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EDITORIAL

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□ Health Analysis

Health Metrics Network: a global partnership to improve access to information for health care practitioners and policy-makers[A]

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It is not because countries are poor that they cannot afford good health information.
It is because they are poor that they cannot afford to be without it.
Health Metrics Network

What is the Health Metrics Network?

Health Metrics Network (HMN) is a global partnership that will work to increase the availability and use of timely and trustworthy health information in developing countries and globally. This partnership supports the use of a common framework and guidelines for assessing, strengthening and monitoring health information systems, for better decision-making and contributes to the development of new knowledge related to health information systems (HIS) development and management. HMN is instituted on the premise that better health information means better decision making and therefore better health for all. HMN partners are working to improve health and save lives by strengthening and aligning investments in the development of HIS in accordance with the broader global development agenda, including the Millennium Development Goals, around the world. HMN has also a direct key investment mechanism through grants targeting low and middle income countries where major needs for improving health information and decision-making, strongest government commitment for improving and changing current process and practices, and the most supportive partners are in place. This global collaboration is designed to deliver long-lasting solutions to HIS development. The website of HMN is available in http://www.who.int/healthmetrics.

Who is the HMN?

HMN was launched in the 58th World Health Assembly in 17 May 2005.[1] The HMN Board is constituted by the African Population and Health Research Center; Bill & Melinda Gates Foundation; Centers for Disease Control and Prevention of the U.S. Department of Health and Human Services; Danish International Development Agency; Department for International Development of United Kingdom (DFID); European Commission; Ghana Health Services; Global Fund to fight AIDS, Tuberculosis and Malaria; Ministry of Health, Mexico; Ministry of Public Health, Thailand; Organization for Economic Co-Operation and Development; Statistics South Africa; Uganda Bureau of Statistics; UNICEF; United Nations Statistics Division; U.S. Agency for International Development (USAID); World Bank; and World Health Organization.[2,3]

The statement of support for HMN[4] was signed by the HMN Board of another four agencies: Global Alliance for Vaccines and Immunization (GAVI); Royal Danish Ministry for Foreign Affairs;[5] Swedish International Development Agency; United Nations Population Fund.

HMN has an organizational structure composed of a Board, a Technical Advisory Group (TAG), an Independent Review Committee (IRC), and a small Secretariat hosted by WHO. More about this structure is described in following sections.

How the HMN will operate?
HMN received a grant of US$ 50 million over seven years from the Bill & Melinda Gates Foundation[6,7] and additional contributions from other donors including the Department for International Development of the United Kingdom,[8] U.S. Agency for International Development,[9] Danish International Development Agency, Goverment of Thailand and other multilateral and bilateral agencies.

HMN will meet its objectives through a variety of actions and activities. The main target for investments is low- and middle- income countries, which may be eligible to apply for grants of up to US$ 500,000 for the strengthening of HIS and can call upon HMN partners for technical assistance using the HMN framework.

When will the HMN operate?
From now until 2011, HMN expects to document improved health outcomes that can be realistically attributed to the enhanced use of information for decision making in at least thirty developing countries. Additional funding will be available to further support this result based global partnership and align investments in HIS in harmony with the global development agenda. The requests for country applications (RFCA)[10,11] will be made anually. Detailed information about this process can be found in: http://www.who.int/healthmetrics/about/en/.

Where will the HMN operate?
Low and middle income countries with the greatest need in terms of health information, the strongest commitment to improvement and change, and the most supportive partners will be the priority for substantive financial support. According to HMN documents, in general, countries will fall into one of three categories[10]:

1. The group of countries of highest priority for HMN action is *low and lower-middle income countries*. These countries would be eligible for *considerable, sustained, long-term financial and technical support*. They may apply for HMN grants of up to US$ 500,000 in a given year for HIS strengthening including consensus-building, strategy development, planning, resource mobilization, assessment and monitoring. Countries in this group may be able to access HMN technical and financial support over several years even though it is anticipated that the main volume of HMN financial support would occur in the diagnostic, developmental and planning phases with in-country donors generating the bulk of the resources for implementation.
2. *Middle and upper middle income countries* will be eligible for *technical assistance plus limited financial support* of up to US$100,000 in a given year to enable convening of partners, focused strengthening of specific elements of the health information system, experience sharing, or time-limited operations research. Countries in this group are likely to focus on specific aspects of the health information system identified as in need of strengthening.
3. *All countries except high income countries* are eligible for *focused technical assistance in specific health information system areas* for which they are able to generate their own in-country financial funds with no expectation of additional resources from HMN. These countries are likely also to serve as regional centers of excellence and inter-country technical support and to facilitate sharing of best practices and learned lessons.

Countries are eligible to apply for an extension and/or expansion of existing HMN support on the basis of a review and evaluation of progress accomplished on ongoing needs. Some countries will receive support over a period of several years, five to ten, to shape national Health Information Systems plans and policies.

What is the Goal and Objectives of HMN?
HMN is set up as an interactive partnership between countries and global actors, not a top-down strategy, and its main focus is building country systems to ensure long-term sustainability of sound data generation and use. Its goal and objectives are:

Goal:[12] To increase the availability and use of timely and reliable health information in countries and globally through a shared agreement on the goal and coordinated investments in core health information systems.

Objectives:

1. Develop a framework and standards for health information systems (Consensus Guidelines).
2. Support countries in applying the HMN framework (Country Implementation).
3. Develop incentives for enhanced dissemination and use of sound health information (Universal Access).

To increase the availability and use of timely and accurate health information by catalyzing the joint funding and development of core health information systems is the overarching strategic goal of HMN. To accomplish this goal, HMN is laying out a vision; identifying strategies for health information systems development and strengthening; supporting countries in strategies implementation; and generating new knowledge and global public good through research, technical innovation, and sharing lessons learned.

As mentioned above, HMN will pursue three interrelated objectives. First, create a consensus framework for the country health information system assessment, development and monitoring that describes standards for health information systems; second, strengthen country health information systems by offering technical and catalytic financial support for the application of the HMN framework; and third, improve accessibility and use of health information through policies, systems and incentives to ensure the access and utilization of information at local, regional and global levels.

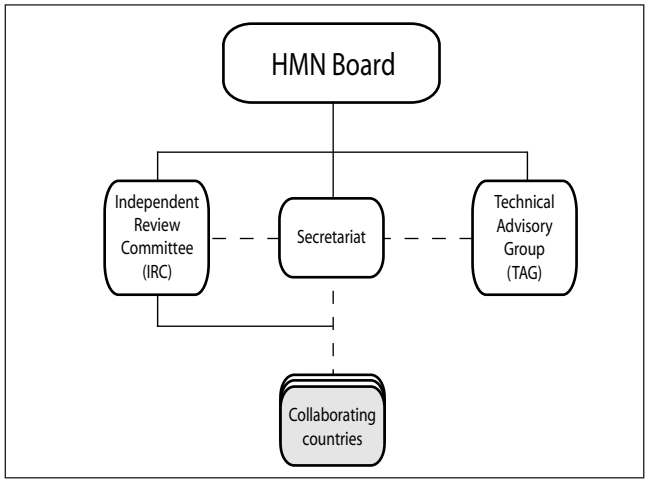
What are the Guiding Principles, Values and Practices of the HMN?
The HMN main principles are country leadership and

linking health information system development with wider efforts to improve and evolve national statistical capacities according to agreed standards, such as the Fundamental Principles of Official Statistics adopted by The United Nations Statistical Commission, in its Special Session of 11-15 April 1994.[13] Building coherent health information systems requires a long-term investment and should be seen as a gradual, incremental process. This will help ensure long-term sustainability and the buy-in of multiple partners including those in non-health sectors.

The process of health information system development is ongoing. As country partners work together to strengthen the health information system, they will draw upon the growing body of knowledge about health information systems development generated through HMN activities. In turn, experiences across many countries will contribute to the further elaboration of the HMN framework at the global level and its adaptation and use in other countries.

What are the governance mechanisms in HMN?
HMN has an organizational structure (figure 1) composed of a Board, a Technical Advisory Group (TAG), an Independent Review Committee (IRC), and a small Secretariat.[14] The members of the Board are representatives from HMN's constituencies, selected on the basis of commitment during the development phase of HMN. New Board membership is reviewed by the Board based on evolving needs. The Board provides leadership and strategic guidance to HMN, approves the overall budget and work plan prepared by the Secretariat, and approves the annual report presented by the Secretariat. The Board appoints the members of the TAG, IRC, and other committees it may establish.

Figure 1. HMN Organigram



The TAG provides guidance on the further development of the harmonized framework and standards for country health information system development, its assessment and monitoring tool; develops guidelines for country solicitations of support from HMN; advises on country support including governance and coordination mechanisms and monitoring of country progress; among other technical advisory responsibilities.

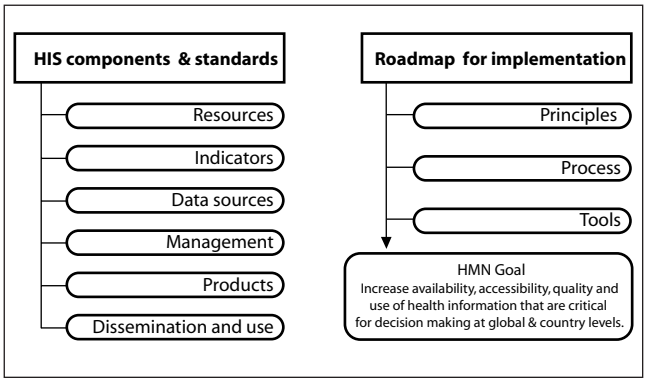
The IRC advises the Board on the selection of countries for HMN support. The recommendations of the IRC are transmitted to the HMN Board through the Secretariat. Country proposals are submitted to the IRC through the Secretariat which ensures that applications meet the administrative requirements outlined in the application guidelines. Technical feedback from the IRC on country proposals may be transmitted to country teams through the Secretariat.

What is the HMN Framework?
The HMN Framework (HMNF) serves to focus partner actions and guide the overall direction of HIS reform. The HMNF conveys varied data generation and gathering approaches within a unifying framework and therefore helps to define country and global systems, standards, capacities and processes needed for health information system strengthening. This is needed because one of the major constraints to strengthening health information systems is the absence of consensus on the relative strengths, usefulness and feasibility of different data collection approaches. The HMNF tries to bring together a normative framework for measurement in health with participatory assessment, planning and implementation modalities that should be objective, transparent and include all stakeholders.

It is expected that the HMNF will serve several purposes: as a diagnostic tool, as a roadmap, as an accreditation tool, and as a tool to focus investment and technical assistance for HIS

The **HMN framework**[15] has two parts: a normative component and an implementation component (figure 2).
1. *The normative component* describes the standards and assessment criteria linked to the inputs, processes, outputs and outcomes of the health information system and encompasses six sub-components:

Figure 2: HMN Framework: components, standards and roadmap.



a) *Context and resources for health information.* The policy, legislative, regulatory, and financial environment that must be in place; and the infrastructure and resources required to guarantee a wholly functional health information system.
b) *Identification of core health indicators*, defining core health indicators covering the domains of health information, grouped in four main types: determinants of health, health system inputs and outputs, health system outcomes, and health status (figure 3).
c) *Data sources and data collection methods*, key

data sources, standards for their use, their role in generating health information and potential linkages between them. The subsystems are census, vital events monitoring, health facilities statistics, public health surveillance, population-based surveys and resource tracking, including health infrastructure and human resources (figure 4).

d) Information management processes, optimal processes for collecting, sharing, and storing data, data flows and feedback loops.

e) Data availability and quality, criteria for assessing the quality of available data.

f) Data dissemination and use, norms for presenting, disseminating data and sharing information among stakeholders and creation of incentives for evidence-based decision making.

Figure 3: Domains of interest of health information systems[17]

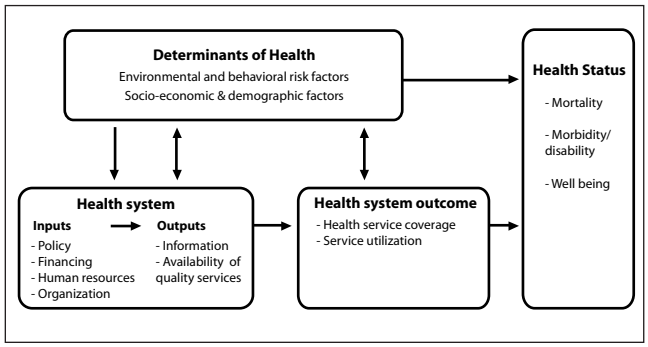
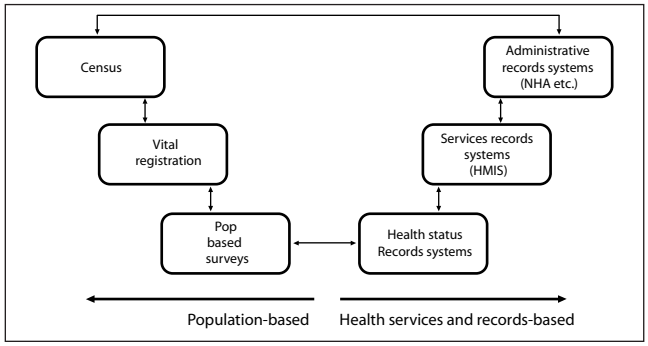


Figure 4: Data sources classification.



2. The implementation component outlines a roadmap for strengthening health information systems and includes a tool to guide situation analysis of the country HIS, thus facilitating countries to establish a baseline and monitor progress of HIS development. This process is linked to the set of principles, processes and benchmarks for implementation of the HMN framework at the country level. The HMN principles include country leadership and ownership, consensus-building, focus on country needs, and HIS development as a gradual and incremental process. The process will clearly define stages and benchmarks and will state the specific role of HMN as a catalyst and technical resource.

As a recommendation of the HMN Board for refining, testing and improving the HMNF and tools, three pathfinder countries have been identified for the first phase: Ghana, Mexico, and Thailand. And the HMN Board mandated the Secretariat to identify two additional pathfinder countries.[17] Pathfinder countries are identified on the basis of expressed desire to support the development phase of HMN and capacity and interest to be involved in the initial development and testing. The identification of a country as pathfinder will not preclude it from submitting a proposal for HMN support through the normal country submissions process.[18]

What are the components of a proposal for HMN?

For the requests for country applications (RFCA) in 2005 a proposal[10] for HMN consisted of:

a) Formal statement of common purpose by key country stakeholders including high-level political commitment to the HMN principles and a willingness to engage in long-term commitment;

b) Summary description of major strengths and weaknesses of current country health information system;

c) Summary of existing national plans for HIS, if any, and/or statistical development;

d) Outline of type of assistance sought (technical support, financial support for development of HIS plan, catalytic support to HIS development);

e) Statement of key deliverables and timeline;

f) Composition of country teams, specifically detailing the involvement and commitment of key partners at senior levels including Ministry of Health, disease-specific program managers, National Statistics Office, country institutes of public health or equivalent, research institutes, private health care providers, donors, multilateral agencies, and technical experts; and

g) Potential resources available in-country and from donors.

It is anticipated that future rounds will use a slightly modified version of the proposal guidelines based on experiences during the first round.

Additional information may be found in: http://www.who.int/healthmetrics/about/applications/en/index.html

How countries can apply for support from HMN?

Applications for HMN support will be assessed through an open and transparent process with all proposals submitted for review by the Independent Review Committee (IRC)[10,11] which will recommend countries for support on the basis of the following criteria:

- Countries in greatest need (measured by level of under-five mortality and GDP per capita) where HIS development is likely to have the greatest potential to enhance the efficiency and effectiveness of health development efforts;
- Completeness and overall coherence of the proposal;
- Involvement and commitment of country partners, in particular, links between Ministry of Health and National Statistics Offices, as well as donors and development agencies;
- Form and functions of country mechanisms for coordination and disbursement of funds; and
- Anticipated results and impact, including sustainability.

Background information on the country health information system, in particular with regard to availability and quality

of reporting on key indicators, will be provided by the Secretariat to support the IRC in making its review and assessment.

What is the PAHO/AIS position regarding HMN?

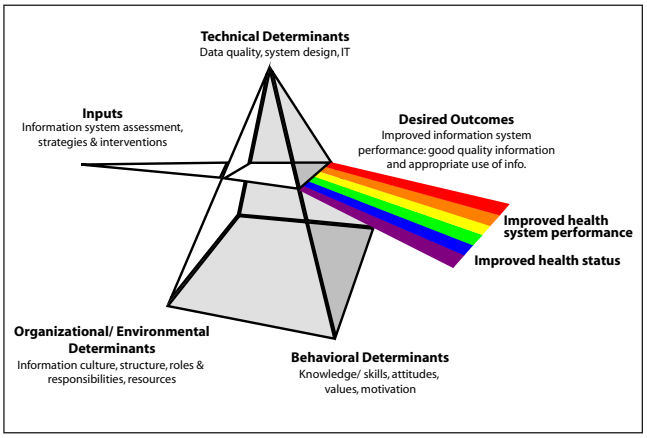
PAHO, as the WHO Regional Office for the Americas, supports the goal, values and principles of HMN, but incorporates the regional perspective, with emphasis on strengthening and expanding already successful current initiatives used such as inputs, as the Core Health Data Initiative[18,19,20] that had been supported by PAHO since 1994, and key national HIS experiences already established in the Americas.

An important issue after an HIS assessment is the selection of sound initiatives and strategies to overcome weaknesses identified as priorities. In this regard, PAHO in partnership with MEASURE/Evaluation[B] and USAID/LAC, together with national teams is carrying out a project for documenting lessons learned, successful stories and key processes in HIS including two case studies in the Region: Brazil and Mexico. The overarching goal of this project is to develop a working standardized framework and evidence for supporting the selection of appropriate strategies and solutions in context for overcoming specific critical elements in HIS. This working framework has been developed based on the documentation of the experience of Brazil and Mexico in HIS. In these countries, under a country-driven process based on the HMN framework and instruments, a more comprehensive in-depth assessment has been carried out using additional methods and instruments. To complement the *situation analysis and monitoring tool* (SAMT, formerly HAM), two additional tools have been specifically selected for implementation: the *Organizational and Behavioral Assessment Tool* (OBAT)[21] part of the MEASURE/Evaluation *Performance Routine Information Systems Management Framework (*PRISM)[22] tool package; and the *Assessment for Health Enterprise Architecture Development* (AHEAD,[23] formerly EIA2Tool) from PAHO/AIS.

The OBAT intends to identify strengths and weaknesses of HIS performance, including the analysis of need components (correlates) to produce good quality of data and sustained uses of health data for improving health system operations and population health status. In the PRISM,[22] the determinants for Routine Health Information Systems (RHIS) performance are classified in three groups: a) technical determinants: data quality, system design, IT, etc.; b) organizational/environmental determinants: information culture, structure, roles and responsibilities, resources; and c) behavioral determinants: knowledge/skills, attitudes, values, motivation, etc. (figure 5) Traditionally, for assessing RHIS only technical determinants are taken in consideration. With the addition of behavioral and organizational determinants of RHIS, the tool draws attention to the important role played by the presence/absence of a culture of information and by the existing knowledge, practices and motivation of staff. Its two main objectives are: a) to assess the role of behavioral and organizational factors on HIS performance; and b) to develop strategies based on gaps and weaknesses identified in behavioral and organizational determinants through the assessment.

The AHEAD framework aims to integrate a maturity model,[C,24,25] for HIS to enable an adaptable Enterprise Architecture (EA)[D,26,27,28,29,30,31] to facilitate the interoperability or integration of current/new HIS, ensuring its appropriate performance aligned to overarching goals of Ministries of Health and key National Health Institutions (social security). One of the key issues of current HIS is its isolation and limited possibilities to be easily integrated or interoperable with other HIS in the Ministries of Health.[32] A silo culture with compartmentalized vertical HIS by programs precludes the possibility of real use of health data and information to support decision-making in important public health programs. To respond better to these challenges the strengthening and development of HIS using an integrated solution as EA is being used in Canada with the initiative Infoway[E]. An EA is a formal description of services and technology options based on standards and guidelines for systems and subsystems organized by structural and functional properties to fulfill HIS goals. The EA describes the HIS or building blocks, defining their interrelationships in a detailed plan, from which a HIS can rapidly incorporate new functionality, being adaptable to changing environments.

Figure 5. Prism Framework for understanding Health Information System performance



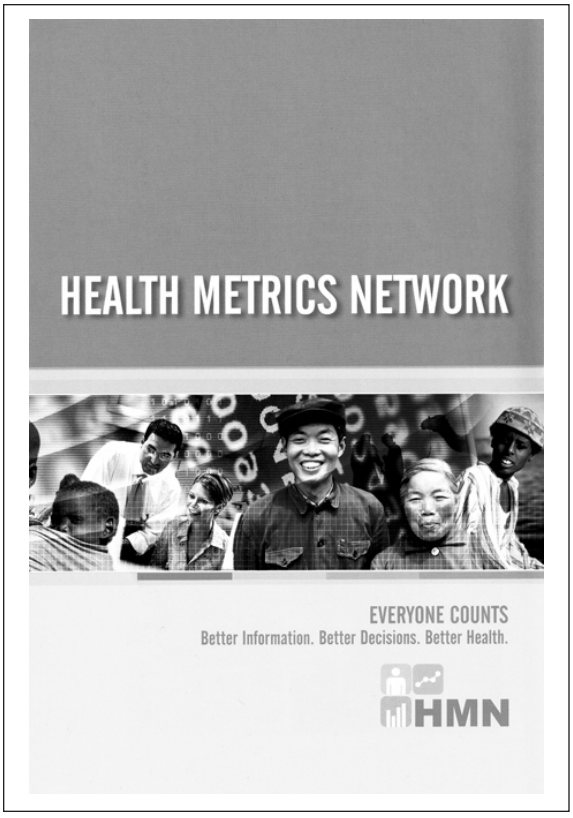
AHEAD includes an ordered set of maturity levels with reference elements that describe effective processes, practices and protocols that generate a road map. This can provide guidance for future investments, supporting the resolution of gaps in the organization's business and information functions. AHEAD contains a rapid assessment and monitoring tool based on a Generalized Enterprise Architecture Model for assessing the current maturity level of the EA. The maturity model can be used as a benchmark for assessing different EA, organizations or HIS for equivalent comparison. The maturity model follows the path of a Ministry of Health as their health EA program matures, and sets benchmarks to measure performance towards progression in the development of its health EA. The AHEAD Generalized Enterprise Architecture Model covers five layers: infrastructural, architectural, organizational, informational, and business/domain.

The AHEAD assessment tool is based on:

* ISO/IEC 15504[33,34] emerging international standard for software process assessment;

* Carnegie Mellon, Software Engineering Institute, Standard Capability Maturity Model Integration® Appraisal Method for Process Improvement (SCAMPISM);[35]
* National Association of State Chief Information Officers (NASCIO). Enterprise Architecture Development Tool-Kit[36]
* US Office of Management and Budget, Enterprise Architecture Assessment Guidelines[37,38]

The OBAT and the AHEAD tools will complement the findings from the application of HMNF-SAMT. In the next two years, results from the above case studies and further evolution of the framework and tools will be available for



use of PAHO Member States. This novel experience will help them to plan and prioritize investments to strengthen HIS and its use for better decisions in public health.

PAHO maintains a close collaboration with the HMN Secretariat and several TAG members to obtain and provide feedback in the application of this framework and tools. Within the process of strengthening HIS, important activities are under way. In November, the first Regional Meeting of National Directors of Statistics and National Directors of Health Statistics will take place in Buenos Aires, Argentina, to identify priority areas for collaboration. As part of the Regional HMN process, the organization of a workshop for writing successful proposals for HMN, for priority countries in the Region, is in the planning phase.

The *PAHO's Transformation Roadmap for Organizational Change* incorporates the initiative of the Forum of Public Health in the Americas (FPHA) to create a regional platform for internal and external constituents to dialogue, debate, and learn about important health topics. The FPHA will include key topics for the debate and dialogue of health metrics as an essential basis to support policy and prospects for Public Health in the XXI century.

More information regarding the above will be provided in coming issues of the PAHO Epidemiological Bulletin.

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A Several portions of this paper were adapted from the HMN Concept Paper: What it is, what it will do and how countries can benefit. http://www.who.int/healthmetrics/about/concept_paper.doc
B http://www.cpc.unc.edu/measure/
C A maturity model is a structured collection of elements that describe characteristics of effective processes, practices, disciplines and protocols, which is ordered as levels with specific sets of elements that an organization must fulfill to earn a specific maturity level.
D Enterprise Architecture is a comprehensive framework used to manage and align an organization's structure, processes, information, operations and projects with the organization's overall strategy. Ultimately, this structured process helps to guide an organization to make sound, targeted decisions about how to manage and structure its information-related assets for maximum effectiveness. http://en.wikipedia.org/wiki/Enterprise_architecture accessed on 27 September 2005
E http://knowledge.infoway-inforoute.ca/ehr_blueprint/en.asp

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□ **Methodological notes in epidemiology**

The cost of antibiotic treatment for priority infectious syndromes in Paraguay, 2004

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Antibiotics are essential for the treatment of human infections. In order to respond to the demand, the pharmaceutical industry in Paraguay provides the public with a large variety of commercial brands, both nationally-produced as well as imported. In the private health care sector, the public purchases prepackage antibiotics from pharmacies. Each package may have the exact number of tablets or capsules necessary to complete the treatment regimen indicated. On occasions, there is a remainder of unused tablets that should be discarded to prevent future use without adequate medical supervision. The unused, discarded portion is an economic waste. In public institutions, such as the Social Security Institute (SSI), these products are acquired through a bidding process and the patient is given only the necessary units to complete the treatment regimen in accordance with the medical advice.

Taking into account the importance and economic variability of different antibiotic treatments for common infectious diseases in adult patients in Paraguay and the influence of therapeutic failure for these costs, it is of interest to determine the cost of those interventions for which the Ministry of Health in Paraguay has promoted standard antibiotic treatment protocols. The costs of antibiotics emphasize the differences among them, depending on the brand, the source (national or imported), and whether acquired in the public or private sector.

The syndromes for which the cost of treatment was determined were selected from those that occur more frequently among adult ambulatory patients. The standard protocol (antibiotic, dose, route, interval, and duration) was described in the "Guide for the Treatment of Infectious Diseases" (PAHO).[1] The cost of the drugs is based on the cost of the package or packages necessary to accomplish the treatment regimen for these specific syndromes. The cost of the unused units was determined by multiplying the cost of each unit in the package by the number of units remaining. In the SSI, the cost refers to the total number of units of the product that are necessary to complete the regimen indicated by the physician. The results, expressed in United States dollars (5,000 Guaranies = US$1) are shown in Table 1.

Twentyfour drugs were analyzed, some of them in different presentations. It was determined that three were exclusively imports. Similarly, two of the antibiotics of choice are only produced abroad and seven are only produced locally.

The results show that there is a difference in the cost to the public for treating the different syndromes depending on the source of the product (the nationally produced drugs are cheaper), and the brand name; this variation can be as high as 300% for some drugs. The use of alternative treatments represents an additional cost, many times higher than that of first choice drugs. Similarly, it should be noted that the cost for unused units ranges from US$0.40 to US$48.00 depending on the product. If one considers that the syndromes and diseases included in the analysis occur most frequently among adults and they represent a significant fraction of hospital diagnoses, the economic impact could be significant. This waste of units, whose cost is absorbed by the patient, could justify the commercial production of some drugs for the therapeutic regimen for some specific diseases in order to prevent financial loss to the public.

The purchase of medicines through the official (SSI) bidding process represents considerable savings. The savings could be even higher if the treatment is dispensed in the exact dosage. This is not only in the pharmacy, but also in the SSI, where the cost of the drug of choice for

the treatment regimen is lower when compared to the alternative treatment. The savings are even greater when there is no treatment failure that justifies the use of more expensive drugs of the second line or last generation.

These findings show the theoretical savings saving of using standard treatment guidelines. In addition, considering that the major part of ambulatory treatment is empirical and that the use of treatment protocols requires knowledge of the prevalence of the causal pathogens, this work also justifies the implementation of a local surveillance system for resistant strain of antimicrobials.

Kind of treatment / Disease	No. of laboratories		Cost for the public				SSI	
			Treatment		Unused drug in original container		Cost of treatment	
	National	Imported	National	Imported	National	Imported	National	Imported
1. Urinary infection uncomplicated in the woman								
- First choice: *Trimethroprim - Sulfamethoxazole, 160/800mg q12hrs PO x 3d*	12	4	1,65 - 7,00	1,60 - 24,00	0,40 - 4.18	1,90 - 9,70	0,25	-
- Alternative: *Nitrofurantoin 100mg,1 tab q12hrs PO x d*	1	-	3,60	-	2,40	-	Producción propia	
If on the 3rd day of treatment symptoms and signs persist, carry out urine culture and administer quinolones								
- First choice: *Ciprofloxacin 250mg, 1 tab q12hrs PO x 3 d*	5	2	7,20 - 10,20	10,90 - 17,90	2,9 - 4.10	4,40 - 7,20	0,26	-
- Alternative: *Norfloxacin 400mg 1 tab q12hrs PO x 3 d*	2	2	7,80 - 13.30	13,30 - 30,30	3,12 - 8,30	7,60 - 21,00	0,40	-
2. Acute bacterial pharyngoamygdalitis								
- First choice: *Penicillin benzatin 1,200,000 IU IM single dose*	4	-	1,00 - 2,25	-	-	-	0,77	-
- Alternative: *Phenoxymethylpenicillin 500mg q8hrs PO x 10 d*	-	2	-	3,00 - 30,00	-	0,50 - 5,00	-	-
Choice in patients allergic to betalactamic:								
- First choice: *Erythromycin 500mg q12hrs PO x 10 d*	5	1	3,60 - 12,00	27,40	1,10 - 2,00	-	Producción propia	
- Alternative: *Clarithromycin 500mg q12hrs PO x 10 d*	-	3	-	25,00 - 130,00	-	4,20 - 48,60	-	26,00
3a. Pneumonia acquired in the community: Without comorbidity								
- First choice: *Amoxicillin 1g q8hrs PO x 10 d*	10	4	15,00 - 28,00	22,00 - 37,00	0,00 - 2,60	0,00 - 2,30	3,00	-
- Alternative: *Clarithromycin 500mg q12hrs PO x 10 d*	-	3	-	36,50 - 129,60	-	2,10 - 48,60	-	26,00
Azithromycin 500mg qd PO the 1° day, next 250mg qd PO x 4 d	4	1	9,60 - 25,00	18,00	0,00 - 11,84	-	12,00	-
Choice if not responsive to the treatment at the 48h (therapeutic fail)								
- First choice: *Levofloxacin 500mg q12hrs PO x 10 d*	1	4	24,00	19,40 - 76,60	-	10,00 - 21,00	-	-

Kind of treatment / Disease	No. of laboratories		Cost for the public				SSI	
			Treatment		Unused drug in original container		Cost of treatment	
	National	Imported	National	Imported	National	Imported	National	Imported
3b. Pneumonia acquired in the community: Over 65 years of age or with comorbidity								
- First choice: *Ceftriaxone 1g x qd IV or IM x 10 d*	4	2	74,00 - 120,00	198,00 - 318,00	-	-	-	9,79
+ *Clarithromycin 500mg q12hrs PO x 10 d*	-	3	-	36,50 - 129,00	-	21,6 - 27,00	-	52,00
Choice if not responsive (therapeutic fail) and hospitalize								
- First choice: *Ceftriaxone 2g x qd IV or IM x 10 d*	4	2	148,00 - 240,00	396,00 - 635,00	-	-	-	19,60
- Alternative: *Levofloxacin 500mg qd IV x 10 d*	-	2	-	530,00	-	-	-	-
4. Infection of the urinary tract in man/prostatitis								
- First choice: *Ciprofloxacin 500mg q12hrs PO x 14 d*	5	7	22 - 32	22 - 96	1,50 - 2,16	1,50 - 6,30	1,22	-
Choice if not responsive to the treatment (therapeutic fail)								
- First choice: *Ciprofloxacin 500mg q12hrs PO x 30 d*	5	7	47 - 64	43 - 189	-	-	2,60	-
5. Erysipela								
- First choice: *Phenoxymethylpenicillin 500mg q8hrs PO x 10 d*	-	2	-	1 - 10	-	0,5 - 5,00	-	-
- Alternative: *Amoxicillin 500mg q8hrs PO x 10 d*	10	5	6,6 - 21	7,6 - 21	0,75 - 2,00	1,17 - 5,5	-	-
Erythromycin 500mg q6hrs PO x 10 d	6	1	7,2 - 20	55	0 - 2,19	0	6	1
Choice if not responsive to the treatment at the 48h (therapeutic fail)								
- First choice: *Penicillin 2,000,000 IU IV q4hrs x 8 d*	2	1	85 - 150	83	-	-	9,60	-
- Alternative: *Clindamycin 600mg q8hrs IV x 10 d*	1	1	292	316	-	-	-	-
6. Cellulitis								
- First choice: *Cephalexin 500mg q8hrs PO x 10 d*	4	1	8,70 - 13,00	21	0,55 - 0,90	1,30	2,25	-
- Alternative: *Cefadroxil 500mg q12hrs PO x 10 d*	3	-	11,80 - 15,60	-	2,00 - 5,85	-	-	-
Dicloxacillin 500mg q6hrs PO x 10 d	1	-	18	-	4	-	-	-
Choice if not responsive to the treatment at the 48h (therapeutic fail)								
- First choice: *Cefazoline 1g q8hrs IV x 10 d*	4	-	114 - 120	-	-	-	36,00	-
- Alternative: *Clindamycin 600mg q8hrs IV x 10 d*	1	1	292	316	-	-	-	-
Oxacillin 2g q6hrs IV x 10 d	3	-	368 - 525	-	-	-	-	-

Kind of treatment / Disease	No. of laboratories		Cost for the public				SSI	
			Treatment		Unused drug in original container		Cost of treatment	
	National	Imported	National	Imported	National	Imported	National	Imported
7. Acute pyelonephritis								
- First choice: *Ciprofloxacin 500mg q12hrs PO x 14 d*	4	6	22,00 - 53,70	23,4 - 94,50	2,16 - 3,00	1,46 - 6,30	1,66	-
- Alternative: *Norfloxacin 400mg q12hrs PO x 3 d*	2	2	7,15 - 7,18	13,30 - 30,00	1,43 - 1,56	1,65 - 6,00	0,40	-
Choice if not responsive to the treatment at the 48h (therapeutic fail)								
- First choice: *Gentamycin 160mg qd IM x d x 10 d*	3	2	9,45 - 42,50	6,32	-	-	3,32	-
- Alternative: *Amikacin 1gr qd IM x d x 10 d*	5	1	88,52 - 94,60	94,84	-	-	12,70	-
Choice if suspect Enterococcus:								
- First choice: *Ampicillin 2g q6hrs IV x 10 d*	4	6	170 - 305	142 - 193	-	-	52,00	-
8a. Invasive diarrhea								
- First choice: *Ciprofloxacin 500mg q12hrs PO x 5 d*	4	3	7,40 - 11,20	9,50 - 31,50	-	-	-	0,50
8b. Presumed salmonellosis (Immunocompromised, intravascular or cardiac prostheses and outbreaks of food poisoning)								
- First choice: *Ciprofloxacin 500mg q12hrs PO x 5 d*	4	3	7,40 - 11,20	9,50 - 31,50	-	-	-	0,50
8c. Relapsing diarrhea								
- First choice: *Metronidazole 250mg q8hrs PO x 7 d*	5	-	3,40 - 16,00	-	3,20 - 16,00	-	-	0,68
If not responsive to the treatment at the 48h (therapeutic fail)								
- First choice: *Vancomycin 125mg q6hrs PO x 10 d*	4	3	137 - 182	140 - 180	-	-	-	-

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Note:

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Methods for measuring health inequalities (Part III)

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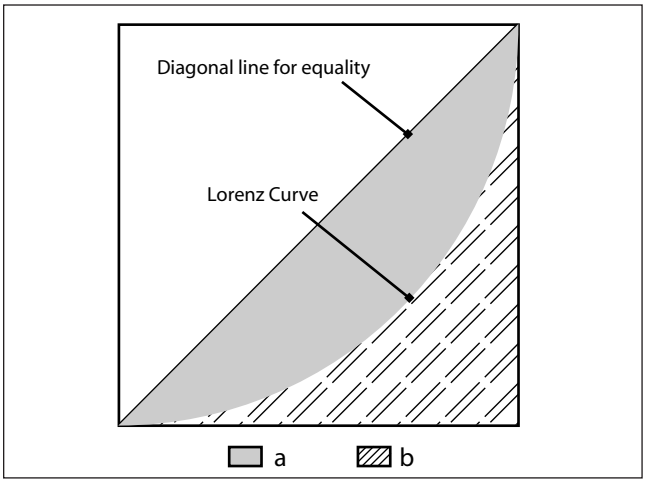
Gini coefficient and Lorenz curve

The Gini coefficient is based on the Lorenz curve, that is a cumulative frequency curve that compares the empirical distribution of a variable with its uniform distribution (based on equality), represented by a diagonal line. The greater the distance, or more properly, the greater the area included between the Lorenz curve and the diagonal, the greater the inequality. The classical example is the distribution of income in a population.

For application in a health context, the abscissa or x-axis represents the cumulative proportion for the population and the ordinate or y-axis, the cumulative proportion for the health variable being studied. The individuals/groups or geographical units that make up the population are ordered by the health variable being studied, from the worst situation to the best situation. The greater the area between the curve and the diagonal, the greater the inequality. The curve can be below

Figure 3. Area for calculation of the Gini coefficient.



Source: Special Program for Health Analysis (SHA), PAHO.

Gini coefficient and Lorenz curve

Examples of questions that they make it possible to answer:

- Is IM distributed uniformly among the countries of the Andean area?
- How are infant deaths distributed among the countries of the Andean area with respect to the number of live births?

Necessary data:
Figure 4 and table 7.

How these are calculated:

There are different ways to calculate the Gini coefficient (G); one way is to use the following formula, known as Brown's formula (11):

$$G = 1 - \sum_{i=0}^{k-1} (Y_{i+1} + Y_i)(X_{i+1} - X_i)$$

Let Y_i be the cumulative proportion for the health variable through the group i, and X_i the cumulative proportion for the population through the group i.

The steps to follow to carry out the calculation are:

1. Order the geographical units by the health variable, from the worst situation to the best situation.
2. Transform the rate into a continuous variable.
3. Calculate cumulative frequencies for the two variables.
4. Graph the Lorenz curve, representing the cumulative frequency of the population on the x-axis (abscissa) and the cumulative frequency of the number of events for the health variable on the y-axis (ordinate).
5. Calculate the Gini coefficient as an absolute value, using the formula cited above (11):

$$G = \left| 1 - \sum_{i=0}^{k-1} (Y_{i+1} + Y_i)(X_{i+1} - X_i) \right| = \left| 1 - 1.20 \right| = 0.20$$

Interpretation

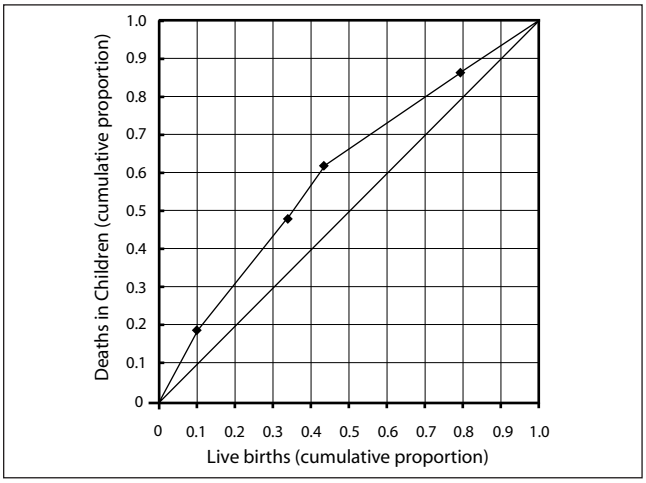
- The Gini coefficient was 0.20, representing the inequality of the distribution of the number of deaths of children under 1 year in relation to the number of live births. The points on the Lorenz curve (figure 4) indicate, for example, that 30% of deaths of children under 1 year occurred in 20% of the population of live births.
- The value of 0.20 is closer to 0 than to 1. However this coefficient should be used in comparative terms. It would be necessary to compare this value with values of the same indicator for other geographical units.

Table 7. Data necessary for calculating the Lorenz curve and the Gini coefficient. Countries of the Andean area, 1997

Country	GNP	IMR	LB	Deaths	RFLB (X)	CFLB (X')	$X'_{i=1} - X'_i$ (X'')	RFD (Y)	CFD (Y')	$Y'_{i=1} - Y'_i$ (Y'')	Y'' x X''
Bolivia	2,860	59	250	14,750	0.09	0.09	0.09	0.17	0.17	0.17	0.02
Peru	4,410	43	621	26,703	0.24	0.33	0.24	0.31	0.48	0.65	0.15
Ecuador	4,730	39	308	12,012	0.12	0.45	0.12	0.14	0.62	1.10	0.13
Colombia	6,720	24	889	21,336	0.34	0.78	0.33	0.24	0.86	1.48	0.50
Venezuela	8,130	22	568	12,496	0.22	1.00	0.22	0.14	1.00	1.86	0.40
Total	—	33	2,636	87,297	1.00		1.00	1.00			1.20

Note: GNP: gross national product per capita adjusted for purchasing power parity. **IMR:** infant mortality rate per 1 000 live births. **LB:** number of live births (thousands). **Deaths:** number of deaths of children under 1 year. **RFLB:** relative frequency of live births (LB of the country/LB total). **CFLB:** cumulative frequency of live births. **RFD:** relative frequency of deaths of children under 1 year (number of deaths in the country/number of deaths total). **CFD:** cumulative frequency of deaths of children under 1 year.

Figure 4. Lorenz Curve for infant mortality, ordered by infant mortality rate. Countries of the Andean area, 1997.



Source: Special Program for Health Analysis (SHA), PAHO.

or above the diagonal, depending on the variable used. When this is beneficial for the population (for example, access to drinking water), the curve is below the diagonal line, while when it is detrimental (for example, deaths) the curve is above the diagonal line.

One of the ways to measure the degree of inequality is the Gini coefficient, that is a summary measure of the deviation of the Lorenz curve with respect to the diagonal line for equality (figure 3). The Gini coefficient is twice the area between the curve of Lorenz and the diagonal; its value ranges from 0 (perfect equality) to 1 (total inequality).

Concentration curve and concentration index

If the population or geographical units are ordered by socioeconomic status, and not by a health variable, one can include the socioeconomic dimension in the analysis. The concentration curve and concentration index are calculated by the same method as the Lorenz curve and the Gini coefficient, but incorporating the social dimension. The concentration index takes values between –1 and + 1. Values are negative when the curve is above the diagonal line and positive when it is below the diagonal. If the orderings by the socioeconomic variable and the health variable coincide, then the Lorenz and concentration curves also coincide, as do the concentration index and the Gini coefficient. Given that the order of the countries used in the previous examples by the socioeconomic variable is the same as that by the health variable, in the following example the countries are ordered by the current value of GNP per capita, without adjusting for purchasing power parity. Thus one avoids getting results identical to those in the previous example.

Concentration curve and concentration index

Examples of questions that they make it possible to answer:

- How are the deaths of children distributed among the countries of the Andean area with regard to their economic situation, as measured by per capita GNP?

Necessary data:
Figure 5 and table 8.

How these are calculated:

The way to calculate the concentration curve and the concentration index is similar to the method used for the Lorenz curve and the Gini coefficient:

1. Order the geographical units by the socioeconomic variable, from the worst situation to the best situation.
2. Transform the rate into a continuous variable.
3. Calculate cumulative frequencies for the two variables.
4. Graph the concentration curve, representing the cumulative frequency for the population, ordered by the socioeconomic variable, on the x-axis (abscissa) and the cumulative frequency for the number of events for the health variable on the y-axis (ordinate).
5. Calculate the concentration index using Brown's formula (11):

$$G = 1 - \sum_{i=0}^{k-1} (Y_{i+1} + Y_i)(X_{i+1} - X_i) = 1 - 1.09 = -0.09$$

Interpretation

- This value of –0.09 is a measure of the inequality of the distribution of infant mortality caused by the difference in values of per capita GNP. In figure 5, the second point from left to right marked on the curve shows that 30% of deaths in children under 1 year occurred in the poorest 20% of the live birth population groups, while the second point from right to left shows that 14% of deaths in children under 1 year occurred in the richest 20% of the population groups.
- Values close to zero (in the example, –0.09) imply very little inequality. Negative values correspond to concentration curves above the diagonal line, which means that poorer units have more adverse health events than would be expected under conditions of equality. It would be necessary to compare this value with those for the same indicator in other geopolitical units.

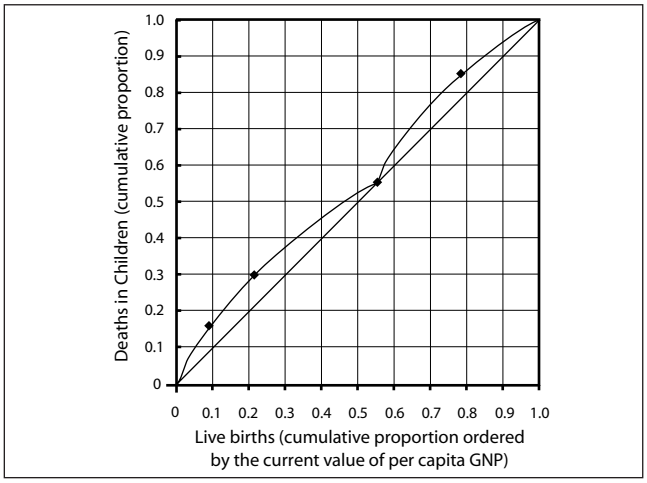
Table 8. Data necessary for calculating the concentration curve and the concentration index. Countries of the Andean area, 1997

Country	GNP	IMR	LB	Deaths	RFLB (X)	CFLB (X')	$X'_{i=1}-X'_i$ (X'')	RFD (Y)	CFD (Y')	$Y'_{i=1}-Y'_i$ (Y'')	Y'' x X''
Bolivia	830	59	250	14,750	0.09	0.09	0.09	0.17	0.17	0.17	0.02
Ecuador	1,500	39	308	12,012	0.12	0.21	0.12	0.14	0.31	0.48	0.06
Colombia	2,140	24	889	21,336	0.34	0.54	0.34	0.24	0.55	0.86	0.29
Peru	2,420	43	621	26,703	0.24	0.78	0.23	0.31	0.86	1.41	0.33
Venezuela	3,020	22	568	12,496	0.22	1.00	0.22	0.14	1.00	1.86	0.40
Total	—	33	2,636	87,297	1.00		1.00	1.00			1.09

Note: GNP: gross national product per capita adjusted for purchasing power parity. **IMR:** infant mortality rate per 1 000 live births. **LB:** number of live births (thousands). **Deaths:** number of deaths of children under 1 year. **RFLB:** relative frequency of live births (LB of the country/LB total). **CFLB:** cumulative frequency of live births. **RFD:** relative frequency of deaths of children under 1 year (number of deaths in the country/number of deaths total). **CFD:** cumulative frequency of deaths of children under 1 year.

If the order does not vary considerably, results for the Gini coefficient and the concentration index tend to be similar, particularly when the number of observations is large. In a study that analyzed a larger number of subnational data for several health indicators it was shown that, for health variables related to socioeconomic factors, differences between the Gini coefficient and the concentration index are small.

Figure 5. Concentration curve for infant mortality, ordered by the current value of per capita GNP. Countries of the Andean area, 1997.



Source: Special Program for Health Analysis (SHA), PAHO.

Comparison of the best known indicators

According to Wagstaff,[4] among the indicators analyzed in their publication (rate ratio, Gini coefficient, modified Gini coefficient, index of dissimilarity, slope index of inequality (SII) and relative index of inequality (RII), and concentration index), only the RII and the concentration index meet the necessary requirements for the measurement of the inequalities cited above: 1) they reflect the socioeconomic dimension of inequalities in the health field; 2) they use information on the entire population, and 3) they are sensitive to redistribution of the population among different social groups.

In the review carried out by Thió,[12] this author notes that Kunst and Mackenbach[5] are inclined toward use of standard regression models and by regression using percentiles (RII), that according to them are the measures that best satisfy the following criteria:

• **Validity:** the indicators should measure both the direction and the strength of the association between socioeconomic level and health. Measures based on ratios, the population attributable risk (PAR), and the index of dissimilarity do not measure health inequalities well when there is not a clear gradient from the highest class to the lowest. Measures that do not take into account the socioeconomic group (Gini coefficient, Lorenz curve) obviously do not have this attribute.

• **Precision:** the indicators should make it possible to calculate confidence intervals for the estimates, especially when working with small samples. In order to increase precision it is important to take into account information on all the socioeconomic groups, something that measures that compare the extremes do not do. It is difficult to calculate confidence intervals for the Gini coefficient and the index of dissimilarity because their distributional properties are complicated.

• **Flexibility:** the indicator should make it possible to calculate both absolute and relative measures. Furthermore, it is desirable to be able to control for the effect of confounding factors and this is only possible using regression models.

Advantages and disadvantages of the indicators presented

In favor of the rate ratio and the rate difference it can be noted that they are the easiest to calculate and interpret, even by people without academic training. Their great disadvantage is that they overlook inequalities among intermediate groups. Another important limitation is that they do not take into account the sizes of different groups.[5]

The advantage of the effect index is that it encompasses all socioeconomic groups (and not only the extremes) and that its calculation incorporates other variables.[5] Its disadvantage is that it is necessary to have statistical knowledge to select the best model and interpret the results. Furthermore, the assumptions for regression can be restrictive and in many cases make it not applicable.

PAR is easy to calculate and interpret. Its other advantage is that it not only measures the health indicator for groups with high socioeconomic levels (compared with the total population), but also takes into account the size of the population of different groups, because the larger the groups with high values of the indicator, the greater is the potential for reduction of the global indicator.[5]

The index of dissimilarity is not sensitive to the direction of the association between socioeconomic level and health.[12] Furthermore, it is not recommended for analysis of health status because it presupposes redistribution of the burden of disease or death, that is inadmissible from the ethical standpoint.

The RII and the SII have the advantage of taking into account the size of the population and the relative socioeconomic position of groups. These measures are sensitive to the average health situation of the population.[12] However, their calculation and interpretation are relatively complex and can yield unreliable results when they are applied to small samples with aggregate data.

The Lorenz curve and the Gini coefficient take full advantage of the information on all subjects or population groups but their disadvantage is that they overlook socioeconomic status.[5] Murray and López[13] have pointed out, in addition, that the Gini coefficient is not very sensitive to changes in the size of inequality in mortality of age groups above 15 years. Moreover, information on the coefficient is not sufficient for understanding the form of the inequality if it is not accompanied by the corresponding curve.

The concentration index incorporates the socioeconomic dimension, but shares the other disadvantages noted for the Gini coefficient.

Types of results that the indicators provide

The indicators presented provide different measures of inequality in health. Some make it possible to estimate how many more times an event occurs in a particular group, in comparison with another group in an opposed situation; others make it possible to estimate how many cases of a given event could be avoided if the situation improved, or what proportion of a given event occurs in a poorer section of the population.

The rate ratio and the RII provide similar information, although the complexity of the method for obtaining them is different. The former is simpler and only takes extreme groups into account. There is a similar contrast between the rate difference and the SII. Nevertheless, the results are not identical. Each investigator must define the degree of sophistication desired for their study.

The PAR obtained through the simplified formula is the measure that is most indicated when the purpose is to obtain data for rapid decision-making. The PAR calculated using regression models makes it possible to control for confounding factors and, as a result, to obtain more complete information, but it is subject to the limitations of verification of the adjustments made and the assumptions for the regression model.

Both the PAR and the index of dissimilarity provide percentage measures of inequality, but the calculation of the former is based on the group or geographical unit with the best socioeconomic status, while the latter takes into account all groups and reduces them to a common reference value. The choice between these two measures depends on the purposes of the study.[5] The index of dissimilarity suggests a less ambitious goal, but this is perhaps more realistic.

The underlying logic of the Gini coefficient and the concentration index is the same but the latter has the advantage of including the socioeconomic dimension, which, in turn, poses the risk of doing this through use of an inappropriate indicator. In a study that compared the results of the Gini coefficient and the concentration index grouping the departments into socioeconomic levels, lower values were found for the concentration index in the 17 variables studied (14 health variables and 3 socioeconomic variables).

Some of the indicators require more complex instruments, such as statistical packages or more complicated methods of calculation. Choice of these indicators depends on the knowledge of the researcher and the objectives of the study. Nevertheless, whatever the indicator, what is important is that it is interpreted adequately and that its scope and its limitations are known.

If the objective of the study is to gain a general view of the issue for practical purposes, for action, rather than for strictly scholarly purposes, it is preferable to use less complex indicators that are easier to calculate and interpret. Thus, measurement of inequalities could have a more immediate application. However, whenever possible, these results should be compared with the results from those from using the most powerful methods, although they are more complex.

Different indicators can lead to different conclusions

The use of different indicators can lead to different conclusions about the existence of inequalities. Wagstaff [4] gives the example of a study on the relationship between chronic diseases and social class in Sweden, compared with another one carried out in England and Wales, in which opposite conclusions were reached using the rate ratio and the concentration index. Regardless of the type of indicator, it is very important that there be a descriptive analysis of the differences and that, whenever possible, more than one indicator is used. Thus the likelihood of correct findings increases.

The existence of low levels of inequality in health always depends on the groups being compared and does not imply that good health conditions exist. In order to interpret the results, it is important to provide a context for them and to take into account the variables used and the scenario in which they existed. There are no set threshold values for high or low inequality, so that the decision tends to be difficult unless the indicators have extreme values, and it is always contextual.

Final considerations

The search for equity in health is one of the principal current objectives of PAHO. It is not enough only to speak about inequalities, but it is also necessary to demonstrate objectively their existence. Measurement of inequalities between countries and within a single country is the first step for taking decisions to implement actions and strategies designed to reduce, and ultimately to eliminate, such inequalities. Transforming the results of these studies into policies is a challenge that it is necessary to confront. To do this, it is necessary to find ways to integrate researchers and decision-making bodies and to develop the capacity of the personnel who work with the decision-making bodies to carry out their own studies on possible inequalities in the field of health.

Once the situation is measured and corresponding actions and strategies are implemented, it is also necessary to measure the impact of these actions and strategies.

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The references respect the order of the original article.

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Epidemiological Calendar 2006

EW		S	M	T	W	T	F	S	EW
1	Jan	1	2	3	4	5	6	7	Jan
2	Jan	8	9	10	11	12	13	14	Jan
3	Jan	15	16	17	18	19	20	21	Jan
4	Jan	22	23	24	25	26	27	28	Jan
5	Jan	29	30	31	1	2	3	4	Feb
6	Feb	5	6	7	8	9	10	11	Feb
7	Feb	12	13	14	15	16	17	18	Feb
8	Feb	19	20	21	22	23	24	25	Feb
9	Feb	26	27	28	1	2	3	4	Mar
10	Mar	5	6	7	8	9	10	11	Mar
11	Mar	12	13	14	15	16	17	18	Mar
12	Mar	19	20	21	22	23	24	25	Mar
13	Mar	26	27	28	29	30	31	1	Apr
14	Apr	2	3	4	5	6	7	8	Apr
15	Apr	9	10	11	12	13	14	15	Apr
16	Apr	16	17	18	19	20	21	22	Apr
17	Apr	23	24	25	26	27	28	29	Apr
18	Apr	30	1	2	3	4	5	6	May
19	May	7	8	9	10	11	12	13	May
20	May	14	15	16	17	18	19	20	May
21	May	21	22	23	24	25	26	27	May
22	May	28	29	30	31	1	2	3	Jun
23	Jun	4	5	6	7	8	9	10	Jun
24	Jun	11	12	13	14	15	16	17	Jun
25	Jun	18	19	20	21	22	23	24	Jun
26	Jun	25	26	27	28	29	30	1	Jul
27	Jul	2	3	4	5	6	7	8	Jul
28	Jul	9	10	11	12	13	14	15	Jul
29	Jul	16	17	18	19	20	21	22	Jul
30	Jul	23	24	25	26	27	28	29	Jul
31	Jul	30	31	1	2	3	4	5	Aug
32	Aug	6	7	8	9	10	11	12	Aug
33	Aug	13	14	15	16	17	18	19	Aug
34	Aug	20	21	22	23	24	25	26	Aug
35	Aug	27	28	29	30	31	1	2	Sep
36	Sep	3	4	5	6	7	8	9	Sep
37	Sep	10	11	12	13	14	15	16	Sep
38	Sep	17	18	19	20	21	22	23	Sep
39	Sep	24	25	26	27	28	29	30	Sep
40	Oct	1	2	3	4	5	6	7	Oct
41	Oct	8	9	10	11	12	13	14	Oct
42	Oct	15	16	17	18	19	20	21	Oct
43	Oct	22	23	24	25	26	27	28	Oct
44	Oct	29	30	31	1	2	3	4	Nov
45	Nov	5	6	7	8	9	10	11	Nov
46	Nov	12	13	14	15	16	17	18	Nov
47	Nov	19	20	21	22	23	24	25	Nov
48	Nov	26	27	28	29	30	1	2	Dec
49	Dec	3	4	5	6	7	8	9	Dec
50	Dec	10	11	12	13	14	15	16	Dec
51	Dec	17	18	19	20	21	22	23	Dec
52	Dec	24	25	26	27	28	29	30	Dec

As in previous years, we are including the Epidemiological Calendar for easy reference and use. The Epidemiological Calendar includes the 365 days of the year, which are grouped in 52 weeks.

Its use during surveillance activities is important because by standardizing the time variable, it provides a means to compare events that occur in a given year or during a specific period to others occurring at a later time or in other countries.

The 2006 Epidemiological Calendar begins on the 1st of January 2006. This is due to the fact that 1) the epidemiological weeks all start on Sunday and finish on Saturday, and 2) to determine the first epidemiological week of the year, we must choose the first Saturday in January that include four or more days in January.

Editor notes:

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