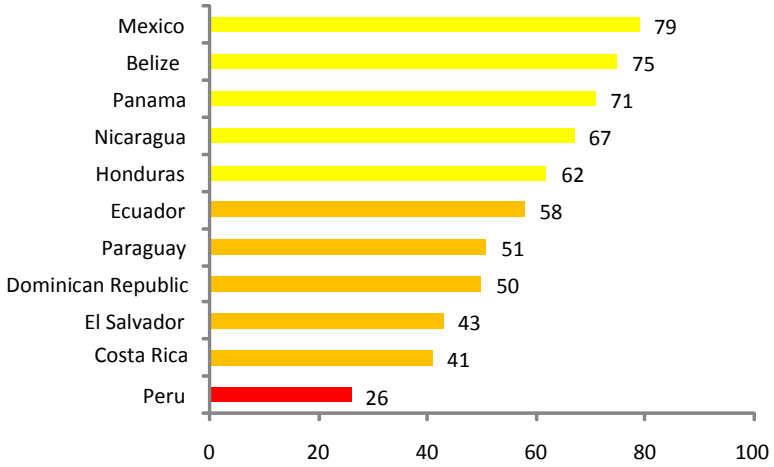
available online, information from previous years is missing and publication printed in national accounts is not available. In Mexico, the analysis of information generated through the HIS is limited, and information is disseminated only at an institutional level within the health sector. Honduras meets demands for timely and high quality health information but in an ad hoc manner, disorganized manner. Furthermore, the central HIS office provides information but without any detailed analysis.

In Paraguay, access to and use of information is perceived as limited. Information generated through the HIS is not used frequently, and information is analyzed at a local level only in case of emergency, not as a matter of course. In Costa Rica, an information system does not exist which integrates data from different institutions, and the timeliness of and access to information is limited. There are no standardized indicators and the existing indicators are not adequate. Information is analyzed by level of service provision and not by health service network which limits its use. Use of information for decision-making, policy-making, and resource allocation is quite limited. A significant amount of data is collected without assessing how they are used or if they are really useful within the current context. Belize stated that health information is sometimes used for planning and priority-setting. Information is used in a selective manner by managers at a national and sub-national level.

Data Dissemination and Use: Policy Planning and Advocacy

Policy planning and advocacy entails the availability of reports with information analysis as well as information dissemination, publication, and use for decision-making in the sector. Figure 39 shows that Mexico, Belize, Panama, Nicaragua, and Honduras assessed this component as Adequate. Ecuador, Paraguay, the Dominican Republic, El Salvador, and Costa Rica assessed it as Somewhat Adequate and finally, Peru was more critical, assessing it as Present but Not Adequate.

Figure 39 Countries that Applied the HMN Framework and Tools: Policy-Making and Advocacy

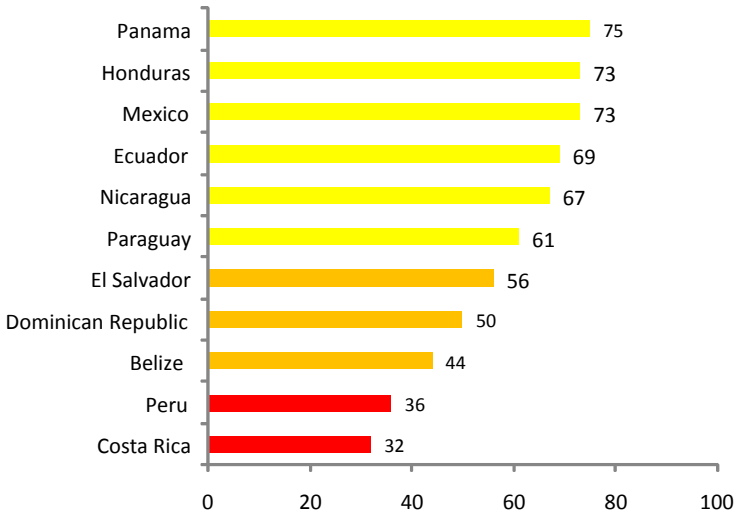


Source: Country reports.

Dissemination and Use: Planning and Priority Setting

In regard to planning and priority-setting, Figure 40 shows how use of data for planning is assessed; the link between indicators and short-term, medium-term, and long-term objectives; and analysis of statistics for decision making. Panama, Honduras, Mexico, Ecuador, Nicaragua, and Paraguay assessed this component as Adequate; El Salvador, the Dominican Republic, and Belize assessed it as Somewhat Adequate, while Peru and Costa Rica assessed this component as Present but Not Adequate.

Figure 40 Countries that Applied the HMN Framework and Tools: Planning and Priority-Setting

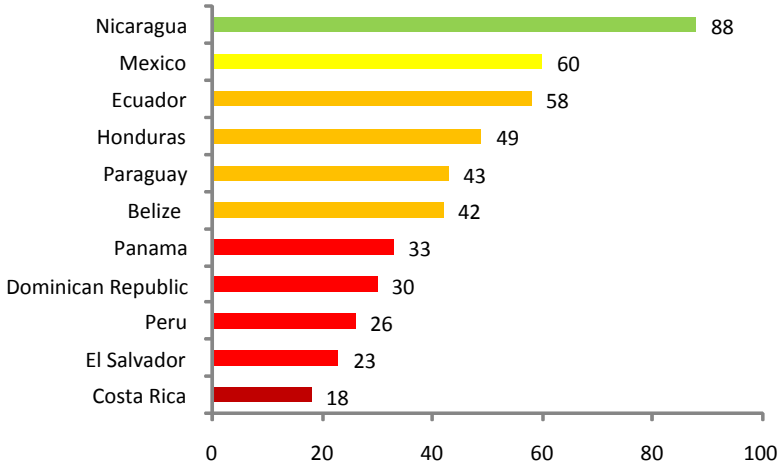


Source: Country reports.

Dissemination and Use: Resource Planning

Resource allocation is another aspect of this component that was assessed. Resource allocation information enables allocations to marginalized populations and illuminates its impact on the annual budget. As shown in Figure 41, resource allocation is one of the aspects with the highest results disparity levels among the different countries. Nicaragua assessed this aspect as Highly Adequate and Mexico as Adequate. For Ecuador, Honduras, Paraguay, and Belize, resource allocation is Somewhat Adequate; Panama, the Dominican Republic, Peru, and El Salvador assessed it as Present but Not Adequate, while Costa Rica is in the lowest quintile level, Inadequate.

Figure 41 Countries that Applied the HMN Framework and Tools: Resource Allocation

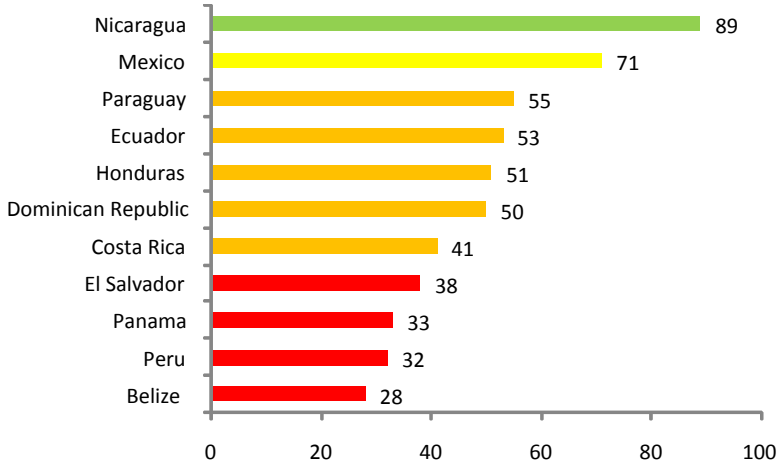


Source: Country reports.

Dissemination and Use: Implementation and Action

The sphere of implementation and action assesses information about service provision, planning, monitoring, and promoting a healthy life among the general public and high-risk populations. Significant contrasts can be observed in this sphere as well. Nicaragua assessed this aspect as Highly Adequate and Mexico as Adequate. Paraguay, Ecuador, Honduras, the Dominican Republic, and Costa Rica considered this aspect to be Somewhat Adequate and finally, El Salvador, Panama, Peru, and Belize considered the level of implementation and action to be Present but Not Adequate.

Figure 42 Countries that Applied the HMN Framework and Tools: Implementation and Actions



Source: Country reports.

Finally, a brief analysis of the general results obtained from implementing the HMN tools is included. Table 5 shows the color scale that helps highlight the aspects to be prioritized in a national HIS strengthening plan and also, the potential lines

of action at a sub-regional level or between countries. The purple and red colors indicate maximum priority, the gold indicates a need for improvement and yellow and green are used for aspects where countries achieved adequate levels that every plan should maintain in the future. This is not a simple task.

Considering the differences in percentages for each sub-component, the information management component obtained the lowest score in all countries, that is, Inadequate. On the contrary, the indicators and information products component achieved the highest score, that is, Adequate. None of the components was assessed as Highly Adequate, but we believe that countries now have a basis to strengthen their HIS and work toward generating more adequate information.

In general terms, different performance levels can be observed between countries. This is a chance to continue promoting regional cooperation to exchange best practices and successful experiences, with the aim of achieving a more homogeneous level of development in the Latin American region.

Table 5—HIS Assessment and Monitoring Tool: Country Results

COUNTRIES	I. RESOURCES				II. INDICATORS	III. DATA SOURCES						
	Planning (Legal Frame. & Context)	Institutions, Human Res. & Financing	Infrastructure	Total		Censuses	Vital Stats.	Population Survey	Health Status Results	Health Facility Records	Admin. Records	Total
Belize	38	43	59	45	74	70	53	54	57	59	33	54
Costa Rica	71	61	89	72	58	100	97	71	67	74	34	74
Ecuador	53	47	61	54	77	68	75	60	51	61	45	60
El Salvador	34	38	33	36	52	52	40	61	42	36	36	45
Honduras	44	48	48	46	71	68	67	75	58	54	42	61
Mexico	60	62	73	64	83	81	91	75	73	71	46	74
Nicaragua	35	43	54	43	70	77	62	89	69	48	38	64
Panama	43	48	64	50	73	82	90	60	61	74	34	67
Paraguay	48	37	35	40	49	52	67	61	54	48	40	47
Peru	25	34	42	33	75	66	58	81	48	55	42	58
Dominican Republic	37	31	45	37	63	70	70	70	50	50	50	60

COUNTRIES	IV. INFORMATION MANAGEMENT	V. INFORMATION PRODUCTS				VI. DISSEMINATION AND USE					
		Indicators Total Health Status	Health System Indicators	Risk Factor Indicators	Global Quality Indicators	Analysis and Use of Information	Policy Planning & Advocacy	Planning & Priority Setting	Resource Allocation	Implement. & Action	Total
Belize	29	77	62	67	66	38	75	44	42	28	41
Costa Rica	24	88	62	93	74	52	41	32	18	41	38
Ecuador	49	72	62	25	65	69	58	69	58	53	61
El Salvador	25	47	36	24	37	47	43	56	23	38	41
Honduras	42	s/d	58	45	62	64	62	73	49	51	60
Mexico	74	89	74	76	84	73	79	73	60	71	71
Nicaragua	18	82	77	64	76	76	67	67	88	89	77
Panama	50	s/d	s/d	s/d	s/d	86	71	75	33	33	64
Paraguay	41	72	58	62	64	60	51	61	43	55	54
Peru	30	66	52	74	60	43	26	36	26	32	33
Dominican Republic	33	70	50	70	70	50	50	50	30	50	50

Source: Country reports.

Table 6 shows the HMN Assessment tool dimensions and the three lower ranked quintiles in the table's outer margins with the countries which fell into those categories in their appropriate cells. The table is self-explanatory since it shows the aspects with the lowest scores for each country and in addition, shows the potential to implement common actions between countries to address these challenges in the future.

Table 6 Country Assessments for Each Dimension

	Insufficient	Inadequate	Present but not adequate
Resources			
Planning (Legal Framework and Context)		BEL ELS NIC PER DOR	ECU HON PAN PAR
Institutions, Human Resources, Financing		ELS PAR PER DOR	BEL ECU HON NIC PAN
Infrastructure		ELS PAR	BEL HON NIC PER DOR
Indicators			COR ELS PAN PAR
Data Sources			
Censuses			ELS PAR
Vital Statistics			BEL ELS PER
Surveys			BEL
Health Status			BEL ECU ELS HON PAN PER DOR
Health Facilities		ELS	BEL HON NIC PAR PER DOR
Administrative Records		BEL COR ELS NIC PAN	ECU HON MEX PAR PER DOR
Information Management	NIC	BEL COR ELS	ECU HON MEX PAN PAR PER DOR
Information Products			
Health Status Indicators			ELS
Health System Indicators		ELS	HON PAR PER DOR
Risk Factor Indicators		ECU ELS	HON PAR PER DOR
Global Quality Indicators			
Dissemination and Use			
Analysis and Use of Information		BEL	COR ELS PER DOR
Planning Policies and Advocacy		PER	COR ECU ELS PAR DOR
Priority-Setting		COR PAR	BEL ELS DOR
Resource Allocation	COR	ELS NIC PER DOR	BEL ECU HON PAR
Implementation and Action		BEL ELS NIC PER	COR ECU HON PAR DOR

Source: Country reports.

3.3 PRISM: EVALUATING THE PERFORMANCE OF ROUTINE HEALTH INFORMATION SYSTEMS: CASE STUDIES

The previous section describes the adaptation, use, and results of implementing the Health Metrics Network (HMN) tool in different countries in the region. Based on this, we conclude that the HMN conceptual framework and the HIS assessment and monitoring tool complement each other in defining and establishing the standards, capacities, and processes that are required to strengthen national HIS. In addition, the HMN framework and tools are useful for creating a map to develop an action plan; monitoring and evaluating HIS; and developing guidelines for investment in identifying the strengths, weaknesses, and opportunities for improvement of the HIS.

The HMN conceptual framework and assessment tools proposed a critical pathway for strengthening the national HIS in each country. On the other hand, the PRISM initiative presents a reference framework and tools for designing, strengthening, and evaluating routine health information systems (RHIS). The PRISM framework incorporates different analytical perspectives focused on technical, organizational, and behavioral factors that determine the performance of RHIS.

The following sections provide excerpts from the country case studies which document implementation of the PRISM tools in multiple countries throughout Latin America (versions available in both Spanish and English). These case studies are based on qualitative methods and assess whether users adopt information systems and how information is used for decision making, in no way do these case studies intend to quantify the benefits on health systems performance. Some countries only carried out national assessments, while the previously mentioned six countries also designed strategic plans to strengthen their HIS: Mexico,[44] Honduras,[45] Paraguay,[46] the Dominican Republic (Assessment[47] and strategic plan 2008[48] and 2009[49]), Peru,[50] and Ecuador.[51] These efforts have contributed to the design, strengthening

[44] For more information see Health Secretariat of Mexico (2006). Diagnóstico del Sistema de Información en Salud (SIS) de México. Reporte sobre el uso de la herramienta de Evaluación Organizacional y de Comportamiento (OBAT).

[45] For more information see Secretariat of State in the Health Office (2006). Plan Estratégico para el Fortalecimiento del Sistema de Información en Salud 2007–2011. Tegucigalpa, Honduras. December 2006. This document contains the Assessment and the Strategic Plan.

[46] For more information see Ministry of Health of Paraguay (2007). Final Report. Aplicación de la Herramienta PRISM: Desempeño de la Administración de sistemas de Salud en Paraguay. December 2007.

[47] For more information see Secretariat of State for Public Health and Social Welfare (SESPAS) and Directorate of Health Information and Statistics (DEIS) (2009). Diagnóstico de los SIRS. Aplicación de la Herramienta de Diagnóstico (PRISM). Para la evaluación de los sistemas Rutinarios en salud (SIRS). March 2009.

[48] Secretariat of State for Public Health and Social Welfare (SESPAS) and General Directorate of Health Information and Statistics (DEIS) (2008). Plan Estratégico del Sistema Nacional de Información en Salud 2009–2013. Draft. November 2008.

[49] For more information see Secretariat of State for Public Health and Social Welfare of the Dominican Republic (2009). Plan de trabajo para completar actividades intersectoriales entre la Secretaría de Salud Pública y Asistencia Social (SESPAS) y la Oficina Nacional de Estadísticas (ONE). September 2009.

[50] For more information see Ministry of Health (2008–2009). Evaluación del Sistema de Información Rutinaria en Salud. Peru, 2008–2009.

[51] For more information see PAHO (2010). Proyecto Fortalecimiento del Sistema de Información en Salud (SIS). Ecuador. Final Report. November 2010.

and monitoring of the RHIS. Sharing the experience and knowledge gained through this project with other countries in the region will greatly benefit the development of their respective HIS. Also included was Brazil, who did not implement the PRISM Tools but initiated PAHO/USAID/MEASURE Evaluation Project activities in conjunction with Mexico.

3.3.1 Mexico

The National Institute of Public Health (INSP), in collaboration with the General Directorate of Health Information of the Health Secretariat (DGIS-SSA), initiated a project named Diagnóstico del Sistema Nacional de Información en Salud (Assessment of the National Health Information System) in 2005. To this effect, INSP signed an agreement of financial support and technical collaboration with MEASURE Evaluation. In addition, financial support was obtained from PAHO through DGIS.

The general objective of the project was to conduct an assessment of the national HIS in collaboration with relevant institutions from the health sector, with the purpose of identifying opportunities to strengthen the national HIS. The following project components were implemented, as described in the HIS Assessment document:

- technical translation into Spanish of the HMN tool and discussion of the HMN conceptual framework;
- revision, adaptation, and implementation of the HMN tool and OBAT;
- development of case studies on relevant experiences of the national HIS; and
- recommendations for the national HIS, a publication.

The implementation of the OBAT is described below.

In 2005, Mexico assessed the overall performance of the HIS using the HMN tools. Results of this assessment showed that the HIS followed the same fragmented pattern as the health system. Additionally while general data collection was adequate, use of information was insufficient.[52]

The government of Mexico, through DGIS-SSA, used the results of this assessment to implement a HIS strengthening process. The process includes, among others, improving the regulatory framework for health information and establishing an inter-sectorial health information committee. The committee established a minimum set of indicators to be shared by all health service provision institutions – public and private.

DGIS, with the aim of complementing this overall assessment, considered it necessary to improve the understanding of the behavioral and organizational factors associated with the performance of the RHIS. Therefore, it was decided to apply OBAT with staff from DGIS, the General Directorate of Epidemiology (both departments of the Health Secretariat), and staff involved in the HIS of the Mexican Institute of

[52] Results of this assessment are published on the HMN website (Health Metrics Network, WHO. Health Metrics Network). http://www.who.int/entity/healthmetrics/library/mexico_05apr.doc

Social Security (IMSS), one of the primary social security institutions in Mexico. In addition, OBAT was applied again in 2008 with staff from the General Directorate of Epidemiology. Results of this assessment showed a gap between self-perceived capacity and real competencies to carry out the functions of the RHIS among HIS staff and the need to strengthen capacities of the workforce involved in HIS.[53]

Data Collection

The Spanish version of the OBAT questionnaire was discussed and revised with relevant experts and users before implementing it. The DGIS staff carried out a pilot test to adjust the questionnaire to the Mexican context. This enabled improving the instrument significantly, developing a pre-analysis, and observing possible results to be obtained through the tool. The assessment questions and examples of OBAT were then adjusted to the organizational context of health sector institutions in Mexico prior to using the tool.

Samples were selected according to convenience, including selected staff involved in the HIS of institutions reporting to the Health Secretariat and IMSS. Staff members with different levels of involvement in the HIS were interviewed, including directors, operators, and users. Interviews with regional staff from all the Mexican states were a priority. The sample included a total number of 271 persons from different levels and geographic areas involved in the HIS in Mexico:

» 22 officials from DGIS
» 105 officials from the Health Secretariat of Federative institutions
» 30 data-coding officials from the Health Secretariat, IMSS, and INEGI
» 20 officials from the General Directorate of Epidemiology (DGE)
» 10 officials from federal hospitals of the Health Secretariat
» 86 officials from IMSS

The survey was self-applied, anonymous and took approximately 45 minutes to complete.

Results Analysis

Characteristics of the HIS Staff: In Mexico, the HIS is primarily operated by male staff (58.4%), both at the Health Secretariat and IMSS. The average age of HIS staff is 42 years (within a range of 35-67 years). Of these individuals, 25.5% did not finish college, 40.9% have an undergraduate degree, and the others have a graduate degree (33.6%).

Promoting a Culture of Information: The quality of data (regular reports) is acceptable (72.0%) in the health sector, with few variations between IMSS and the Health Secretariat. On the use of information, an average of 75.0% was obtained (72.3% for the Health Secretariat and 81.3% for IMSS). Decision making within

[53] Within this context, the National Institute of Public Health launched a new Master's Degree Program in Public Health with a focus on Biostatistics and Health Information Systems (MSP BIOSIS, Spanish acronym). Efforts are currently underway to offer this program online, with the purpose of initially reaching all 32 states of the Republic of Mexico and subsequently, covering the entire Latin American and Caribbean region by the end of 2011.

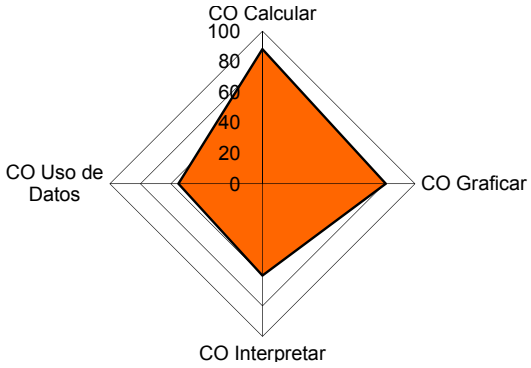
HIS institutions was lower (56.8%). Problem solving based on data generated through the HIS obtained a high percentage, 73%. In addition, aspects such as feedback within the HIS (65.5%) were also assessed. Moreover, 71.0% of the respondents believe that the members of the HIS working team had a high sense of responsibility.

Organizational Factors: The following perspectives were considered in analyzing the dimension of the organizational factors: perceived availability of resources; support from managers; knowledge of performance criteria; criteria for merit-based promotions; and the reward system. One of the aspects that achieved the highest percentage is resource availability (71.7%), while the percentage for support from high-level management is 69.0%. The percentage for HIS performance assessment criteria is lower (51.2%), and promotion of information was known by only 41.2% of the interviewed persons. Sixty-five percent of the interviewees stated that they are rewarded for good performance.

Perceived Self-Efficacy: This dimension assesses six important aspects in data processing to generate information: self- perceived competency in reviewing, calculating, entering, interpreting, or using data. For the data reviewing phase, perceptions relating to the ability to appropriately prepare monthly reports of the service unit and verify data accuracy were assessed. Based on perceived self-efficacy, the percentage for this phase is 83.9%. Data entry by month and year obtained 87.6%. Data interpreting, which could be a task that requires more training, also achieved a high percentage (85.6%). Perceived self-efficacy to use information, assessed as the ability to use information to identify gaps, establish objectives, or prepare reports, obtained 86.0%. It should be noted that the level of motivation to carry out HIS-related tasks was low in 70.7% of the interviewed persons.

Competencies: To assess staff competency in the above tasks, field assessments were carried out through a supervised exercise. The assessed tasks included the following: calculating, developing graphs, interpreting, and using data generated through the HIS. The observed competency for the calculation phase was 88.2%; developing graphs, 80.8%; interpreting data, 60.1%; and use of information, 55.1% (Figure 43).

Figure 43 Mexico: Observed Competencies in Carrying Out Tasks Relating to the HIS



Translated text of Figure 43: OC Calculating; OC Developing graphs; OC Interpreting; OC Use of information
Source: OBAT Questionnaire, Health Secretariat, December 2005.

Three aspects were assessed for this component: understanding the logic and importance of collecting data; knowing methods to review the quality of data; and problem solving skills. The percentages for each item were: 67.4%, 59.4%, and 39.5%, respectively.

Implementing the Assessment Results

The following actions have been implemented as a result of the HIS assessment carried out in Mexico:

» In 2006, the HIS assessment was used as input for the National Development Plan. Specifically, it was transformed into the National Health Plan 2006–2012, which is described in the HIS strategic plan. This is a substantial advancement toward sustainability, and objectives have been established in terms of follow-up indicators.

» Furthermore, advances have been made in designing and developing a comprehensive data base comprising relevant information about services provided to the population, hospital patient discharge, infrastructure, and human and material resources is made available.

» The DGIS (of the Health Secretariat) has now made available a set of data bases to the general public which can be consulted online, thus facilitating access to and use of information.

» In a more general but equally valuable manner, social security institutions have developed internet portals with varying degrees of functionality to access health information.

The DGIS is currently reviewing the Official Mexican Regulations (NOM040-SSA) on matters of health information. These regulations lay the foundation for data production through the HIS as well as relevant processes and data flows.

Based on the results of the above-mentioned assessments, the Instituto Nacional de Salud Publico (INSP) has developed several capacity building programs and training workshops for human resources involved in health information. In addition, a master's degree program in public health with a focus on biostatistics and health information systems has recently been launched. The program is available both virtually and through classroom setting and meets the need to strengthen HIS staff capacity.

3.3.2 Honduras

The Honduras HIS is stable given that it has been developed in an ongoing manner for several years. The system enables collecting data and products from various technical/regulatory programs and other external systems. However, recent studies have shown that the HIS in Honduras has serious deficiencies, especially in regard to reliable data sources, establishment and standardization of indicators, analysis, use, and dissemination of the generated information.

The existing information sub-systems show varying degrees of development are not integrated and operate independently from each other. The sub-systems include the Epidemiology and Health Surveillance Information System (SIEVIS), the Administrative/Financial Management Information System (SIGAF), the Regulation Information System (SIRE), PROHOSPITAL, the Administrative/Financial System for Hospitals (SAFH), WINSIG, the PAHO Management Information System (SIGO), the PAHO Geo-Referenced Information System (SIGEO), the Health Information System (SIS), as well as existing systems for programs addressing tuberculosis, AIDS, and immunization programs.

In early 2006, the Honduras Health Secretariat conducted an assessment with the aim of establishing strategies to strengthen the HIS. The HMN framework and tools were used to carry out the assessment, together with OBAT from the PRISM reference framework. The results, together with input from other studies conducted by various agencies and consultants in the past five years, were used by an Ad hoc Committee in collaboration with different health sector institutions and key actors as the starting point to develop a strategic plan to strengthen the HIS in Honduras.

Data Collection

The Spanish language was adjusted to the Honduran context, particularly with the adjustment of the measurement indicators to render them more objective and comprehensible. The tools were applied through group interviews, with experts from the health information units of key national health institutions. The tool was applied with approximately 65 HIS officials.

Results Analysis

The results show that most deficiencies are related to organizational factors such as lack of criteria for decision-making, lack of recognition of merits and use of rewards, and deficiencies in the use and quality control of data. The OBAT enabled exploring the promotion of an information culture, organizational factors, perceived self-competency, motivation, and finally, competencies in analysis and use of information.

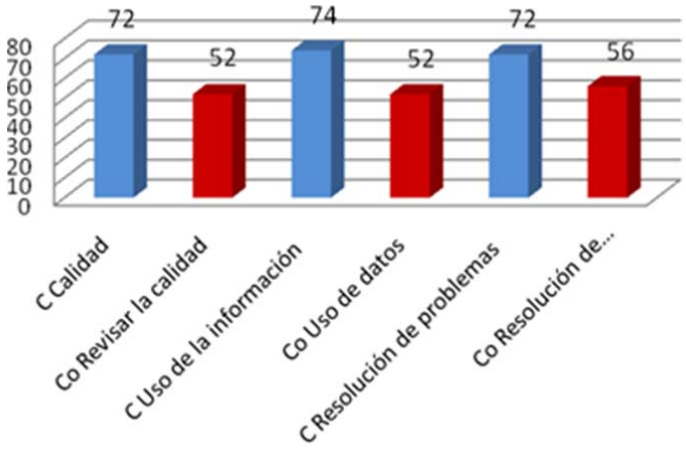
» Some of the identified deficiencies are a result of technical issues relating to data quality, information system design, and technology availability. The deficiencies relating to organizational or environmental issues are the absence of a strong organizational culture, relevant administrative structures, and allocation of roles and responsibilities. The behavioral issues relate to levels of knowledge, skills, attitudes, and values.

» The deficiencies of the current system do not facilitate its management. Limitations in terms of coverage are due to a lack of human and financial resources and are organizational in nature. The lack of integrity is a result of the above-mentioned factors. This is further aggravated by the lack of compliance with established procedures and sufficient regulations required to standardize processes. Managers who are the priority users of the information do not prioritize development and compliance with standardized processes

» Seventy-two percent of the informants mentioned the importance of reviewing the data quality, while only 52% were able to mention at least two methods for doing so. Therefore, the quality of the information is affected by the lack of implicit or explicit validation procedures in sub-systems of the statistics process and other areas that are not related to statistics.

» About 72% of the informants believed that problem solving is promoted. However, only 56% of these exhibited problem solving skills. With respect to use of information (Figure 44), 72% of the informants expressed that the information system promotes use of information; however, only 52% demonstrated skills to identify and solve problems related to information use. The respondents concluded there is no demand for the information that is generated and the information is not systematically analyzed. When the generated information is not used appropriately, it contributes to the deterioration and absence of interactions between data producers and data users. The results show an organizational culture lacking in information management for management purposes as well as for information to be used in developing and implementing health and social policy; currently, information is basically used for vital statistics and morbidity statistics.

Figure 44 Honduras: Comparing the Culture of Information Against Observed Competencies



Translated text of Figure 44: C Quality; OC Quality control; C Use of information; OC Use of data; C Problem solving; OC Problem solving. *Source: Country Report.*

Implementing the Assessment Results

As a result of the assessment, nine strategic objectives have been established prioritizing actions to address the identified problems. In addition, the time and budget required to implement these strategies, actions, and tasks have been estimated. This will enable mobilizing resources – first at a national level and, in a parallel manner, external cooperation for specific aspects as required.

The HIS strategic plan is a development tool that enables addressing priority problems (relating to information and information technologies) and identifying resources (technical, financial, material,) required for its implementation.

» Specific achievements include securing financial support from the Canadian International Development Agency (CIDA) to implement the strategic plan to strengthen the Health Secretariat HIS.

» The conceptual and legal framework and the role of strategic leadership of the Information Systems Unit (ASI) were reviewed. This task was carried out together with the Legal Unit of the Health Secretariat. The legal, conceptual, and strategic framework of ASI have been validated and will be used for the organizational model to be followed in implementing the Strategic Plan and achieving other related objectives.

» In addition, the existing components of the ASI organizational model were analyzed, adjusted, and strengthened, and a manual on the structure and functions of the Management Planning and Evaluation Unit of the Health Secretariat was developed. In reviewing the conceptual framework, critical roles, processes, and products in this unit were analyzed and procedures were developed to implement these processes, which is how the model becomes operational. Once the critical processes had been defined, validated, and their respective procedures had been established, the organizational structure of the unit was reviewed and validated. This facilitated strengthening job descriptions, and significant efforts were made to align the structure with processes and job descriptions. Thus, the model was developed. The model includes all the interactions with the other units from the Health Secretariat and key actors, as well as coordination mechanisms.

» Training conducted for the unit management team on implementation of the reviewed ASI organizational model.

3.3.3 Paraguay

Paraguay's Ministry of Public Health and Social Welfare (MSPYBS) designed and implemented a HIS in 1992. However, its components are not integrated, operations are weak, and the human and financial resources required for optimal performance are not available. In 2000 a short-lived Committee was established to redesign the HIS.

In September 2005 the committee on HIS redesign was reactivated. The committee carried out an assessment of the HIS situation through surveys conducted at two levels: general directorates from the central level and regional directorates. The objective of the assessment was to develop a platform for redesigning the HIS that recognized the importance of integrating the other sub-sectors into the system as well.

In February 2006 the PAHO/MEASURE Evaluation project proposed the MSPYBS join them in working on HIS strengthening. The National authorities and technical staff from PAHO, MEASURE Evaluation and the USAID mission in Paraguay agreed to include Paraguay in the joint HIS strengthening project. Since the MSPYBS had already undertaken a HIS assessment, working together would complement work already completed and guide decisions relating to redesign and priority-setting. A Paraguayan Inter-institutional technical team was established,

coordinated by MSPYBS and including representatives from the Institute of Social Welfare (IPS), the Military Health Unit, the Police Health Unit, and the General Directorate of Statistics, Surveys, and Censuses (DGEEC).

In September of the same year, representatives from the inter-institutional technical team (MSPYBS, IPS and DGEEC) participated in a workshop on improving RHIS management performance held in Cuernavaca, Mexico that allowed them to gain knowledge, experience, and skills required to use the PRISM tools. Paraguay applied the PRISM tools in two stages: the OBAT in December 2006 and the remaining tools in June-September 2007.

Data Collection

The sample included 110 health facilities distributed in the following way: 85 health facilities from the central level, nine at regional directorates reporting to MSPYBS, and 16 health facilities from IPS, military health, and police health.

Data were collected using the management assessment tool, the HIS overview, and the facility checklist. The MSPYBS established the health system levels used to assess the RHIS management; the assessment was conducted using observation, record reviews, and direct interviews.

The OBAT was applied in a sample of 90 health facilities from a total number of 849 health facilities reporting to MSBYBS. In addition, representatives from eight health facilities reporting to IPS, one military health facility, and one police health facility participated in the survey.

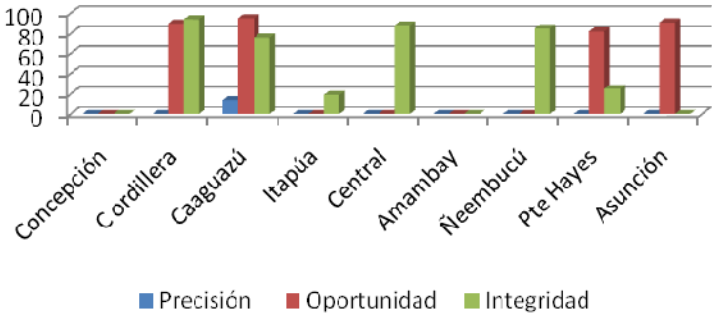
Results Analysis

Results showed that the quality of data generated through the HIS of the regional directorates is low. According to measurement standards established in the PRISM tools, the scores for the majority of health regions are zero for all three indicators, since they did not comply with the minimum error levels that are acceptable for the measurement of indicators (Figure 45).

Analysis results of the data quality indicators showed (independently from each other) only two health regions with scores higher than zero for Data Accuracy, and four health regions with scores higher than zero for Timeliness of Data. However, for the Data Integrity indicator, most of the health regions (six) achieved percentages higher than zero. Nonetheless, it is important to mention that the monthly reports for some health regions were not recorded due to lack of personnel dedicated to this scoring task and therefore they were not reviewed. As a result, scores of zero were allocated to these health regions in the final results.

Some difficulties faced in the assessment included lack of access to reports from computerized databases due to the lack of supplies which precluded printing the reports (Asunción); a score of zero was recorded for this health region. The score of zero for the Central Health Region is due to the fact that neither manual nor computerized reports were available to be reviewed, since no staff are currently available to carry out this task and, therefore, reports have not been compiled.

Figure 45 Paraguay: Quality and Its Components, by Region



Translated text of Figure 45: Quality and its Components, by Region; Paraguay; Accuracy; Timeliness; Integrity
Source: Country Report.

In other cases, manual records of the reports did not exist due to lack of financial resources to make copies of the original reports. In Concepción and Amambay, data from reports were directly entered into computer systems and the original reports were returned to the health facilities. Therefore, a score could not be obtained for timeliness of data and data integrity in these health regions. Only two health regions Cordillera and Caaguazú achieved percentages higher than zero for all quality indicators that were considered, and Presidente Hayes Health Region achieved a percentage higher than zero for timeliness of data and data integrity.

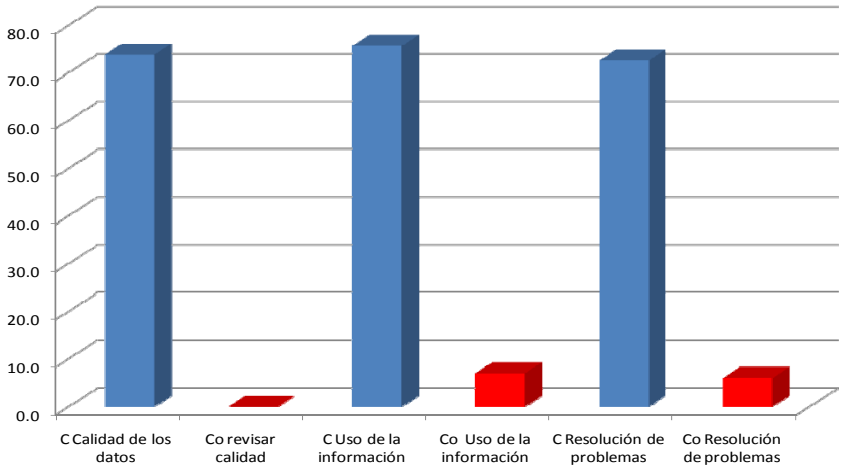
One of the components with the lowest score was "Culture of Information and Observed Competencies" with an average percentage of 7.0%. Informants expressed a nearly complete lack of knowledge about methods for reviewing data quality, insufficient problem solving skills, and insufficient knowledge about the importance of collecting data on a monthly basis (Figure 46).

» Knowledge of the logic and importance of collecting data is relatively low, 13.5%.

» To assess "knowledge of methods for reviewing the quality of data," informants were requested to describe at least three methods for reviewing the quality of data (open question). This indicator showed that, on average, only 0.2% of the informants have the skills required to review the quality of data. This indicator achieved the lowest percentage in the entire assessment.

» Observed competencies relating to "problem solving skills" were 6.0%, on average.

Figure 46 Paraguay: Culture of Information and Observed Competencies



Translated text of Figure 46: Culture of Information and Observed Competencies in Paraguay; C Quality of data; OC Reviewing quality of data; C Use of information; OC Use of information; C Problem solving; OC Problem solving
Source: Country Report.

Implementing the Results of the Assessment

Paraguay has made significant progress in implementing a variety of interventions to improve their HIS. Some interventions, among many others, that have helped to strengthen HIS processes and human resources are described below.

Several sub-systems are being developed. For example, efforts are being implemented to use new methodologies to strengthen the health information sub-system for vital statistics, with the aim of improving the quality of data and increasing coverage.

The design of the health service information sub-system has been completed, including the following: data entry records, procedures manuals, training human resources involved in different areas (medical, nursing, and statistics). This sub-system is currently in the process of being implemented. Consequently, it is not possible to state that a completely integrated system is yet in place in Paraguay.

Establishment of human resources training: A program for a technical training course on information recording and systems has been designed and developed with support from the local PAHO office. The course is oriented toward officials specifically involved in the area of statistics in health institutions at a sub-national level. In addition, human resources working in sub-national health systems are being strengthened through training on information recording and analysis through programs such as SPSS, Epi-Info, and coding with ICD-10. Furthermore, agreements have been signed with universities and national and international institutes to train staff.

Investments in infrastructure and technology have been made for the national HIS, for example:

» The DIGIES has been installed at the central level.
» A data center with WEB connection has been created.

» An Internet network has been established, which includes the 18 health regions (district hospitals) and computer equipment has been installed in each one of them.
» An agreement has been signed between the Ministry of Health of Paraguay and the Ministry of Planning of Brazil to use their public portal.
» The Ministry of Health has developed a Web page that is being updated with information and training materials in an ongoing basis.
» A technical cooperation between countries (TCC) project has been established with Brazil to manage and disseminate knowledge about health.
» Pilot test Implementation of the Health Service Information Sub-system (SSISS) new data collection tools.

3.3.4 Dominican Republic

In the Dominican Republic, the HIS is mixed and is characterized by high fragmentation and lack of articulation between different sub-sectors. Many actors from the public sub-sectors participate in the HIS, such as: the Secretariat of Public Health (SESPAS), the Health Unit of the Armed Forces (ISFA), the National Police Force (PN), the Dominican Social Security Institute (IDSS), and the private sub-sector. The Secretariat of Public Health and Social Welfare has the leading role. An institutional information system is in place at SESPAS which includes three components: epidemiological surveillance, service statistics, and vital statistics. The components are not integrated and multiple sub-systems exist, which leads to duplication of the information that is produced, mainly at the local level, and affects the quality of the data that are being generated. Processing and analysis capacities are weak, and use of information generated through the system for decision-making and interventions is very low.

SESPAS carried out an assessment of the health sector HIS with the aim of establishing HIS strengthening strategies. The PRISM tools were used to conduct this assessment and included gathering information on the organizational and behavioral factors that affect the RHIS performance. This enabled updating proposals for a strategic plan to strengthen the HIS with the aim of improving the health status of the population.

Data Collection

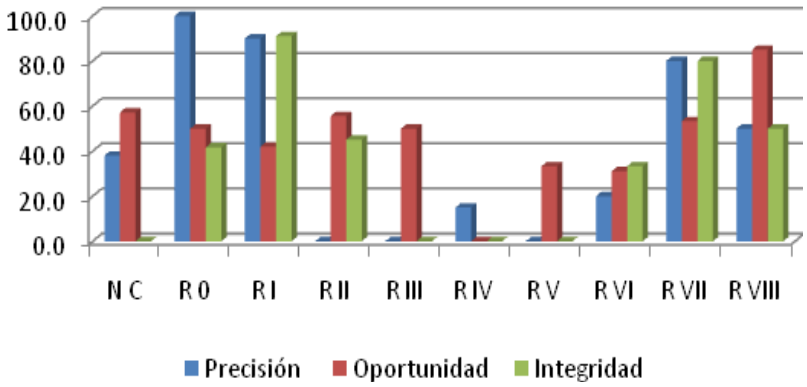
Data collected under the assessment cover the entire national territory, composed of nine health regions with representatives from each hierarchy level. Health facilities within each health region that are included in the network of public health service provision (SESPAS, IDSS, Military Health, and Police Health) were assessed by level of complexity. A total number of 93 health facilities exist in the country.

Results Analysis

Supervisors were in charge of reviewing the consistency of the data collected through the use of the PRISM tools. The General Directorate of Statistical Information of SESPAS coded and entered data in Microsoft Excel to create a database, make calculations, and design tables and graphs. The results clearly show opportunities for system strengthening interventions.

The quality of data (Figure 47) is assessed through three indicators: accuracy, timeliness, and integrity. In general, it was observed that the quality of HIS data at the regional directorates' level is medium to low. In accordance with the measurement standards from the PRISM tools, Figure 48 shows that the scores for some regions are zero when they do not comply with minimum acceptable levels of error. The lack of available data in physical or electronic format precluded access to information sources to record data in the tools and calculate indicators.

Figure 47 Dominican Republic: Quality and its Components, Central Level and Regions



Translated text of Figure 47: Quality and its Components, Central Level and Regions, Dominican Republic; Accuracy; Timeliness; Integrity. *Source: Country Report.*

It was observed that the use of different instruments to collect data for monthly reports affects the quality of the financial report on determining the supply and demand for services. Results (Table 7) for use of information at health facilities show that most percentages are medium to low. It is at this level that data are collected and should be reported. Use of information achieved the highest percentage, showing significant heterogeneity. Regions I and VII achieved 80.0% and 79.0%, respectively, while facilities from the other regions achieved percentages of 55.0% to 74.0%.

Presentation of information and data analysis show the lowest percentages (32.0% and 29.0% respectively). With regard to presentation of information, Region V shows the highest percentage (53.0%) and Region I shows the lowest percentage (14.0%). Furthermore, in regard to data analysis, percentages range from 16.0% to 49.0%. Once again, Regions V and VII show the highest percentages; and Regions II and III show the lowest percentages (16.0% and 18.0%, respectively). Regions V and II had the highest and lowest results at 63% and 15% respectively while all the other Regions fell in the 30 and 40 percentiles.

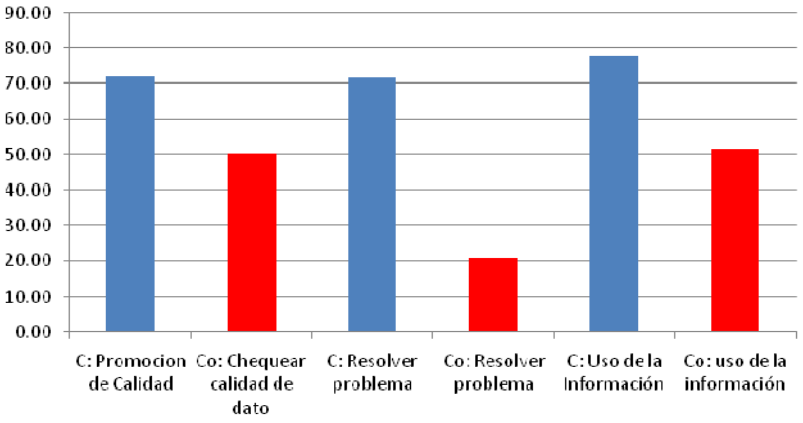
Table 7 Dominican Republic: Use of Information at Health Facilities

Region	Reports	Presentation	Analysis	Discussion
Total	66%	32%	29%	41%
0	57%	42%	35%	42%
I	80%	14%	20%	35%
II	67%	20%	16%	15%
III	58%	17%	18%	52%
IV	58%	34%	27%	48%
V	73%	53%	49%	63%
VI	74%	41%	23%	43%
VII	79%	46%	43%	38%
VIII	55%	21%	31%	38%

Source: Country Report.

The use of OBAT (Figure 48) enabled identifying gaps between the perceived promotion of a culture of information and competencies, and real knowledge of informants.

Figure 48 Dominican Republic: Culture of Information and Observed Competencies



Translated text of Figure 48: C: Promoting quality of data; OC: Verifying quality of data; C: Problem solving; OC: Problem solving; C: Use of information; OC: Use of information. *Source: Country Report.*

» About 72.0% of the informants believed that the HIS supports reviewing the quality of data but only 50.0% were able to mention at least two methods for reviewing data quality.

» About 78.0% of the informants believed that the HIS promotes use of information; however, only 51.0% were able to show how information is used.

» Approximately 72.0% of the informants thought that the HIS promotes problem solving skills, but only 21.0% proved having skills for identifying and solving problems.

» The lowest results were obtained for evidence-based decision making, empowerment, and accountability.

Implementing the Results of the Assessment

The results of the assessments (HMN and PRISM) were used for the following:

» Developing a national strategic plan to strengthen the HIS with a strong focus on training and capacity building of human resources.
» Developing HIS strengthening plans with participation of the Directorate of Training and Statistics (DIES).
» Reactivating the Inter-institutional Technical Group, particularly the group working on vital statistics and technical staff and experts from the other priority sub-systems, such as: population statistics, morbidity, and primary health care level clinical management.

3.3.5 Peru

In 1999 the Arthur Andersen consulting firm conducted a study on "Strengthening Health Services in Peru" and concluded that the health information system is characterized by a proliferation of automated islands in various central and decentralized units; each area manages its own procurement, contracting, and information technology through its own separate set of criteria. The report also stated the health information system's development is empirical, isolated and with little direction, technically incompatible systems, obsolete, and lacking interfaces. The local databases are small, disjointed with outdated technology, operations primarily performed manually, and produce many applications, precarious duplication, limited in scope, and delayed information of poor quality.

In 2004, PAHO conducted a situational assessment related to Vital Statistics in which Peru ranked in the fourth lowest group characterized as having low levels of coverage and data quality. The study also cited: little capacity building and training of HIS personnel, lack of standards, a negative perception of the producers of information, lack of interagency committees and empowerment to make decisions. The study found that there is no general analysis of morbidity statistics and resources even at the basic level or regional level.

Both studies mainly covered the technical quality of the information system and were based on secondary sources; they did not evaluate the system within the regions.

Shortly after having applied the HMN framework and assessment tool, the Ministry of Health proposed assessing the determinants of the information system using the PRISM framework and tools. The General Office of Statistics and Informatics and the Department of Epidemiology, the Regional Directorates of Health, led this initiative with the technical and financial support of USAID Health Policy Initiative, MEASURE Evaluation and PAHO.

Apart from the PRISM diagnostic tools, adapted to the characteristics of the Ministry of Health's RHIS, Peru developed additional tools to collect information on the technical quality of the data and on the characteristics of vital events. Tools

were developed for the transmission of data, transmission of databases, live birth statistical reports, and statistical reports on death.

Data Collection

The sample covered the national and regional level, including the participation of 12 regions and the four health directorates of Lima, 247 health facilities (50 hospitals and 197 health centers), and an average of five health workers from each health facility. The PRISM tools[54] were used, adapting them to the characteristics of Peru's RHIS. Sixteen workshops on the PRISM methodology were held for participants from the regions and health directorates. Peru developed a PRISM User Guide for training and implementation at the local level.

To facilitate data entry and statistical analysis, Microsoft Excel was used to create tables, graphs, and indicators in an immediate manner. This enabled presenting the results to health facility management teams and consolidating the results of facilities at a regional level.

Results Analysis

The health system includes health facilities reporting to the Ministry of Health (6,821), Social Security (330), Military Health and Police Health (60), and private facilities (564), including a minimum number of hospitals—most of the health facilities are clinics and policlinics.

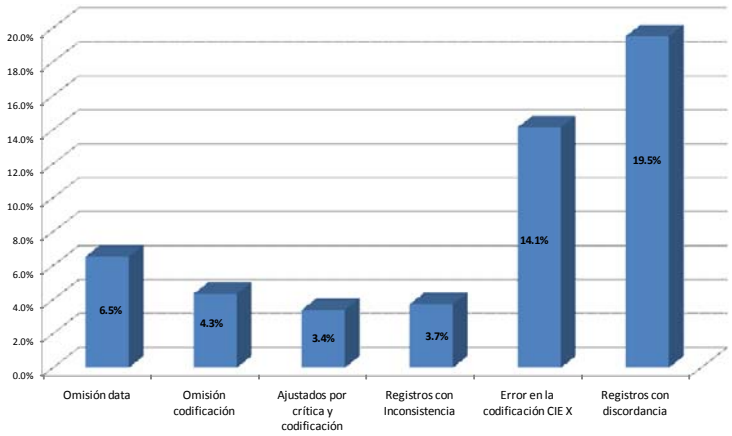
Health facilities generate information on ambulatory patient consultations, hospitalization, and emergency health care, as well as preventive, promotional, and control activities. This information flows through parallel channels in each institution without reaching the Ministry of Health, where national statistics are generated.

In 2008, the Ministry of Health, the Institute of Statistics and Computer Science, and the Health Policy Initiative began a process to improve the HIS. MEASURE Evaluation and PAHO later joined this effort. The assessment was financed by the national government, regional governments, the Health Policy Initiative, and MEASURE Evaluation.

The results show weaknesses in data quality. Figure 49 shows the indicators and their results for ambulatory care. The percentage for data omission in records is 6.5%; coding omissions, 4.3%; records with inconsistencies, 3.7%; errors in ICD-10 coding, 14.1%. Of the total errors, only 3.4% are adjusted by the reviewing and coding staff, and the adjustments do not ensure the quality of data; 19.5% of the data from the records differ from the information included in clinical records. These indicators show difficulties regarding data quality.

[54] For more information see HMN—MEASURE Evaluation—PAHO (S/F). Evaluación del Sistema de Información en Salud a nivel Regional en el Perú: Marco de Referencia, propuesta metodológica y momentos de desarrollo. Lima, Peru.

Figure 49 **Peru: Quality of Data from Daily Records of Services Provided to Ambulatory Patients at Health Facilities, 2009**



Translated text of Figure 49: Omission of data; Omissions in coding; Adjusted by reviewing and coding staff; Records with inconsistencies; Errors in CIE X coding; Records with discrepancies. *Source: Country Report.*

» The results from applying the OBAT (Figure 49) show that while 73.3% of the staff recognize the importance of high quality information, most do not have the knowledge, skills, and capabilities to review the quality of data—only 35.2 % do.

» In regard to data completion, a similar situation exists: self-perceived competency is 73.6% but observed competency is only 46.1%.

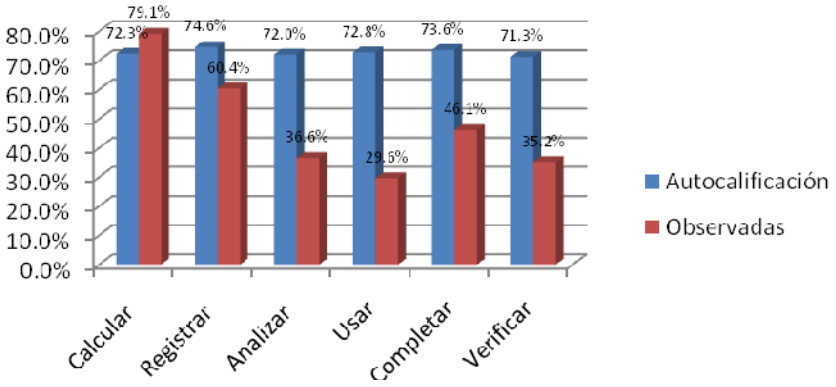
» The average for self-perceived competency is 72.5%, while the average for observed competency is 41.3%. This shows a 31.3% gap between self-perception and real knowledge.

» The competencies with the lowest percentages are those related to Data Analysis (36.6%) and Use of Information (29.6%).

» In regard to organizational factors, no more than 27.0% of the staff have been trained to carry out tasks related to the HIS.

» Data recording manuals were available in 19.1% of the health facilities.

Figure 50 Peru: Self-evaluation and Observed Competencies in Health Facility Staff



Translated text of Figure 50: Calculating; Recording; Analyzing; Completing; Verifying; Self-assessment; Observed
Source: Country Report.

Implementing the Results of the Assessment

The results of the assessment have led to immediate and medium-term actions, including the following:

» **Actions:** Workshops were held to establish a local plan of action in each health facility included in the study. Once each facility's management team received the results, they classified problems according to those to help improve facilities and those that were contingent on other management levels.

» **Local Action Plans:** Strategies to strengthen the HIS have been identified and necessary actions to implement these were defined. HIS management teams and staff in each facility developed a total of 247 action plans to improve information. The statistician's quantitative data provides the evidence of the important role health service providers play in the HIS strengthening process. Impressed by the quantitative results, the facility managers have committed to the HIS strengthening process through signed agreements.

» **Regional Health Plans:** Different advances have been achieved in the Regional Directorates.

- *San Martín Region:* In this region one of the established objectives was to support the strengthening of the regional HIS so that it could become a reference tool in decision-making and could then enable timely monitoring of social indicators, Comprehensive Dashboard.

- *Huánuco Region:* a regional plan of action for HIS strengthening,[55] reporting organ of the HIS.
- *Cuzco Region:* HIS-related actions have been included in the Operational Plan 2009. Objective: "To implement preventive measures, risk and damage control resulting from emergency situations and natural disasters." Specific Objectives:

[55] http://www.minsa.gob.pe/diresahuanuco/OITE/ADJUNTOS/2009/plansisteminfsalud.pdf

To develop the public health surveillance system, to conduct an assessment of the health status as a planning and management tool, and improve the quality and timeliness of comprehensive information used in decision-making.[56]

- *Huancavelica Region:* The Directorate of the Health Region (DIRESA) received a quality of information and technology innovation award for its implementation of innovative HIS-Report software that enables users to obtain accurate reports on maternal mortality, malnutrition, and disease indicators in this region.

- *Junín Region:* Regional government-level technical committees and regional health work groups were developed as an Integrated Information System.

- *Lima Region:* This region, among all others, has received special recognition. It includes all the departmental provinces in carrying out improvement processes in networks and health facilities. The objective is to ensure implementation of an integrated information system thus generating up-to-date, high quality information that enables analysis.[57] A computerized HIS auditing system was used to improve the quality of data. An HIS information reporting system and one for emergency and patient discharge were used to facilitate data analysis.

- *Lima Health Directorates:* A HIS reporting system has been established at the Eastern Lima Health Directorate. Actions implemented at the City of Lima Health Directorate include, among others, the publication of an article in the Peruvian magazine for epidemiology" ("Revista Peruana de Epidemiología").[58]

- *Equipment:* Due to the commitment taken on by regional authorities, computer equipment and servers have been obtained and are being operated by the regions that conducted assessments

3.3.6 Ecuador

The health system in Ecuador, led by the Ministry of Public Health (MSP), is divided into different sub-sectors. No definitive figures are available on health service coverage, but an estimated 60.0% of the population is covered by MSP, 17.0% by Social Security, 3.0% by the Social Security System of Military Health and Police Health, and 10.0% by the Charity Board of Guayaquil (JBG), municipalities, and the private sector. The Organic Law of the National Health System establishes that the objective of the national health system is to improve the health and the quality of life status of the Ecuadorian population and to ensure they exercise their right to health. The national health system is composed of public, private, autonomous, and community organizations from the health sector which coordinate actions in a functional manner based on common principles, policies, objectives, and rules.

[56] http://www.diresacusco.gob.pe/planeamiento/documentos%20de%20Gestion/poi-2009.pdf
[57] http://www.regionlima.gob.pe/direcciones/diresa/descargas/LINEAMIENTOS%20DE%20POLITICA.pdf
[58] http://rpe.epiredperu.net/portada.html

In March 2009, an Inter-institutional Committee was established that included representatives from the Ministry of Public Health (MSP), the National Institute of Statistics and Censuses (INEC), the Generate Directorate of Civil Registry, Identification, and Registration (RC), and the National Secretariat of Planning and Development (SENPLADES). The initial objective of the Committee was to improve the administrative registers of vital events, and this was taken into account when conducting the assessment of the entire HIS.

The PAHO/MEASURE Evaluation proposal for the use of the HMN and PRISM frameworks and HIS assessment tools was approved in July 2010. The HMN tool was applied to gain a general overview of the HIS. The PRISM Tools were also used to complement this assessment with the goal of analyzing the RHIS in more depth.

In October 2010, after a tool implementation workshop, it was agreed to conduct an HIS assessment in Ecuador. A schedule of activities to be carried out with benchmarks and a plan for the implementation of the entire assessment process was developed. It included everything from review and modification of the tools to the development of an HIS Strengthening Plan; a supporting budget was also elaborated.

In general, results from applying the HMN and PRISM tools show that data are the weakest aspect of the HIS and the RHIS. The following dimensions were assessed: data sources, data management, data disaggregation, periodicity, consistency, and resources, which include the legal framework, intra- and inter-institutional coordination, human resources, institutions, and HIS infrastructure.

Data Collection

In conducting this survey, key officials from the RHIS in each Provincial Health Directorate (11) and a selected sample of health units (96) from the sample were interviewed. It should be noted that the Provincial Health Directorates are not health service providers but administrative units. Therefore, when applying the PRISM tools 107 health facilities were selected, however the province of Galápagos was not included. The assessed health facilities were located in urban areas of the municipalities. The rural zones were not considered because of the low level of influence by these peripheral units on the RHIS, their small numbers in population, resulting in very few data collected and the information is only submitted to Area Manager quarters (a hospital or health center) located in an urban area.

Results Analysis

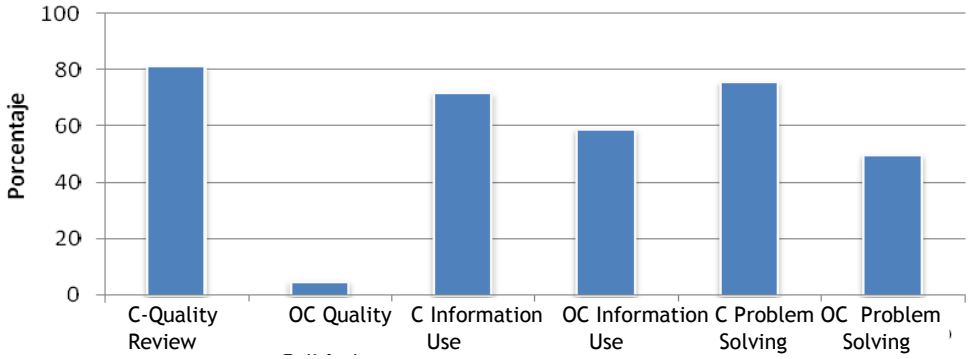
» Significant differences exist between promotion of data quality and the observed competencies in reviewing data quality. A percentage of approximately 79% was obtained for the indicator of promoting data quality. Only 5.0% of those interviewed demonstrated actual skill in reviewing the quality of data (Figure 52).

» The low percentages obtained for observed competency in the items reviewing data quality, the importance health providers place on data collection, and use of information suggest that, while the organization promotes it and staff is aware of it, their practices don't reflect the importance of data quality. Therefore, the tools or methods used to review data quality should be examined for their relevance.

» The percentage for problem solving skills is 48.0%. This suggests a low level of problem solving skills, which include identifying a problem, defining it correctly, and developing a relevant plan of action to solve it.

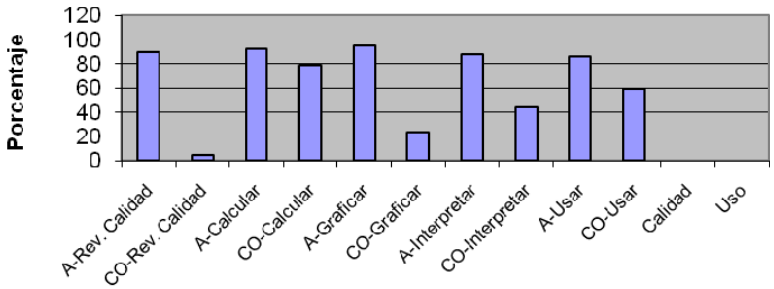
» The percentages for observed competency to do calculations showed that 78.0% of those interviewed knew how to calculate data although 59.0% do not know how to use information. Furthermore, only 44.0% know how to interpret data, only 24.0% are able to develop graphs, and only about 5.0% are familiar with methods for reviewing the quality of data (Figure 51).

Figure 51 **Ecuador: Promoting Quality of Data Compared Against Use of Data (C) and Observed Competency related to Quality of Data and Use of Data (OC)**



Source: Country Report.

Figure 52 **Perceived Level of Confidence Compared Against Observed Competency to Carry Out HIS-related Tasks, Review the Quality of Data, and Use Data**



Translated text of Figure 52: Percentage; A Review ing quality of data/OC Reviewing quality of data/A Calculating; OC Calculating/A Preparing graphs/OC Preparing graphs/A Interpreting data; OC Interpreting data/A Use of information/ OC Use of information/Quality/Use. *Source: Country Report.*

Implementing the Results of the Assessment

Based on an analysis of the assessment results and given the obvious need to strengthen the HIS in the country, the Inter-institutional Committee considered that gaining political support from the highest level of authorities of the involved institutions was essential for the next phase: implementation of the Strategic Plan. The institution in charge of implementing the process—SENPLADES—suggested that training human resources should not only be a priority but that it should be implemented before or in conjunction with processes to improve computer systems and the communication technology platform.

The information systems concept is very broad and includes various priority components, such as human resources training and computer platform development, which need to be implemented in a synergetic and complementary manner. The following priority recommendations were proposed, with the goal of ensuring financial sustainability, effectiveness of the implementation actions, and the impact of the interventions.

» Make commitments to maintain and strengthen actions by the Inter-institutional Committee to ensure implementation, coordination in all sectors, and monitoring and evaluation of the Strategic Plan.
» Design a Monitoring and Evaluation Plan that measures advances in the implementation of the Strategic Plan, identifies its weaknesses or obstacles, and proposes changes in the course of action if required.
» Develop a proposal for a budget to be analyzed by SENPLADES and to achieve financial sustainability of the project and monitoring activities.
» Involve staff designing software and virtual platforms from the MSP to coordinate actions within the implementation framework of the Plan.
» Incorporate the Social Security System, due to the large number of health facilities they own, into the National Committee as a key player in the process.

3.3.7 Brazil

Brazil did not apply the PRISM tools but as mentioned, it participated in the Project jointly with Mexico in 2005. MEASURE Evaluation and PAHO proposed documenting the 10 year experience of the Brazilian HIS reform and sharing it with other countries in the region who could benefit from this information. Such actions would create an enabling environment for countries reforming or restructuring their HIS and to contribute to the development of a growing database resource of regional experiences. The Brazilian experience of its national HIS is especially relevant for other Latin American countries and their efforts in this area are particularly significant. MEASURE Evaluation and PAHO provided technical assistance to document this experience, highlighting lessons learned, successful experiences, appropriate practices, and key processes. The effort culminated in the publication of two books—one on production and dissemination of health information in Brazil and the other on the Brazilian experiences in health information systems.[59]

Some common aspects in the results from applying the PRISM Tool in different countries are as follows:

» It has been observed that the two components of performance – data quality and use of information - show varying behaviors. Use of information has consistently achieved fairly high scores in all countries, while data quality shows low percentages. This could indicate that information use is not always linked to data quality. Appropriate use of information does not guarantee high quality of data. This confirms that other aspects such as the determining factors

[59] For more information see Ministry of Health—PAHO, Fundacion Oswaldo Cruz (2009). A experiência brasileira em sistemas de informação em saúde,Volume 1, Produção e disseminação de informações sobre saúde no Brasil; y A experiência brasileira em sistemas de informação em saúde, Volume 2 Falando sobre os sistemas de informação em saúde no Brasil.

measured through the PRISM tools have an impact as well. The same is true for the opposite situation – higher quality of data does not necessarily mean that information is used appropriately.

» Behavioral factors also have a direct impact on the performance of the system and processes such as data collection, filling out forms, data integration, capturing, transmission, processing, analysis, presentation, and feedback are affected by the gaps between real competencies and perceived competencies of health care professionals. Furthermore, in most countries, the limited knowledge about the usefulness of data has been the primary factor linked to low quality of data and use of information. These and other identified gaps relating to knowledge of methods and skills to verify the quality of data and interpret data, problem solving skills, and the capacity or skills to implement processes, have been incorporated into these countries' strategic plans as priority elements in improving the HIS.

» With respect to the organizational factors, the absence or promotion of a culture of information directly affects the performance of the RHIS in most countries where assessments have been conducted. That is, if a working environment where key attitudes, values (evidence-based decision-making, empowerment, problem solving, accountability, and rewarding good performance, and activities related to the RHIS are emphasized) do not exist, health workers do not internalize the values required to generate, maintain, and change the information system. Moreover, in regards to the administrative functions of the HIS, the primary weaknesses in terms of governance and training have been observed to be related to evidence-based decision-making, rewarding good performance, and quality of supervision visits and feedback.

» An analysis of the technical factors has revealed that deficiencies in most countries lie within components related to information technologies, development of software for data processing and analysis, development of indicators, design of data collection forms, and development of procedure manuals. The majority of countries that have carried out assessments have included relevant improvement plans or interventions in their strategic plans, for future development related to these issues.

» Lastly, routine health information systems interventions are complex and therefore difficult to detect their direct and immediate impact on health systems. The changes in technical and behavioral components are easier to gage in the short run but it takes a significant period of time for organizational interventions to achieve performance gains.

Section 4 Final Considerations

This final section first focuses on results and impacts for the project, the countries, and the region. Next, limitations of the tools are described as well as how tools could be improved in subsequent versions. And finally, the lessons learned by all the involved actors are included, as well as aspects that should be considered in the future.

4.1 RESULTS AND IMPACTS

PAHO and USAID/MEASURE Evaluation have led the joint project on strengthening HIS in countries in the Americas, obtaining two major results since 2004 and creating significant synergies between countries (particularly between the Spanish speaking countries and Brazil).

4.1.1 Results and Impact: For the Project and the Countries Themselves

The primary objectives that have been achieved are: to establish a standardized reference framework, methods, and instruments to monitor performance of the HIS; to identify, document, and disseminate successful experiences, key processes, and lessons learned in assessment processes; and to design strategic plans to strengthen the HIS in selected countries.

Participating countries have taken absolute ownership and leadership of the assessment process through use of the HMN, PRISM, and PAHO assessment tools, developing and implementing their own strategies to strengthen their HIS. This is done in compliance with one of the primary objectives of the 2005 Paris Declaration in which countries agreed to be in charge of their own development processes.

Clearly, implementing the HMN and PRISM tools has contributed to the following: strengthening, improving, and promoting the development of HIS in general; greater investment in management and staffing of the HIS and the health system; improving the quality of information production processes; improving policy-making, planning, management, decision making, and monitoring of programs; developing and implementing strategic plans to guide strengthening processes; and incorporating HIS in public policy.

The project has increased its potential by integrating three current efforts in the region: the HMN initiative; the PRISM initiative; and the PAHO initiative, through their Health and Information Analysis Project, particularly the Regional Plan to Strengthen Vital and Health Statistics (PEVS).

The project has promoted technical assistance through South-South cooperation.

The integrated contribution of conceptual frameworks and tools has enabled the countries and the project to achieve the following: defining the different stages of the HIS data production process; describing for each level—local, intermediate,

and central—the processes, inputs, and products for each data source and, thus, identifying data-related problems for each phase; identifying the determining factors for each problem and establishing the required interventions to minimize the impact of these factors; and learning about the performance level of HIS resources (technological and, essentially, human resources) to assist development HIS strengthening plans.

HIS Assessments have been conducted and strategic plans developed in six countries (the Dominican Republic, Ecuador, Honduras, Mexico, Paraguay, and local plans in Peru). Other countries in the region have developed HIS strengthening plans with the assistance of the HMN, the Mesoamerican Health Initiative or on their own (Belize, El Salvador, Nicaragua, Panama, Argentina, Brazil, Chile, and Cuba).

In addition to the findings relating to HIS performance, efforts implemented under the project include a critical analysis of the assessment tools that have been used, making them suitable for the process of monitoring and evaluating outcomes in these countries.

4.1.2 Results and Impact: For the Region

Once all assessments and strategic plans were finalized and available, it then became necessary to create a network where concrete actions common to the region could be implemented. Thus RELACSIS (Latin American Network to Strengthen HIS) was established in order to exchange, disseminate, implement, monitor, and learn from practices in different countries. It was also an opportune moment for taking full advantage of the existing technical collaboration of donor agencies involved and the ongoing south-to-south collaboration among countries.

RELACSIS was officially launched in Lima, Peru in April 2010. This was the culmination of five years of the HIS strengthening and improvement cycle as well as a strategic alliance between USAID, PAHO and MEASURE Evaluation but most importantly an alliance with all the countries involved in this process. The following conclusions from the Lima meeting should be highlighted:

The purpose of the RELACSIS network is to develop a mechanism to coordinate regional efforts aimed at contributing to the ongoing improvement of HIS in countries included in the Network. The overall objective is to contribute to HIS strengthening, dissemination, and use of information. The specific objectives are focused on:

- proposing standards (methodologies, procedures, techniques, etc.) to generate higher-quality, more reliable, and more timely information;
- developing and sharing practices, lessons learned, and knowledge;
- promoting the dissemination and use of generated information and knowledge;
- promoting monitoring and evaluation of the performance of national HIS;
- strengthening human and financial resources and
- developing and continually promoting south-to-south technical cooperation between countries.

RELACSIS Country teams have been formed and are actively involved in defining future areas of interest for the Network. To date the teams have established commitments to the following areas: goals for improving coverage and quality; identifying information gaps; tool production; sensitization strategies; and human resource capacity building strategies.

A provisional Coordinating Committee (members are from Peru, Cuba, Brazil, Nicaragua and Mexico) and a Technical Network Secretariat (consisting of PAHO, MEASURE Evaluation and the Mexican National Institute of Health) have been established while RELACSIS defines a normative framework.

The Technical Network Secretariat developed mechanisms for communication: A network portal was established and virtual sessions as well as face to face sessions in Cuernavaca, Mexico have been held.

In August 2010, RELACSIS held a "Network Plan of Action" workshop in Cuernavaca, Mexico, where best practices for each attending country were discussed, classified and organized according to a set of priorities (improving the coverage and quality of data on mortality at the local level; improving morbidity statistics; actions related to improving registration of births; and training human resources). The central focus for 2011 will be capacity building and training of health personnel on improving the quality and analysis of morbidity and mortality data through the use of the International Classification of Diseases, version 10 (ICD-10).

4.2 THE TOOLS: LIMITATIONS AND SUGGESTED IMPROVEMENTS

4.2.1 The PAHO Tool

This tool includes too many forms. In addition, collecting data on processes implemented at different administrative and geographic data production levels leads to repeating the same questions and therefore, completing the forms becomes tedious. Revision and simplification of the tools to be more "user friendly" would be useful.

The tool describes processes in a manner that is fairly objective. However, it does not escape the subjectivity of the actor, which is inevitable (as with other tools). Building bias checks into the tools would lead to more objective reporting. The contents of the open ended questions should be reviewed when using them to monitor results.

More follow-up actions should be implemented in regard to demographic, semi-demographic, and mathematical applications. The applications provide highly valuable quantitative information but require special support in countries where a culture of evaluation relating to the HIS production processes does not exist. Unfortunately, the PAHO tool and the HMN tools, which have been used under the project as well, were designed simultaneously but independently. Since the HMN tool includes items on the vital registration/statistics data source there was some content overlap of the PAHO and HMN tools. The inter-agency collaboration established through this Project will help minimize such occurrences in the future.

4.2.2 The HMN Tool

The tool is based on the perceptions of key actors who, depending on which actors are selected, might not have a knowledgeable opinion of the status of all the components that are assessed in the tool. Also some countries chose to have one or two experts respond to an item in their field of expertise rather than using a broader cross section of respondents to respond to the item. The smaller, more select number provides an opportunity for bias influencing the responses.

The tool provides a general view or context of the status of the HIS in the country, but it does not provide specific or detailed information that helps implement specific interventions. Rather it is useful in providing an overall picture of the HIS and is helpful in identifying priority areas for improvement; it also acts as the basis for strategic planning. Respondents found the directions for the tool's use led to methodological ambiguities that could be reflected in the results. A review of the directions for using the tool and calculating the results is suggested with an objective to simplify and clarify the instructions.

The HMN tool provides a general view of the status of the HIS, using a numeric measurement scale that enables establishing a level of development, as perceived by participants. Rich qualitative information about both the tool and the country HIS systems was obtained through comments from the focus group discussions. It is suggested that feedback using the discussion group content be built into the assessment "results" process and instructions for its use included in the revised instructions for the use of the assessment tool.

Places the HIS as a priority on the government agenda. The manner of presenting results is impressive, easy to understand and interpret by decision makers.

4.2.3 The PRISM Tools

Each tool includes a wide array of questions, but not all of them are used in the resulting graphs and indicators that are developed in processing the data. It would be better to only include those questions that will in fact be used, taking care to adjust the tools to different situations of the HIS, from manual data collection and processing to use of state-of-the-art technologies.

The tools are simple and have been designed for less complex systems than might be in place in some Latin American countries. They are of limited use in assessing the HIS in complex systems in the more developed countries in the region. The tools have been designed for manual HIS, while in Latin America a transition toward computerized HIS has been observed. In these cases, some processes that are assessed through these tools are omitted or changed.

No standards have been established for the indicators that are measured with the exception of the OBAT indicators which have been standardized using a seven-step Likert scale. The HMN tool does include such standards. Standards would help countries assess how far they are from an appropriate level of development.

It would be good to have a methodological manual that includes detailed information on the methodology to calculate indicators with an explanation of the established standards and their corresponding results graphs such as those included with the OBAT instrument.

4.2.4 The Future of the Tools to Assess Health Information Systems: Final Considerations

» The countries that have not yet implemented the tools should be encouraged to do so with the aim of establishing a comprehensive framework for the entire region.

» Improve the tools based on the previous experiences with their use.

» Apply the tools in the future 1) with the aim of implementing effective interventions and 2) to measure the capacity of the tools to monitor and evaluate changes.

» Develop interventions aimed at promoting exchange of experiences and supporting the development of the HIS in the region; subsequently the tool should be used to measure the impact of the interventions through a measurement carried out on a later date and compared with the established baseline assessment.

» Collaborate with other agencies and countries to adjust the tools and enrich them by incorporating monitoring and evaluation elements that are not yet included in any of the tools.

» Adjust the tools to the situation of the HIS in Latin America and the Caribbean which can then be useful in conducting a baseline assessment and monitoring HIS strengthening actions after implementation.

» Have simpler, more specific tools including methodological manuals rather than complex tools that preclude taking full advantage of the results. An example of appropriate use of results could be OBAT, which is perhaps the tool that can be adjusted more easily, given the extensive use of results through indicators and graphs developed in implementing the tool.

4.3 LESSONS LEARNED

Executing the project has not been an easy task and numerous difficulties have had to be overcome. The overwhelming willingness and dedication of the involved parties helped, in some cases, to avoid failure in implementing some of the planned activities. The following aspects should be highlighted:

» Following up with countries that conducted an assessment and developed a strategic plan, as well as simultaneously monitoring the implementation of these actions in "new" countries generated a work overload for both PAHO

and MEASURE Evaluation. Two persons (with no support staff) were in charge of carrying out administrative and technical tasks and following up on implementation of workshops and meetings. PAHO has addressed this issue and has currently assigned tasks to other professionals within the project.

» The turnover of public servants with political roles led to changes in the counterparts in some countries, and it was necessary to initiate a process to inform the new officials about the Project's background and previous experiences. This information was well received in the majority of cases. The support provided by PAHO and MEASURE Evaluation to country technical staff who kept their positions despite the institutional changes, was an important factor that favored the acceptance and continued execution of the Project in these countries.

» The limited financial support for HIS strengthening projects is another factor that in some cases delayed the implementation of actions. Therefore, the need for countries to incorporate financing for the HIS into their budgets was heavily emphasized. The countries that were able to do this are a positive example in the Region and by securing funds they have been able to work independently and across boundaries in implementing HIS activities.

» RELACSIS has strengthened south-to-south technical cooperation between countries to exchange successful practices, with the aim of avoiding duplication of efforts in terms of human, technological, and financial resources.

» The aspect of "mainstreaming" vertical programs within the HIS has led to disagreements in some countries. The HIS with numerous sub-systems, some of which comprise a single vertical program that is promoted and financed by donors and international organizations, have hindered, and still do hinder, the existence of an integrated, strong, and harmonized HIS with the capacity to provide information to any sector that requests it. Implementing actions through inter-sectorial committees, even within the ministries of health, is a practice that should not be abandoned and that should be promoted.

» In regard to international organizations, ensuring the coordination of actions within a country has not been easy and continues to be a challenge. The mandate by the UN Secretary-General has not been implemented in its real dimension. Different agencies continue to compete with each other around a common topic within the same country; efforts are duplicated, while the demands placed on country staff wear them out risking the possibility of project failure. Harmonization among donors is a lesson that should be prioritized in future phases of the project.

Finally some achievements occurred in this Project that were critical to its success and which are applicable to other countries and regions. Touched upon briefly earlier in the document they deserve to be highlighted now as a summary statement of the Project.

Country Ownership of the Frameworks and Process

Individuals, institutions and countries supported the HIS strengthening process at its onset and evolved into taking ownership of the process as it progressed. This was one of the most important factors leading to the Project's success. The opportunity for the countries to adapt and adopt the Frameworks and tools to their country's own particular situation and culture was significant in bringing about this sense of ownership.

Creating South-to-South Technical Assistance

One part of the Project strategy was to encourage South-to-South assistance. As the countries became partners, owners, and actors in the process, professionals and institutions in the participating countries became aware of existing expertise present in their countries which could be helpful to others. As the Project advanced this South-to-South technical assistance was made available throughout the Region. Now, through the RELACSIS Network they have created a mechanism in which this expertise can be accessed and the knowledge made available throughout the Region beyond the life of the Project.

Using the Information Strategically

An outcome of the Project was country understanding and buy-in of the Framework and methodology, documenting the results of the assessments and country plans, and strategically channeling and disseminating the results to decision makers which enabled them to take ownership of the process. This led to the decision makers working within and between their countries and helping to mobilize resources for HIS strengthening.

Synthesizing the Frameworks into a New Collaborative Model

Each of the frameworks and tools (PAHO, HMN, PRISM) share similarities and each has its own "sphere of interest, purpose and action". This Project has demonstrated in a very pragmatic and fruitful way that they complement one another and that together they are more powerful than any one tool alone in accomplishing the tasks of strengthening HIS. Looking to the future, it is a task for the organizations that developed these tools to continue to work on their further development and use and to encourage their use in strengthening and maintaining health information systems.

Bibliography

Aqil A, Lippeveld T. (2008). *PRISM Tools for Assessing, Monitoring, and Evaluating the Performance of Routine Health Information Systems. Version 3.0*. June 2008 (Spanish).

Aqil A, Lippeveld T, Hozumi D. (2009). PRISM framework: a paradigm shift for designing, strengthening and evaluating routine health information systems. *Health Policy Plan* 2009; 1–12.

Aqil A, Lippeveld T, Hozumi D. (2005). *Organizational and Behavioral Assessment Tool (OBAT)*. MEASURE / JSI. January 28, 2005. (Spanish).

Grindle MS, Thomas JW. (1991). *Public Choices and Policy Change: The Political Economy of Reform in Developing Countries*. Baltimore, MD: Johns Hopkins University Press; 1991.

HMN and Panama Ministry of Health. (2007). *Diagnostic Study of the Panamanian Health Information System*. September 2007.

HMN and Ministry of Health. (2007). *Strategic Planning of the Health Information System*. September 2007.

HMN—MEASURE Evaluation—PAHO. (S / F). *Evaluation of the Health Information System at the Regional Level in Peru: Framework, Proposed Methodology and Development Stages*. Lima, Peru.

HMN and Mexico Secretary of Health. (2009). *Diagnostic Study of the Mexican Health Information System.* Version updated in 2009.

HMN. (S / F). *Towards a framework and standards for country health information systems. Version 1.65*. Health Metrics Network.

Lafond A, Field R. (2003). *PRISM: Introducing an analytical framework for understanding performance of routine health information systems in developing countries. (A work in progress).* MEASURE Evaluation, USAID, JSI, the Equity Project. RHINO 2nd International Workshop; 2003 September 29–October 4; Eastern Cape, South Africa.

Ministry of Health. (2008–2009). *Evaluation of the Performance of the Routine Health Information System*. Peru, 2008–2009.

Peru Ministry of Health. (2008). *Evaluation of the 2008 Peru Health Information System*. June, 2008.

Nicaragua Ministry of Health. (2008). Strategic Plan. *Health Information System (Pesis) 2008–2010. (Draft document for discussion)*. January 2008. Managua, Nicaragua.

Nicaragua Ministry of Health. (2007). *Situation Diagnostic. Health Information System*. Nicaragua. November 2007.

Paraguay Ministry of Health. (2007). Final Report. *PRISM Tool Application: Performance of the Paraguay health systems management*. December 2007.

Paraguay Ministry of Health. (2006). *Implementation of the Health Metrics Network analysis and monitoring tool and strategic guidelines for a health information system strengthening plan*. November 2006.

El Salvador Ministry of Health and Welfare. (2008). *Health Information System assessment results*. September 2008.

Ministry of Health. (2007). *Improving the Health Information Systems Performance and Information Use for Health System Management. Interviewer's Manual.* Interviews using PRISM tools in facilities of the Ministry of Public Health and Social Assistance (PRISM-MSP and BS, Paraguay).

Costa Rica Ministry of Health. (2009). *Diagnosis of the health information system. Draft.* Costa Rica. September 2009.

Ministry of Health—PAHO. (2009). *The Brazilian experience in health information systems. Volume 1*. Production and dissemination of health information in Brazil. (Portuguese)

Ministry of Health—PAHO. (2009). *The Brazilian experience in health information systems. Volume 2*. Talking about the health information system in Brazil. (Portuguese)

Ministry of Health of Belize. (2009). Belize. *National Health Information System Strategic Plan 2010–2014*. October 2009.

Ministry of Health of Belize. (2008). *Diagnostic Study of the National Health Information System of Belize*. June 2008.

PAHO. (2010). *Project to Strengthen the Health Information System (HIS). Ecuador. Final Report*. November 2010.

WHO. (2009). *Health Metrics Network Technical Support Partnership. Assessment Report Checklist. Version 3.* Assessment reports checklist. (Spanish). March 2009.

WHO. (2008). *Framework and standards for national health information systems. Second Edition*. June 2008.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas*. Regional report synthesis. PAHO / WHO. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Situation of the vital and health statistics in the country around 2005. Argentina*. Preliminary, subject to being reviewed. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics by 2005. Bahamas*. Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics by 2005. Barbados.* Preliminary, subject to revision. November 2007.

PAHO. (2007) *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics by 2005. Belize.* Preliminary, subject to revision. November 2007.

PAHO. (2007). Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Bolivia. Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Brazil.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Chile.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Colombia.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Costa Rica.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Cuba.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Ecuador.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. El Salvador.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. United States of America.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Guatemala.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Honduras.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Mexico.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Nicaragua.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Panama.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Paraguay.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Peru.* Preliminary, subject to revision. November 2007.

PAHO. (2007) *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Dominican Republic.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Saint Vincent and the Grenadines.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Trinidad and Tobago.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Uruguay.* Preliminary, subject to revision. November 2007.

PAHO. (2007). *Situation of vital, morbidity and health resources and services statistics in the Americas. Status of the country's vital and health statistics 2005. Venezuela.* Preliminary, subject to revision. November 2007.

PAHO. (2005). *Guide for analysis of vital, morbidity, health resources and services statistics in the countries of the Americas.* PAHO / WHO.

PAHO. (2005). *Meeting of Heads of National Statistical Offices and directors of health statistics of the countries of the Americas (RD-2005). Final Report.* Buenos Aires, 21–22 November 2005.

PAHO. (2004). *Report of the Second Session of the Regional Advisory Committee on Health Statistics of PAHO / WHO*. Washington, DC, 10–12 September, 2003. Washington.

PAHO / WHO. (2004). *Meeting in Buenos Aires 2005 (RD-2005). Plan for Strengthening Vital and Health Statistics of the countries of the Americas (PFEVS)*. Conceptual aspects of design.

PAHO-USAID. *Umbrella Agreement 2007–2010.* (Grant No. LAC-G-00-07-00001). Washington, DC, 2007.

Health Metrics Network. (2008). *Framework and standards for national health information systems. Second Edition*. Geneva, Switzerland. WHO, June 2008. (Spanish version).

Health Metrics Network. (2006). *Towards a framework and standards for the development of a national Health Information System.* Geneva, Switzerland. January 2006. (Spanish version).

Sauerborn R. (2000). Using information to make decision. Chapter 3. En: Lippeveld T, Sauerborn R., Bodart C. 2000. *Design and Implementation of Health Information Systems*. Geneva: WHO.

Secretary of Public Health and Social Assistance of the Dominican Republic. (2009). *Work plan to complete intersectorial activities between the Secretary of Public Health and Social Assistance (SESPAS, in Spanish) and the National Statistics Office (ONE, in Spanish)*. September 2009.

Secretary of Public Health and Social Assistance of the Dominican Republic. (2008). *Results of the HIS diagnostic. Implementation of the Health Metrics Network assessment and monitoring tool.* August 2008.

Secretary of Public Health and Social Assistance (SESPAS) and Directorate of Health Information and Statistics (DIES, in Spanish) (2009). *RHIS Diagnostics. Application of the (PRISM) diagnostic tool for evaluating the routine health information systems (RHIS).* March 2009.

Secretary of State for Health. (2006). *Strategic Plan 2007–2011 for Strengthening the Health Information System.* Tegucigalpa, Honduras. December 2006.

USAID—MEASURE Evaluation (2010). *Improving Routine Health Information Systems Performance (RHIS) and Information Use for Health System Management.* Course on HIS. Instructor's guide. January 2010.

USAID—MEASURE Evaluation. (2009). *PRISM Tools User Guide*. June 2009.

USAID—MEASURE Evaluation. (2008). *PRISM: Performance of Routine Information System Management.* PRISM Tools for Assessing, Monitoring, and Evaluating Routine Health Information System Performance. Version 2008.

WEB PAGES

http://www.relacsis.org/login.php
http://www.rhinonet.org
http://www.paho.org
http://www.cpc.unc.edu/measure
http://www.usaid.gov/
http://www.lachealthsys.org/index.php?option=com_content&task=view&id=379&Itemid=449&lang=es

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