



The Management Information System and Change Processes in Health Systems¹

EDUARDO CARRILLO,² MIGUEL SEGOVIA,²
& JOSÉ MARÍA PAGANINI²

This report describes a management information system (MIS) designed by PAHO's Health Systems and Services Division in collaboration with technical experts from a number of different countries. This MIS, a methodology currently used at the institutional or national level in more than 21 countries of the Americas, is a strategic and practical instrument that is easy to apply, interpret, and use, and whose purpose is to facilitate fundamental changes in health management. Based on the management concept that inputs, processes, and outputs are quantifiable, the MIS places special emphasis on health system productivity, an essential condition for achieving health coverage that is both adequate and equitable.

The Region of the Americas has renewed its commitment to seeking universal and equitable health coverage by adopting Local Health Systems (*Sistemas Locales de Salud*—SILOS) as an operational primary care strategy. The goal is “to achieve social participation, intersectoral action, effective decentralization, and control over decisions and the use of more effective planning and management methods as a function of the needs of each population group” (1). Facing the large coverage deficit that affects over 160 million inhabitants of the Region and is exacerbated by the economic crisis of the 1990s, the SILOS constitute a strategic measure for developing community ser-

vices, and accordingly comprise part of the modernization processes of the State.

In support of national initiatives and experiences, the Pan American Health Organization (PAHO) has encouraged development of concepts, methodologies, and instruments aimed at improving development of the SILOS. Within this context, the Management Information System (MIS) designed by PAHO is a fundamental instrument for analyzing and developing local productivity and management processes in general. This article provides a summary overview of its principal features.

THE MIS AND HOW IT WORKS

The MIS is not a new information system, but rather a tool for relating various components of existing information subsystems so as to permit a strategic approach to the health system. The MIS seeks to answer five critical questions

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²Pan American Health Organization, Health Systems and Services Division, Washington, D.C., USA.

about the modernization and change processes facing countries:

- What are the current production and potential production of each organization or group of organizations within the health system?
- What relation exists between the health system's structure and the care provided?
- What relation exists between that care and its results?
- What are the strategic factors or problems that determine the overall productivity of an organization?
- What are the strategic options for achieving maximum productivity and obtaining the best results with available resources?

The MIS also includes a minimum of four modules that receive data from a single database. These modules are as follows:

- *The institutional module:* This includes information organized strategically to quantify the productive processes taking place in individual health units (health centers, hospitals, and other health facilities).
- *The service network module:* This permits characterization of the management of service networks or of local, regional, or national health systems.
- *The analytic module:* This allows the manager to work with various cost-benefit or cost-effectiveness options, to modify variables, and to determine immediately the impact of these modifications on production, yield, and costs. Some of these options are included within a computerized program accompanying the MIS manual.
- *The program and budget module:* This facilitates preliminary analysis of the factors affecting resource productiv-

ity—their structure, endowment, composition, and use pattern—and quantification of the corresponding program goals and costs.

The institutional module has four easy-to-interpret components. The first disaggregates an institution into productive subcenters (programs, services, etc.) and establishes, for each, the volume of its production over a given period, the total cost of its operations, the costs per unit of production, and critical productivity or use indicators.

The second component combines the production of substantive services (in a hospital organization these are the services offered directly to the user, among others those indicated by consultations and discharges) with production of complementary services (components subordinate to the substantive services) in order to establish coefficients of use per unit of substantive production (surgical procedures, laboratory tests, medical prescriptions, etc., per discharge or patient-day). When made available without diminishing the quality and equity of the care provided, complementary services account for over 50% of the operating costs of secondary and tertiary institutions.

The third component relates to human resources. Within each service (whether substantive or complementary), staff members are grouped into critical categories, normally no more than seven (physicians, biochemists, nutritionists, nursing staff, nurse auxiliaries, technicians, and administrative personnel). The information provided includes total staff hours, staff composition, staff hours employed in each production unit, and the institutional distribution of personnel.

The fourth component provides detailed information about the costs of the productive process. The costs' structure makes it possible to determine, among

other things, which are the strategic elements of the process, the specific costs of each type of input and production unit, and the numerous functions of production.

TOWARD A CHANGE IN MANAGEMENT "CULTURE"

The MIS was developed as an instrument for changing health system management in the face of a need for rapid institutional rationalization. Efficiency is a major element in government modernization and health sector reform, because the inefficiency of the current sector organization constitutes the prime obstacle to productivity, i.e., to health systems' ability to generate services quantitatively and qualitatively satisfying the basic needs of the population served (2).

Equity, effectiveness, and efficiency are three essential aims of health systems reform, and management style is the key to activating the structures and resources that determine the extent to which those aims are achieved. Within this context, the MIS has been derived from a concept of health management that, while not innovative, differs from those currently prevailing in the health field. Basic notions underlying this concept include the following:

(a) *Managerial responsibility*: According to this notion, solving health systems' problems falls largely to those within them, and the primary means of solving such problems are installed capacity and existing resources. This notion opposes the so-called "resource shortage syndrome" that tends to attribute most problems to resource shortages—with certain implications that could not be worse. First, the resource shortage syndrome suggests that solving the resource problem depends on entities outside the health system—such as finance ministries and agencies providing funding and assist-

ance. Consequently, internal institutional change plays a secondary role. Second, if internal changes are postponed or lack appropriate transformational vigor, the persistence of crisis conditions offsets not only resource increases but also the vast infrastructure available to national health systems that is their principal tool for extending coverage. Under these circumstances, increased resources may simply lead to greater inefficiency, with minimal impact on the population's health status.

The MIS allows the manager to identify "idle," i.e., unused, capacity and provides him or her with options for improving resource use, frequently through internal processes designed to bring about resource relocation or restructuring.³ In other cases, the MIS makes it possible to quantify legitimate deficiencies, i.e., areas that may require additional resources.

(b) *Strategic action*: This notion is based on the ability of the MIS to provide an overview of institutional performance and of the basic issues that determine total productivity.

(c) *Emphasis on quantitative methods*: Without neglecting qualitative factors, the MIS introduces information that makes decision-making more objective and permits reduction of the inaccuracy characterizing health systems—inaccuracy that expresses itself in inefficiency, high costs, and lost opportunities for change.

(d) *Better control for effective decentralization*: The MIS makes a key contribution to balancing decentralization and control. On the one hand, it facilitates control over organizational performance by minimizing administrative interference and the physical presence of supervisors. On the other, it permits determination of pro-

³Pan American Health Organization. Management Information Systems. Bridgetown, Barbados: PAHO; 1992. (Unpublished document).

duction amounts and costs as well as productivity levels for service networks and individual units. It thus enables supervisors to stimulate or pass by networks or units that are operating efficiently and concentrate their efforts on developing problem-solving capacity where major deficiencies exist.

(e) *Accountability*: By facilitating exercise of control, the MIS heightens a sense of institutional and individual responsibility. Administrative processes are translated into concrete goals that must be attained within specified times. The MIS indicators applied permit observation of the goal achievement process and determination of responsible factors. Consequently, the exempt status (lack of responsibility to the public) so frequently found in public bureaucracy is minimized or eliminated.

(f) *Participatory management*: The MIS takes the form of a network whose central axis is production associated with the organization's primary aims. This production is tied to ancillary services as well as to essential inputs and resources. Each component is quantitatively and explicitly tied to the institutional work of generating a product (health services) with defined characteristics. Managerial activity follows the same pattern: any given product is the result of a participatory effort requiring appropriate situations, so that groups (units) or individuals can bring their support to bear effectively.

The MIS can streamline and accelerate change processes by facilitating identification of problems having an important impact on each organization's overall efficiency.⁴ The use of indicators increases this capacity and extends it to local, re-

gional, and national health systems. The MIS also permits problems to be localized in terms of geography, resources, institutions, or programs. Using these methods, the manager can reconcile his or her requirements for coverage extension with the potential productivity of the national health system, within a context of adjustments and concrete institutional development projects that translate, in a quantitatively verifiable way, into higher volumes of production and a relative reduction in costs.

(g) *Managerial intervention*: The MIS has been used in a wide variety of ways by many managers, with direct consequences in terms of improved equity, efficacy, and efficiency. Some of the managers' interventions have been precise and derived from the specific indicators of the MIS, but more often they have begun because adopting the method has led to a collection of analytical activities and subsequent corrective measures. Some important examples of the latter process are as follows:

- In one Caribbean country, application of the MIS provided a clearer view of the problems of the principal hospital, a facility absorbing over 50% of the resources of the Ministry of Health, and gave rise to a new administrative system in which the managers acquired better control of the institution, for which they were delegated authority by the Ministry.
- In a South American country, application of the MIS to a local health system with a 90-bed hospital and 32 outpatient centers led to adoption of strategies to combat the "new profile" of detected problems, namely: (1) The distribution of production revealed marked differences in the coverage levels of different population groups. (2) The same tendency was observed with regard to utilization of

⁴Pan American Health Organization. Management Information Systems: method's overview. Bridgetown, Barbados: PAHO; 1992. (Unpublished document).

critical services, such as those provided by laboratories and pharmacies. (3) The costs of primary care services were unnecessarily high for reasons that could be easily controlled.

- In many hospital institutions the indicators of bed utilization have shown favorable tendencies that have led to cost reduction and an increase in productive capacity.
- In one Central American country, analysis of the problems faced by a tertiary hospital service opened the way for a substantial process of change in the network of gynecologic services.
- The administration of one highly complex hospital opted to bar transplants of certain organs upon determining their cost in an objective manner and demonstrating their impact upon medical service resource utilization and productivity, especially with regard to care for elderly and low-income patients. Certain consequences of other aspects of care were also found that had not been considered previously.
- In another case, application of the MIS raised questions about an ambitious physical plant investment program, produced immediate savings through rationalization of the outlays by category, and dispelled an atmosphere of recrimination between the institution involved and the Ministry of Health regarding who was responsible for shortages of pharmaceuticals and medical and surgical equipment.
- In one instance that involved the World Bank working with PAHO support, an Asian country gained better appreciation of the productive potential of its own resources during the process of modernizing its national health system.

- In many countries, use of the MIS has strengthened the negotiating ability of health ministers and institutions vis-a-vis government authorities responsible for budgetary matters.

WHO ARE THE PRINCIPAL USERS OF THE MIS?

The principal users of the MIS are the management teams at each level of the health system, the following having special importance:

National Management

The task of managing national systems has two principal components: (1) making policy decisions and (2) formulating standards and monitoring their application. In this way national goals are established and parameters provided for determining what each institutional level of the system must contribute to national coverage goals. The MIS indicators, aggregated at the national level (a job easily performed by the computer program), support this process in various specific ways through:

- formulation of policies to extend coverage;
- formulation of realistic and attainable goals (via a substantive transformation process) aimed at increasing the national health system's productive capacity and thereby permitting attainment of the desired coverage;
- localization—institutional, programmatic, geographic, etc.—of the problems that must be overcome to achieve the corresponding goals;
- definition of what each organizational level in the system must contribute; and

- control of the products generated by each of the system's organizations or levels so as to help fulfill the national coverage extension goals.

The previously mentioned indicators enable the national manager to perform this complex task with a practical approach and good prospects of success. These indicators permit observation of how the national health system's myriad institutional components work together and which are the problem areas able to block achievement of the corresponding goals. In this way, focused strategic action can be exercised where needed, without wasting efficiency and resources.

Regional Management

In a like manner, aggregation of regional indicators (an automatic process performed with the computer program) permits regional management to conduct the work of establishing regional goals, determining the contributions of local systems or individual institutions, monitoring results, and correcting deficiencies in operating capacity.

SILOS Management

The MIS has been designed to provide the SILOS with a flexible management instrument for (1) reducing higher management levels' bureaucratic interference in local management by providing objective information about production, yields, and costs; (2) seeking good means of detecting underutilized capacity and formulating projects to mobilize resources; and (3) assuming greater control over local programs.⁵ The contribution of the

MIS, similar to that described regarding regional management, enables SILOS managers to increase their operational participation, in accord with the complexity and size of the local systems.

Institutional Management

This level of action, the most important, deals with the single unit, facility, or program. The MIS is extremely flexible and can function with any given structure of services. As a rule, especially outside the level of the hospital, this structure incorporates community or social actions relating to social development, nutrition supplementation, basic sanitation, family medicine, and other matters. In this variable institutional setting the MIS offers the elements needed to increase productive capacity: situation assessment; analytic instruments (including variable modification and outcome evaluation in terms of production, yield, and costs); and implementation and monitoring of institutional adjustments through a nonbureaucratic process based on evolution of the same MIS indicators.

THE BUDGET PROGRAM

Despite some advances in this field, the process of devising the public sector budget tends to repeat 'preceding successes and failures with little or no alteration. The MIS paves the way for more productive and economic actions.

Using the MIS, each management team is able to define the standards or indicators considered appropriate for the prevailing institutional reality as well as practical and economic feasibility. This analytic contribution makes it easier to modify any pertinent norm or variable and to provide immediate warning of such a change's impact upon levels and costs of production. In programming terms, the selection of the option that best combines

⁵Paganini JM, Segovia MA, Carrillo E. Organizing information for decision-making. Washington, DC: Pan American Health Organization; 1990. [Unpublished document].

viability with productivity is expressed in quantitative goals for production, resources, costs, and yields (efficiency indicators).

Besides facilitating this interplay of cost-benefit and cost-efficacy relationships, the MIS permits aggregation of the matrices in accord with the structural divisions of each country, such as the units of the SILOS, regions, provinces, or states. As may be appreciated, this constitutes a methodologically important contribution, one that permits the public sector manager to begin using methods similar to those used by managers in the private sector.

MIS APPLICATION REQUIREMENTS

In accord with the above concepts, the most important requirement is the existence of a political will for change that affects health systems management at all levels. Other requirements are as follows:

- A team responsible for analyzing and directing the MIS-derived change processes must be designated. Given the nature of this responsibility, the director-generals of health (or those performing an equivalent function) should bear overall responsibility for directing these processes and, for this purpose, need technical resources. While this need varies with the size of the national health system, it is generally within the reach of all countries. (Technical responsibility is commonly assigned to already existing units or to staff members, and to anywhere from one to several individuals dedicated exclusively to supporting application of the MIS.)
- Practical training must be provided through application of the MIS and interaction of those in training with national or PAHO personnel having prior experience.

- Local managers and their staffs must be willing to devote a minimal amount of time to analyzing information concerning the course of institutional development projects.
- A strategy for applying the MIS must be defined. To date the countries involved have opted for various strategies ranging from selective application of the MIS at institutions with recognized problems to establishment of broader programs directed at introducing the method on a national scale.

Formal training, which is minimal, consists of attending brief workshops where basic concepts are explained, acquiring practical experience in MIS application, performing an institutional analysis, and formulating and implementing projects for change. The costs involved are modest. However, information collection in such areas as personnel, medications, and laboratory work can pose difficulty. In these areas, auxiliary electronic data processing systems are available to facilitate the corresponding tasks.

ELECTRONIC DATA PROCESSING

PAHO has designed a computerized MIS program that facilitates data processing. This MIS program, the most recent version of which is 3.0, is provided free to those countries or institutions wishing to initiate change processes. The principal features and activities of MIS 3.0 are as follows:

- a module for translating the program into any language;
- preparation of tables for the institution, with disaggregations (tables of production, yield, resources, and costs) for each of its component programs or services;

- conversion of the MIS indicators to a graphic format;
- generation of historic management indicators;
- aggregation of the information by user-determined periods;
- modification of variables through an automatic process that permits simultaneous observation of their effects on production, yields, and costs;
- aggregation of indicators by SILOS, region, or country (3).

The program itself operates on small personal computers. To print the tables, however, a wide-carriage printer is needed. The MIS can also be applied manually at the institutional level, but it needs computer equipment to readily aggregate the indicators corresponding to SILOS, region, or country.

TECHNICAL SUPPORT FROM HSS⁶ AND PAHO

The technical cooperation, resources, and instruments required by the MIS should constitute part of country priorities and programs and be reflected in PAHO's annual operating budget. PAHO's Health Systems and Services Di-

vision (HSS) is formally responsible for administering the MIS and for maintaining and updating the computer program and other methodologic instruments. PAHO currently provides the following support:

- documentation on the philosophy, aims, and content of the MIS;
- cooperation in formulating and implementing projects for change based on the MIS;
- maintenance of a primary computer program and several auxiliary programs;
- maintenance and updating of the user's computer program;
- provision of educational materials on the MIS; and
- provision of operating guides on how to apply the MIS (including the manual for MIS version 3.0).

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3. Carrillo E. Manual de operación del programa computacional SIG 2.2. Bridgetown, Barbados: Pan American Health Organization. [In press].

⁶Effective 1 March 1995, PAHO's Health Systems and Services Division (HSS) was renamed the Health Systems and Services Development Division (HSP).