Original article

Characteristics of the Mortality Information System in municipalities of São Paulo State, Brazil, 2015*

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Abstract

Objective: to describe characteristics of the Mortality Information System (SIM) in municipalities of São Paulo State, in 2015. **Methods**: descriptive study with data collected through an electronic questionnaire, with questions on the profile of technical managers, human resources and IT structure. **Results**: 584/645 municipalities (90.5%) participated; technical managers were mainly women (81.5%), nurses (64.9%), career civil servants (66.1%) and had more than 3 years of work experience with SIM (68.2%); in small-sized municipalities (≤30,000 inhabitants), managers were younger (average age of 37.7 years), were also responsible for other systems (92.4%) and used computers with older operating systems (69.5%); in large-sized municipalities (>200,000 inhabitants), managers were older (average age of 47.1 years) and had higher education level (86.5% with higher education degree), they had fast-access internet (83.8%) and in-house technical support (81.1%). **Conclusion**: the technical managers' profile and availability of technological resources used at SIM were different according to population size of the municipalities.

Keywords: Information systems; Mortality; Cross-Sectional Studies; Human Resources; Information Technology.

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Introduction

Decision making in Public Health depends on the timely availability of reliable data.[1] The role of health information systems (HIS) is to produce, analyze and publicize such data, which makes them important tools for heath situation diagnosis, generating knowledge to support health services management and to plan interventions regarding the health needs of the population, in all levels of the Brazilian National Health System (SUS).[1,2]

The decentralization of SUS health services led to the need to organize municipal information systems. Currently, the municipalities are co-responsible for monitoring, assessing and releasing information on health situation, organizing and coordinating HIS, using epidemiology to set priorities, allocate resources and refer programmatic guidelines on the local health.[3] For some authors, HIS decentralization increased without a cautious process of responsibilities transference from the national level to state and municipal levels.[2,4-6] The municipalization faced difficulties, partly due to the federalism model, in which municipalities are federated units with political, administrative and financial autonomy, and well established constitutional competencies, however they have huge differences in size, population and socioeconomic aspects[6,7] which have consequences in their administrative, financial and management capacity;[8] all these factors should be considered in the analyses of HIS decentralization.

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Since 1975, in order to understand the epidemiological profile of mortality in the country, Brazil uses the Mortality Information System (SIM), originally centralized by the Ministry of Health.[9,10]

With the advance of the decentralization process, the municipalities became responsible not only for data collection, but also for management and assessment of HIS. From 2005 to 2010, São Paulo State, following national guidelines,[11,12] standardized the flow and competencies of SIM municipal managers.[13]

Several dimensions (coverage, accuracy, update, usability, relevance)[1,14-16] can be considered when assessing HIS. New approaches point to the need of a multidimensional assessment[1,17] which considers all the process of generation and use of information, besides the analysis of data quality and indicators used.[1,17] Some models cover aspects related to the context in which the data are produced[16-18] and the availability of resources, including infrastructure, financial, information technology and communication, besides qualified human resources.[1]

Although SIM coverage has increased, especially with the experience of active search for vital events,[14] there are still some quality problems regarding the causes of death and fetal deaths.[9] In Brazil, there have been some recent researches on operationalization and management of HIS in municipal level,[5,17,18] where the data which feed several systems are produced. Understanding the conditions in which the data are generated can help subsidize the three government levels in the improvement of quality and management of SIM. This study aimed to describe the characteristics of the Mortality Information System (SIM) in municipalities of São Paulo State, in 2015.

Methods

This is a descriptive study, conducted in São Paulo State. The state has a population of 41,223,683 inhabitants, distributed in 645 municipalities, of which 90% presented high/very high HDI in 2010.[19]

An electronic questionnaire via FormSUS (formsus.datasus.gov.br/) was applied between March and May 2015. The questionnaire was sent to all Municipal Health Departments of the state (n=645); it was elaborated based on the minimal requirements of the working processes established by the Ministry of Health,[11] and in other requirements found in the literature.[5,17] The questionnaire was pre-evaluated by two specialists. The municipal managers received an invitation containing instructions on how to fill in the questionnaire and a recommendation for the instrument to be answered by the manager responsible for SIM. The Center for Diseases Control of the State Health Department (CDC/SES) disclosed the research.

The dimensions and variables studied were:

a) Profile of SIM technical manager

- sex (male, female);

- age (in years: <40, 40 to 49, ≥50);
- academic degree (Nursing, Administration, Medicine, Biology/Biological Sciences, Information Systems/ Computer Science, Computing, Pedagogy, others);
- position (Director/Coordinator/Supervisor, Technical Assistant/IT Technician or similar, Typist/ Administrative Assistant or similar, other);
- employment relationship (career civil servant, employee working under the Consolidation of Labour Laws (CLT) regime [CLT employee], commissioned position, others);
- length of time working in the Health area (in years: <3, ≥3);
- length of time working with SIM (in years: <3, ≥3);
- responsibility with other information systems (yes, no); and

b) Structure

- sector of the Municipal Health Department where SIM is allocated (health care unit, Epidemiological Surveillance, health information sector);
- number of employees at SIM team (1, 2, 3, ≥4);
- number of computers (0, 1, 2 -3, ≥4);
- operating system (Windows: XP, 7, 8, others);
- internet access (none, dialed, radio, fast-access);
- and computing technical support (none, in-house service, outsourced service).

The municipalities were grouped according to population size, based on 2014 estimates by the Brazilian Institute of Geography and Statistics (IBGE), stratified into three groups: up to 30,000 inhabitants (small-sized); from 30,001 to 200,000 inhabitants (medium-sized); and above 200,000 inhabitants (large-sized). The choice considered the clipping of municipalities <30,000 inhabitants, used by the Ministry of Health to monitor regularity of data supply at SIM and to maintain the transfer of resources of the component Surveillance and Health Promotion.[12] We also used the average number of deaths obtained per from the municipalities where the death occurred and the range of values, according to population size of municipalities, provided by CDC/SES.

We conducted descriptive statistics analyses and elaborated distribution and central tendency measurements. Pearson chi-square, Fisher exact test and ANOVA were used in the comparison of proportions and averages, between the three groups of municipalities. A 5% significance level was adopted. Data were processed using Statistical Package for the Social Sciences (SPSS) version 17.0.

This study is tied to the research 'Decentralization of the Health Information Systems in municipalities of São Paulo State'. The project was approved by the Ethics in Research Committee of the School of Public Health of the University of São Paulo: Report No. 766,167, dated August 26th 2014.

Results

A total of 584 municipalities (90.5%) answered the questionnaire, which represents a loss of 61 municipalities (9.5%), distributed as follows, according to population size: 9.0% (40/446), 11.3% (18/159) and 7.5% (3/40), among small, medium and large-sized municipalities, respectively.

Table 1 shows that the annual average volume of deaths grew as the population size increased. Of the 584 participant municipalities, about 70% were small-sized and only 6% were large-sized. As expected, there was great range in the occurrence of deaths: whilst in smaller municipalities the annual average was about 40 deaths, in large-sized municipalities (excluding the municipality of São Paulo), this number was close to 2,850, ranging from 690 to 8,777.

SIM was predominantly allocated at the Epidemiological Surveillance sector, followed by the health care unit; only 12.0% were in the health information sector of the Health Department. The Epidemiological Surveillance was more frequent in medium (86.5%) and large (78.4%) municipalities; in small-sized, the allocation in health care unit (40.1%) or in the Epidemiological Surveillance (40.6%) presented similar proportions. The differences between the municipalities groups were statistically relevant (p<0.001).

With regard to the profile of technical managers, most of them were women (81.5%) in all the groups, with no statistically significant differences (p=0.167). Age ranged from 20 to 67 – average of 39.3 years old (95%CI 29.5;49.1) –, with an increase from small-sized municipalities (37.7; 95%CI 28.6;46.8) to larger municipalities (47.1; 95%CI 35.3;58.8). In small municipalities, 63.5% of the managers were less than 40 years old, a higher proportion when compared to medium-sized (48.2%) and large-sized municipalities (27.0%) (p<0.001) (Table 2).

Most managers had higher education degree (78.9%), which was most common in larger municipalities (p=0.017). Among the 21.1% who did not have higher

Table 1 – Number of participant municipalities and number of deaths per place of occurrence, according to population size of municipalities, São Paulo, 2015

Size of municipalities (Number of inhabitants)	Respondent municipalities		Deaths per occurrence			
	N	%	N	%	Minimum – Maximum [a]	Mean [a]
Up to 30,000	406	69.5	16,270	5.9	0 – 824	40.4
From 30,001 to 200,000	141	24.1	72,985	26.3	57 – 2,708	493.2
Over 200,000 [a]	37	6.3	188,166	67.8	690 – 8,777	2,847.90
Total	584	100.0	277,421	100.0	0 – 86,150	475.0

a) To calculate average and range in the group of municipalities with more than 200 thousand inhabitants, the municipality of São Paulo was excluded (86,150 deaths).

Table 2 – Profile of municipal technical managers of the Mortality Information System (SIM) according to population size of municipalities, São Paulo, 2015

Variables	Municipality size (number of inhabitants)						Total	
	Up to 30,000		From 30,001 to 200,000		Over 200,000			
	n	%	n	%	n	%	n	%
Sex [a]	406	100.0	141	100.0	37	100.0	584	100.0
Male	80	19.7	19	13.5	9	24.3	108	18.5
Female	326	80.3	122	86.5	28	75.7	476	81.5
Age [b] **(in years)**	406	100.0	141	100.0	37	100.0	584	100.0
Less than 40	258	63.5	68	48.2	10	27.0	336	57.5
40 to 49	92	22.7	36	25.5	10	27.0	138	23.6
50 or over	56	13.8	37	26.2	17	45.9	110	18.8
Education level [c]	406	100.0	141	100.0	37	100.0	584	100.0
Less than higher education degree	87	21.4	31	22.0	5	13.5	123	21.1
Higher Education degree	319	78.6	110	78.0	32	86.5	461	78.9
Academic degree [d]	231	100.0	84	100.0	24	100.0	339	100.0
Nursing	164	71.0	46	54.8	10	41.7	220	64.9
Administration	9	3.9	2	2.4	3	12.5	14	4.1
Medicine	1	0.4	5	6.0	5	20.8	11	3.2
Biology/Biologic Sciences	3	1.3	3	3.6	1	4.2	7	2.1
Informations Systems/Computer Sciences/Computing	5	2.2	2	2.4	–	–	7	2.1
Pedagogy	5	2.2	–	–	1	4.2	6	1.8
Others	44	19.0	26	31.0	4	16.7	74	21.8

Pearson chi-square test: a) p=0.167; b) p<0.001; c) p=0.017; d) p<0.001.

education degree, the amount of individuals with only Elementary School degree was small (1.7%). For the municipalities where the technical manager of SIM had higher education degree, we obtained data on the academic degree of 73.5% of them, with prevalence of Health Sciences (76.5%), followed by Applied Social Sciences (14.0%). A total of 38 academic degrees were mentioned, with lower variety (n=9) in larger municipalities; the most common was Nursing (64.9%), followed by Administration (4.1%) and Medicine (3.2%). More than 70.0% of the managers in small municipalities were nurses; in medium and large municipalities, this proportion dropped to 54.8% and 41.7%, being followed by physicians, with 6.0% and 20.8%, respectively.

With regard to employment relationship, the most common was career civil servant (66.1%), with a proportion of 81.1% in large municipalities. CLT employees were the second most common (24.0%) – it dropped as the population size increased; 7.9% occupied commissioned position, with no relevant differences between the groups of population size (p=0.086) (Table 3).

With regard to length of time working in the Health area, most professionals had been working for 3 years or more in the area (88.9%), reaching 97.3% in large-sized municipalities, with no relevant differences between the groups of municipalities (p=0.091). Most municipalities had experienced professionals working with SIM management: 68.2% had 3 or more years of experience, with no relevant differences between the groups (p=0.332), although about 10.0% were responsible for the system for less than a year.

Table 3 – Municipal technical managers of the Mortality Information System (SIM), according to characteristics and population size of municipalities, São Paulo, 2015

Variables	Municipality size (number of inhabitants)						Total	
	Up to 30,000		From 30,001 to 200,000		Over 200,000			
	n	%	n	%	n	%	n	%
Employment relationship[a]	406	100.0	141	100.0	37	100.0	584	100.0
Career civil servant	264	65.0	92	65.2	30	81.1	386	66.1
CLT employee	102	25.1	34	24.1	4	10.8	140	24.0
Commissioned position	30	7.4	13	9.2	3	8.1	46	7.9
Others	10	2.5	2	1.4	–	–	12	2.1
Position[b]	406	100.0	141	100.0	37	100.0	584	100.0
Director/Coordinator/Supervisor	162	39.9	61	43.3	15	40.5	238	40.8
Technical Assistant/IT Technician or similar	26	6.4	15	10.6	7	18.9	48	8.2
Typist/Administrative Assistant or similar	99	24.4	28	19.9	5	13.5	132	22.6
Other	114	28.1	35	24.8	9	24.3	158	27.1
Length of time working in the Health area[c]	406	100.0	141	100.0	37	100.0	584	100.0
Less than 3 years	52	12.8	12	8.5	1	2.7	65	11.1
3 years or more	354	87.2	129	91.5	36	97.3	519	88.9
Time of work at SIM[d]	406	100.0	141	100.0	37	100.0	584	100.0
Less than 3 years	137	33.7	39	27.7	10	27.0	186	31.8
3 years or more	269	66.3	102	72.3	27	73.0	398	68.2
Responsibility with other information systems[e]	406	100.0	141	100.0	37	100.0	584	100.0
No	31	7.6	39	27.7	25	67.6	95	16.3
Yes	375	92.4	102	72.3	12	32.4	489	83.7

Pearson chi-square test: a) p=0.333; b) p=0.086; c) p=0.091; d) p=0.332; e) p<0.001.

The State Health Department of São Paulo informed that in almost all municipalities the technical manager of SIM was also responsible for the Information System on Live Births (Sinasc). Only three municipalities had different managers for each system. Overload of responsibilities was high (83.7%), and more frequent in small municipalities (92.4%) than in larger (32.4%) (p<0.001): in small municipalities, 86.0% of the managers were responsible for up to five HIS, besides SIM and Sinasc. The other systems most mentioned were: Information System for Notifiable Diseases (Sinan) (80.0%) and Brazilian National Immunization Program Information System (SI-PNI) (63.2%); in a smaller frequency, the following systems were mentioned: Monitoring System of the Humanization Program in Prenatal Care and Birth (SisPreNatal) (37.0%), Primary Health Care Information System (SIAB) and SUS Ambulatory Care Information System (SIA/SUS) (19.4%).

A total of 1,237 professionals were working with SIM on December 31st 2014 – average of 2.12 (95%CI 1.02;3.22) per municipality –, 61.4% of them were in small-sized municipalities, 27.1% in medium-sized, and 11.5% in large-sized. About half of small and medium municipalities had two employees at SIM staff, and 48.6% of large municipalities had 4 or more, representing significant differences (p<0.001) (Table 4).

With regard to upgrading of technology infrastructure, 68.3% used Windows XP as operating system to load SIM, 20.0% used Windows 7 and only 2.4% used Windows 8, this latter being the most recent at the time; 50 respondents did not know the type of operating system used (Table 4).

Data were exported to higher management levels monthly. Among the municipalities, 74.3% had fast-access internet. 20.7% had radio access internet and 2.9% had dialed internet, this latter being restricted to small and medium municipalities; 2.1% informed not having internet access in the computers used to load SIM (p=0.432). It was verified that 93.7% had computing technical support; 61.8% had in-house service, more than 80.0% of those were in medium and large municipalities; 31.8% of municipalities counted with outsourced service (p<0.001).

Discussion

São Paulo State municipalities have differences in the management of SIM, depending on the municipality population size. In smaller municipalities, technical managers were younger, were also responsible for other information systems, used computers with older operating systems and relied more on outsourced technical support. In larger municipalities, managers were older, had higher education level, there was a prevalence of career civil servants, with more experience with SIM and less responsibility with other systems; those municipalities had more computers, updated operating systems, fast-access internet and exclusive technical support.

São Paulo State is the Brazilian federative unit with the largest population in the country, and, consequently, has the highest volume of events recorded at SIM – the municipalities studied answer for the record of more than 277 thousand deaths –, and its coverage is considered of good quality.[15] We verified a variation in the average number of deaths according to population size, which may explain the differences found in human resources, equipment and technical support regarding SIM. It is worth mentioning that the great participation of small-sized municipalities, although they have little events occurrence, not only can be seen in São Paulo State, but it is similar throughout the country.

SIM has been managed by several areas of the Ministry of Health over its history, and in 2003 the Secretariat of Health Surveillance (SVS) took over the management of the system in the national level.[10] In local level, we observed that in medium and large-sized municipalities of São Paulo State, SIM was mostly allocated in the Epidemiological Surveillance, a fact related to some functions of this area, such as surveillance of death and of notifiable diseases; the transfer of resources of the component Surveillance and Health Promotion is linked to SIM fulfillment and immediate report of maternal and infant death.[20] In small-sized municipalities, the allocation in primary health care units may be related to the small structure of local Health. In large-sized municipalities, the allocation of SIM in information sectors of the Municipal Health Departments aims at optimizing the data processing related to all their activities – including health care data –, which may demand a specific structure to handle the processing of big amounts of data.

In each municipality there is a technical manager responsible for managing the system at local level and establish the communication with the health care facilities and regional and state levels. We identified a prevalence

Table 4 – Municipalitie's distribution according to number of individuals and computers, type of operating system, internet access and technical support available for the Mortality Information System (SIM), and population size, São Paulo, 2015

Variables	Municipality size (number of inhabitants)						Total	
	Up to 30,000		From 30,001 to 200,000		Over 200,000			
	n	%	n	%	n	%	n	%
Number of employees at SIM team[a,b]	405	100.0	141	100.0	37	100.0	583	100.0
1	124	30.5	17	12.1	4	10.8	145	24.8
2	221	54.4	71	50.4	8	21.6	300	51.4
3	48	11.8	38	27.0	7	18.9	93	15.9
4 or over	12	3.0	15	10.6	18	48.6	45	7.7
Number of computers[b]	406	100.0	141	100.0	37	100.0	584	100.0
0	1	0.2	–	–	–	–	1	0.2
1	396	97.5	127	90.1	15	40.5	538	92.1
2 to 3	9	2.2	13	9.2	9	24.3	31	5.3
4 or over	–	–	1	0.7	13	35.1	14	2.4
Operating system[c]	406	100.0	141	100.0	37	100.0	584	100.0
Windows XP	282	69.5	100	70.9	17	45.9	399	68.3
Windows 7	73	18.0	32	22.7	12	32.4	117	20.0
Windows 8	8	2.0	4	2.8	2	5.4	14	2.4
Others	2	0.5	–	–	2	5.4	4	0.7
Unknown	41	10.1	5	3.5	4	10.8	50	8.6
Internet access[d]	406	100.0	141	100.0	37	100.0	584	100.0
No	10	2.5	1	0.7	1	2.7	12	2.1
Yes, dialed access	15	3.7	2	1.4	–	–	17	2.9
Yes, radio access	87	21.4	29	20.6	5	13.5	121	20.7
Yes, fast-access	294	72.4	109	77.3	31	83.8	434	74.3
Technical support[b]	406	100.0	141	100.0	37	100.0	584	100.0
No	29	7.1	7	5.0	1	2.7	37	6.3
Yes, in-house service	217	53.4	114	80.9	30	81.1	361	61.8
Yes, outsourced service	160	39.4	20	14.2	6	16.2	186	31.8

a) One municipality did not answer the question and was excluded.
Fisher exact test: b) p<0.001; c) p=0.002; d) p=0.432.

of women in this function, which is similar to a study that assessed the profile of the manager in health care units of Belo Horizonte, Minas Gerais, between 2000 and 2001.[21] These data expressively reflect the feminization of health work, a fact identified some decades ago.[22]

A little more than half of the managers were less than 40 years old, proportion lower than in a study about the responsible for Sinasc (66.0%) in municipalities from Minas Gerais State, in 2010.[17] The responsible for SIM are younger in smaller municipalities, whilst in larger municipalities there is a high number of workers above 50 years. This may be related to a solid administrative structure, which enables the professional to work longer in that function.

SIM managers present high education level, which was less frequent in small municipalities. São Paulo State Health Department, considering the importance of SIM and the need of knowledge about legal matters, established that the system's technical manager should have higher education degree (Resolution No. 66, dated May 3rd 2010).[23] This Resolution may have contributed to the high proportion of managers with higher education degree. In turn, as 21.1% of the municipalities did not fulfill this requirement, it may suggest unavailability of more qualified professionals. Indeed, the literature points to higher deficiency and staff turnover in smaller municipalities.[5,6,13,17,24]

Most SIM managers are career civil servants, especially those from larger municipalities, which may suggest low staff turnover; in smaller municipalities, there was higher participation of CLT employees, probably because this type of hiring process is faster and more flexible. These results are similar to those obtained in a research on the staff of municipal direct administration in Brazil, conducted in 2013, in which the Southeast region registers a prevalence of career civil servants, followed by not stable civil servant; this latter reduce as the population size of the municipality increases.[25]

Almost 90% of the managers had been working for at least 3 years in the Health sector, which also indicates the low staff turnover and, consequently, the presence of more experienced professionals. Length of time working with SIM was shorter, probably because the Health workers usually begin with health care activities, and, later, join the activities of the Information area, for which there is no specific career. In 2010, a study on Sinasc pointed that most of the technical managers had been in the function for at least five years.[17] Usually, the quality of information depends on the knowledge of the professionals involved; thus, low staff turnover in an important factor in this sense. Experience enables a better performance in the activities, as shown in a study from Alagoas State, where the workers' performance was worse as the time in the function was shorter.[26]

In small municipalities, workers were also responsible for other information systems. Possibly, this happens because there is a lower demand towards SIM (low occurrence of deaths) and because of the small structure of the Municipal Health Departments. This finding corroborates to a study conducted in Minas Gerais State (2010),[17] according to which not only do the professionals take responsibility over more than one information system, but they also accumulate other functions in the Health area.

Most municipalities reported having up to two individuals working with SIM, which is adequate, even in smaller municipalities. The number of events occurred in the municipality determines the size of the team. This was observed in larger municipalities, but there is no defined standard for the size of SIM team. São Paulo state defined that there can be two managers in municipalities with over 500 thousand inhabitants, being mandatory to be one for SIM and one for Sinasc, but it did not signal anything about the team structure.[27] In this present study, we verified an average of 1.87 individuals working with SIM per municipality, which is above the number verified in a 2010 study (1.58);[13] this shows the greater involvement of municipal teams with the system.

Technological development contributed to the increase of health data production. At the same time, it brought one more variable to be considered: the update of information technology. Any system demands a minimal structure to achieve its objectives; in the case of SIM, the Ministry of Health has some recommendations related to the operation capacity of the computers that can load the system, the number of devices versus the volume of events, the operating system, internet access and technical support. This survey showed that the number of computers increased as the population size and the number of deaths recorded increased, which is similar to municipalities from Rio Grande do Sul[5] and Minas Gerais.[17] Nowadays, technology evolves very fast; however, in this study only 14 municipalities used an up-to-date operating system. The most obsolete system (Windows XP) found in this study was present in smaller municipalities and suggest that they face financial restrictions concerning the updating of their electronic devices.

Data referral to state and federal levels is periodically monitored, and is related to financial transfers for actions of health surveillance.[28] The access to internet in the country is getting increasingly easier. More than two thirds of small-sized São Paulo State municipalities had fast-access internet; however, more than one fifth reported using radio access and a small amount still used dialed access. In a study conducted in 2004, in municipalities from Rio Grande do Sul State with less than 10 thousand inhabitants, 52.0% had dialed internet access and 19.0% had fast-access internet.[5] Ten

years later, São Paulo State municipalities presented higher proportion of fast-access internet, which proves the technological evolution that occurred over the period; however, the radio access followed the same pattern identified in the municipalities from Rio Grande do Sul.[5] The demand for fast-access internet to send data or for updated versions of systems will become increasingly higher. However, Brazil has an uneven development pattern among its regions, and many municipalities do not even have fast internet services – which is mostly concentrated in larger municipalities –;[29] 77% of Brazilian municipalities have less than 25 thousand inhabitants[8] and several are not digitally included,[29] which imposes important challenges for the areas of telecommunication and Health.

As this was a descriptive study, its results reflect the moment when the survey was conducted. Since the questionnaires were self-applied, some words and terms used by researchers may not have been understood by respondents, which would represent a limitation for the research. Among the variables studied, information on the academic degree of the technical manager may present bias, because 26.5% of respondents did not answer this question.

SIM helps calculating important municipal indicators which are settled with the state. The decentralization to municipalities enabled the immediate access to information on mortality and allowed managers to quantify and qualify the distribution of the health problems that affect the population. This can subsidize actions with the aim of improving living conditions and health management models. However, we still have problems in the quality of information with regional differences,[15,30] partly due to the uneven availability of technological resources, and qualification of human resources who work in the production of information in municipalities.[16-18]

The knowledge obtained in researches aimed at analyzing HIS implementation may contribute to the identification of problems related to its organizations and functioning, besides supporting decisions directed to its improvement and consolidation.[1,9,17,18] The results presented here allow managers to identify different realities of municipal administration, enabling a more directed action planning, capable of covering different types of physical investments, qualification and training for operating and managing the Mortality Information System. They also show the importance of keeping professionals in the area, considering the specifications that the working processes with health information systems demand.

Authors' Contributions

Minto CM contributed to the conception of the study, data collection and analysis. Silva ZP contributed to the conception of the study and data analysis. Alencar GP e Almeida MF contributed to the data analysis. All the authors contributed to drafting preliminary versions, approved the final version of the article and declared to be responsible for all aspects of the study, ensuring its accuracy and integrity.

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