

## The Brazilian National Health Informatics Strategy

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### Abstract

*This paper describes the Brazilian National Strategy for the development of the national Health Informatics Infrastructure. An overall description of the use of IT in the Brazilian Health scenario is presented with emphasis on the federal initiatives by DATASUS, the informatics division of the Ministry of Health. The national health card project is discussed and the strategies to establish interoperability among systems are presented. The adopted standards and methodologies used are also discussed.*

### Keywords:

Health informatics infrastructure; standards; health cards

### Introduction

Brazil is the 5th Largest Country and 10th Largest Economy in the World. According to the 2000 national census the country has almost 170 million inhabitants, 81% living in urban areas. Life expectancy has increased in the last years whereas birth rate is decreasing. For those born today the national average life expectancy is 68.4 years [1]. It can go up to 81.2 years for females in some of the southern states. The population grew 1.6 % in the last decade. This leads to the Population distribution by age depicted in Figure 1 below. Every year the bottom of the pyramid gets narrower while the top widens [2].

Major social-economic and epidemiological regional differences impose a challenge to the health authorities. Owing to the growth of the elderly population there is an increase of chronic and degenerative diseases such as cancer, heart diseases and diabetes. Circulatory diseases count for almost 27% of all deaths. There is a decrease of infectious diseases, but they are still important, especially in the north and northeast regions of the country where they can represent up to 13% of the hospital admissions [2].

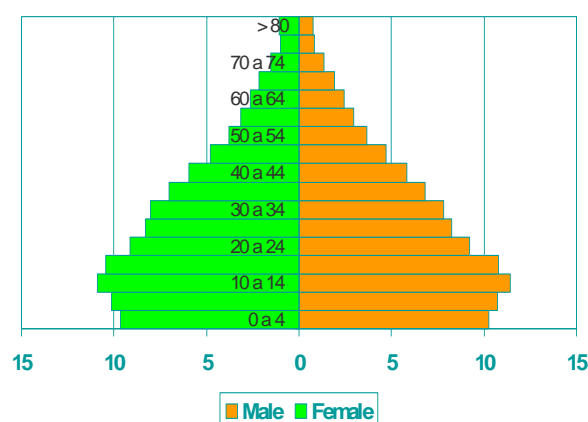


Figure 1. Brazilian Population distribution by age -  
Source DATASUS

### Brazilian Healthcare System

Brazil has a comprehensive health care model – SUS (Sistema Único de Saúde – Unified Health System) with full coverage to every citizen. Since 1988 (new Constitution) the decentralization of health services management has increased. According to this model, the administration of the health care budget and payment to the providers are managed at the municipal level and depends on its population and services provided. Healthcare budget comes from federal, state and municipal taxes, not from Social Security.

There are 5,500 cities in the country - 600 of which enjoy complete autonomy regarding their healthcare services whereas the other 4,900 have autonomy only for basic care. The city's health secretary has an obligation to send information to DATASUS, the informatics division of SUS as described in the next section.

The healthcare system counts on 65,000 primary care units, mostly public, and 7,800 hospitals: 2,640 public and 5,160 private. From those, 4,000 also work for SUS. Almost 75% of the hospitals have less than 100 beds. SUS covers 75%

of the population. The system attends 1.2 million inpatients per month in 18.9 M medical consultations per month. More than 100 M outpatient procedures are performed per month. SUS provides attention at all levels: from immunizations (US\$0.20 / inhabitant) to heart transplants (US\$ 40,000.00 /procedure). Public health service is universal, but badly distributed throughout the country. More information can be obtained at DATASUS home page at the URL: [www.datasus.gov.br](http://www.datasus.gov.br).

## IT in Healthcare: the present

Brazil has always had very strong policies regarding informatics. Many years ago the market was closed to protect the local IT vendors. In the last years several state governments created specific lines of investment for software development. Because of that there are many successful initiatives going on. It is worth mentioning that Brazil has very good human resources in IT, although their number could be bigger to stand up to the new challenges.

In February, 1999 the government launched the Society of Information Program with the objective to foster and organize initiatives of utilization of IT in the country, using the Internet [3].

The commitment to use Internet in the country is very important. At the moment only 9% of the population have proper access to the Internet. The numbers are growing fast. This year more than 9 million people delivered their income tax forms using the Internet (more than 80% of all individual tax payers). All banks have web-services, some provide Internet access to their clients and almost 40% of them use Internet heavily. National elections were held last November. Voting is mandatory and the process ran smoothly with electronic polling stations all over the country, even in the distant regions of the Amazon. The election result was known 24 hours after the end of the election. Partial results could be followed through the Internet.

The national telecommunications infrastructure is good. There are fiber optics loops connecting the main capitals (private and public). Radio communications and satellite links cover the rest of the country. Many private companies are starting to announce hosting services and datacenters.

The Brazilian Health Informatics Association - SBIS was founded in 1986 integrating the academic work that was flourishing here and there across the country in the area of health informatics. Today this community has evolved and grown. Six national conferences were held and in the last four years SBIS has been involved in standards definitions together with DATASUS and is presently supporting the construction of the national health informatics strategy.

In the last years the need for information in healthcare has increased. The government has been playing a major role demanding from the municipal authorities data on patient care and management as well as epidemiological profiles or information on specific Health Programs such as AIDS and

Tuberculosis, among other 40 diseases of compulsory notification. As the Ministry of Health demands for information to be sent to DATASUS, it also provides the means to accomplish the task, through the development and distribution of software for collecting, consisting, managing, processing and sending healthcare data. The next section details these activities. Although this is a meritorious effort, it only offers a partial solution, mainly for the administrative and management tasks. Still very little IT is being used in private health care sector in the country. It is estimated that less than 7% of all hospitals have any kind of Information System. There are exceptions, such as the Heart Institute of the University of São Paulo (InCor) that has a state-of-the-art HIS, including an electronic patient record that incorporates images.

There are only a handful of companies selling HIS products and maybe another 200 selling office automation systems. Most of these are small regional vendors that attend the local market. There are very few legacy systems, restricted to a few academic hospitals in the country. Most of the existing systems are simple applications written in Clipper or more recently for the Windows/Linux environment. At the same time, as the number of Internet connections increase and the network reaches distant areas of the country the idea to work with hosted systems (ASP) becomes not only feasible but very attractive.

The understanding that IT is a strategic tool for the health provider and administrator is now maturing in the country. Aware of the need of the construction of a national infrastructure to integrate all these efforts, DATASUS has been working in this direction as described below.

## DATASUS

The national health informatics infrastructure is provided by DATASUS - the informatics division of SUS. DATASUS has as mission:

- to coordinate the implementation of the National Health Information System;
- to help states and cities in the process of using IT in their activities
- to be the guardian of the National Health Information databases;
- to make information available to the public, managers, researchers and civil society;
- to define the standards for exchanging health care information for both public and private systems.

The main users of DATASUS are federal, state and municipal health departments and councils, healthcare units staff, universities and research centers, auditing departments, justice and police institutions, civil society, NGO, press and citizens.

## Health Information Flow

Health information is gathered at the point-of-care either manually or using software, usually, provided by DATASUS. From the healthcare unit, data is sent to the Municipal Health Secretary that types in what has been sent

manually and either generates diskettes or sends the information directly through the network to the State Health Secretary. The State Health Secretary aggregates the information from all the state using software provided by DATASUS or locally developed according to the national standards and sends through the network the information to DATASUS. In addition to that, everyone may access DATASUS homepage ([www.datasus.gov.br](http://www.datasus.gov.br)) to freely download software or make on-line queries to the national database. The information flows from bottom to the top, and aggregations occur at the municipal and state levels.

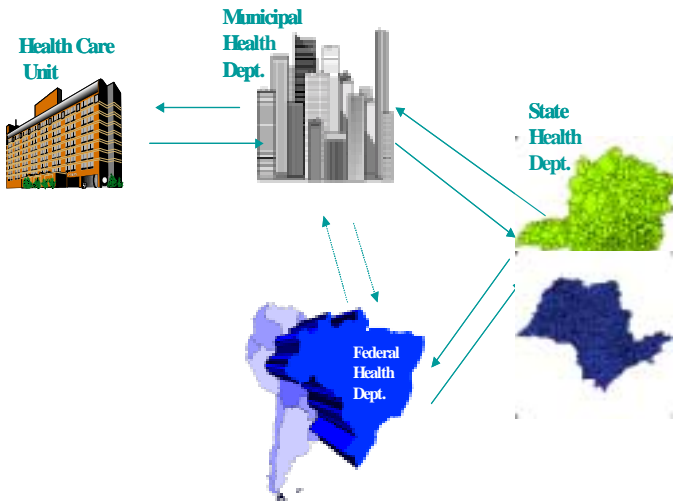


Figure 2. Health information flow

DATASUS has developed the following software titles that area available for download from its homepage: Hospital (HOSPUB), Ambulatory (SIGAB) and Blood Centers (HEMO) Management Systems; Regulation Center (SISREG); Live Births Information System (SINASC); Primary Care Information System (SIAB) - Immunization, Community Agents, Family Doctor Programs; Diseases of mandatory notification (SINAN) – (AIDS, tuberculosis, measles, mumps.); Hospital (SIH) and Ambulatory (SIA) Information Systems – payment for providers and building of the national databases; Mortality Information System (SIM) and Administrative Systems - inventory, patrimony, covenants etc - for the Ministry of Health. This software has been developed in the last 25 years and use different technologies. The main challenge today is to establish interoperability between them.

In the healthcare domain, DATASUS is the largest web repository in the country offering, for example, with no patient identification, the possibility to build different types of queries to the national database, such as number of hospital admissions and outpatient services, mortality and morbidity through the investigation of ICD codes. PAHO has recognized DATASUS as one of the most complete health information repository in the world. Besides the Internet availability a CD-ROM with data on mortality, live births, hospital admissions, ambulatory production and high complexity ambulatory services such as angioplasty or

hemodialysis is also distributed to all municipal health secretaries. Organizations or even individuals may request additional copies of these CDs.

## Health Informatics Strategy

### .The National Health Informatics System

The national strategy for health informatics - SNIS (Sistema Nacional de Informação em Saúde) is part of SUS and has to be implemented by DATASUS, as express the regulations that defined SNIS in 1990.

SNIS mission is to improve the quality of care through the inventive and adequate use of IT. SNIS will also improve the quality and accessibility of health services to patients and the public. It is also expected that SNIS will improve the quality and range of information available to patients and the public, empowering citizens to exercise their social control. A portal with health information and services for patients and public has a major role in this initiative and is already under development. SNIS construction is a long-term process that demands continuous investment, skilled HR able to work with new methodologies of software development, and, mainly, models and standards.

### Brazilian Initiatives on Health Informatics Standards

#### Vocabularies

ICD-10 - International Classification of Diseases is the national standard for diagnoses, since January 1999. The country has adhered to ICD, for decades, always in its latest versions. This rule applies to all SUS for both inpatient and outpatient, private and public institutions.

There is also a national procedure code table, for both inpatient and outpatient treatment. These codes apply only to the public sector and have a billing perspective. They are, therefore, not well suited to describe the information from the point of care perspective. The private sector still pays on a fee for service basis and uses a list of procedures codes created by the Brazilian Medical Association (AMB). This coding-table resembles the North-American CPT codes and does not map directly to the procedures codes used by the public system.

There is also a vocabulary with a unique code to describe all medications as they are registered in our FDA-like Agency (Agência Nacional de Vigilância Sanitária). Still there is no national agreement on a single standard to describe drugs.

At the present all the national vocabularies are under discussion, since the National Health Card Project demands for vocabularies to describe health encounters. One of the first challenges of the national health informatics strategy is to work towards the definition of all vocabularies used to describe health encounters.

Regarding health information content, there are some de facto standards in the country, mostly for the public sector. These standards define the information that has to be sent to

the local health authority. The information can be filled in paper form or more frequently typed-in a local software, distributed freely by DATASUS, running on a simple PC. The diskettes are sent to the local health authority that puts all the files together and sends them to the State and Federal Levels. For each developed and deployed system, there are contents and vocabularies standards intrinsically incorporated, such as inpatient and outpatient billing system, Live Births Information System; Primary Care Information System (SIAB) - Immunization, Community Agents, Family Doctor Programs; Diseases of mandatory notification (SINAN) – (AIDS, tuberculosis, measles, mumps); Mortality Information System (SIM).

In December 1998, the National Committee on Standards for the EPR – Electronic Patient Record (PRC Committee) was created with the mission to establish standards for the construction of the Electronic Health Record, using an open methodology. The standards are intended for universal use, including primary care procedures and health promotion.

The PRC Committee methodology is based on Request for Proposals (RFP) using the Internet to publish and download the documents and a discussion list. The first RFP was issued in March 1999 asking for the essential data set of information for the EHR. Three proposals were submitted, June 1999: one from Rio de Janeiro, another from São Paulo and still another from Porto Alegre. These proposals represented the three largest academic hospitals in the country, one municipal Health Secretary, software vendors and three private hospitals. These three proposals were merged into a single one after two presentational meetings. In December 1999 the final recommendation came out. The essential data set consists of: patient, professional and provider identification; allergies and relevant clinical data expressed in ICD-10 and/or free text; encounter data: date of the encounter, professional responsible; diagnoses (ICD10), procedures and exams (Brazilian Procedure Code List) and discharge status and date. Medications were not included in this recommendation because there was no consensus on what vocabulary to use. This essential data set needs now to have a field test and a revision in order to accommodate the needs aroused by the national health card project. In parallel to that, the discussion on the standard vocabularies for medications has started. Presently, the PRC committee is being reshaped in order to fulfill the needs of the national health card project that demands for quicker answers.

There are also transmission standards for health information. The channel most used to transfer information from the state and municipal health secretaries is DATASUS's BBS. The National Health Network – RNIS, aims at providing at least one Internet point of access to every municipal health authority in the country. So far this project has covered 1,184 out of 5,507 cities. From the cities involved in this project, 21% are now covered. The map below shows RNIS first phase coverage in the country.



Figure 3. National Health Network Coverage

#### CCS-SUS - Consortium of Software Components for SUS

The Consortium of Software Components for SUS – CCSSUS was officially launched on March 9, 1998. CCS-SUS's mission is to specify and implement a framework of software components for the national healthcare system – SUS [5]. CCS-SUS components incorporate the knowledge (structure and functionality) required to support the local health care administrator as well as the mechanisms to ensure the quality of the information for the national repository [3]. There are several software components available for download under the GNU-like license at [www.datasus.gov.br/ccs](http://www.datasus.gov.br/ccs). These include a suite of components to implement the phonetic identification algorithm used for the attribution of the unique national identifier for the national health card.

#### The National Health Card Project – CNS

The CNS project is the largest and most challenging initiative for the construction of the national health information infrastructure [4]. CNS main objective is to identify uniquely all users of SUS, allowing for the implementation of the national repository of clinical data. This will make it possible to integrate all data from different encounters at different health providers. The expectations are that by having access to this information better care will be delivered, as well as more efficiency in the administration of health services will be achieved. In addition, the crucial information will be available to health policy makers and surveillance teams. The project is supported by the Inter-American Development Bank - IADB. The CNS project is in its first phase that aims to: a) identify 13 M persons and 100,000 healthcare professionals from 44 cities; b) build a national infrastructure to connect

all units involved in the project (private and public), the Municipal and State Health Secretaries to the Ministry of Health; c) deliver training and education at all levels, d) provide interoperability of all legacy systems and the CNS system, and, finally, e) offer an evaluation of the whole process. So far 6 M persons have been registered. Open standards to establish the interoperability have been defined: XML has been appointed as the means to integrate all systems. The two key words for this phase are: flexibility and learning. The first systems will be in production January, 2001. For the second phase, starting June 2001, the objective is to register 100 M persons

### Telecommunications infrastructure

In the last few years the telecommunications companies in Brazil became private. At the same time, in order to guarantee that the small and distant areas would be able to count on telecom infrastructure, a National Telecommunications Fund was created (FUST). The law that created FUST states that 1.5% of the annual gross profit of the telecommunications companies should be directed to the construction of a national fund to be used to install telephone lines in the rural and small towns. The law also states that these resources will be used to build the telecommunications infrastructure for health and education. In this first year (2001) there are US\$ 150 M already available for utilization. The idea is to use these resources for the second phase of the National Health Card Project.

### Conclusions

Brazil faces today a very special moment as far as healthcare informatics is concerned. The development of a national healthcare informatics strategy is complex and challenging especially due to the country many different cultural differences and economical profiles. The National Health Card project shifts the focus from the billing perspective to the health encounters, allowing for the construction of the national repository of clinical data. At the same time, connectivity is being provided. In addition to the operational and management aspects of the National Health Card project that are demanding a team of qualified

human resources, there is also the concern on the theoretical and conceptual aspects of the project. Standards are a key issue and considered to be so. So far a lot has already been accomplished and a lot has been learned. The most fascinating aspect is the understanding that this strategy is promoting a historical change in the health scenario in the country.

### Acknowledgments

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