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REVIEW ARTICLE

EVALUATION OF THE VIGIDESASTRES PROGRAM IN FIVE MUNICIPALITIES IN THE RIO DE JANEIRO METROPOLITAN REGION

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ABSTRACT

This study examines the Vigidesastres program, which carries out environmental health surveillance in the state of Rio de Janeiro, Brazil, focusing on the region formed by the municipalities of Nova Iguaçu, Belford Roxo, Nilópolis, Mesquita and São João de Meriti. This region, also known as Baixada Fluminense, besides being located in a lowlands area that is prone to flooding, also has precarious basic sanitation infrastructure, factors that can lead to disasters. Interviews were conducted with the managers of the program to obtain data on the situation of each municipality studied. This information is analyzed and discussed from the standpoints of organizational capacity, structure and techniques of environmental health surveillance of each municipality (identified with letters "A" through "E" to preserve the respondents' anonymity). The results indicate that, in terms of management capacity of the Vigidesastres program, municipality B has the best general conditions, while E has the worst.

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INTRODUCTION

Brazil has a history of extreme hydrological events that cause frequent disasters, generally aggravated by absent or substandard sanitation works, inadequate land use and occupation and fragmented civil defense actions (Araújo et al., 2010). The Baixada Fluminense is a lowland region of the state of Rio de Janeiro, with a population of more than 4 million, and stands out for its precarious basic sanitation services, reflected in low socioenvironmental indicators, with often inadequate and/or incomplete sewage treatment, trash collection and water supply services (Datusus et al., 2012). This region also suffers from problems due to its geography, surrounding the western part of Guanabara Bay, perhaps the state's most critical region in terms of flooding (Araújo, 2010). Nearly all the territory of the municipalities of Baixada Fluminense is composed of low-lying plains that are prone to periodic disastrous flood events. This geographic situation places a heavy burden on civil

defense units and the other institutions involved in programming and executing actions to prevent or minimize the impacts of disasters and provide emergency response when they occur (Marcelino et al., 2006). Among the response actions to floods is fast and efficient provision of public health services, to avoid outbreaks of communicable diseases and relieve the suffering of victims. This creates a need for public and private health institutions that are prepared to act and have the necessary human and material resources to respond efficiently to any adversity. The "National Program for Environmental Health Vigilance of Risks Resulting from Natural Disasters" (Vigidesastres) is a program run by the Ministry of Health. As the name suggests, its mission is to prevent and control risks to human life and health associated with natural disasters (Brasil et al., 2005). The main civil defense problems are flooding in low-lying areas, landslides on hillsides and fires in heavily populated slum areas. The actions of Vigidesastres (VD) are focused on the population at greatest risk, as well as on health professionals and the infrastructure of health services available to render assistance during disasters. The program is a response to the importance of integrated and

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systematic planning of actions in the realm of public health to respond to natural disasters. The aim of this study is to assess the performance of the Vigidesastres program as put into action by the local environmental health surveillance agencies (VSAs) of the municipalities of Nova Iguaçu, Belford Roxo, Nilópolis, Mesquita and São João de Meriti, making up the Baixada Fluminense region, located in the Rio de Janeiro metropolitan region.

### Experimental Section

We initially gathered primary data from the online application of a structured questionnaire containing 20 open-ended questions, whose responses (indicators) were classified as satisfactory (1) or unsatisfactory (0). The questions were formulated to elicit an evaluation of the conditions of implementation and execution of the Vigidesastres program, as well as the level of knowledge and perception about the concepts of civil defense, with focus on public health actions. Then we carried out in-person interviews, in April and May 2012, with the persons in charge of managing the program in each VSA of the municipalities considered in the study. To preserve the anonymity of the respondents, the municipalities are identified by letters (A to E). We established five dimensions for assessment of the program, to facilitate comparative analysis in terms of indicators. The dimensions used were: 1) Human Capital; 2) Material Resources and Infrastructure; 3) Information System and Technology; 4) Normative and Legal Resources; and 5) Intersectorial and Interinstitutional Relations.

The assessment of the Human Capital dimension was divided into seven dichotomic indicators, related to:

- VSA training course;
- VD training course;
- College training and experience of the head of the VSA;
- Knowledge of the concept of disaster;
- Knowledge of the concept of vulnerability;
- Knowledge of the objective of the VD; and
- Knowledge of the types of actions included in the VD.

The evaluation of the “Material Resources and Infrastructure” dimension was composed of indicators based on technical/informative literature on the VD; computers with Internet access and vehicles. The “Information System and Technology” dimension was assessed based on two indicators: use of information systems and knowledge about the Center for Strategic Information and Responses in Health Vigilance (CIEVS). The “Normative and Legal Resources” was composed of four indicators, on the existence of a health risk map; VSA contingency plan; municipal sanitation code; and municipal master plan. Finally, the “Intersectorial and Interinstitutional Relations” dimension was composed of the following indicators, on the existence of civil defense actions to implement the VD; civil defense actions in general; epidemiology monitoring actions and an emergency operations committee.

### Quantitative Analysis of the Data

To quantitatively assess the conditions for implementation of the VD program in the municipalities studied, we classified the

indicators dichotomously, as “satisfactory” (score of 1) or “unsatisfactory” (score of 0), based on the responses by the managers of the program in each municipality. The questionnaire contained 20 questions, with the following breakdown by dimension; 7 regarding Human Capital, 3 on Material Resources and Infrastructure, 2 on Information System and Technology, 4 involving Normative and Legal Resources and 4 on Intersectorial and Interinstitutional Relations.

From the binary indicators, we calculated the percentage of indicators considered satisfactory for each of the five assessment dimensions. Therefore, each municipality received a percentage of satisfactory indicators in dimension D, defined as the ratio between the total number of satisfactory indicators in dimension D and the total number of indicators belonging to dimension D, multiplied by 100. This percentage allows assessing the implementation condition of the VD in the municipality in relation to dimension D. The higher the value, the better the implementation of the program is in that municipality with respect to dimension D.

Additionally, to evaluate the municipalities in all the dimensions proposed, we also calculated the overall average percentage of satisfactory indicators in all the dimensions, defined as the ratio between the sum of the percentages of satisfactory indicators in all dimensions and the total number of dimensions for evaluation of the program, multiplied by 100. This percentage was computed for each municipality by attributing the same weight (degree of importance) to each of the dimensions: the higher the value, the better the overall status of the municipality in implementing and executing the VD program.

Since the five proposed dimensions represent the minimum conditions or resources necessary to implement and execute the VD, it was possible to evaluate and rank the municipalities based on the overall average percentage of the dimensions. In other words, it was possible to establish a relative hierarchy of the municipalities with respect to their general implantation of the VD.

### We now describe the criteria adopted for classification of the indicators:

- Training course in VSA and VG: considered satisfactory when the VSA manager had completed courses given by the Ministry of Health and Rio de Janeiro State Health Secretariat.
- College training and experience of the head of the VSA: considered satisfactory when the manager had a college degree and previous experience in working for a VSA.
- Knowledge of the disaster concept: classified as satisfactory when the response included damages to health services infrastructure and human resources, and when this affected the capability to provide health services.
- Knowledge of the vulnerability concept: considered satisfactory when the response included specific vulnerabilities to the health sector.

- Knowledge of the objective of the VD: classified as satisfactory when the response included reduction of exposure of the population and health care professionals to the risks of disaster.
- Knowledge of the types of actions included in the VD program: classified as satisfactory when the response included strategic actions and actions to manage risk.
- Informative material: considered satisfactory when the VSA provided informative material on actions in response to disasters caused by hydrological events.
- Computers with Internet access: considered satisfactory when the VSA had at least one computer with Internet access to use in implementing the VD.
- Vehicles: considered satisfactory when the VSA had at least one official vehicle to carry out activities related to VD implementation.
- Use of information systems: considered satisfactory when the respondent reported the use of information systems related to civil defense actions.
- Knowledge about the CIEVS: considered satisfactory when the respondent demonstrated knowledge of this system and how to use it to support implementation of the VD.
- Health risk map and contingency plan: considered satisfactory when the municipality had a health risk map and contingency plan covering health services in risk areas.
- Municipal sanitary code and municipal master plan: considered satisfactory when the respondent demonstrated knowledge of the municipal sanitation code and municipal master plan, and confirmed that the actions by the local VSA were contemplated in these documents.
- Civil defense activities and actions: considered satisfactory when at least one activity was carried out.
- Epidemiological monitoring actions: considered satisfactory when the VSA carried out at least one joint action with another similar entity.
- Emergency operations committee: considered satisfactory when such a committee was officially established.

## RESULTS AND DISCUSSION

The indicators related to Human Capital are reported in Table 1. Four of the managers interviewed had participated in courses related to the area of environmental health surveillance, namely: municipality B – Training Course in Monitoring Water Quality for Human Consumption; municipalities C and D – Course for Operation of the Information System for Monitoring Water Quality for Human Consumption (Sisagua); municipality E – Training Course in Health Surveillance of Populations Exposed to Contaminated Soil (Vigisolo).

the conditions for implementation and execution of the VD program, since such knowledge is fundamental to plan and carry out the activities of the VSA related to the program. The fact that none of the managers had completed any VD training might have influenced their difficulty in defining disasters and listing the types of actions that are proposed for the Vigidesastres program. Regarding professional training, all the respondents were civil servants holding college degrees who had passed public examinations, and had previous experience working for a VSA, as follows: municipality A – environmental engineer; municipality B – business administrator, with experience as an epidemic monitor with the National Health Foundation (FUNASA); municipality C – veterinarian also with training as a public health agent; municipality D – biologist; and municipality E – sanitation engineer, with a master's degree in environmental sciences. With respect to knowledge of the objectives of the VD, the respondents from municipalities B, C and E demonstrated they understood that the program's main objective is to reduce the exposure of the population and health care professionals to risks of disasters and to reduce diseases and associated problems (Brasil *et al.*, 2012). On being questioned about the concept of vulnerability, the respondents from municipalities B, C and E demonstrated they understood the concept applied to the VD (Brasil *et al.*, 2007).

**Table 1. Indicators of Dimension 1 – Human Capital**

Municipality	VSA training course	VD training course	Professional training and experience in VSA	Concept of disasters	Concept of vulnerability	Objective of the VD	Types of actions of the VD	Percentage of satisfactory indicators (%)
A	0	0	1	0	0	0	0	14.3
B	1	0	1	0	1	1	0	57.1
C	1	0	1	0	1	1	0	57.1
D	1	0	1	0	0	0	0	28.6
E	1	0	1	0	1	1	0	57.1

In this dimension, municipalities B, C and E had the highest percentage of satisfactory indicators (57.1%), while municipality A had the lowest percentage (14.3%). It is important to note that public health officials in general sometimes attribute the difficulties in their daily work to the precarious organization of their working processes (Brasil, 2010).

**Table 2. Indicators of Dimension 2 – Material Resources and Infrastructure**

Municipalities	Informative material	Computers	Vehicles	Percentage of satisfactory indicators (%)
A	0	1	1	66.7
B	1	1	1	100
C	0	0	0	0
D	1	1	1	100
E	0	1	0	33.3

All the municipalities were classified as unsatisfactory regarding the indicators "Concept of Disasters" and "Types of VD Action". This can have a direct influence on the quality of

The respondents from municipalities B and D presented instructive and informative materials on VD, but none of these materials contained information aimed at health professionals,

which is a main objective of the VD program. These materials had been prepared and supplied by the Ministry of Health/FUNASA. Municipality C did not present any satisfactory indicator in this dimension, which can impair the work of the staff of its VSA and prevent actions to implement and execute the VD. Also, three municipalities (A, C, E) did not have any material with information on disasters. Municipalities A, B, D and E had computers with Internet access to perform activities, while municipality C did not have computers with Internet access. With respect to the availability of vehicles, the respondents from municipalities A, B and D stated their respective VSAs had vehicles, including related to the Vigidesastres program, while the respondents from municipalities C and E stated otherwise. In this dimension, municipalities B and D attained a 100% rate of satisfactory indicators, indicating that in these municipalities, the VSAs have good infrastructure conditions. Municipalities A and E had satisfactory indicator rates of 33.3% and 66.7%, respectively, while municipality C did not have any satisfactory indicators (0%) in this dimension.

The indicators regarding the Information System and Technology dimension are presented in Table 3.

**Table 3. Indicators of Dimension 3 – Information System and Technology**

Municipalities	Information system of other entities	CIEVS	Percentage of satisfactory indicators (%)
A	1	0	50
B	1	0	50
C	1	0	50
D	0	0	0
E	0	0	0

Municipalities D and E received scores of zero in this dimension because they did not use any type of information system to support decisions regarding the VD program. This situation is worrying, since the use of information technology greatly facilitates public health and civil defense efforts, through the rapid access to and sharing of information, enabling rapid analysis of the situations faced (Lunardi *et al.*, 2010).

The manager of the GSA of municipality A stated he consults information made available by the Rio de Janeiro State Fire Department (CBMERJ), State Environmental Secretariat and State Civil Defense Office. The managers for municipalities B and C indicated they use information from the State Civil Defense Office, but could not explain the way this information could support their actions. Only the respondents from municipalities B and D said they knew about the CIEVS, but they did not use the system to support their actions. None of the municipalities studied use this system. None of the interviewees mentioned sharing of information with other entities directly involved in disaster response, such as the State Environmental Secretariat, State Civil Defense Office, Municipal Civil Defense Office, epidemiological or sanitary surveillance authorities, among others. In this dimension, municipalities A, B and C presented a satisfactory indicator

rate of 50%, while none of the indicators were considered satisfactory for municipalities D and E.

The information regarding the Normative and Legal Resources dimension is presented in Table 4. Mapping of areas subject to risk is one of the most efficient risk assessment instruments. This map serves as the starting point to prepare preventive measures, plans for response to emergency situations and to carry out work together with leaders of communities at risk to promote defense against disasters (Kobiyama *et al.*, 2010). Regarding the existence of health risk maps due to natural disasters or to characterize populations potentially exposed to risks of floods or landslides, the managers interviewed from municipalities A, B, D and E stated they have such maps or had identified such areas. Municipalities A, B and D have contingency plans for natural disasters related to hydrological events. However, none of the managers could state if the municipal sanitary code or master plan contained any definition of responsibilities of the VSA regarding control of risks to human health resulting from natural disasters.

In this dimension, municipalities A, B and D had satisfactory indicator rates of 50%, while municipality E had a rate of 25% and municipality C did not have any satisfactory indicators. The absence of these normative instruments is an indication of the absence of a legal base for actions of the VD program. The information regarding joint actions in civil defense and epidemiology monitoring and also the establishment of an emergency operations committee are shown in Table 5. Intersectorial actions emerge from the need to resolve problems and produce results, even if only partial, that assure mutual benefits to the sectors involved (Feuerwerker *et al.*, 2000). In light of this, it can be inferred that the integrated action between different sectors of a municipality in practice should aim to articulate strategies and share knowledge and propose responses to the human health problems of a community.

The managers from municipalities A, B and D stated they use the structure and knowledge of the Municipal Civil Defense Office to help map the health risk areas. The managers from municipalities C and E did not engage in this type of activity with the civil defense authorities during the implementation and/or execution of the VD. According to the respondents, the VSAs of municipalities A, B and D had already carried out joint activity with the Municipal Civil Defense Office. The VSA of Municipality A had participated in educational and public awareness actions about the emergency alert system together with community leaders. The VSA of municipality B conducted educational actions in schools to spread awareness of risks and learn the vulnerability of populations in risky areas. In municipalities B and D, the VSAs had participated in response actions during floods in 2010 and 2011, supplying information on the risk of waterborne diseases and the use of sodium hypochlorite for treatment of drinking water during the interruption of the public water supply system. Only municipality E did not participate in joint epidemiology monitoring actions. In municipalities A, B and D, the VSAs had assisted with epidemiology monitoring actions in investigations of suspected cases of leptospirosis and other diseases.

**Table 4. Indicators of Dimension 4 – Normative and Legal Resources**

Municipalities	Health risk map	VSA contingency plan	Municipal sanitation code	Municipal master plan	Percentage of satisfactory indicators (%)
A	1	1	0	0	50
B	1	1	0	0	50
C	0	0	0	0	0
D	1	1	0	0	50
E	1	0	0	0	25

**Table 5. Indicators of Dimension 5 – Intersectorial and Interinstitutional Relations**

Municipalities	Civil defense activities	Civil defense actions	Epidemiology monitoring actions	Emergency operations committee	Percentage of satisfactory indicators (%)
A	1	1	1	0	75
B	1	1	1	0	75
C	0	0	1	0	25
D	1	1	1	0	75
E	0	0	0	0	0

With respect to dimension 5, municipalities A, B and D presented the highest satisfactory indicator percentage (75%), while the rate for municipality C was 25% and for municipality E it was 0%. The overall percentages of satisfactory indicators for the set of five dimensions were 51.2% for municipality A, 66.4% for B, 26.4% for C, 50.7% for D and 23.1% for E. Therefore, municipalities B, C and E presented the best technical conditions and municipalities A and D the worst. Overall, the results show a lack of knowledge of the basic concepts for implementing and executing the VD program. This failing was particularly glaring in dimension 1, for which none of the managers received a score on the indicators related to the concept of disasters focused on public health or the specific actions contemplated in the VD program. These unsatisfactory indicators can be related to the fact that none of the managers interviewed had taken a VD training course. Municipalities B and D presented the best infrastructure conditions. For municipality E it was possible to infer that the infrastructure conditions can impede the work of the teams in the process of implementing and executing the VD program. Municipality C did not have any satisfactory indicator in dimension 2, so according to the assessment criteria established in this study, it does not have conditions for VD implementation and execution.

Although none of the managers stated they use the CIEVS system, in municipalities A, B and C there is use of the information systems of other entities, indicating the existence of a routine for use of information tools to support the planning and execution of health programs. Municipalities D and E did not present any satisfactory indicator in dimension 3, demonstrating the poor understanding of the managers regarding the need to use information tools for planning and execution of VD actions. With respect to the dimension "Normative and Legal Resources", municipalities A, B and D were better ranked than municipality E, while municipality C did not have any satisfactory indicators in dimension 4, evidencing its difficulty in implementing and executing the VD program. However, it should be mentioned that none of the managers could state whether the respective municipal

sanitation code and municipal master plan cover the competencies of the VSA in controlling risk factors to human health caused by natural disasters. Both of these legal instruments are important to provide legal support to VD actions. In relation to the VSA contingency plan, although the respondents from municipalities A, B and D stated the existence of this document, they had not yet established an emergency operations committee, something that is essential to prepare and execute this plan. This suggests an inconsistency of information in the indicators of the VSA contingency plan (dimension 4) and the emergency operations committee indicator (dimension 5). Municipalities A, B and D presented the best intersectorial and interinstitutional articulations with civil defense agencies, while municipalities C and E were the worst. However, the VSA managers of all the municipalities stated that the corresponding Municipal Health Secretariat did not have an emergency operations committee, demonstrating the incapacity to implement and execute the VD program effectively. Municipality E did not receive any satisfactory indicator, showing a lack of articulated actions with other civil defense or health authorities.

#### Limitations of the study

The main difficulty faced in this investigation was the shortage of specific studies on the theme of "Vigidesastres" and the nature of the information obtained from the survey of managers from the five municipalities, making it hard to assess the quality of the execution of the program. Furthermore, none of the respondents provided copies of the risk map or contingency plan during the interviews. Given the importance of these instruments, which are fundamental for implementation and execution of the Vigidesastres program, the analysis of these documents could have provided more support and a deeper analysis.

#### Conclusion

Based on our ranking of all the dimensions as being equally important to assess the implementation and execution of the

Vigidesastres program, municipality B has the best overall position, while municipality E has the worst performance. These results can translate into better and worse capability to manage the Vigidesastres program by these two municipalities. In light of the problems faced by the managers, we recommend greater attention be paid to compliance with the shared responsibility at the federal and state level, established in the laws that govern the National Health System (SUS), with respect to training of human resources in health and supplementary financing to enable local authorities to acquire the materials and equipment necessary to carry out their duties. Another need is for all the managers to consult the legal documents and other rules on their actions.

In the case of the Vigidesastres program, it is important for each VSA manager to be thoroughly familiar with the risk map, contingency plan, municipal sanitation code and municipal master plan, as well as a copy of the Vigidesastres program guidelines. Furthermore, the managers should base their actions on the premise that health is a right of all citizens and a duty of the government at all levels, so they must have the proper level of independent authority make decisions in the performance of their functions. Finally, the managers should not lose sight of the need to meet with government representatives to provide technical information and convince them of the importance of the Vigidesastres program. The overall impression we obtained during the study, and mainly during the visits to the municipal VSA offices, was of a lack of basic instruments to support the managers' actions. This was confirmed by the results of the assessment indicators.

We hope this study will provide a starting point for other studies to assess the effectiveness of the Vigidesastres program, with refinement of the evaluation model by incorporating other dimensions and indicators, as well as to expand the investigation to other people involved in its execution.

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