

Effective implementation of a Health Information System in Tunisia

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Abstract— This paper aims to highlight the benefits of better using data from a comprehensive, reliable and consistent health information system (HIS) as a support to decision-making for the continuous assessment of the needs of population health and the corresponding health policy. Our study is based on benchmarking analysis. We try to illustrate the ways in which decision-making process, both at the individual and the collective levels, could benefit from an integrated information system. A roadmap identifying priorities and specific procedures is proposed to better support relevant stakeholders in the future. The ultimate target is to frame and coordinate all steps that lead to an effective implementation of a HIS in Tunisia.

Keywords—Decision support system, Health Policy Process, Information System, Health Database.

I. INTRODUCTION

The new constitution in Tunisia, the recommendations of the societal dialogue on policies, strategies and national development plans and the international charters and declarations advocate an active engagement of the State to promote universal and equitable access to health services. With the financial challenges that many countries, including Tunisia, are currently facing, the debate continues on the measures to be taken in order to reach these objectives. The latter are more likely to be achieved through the adoption of well-informed policies and measures.

An enlightened approach highlights that any taken decision should be based on the best reliable data, allowing policy makers to monitor, assess, communicate and review the achievement of health goals.

Key data and financial indicators are essential to provide adequate responses to help establish decision-making and an informed health system management. Several studies admit that lack of disaggregated data weakened both the assessment of certain undertaken reforms and the development of innovative strategies. Solutions should necessarily be informed by data relevant and appropriate to the analysis context.

The use of evidence-based data to make health-related decisions arouses more and more interest of the international committee. The World Report on Knowledge for Better Health: Strengthening Health Systems (World Health Organization, WHO, 2004) has, among others, highlighted the links to be made between databases -based research and

actions in support of health systems. Other WHO studies encourage policy makers to give a greater importance to research-based data and the role they can play to inform decisions on health policy.

In Tunisia, the establishment of a complete Social Protection Floor is a major concern in current debates. Between 2008 and 2013, the number of health care cases fully covered increased from 270,055 to 1079,352. The ultimate goal is to provide basic social security guarantees in order to reduce poverty, vulnerability and social exclusion. The majority of studies on the evaluation of the effectiveness of the social protection system in Tunisia (ILO 2011) show several shortcomings in the contributory and non-contributory components notably, the health sector which faces many financial, medical, social, and accounting challenges. The key data is large, poorly consolidated, and not conducive to detailed nation-wide surveys. This data has great value, whose exploitation and dissemination, according to a regulatory frame work adapted to health data management, would be of great interest both at the individual level by improving access to health care, and at the collective level, for good disease risk management and to meet research and health policy needs.

Thus, the challenges and opportunities for HIS have never been this salient. In this context, this paper argues that the ambition of the Social Protection Floor to reduce poverty to lower levels should be combined with the establishing of a HIS. This paper, the first done for Tunisian context at our knowledge, is a contribution to the debate and reflection on this theme. It aims to highlight the benefits of better using data from a comprehensive, reliable and consistent HIS as a support to decision-making for the continuous assessment of the needs of population health and the corresponding health policy. The paper emphasizes the importance of exploring economic studies and national and international experiences, to illustrate the ways in which decision-making process, both at the individual and the collective levels could benefit from such a HIS. From our study, we propose to carry out a set of social and economic policy implications, thus, it is possible to draw a roadmap useful for policy making targeting HIS implementation.

The paper is organized as follows: section 2 presents concepts and definitions concerning HIS. Section 3 illustrates a diagnosis of the current situation of the Tunisian HIS. Section 4 illustrates the usefulness of a comprehensive, reliable and consistent HIS. Implications for economic policy

are detailed in section 5. A roadmap identifying the priorities and specific procedures to encourage the establishment of a HIS in Tunisia is carried out in section 6. Finally, we conclude in section 7.

II. CONCEPTS AND DEFINITIONS FOR HIS

In the broad sense, "An information system is an organized grouping of resources which can collect, aggregate, classify, process and disseminate information on a given environment". According to the definition given by experts of the European Health Committee², a health information system is "a coherent set of information related to sick and healthy people, oriented towards defined goals such as curative and preventive, medical research, evaluation of health care and not only medical management, but also financial health care". The international expert in health economics A-P Contandriopoulos (2001)³ defines a health information system as "a set of data and its operating system needed for an organized action system to be intelligible and transparent at all times for professionals, managers, planners, patients and the population".

Information is the "product of transforming data by adding order, context and purpose". Data are "collected hard facts (untreated) forming the base of our knowledge".

The health information system gathers data taken from:

1. Hospital information systems;
2. Health insurance information system;
3. Supplementary health insurance organizations;
4. Different studies and health surveys.

The data recorded by the health information system are of several types:

- a. Health data (mortality, hospital records).
- b. Statistics data: measure the state of enlistment and evolution of affiliates and their distribution according to the system's different care pathways (Number of insured, number of dependents, average household size, number of current beneficiaries, Number of standby beneficiaries ...).
- c. expenditure data: on the state of recovered, consumption, quality expenses ... health benefits (expenses, number of cases, average costs, distribution depending on care providers, health services, long-term diseases, types of drugs ...)
- d. Financial data: on the collection of contributions, health expenses and collected contributions ratio, the financial balance by affiliates schemes before and after deducting management expenses.
- e. Management Data: measures operating costs (operating expenses, personnel expenses, administrative expenses, training expenses ...)

Several stakeholders in the health sector and other sectors involved in the production and use of public health data are identified, as shown in Fig. 1, to determine the responsibility of each group in the process developing health information: Ministries, Social Security Funds, Insurance, Business, Consumer, Patients, Doctors, Administrators, Network Computer Specialists, Specialists on Information and Communication Technology and Media (Fig. 2).



Fig. 1 HIS stakeholders

Source : Degoulet (2007)

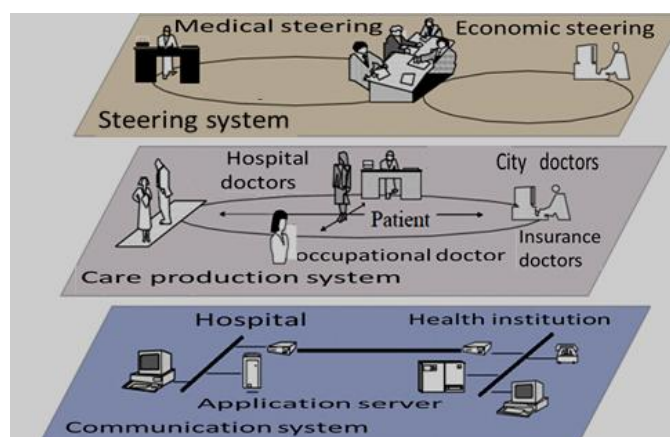


Fig. 2 Functional architecture

Source : Degoulet (2007)

Given that agencies are numerous and independent, with sometimes different guardianships, coordinating the various steering and follow-up actions of information systems for public health is essential to establish a central management body.

III. THE TUNISIAN CONTEXT OF HIS

In Tunisia, health accounts are a major management tool for the health system's policy makers. Strategies to be adopted rely mainly on data from these accounts that focus on the financing and expenses of the health system. Health accounts in Tunisia are available for three periods: 1997-1998, 2004-2005 and 2012-2013. The first two were developed by the research team of the National Institute of Public Health and the latest by a technical committee representing five ministries and 11 institutions. The main indicators published refer to: Public health expenditure, households' direct payments on health, total health expenditure, total financing units on health expenditure (Ministry of Health, National Health Insurance Fund (NHIF), Households, Other Ministries, Mutual and

private Insurance funds) direct household expenditure by sector (private, public), NHIF spending by sector (private, public), health spending in the public sector.

The data generated by health accounts help policy makers to take better decisions on certain health issues. Nevertheless, and despite the considerable effort made to develop these accounts, limitations persist.

a. Data collection-wise, there is a wide disparity across information sources. Indeed, indicators are constructed from multiple databases. According to the report of the Health Accounts 2012-2013, disparity of information sources and the non-consolidation of some of them need revision.

b. The total expenditure on prevention could not be collected because of the failures of the nomenclatures of the hospital information system that cannot distinguish between preventive and curative costs. Data from health accounts refer only to the expenditure of large national prevention programs.

c. Information on health risk coverage is not covered by health accounts. To obtain such information, we must use other data sources from the NHIF and the Center for Research and Social Studies (CRSS).

d. Data on costs by pathology, by gender and age groups is not saved because the accounting tools, including cost accounting, are underdeveloped and underused in the hospital information system.

e. The individual database available to the NHIF is only used for reference purposes. For example, we find, for all the affiliates of social security funds, information on the single health identifier, date of birth, gender and salary (for National Social Security Fund, NSSF, affiliates).

f. In this regard, it should be noted that several attempts have been made in Tunisia to develop a health information system. Specifically, a large upgrade program of the public health sector has been initiated. Among its general guide lines, it includes a support tool for the health system that seeks the development of a national health information system and an efficient patient-centered knowledge management system. It is in line with these guidelines that the Neighborhood Action Plan put into force in 2005 (as part of cooperation programs on social security and support for the reform of the health insurance system financed by the EU), provides, inter alia, for promoting the use of new information and communication technologies (NICTs) in the health sector. The main objective is to exploit an integrated information system which, combined with economic studies, allows the government to have a more informed view of the decisions to be taken. However, this experience has revealed some limitations including lack of skilled human resources needed codify acts and conditions and some information storing problems (dislocated input, postponed input, double data entry).

Overall, we find that the information available is still insufficient to meet the needs of the assessment of public health goals. A concerted policy, to ensure consistency of all information systems for public health in terms of the production and the collection of data and the merging of all

available databases into a national database, is nonexistent. Furthermore, it is important to highlight the deficiencies in the use of NICT infrastructure. NICT, that collect and rapidly exchange accurate data, are not yet generalized to be applied in the health sector.

In this regard, and assessing the national program of health districts development in 2013, we report below an extract from the report⁴ on the condition of the health information system in Tunisia:

"... At the peripheral level (health districts), it was found that the information system is still too compartmentalized and information is not oriented towards management (decision-making) but towards archiving. It must be added as constraints that the volume of information to be collected is important and that the system's processing capacity is limited. Motivation of the data-recording personnel is not optimal, in part because they are not the beneficiaries of the system. One can also regret the very low access to new information technologies that allow to interconnect the structures operating at different layers, to exchange information, to develop applications and to value the results ... The limitation in human and material resources at the central level explains to a large extent this state of affairs"⁵.

IV. THE USEFULNESS OF A HIS

A. *HIS as a support tool to decision-making process*

To optimize support to the decision-maker in matters of public health, we illustrate in the following, through case studies and assessment of some health policies, both nationally and internationally, the usefulness of a comprehensive, reliable and consistent health information system.

Important reforms to the health system have been undertaken in recent decades in Tunisia, in particular, the reform of public health institutions (PHI 1991) and the reform of the National Health Insurance Fund (in 2004). An assessment of the design and implementation process of the reforms was conducted by experts in the field within the framework of a workshop on the governance of the health system (1 July 2013). The results of the study indicated that the implementation of these reforms was not complete, their relevance and acceptability were limited. Indeed, accumulation of unresolved issues has led to failures in the functioning of the reforms' mechanisms. The study identifies three major reasons behind such a poor performance:

- a. a communication and participation deficit,
- b. underestimation of the constraints of implementing reforms in the design phase,
- c. lack of data and upstream reliable information systems and a monitoring and evaluation process.

Within this context of health policy assessment, the mission of the ACS cabinet led by JOUINLE and Laurent.T (2002) took place: the study of the financial impact of the health insurance reform. In fact, the CRSS had prepared a scheme to enable decision makers to assess, in particular, the cost of the

proposed reform and deduce the average equilibrium rate, which was estimated at 6.75 per cent. The research done by SCA has offered to enrich the scheme using data from the health insurance contracts of the STAR insurance company (average spending by age group) instead of National Pension and Social Welfare Fund (NPSW) based data. The average equilibrium rate of the reform, for the period 2002- 2012, under the new version of the scheme, is then set at 7.73%, nearly one point above the average rate estimated by the CRSS model. It is clear then that the nature of the used data influenced the estimated results and consequently the decisions to take. According to this study, the reform would cost more than what was expected and that is what has been observed in reality, a case in point is the growing deficits of the health insurance plan. Policymakers could have saved the health insurance system from worsening to reach its current financial situation.

In addition, aggregated data often hide important regional differences as recently evidenced for example by the MICS4 survey (Multiple Indicator Cluster Survey is an international program of household surveys developed by UNICEF). The conclusion to draw from these surveys is that a disaggregated database would better focus health-oriented actions, since it would reach a set of results that highlight the problems that lie at the sub-groups level. Data is disaggregated, for example, by gender, urban / rural location, income, geographic location or age groups. Disaggregated data helps to highlight hidden trends, and can allow the identification of vulnerable populations for a better targeting of policies, therefore acting with effective measures. For example, The WHO data calculated from the database of the demographic and health survey of Swaziland 2006-2007, on prevalence of HIV among women across different socio-economic groups, nationally and in urban areas, illustrates these conclusions. The Swaziland National data shows that it is essential not to be limited to national averages. At the national level there is no difference, in the prevalence of HIV, among women, across different socio-economic groups. However, with data disaggregated by urban zones, a marked inequality in health appears: poor urban women are more likely to be infected with HIV than wealthier ones (Fig. 1).

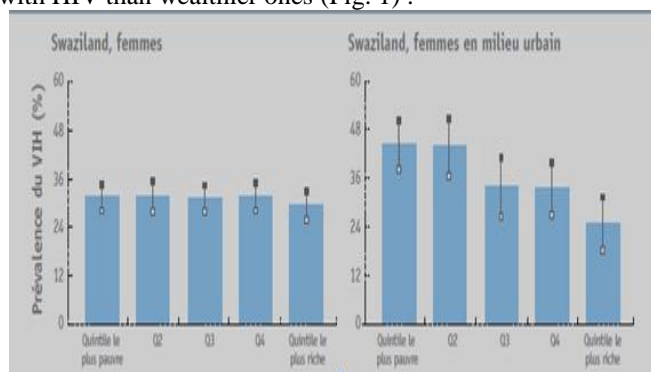


Fig. 2 Prevalence of HIV among women between different socio-economic groups, nationally and in urban areas in Swaziland 2006-2007

Source : WHO calculation

Tunisia was the subject of such an investigation (MICS4-2011-2012). Among the conclusions reached: "The positive impact of the targeting strategy of the western central region (conducted since 2000) seems to be coherent as evidenced by maintaining the improvement trend of most maternal and child health indicators revealed by the MICS4 survey, but sometimes they remain below national averages".

Disaggregated data are crucial to support decision-making process. However, such data implies significant costs if we want to opt for on-field surveys. A solution that would alleviate the financial burden (unless there is locally the will, capacity and resources to conduct surveys) is to collect data from existing information systems, health records and regular reports. The process of producing and analysing data must be at a minimum cost, and integrate institutional mechanisms belonging to local and national authorities.

B. Efficiency gains from HIS

Health information systems have taken more ground following the contribution of new information and communication technologies. It is in this context that the OECD report (2010), based on case studies in six OECD countries (Australia, Canada, Spain, United States, Netherlands and Sweden) emphasizes the benefits that may result from the implementation of NICT in the health sector, particularly the benefits to medical record keeping and information exchange. The findings of the case studies confirm that the collection and the automated processing of data are used to continuously feed health information systems, which reinforces, strengthens and facilitates data sharing. Numerical examples show how policymakers use these technologies to devise key national reform strategies of the health sector.

For example, clinical decisions could be assisted by computerized information (electronic transmission of reports, medical images, computerized prescription) to the point of reducing the consumption of laboratory and radiological examinations by as much as 24 per cent and reduce care costs by informing doctors about "comparative effectiveness" of various medical treatments. Therefore, a more efficient information sharing system could be a way of limiting costly services. Efficiency gains were also recorded, in particular, in the ability to see more patients and shorten waiting time for examination and results collection.

Another study in the UK shows that the use of electronic processing tools to recover health insurance fees through the NEHEN network (New England Healthcare Electronic Data Interchange Network) has significantly reduced administrative costs. The manual processing (paper-based), to recover such fees, was \$ 5.00 per transaction in labor costs. The latter, once processed electronically, has a unit cost of only 25 cents. In 2006, the network handled over 4.5 million transactions per month. With NICT, the annual administrative costs were significantly reduced. The Baystate Health care provider, for example, could save more than USD 1.5 million of transaction costs, between September 2006 and April 2009. Administrative labor simplification and the huge time saving over manual invoicing and processing of information on

recovering insurance fees represent for most health care institutions a significant savings tools.

Furthermore, the use of NICT would enhance the efficiency of the NHIF and agencies of the Health Insurance Network. Indeed, the absence of an information system that coordinates between the different NHIF services and its contracted partners (doctors, pharmacists, affiliates ...) is the source of many voluntary and / or involuntary abuses because of information asymmetry. The multiple frauds and embezzlements further burdened the budget deficit of the fund which could be fatal to the private health insurance sector. The fight against this phenomenon will save money that can be reinvested in the fund. Information technologies are effective tools to win this battle, while fighting against the red tape generated by manual labour. Note that the NHIF is committed conventionally, since 2006, to set up an information and data exchange system, including smart cards that will certify the rights for health care services and track in real-time the upper limits. This project is not implemented until today.

C. Lessons from the case of France

According to a report published by the High Public Health Council (2012):

"France disposes of medical, social and centralized national economic data bases, established and managed by government agencies, covering completely and permanently the entire population in various strategic areas of public health and research: use care, hospitalization, disability, and professional, social and economic benefits. In addition, a single individual identifier is currently used by all national databases. Despite some limitations in terms of coverage, quality and data validity, these databases, covering more than 60 million people, are a considerable heritage, probably unique in the world".

A mapping of available public data in the health field contains over 260 databases or data sets.

The data recorded by the information systems of health insurance are gathered in regional data processing centers, which play a central role in the data management of health insurance. This data is grouped into two main repositories: ERASME (Extraction, Search, Analysis, Medical Economic Monitoring) and SNIIR-AM (National Information System of Inter-schemes Health Insurance). According to experts of the High Public Health Council, this data warehousing-oriented repository is the largest "data warehouse" of the world:

"The general scheme represents 100,000 employees, 47 millions "customers", 1 billion invoices per year and 100 billion Euros of turnover. The project covers all social security schemes, i.e. the entire French population"

The databases can be used in isolation, consolidated or enriched by other survey data. Depending on the nature of the data, access to health information is for all, restricted or closed, free or paid and exploitable (Excel, CSV) or not (PDF, online consultation).

In fact, with the data opening process initiated by the United States and the United Kingdom in 2009 and 2010 respectively, an international trend toward open Data has

grown. It resulted in the signing of the Charter for the opening of public data, signed in June 2013 by the G8. In France, the creation of a platform of public data gave impetus to the Open Data process.

V. THE USEFULNESS OF A HIS

To ensure universal and equitable access to health services, with a health system facing internal inefficiencies and a funding mismatch, making it increasingly expensive, the adoption of any decision-making system based on diversified data bases and solid, reliable and valid information is needed. Indeed, policymakers would be required to make choices and to set national priorities in line with the expectations of users and the availability of resources. Health information is crucial for the choice of measures to be taken, to their implementation and the evaluation of their effectiveness. It is also necessary that the information is available.

The data on the Tunisian health system is not yet sufficient to meet the needs of the assessment of public health goals. The shortcomings of information systems are a main obstacle to the establishment of effective measures. Indeed, an overview of the major reforms that has been implemented in Tunisia allows highlighting that often they have not been applied in full, or remained only at the stage of a pilot project and / or has shortcomings.

Misinformed decisions are harmful to the introduction of reform measures and the achievement of planned objectives. Hence we need for an integrated shared and sharable information system as a tool to help in decision making at the health care unit of the hospital, region and at a national level. To achieve this system, we should:

- a. Include medical and health care information as well as economic and management data.
- b. Arrange the most detailed possible data on both health insurance recovery and on the benefiting population. In this regard, medicalizing information systems (a medico-economic double approach, centred on the patient's medical records) started in 6 pilot public hospitals and its support by cost accounting should be generalized.
- c. Promote communication, exchange and data sharing between all stakeholders and the various partners (within the same unit of a hospital, between units within the hospital between the hospital and its external partners).
- d. Complete routine data with others derived from surveys.

However, data alone is not enough, it has value only if it can be exploited by different partners, it should be evaluated and treated to build indicators of relevant information to help in decision making. It is for this purpose that it is imperative to preserve the ongoing participation of the key stakeholders of the health sector and other sectors, both in the production and the use of information.

The fact of taking into accounts their interests and expectations provide a more complete view of the technical, political and social context, while enhancing the acceptability of the proposed strategic measures. The successful

implementation of a comprehensive health information system depends heavily on stakeholders' support and participation. It is this condition that could guarantee the continuity of the development process of such a system.

Thus, a co-pilot of ministries, social affairs, health, higher education and scientific research, Employment and Vocational Training, Information and Communication Technology and Digital Economy, should be implemented as part of a national strategy for the development of a health information system.

Simultaneously, reforms NICT-oriented resources are needed in this strategy. The digital revolution with new information and communication technologies, which are suitable for multiple applications in the health sector, is a major success factor for the development of a health information system. Indeed, in a patient's optical scanning files and medical data, information technologies bring efficiencies that benefit the patient and health systems in particular through:

- improving the quality and security of reference, medical, care and economic data, while respecting privacy of patients;
- a more informed national steering of the health care system through better availability of data of various types;
- improving prevention, diagnosis, treatment and monitoring of patients;
- a better control over the evolution of health expenditure, especially sharing of information could be a way of limiting costly services including limiting redundant acts;
- Significant savings in administrative costs for each health care unit.

Some measures are necessary to improve and accelerate the adoption and use of NICT in the health sector. Lessons learned from the best practices implemented at the international level could minimize risks, delays and costs.

The establishment of a health information system is imperatively needed today, and the process of developing information should be:

- preserved as part of a health economics pole,
- institutionalized nearly as a performing decision-making organization oriented to the health system,
- exploited and valued for the benefit of all stakeholders in the health system while respecting medical confidentiality and rules guaranteeing anonymity,
- accompanied with staff trained on its use.

It is therefore important to initiate a reflection involving the main data producers and users in the health sector. The different stages of developing the health information system should actually be designed simultaneously. In this way, all the actors could operate synchronously.

VI. A ROADMAP FOR HIS IMPLEMENTATION IN TUNISIA

A roadmap identifying the priorities and specific procedures to encourage the establishment of a health information system is needed. This amounts actually to framing and coordinating all steps to lead to an effective implementation of the system. The main directions to be taken to this end are:

a. Steering: The creation of a national e-Health institution reporting to the Ministry of Health whose key tasks are the implementation and monitoring of the standards essential for the development of information systems in the health sector, updating a blueprint contributing to the development of a health information system and the management and coordination of the activities of the different players of the health and medico-social sector in terms of computerization.

b. Standardization of identification and medical administrative data: developing and updating the classification and coding systems, diseases and drugs through the implementation of a national repository. Moreover, patient identification should be extended to all recipients of health care, thanks to a single national health identifier that should be generated in connection with the classification laid down in the framework of the personal digitized medical records (PDMR) project.

c. Deployment of PDMR: After piloting the PDMR project in five hospitals, the next steps relate to generalizing this experience and the actual deployment of PDMR on widespread health professionals. PDMR can be accessed either by patients or by health professionals, using a secure Internet connection and a Web browser (depending on the personal data protection legislation). Hence, the need for the establishment of an IT infrastructure.

d. Supporting and accelerating the computerization of health institutions: This step should be undertaken in parallel with the PDMR project. In fact, there is a need for continuity and simultaneity across the different stakeholders' information systems, the PDMR platform and e-Health services (technical infrastructure for the services offered to stakeholders in the health system). A national platform to exchange and share health data would be needed to input and / or acquire data.

e. The development of a training plan: Train staff on the management, analysis and dissemination of data at all levels.

f. Communication: inform patients and health care providers on the operational features and security measures of the PDMR and the national electronic platform for the exchange and sharing of health data.

VII. CONCLUSIONS

This study aimed to contribute to the debate on HIS, it emphasizes the importance of such system to better support relevant Tunisian stakeholders in the future. It proposes to highlight the benefits of better using data from a comprehensive, reliable and consistent HIS as a support to decision-making for the continuous assessment of the needs of population health and the corresponding health policy. In response to this, we review economic studies in conjunction with reported national and international experiences within this domain.

This topic is timely and relevant for Tunisian context, since the establishment of a complete Social Protection Floor is a major concern in current debates. Indeed, to ensure universal

and equitable access to health services, with a health system facing internal inefficiencies and a funding mismatch, making it increasingly expensive, the adoption of any decision-making system based on diversified data bases and solid, reliable and valid information is needed. From our study, a set of social and economic policy implications have been carried out. Thus, it is possible to draw a roadmap useful for policy making targeting HIS implementation. Health information is crucial for the choice of measures to be taken, to their implementation and the evaluation of their effectiveness.

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