

**УНИВЕРЗИТЕТ „ГОЦЕ ДЕЛЧЕВ“ - ШТИП  
ФАКУЛТЕТ ЗА ИНФОРМАТИКА**

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2012**

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**VOLUME I**

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**GOCE DELCEV UNIVERSITY - STIP  
FACULTY OF COMPUTER SCIENCE**

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## ESTABLISHMENT OF A HEALTHCARE INFORMATION SYSTEM

Ass. Prof. Alexandar Kostadinovski, Faculty of Economics, "Goce Delchev University " - Stip, [aleksandar.kostadinovski@ugd.edu.mk](mailto:aleksandar.kostadinovski@ugd.edu.mk);

Ass. Prof. Drasko Atanasoski, Faculty of Tourism and Business Logistics, "Goce Delchev University-Stip, [drasko.atanasoski@ugd.edu.mk](mailto:drasko.atanasoski@ugd.edu.mk)

### **Abstract**

Having healthcare information on a disposal which is reliable and timely is a base for starting up any action on the healthcare system. But often, especially in developing countries, such information is not available, because these are traits of insufficient investment in data collection system, their analyses, understanding and usage. As a result, managers in these countries are not able to identify problems and needs, also to monitor progress and assess the impact of interventions which appear as a condition to make decisions related to health policy and the design of programs and allocations of resources which are based on evidence.

### **Introduction**

The ultimate goal of the Healthcare information system is to enable various stakeholders in the healthcare system in order to make transparent decisions based on evidence. The performances of Healthcare information system should not only be calculated on the basis of quality of the produced data, but on the evidence for continued usage of such data as well; all of this in order to improve the performances of the healthcare system and health status among population. Improving the Healthcare information systems in terms of data availability, quality and their application often require interventions that indicate a wide range of possible determinants of performance. Lafond and Field proposed a classification of these determinants divided into three categories: technical, organizational and behavioral determinants<sup>1</sup>. These determinants are explained in a triple or prismatic framework shown in Figure 1.

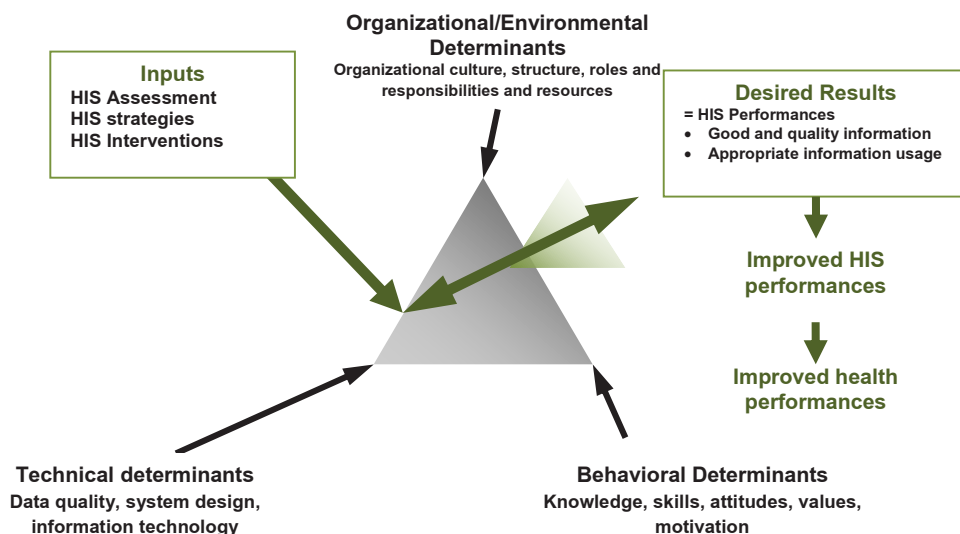
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<sup>1</sup> Lafond A, Field R: The Prism: introducing an analytical framework for understanding performance of routine Healthcare information systems in developing countries. Eastern Cape Province, South Africa, 2003



## Components of the healthcare system

Healthcare information system can be illustrated through terms of its inputs (resources), processes (selection of indicators and data sources; collection and data management) and outputs (product information and dissemination and use of information). As of the aforementioned it can be concluded that the Healthcare information system is consisted of the following 6 components.<sup>2</sup>



**Figure 1: Prismatic framework for comprehension of HIS performance**

**Resources of the healthcare information system.** During operation of the HIS there are certain prerequisites that should be fulfilled. It is about legal, regulatory and planning frameworks in order to ensure a fully functioning of HIS and availability of resources for health information necessities, including human potential, logistical support, information and communication technologies and the coordinating mechanisms in terms of and between those 6 components.

<sup>2</sup> World Health Organization: Health metrics network: Framework and standards for the development of country healthcare information systems, WHO 2006, pg. 19

*Information policies.* This refers to a legal and regulatory context within which the application of the health information is generated, which is actually an essential element because it allows the establishment of mechanisms to ensure availability, exchange, quality and sharing data. The existence of a legal and policy framework which is consistent with international standards enhances confidence in the integrity of the results. Financial resources. Not enough evidence is to determine the required level of investments in order to ensure sustainable healthcare information system, but it can be expected to vary according to the overall level of development of the concerned country. The annual expenses for a complete healthcare information system were estimated to a range between 0.53- 2.99 USD per capita<sup>3</sup>.

*Human resources.* Improvements of the healthcare information system cannot be achieved if a proper attention is not paid to the training, development, reward and career growth of staff at all levels. Numerous skilled epidemiologists, statisticians and demographers are needed on a national level in order to monitor the quality of data and to ensure proper analysis. At a peripheral level, health information staff should be responsible for collecting, reporting and data analysis.

*Information and communication technology.* Information technology can affect the improvement of the quality of data collected and communication technology can improve the timeliness, analysis and information usage. This indicates the need to adopt a clear policy of data management, which would also point out the issues of privacy and confidentiality. Ideally, at a national and sub-national level, health managers should have access to the information infrastructure that includes computers, email and internet access. National and regional statistical units should be equipped with transport and communication equipment in order to enable timely collection and compilation of data on sub-national level.

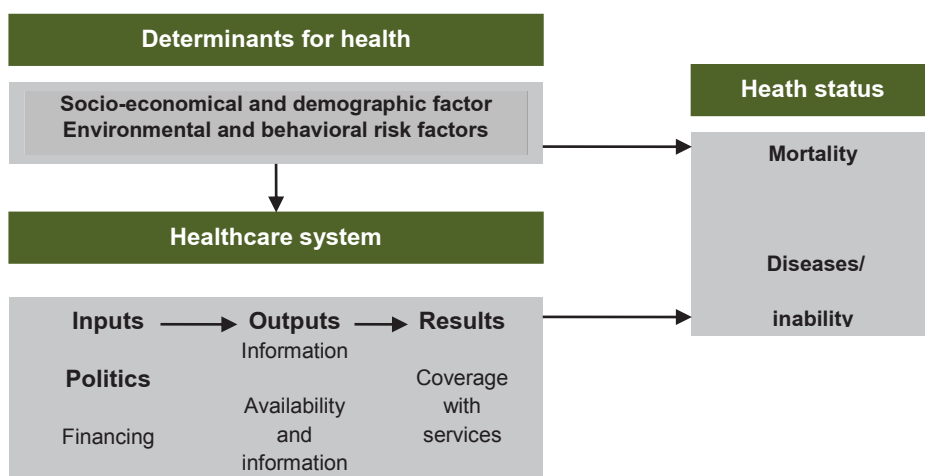
*Coordination and leadership.* It is necessary to establish a committee that would have constituted the key interest groups from the country's health and statistical sectors. He should be responsible for development and maintenance of healthcare information system and to ensure that information is shared between programs and institutions.

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<sup>3</sup> Stansfield SK et al: Information to improve decision making for health. Pg. 20

**1. Indicators.** Healthcare information system is not restrictively limited to the health sector, at the same time, there is a strong connection between this system and the information systems in the other sectors. HIS should provide information that would meet wide range of needs, from the data for delivery of services to individual customers, statistical data for planning and management of health services and measurements relevant to health policy formulation and evaluation.

Some essential health indicators in the assessment of changes in the three main areas are required (figure 2): *determinants of health, healthcare system and health status*.



**Figure 2:** Measuring areas of healthcare information systems

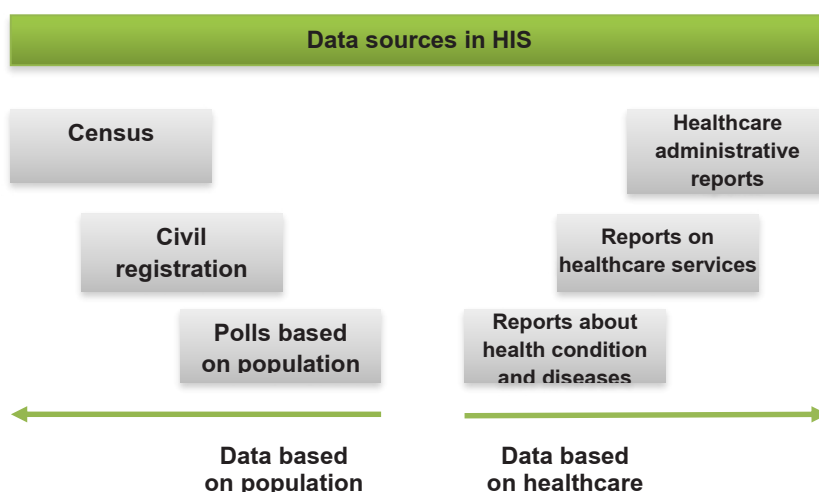
(Source: World Health Organization: Health metrics network: Framework and standards for the development of country Healthcare information systems, WHO, 2006, p. 23).

It is important to make a rational selection of the minimum set of core health indicators. In recent WHO publications standard definitions and points of measurements related to 40 core indicators could be found<sup>4</sup>. Health indicators should be valid, reliable, specific, sensitive and feasible to measurements.

<sup>4</sup> World Health Statistics 2005. Geneva, World Health Organization, 2005.

They also need to be relevant or useful for decision making at the level of data that is collected or where necessity for data at higher levels is quite clear.

**2. Data sources.** The selection of the most appropriate data source depends on the required information, the effectiveness and convenience methods, human and technical capacity required for data collection, management and dissemination of data, as well as the financial and time constraints. All healthcare information systems of the countries should be based on a set of core data sources. Sources of data, as seen from figure 3, can be divided into two broad categories: those that generate data concerning the population as a whole (population-based sources) and those that generate data for operations related to health services (based sources of health services).<sup>5</sup>



<sup>5</sup> World Health Organization: cited, pg.26

<b>Census</b>				•
<b>Life's statistics</b>	•			•
<b>Polls</b>	•	•	•	•
<b>Reports on health status</b>	•		•	•
<b>Reports on services</b>	•		•	
<b>Administrative reports</b>		•		

**Table 1: Data sources for indicators according to regions**

**3. Data management.** Data management involves a set of procedures applied during collection, storage, analysis and distribution of data (figure 4).

**Figure 3: Data sources into a comprehensive healthcare information system**

(Source: World Health Organization: Health metrics network: Framework and standards for the development of country Healthcare information systems, WHO, 2006, p. 27)

Every important health indicator should be associated with one or more appropriate data sources. Sometimes there is only one method of data collection, but it happens very often that different data sources can be used in generating similar indicators. In such a situation, all the circumstances should be taken into account, in order to make decisions about the most appropriate data sources (Table 1).

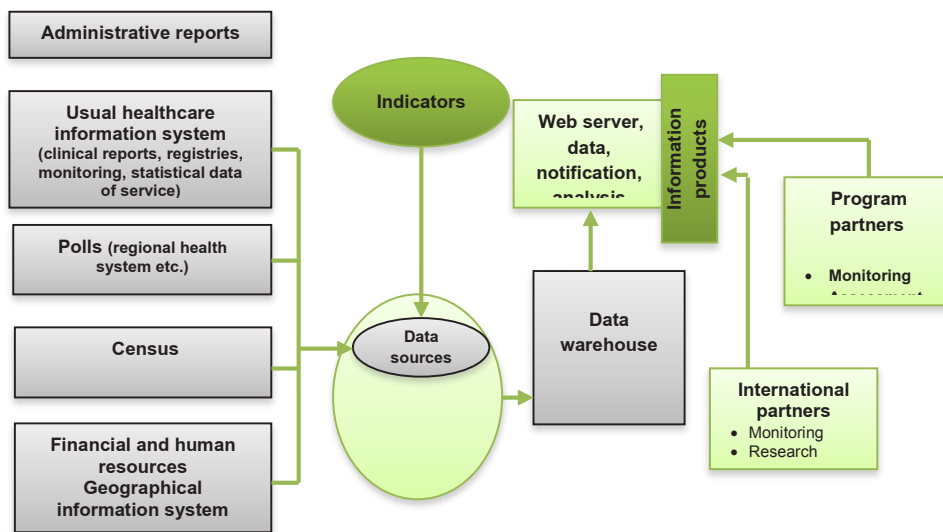
<b>Health status</b>	<b>Healthcare system</b>		<b>Determinants</b>
	<b>Inputs and outputs</b>	<b>Results (benefits)</b>	

*The collection* of accurate and complete data is a fundamental prerequisite and a basic of data management plan. The tool used for this purpose is the so-called metadata dictionary. Metadata dictionary strictly defines the data elements and their usage in indicators. It specifies the method of collecting data, periodicity, and measurement techniques used methods of assessment and possible inconsistencies in the data. It is a critical element in ensuring the quality and transparency of data.

*Integrated data storage* offers many significant benefits. Integrated data from various sources could perform the best application of complementarity and data synergy. Developing data warehouse and metadata dictionary becomes possible to create an integrated healthcare information system.

*The analysis and presentation of data* should improve their usage of local or district level where they could acquire the most significant impact on the delivery of health services. Data repository provides instantaneous feedback of information to the institution or district level. At the national level, the data warehouse provides adequate central position where all data are available for analysis, evaluation and research, which in turn has an impact on decisions related to policy, planning and management.

*The distribution of data* at all levels within the country, beginning from the authorities as well as international partners, is eased owing to the data repository. It should be designed with a web internet network and is connected with the appropriate access control. A significant tool in the management of information is the electronic documentation center where all relevant outputs of the country are accumulated.

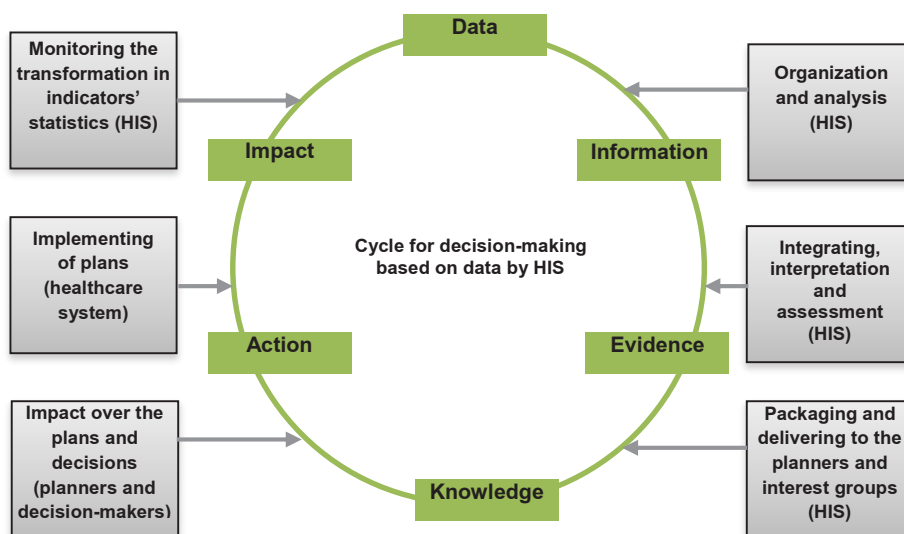


**Figure 4: Data management**

HIS should ensure that the data is intercepting the standards of reliability, transparency and completeness.

**4. Information products.** As previously discussed HIS data where pointed out as in the form of *products*. However, the data represent only raw products. Appearing as such, they have a minor value until they are refined, controlled, organized and analyzed. At this stage the data becomes *information*. Information should be displayed in front of the staff and the public. As with this information system and the quality of its information is gradually improving through cyclical processes of learning. Such necessity arouses because individual information has limited value until it is integrated with other information and therefore be evaluated through issues facing the healthcare system. At this level, information becomes *evidence*, which as such is used for making local decisions within the system.

(Source: World Health Organization: Health metrics network: Framework and standards for the development of country Healthcare information systems, WHO 2006, pg. 39)



**Figure 5: Relation of data impact over healthcare system**

As of the data's movement towards higher levels of the healthcare system through data repositories at these levels, they are synthesizing and triangulating (comparing) with other sources and further on compiling into statistical data which is useful for more thorough analyses and comparison within the healthcare system. The synthesis of the evidence is not yet sufficient until they pack up, communicate and deliver to the management in a form that changes their understanding of issues and needs. At this level, the evidence becomes *knowledge*. Once knowledge is applied, it is logical to expect that through the planning process it could easily result in *action* or change, which in turn has an *impact* to the indicators. Such impact should be measurable through changes of statistics indicators data.

**5. Dispersion and usage.** Information is used at different levels within the healthcare system through the processes of managing healthcare services, healthcare system management, planning, advocacy and policy

(Source: World Health Organization: Health metrics network: Framework and standards for the development of country Healthcare information systems, WHO 2006, pg. 44)



development. Information dissemination should be planned in accordance with the very own characteristics of each user, in which the utmost effective packaging and communication channel for transmitting information should be selected. Time transfer of information should be carefully planned, in order to fully coincide with the planning cycle and the needs of users. Communication experts can be considered as of a great assistance in packaging information for different audiences.

### **Conclusion**

Healthcare information systems include complex processes and relations that go beyond the responsibility of any single government agency. The development of healthcare information systems need to respond to the needs and requirements of different institutions within the comprehensive plan, using the approach of cooperation rather than individual consideration of only one entity. In the context of health sector reforms and decentralization, healthcare systems are managed to the level of service delivery. Such transfer of functions from central to peripheral levels generates new information needs and requires in-depth restructuring of information systems altering of requirements for data collection, processing, analyzing and understanding them as well. Standardization and quality information are the main challenges in the implementation of health sector reform, which is an issue that should be raised from the central level.

### **References:**

1. Lafond A, Field R (2003): The Prism: introducing an analytical framework for understanding performance of routine Healthcare information systems in developing countries. Eastern Cape Province, South Africa.
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