

Integrating surveillance data on water-related diseases and drinking-water quality; action-research in a Brazilian municipality

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ABSTRACT

The Brazilian Ministry of Health proposed a research study involving municipal professional staff conducting both epidemiological and water quality surveillance to facilitate the integration of the data which they collected. It aimed to improve the intersectoral collaboration and health promotion activities in the municipalities, especially regarding drinking-water quality. We then conducted a study using the action-research approach. At its evaluation phase, a technique which we called 'the tree analogy' was applied in order to identify both possibilities and challenges related to the proposed interlinkage. Results showed that integrating the two data collection systems cannot be attained without prior institutional adjustments. It suggests therefore the necessity to unravel issues that go beyond the selection and the interrelation of indicators and compatibility of software, to include political, administrative and personal matters. The evaluation process led those involved to re-think their practice by sharing experiences encountered in everyday practice, and formulating constructive criticisms. All this inevitably unleashes a process of empowerment. From this perspective, we have certainly gathered some fruit from the Tree, but not necessarily the most visible.

Key words | Brazil, data integration, intersectoral collaboration, qualitative research, surveillance, water quality

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INTRODUCTION

There is growing recognition of the need to integrate the information systems of individual sectors (Boerma & Stansfield 2007) – or to make them 'interoperable'. Interoperable routine information systems are necessary for programmes to be able to share information and for governments to have a complete picture of the coverage of interventions being implemented (singly or as part of an integrated service package); regardless of the sector or reporting stream from which that intervention originated (Atun *et al.* 2010). It is necessary to develop integrated electronic systems. Beyond that, but based on what happens in the health sector, Reynolds & Sutherland (2013) point out that the integration is dependent on the functionality and skilled interlinking of

all health system elements, which can be time consuming and costly (Suter *et al.* 2009). The use of systems and collaboration across disciplines and departments is often advocated as means to handle complex issues, such as drinking-water quality. However the literature offers little guidance on how to apply them in practice.

Intersectoral collaboration in the context of the health-sanitation interface

Environmental, sanitary and epidemiological surveillance are conducted by professionals trained in different disciplines and working in different departments, sectors and

organizations. Integration of the data therefore requires intersectoral collaboration between them. This still remains an operational and institutional challenge in many local contexts, especially in Brazil where, for many professionals, knowledge of other disciplines is still seen as deviant (Besse-laar & Heimeriks 2001).

Intersectoral collaboration involves a relationship among different sectors that have cross-cutting issues; and it depends on mobilization and cooperation of a range of actors to achieve a common objective or solution to a given problem (Van Herten *et al.* 2001; Wimmer & Figueiredo 2006). It usually involves a network of actors and/or alliances and the establishment of partnerships between professionals and technicians, politicians, community, non-governmental organizations (NGOs) and private groups at different levels of communication and contexts (Davies & Macdonald 1998; Axelsson & Bihare-Axelsson 2006; Magalhães & Bodstein 2009). Although it has been much discussed as a mechanism to promote changes in action-planning and decision-making (Holveck *et al.* 2007; Kemm 2008), its actual implementation is less often mentioned; especially with regards to the health-sanitation interface. According to Stead (2008), intersectoral collaboration rarely occurs naturally, and therefore requires intervention, with specially designed tools to bring it about.

In 2008, the Brazilian Ministry of Health proposed a research study, involving the professional staff related to both epidemiological surveillance and the drinking-water quality monitoring programme, known as *Vigiagua*. It aimed to develop technical tools for use at the municipal level. *Vigiagua* was to contribute with information about the potential hazards from shortcomings in water quality, while the epidemiological surveillance system would provide morbidity and mortality data. In its scope, the Brazilian Ministry of Health proposal aimed to improve the intersectoral collaboration and health promotion activities in the municipalities. The technical tools included mainly maps and software designated to facilitate the integration of the data collected by both these health-related surveillance services.

We selected nine municipalities on the advice of the Health Department of the State of Minas Gerais, Brazil, which met the following selection criteria: water quality surveillance and an active programme of epidemiological surveillance and Family Health Programme (FHP)

established. The FHP aims to broaden access to public health services, especially in deprived areas, by offering free, community-based health care (Rasella *et al.* 2013). By 2011, it had reached 94% of municipalities, covering 53% of the Brazilian population. It actively monitors population health through surveys which also include living conditions and water-related diseases. Meetings were held with municipal health directors and health surveillance coordinators to present the research project and to explain the study design. Three out of the original nine municipalities turned out not to have implemented the Family Health Strategy, two were found to lack a properly organized epidemiological or water quality surveillance service, and a sixth declined to participate. We then worked with the three remaining municipalities of different population sizes (approximately 15,000, 70,000 and 600,000 inhabitants). Field work was conducted between August 2008 and June 2011.

This paper aims to throw light on the process of data integration, based on the experience of one of the municipalities in which we worked, the one with intermediate population size. The evaluation process in that municipality differed from those used in the other two. The data from the largest municipality have been presented elsewhere (Queiroz *et al.* 2012).

METHODS

Action-research

To perform the study we chose the action-research approach as it would allow joint identification – by participants and researchers – of problems and solutions regarding data integration and intersectoral collaboration in service practice. Lewin (1946/1948) describes it as a spiralling process in which we combine cycles of action planning, action implementation and discovery of new issues and problems. This methodology also enables a broad and clear interaction between the research team and those individuals effectively involved in the research. We chose it mainly for its flexibility, allowing occasional evaluation, readjustment and interventions during the process. The action-research is usually divided into four phases, namely: exploratory, planning, action and evaluation (Thiollent 2011).

In the study, the 'exploratory phase' was the initial contact by the research team with the situation in the selected municipalities, in order to observe the functioning of *Vigiagua* and the epidemiological surveillance system, as well as other related departments and sectors. Semi-structured interviews were used to investigate aspects such as data generation, the work of the staff of the two key departments, interdepartmental relations and the communication channels between them. We interviewed the head of the municipal health department, coordinators and technical staff involved in environmental and epidemiological surveillance. They included men and women with from 5 to 30 years of service and educational levels ranging from vocational training to postgraduate qualifications. Free and informed consent of the participants or their legal representatives was obtained and the study protocol was approved by the Research Ethics Committee of the Federal University of Minas Gerais, Protocol #431, from 14 October 2008, and every participant read and signed a declaration of informed consent.

Once the interview responses had been analysed, the 'planning phase' of the study began. The participating municipal staff were invited to a seminar, which lasted 3 hours on average. The results from the 'exploratory phase' were presented, followed by a discussion on the strategies and instruments which could facilitate the integration of data and intersectoral collaboration in their municipality. We also assessed the participants' motivation to work in a multidisciplinary/collaborative way and, no less important, we obtained their commitments to action. The participants drew up plans of action which included objectives and the strategies to attain them. These plans also stated which departments and sectors were responsible for each action and the deadlines for their implementation.

The actions to which the participants made commitments in the 'planning phase' were for implementation in the 'action phase' of the study. This lasted 18 months, during which the research team, according to plan, avoided excessive involvement in the work, making only nine visits to the field. On each of these visits, we encouraged discussion of the objectives agreed in the 'planning phase', and their pursuit in the current 'action phase'. This helped the participants to identify weaknesses and reconsider strategies and practice, and if necessary to adapt them.

During the 'action phase', it became clear to us that the goal of integrating the two data collection systems could not be attained without prior institutional adjustments. Once the main objective was not attained, identifying and understanding the factors that may have contributed to it became a new goal to the research team, which was assessed in the 'final evaluation'. This closure phase lasted until 26 months after our initial arrival in the field and is described below.

The action-research closure using the 'tree analogy'

The final evaluation plan envisaged a forum for discussion and reflection in the municipal administration, in which critical analysis of the integration process could be promoted. We developed a technique which we called 'tree analogy'. By means of analogy with parts of a tree, such as the roots, the trunk and the fruit, the participants discussed the principal issues that emerged from trying to combine data on drinking-water quality collected by *Vigiagua*, with data on morbidity and mortality due to specific causes, collected by the epidemiological surveillance system. Since the goals agreed in the planning phase of the action-research had not been achieved, we chose to reduce tension among the participants and to avoid the feeling of being judged and evaluated negatively, by evaluating the integration process in a playful and relaxed way.

We presented a poster with a time line that started from the initial meeting and the municipality's agreement to participate in the research project, and also included each subsequent meeting and technical visit carried out to date. The aim was to remind the participants of the process of strategy development, of the partnerships developed, of the advances made (and setbacks), and of other activities carried out. This was followed by a brief explanation of the analogy between a tree and the collaborative programme which everyone was trying to plant and to grow. Another poster showing drawings of a tree, a packet of fertiliser and a set of pruning shears was used as a visual aid. It aimed to make the ideas more concrete, and to motivate the participation of the staff, not only expressing their opinions on the questions discussed, but also registering them by writing on the drawings.

The workshop was recorded on video, to facilitate the analysis of the results. This enabled us to review the video

footage several times, alerting us to glances, sighs, gestures, individual performances, participation and commitment, which otherwise might never have been noticed. Notes made during the evaluation workshop and notations made by the participants on the tree poster were complementary to the other results. In addition to the 4-hour workshop with six participants, further data were collected by a questionnaire with 13 questions, on the same themes as those discussed in the workshop. We considered the action taken alone and collectively by stakeholders in the different departments involved, and the communication channels and collaboration strategies they used. We also evaluated the action-research method. The participants, and other staff who were directly involved in the integration project but who were unable, for one reason or another, to participate, were all invited to complete the questionnaire, which was distributed in hard copy and also via e-mail. Thirteen completed questionnaires were received.

Data analysis

The data analysed for this paper consisted of notes taken and video footage recorded during the evaluation workshop. The questionnaire responses and other data collected and stored during the 26 months of action-research taken in the municipality enabled us to compare speech and reality, and to collate information from different sources. The pre-analysis stage involved choosing and organizing these materials. The exploratory stage was based on reading and studying it, trying to find patterns and divergences on the answers and notations made by the participants of the action-research. This was followed by the analytic stage, consisting of data analysis and interpretation. Our findings are described below.

RESULTS

The first topic for evaluation related to the participation of professional staff in the development of strategies and procedures for the integration of data. We sought to identify those who 'sustained' the integration process, and who thus could be said to represent the 'roots' of the tree. The participants stated that the Departments of Environmental

Health Surveillance, Health Education and Epidemiological Surveillance made up the roots of the integration project, noting that they were present throughout the 3 years of strategy development and were essential to implementation of the process. They also mentioned individual staff and even members of the research team, underlining the roles of individuals, and their personal commitment as a key element in the establishment of such a programme or policy in the municipality. It was noticeable that those people mentioned had been active in the search for new partnerships and communication channels, even when the culture of the organization impeded such connections.

We then asked the participants to list those partners who became involved in the course of the project, and whose relationship with the epidemiological surveillance system, and principally with the *Vigiagua* programme, made the integration proposal sustainable, representing the 'trunk' of the tree. They mentioned the municipal departments of Environmental Health, Health Education, Primary Health Care and the Environment sector, in addition to the State Department of Environmental Health Surveillance under the State Secretary for Health of Minas Gerais. It was clear that these stakeholders played a fundamental role in the process, collecting the raw data and also planning and implementing remedial measures when drinking-water quality is not up to the standard. They also mentioned the water supply utility, municipal managers and the population as essential partners, but conceded that they were not yet ready to act in an intersectoral way.

Alluding to 'fertiliser' in the tree analogy, the participants discussed strategies and procedures to integrate surveillance and achieve intersectoral collaboration. They highlighted the action planning and principally the adoption of other measures to ensure reliable data. Other elements mentioned as contributing to 'fertilise the soil' and so supporting the concept included: recognition of the value of the work by the municipality, continued training for the workers, community participation, social accountability, motivation and political support. Personal commitment was mentioned as an important determinant of success, giving a preponderant role to a personal factor in the professional dimension. Among the strategies described as essential for the continuity of intersectoral collaboration, the participants considered inter-organizational communication the most important of all,

although it is not yet formally incorporated into professional practice. However, they gave no indication of how this communication could be established, or who would be responsible for its implementation.

The group suggested that 'pruning' represented those actors who constrained the work which they had planned and envisaged. We explained that pruning did not represent only the negative aspects of poor coordination. They made possible a better understanding of the subtleties of the integration process and hence led participants to seek new strategies and tactics to overcome the challenges. Factors with a negative effect on integration included the reluctance of the coordinator of epidemiological surveillance to work collaboratively with other departments. His absence from the end-of-project evaluation workshop and his failure to complete the evaluation questionnaire reinforced the group's perception. His negative attitude was also shown in informal conversations with the research team. Municipal bureaucracy and the tendency of some managers to limit the autonomy of professional staff were also mentioned as constraints. The excessive workload (personal and institutional) and the lack of time to plan were seen as favouring the 'fire brigade' approach; usually the departments responded to emergencies rather than taking systematic pre-emptive steps. Among the possible explanations for the absence of action-planning, the group pointed out: lack of awareness by epidemiological surveillance professional staff of the benefits of sharing data with other departments; lack of resources needed to carry out the collection of water quality surveillance data, such as a vehicle, geographic information system (GIS) equipment, and a budget severely limiting the number of water samples for quality examination. Some difficulties were in fact based on administrative issues, but often manifested themselves as a lack of reliable data to work with.

Lastly, the 'fruit' represented the targets agreed by the staff in the course of the seminars and workshops organized along our 3 years of working with the municipality. We divided them into ripe and unripe fruit, with the former representing targets which were considered to have been met. The unripe represented the targets not yet attained, because of a lack of 'fertiliser', the recurrent pruning and the slow process of ripening of fruit and development of seeds. Some of the fruit gathered were: a greater depth of knowledge of the work performed by the departments

involved, principally Water Quality Surveillance, Epidemiological Surveillance and Health Education. They also included the opportunity to interact with different departments and sectors and the exchange of experiences arising from it. Associated with that, there has been increased awareness of the need to improve the collaboration among staff working on health, principally primary health care. An increased appreciation of the work done by Vigiagua, by their municipal partners and by the population was also highlighted by the group as a fruit collected during the work, as well as the development of partnerships which previously did not exist in the municipal institutions. An additional benefit was the accumulation of experiences to improve their work. Some unripe fruits, which could not be collected during the research, were also identified: the need to apprise the municipal manager of the importance of Vigiagua's work, the importance of generating and sharing data, using maps where possible, and the value of institutional incentives for coordinated action between departments and sectors.

DISCUSSION

While this paper is based upon just one municipality, we suspect that what we found there is similar to conditions in other Brazilian settings and in many other countries. The results of the action-research implemented in the larger and the smaller municipality of the study, for instance, showed some convergence with those found in the medium sized one, despite the different evaluation methods used. Our findings show the need for a change of organizational culture, requiring professionals to imbue their work with a new significance. Personal commitment, the value set on one's work and continuing professional training and development proved to be important when intersectoral collaboration is pursued. Interpersonal relations, community participation and social accountability may also have some influence when a goal is to integrate data and actions.

The establishment of channels for inter-organizational communication has also proved important. For this to occur, some reorientation of the prevailing political agenda is required. [De Jong & Jackson \(2001\)](#) suggest integration strategies focussed on communication and access,

culture, values and teamwork. [Queiroz *et al.* \(2012\)](#) suggest the creation of opportunities for discussion, such as seminars and interdepartmental meetings, to facilitate the development of partnerships between professionals and the sharing of information about the field on which they work and about indicators and other useful instruments. [Rivera & Artmann \(2010\)](#) maintain that 'imminent dialogue' through effective channels, and 'communication flows' can assist the search for understanding and mutually agreed plans, since action taken is no longer the exclusive responsibility of a single department. The establishment of these channels and opportunities for communication can be seen as the democratization of power relations and the re-balancing of asymmetries in decision-making capacity ([Guizard & Cavalcanti 2010](#), p. 1249). It thus seeks to strengthen the roots which will support the trunk, and through it the branches, which in their turn will provide the fruit.

Motivation and political will, as well as the means to carry out the work also need to be addressed in order to integrate data and to drive intersectoral initiatives. Lack of resources to carry out the collection of water quality surveillance data and a budget severely limiting the number of water samples for laboratory examination are some examples of how municipal water quality monitoring needs to move forward. A seven-country study ([Rahman *et al.* 2011](#)) showed that, even where institutional responsibility for surveillance is well established, surveillance agencies are commonly constrained by limited funding and human resources. The reporting of cases of disease by the Epidemiological Surveillance Service also needs to be considered and recognized as important.

CONCLUSIONS

The management of complex issues such as drinking-water quality and health requires the joint action of different sectors and involves several areas of knowledge. Our study responded to the wish of the Brazilian Government to integrate the data generated by different surveillance systems. However, its central finding is the degree of exposure of the professionals who serve the municipality.

Interconnection, integration, interdisciplinarity and intersectoral collaboration require a look at oneself before

one engages the other. We found that the municipal departments do not yet have sufficient capacity – not only in technology and equipment, but also in staff training and institutional sustainability – to generate data with which one can work. They and the stimuli which motivate them are too weak, though even so they are looking for alternative ways to act. When a group has difficulty taking a new position in relation to reality, that difficulty may arise from recurrent constraints in the work, such as political and organizational obstacles to new strategies or the exercise of power. Those obstacles can arise when the organization is overloaded with activities but lacks systematic planning and effective interdepartmental communication. This leads to any set of activities being confined to a single 'department responsible'.

When joint action is the goal, it is necessary to understand the context in which one acts, and to recognize the importance of the work of each individual while bearing in mind the potential partnerships which are essential to the strategy. Knowledge is power, so that information can confer power. If the departments can collaborate successfully, the data they collect will accumulate into a formidable base, which will empower them to collect new data and point to new initiatives. This could lead to a virtuous cycle involving other partners, sectors, data and so on. In a normal world, the stimulus for this process would begin with management. However, our experience suggests that before this happens there is a long way to go.

On the other hand, despite the fact that the goal of integrating data and actions was not fully attained, the evaluation process led those involved to re-think their practice by sharing reflections, discussions and experiences encountered in everyday practice, and formulating constructive criticisms. All this inevitably unleashes a process of empowerment. From this perspective, we have certainly gathered some fruit, but not necessarily the most visible.

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