

Ana Cristina Vidor
Paul Douglas Fisher
Ronaldo Bordin

Use of health information systems in small municipalities in Southern Brazil

ABSTRACT

OBJECTIVE: To describe the use of health information systems in towns with fewer than 10,000 inhabitants.

METHODS: Study conducted in the state of Rio de Grande do Sul, Southern Brazil, between 2003 and 2004. A self-administered questionnaire was sent to municipal managers, containing 11 single-choice questions, three multiple-choice questions and three open questions on the structure available, use of information, indicators valued and satisfaction with the systems. The questionnaire was answered by managers in 127 of the municipalities in this state with fewer than 10,000 inhabitants (37.7%). The responses were tabulated in an electronic spreadsheet and the differences between respondent and non-respondent municipalities were evaluated using the chi-square test, taking the significance level to be $p < 0.05$.

RESULTS: All the municipalities had computers available (mean of three per municipality) and 94% had internet access. The personnel responsible for information system inputs and analysis were public employees (59%) who also performed other tasks. The systems most used related to budget control and transfer of funds. Data analysis and generation of information used in local planning was carried out in 59.1% of the municipalities. The indicators cited as important for local planning were the same ones used in arrangements agreed with the state, but there was difficulty in understanding the terms "indicators" and "statistical data". Only 4.7% were fully satisfied with the information obtained from the health information systems.

CONCLUSIONS: Two realities coexisted: municipalities that perceived that inputs to health information systems were a task to be complied with because of orders from central levels, in contrast with municipalities that saw the potential for these systems but had difficulty in using them.

DESCRIPTORS: Information Systems, utilization. Small-Area Analysis. Health Manager. Health Management.

INTRODUCTION

The Brazilian Constitution of 1988 conferred political-administrative autonomy on municipalities and the Basic Operational Regulations of the Brazilian National Health System (Sistema Único de Saúde; SUS) of 1996 (NOB/SUS 01/96) increased municipalities' responsibilities, such that they took on a decisive role in healthcare actions within their own territories.³ Fulfillment of this new role increased the need to produce reliable information that was available within deadlines, in order to support the work of technicians and managers.

Programa de Pós-Graduação em
Epidemiologia. Faculdade de Medicina.
Universidade Federal do Rio Grande do Sul.
Porto Alegre, RS, Brasil

Correspondence:

Ana Cristina Vidor
R. 23 de Março, 134 Itaguaçu
88085-440 Florianópolis, SC, Brasil
E-mail: vidoranacris@yahoo.com.br

Received: 6/30/2009
Approved: 6/27/2010

Most of the federal health information systems, that potentially would assist in this process, was conceived prior to the implementation of SUS. Their designs, objectives and targets revolved around a different policy setup, in which the federal or state government would generally produce and use the health information to diagnose the municipal situation. Thus, municipalities have faced difficulties in developing their technical capacities and have preferred to take on the role of data gatherers, which has led them to underuse the information systems. Several initiatives aimed at adapted the health information systems to the new needs have been undertaken, but the diversity of Brazilian municipalities implies that there are different possibilities for implementing health policies.⁴ Smaller municipalities have greater difficulty with regard to management capacity.¹ They may have additional difficulties in allocating material and human resources for work using health information systems. They are also perhaps the entities that receive least benefit through these systems, which do not allow the information to be broken down to municipal level very much. Nonetheless, the investment in inputs for the health information systems is high, given that it depends on taking healthcare team professionals away from the tasks of attending to the population's health.⁵ According to Lima (2004),⁶ the equivalent of around 25% of the hours worked and consequently 25% of the financial investment applied to the teams at primary healthcare units is used only in the process of information consolidation. However, the conceptual or geographical incompatibilities between the different databases,⁸ the discrepancy between the static nature of the data and the dynamism of the local realities, and the way in which local power operates, among other factors, represent challenges with regard to using this information. Moreover, the task of measuring health levels based on small populations has been neglected in favor of measurements in larger urban spaces,³ which further strengthens the need to decentralize the operation of health information systems and to evaluate their adequacy for small municipalities.

The State of Rio Grande do Sul, Southern Brazil, has made endeavors to decentralize health management. However, among its 496 municipalities, 68% are of small size (with fewer than 10,000 inhabitants). Managerial capacitation in these municipalities is of strategic importance for putting health management decentralization into effect in this State. In this regard, ascertaining how health information systems are used by these municipalities contributes towards comprehending their needs and supporting the use of these systems as a tool for municipal management.

Thus, the present study aimed to describe the use of health information systems in municipalities with less than 10,000 inhabitants and the specific features of their use.

METHODS

A self-administered questionnaire was sent by post to all municipalities in the State of Rio Grande do Sul with fewer than 10,000 inhabitants ($n = 337$) in 2003 and 2004. The questionnaire contained 11 single-choice questions, three multiple-choice questions and three open questions, and always took into consideration the respondent's interpretation. In addition to asking about the health information systems that were most used and the structure available for putting them into operation, the questions sought to identify the process used for transferring data and information between the municipalities and the central levels; the way in which the information generated was used for making managerial healthcare decisions; the health indicators that were most valued; the usefulness of the health information systems in constructing these indicators; and the satisfaction within the municipalities regarding the health information systems.

The responses could be sent by post, fax or an electronic form. To increase the return rate, consecutive contacts were made using the post, electronic means and telephone calls.⁵ A preliminary questionnaire was drawn up based on structured interviews conducted with the personnel responsible for the health information systems at the Health Department of the State of Rio Grande do Sul. Subsequently, this was tested on a sample of health secretaries in municipalities with fewer than 10,000 inhabitants ($n = 64$). The questionnaire was refined and again tested in two pilot studies among health secretaries in municipalities with more than 10,000 inhabitants, in printed format ($n = 6$) and electronic format ($n = 12$), in order to verify that the questions could be understood and that the electronic form was working. The definitive questionnaire was then sent out to all the municipalities with fewer than 10,000 inhabitants (including the previously mentioned 64).

The respondent municipalities were compared with the complete set of municipalities in this State with fewer than 10,000 inhabitants, with regard to size, length of time since founding and geographical distribution, in order to ascertain their representativeness (chi-square test: $p < 0.05$).

The municipalities that did not send back the completed questionnaire within three weeks after the fifth telephone contact were considered to be non-respondents. Among the latter, a random sample of 10%+2 underwent a telephone interview and their responses were compared with those of the respondent municipalities, in order to detect any non-response bias (chi-square test: $p < 0.05$).

Quality control over data entry was done by means of double checking, and the SPSS 10 software was used in the calculations.

The project was approved by the Ethics Committee of the Universidade Federal do Rio Grande do Sul (Process no. 2004260, on April 24, 2004).

RESULTS

Among the 337 municipalities in the State of Rio Grande do Sul with fewer than 10,000 inhabitants, 127 (37.7%) answered the questionnaire. The respondents were representative of the complete set of municipalities in this State with fewer than 10,000 inhabitants, with regard to the length of time since founding, size and region of the State (Table 1).

The responses were mainly sent by post (49.6%) and fax (22.0%), rather than electronically (17.3%).

All the municipalities had at least one computer available for use in relation to health information systems (mean of three computers per municipality), and 94% had an internet connection available (52% via dial-up access, 22% via a wireless access and 19% via an ADSL broadband connection [asymmetric digital subscriber line] or cable). In 51% of the municipalities, there was a local area network system.

The personnel making the inputs to the health information systems were predominantly public employees (59.0%) with training in healthcare and information technology (46.5%) or in health-related fields only (38.6%). The inputs for the health information systems were organized by a team that was also responsible for other tasks in 74.8% of the municipalities. Data analysis, when it took place, was done by the same person or team that had organized the data gathering (65.7%).

The health information systems that received inputs most frequently were not necessarily the ones that were most analyzed (Figure 1). Twenty-four information systems or applications were cited in the "others" category, including the Healthcare Establishment Registration File, the SUS Users Registration and Maintenance application and the Unified Social Program Register.

Most of the municipalities sent data to the regional coordination offices by means of printed forms, especially in the cases of the Mortality Information System (92% of the municipalities), National Notifiable Diseases Information System (88%) and Live Birth Information System (76%). In these cases, the coordination offices had the task of typing the data. Floppy disks and CDs were the second most used means, especially in relation to the Primary Care Management Information System (89% of the municipalities), Outpatient Clinic Information System (86%), Primary Pharmaceutical Care Promotion Information System (78%) and Prenatal Follow-up Information System (72%). The

Table 1. Number of municipalities with fewer than 10,000 inhabitants (337) and number of respondents (127), according to selected variables. State of Rio Grande do Sul, Southern Brazil, 2003-2004.

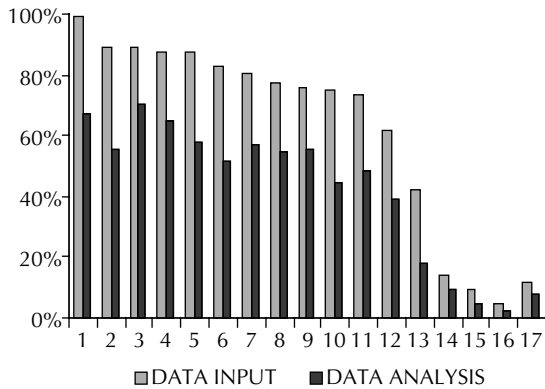
Variable	Municipalities	Respondents		p
	n	n	%	
Total	337	127	37.7	
Population > 5000	111	44	37.6	
Population < 5000	226	83	39.6	>0.6*
Founded > 15 years ago	178	71	39.9	
Founded < 15 years ago	159	56	35.2	>0.5*
Central-western macroregion	18	7	28	
Metropolitan macroregion	43	12	27.9	
Missions macroregion	65	24	36.9	
Northern macroregion	116	45	38.8	
Mountains macroregion	30	19	63.3	
Southern macroregion	13	5	38.5	
Valleys macroregion	45	15	33.3	>0.07*

* Chi-square

internet was the predominant means of transmission only in the cases of the Public Healthcare Budget Information System (76% of the localities) and the Hypertension and Diabetes Registration and Follow-up Information System (60%).

The majority of the municipalities (59.1%) said that data analysis was done locally, thus generating indicators used in healthcare planning and management. In 19.7% of the localities, there was analysis but the data were not used in planning; and in 17.3%, the data were not analyzed. Among the 40 municipalities that gave explanations for the lack of data analysis, the causes cited were: lack of qualifications among the professionals involved with the health information systems (27.5%); the view that the indicators needed would come ready-made from the central levels (27.5%); and the idea that the health information systems would only allow inputs, thus making it difficult to work with the data in a manner appropriate for users (25.0%). Lack of computers was cited by 10.0% of the respondents.

In an open question, the managers were asked to cite which indicators or statistical data were the most important for planning healthcare actions in the municipality. The responses were considered exactly as the



Legend:

- 1-SIA (Outpatient Clinic Information System)
- 2- SINAN (National Notifiable Diseases Information System)
- 3- SIAB (Primary Care Information System)
- 4- SIAIH (Hospitalization Authorization Information System)
- 5- SIS-HIPERDIA (Arterial Hypertension and Diabetes Mellitus Clinical Management Information System for Primary Care)
- 6- SI-PNI (National Immunization Program Information System)
- 7- SIM (Mortality Information System)
- 8- SINASC (Live Birth Information System)
- 9- SIOPS (Public Healthcare Budget Information System)
- 10- SISVAN (Food and Nutrition Surveillance Information System)
- 11- SIS PRÉ-NATAL (Prenatal Follow-up Information System)
- 12- SIFAB (Primary Pharmaceutical Care Promotion Information System)
- 13- SIST (Occupational Health Information System)
- 14- SIGAB (Primary Care Management Information System)
- 15- SIRH-SUS (SUS Human Resources Information System)
- 16- SISMAL (Malaria Information System)
- 17- Others

Figure. Proportions of the municipalities that carried out data input and data analysis regarding health indicators, per system. State of Rio Grande do Sul, Southern Brazil, 2003-2004

respondents' words and synonyms were grouped for analysis (Table 2).

The contributions from the health information systems towards constructing indicators that were considered relevant (Table 3) and the levels of satisfaction with consolidated information distributed from the central levels to the municipalities (Table 4) were also investigated.

Only 29 of the municipalities made comments or suggestions in relation to the health information systems. Many of them stressed the need for qualified personnel, as illustrated by the following:

“There is a need for training for the team in order to analyzed the data that is gathered and input to the systems. It's possible that we have important data in

our hands that isn't being used well for planning the work.”

The need for greater support from the regional coordination offices was also cited:

“(…) there are also not enough technicians at state and regional levels, and they have as much difficulty as we do in sorting out doubts. The professionals need better qualifications so that they can help the municipalities.”

In addition, problems and suggestions relating to the speed of obtaining responses regarding the information were presented:

“It's often just a one-way flow of data, in which we don't get any feedback and knowledge about our work. This is very harmful because if we fail in some action, how are we to know? Delays in getting feedback, when they occur, impair evaluations, decision-making and the team's action plan.”

The dependability of the data was also cited:

“The reality of the present population is different from the IBGE population [Instituto Brasileiro de Geografia e Estatística - Brazilian Institute for Geography and Statistics]. This impairs the targets to be attained.”

Another concern was the particular features of evaluations on indicators in small populations:

“Evaluations on indicators in very small municipalities (1,800 inhabitants) are totally different to those in medium-sized and large municipalities because the data are practically 'subjective'. There are cases in which the analysis is individual. For example, the number of children vaccinated with the third dose of the DTP triple vaccine: if a single child isn't vaccinated, the coverage may go down below 95%.”

Table 2. Indicators cited as having the greatest importance for planning municipal actions, according to frequency of citation. Rio Grande do Sul, Southern Brazil, 2003-2004.

Responses	n	%
Immunization	45	40.5
Health information systems	42	37.8
Child mortality	42	37.8
Prenatal	39	35.1
Diabetes control	36	32.4
Hypertension control	36	32.4
Oral health	28	25.2
Productivity	17	15.3
Hospital admissions (causes)	17	15.3
Sanitary and epidemiological surveillance indicators	14	12.6

Table 3. Distribution of respondents according to evaluation of satisfaction with health indicators. State of Rio Grande do Sul, Southern Brazil, 2003-2004.

Response	%
The needs are fully satisfied	4.9
Almost all the indicators needed are generated through data from the health information systems	34.1
Some of the indicators needed are generated through data from the health information systems	39.8
Very few of the indicators needed are generated through data from the health information systems	19.5
None of the indicators needed are generated through data from the health information systems	1.6

The following illustrates the difficulties in relation to human resources:

“(...) the bureaucracy is enormous and the human resources are not enough to meet all the demands, which ends up overloading the professionals.”

The sample of municipalities classified as non-respondents showed a more unfavorable opinion of the health information systems than did the respondents: 26% stated that there was usually no feedback of information from the central levels (in comparison with 8% of the respondents); 35% generated few or no indicators using the health information system data (versus 20% of the respondents); and 45% cited insufficient qualifications among the professionals involved with the health information systems (versus 27% of the respondents). This sample was too small to allow statistical precision (chi-square test: $p > 0.06$).

DISCUSSION

The results obtained and the heterogeneity of the decentralization process in Rio Grande do Sul make it possible to suppose that two realities existed: municipalities that perceived that inputs to health information systems were a task to be complied with because of orders from central levels, in contrast with municipalities that saw the potential for these systems but had difficulty in using them, thus reinforcing the findings of Moraes (1994).⁷

In a similar manner, Bordignon (1996)² evaluated the use of the Outpatient Clinic Information System in Porto Alegre, Rio Grande do Sul, and observed that using the information generated from this information system did not form part of the institutional culture. Moreover, the few data that were fed back to the local level were not properly applied, since the workers did not always know how to use them.

Table 4. Distribution of respondents according to feedback of information generated from the health indicators. State of Rio Grande do Sul, Southern Brazil, 2003-2004.

Opinion	%
Clear feedback with adequate periodicity for planning healthcare actions	22.1
Clear feedback but with insufficient periodicity for planning healthcare actions	40.2
Feedback with adequate periodicity but confused, thus making it difficult to use	6.6
Feedback in a confused manner, with inadequate periodicity	23.0
Frequently no feedback to the municipality	8.2

In the present study, the measures used to reduce the proportion of non-respondents made it possible to obtain a return level higher than what would be considered satisfactory for the method used, and the respondent municipalities were representative of the study population. Nonetheless, some limitations need to be noted.

If the municipalities that did not respond to the survey were the ones that were more dissatisfied with the health information systems, as suggested by the sample of non-respondents, the use of health information systems may have been overvalued in the results presented. The method used also did not allow deeper investigation into the conditions under which the health information systems were used.

Furthermore, the two pilot studies for constructing the questionnaire did not ensure that the terms used were interpreted in the same way by the interviewees, which may place limitations on some of the conclusions. The present study used the terms “indicators” and “statistical data” as synonyms, as done by Capucci (1999),^a with the aim of making it easier to understand the statements and achieve more reliable responses, considering that “statistical data” is a term with a broader connotation and is used more commonly than “indicators”. Many respondents cited vague terms like “alcoholism”, “oncology” or “disease control” as the most important indicators for healthcare planning in their municipalities, and 42% of them cited the health information systems themselves as indicators. This result shows lack of familiarity with the terms “indicators” and “statistical data”, even though no comprehension problem was identified during the pilot study. However, the pilot study was conducted in municipalities with larger populations.

Lack of computers was indicated as a problem for using health information systems by only 10% of the respondents. This result differed from the findings of Capucci (1999)^a and shows that it may have become

^a Capucci PF. Uso de indicadores em sistemas locais de saúde: um estudo sobre municípios entre 100 mil e 300 mil habitantes no Estado de São Paulo [master's dissertation]. São Paulo: Fundação Getúlio Vargas, Escola de Administração de Empresas de São Paulo; 1999.

easier to access information technology supplies. In turn, internet access was well distributed but fragile, with predominance of dial-up access.

Concern regarding training and qualifications for human resources was highlighted, both in the objective question and in the comments. This may represent an important factor in the underuse of health information systems in the small-sized municipalities. The personnel responsible for the health information systems in these localities were mostly public employees and they performed a wide variety of tasks, such that support from the State towards improving these human resources will contribute towards optimizing the use of the health information systems.

The health information systems that received inputs and were analyzed most frequently were those relating to budget control and fund transfers from the central levels. The municipalities studied provided inputs to health information systems in a systematic manner, even though some systems were little used because of the characteristics of the municipalities (such as in the case of the Malaria Information System). Analysis on the data generally took place at a much lower rate than the data input rate. The worst relationships between analysis and input were with regard to the Food and Nutrition Surveillance System (60.0%), National Immunization Program Information System (61.9%) and National Notifiable Diseases Information System (61.9%). These are precisely the systems that were created for decentralized operation, with great potential to contribute towards local epidemiological surveillance. This observation reinforces the idea that complying with routines for receiving funds takes priority, and that the use of information systems in the municipalities is still limited.

Almost all the municipalities had computer and internet availability, but most of them preferred more traditional communication methods for returning the completed questionnaires, such as post or fax. This suggests either that there is resistance to electronic communication or fragility of internet access. These factors contribute towards delays in feeding back information from the central levels to the municipalities. This exchange of information might be speeded up through better equipment in the municipalities and encouragement of their use of electronic means of communication. In addition to eliminating the intermediate stages of typing and data consolidation, this process would increase the reliability

of the data, facilitate its analysis and optimize the use of human resources.

Many of the indicators cited as important in this study were precisely the ones relating to agreements with the State, which should be presented in management reports or be used in evaluating the program of fund transfers to the municipalities. Thus, these indicators may have been cited both because of their great relevance to local planning and because of demands from central levels. According to Moraes (1994),⁷ the different levels of the federation have established a bureaucratized relationship in which the level of greater coverage (federal or state) asks questions and the level of lower coverage (state or municipal) replies. If managers take the view that they need to know only what the State asks them, then their need is determined by the State. In this regard, inputs provided for health information systems may become a technocratic practice, "in which the urgency of procedures and deadlines for data compilation are solely responses to the rigid rules of the bureaucracy and the funding of the system" (Bordignon, 1996).²

The use of health information systems for constructing indicators that the managers valued was low, and fewer than 5% of the municipal departments were fully satisfied regarding the information furnished by the health information systems. The difficulty in accessing the information that was fed back from the central levels and the difficulty in understanding this information confirm that a considerable proportion of the managers were not benefiting from the health information systems. In this regard, there is a lack of analysis on the fit between the information demanded by health system managers and the data supplied by the health information systems, as identified previously by Moraes (1994).⁷

In addition to adaptation of the health information systems to the needs of small-sized municipalities, managers need support in the planning and decision-making process, so that they can determine their requirements and identify the relevant information for supporting their decision-making locally. In this way, managers would be able to take hold of the entire process. Furthermore, the regional healthcare coordination offices in the State have a strategic position in relation to organizing health-care management in the State, and for this reason, they deserve special evaluation and qualification, so that they can carry out their technical support role of providing assistance towards organizing the municipalities administratively, in the best manner possible.

REFERENCES

1. Arretche M, Marques E. Municipalização da saúde no Brasil: diferenças regionais, poder do voto e estratégias de governo. *Cienc Saude Coletiva*. 2002;7(3):455-79. DOI:10.1590/S1413-81232002000300006.
2. Bordignon MO. Informação em saúde: potencialização e sentido. In: Bordin R, et al, organizadores. Práticas de gestão em saúde: em busca da qualidade. Porto Alegre: Dacasa; 1996. p. 29.
3. Branco MAF. Sistemas de informação em saúde no nível local. *Cad Saude Publica*. 1996;12(2):267-70. DOI: 10.1590/S0102-311X1996000200016
4. Cohn A, Westphal MF, Elias PE. Data and the process of formulating health policies. *Rev Saude Publica*. 2005;39(1):114-21. DOI: 10.1590/S0034-89102005000100015
5. Edwards P, Roberts I, Clarke M, DiGiuseppi C, Prata S, Wentz R, et al. Increasing response rates to postal questionnaires: systematic review. *BMJ*. 2002;324(7347):1183.
6. Lima MV. A informática médica na atenção primária. In: Duncan B, Schmidt BB, Giugliani E, organizadores. Medicina ambulatorial: condutas de atenção primária baseadas em evidências. 3. ed. Porto Alegre: Artmed, 2004; p.107-14.
7. Moraes IHS. Informações em saúde: da prática fragmentada ao exercício da cidadania. São Paulo: Hucitec; 1994.
8. Silva AS, Laprega MR. Avaliação crítica do Sistema de Informação da Atenção Básica (SIAB) e de sua implantação na região de Ribeirão Preto, São Paulo, Brasil. *Cad Saude Publica*. 2005;21(6):1821-8. DOI:10.1590/S0102-311X2005000600031

Article based on the master's dissertation of Vidor AC, presented to the Programa de Pós-Graduação em Epidemiologia da Faculdade de Medicina da Universidade Federal do Rio Grande do Sul, in 2004.

Work presented at 9th International Congress of Medical Librarianship and 70^o Congresso Regional de Informação em Ciências da Saúde, in Salvador, Southeastern Brazil, 9/21/2005.

The authors declare that there are no conflicts of interest.