EDITORIAL

The Use of Health Information Systems for Investigations

Paulo Henrique Godoy[1]

Universidade Federal do Estado do Rio de Janeiro (UNIRIO),[1] Rio de Janeiro, RJ – Brazil
Editorial referring to the article: Cardiovascular Diseases Mortality Rates in Nine Cities of Rio Grande do Sul from 2009 to 2019: Temporal Trends and Demographic Differences

Information is a fundamental resource in a society, mainly for decision making. The process of obtaining this precious resource requires mastery and knowledge of its source.

In investigations in several areas, regardless of their purposes, the use of information systems is frequently observed. An information system is complex, but, according to Siqueira, initially, it is composed of three basic elements: data, information, and knowledge.[1] The data, according to the author, would be the smallest particle of this system. It is the element from registration, without any analysis. It is essential, as it will affect the other elements depending on how it is registered. Data quality is influenced by the following: reliability, it corresponds to the reality of the event; up-to-dateness, the registered data is made available in a timely manner for its use; and completeness, the data covers all the characteristics of the investigated event.[2] Information is regularly formed by a set of data. It comes from combining and analyzing several data. Knowledge comes from factors related to the use of information such as interpretation and applicability.

According to O'Brien, the definition of information system would be a combination of the concept of information and system, which brings together interrelated elements with the capacity to articulate, produce results, and meet purposes.[3]

Thus, an information system could be interpreted as a set of people, equipment, procedures, and communication resources that collect data, analyze, and disseminate knowledge.[2]

Keywords

Health Information Systems; Statistical Databases; Epidemiological Investigation.

However, in the context of investigation, the challenge is not only in how and where to obtain the information; perhaps, the biggest problem is asking the right question. A system finds itself with data available for limited responses to its information. Therefore, it is essential to know the information system from which results are intended, in order to answer questions with the lowest probability of uncertainty.

Regarding health investigations, the World Health Organization defines a health information system (HIS) as a set that operates in an integrated manner in the collection, processing, communication, and production of essential information to improve the effectiveness of health services, with regard to decisions.[4]

In Brazil, the management and maintenance of the databases necessary for the HIS and the internal institutional management systems are the responsibility of the Department of Informatics of the Brazilian National Health System (DATASUS, SUS being the abbreviation for the Brazilian Unified Health System).[2] DATASUS aggregates databases (information systems), which have records for different purposes and can be used in investigations, depending on the aim of the study. The main bases used for these purposes are: Mortality Information System (SIM);[2,5] Live Birth Information System (SINASC);[2,6] Hospital Information System of the Brazilian National Health System (SIH-SUS);[2,7] Notifiable Diseases Information System (SINAN);[2] Primary Healthcare Information System and e-SUS Primary Care System (SISAB and Sistema e-SUS AB);[2] SUS Outpatient Information System and High Complexity Procedures Authorization Subsystem (SIA-APAC);[2] National Immunization Program Information System (SI-PNI);[2] Food and Nutrition Surveillance System (SISVAN);[2] and System to Accompany the Prenatal, currently

Mailing Address: Paulo Henrique Godoy
Universidade Federal do Estado do Rio de Janeiro, Medicina Especializada/Cardiologia. Rua Silva Ramos, 32. Postal code: 20270-330. Rio de Janeiro, RJ – Brazil
E-mail: godoypauloh@gmail.com

integrated into e-SUS Primary Care (SISPRENATAL/ e-SUS),[2] which are described in Table 1.

As mentioned, these are the most commonly used systems. However, there are other coexisting systems and subsystems, which over time become integrated or extinct.

In this context, it is worth mentioning the study by Coelho Neto and Chioro, published in 2021, which identified and analyzed the nationally based HIS that were in operation in Brazil between 2010 and 2018. Despite the description in relation to the analyzed documents with incomplete and different data, the authors found 54 nationally based HIS in operation during the period and 7 decentralized information technology centers, in departments of the Brazilian Ministry of Health, which worked autonomously from DATASUS.[8] Thus, it is essential to know the content and the definition of what is registered in a HIS with which one intends to work. Still in this regard, it is important to consider the main limitation of these systems: the quality of the information is directly related to the quality of the records. This limitation must be considered when analyzing studies in a country like Brazil, with a large territorial extension and important inequalities in different aspects between its regions, states, and cities. Information obtained from HIS may be of lower quality, as they do not follow rigorous protocols such as those of randomized controlled clinical trials. However, they make it possible to evaluate a considerably larger number of outpatient appointments, hospitalizations, and procedures, for example, performed in clinical practice, which sometimes show results that do not coincide with those found in controlled studies.

Information that guides clinical decisions is based mainly on randomized controlled clinical trials, which generally involve younger patients, with fewer comorbidities than real world patients, and exclude many treatment problems faced in clinical practice.[9,10] Therefore, if there is an understanding of what is recorded, how the recording is performed, and the limitations of HIS, they can be of great use for real world investigations.

The study published in the *International Journal of Cardiovascular Sciences* titled "Cardiovascular Diseases Mortality Rates in Nine Cities of Rio Grande do Sul

Table 1 – DATASUS Information Systems according to the type of record and use		
Information Systems	**Records**	**Possibilities of use**
SIM	Deaths	Characterization and specifications on deaths
SINASC	Birth information	Conditions of birth and maternal health at birth
SIH-SUS	Hospitalizations financed by SUS	Morbidity, mortality, hospitalizations and procedures performed in hospitals
SINAN	Notifiable injuries and diseases	Morbidity of injuries and diseases under notification
SISAB/Sistema e-SUS AB	Primary care actions and procedures	Monitoring of living conditions and health of individuals and registered families
SIA-APAC	Outpatient care and high-complexity or high-cost procedures	Monitoring of high-cost and complex procedures performed in an outpatient clinic
SI-PNI	Vaccination data from residents in Brazil. Assistance and administrative actions of the National Immunization Program	Monitoring of vaccination coverage, adverse events, inventory control, and distribution of supplies
SISVAN	Actions planned for the National Food and Nutrition Policy	Monitoring of food profile and nutritional status
SISPRENATAL/ e-SUS AB	Actions of the Humanization Program in Prenatal and Birth	Monitoring of care for pregnant and postpartum women

Source: Reproduced and adapted from Técnico de Vigilância em Saúde: Fundamentos - Volume 2. Sistemas de Informação do Sistema Único de Saúde. Capítulo 2. Ministério da Saúde, Escola Politécnica de Saúde Joaquim Venâncio da Fundação Oswaldo Cruz. SIM: Mortality Information System; SINASC: Live Birth Information System; SIH-SUS: Hospital Information System of the Brazilian National Health System; SINAN: Notifiable Diseases Information System; SISAB: Primary Healthcare Information System; SIA-APAC: SUS Outpatient Information System and High Complexity Procedures Authorization Subsystem; SI-PNI: National Immunization Program Information System; SISVAN: Food and Nutrition Surveillance System; SISPRENATAL/e-SUS: System to Accompany the Prenatal, currently integrated into e-SUS Primary Care; SUS: Brazilian National Health System.

from 2009 to 2019: Temporal Trends and Demographic Differences" used one of the HIS to obtain the necessary data and provide scientific information.[11] Sandri et al. aimed to analyze the temporal trend and the main causes of death due to cardiovascular diseases (CVD), according to sex and age group, in 9 cities in Rio Grande do Sul, from 2000 to 2019. An ecological study was designed, in which data were obtained from the consolidated database of the SIM, in DATASUS. These were extracted from the system, according to the underlying cause of death due to circulatory system diseases, according to the International Statistical Classification of Diseases and Related Health Statistical Classification of Diseases and Related Health Problems (ICD-10). The authors also analyzed data on deaths from CVD stratified into 3 groups: ischemic heart disease , cerebrovascular disease, and hypertensive disease. Data on demographic estimates, in relation to the 9 cities studied, were obtained from another information system, the Brazilian Institute of Geography and Statistics (IBGE). Age was categorized into the following ranges: 20 to 39 years, 40 to 59 years, 60 to 69 years, 70 to 79 years, and 80 years or older. The authors found that 3 of the 9 cities had a reduction in mortality rates due to CVD during the period. They observed that there was a decreasing trend in ischemic heart disease mortality in Caxias do Sul, Ijuí, and Porto Alegre. In these cities, as well as in Passo Fundo and Uruguaiana, there was a decrease in mortality

due to cerebrovascular disease. However, an increase in hypertensive disease mortality rates was found for the cities of Ijuí, Porto Alegre, and Santa Maria. An increase in rates related to the older age group and male sex was reported in most cities. The authors concluded that there was heterogeneity in the trend of mortality due to CVD in the analyzed period.[11]

The authors' results and conclusion are plausible, since such heterogeneity is possibly related to existing demographic and socioeconomic differences between the cities analyzed. As the authors mention in the discussion, the influence of socioeconomic indicators on CVD mortality rates has been consistently described in the literature.

Finally, despite the limitation already described regarding the quality of the data, this type of study provides evidence on the causes of death due to CVD, the main causes of morbidity and mortality, which occurred in the municipalities analyzed, providing a real-world situation. The study is relevant in several aspects, particularly in showing the heterogeneity in mortality trends for causes and regions. This information is important for health professionals and managers, as it reflects greater attention and health actions, depending on the characteristics of each region, to minimize the impact of these diseases.

References

1. Siqueira MC. Gestão Estratégica da Informação. Rio de Janeiro: Brasport; 2005.

2. Cunha EM, Vargens JMC. Sistemas de Informação do Sistema Único de Saúde. In: Gondim GMM, Christófaro MAC, Miyashiro GM. Técnico de Vigilância em Saúde: Fundamentos. Rio de Janeiro: Ministério da Saúde, Escola Politécnica de Saúde Joaquim Venâncio da Fundação Oswaldo Cruz; 2017. p. 85-102.

3. O'Brien JA. Sistemas de Informação e as Decisões Gerenciais na Era da Internet. 2. ed. São Paulo: Saraiva; 2004.

4. World Health Organization. Developing Health Management Information Systems: A Practical for Developing Countries [Internet]. Geneva: World Health Organization; 2004 [cited 2023 Feb 7]. Available from: https://apps.who.int/iris/bitstream/handle/10665/207050/9290611650_eng.pdf.

5. Brasil. Ministério da Saúde. Declaração de Óbito: Manual de Instruções para Preenchimento [Internet]. Brasília: Ministério da Saúde; 2022 [cited 2022 Dez 1]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/declaracao_obito_manual_preenchimento.pdf

6. Brasil. Ministério da Saúde. Declaração de Nascido Vivo: Manual de Instruções para Preenchimento [Internet]. Brasília: Ministério da Saúde; 2022 [cited 2022 Dez 1]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/declaracao_nascido_vivo_manual_4ed.pdf

7. Brasil. Ministério da Saúde. Manual Técnico Operacional do Sistema de Informação Hospitalar [Internet]. Brasília: Ministério da Saúde; 2010 [cited 2020 Mar 21]. Available from: http://www.saude.gov.br/sas

8. Coelho GC, Chioro A. After All, How Many Nationwide Health Information Systems are There in Brazil?. Cad Saude Publica. 2021;37(7):e00182119. doi: 10.1590/0102-311X00182119.

9. Silverman SL. From Randomized Controlled Trials to Observational Studies. Am J Med. 2009;122(2):114-20. doi: 10.1016/j.amjmed.2008.09.030.

10. Huynh T, Perron S, O'Loughlin J, Joseph L, Labrecque M, Tu JV, et al. Comparison of Primary Percutaneous Coronary Intervention and Fibrinolytic Therapy in ST-Segment-Elevation Myocardial Infarction: Bayesian Hierarchical Meta-Analyses of Randomized Controlled Trials and Observational Studies. Circulation. 2009;119(24):3101-9. doi: 10.1161/CIRCULATIONAHA.108.793745.

11. Sandri P, Rosa LA, Almeida ES, Silva SG. Cardiovascular Diseases Mortality Rates in Nine Cities of Rio Grande do Sul from 2009 to 2019: Temporal Trends and Demographic Differences. Int J Cardiovasc Sci. 2023;36:e20220062. doi: 10.36660/ijcs.20220062.