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Paradigmas e desafios para a informatização da saúde no Brasil: perspectivas para os sistemas de informação.

Paradigms and challenges for health informatization in Brazil: perspectives for information systems.

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Resumo:

Historicamente, os Sistemas de Informação em Saúde do Brasil foram construídos de maneira fragmentada. Com múltiplas fontes, os dados são considerados frágeis e com baixa qualidade, além das dificuldades com a disponibilização trabalhosa, ocasionando dificuldade de apropriação e uso pelos gestores em saúde. É importante compreender como os Sistemas de Informação em Saúde do Sistema Único de Saúde (SIS-SUS) estão sendo utilizados no Brasil, suas dificuldades e seus impactos sobre a gestão e políticas públicas no País. Este estudo trata-se de uma revisão integrativa da literatura. A coleta de dados foi realizada entre os meses de março e maio do ano de 2024, por meio de busca pareada nas bases de dados, Biblioteca Virtual em Saúde (BVS), Web of Science e Pubmed. Revisão bibliográfica: Com múltiplas fontes, os dados são considerados frágeis e com baixa qualidade, além das dificuldades com a disponibilização trabalhosa, ocasionando dificuldade de apropriação e uso pelos gestores em saúde. Os SIS conferem suporte à gestão na tomada de decisões em saúde, a medida que fornece dados, informações, comunicação, conhecimento e ação, oportunizando a compreensão do processo saúde-doença e do perfil epidemiológico das populações, de modo que compreendendo o fenômeno seja possível a promoção de estratégias de inclusão social. Por fim, ressalta-se que são necessárias mais pesquisas relacionadas ao uso e importância da tecnologia da informação, dos SIS, e das possibilidades que estes oferecem para o progresso da administração pública e dos serviços de saúde.

***Palavras-chave**: Sistemas de informação em saúde; Informática em saúde pública; Saúde pública.*

Abstract:

Historically, Brazil's Health Information Systems have been built in a fragmented way. With multiple sources, the data is considered to be fragile and of poor quality, as well as being laborious to make available, making it difficult for health managers to appropriate and use. It is important to understand how the Health Information Systems of the Unified Health System (SIS-SUS) are being used in Brazil, their difficulties and their impact on management and public policies in the country. This study is an integrative literature review. The data was collected between March and May 2024 by means of a paired search in the Virtual Health Library (VHL), Web of Science and Pubmed databases. Bibliographic review: With multiple sources, the data is considered to be fragile and of poor quality, as well as being laborious to make available, making it difficult for health managers to appropriate and use. HIS support management in making health decisions, as they provide data, information, communication, knowledge and action, making it possible to understand the health-disease process and the epidemiological profile of populations, so that understanding the phenomenon makes it possible to promote social inclusion strategies. Finally, it should be emphasized that more research is needed into the use and importance of information technology, HIS, and the possibilities they offer for progress in public administration and health services.

Keywords: Health information systems; Public health informatics; Public health.

1. **Introduction**

The creation of Public Policies (PP) in Brazil went hand in hand with the promulgation of the 1988 Federal Constitution, which determined the implementation of PP considering the socio-economic and geographical characteristics of the regions, with the aim of promoting a better quality of life for the population (REIS-SANTOS, 2023).

Historically, Brazil's Health Information Systems (SIS) were built in a fragmented way. With multiple sources, the data is considered to be fragile and of poor quality, as well as being laborious to make available, making it difficult for health managers to appropriate and use (CIELO *et al*., 2022).

HIS support management in making health decisions, as they provide data, information, communication, knowledge and action, making it possible to understand the health-disease process and the epidemiological profile of populations, so that understanding the phenomenon makes it possible to promote social inclusion strategies (SOUZA, ARAÚJO E SILVA FILHO, 2024).

However, for interventions on health determinants to be carried out correctly, HISs need to be properly implemented and have mechanisms in place to improve the quality of data recording and its use for planning HPs (WHO, 2010).

Primary health care (PHC) is seen as one of the most important strategies for reducing mortality and hospitalization rates, mainly due to chronic non-communicable diseases. PHC has been strengthened since the 1990s and reached 99.7% of Brazilian municipalities in 2019, when an average of 156 million people were treated in PHC, corresponding to around 74.76% of the Brazilian population (BARROS, SILVA E SOUZA, 2024).

The authors highlight the Ministry of Health's efforts to systematize information from primary care (PHC), as the first level of health care, considering territorial particularities. Records on health conditions, sociodemographic profile and services provided are recommended.

Therefore, this study aimed to understand how the Health Information Systems of the Unified Health System (SIS-SUS) are being used in Brazil, their difficulties and their impact on management and public policies in the country.

2. **Literature review**

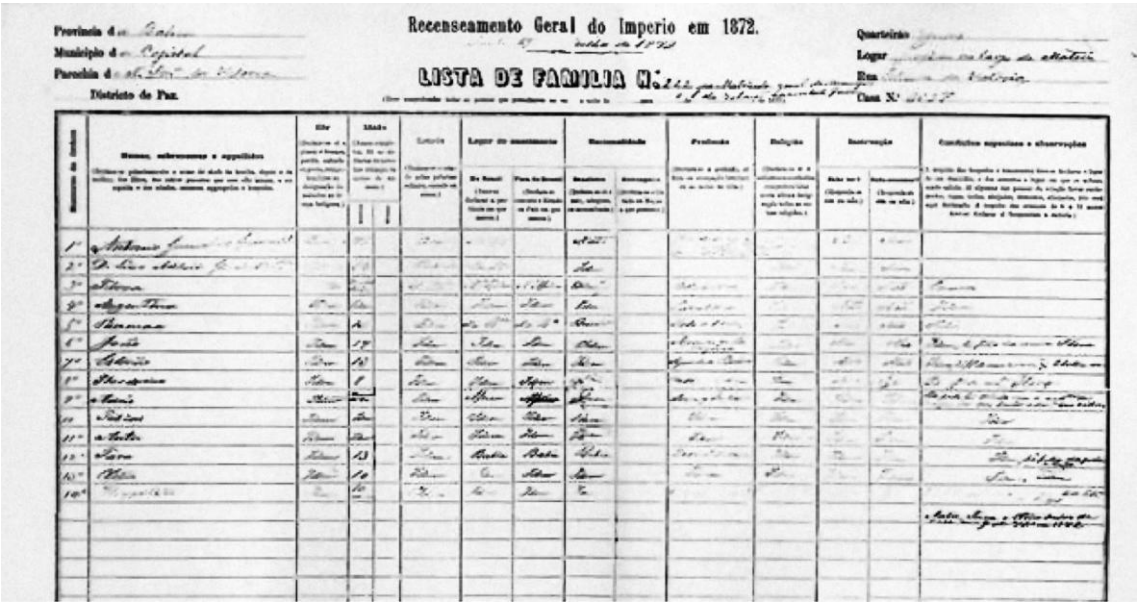
2.1 A brief history of demographic censuses

The word "Census" has its origins in Latin, meaning the collection of information and statistical data on the inhabitants of a given place, for tax and military monitoring purposes. The first information on demographic censuses dates back to 2238 BC in China, 1700 BC in Egypt, 578-534 BC in Greece and 555 BC to 72 AD in Italy (PRADO; CORTIZO, 2015).

On the American continent, the first numerical information on the population was recorded by the Incas in the so-called "quipus", a system of knotted ropes that determined the number of people living in the area (BRASIL, 2011).

In Brazil, population statistics were compiled for many years through ecclesiastical reports and records, as well as estimates given by authorities such as ombudsmen and police officers. In 1870, the first direct, decennial collection of population data took place to that in 1872 the 1st Population Census of the Empire of Brazil took place (PRADO; CORTIZO, 2015; CASTRO, 2003).

Figure 1: Population Census of the Empire of Brazil in 1872.



Source: Prado; Cortizo (2015).

The census model shown in Figure 1 was repeated until 1940, excluding the years 1910 and 1930, when political conflicts prevented the census process from being carried out. It wasn't until 1938 that the Brazilian Institute of Geography and Statistics (IBGE) was created and

became responsible for planning and implementing a new census model in Brazil (PRADO; CORTIZO, 2015).

In Brazil, the census follows the concept of resident or “de jure” population, a strategy in which the population is quantified in its own place of residence and nationwide, with data being collected “face to face”, in person at the individual's home, through interviews that are structured to include information about: characteristics of the person, the geographical territory, the conditions of the home and migration (BRASIL, 2015).

From the range of information collected by the Demographic Census, it is possible to compare, over the years, the multiple variables that permeate population dynamics in the country's various territorial and geopolitical spaces, as well as to study them nationally and internationally, making it possible to know and monitor the population periodically (CUNHA, 2012).

The 2000s were a milestone for the implementation of information technologies, especially the digitization of cartographic bases, the computerization of agencies, electronic websites, optical reading, data processing and analysis through multidimensional databases, among others (PRADO; CORTIZO, 2015).

In 2010, the digital modernization of census processes continued, incorporating tools that made data collection, analysis and reliability even easier. This census included the digitalization of the territorial base with urban and rural mapping; the national address register (CNE); data collection using handheld computers (PDA) with GPS (Global Positioning System); faster data transmission; georeferencing of physical elements (schools, homes, health units); the possibility of self-completion in a confidential and secure manner via the internet, with the implementation of encryption.

In the 2010 census, one can see the marked presence of technology, completely reformulating the way census research is carried out in the country, mobilizing approximately 230,000 professionals, hundreds of interconnected computers, 220,000 PDAs working with GPS, which generated data from 67.6 million households in 5,565 municipalities in Brazil (BRASIL, 2015).

Due to the COVID-19 pandemic, the 2020 census was moved to 2022, with significant changes, including: the incorporation of the characteristic “type of building”, classifying the nature of each household, and the inclusion of a unique code for each address from the National Register of Addresses for Statistical Purposes (CNEFE), allowing users to use this code in their analysis, studies or pairings with other registers in the country, resulting in a much more reliable registration regarding the street (IBGE, 2024).

2.2 SIS

SISs are a strategy that aims to guarantee the collection, analysis and transformation of data into information, so that once it has been collected, processed and stored, it generates systematized knowledge about the health conditions of populations, under their many aspects of life, and that this data is shared with public management, contributing to health decision-making (FERREIRA *et al*., 2020).

Thus, according to Pinochet; Lopes; Silva (2014), as management and assistance processes are optimized, more assertive care is offered, even to the individual, favoring, as cited by Araújo and Razzolini (2017), the targeting of actions and resources aimed at the country's health problems.

In Brazil, 1975 and 1976 saw the implementation of the first current SIS, the Mortality Information System (SIM), which was only decentralized in 1990, facilitating greater investment in its computerization (FERREIRA *et al*., 2020).

Since then, various systems have been developed with the aim of continuously providing health information, through the establishment of indicators, which make it possible to analyze health-disease conditions at the municipal, state and national levels, including: the notification of diseases and health problems (Sinan), primary care (Sisab), outpatient (SAI-SUS), among others (PINTO; FREITAS; FIGUEIREDO, 2018).

Considered a hub for computational development in health, Brazil still has timid results when it comes to the digital detection of diseases, despite its excellent results with data mining on social networks and participatory surveillance, linked to studies on dengue, especially the Dengue Observatory and Dengue on the Web projects (LEAL-NETO *et al*., 2016).

According to Ferreira *et al*. (2020), publications based on HIS support for structuring services, especially in primary health care (PHC), are still scarce.

3. **Material and methods**

This study is an integrative literature review, which is an analysis methodology that enables the grouping, observation and collation of available research on a given subject in a systematic and appropriate manner. The methodology makes it possible to associate various research methodologies, broadening the understanding of the issue being researched, while at the same time requiring careful observation of the analyses and results presented.

The review adopted the following seven stages: 1) identification of the topicand selection of the research question; 2) selection of the inclusion and exclusion criteria; 3)

searching for studies in the selected databases; 4) screening the articles; 5) dividing the studies into categories of analysis; 6) analyzing and interpreting the results; and 7) organizing the review/synthesis of the material studied.

The data was collected between March and May 2024 through a paired search of the databases. The inclusion criteria were articles available in full text, from the last 10 years (2013-2023), in Portuguese and English, which dealt with health information systems in Brazil and with free access. Studies which were notincluded in the selected databases, which were not published between 2013 and 2023, which were not published in Portuguese or English, with information systems from countries other than Brazil and paid-for articles were excluded.

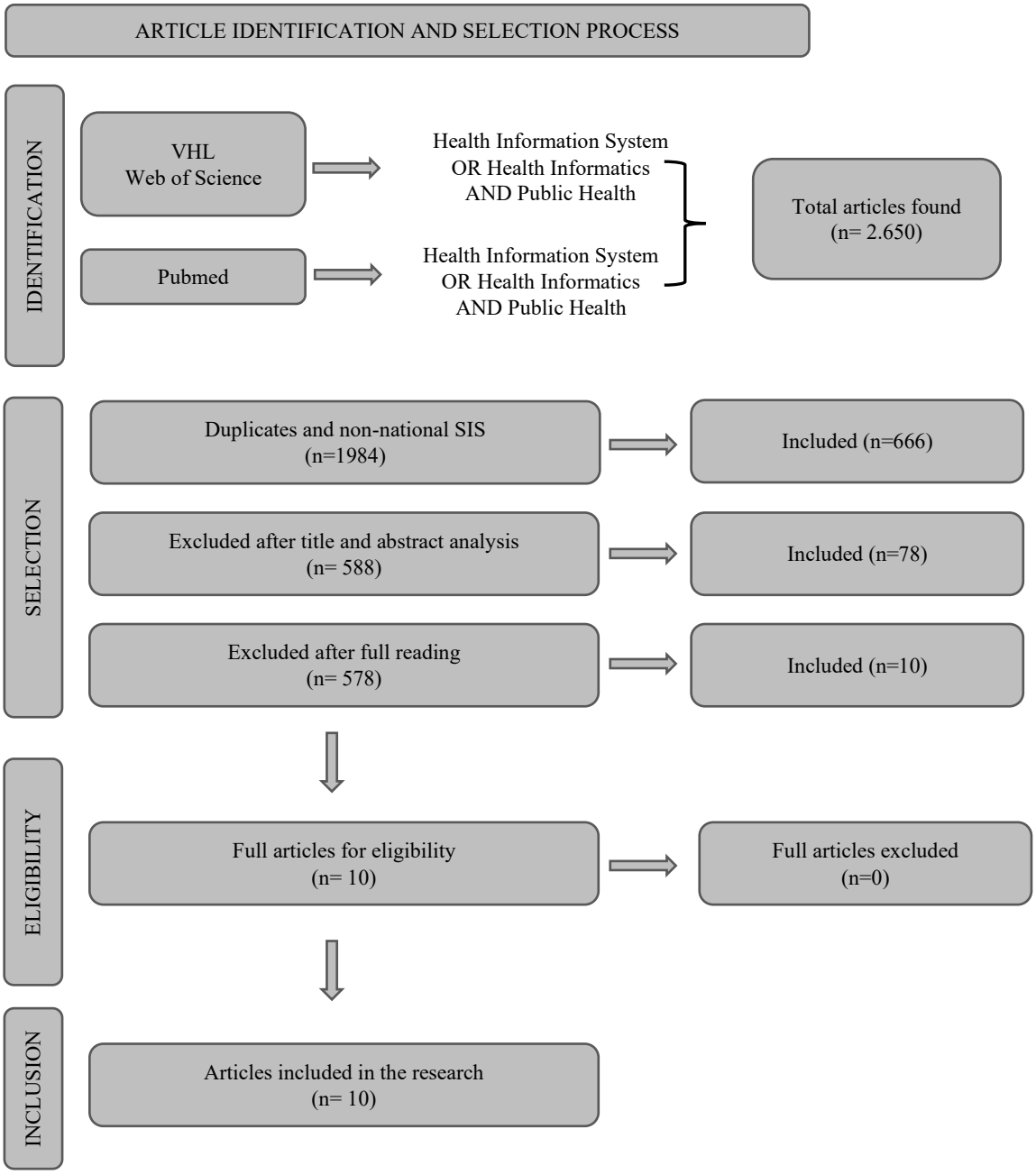
As shown in Figure 2, this study searched the databases of the Virtual Health Library (VHL), Web of Science and Pubmed, using the descriptors in Health Sciences (DeCS) in Portuguese Health Information System, Health Informatics and Public Health, and in English Health *Information System*, *Health Informatics* and *Public Health*, combined with the Boolean operators "Or" and "AND" as shown in the identification and selection flowchart**.**

In the VHL, 2,198 articles were found, of which 391 referenced Brazilian SIS. After analyzing the titles, 43 articles were included for abstract reading, resulting in 6 articles selected for full text reading, with 4 articles selected for inclusion in this research.

In the *Web of Science*, 291 articles were identified, of which 195 were related to SIS in Brazil. 9 articles were selected for abstract reading, of which 3 were selected for full reading, and 2 were included in this study.

On the Pubmed platform, 161 articles were located, 80 of which were related to national SIS. After analyzing the titles, 11 articles were included for reading and analysis of the abstracts, of which 6 articles remained to be read in full, and 4 articles were then included in the research.

Figure 2: Flowchart/prism for identifying and selecting articles for the study.



Source: Prepared by the authors (2024)

4. **Results and discussion**

In Table 1, the articles included in this study are organized by Identification number, Title, Author/Year, Database/Journal.

Table 1 - Articles selected in this study

ID	TITLE	AUTHOR /YEAR	SOURCE DATABASE
A1	Computerization of primary health care: advances and challenges.	Cavalcante *et al.* (2018)	VHL
A2	Information system of primary care: integrative rewiew of literature.	Nogueira *et al.* (2014)	VHL
A3	Using information systems: challenges for health management.	Pinheiro *et al.* (2015)	VHL
A4	Articulating theoretical perspectives to analyze health informatics in Brazil.	Fornazin; Joia (2015)	VHL
A5	Methods for assessing the completeness of data from health information systems in Brazil: a systematic review.	Correia; Padilha; Vasconcelos (2014)	Pubmed
A6	After all, how many national Health Information Systems are there in Brazil?	Coelho Neto; Chioro (2021a)	Pubmed
A7	Integration among national health information systems in Brazil: the case of e-SUS Primary Care.	Coelho Neto; Andreazza; Chioro (2021b)	Pubmed
A8	Evaluation in health: participatory methodology and involvement of municipal managers.	Almeida; Tanaka (2016)	Pubmed
A9	Implementation of the e-SUS Primary Care Strategy: an analysis based on official data.	Cielo *et al.* (2022)	Web of Science
A10	Social participation in the health technology incorporation process into Unified Health System	Silva *et al.* (2019)	Web of Science

Source: Prepared by the authors (2024)

Table 1 shows the articles included in this study, as well as their authorship, year of publication, database and journal in which they were published. The results were divided into 2 blocks of analysis: (1) Use and difficulties of Health Information Systems in Brazil; (2)

Management and Public Health Policies in Brazil. The findings were presented in tables for better visualization.

Table 2 shows the use and difficulties of Health Information Systems in Brazil, with the objectives and results found, which will be discussed below.

Table 2 – Use and difficulties of Health Information Systems in Brazil

ID	OBJECTIVES	RESULTS
A1	To analyze the implementation of the e-SUS AB strategy in the Western Health Region of Minas Gerais, Brazil.	- Most of the municipalities had UBSs that were not computerized and UBSs without internet, but with e-SUS AB; - Registering the population and using the forms to do so were seen as actions to implement e-SUS AB; - Task forces were held to speed up the process; - Insufficient number of professionals to meet demand, even after hiring; - The provision of training to professionals proved to be effective, but there were reports of difficulties in putting this into practice; - Immature information technology coexisting with paper; - Difficulties with backup, leading to loss of information; Lack of reports for analyzing consolidated information; - Software development without user participation; - Personal resistance to the implementation process; - Lack of financial resources was an obstacle; Insufficient infrastructure;

		- Lack of computerization of units.
A2	Identify the scientific productions on the Primary Care Information System - SIAB and critically analyze the pertinent scientific productions outlining the themes addressed with their applicability in the service.	- Need to adapt the SIAB to the service in order to make decisions and provide coherent care; - Little use compared to the system's potential; - Difficulties in interpretation, content and quantity; - Need for ongoing training in the use of the tool; - Professionals recognize that the SIAB plays an important role in organizing the service; - Need to reduce the number of forms, as well as regionalization and other activities; - The quality of care can be improved if decisions are based on up-to-date and accurate information; - Handling the growing volume of information in the search for the most relevant data proved to be an obstacle; - Access, responsibility and transforming information into action proved to be a challenge for professionals; - Difficulties were reported in operating the system; - Lack of clarity in filling in and handling the forms; - Difficulty due to the high turnover of community health agents (CHA); - Not all of the team's professionals use the forms, with the doctor being the

		professional who uses the system the least; - The CHAs were the professionals who used the SIAB the most, but without discussion, use and appreciation by the team, generating underuse of the tool; - Data not filled in, negatively influencing epidemiological analysis; - Insufficient human resources.
A5	To review the literature on the methods used to assess the completeness of data in health information systems.	- HIV/AIDS notifications had the longest notification period, with 23 years of records; - The quality and relevance of the information can be compromised when the data in the SIS is inadequate and incomplete; - Lower volume of information produced at municipal level; - Poor methodological clarity in the manuals for filling in the SIS, which needs to be assessed in all SIS (this has already been done in SIM, Sinasc and SISHIPERDIA); - Lack of continuing training and awareness-raising among professionals on how to fill in the data correctly; - Difficulty downloading SIS data, with failures in the transfer process and restricted public access.
A6	To identify and analyze the national SIS that were in operation between 2010 and 2018 in Brazil, as well as to understand the	- Documents with incomplete and divergent data; - Lack of a correct and complete list of SIS in force in the country; - Most Information Technology Centers

	technology support structure in the Ministry of Health.	(NTI) report working with their own staff, including permanent civil servants and administrative contracts; - Higher number of national SIS than those found in the literature; - Scarcity of studies on the subject; - Difficulty for the Ministry of Health to create a unified list of national HIS under its responsibility; - Little transparency about the data for academia and society in general; - Several SIS with optional use; - Intense fragmentation of information in the SIS; - The most recent HIS provide locoregional support for the SUS, with some integration with other systems, such as the Primary Care Information System (SISAB) and the Electronic Citizen's Record (PEC), which are already integrated with 11 national HIS in use.
A7	To describe and measure the integration of the Electronic Citizen Record (PEC) with the other National Health Information Systems (SNIS), making a relationship with the political and organizational structure of the Ministry of Health and testing the possible	- We found 31 National Health Information Systems (SNIS) in operation in PC between 2013 and 2018 under the technical management of the Health Care Secretariat (SAS) and the Health Surveillance Superintendence (SVS); - e-SUS AB carried out complete unification of user interfaces with 12 of the 31 SNIS in use, and incomplete integration with 4 SNIS, the remaining 15 systems had no integration; - The trend towards fragmentation of SNIS

	fragmentation of the SNIS with the bureaucracy of the State.	in Brazil persists, as documented in various technical studies; - It was possible to see more integration between the SNIS managed by the Primary Care Department (DAB), and little integration with the SNIS of other secretariats; - There has been partial progress in integrating e-SUS AB with the National Immunization Program Information System (SI-PNI).
A9	To analyze the implementation of the e-SUS AB strategy in Brazil, between the initial years of the system, from 2013 to 2019.	- The implementation of e-SUS still needs specific strategies to overcome the country's geographical barriers; - The need for consistent investment in the training of professionals who will use the SIS; - The need to invest in technological resources to computerize municipalities.
A10	To describe the current process of social participation in the incorporation of health technologies in Brazil, in the context of the SUS.	- The strategies have proved capable of adapting social participation to the particularities of health technologies, but engaging society is still a major challenge; - The need to evaluate actions to encourage social participation, making itpossible to maintain and improve strategies; - The need for more active, continuous and qualified social participation in social spaces, including those provided for by law; - It is suggested that public hearings be used as an outreach strategy, a mechanism that has been planned but notyet

		incorporated; - Strengthening the social appropriation of knowledge; Conitec has made progress in promoting and implementing technologies in the SUS, although it stillneeds to improvement.

Source: Prepared by the authors (2024)

Corroborating this study, Ferreira *et al*. (2020) and Martins; Silva; Marques(2016) point out that HISs are fundamental for conducting situation room dataand strategies, since the data and tables made available electronically enable professionals to carry out surveys and comparisons, contributing entirely to the formulation of correct health indicators.

It is important to note that, in order for resource management to be effective,in addition to structuring and computerizing the healthcare network, it is necessary to have adequate and reliable recording of information, which continuously and increasingly presents the reality of the population's health more reliably, which is a major challenge for improving decision-making (PINTO; ROCHA, 2016).

Understanding the health conditions of the population in the health- disease process makes it possible to identify and understand the phenomenathat directly contribute to possible changes in risks and health problems in the community. The processing of correct information supports the planning and implementation of health actions targeted at priority health problems, thus outlining intervention strategies to solve problems in the territory (FERREIRA, 2020; CORDEIRO; NETO, 2017).

In Brazil, the structural precariousness of the UBS remains a problem reality, there are still many units that are not adequately adapted tocomputerization in health, with difficulties ranging from material shortages to professional deficits, conditions that culminate in interoperability that falls short ofwhat is expected and recommended, with registers filled out incorrectly, with losses in the correct typing of data and in the feeding of the system, causing datareliability to fail (FERREIRA, 2020).

Despite the increase in data recording in SIS, the quality of the data is still poor, requiring routine monitoring and continuous training of professionals, so that notifications are made correctly (SOUSA *et al*, 2020). Underreporting in the data causes significant damage to knowledge of the true dimension of the disease and, consequently,

to the prevention and control actions of public managers (BELO *et al*., 2021). Rodrigues; Santana (2019) propose a flow of information between government sectors to ensure the effectiveness ofnotification in workers' health policies.

Silva *et al*. (2022) emphasize in their studies that international efforts are increasingly evident to strengthen the use of health data for decision-making, considering the cultural and budgetary context, so that the use of strategies is successful in different scenarios.

Table 3 – Public Health Management and Policies in Brazil.

ID	OBJECTIVES	RESULTS
A3	To analyze the use of SIS for decision-making by co-managers in two municipalities in the south of Bahia, Brazil.	- The SIAB is an essential strategy, since it makes it possible to know the socio-sanitary reality of the population being monitored, and is a facilitator for developing, monitoring and improving health policies, plans and programs; - The SIAB seeks to integrate the PHC SIS, reducing the need to record the same information in different systems; - Mechanism to stimulate a culture of information use; HIS were seen as "the backbone of primary care"; - Difficulty in obtaining correct information, as it sometimes differs from the local reality; - Incomplete data prevents the correct evaluation of SIS, and consequently management at all levels; - The low number of qualifications to use the systems is a weakness that needs to be remedied; - Quality data shows the real situation ofhealth services, and can guide priority problems and the targeting of resources;

		- The manager needs political will and commitment so that health production is effective and continuous; - It is important to analyze the qualitative indicators, which are sometimes neglected to the detriment of looking only at quantitative indicators; - One of the challenges for managementis the incorporation of a scientific body, where knowledge and practices are produced; - Implement the Information Resources Management (GRI), with multidisciplinary activity, in all municipalities, - involving: management, technology, informationand the environment.
A4	To analyze the existing barriers to the use of Information and Communication Technologies (ICT) in health, and the consequences of this situation f o r Brazilian society.	- It is not possible to analyze computerizationin Brazil without considering the country's historical process and events; - The local/regional context influencesthe implementation of SIS; - HIS is an intrinsically political activity, requiring a network of actors (politicians, bureaucrats, representatives of international organizations, researchers, technical staff, infrastructure, technological resources) to sustain and expand it; - It is important to establish flexible strategiesthat encourage social participation; - There is a need for technical training and continuing education; - The implementation of the HIS must not only focus on technology, but must also consider regionalization, territorialization and

		human resources in order to sustain it in the long term; - Building standards for information interoperability has proved to be a constant challenge for management, where political andinstitutional alignment is required to continue in synergy with overcoming technicalissues.
A5	To review the literature on the methods used to assess the completeness of data inhealth information systems.	- Incompletely recorded data hampers the assessment of quality dimensions and consequently decision-making; - Completeness studies are more frequent inthe south and southeast of Brazil, making it easier to correct problems; - Low investment from the management body; - The need to identify faulty forms and correct them at municipal level would speedup the process, given the proximity to the source of the data.

A6	To identify and analyze the national SIS that were in operation between 2010 and 2018 in Brazil, as well as to understand the technology support structure in the Ministry of Health.	- DATASUS does not have complete management of the NTIs in the Ministry, which means that there is no information on the systems; - The functioning of the NTIs was not monitored by DATASUS; - Some NTIs have partnerships with federal universities to develop, monitor and maintain software (UFSC manages e-SUS APS; UFRN manages 8 SIS); - A significant NTI network, but with little visibility in the official documents and sites of the MoH's information and IT policy; - There is a need to integrate the SIS toprovide a comprehensive view of the individuals monitored by the SIS; - Vertical relationship between the federal government and other federal entities; - SIREG, one of the largest national systems,is mainly used to improve the control and quality of patient care flows between municipal and state services; - Underutilization of SISREG, which is not linked to policies for the transfer of funds by theFederal Government or the monitoring of individuals registered for control of some national policy.
A7	Describe and measure the integration of the Electronic Citizen Record (PEC) with the other National Health	- Disparity between the integration of PHC in the e- SUS and the SAS, alerting us to the presence of some level of historical division

	Information Systems (SNIS), making a relationship with the political and organizational structure of the Ministry of Health and testing the possible fragmentation of the SNIS with the SNIS state bureaucracy.	and false dichotomy between health care and health surveillance practices and processes; - Greater success in integrating e- SUS PC with the SNIS under DAB governance, compared to the SNIS under the management of other departments and secretariats of the MoH.
A8	To analyze the scope and limits of using a participatory evaluation methodology with municipal healthmanagers.	- The use of pragmatic participatory methodology enabled the workshops to be democratic, highlighting the direct interests of the managers and actors responsible for the PPs; - The methodology generated a great deal of reflection, bringing managers closer to everyday life and broadening the participants' view of the dynamics of how the SUS works; - This highlights the need for the state and municipalities to work together on strategies to resolve users' problems; - The need to strengthen networking, where each federative entity preserves its autonomy but all cooperate for the common good; - Technical training is needed so that managers and professionals understand the flows, degree of autonomy and user support mechanisms; - Awareness-raising among managers and professionals is proving to be a challenge,

		given that the participants consider that that this thinking is not part of the routine and historical-political construction of the SUS.

Source: Prepared by the authors (2024)

In 1949, the Congress of the International Geographical Union (IUG) was held in Lisbon (Portugal), where a major step was taken for collective health studies. The science of Medical Geography was officially recognized, based on the concept of health proposed by the WHO in 1946, where it was understood asa complete state of physical health, and social and mental well-being, not just the absence of disease. Since then, countless researchers not only strengthened research, but began to incorporate medical geography into thehealth of populations (BARCELLOS; BUZAI; SANTANA, 2018)

The aforementioned authors also point out that during the second half of the 20th century, it was possible to follow a revolution in geography research, culminating in a rationalist model, building procedures based on regionalization, where qualitative analyses continue to be the main conceptual step, but begin to be complemented with the use of quantitative methods, seeking to build scientificmodels and laws that determine the spatial distribution of diseases. The term Medical Geography was then replaced by Health Geography in 1976, at the IUG congress, and became subdivided into: Geography of diseases and geographyof health services.

It can be seen that the dialog between the authors in Table 3 converges with the reflections of Barcellos; Buzai; Santana (2018), proposing the need to observe the particularities and difficulties of each region of the country, so that the planning ofhealth policies can be democratic and effective in all municipalities, overcoming the geographical and technological barriers encountered during the implementation of policies, taking into account, in addition to the diseases, the evaluation of the conditions of local health services.

Barcellos; Buzai; Santana (2018) reinforce that health geography seeks to understand the context in which health problems occur, advocating action in territories and not in individuals/organisms, proposing a macroscopic view of problems so that it is possible to understand the health-disease and care-diseaseprocess.

The findings of Stopa *et al*. (2016) agree with the results of this study, in terms of the need to implement and evaluate services while observing regional differences, especially those related to access to and use of health services. Therefore, it is essential to advocate reducing regional disparities and those at different levels of society, bearing in

mind that the implementation of health services should strive for universality, respecting the Federal Constitution and meeting the demands of the population it serves.

The information was made available through the SIS, as well as the reports. The data generated from them has the potential to guide and instrumentalize decision-making by health care managers, making it possible to construct, evaluate and disseminate the health indicators produced. Thus, the relationship between HIS and situation rooms needs to be increasingly strengthened, discussed, studied and promoted as a management strategy, especially in primary health care (PHC), transforming raw data into relevant information for management and all the actors that permeate PHC (FERREIRA *et al*., 2020; NEVES; MONTENEGRO; BITTENCOURT, 2014).

It is important to integrate information systems to make information more effective, and to strengthen epidemiological and hospital surveillance, promoting health education at all levels of care (SILVA *et al*., 2021).

Given the evolution of information technology (ICT), it can be seen as an indispensable tool for public administration, highlighting digital inclusion and e-government, but there is resistance to computerization in health, whether on the part of professionals or managers, however, ICT favors electronic transparency, public management, decision-making and time management (PROCÓPIO; SILVA; MELLO, 2019).

Lima *et al*. (2024) state that improving the quality of records is a multifaceted challenge, requiring specific actions to overcome the deficiencies identified and minimize territorial heterogeneities, thus requiring intervention methods, as well as strengthening the look at regionalization and socioeconomic conditions in the collection and analysis of electronic data, enabling a more reliable drawing of the country's epidemiological reality for the planning of effective health policies, they also stress the urgency of training and sensitizing health professionals to do so.

5. **Conclusões**

It is necessary to think about strategies for the control and effective generation of data that guide the country's epidemiology, so that they show the most legitimate picture possible of the population's health problems, conditions and determinants. In the same way, it is urgent and fundamental to training and raising the awareness of public managers, health professionals and the population regarding the computerization of health in the SUS.

It is also suggested that it is essential to improve mechanisms to prevent repetition, duplication and promote the integration of SIS in Brazil, facilitating the handling, analysis and dissemination of epidemiological data, as well as the promotion and monitoring of health policies guided quantitatively and qualitativelyby SIS reports.

Finally, more research is needed into the use and importance of information technology, HIS, and the possibilities they offer for progress in public administration and health services.

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8. **References**

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