Drinking Water Quality Surveillance Information System (SISAGUA): characteristics, evolution and applicability*

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Abstract

The Drinking Water Quality Surveillance Information System (SISAGUA) is an instrument used in Brazil to record forms of water supply and water quality monitoring data recommended by the potable water standard. This information is used in the management of health risks associated with water supply in the country and supports the surveillance of drinking water quality, the structuring of public policies in the area of environmental health and sanitation, the prevention of waterborne diseases, and the characterization of the quality of water consumed by the Brazilian population. This article describes the history of SISAGUA and presents the main features of its current version (SISAGUA 4) regarding data collection and processing, variables, uses and accesses, data coverage and quality, as well as the system's applicability, limitations and challenges.

Keywords: Drinking Water; Information Systems; Public Health Surveillance; Environmental Health; Brazilian National Health System.

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Introduction

The Drinking Water Quality Surveillance Information System (SISAGUA) is a Health Information System (SIS) made available on the internet by the Brazilian Ministry of Health. Its purpose is to assist in the management of health risks associated with the supply of drinking water in Brazil.[1] The information generated by SISAGUA is used in health situation analysis related to the supply of drinking water, with the aim of minimizing the risks associated with the consumption of water that does not meet the drinking water standard.

The health care or epidemiological health information systems developed by the Ministry of Health in recent decades have been highlighted as key tools for diagnosis and health surveillance, aimed at generating interventions more in keeping with the characteristics of the population.[2] The technological evolution of information has increasingly motivated managers of different segments to ponder on the use of information systems to generate evidence that will be used in decision-making processes.[3] When these are decisions relating to a basic and constitutional right, such as access to health, the relevance of information being presented adequately and in a timely manner becomes even more evident.[3]

> **SISAGUA is to assist in the management of health risks associated with the supply of drinking water in Brazil.**

SISAGUA is an instrument of the National Drinking Water Quality Surveillance Program (VIGIAGUA), which aims to promote health and prevent waterborne diseases and conditions, through actions planned by the Brazilian National Health System (SUS).[1] The system holds data relating to types of water supply used by the population (Registry data), information related to supply infrastructure and operating conditions and data on water quality monitoring performed by drinking water supply utilities, i.e. state companies, municipal companies and authorities, private companies or municipal governments (Control data), and data on water quality monitoring done by Municipal and State Health Departments (Surveillance data). In addition, SISAGUA is the official data source for VIGIAGUA institutional indicator results.

Data are entered manually on SISAGUA by Health Department professionals working in the VIGIAGUA program, and also by employees of drinking water supply utilities. SISAGUA also automatically receives Control data and results of the analyses of basic surveillance data parameters for drinking water (residual disinfectant agent, turbidity, color, pH, fluoride, heterotrophic bacteria, total coliforms and *Escherichia coli*).

In Brazil, besides SISAGUA, information about water supply can also be obtained from the National Sanitation Information System (SNIS) under the responsibility of the Ministry of Cities' (MCid) National Environmental Sanitation Department (SNSA), and also from the National Household Sample Survey (PNAD), conducted by the Brazilian Institute of Geography and Statistics (IBGE). SNIS has the objective of demonstrating the quality of water supply service provision and all information held on it is provided by the water supply utilities operating in Brazil.[4]

SNIS water quality data involve only the following parameters: free residual chlorine, turbidity and coliforms. Utilities supplying water to municipalities provide annual data on the quantity of mandatory samples, the quantity of samples analyzed and the number of results not meeting the standard. PNAD investigates whether there is piped water in private households and if the household is provided with water from a general supply network or from other sources (wells or springs, cisterns supplied by water tank trucks, rainwater harvesting).[5]

In view of the scope of VIGIAGUA's actions and SISAGUA's comprehensiveness, it is considered that the information held on SYSAGUA should be used for monitoring indicators related to drinking water in Brazil.

This article aims to describe the history of SISAGUA, its main characteristics and their applicability, showing how it is a national health database holding information about water supply coverage and the quality of water consumed by the Brazilian population.

History

Federal Decree No. 79.367/1977[6] provided the Ministry of Health with authority to develop rules and establish potable water standards to be complied with in the entire national territory. Moreover, the 1988 Brazilian

Federal Constitution (CF/88)[7] gave SUS competence to participate in policy-making on and implementation of basic sanitation actions, and also to supervise and inspect food, including nutritional content control, as well as beverages and drinking water.

Supervision and control of compliance with drinking water standards are done by municipal, state and Federal District Health Departments, in an articulated manner with the Ministry of Health, through surveillance of drinking water quality. Such surveillance is defined by the Potable Water Ordinance[8] as a set of actions taken regularly by the public health authority to verify compliance with standards, considering socioenvironmental aspects and the local reality, to assess whether the water consumed by the population presents risks to human health.

These actions are carried out through the VIGIAGUA Program, which aims to develop environmental health surveillance actions related to the quality of drinking water. These actions have the objective of guaranteeing the population's access to sufficient water the quality of which is compatible with the potable water standard established by current legislation, as part of health promotion.[9] VIGIAGUA's basic operational actions are described in Figure 1. Information actions include data input to SISAGUA. This refers to recording types of supply in the municipality and water quality monitoring, in order to enable data analysis and evaluation, production of information and assistance with managing the risk related to water supply.

The first system version (SISAGUA 1) had as its reference Potable Water Ordinance GM No. 36/1990 and was designed in 1999 by the National Health Foundation (FUNASA). It was released in the year 2000. Initially, five states adhered to it – Bahia, Pernambuco, Paraná, Rio Grande do Sul and São Paulo – on a pilot basis involving tests. The system was implemented the following year in all Brazil's Federative Units.

SISAGUA's design was based on the definition of environmental health indicators used in the prevention
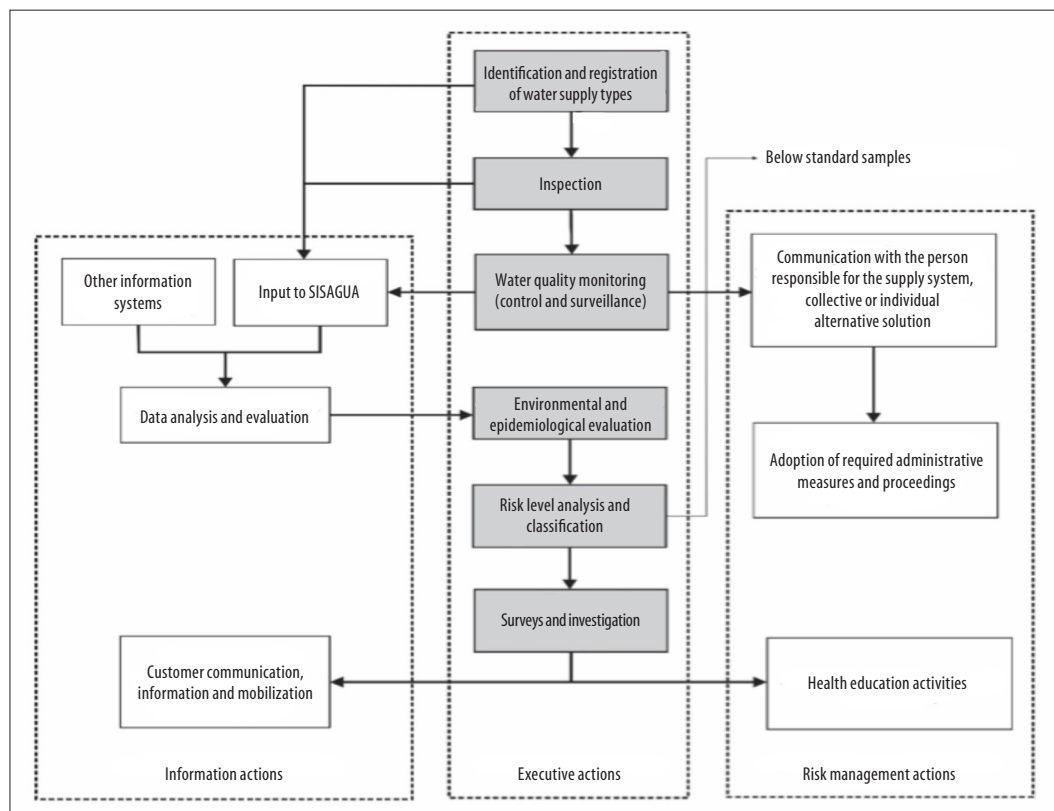
SISAGUA: Drinking Water Quality Surveillance Information System.
Source: Adapted from Ministry of Health (BR). Health Surveillance Secretariat. General Coordination of Environmental Health Surveillance. National Program of Environmental Health Surveillance related to the quality of water for human consumption. Brasília, DF: Ministry of Health; 2005.[9]

Figure 1 – Basic actions for the operationalization of surveillance of drinking water quality in Brazil

and control of diseases and conditions related to sanitation. As such, the variables were defined using World Health Organization (WHO) methodology, adapted by the Organization for Economic Cooperation and Development (OECD), as per the Driving Force, Pressure, State, Exposure, Effect and Action (DPSEEA) framework.[10]

As such, in order to structure SISAGUA 1, the following groups of indicators were selected: (i) bacteriological quality of water: percentage of samples with absence of total coliforms (treatment outfall and distribution network); and percentage of samples with absence of thermotolerant coliforms (treatment outfall and distribution network); (ii) water turbidity: percentage of samples with turbidity compatible with Potable Water Ordinance standards (treatment outfall and distribution network); (iii) residual chlorine level: percentage of samples with free residual chlorine compatible with Potable Water Ordinance standards (treatment outfall and distribution network); (iv) water supply coverage: percentage of the municipality's population served with water supply systems and alternative solutions; (v) water treatment: percentage of the municipality's population served with treated water supply systems or treated collective alternative solutions; (vi) water disinfection: percentage of the municipality's population served with disinfected water supply systems or alternative disinfected solutions; and (vii) regularity: percentage of the municipality's population served with intermittent water supply systems and intermittent collective alternative solutions.

In July 2003, Decree No. 4,726 established the Health Surveillance Secretariat (SVS) within the Ministry of Health. Environmental health actions became part of SVS responsibilities. As a result, the system had to be modified to comply with the new institutional norm and with the potable water ordinance in force at the time (Ministerial Ordinance No. 1.469/2000). In 2004, the Brazilian National Health System Information Technology Department (DATASUS), together with SVS, made the necessary alterations to the system and drafted its second version (SISAGUA 2).

Between 2005 and 2006, SVS collected data on the need to improve the system to adapt it to the potable water ordinance in force at the time (Ordinance GM/MS No. 518/2004), and, in December 2006, a workshop

was held in Brasília/DF to approve the system's new version. After adjustments, SISAGUA 3 was released in May 2007. The main improvements were: the definition of data entry modules (Registry, Control, Surveillance); the provision of management reports; and the creation of system access profiles – federal, state, regional and municipal levels.

In December 2011, a new Potable Water Ordinance was published (Ordinance GM/MS No. 2.914/2011), which generated the need to adapt SISAGUA 3. Additionally, technicians who operate and manage the system pointed out improvement needs such as the elimination of open fields for data entry, the creation of rules to validate data entry fields, the possibility of using it in all browsers and the enabling of fields according to registry data.

In April 2013, during VIGIAGUA's Annual Meeting held in Brasília/DF, representatives of the State Health Departments, the National Council of Municipal Health Secretaries (CONASEMS) and the National Council of Health Secretaries (CONASS) formalized the need for a new SISAGUA.

In this context, in August 2013, the project for the construction of the system's new version started, justified by the need for meet the Potable Water standard; the need to improve data entry fields, to reduce data inconsistency and weakness; and to solve technological issues, such as obsolete language, incompatibility with free browsers, slowness, lack of interoperability and access problems, as well as to provide information requested by various sectors.

The new system was developed under the responsibility of DATASUS, together with SVS VIGIAGUA technical team members. It was validated and approved by SVS VIGIAGUA technicians in the Federative Units and municipalities, as laid down in Resolution GM/CIT No. 6/2013.[11]

In January 2014, the system's current version (SISAGUA 4) was released. This version is a result of the evaluation and improvement of SISAGUA 3, and it was developed based on Potable Water Ordinance GM/MS No. 2.914/2011, VIGIAGUA[9], the National Guidelines[12] for the VIGIAGUA Sampling Plan, as well as being based on the definition of health indicators (water treatment and quality , supply coverage, among others) used in the prevention and control of diseases and conditions related to drinking water supply. In September 2017, the Potable Water Ordinance became Annex XX of

Consolidation Ordinance No. 5/2017 (PRC No. 5).[8] As there was no change in the ordinance content, no changes were made to the system.

Figure 2 shows the time line for Potable Water ordinances and SISAGUA versions.

Data collection and processing

SISAGUA 4 has three primary data entry modules: Registry, Control and Surveillance. Information is entered according to municipality and supply service type, as per the flowchart in Figure 3.

Registry and Control data are obtained from water supply service providers in the municipality and can be entered directly onto the system or sent to the Health Department for input. Surveillance data are produced by the health sector (State or Municipal Health Departments) and are input to the system by the sector itself. The data are produced according to the model established by SVS to suit SISAGUA entry fields.[13] Standardized forms for data entry are available on the system's home page and on the following website: http://portalms.saude.gov.br/vigilancia-em-saude/vigilancia-ambiental/vigiagua/sisagua.

The Registry module refers to data on water supply service type(s) in the municipality, and the information should be updated annually and whenever there are changes in water collection or treatment type and/or distribution.[13]

It is possible to register the three types of water supply established in the Potable Water Ordinance:[8] Water Supply System (SAA) – a system comprised of a set of civil engineering works, materials and equipment, ranging from the water collection area to connections to buildings, intended for drinking water production and collective supply, by means of a distribution network; Alternative Collective Solution (SAC) – mode of collective supplies intended to provide drinking water, with surface or subsurface collection, with or without pipeline and without a distribution network; and Alternative Individual Solution (SAI) – mode of water supply for human consumption serving single family residences, including other people living in the same household.

SAA and SAC data are the responsibility of water supply service providers and are input directly to SISAGUA or passed on to the health sector for input. SAI data are obtained by VIGIAGUA professionals in the municipality and input to the system.

Information about the estimated population served by each supply type can be obtained from the Registry data. Such information is calculated by SISAGUA 4 at the time of their registration, by means of multiplying of the value entered in the "Number of residential economies (permanent households)" field by the number of inhabitants/domicile of the municipality as defined by the IBGE.[13]

Consolidation of the "estimated population served" by registered supply types allows characterization, for the reference year, of drinking water supply coverage in the municipality as supply type, water collection type (surface or subsurface) and water treatment stages, as well as the identification of the population that does not know the supply type being used. The information added to the Registry reveals the characterization of supply in Brazil's municipalities, states, and regions.[13]

Figure 4 shows the characterization of Brazilian municipalities according to the percentage of the
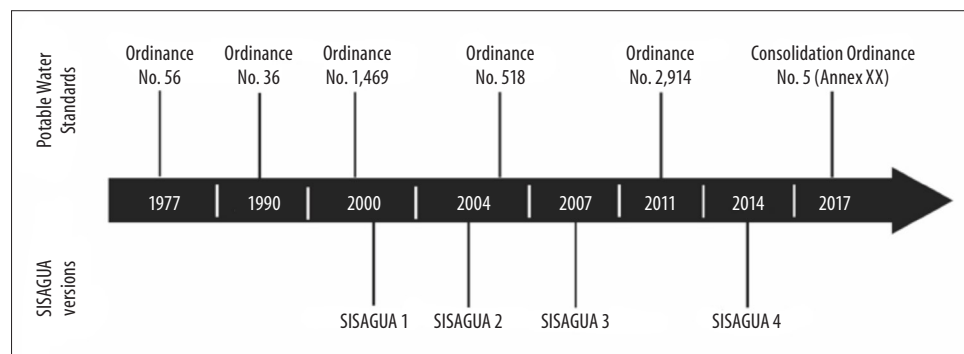
SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 2 – Timeline showing Potable Water Standards and SISAGUA versions

population with information about water supply registered on SISAGUA 4. Aggregated data for Brazil (2014: 67.22%; 2015: 73.19%; 2016: 73.26; 2017: 78.31%) show a trend of growth in the percentage and indicate an increase in SISAGUA's capacity to characterize the water supply in Brazilian municipalities. The Control module contains information on water quality monitoring conducted by water supply service providers, according to parameters, minimum number of samples and frequency defined in the Potable Water Ordinance, according to the sampling plan, the population served and the source type of every type of supply (SAA or SAC).

Monthly control data are input by month and year of reference. Half-year control data are input per semester and year of reference, according to the water sample collection date.[13] In compliance with Potable Water Standard, article 13, item V,[8] the data should be forwarded to the state, Federal District and municipal public health authorities according to the model established for manual data entry to the system. However, SISAGUA users whose profile is linked to the water supply service provider responsible for the supply type can also enter data onto the system manually or by automatic data submission, through the web service tool available on SISAGUA 4.

The Surveillance module refers to data from water quality monitoring conducted by the Health Departments in the municipalities, as recommended in the National Guidelines for the VIGIAGUA Sampling Plan.[12] This document indicates the quantity of samples to be analyzed in each municipality according to its population, the sampling frequency, the parameters to be analyzed, as well as guidelines for the selection of collection points, considering all water supply service types.

The sampling plan for routine surveillance of drinking water quality involves the basic sampling plan, the parameters of which are free residual chlorine (or other residual chlorine), turbidity, total coliforms, *Escherichia coli* and fluoride, besides the pesticides monitoring plan and, when necessary, a specific monitoring plan according to local characteristics.[12]
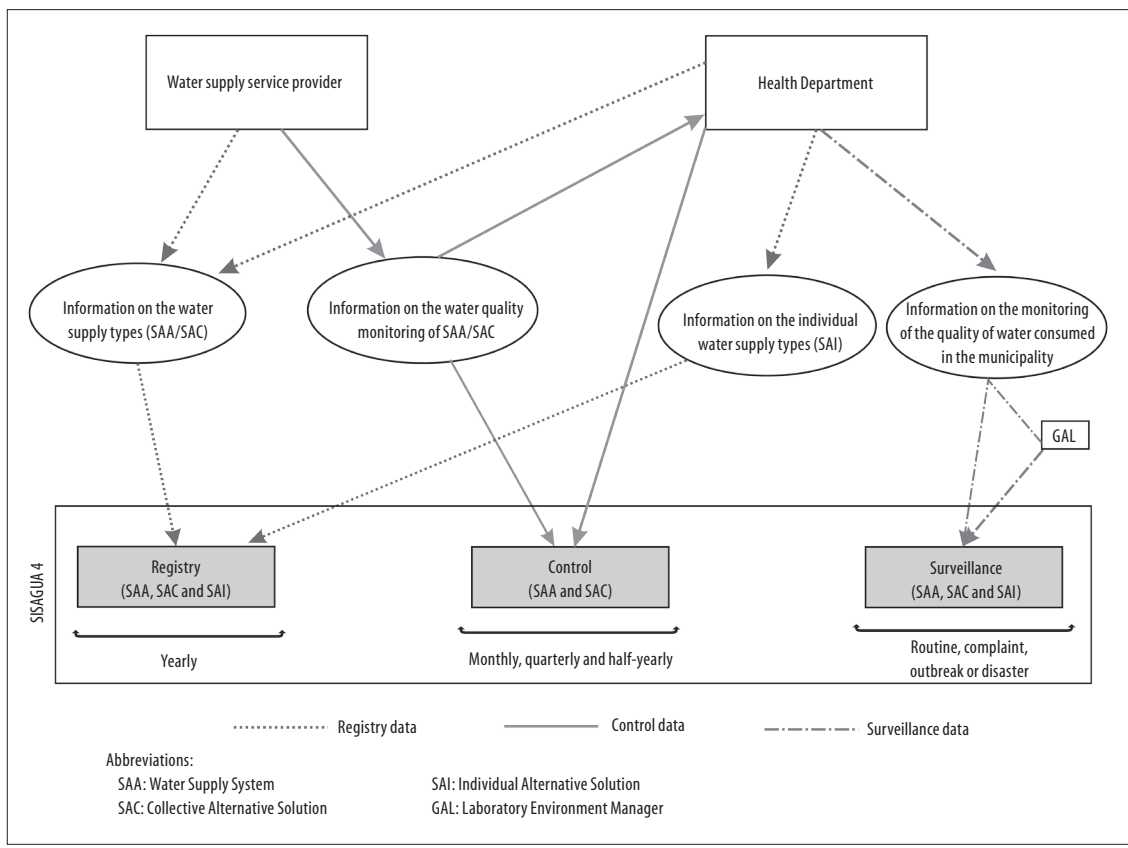
SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 3 – Flowchart for data entry in the main SISAGUA 4 modules
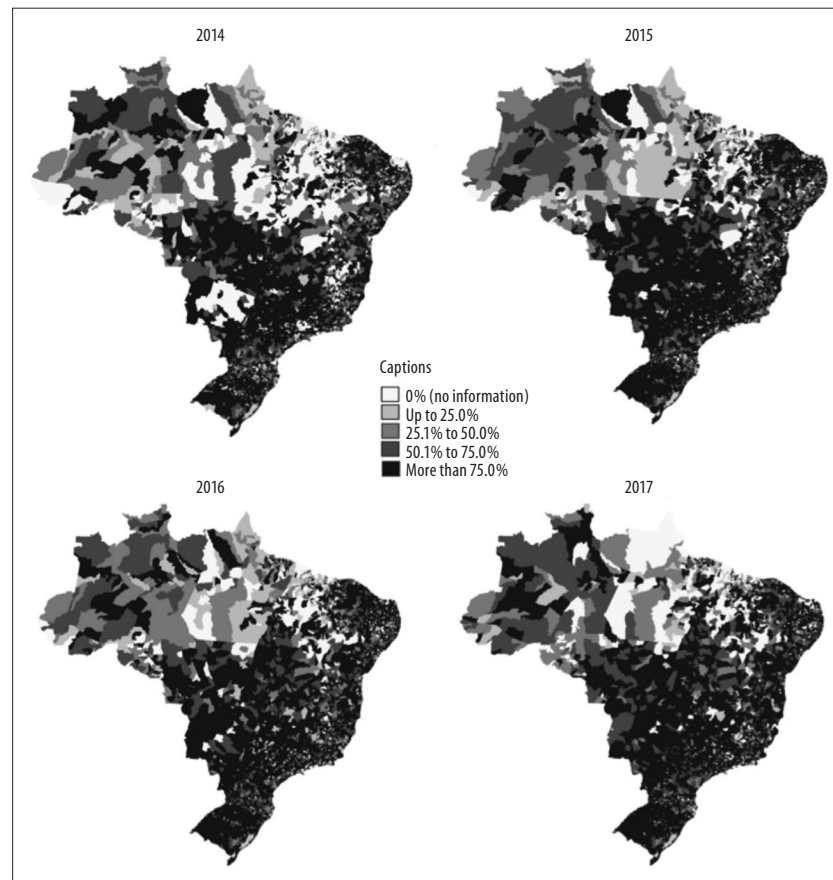
Source: SISAGUA (02/02/2018).
SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 4 – Spatial Representation of the percentage of the population with information on water supply type registered on SISAGUA 4

In relation to interoperability, the current version has a tool that allows automated receipt of "control" data, i.e., information from monitoring conducted by water supply service providers can be sent electronically from their information systems to SISAGUA 4 via a web service tool. Another improvement on the current version is the integration with the public health laboratories' information system, or Laboratory Environment Manager (GAL). In this case, results of basic parameter analyses (residual disinfectant agent, turbidity, color, pH, fluoride, heterotrophic bacteria, total coliforms and *Escherichia coli*) input to GAL are automatically sent to SISAGUA 4 after the reports' release.

In both cases, it is not necessary to input data to SISAGUA that has already been entered on another system, thus reducing effort expended and the probability of typing errors.

Variables

SISAGUA 4 variables are divided according to the system modules. The Registry field contains information on the type(s) of supply (name, institution responsible), water treatment plant(s) (name, address, responsible technician, water collection and water treatment) and distribution system or consumption point (municipality served, estimated population served, supply areas and locations).

The information from the monitoring carried out by service providers is input to the Control module (monthly or half-yearly), with supply type identification (name, code, municipality and responsible institution), data month and year of reference, collection place identification (collection point, treated water and distribution system or consumption point) and water quality data.

The Surveillance module contains general data on the municipality (name, Federative Unit, IBGE code), sample number (identification code of the water sample collected for analysis), reference year, reason for collection and those responsible for it, identification of supply type, origin information, collection point, address, geographic coordinates, date and time of collection and the results of the analyses of the water quality monitoring parameters.

In Figure 5, entitled "Summary of SISAGUA 4 Characteristics" shows the system's main variables. The characterization of water supply coverage is obtained by reference year, through SAA, SAC and SAI data input to the Registry module. Information related to infrastructure and operational conditions is obtained through Monthly Control forms (SAA and SAC) reported by water supply service providers on a monthly basis.

Data on the quality of water consumed by the population are registered on the Surveillance and Control modules, and cover all 104 parameters established in the current Brazilian Potable Water Standard[8] (Annex XX of PRC No. 5/2017).

Uses and accesses

SISAGUA data are public domain data and may be requested through the Citizen Information Service (SIC), personally or in electronic form, via the electronic SIC system (e-SIC), available on the website www.saude.gov.br/acessoainformacao. In addition, SISAGUA 4 data are available on the Brazilian Open Data Website and can be accessed at: http://dados. gov.br/dataset?q=sisagua. SISAGUA information assists management of drinking water quality surveillance actions as well as obtaining results for VIGIAGUA institutional indicators. It also provides data on the characterization of the Brazilian water supply and its quality; and identification of vulnerabilities related to the population's water consumption.

Data from 2000 to 2006 (SISAGUA 1 and 2) are stored in Product Data Management (PDM) file format. Data from 2007 to 2013 (SISAGUA 3) are stored by the Ministry of Health in Database File (DBF) format. In this case, the data can also be consulted on the http://portalweb04.saude.gov.br/sisagua website by users who have access to SISAGUA 3. Data for the year 2014 can be obtained from SISAGUA 4 through system generated reports or through data sets available on the Open Data Website. A SISAGUA 4 public panel is in the process of being approved. Its disaggregated information (per municipality or supply type) or aggregated information (by region, state or country) can be accessed and retrieved freely by any person interested in knowing the characteristics of water consumed in Brazil.

The information obtained through SISAGUA is used by VIGIAGUA professionals, and by various institutions

Content	Information about drinking water supply coverage and quality
Year	As of 2014
Main variables	(i) Characterization of supply coverage: % of the population that receives water per collection type (surface or subsurface); % of the population that receives water per supply type (distribution network, cistern, spring etc.) and supply service type (Water Supply System – SAA; Alternative Collective Solution – SAC; or Alternative Individual Solution – SAI); % of population that receives water per treatment type. (ii) Supply regularity and information related to infrastructure and operational conditions: monthly data, by SAA and SAC, on repairs to the network, intermittence, lack of water, complaints about the water color, taste and odor; (iii) Water quality: data from the monitoring of drinking water quality of all 104 parameters defined in the potable water standard in Brazil; results of analyses carried out by the health sector (Surveillance) and data from monitoring conducted by water supply service providers (Control).
Limitations	Data input in a timely manner and completeness of information.
Periodicity	Monthly, half-yearly and yearly.
Scope	Cities, States, Federal District and Brazil as a whole.
Link to access	http://sisagua.saude.gov.br/sisagua

SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 5 – Summary of SISAGUA 4 characteristics

involved with the theme, such as: the Chief of Staff Office of the Presidency of the Republic; the Ministry of Cities, Ministry of National Integration and Ministry of the Environment; the Brazilian National Water Agency (ANA); the National Advisory for Hydro Resources (CNRH); the National Health Foundation; the Public Prosecutor's Office; and universities, among others. Such information supports the surveillance of drinking water quality, the structuring of public policies on environmental health and sanitation, prevention of waterborne diseases and scientific studies on the evaluation of the quality of water consumed by the Brazilian population.

SISAGUA 4 is accessed on the website <http://sisagua.saude.gov.br/sisagua> by State and Municipal Health Department professionals and by technical staff of water supply service providers, according to their system access profile, established in accordance with the attribution and sphere of professional activity or the need for consulting the data. Each access is authorized by VIGIAGUA managers in their scope of their duties. The guidelines for requesting access to SISAGUA are available on the website: http://portalms.saude.gov.br/vigilancia-em-saude/vigilancia-ambiental/vigiagua/sisagua.

The access profiles can be divided into: "VIGIAGUA", intended for health care sector professionals who work in the Brazilian National Health System; "Indigenous", for professionals who work with water supply in indigenous areas; "Companies", intended for professionals linked to supply service providers; and "Consultation", for users who need to routinely monitor system data or specifically need to view data. Each profile has specific scope of access to information, as detailed in Figure 6.

Coverage

SISAGUA 4 is available on the internet for data input for all the Brazilian municipalities and the 31 Federal District administrative regions, which are considered municipalities on the system's current version, totaling 5,600 municipalities. Figure 7 shows the historic series with the quantity and the percentage of municipalities that input Registry, Control and Surveillance data at the same time on SISAGUA, versions 3 and 4.

Even though the information held on SISAGUA does not extend to all municipalities or to the total population, it enables the water consumed by the population to be characterized. This characterization is important for the identification of vulnerabilities and for managerial decision-making. It also helps Ministry of Health responses on this issue.

Quality

The General Coordination of Environmental Health Surveillance (CGVAM), part of the Health Surveillance Secretariat, conducts training on SISAGUA for managers and technicians of State, Municipal and Federal District Health Departments. The participants become multipliers and pass on knowledge to other users, according to SUS hierarchical structure. Since SISAGUA 4 was released, CGVAM has held 12 capacity-building courses – the first two occurred in Brasília/DF, in February and May 2014, for VIGIAGUA managers from the 27 Federative Units. The other courses occurred in Federative Units that requested SVS support for training, namely: Acre, Amapá, Amazonas, Federal District, Espírito Santo, Mato Grosso, Pernambuco and Rio de Janeiro.

In order to minimize inconsistencies, rules have been implemented in SISAGUA 4 data entry fields. Among them: (i) the municipality's supply coverage may not exceed its population; (ii) the fields for entering results of analyses only accept numerical characters; (iii) complex analysis data entry, such as pesticides, has a pre-tabulated result type format, to include specificities of analytical methods, besides the numeric field for filling in when possible; and (iv) the fields for entering monitoring data are enabled according to Registry data on supply type. Periodically, analyses are carried out on the system in order to identify data inconsistencies or lack of information. When problems are identified, VIGIAGUA state-level managers are informed and advised to request corrections by those responsible for data input in the municipalities. E-mails are regularly sent to system users to inform them about the quantity and quality of entered data. In addition, letters are sent to Federative Unit environmental health surveillance leaders to reinforce the need to input data in a timely manner and in sufficient quantity to enable relevant analyses that allow identification of vulnerabilities.

Limitations

SISAGUA's four versions have different database structures, thus making it difficult to build historical series for several variables. SVS and DATASUS are working on building mechanisms to provide data from previous SISAGUA versions jointly with SISAGUA 4 data.

Currently, SISAGUA data are only accessed by registered users or upon data request. A SISAGUA 4 public information panel is under construction and the Ministry of Health is working on the Open Data Plan (PDA-MS)[14] to provide data from all SISAGUA versions on the Brazilian Open Data Website.

There is no information about the water supply of the entire Brazilian population. In 2017, only 456 municipalities had 100% of the population with information on water supply registered on SISAGUA 4. Quantitative data from the monitoring of the drinking water quality (Control and Surveillance modules) is still lower than that established in the Control sampling plan defined by the potable water standards and by the National Guidelines for the VIGIAGUA Sampling Plan.[12] In this sense, it is necessary to improve data input at the appropriate time (up to one month after routine sample collection) and in sufficient quantity and quality to enable situation analyses on public health and surveillance actions. SVS works in partnership with the State Health Departments to raise awareness of stakeholders involved in this issue with regard to the importance of permanent and adequate data input to SISAGUA.
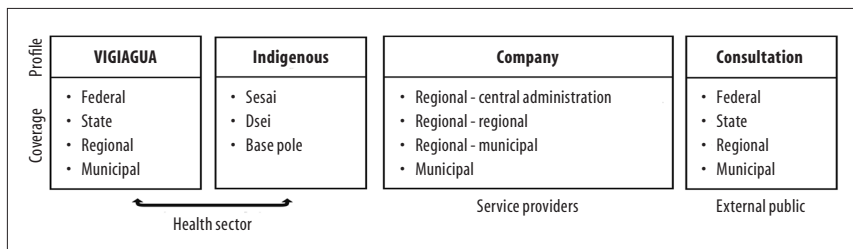
SISAGUA: Drinking Water Quality Surveillance Information System.
VIGIAGUA: Water Quality Surveillance Program.
SESAI: Special Secretariat of Indigenous Health.
DSEI: Special Indigenous Health District.

Figure 6 – SISAGUA 4 Access Profiles
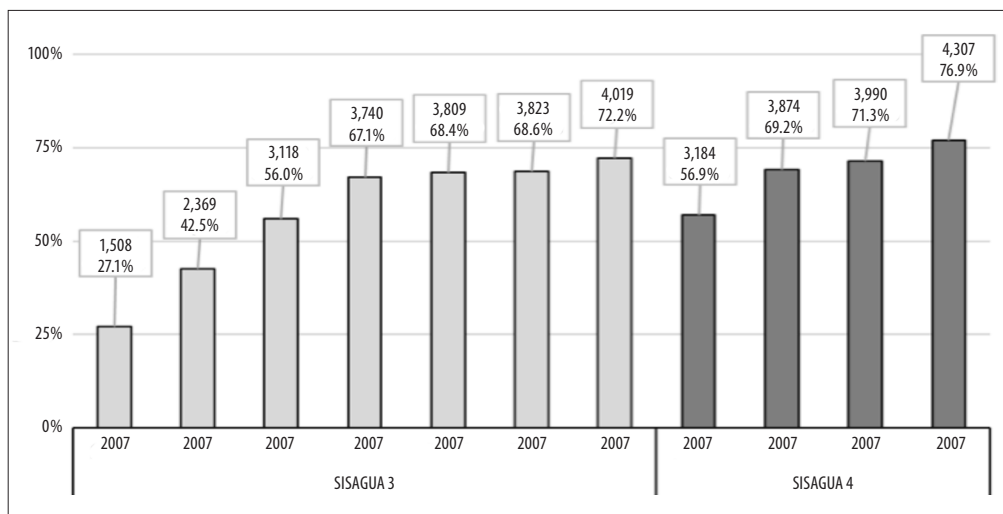
Source: SISAGUA 3 (Database closed in April 2014); SISAGUA 4 (system reports retrieved in 02/02/2018).
SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 7 – Number and percentage of Brazilian municipalities with data Registry, Control and Surveillance on SISAGUA (versions 3 and 4)

Challenges

- To highlight SISAGUA's importance in managing health risks related to water supply in Brazil and making it the official data source for accessing health, sanitation and environmental indicators related to drinking water in Brazil.
- To raise awareness among stakeholders about the need to input data to SISAGUA and obtain information about the water supply of all Brazilian municipalities and about the quality of drinking water. To enhance the production and availability of information about the quality of water consumed by the Brazilian population in order to support the building, management and evaluation of public policies in the sector.
- To make SISAGUA known nationally and internationally as a reference in data recording and transparency in the disclosure of information on the water supply in Brazil, for use and consultation of governmental agencies, academia and society. To use water quality data for promoting health and preventing waterborne diseases. To contribute to the fulfillment of the Law on Access to Information in Brazil (Law No. 12.527/2011) and to foster the development of a culture of transparency and social control in matters relating to drinking water.

Authors' contributions

Oliveira Júnior A. worked on drawing up the initial version of the article. Magalhães TB, Mata RN and Santos FSG undertook a critical review of the article. Araújo WN, Carvalho JLB and Oliveira DC worked on the revised final version of the manuscript. Oliveira Júnior A, Santos FSG and Mata RN made final adjustments to the version of the manuscript to be published. All the authors have approved the final version and declared themselves to be responsible for all aspects of the study, ensuring its accuracy and integrity.

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Erratum

In the article "Drinking Water Quality Surveillance Information System (SISAGUA): characteristics, evolution and applicability", DOI: 10.5123/S1679-49742019000100024, published on *Epidemiology and Health Services*, 28(1):1-12:
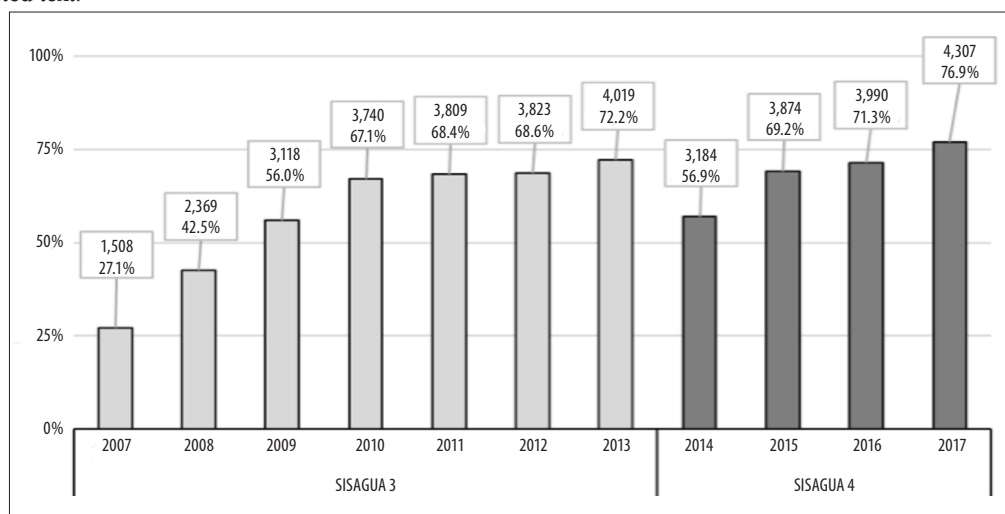
Original text:
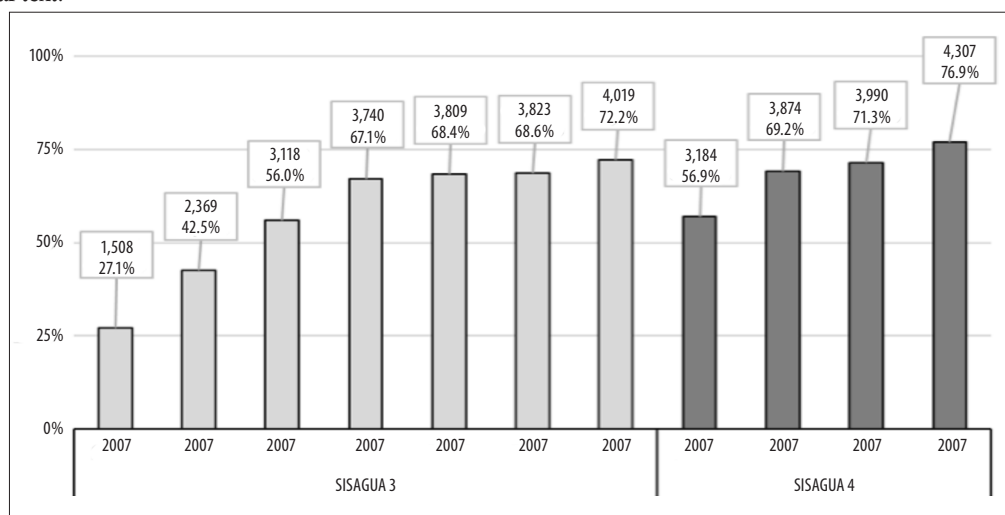
Source: SISAGUA 3 (Database closed in April 2014); SISAGUA 4 (system reports retrieved in 02/02/2018).
SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 7 – Number and percentage of Brazilian municipalities with data Registry, Control and Surveillance on SISAGUA (versions 3 and 4)

Corrected text:

Source: SISAGUA 3 (Database closed in April 2014); SISAGUA 4 (system reports retrieved in 02/02/2018).
SISAGUA: Drinking Water Quality Surveillance Information System.

Figure 7 – Number and percentage of Brazilian municipalities with data Registry, Control and Surveillance on SISAGUA (versions 3 and 4)