Managing Brazil's Health System at municipal level against Covid-19: a preliminary analysis

Gerenciando o SUS no nível municipal ante a Covid-19: uma análise preliminar

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ABSTRACT This qualitative, observational, and exploratory study was supported by quantitative data to analyze the Brazilian Unified Health System (SUS) response to Covid-19 in three Brazilian municipalities. We used semi-structured interviews to listen to and dialogue with managers of the cities analyzed, guided by a roadmap to explore the managers' perception during the response to the pandemic, understand the motivations that guided their strategic choices, and visualize the weaknesses and potentials of the municipal system in a public health emergency. We conducted a qualitative analysis considering the critical points of the SUS response to the pandemic, including coordination and governance, surveillance and prevention, and the health services network. In the results, we present and discuss the main characteristics of the municipalities, the 2020 pandemic course, the response actions adopted, and submit an analysis of the response pattern of municipal SUS managers in the pandemic.

KEYWORDS Public health systems research. Covid-19. Universal access to health care services. Delivery of health care.

RESUMO *Este é um estudo observacional, exploratório, que utilizou metodologia qualitativa, com apoio de dados quantitativos, para analisar a resposta do Sistema Único de Saúde (SUS) à Covid-19 em três municípios brasileiros. Utilizaram-se entrevistas semiestruturadas para escuta e diálogo com gestores das cidades analisadas, que foram orientadas por roteiro para explorar a percepção dos gestores durante o processo de resposta à pandemia, compreender as motivações que orientaram suas escolhas estratégicas e visualizar as fragilidades e potencialidades do sistema municipal em uma emergência de saúde pública. Realizou-se análise qualitativa considerando pontos-chave da resposta do SUS à pandemia, entre eles, coordenação e governança, vigilância e prevenção, e rede de serviços de saúde. Nos resultados, apresentam-se e discutem-se as principais características dos municípios, o curso da pandemia em 2020, ações de resposta adotadas; e exibe-se uma análise do padrão de resposta dos gestores do SUS municipal na pandemia.*

PALAVRAS-CHAVE *Pesquisa em sistemas de saúde pública. Covid-19. Acesso universal aos serviços de saúde. Atenção à saúde.*

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Introduction

Initially registered in the province of Wuhan in China, in December 2019, the first case of infection by Sars-CoV-2, which causes Covid-19, was diagnosed in Brazil on February 26, 2020, in São Paulo[1]. On March 12, 2020, Brazil recorded the first death caused by the disease. On March 20, the Ministry of Health (MS) declared a community transmission of the virus in the national territory[2]. In April 2021, Brazil was nearing 400 thousand deaths caused by the disease with a mean of more than three thousand daily deaths, trailing only behind the U.S. in the number of lives lost globally[3].

Having a universal health system, such as the Unified Health System (SUS), and organizing a network to respond to public health emergencies[4] could give Brazil greater resilience to face the pandemic[5,6]. The concept of resilience has been applied to analyze the capacity of health systems to prepare, manage (absorb, adapt, and transform), and learn from the shocks caused by epidemics, natural disasters, and financial crises[7]. In response to Covid-19, this concept has been widely used for comparative analysis of national responses to control the pandemic[8-11], offering important lessons for managing health systems[12,13].

Unlike most countries, SUS management is decentralized to the municipalities[14]. Municipal Health Secretariats (SMS) are responsible for offering actions that range from health surveillance to providing care services to their citizens. The coordination of strategic public health programs, the provision of specialized non-decentralized services to the municipalities, and the organization of care flows between municipalities in health regions are the responsibility of the State Health Secretariats (SES); the MS is responsible for the national coordination of the SUS and for responding to Public Health Emergencies of National Importance (Espin)[15].

Despite the persistent organizational problems in the Brazilian health system, aggravated by the effect of recent fiscal austerity policies[16,17], the tripartite governance of the SUS has grounded the health care network in a continental country with huge inequalities between the 5,570 municipalities, of which 68.3% with less than 20 thousand inhabitants[18]. Furthermore, the MS technical health authority was crucial to coordinate local actions implemented by states and municipalities in the responses to previous public health emergencies, such as influenza in 2009[19] and Zika in 2015[20].

In the comparative analysis of the Covid-19 response between countries, we observed that the decentralized management of the health system can have advantages and disadvantages. In Finland, a country with only 5.5 million inhabitants and one of the few that, like Brazil, has municipal health management, decentralization to the local level engaged the population in implementing public health actions to fight the pandemic[21]. Incorporating digital health services and telemedicine strengthened the health system's resilience in the face of this threat[21]. On the other hand, in Spain and Italy, countries with decentralized management of their health systems to the level of provinces (like Brazilian states), coordination problems between national and regional governments were highly relevant to reduce the national capacity to respond to the pandemic[22,23].

The intergovernmental lack of coordination, caused by the Federal Government's failure to assume its role as responsible for the national coordination of the Covid-19 response, is seen as decisive for the failure of the Brazilian response[24-26]. Recent publications analyzed the preparedness and response of the SUS to Covid-19. They showed that socioeconomic inequalities defined the course of the epidemic in the country, unlike what was seen in other countries, where the disease affected more older adults

and people with chronic diseases[25,26]. In Brazil, States and municipalities with high socioeconomic vulnerability were the most affected by the pandemic. On the other hand, the responses of local governments and the population's behavior in States and municipalities with greater socioeconomic vulnerability were effective in containing the pandemic's effects[25,26].

However, given the Federal Government's failure to support local governments in the fight against Covid-19, State and municipal managers had to build their strategies to address the pandemic[25]. From this perspective, exploring the context faced by States and municipalities and the strategies developed by these managers in response to the pandemic is crucial to increase knowledge about the resilience capacity of local SUS management before such an emergency.

This study aims to contribute to the analysis of the SUS response to Covid-19 from the viewpoint of system managers in Fortaleza, Pelotas, and Uberlândia. The study is nested in a funded study that analyzes the preparedness and response of the Brazilian health system to Covid-19. We should emphasize that we did not attempt to evaluate managers' performance or assign results to measures they adopted. Our investigation aimed to gather elements that would allow us to draw an overview of the challenges, response patterns, and innovative solutions implemented at the local level.

Methods

Methodological approach and sample selection

Quantitative data supported this qualitative, observational, and exploratory study to analyze the SUS response to Covid-19 at the municipal level. We worked with a purposeful selection of three Brazilian cities to analyze in-depth. Given the significant heterogeneity of Brazilian municipalities, the sample did not aim to represent the national reality. On the other hand, we targeted municipalities that had implemented relevant experiences in addressing the pandemic and represented different realities of the Brazilian health system.

To select the sample of municipalities, we initially started from a group of 50 pre-selected municipalities that developed outstanding experiences in the fight against Covid-19 in the 'Strong PHC in the SUS Award in the Fight against the Pandemic' [Our English translation]. This initiative was organized by the Pan American Health Organization (Paho) in partnership with the Ministry of Health and the National Council of Municipal Health Secretariats (Conasems). Next, we used the size of the municipalities (small, medium, and large), the geographic distribution (South, Southeast, Midwest, Northeast, and North), the service management model (direct administration by the Municipality and contract with the Social Health Organization – OSS), and the ease of access to local SUS managers to collect information as selection criteria.

We opted to exclude small municipalities as we intended to analyze SUS managers who worked in a network of services of different complexities. We selected one city from the Northeast, one from the Southeast, and one from the South, as follows:

– Fortaleza: Capital of the state of Ceará (CE), large, Northeast, predominantly direct management model.

– Pelotas: Regional reference in the state of Rio Grande do Sul (RS), medium-sized, South, direct management model in partnership with universities.

– Uberlândia: Regional reference in Minas Gerais (MG), medium/large, Southeast region, predominant management model by OSS.

Data collection and analysis

We employed semi-structured interviews to listen and dialogue with municipal managers of the cities analyzed to collect the research material. A roadmap was developed to explore managers' perceptions in responding to the pandemic to guide the interviews, understand the motivations that guided their strategic choices, and visualize the municipal system's weaknesses and potential in a public health emergency. The roadmap's questions followed an analytical model developed to analyze critical points in the SUS response to the pandemic[27], summarized in three main axes: Coordination and Governance, Surveillance and Prevention, and Health services network.

The interviews were conducted in a virtual seminar format, with the concomitant presence of the managers of the three municipalities, allowing for dialogue between them and the research team. The event was held in December 2020 and, thus, portrays the experience in that year. In one of the cities, the key informant was the Health Secretary; in the other two, one was the Health Surveillance Coordinator, and the other was the PHC Coordinator. Participants signed a consent form. The meeting was recorded using the Zoom platform and later transcribed in full.

Axial coding was carried out from the elements related to the questions asked for qualitative analysis of the material collected in the interviews. The codes were municipal coordination and management; prevention, communication, and surveillance; and organization of health services. Then, all codes were analyzed again to understand the similarities and differences between the responses and group them into response types.

With a synthesis of the main results of the analysis of the managers' reports, we analyzed basic information regarding the socioeconomic context, the installed capacity of health services, and the epidemiological situation of the Covid-19 infection in each Municipality. These data were intended to show the background against which managing the response to the pandemic developed in each place.

To this end, we searched in the following databases: Demographic information – TabNet/MS; Socioeconomic information – Atlas Brasil platform/ United Nations Development Program (UNDP); Family health coverage – e-Gestor AB/MS platform; Care infrastructure and resources – National Registry of Health Establishments (CNES)/ MS; Number of procedures – Outpatient Information System (SIA) and Hospital Information System (SIH).

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Characterization of the municipalities

The three cities analyzed have different demographic and health care structure characteristics, as shown in *table 1*.

Table 1. Demographic and health care characteristics

	Fortaleza	Pelotas	Uberlândia
Demography			
Population *	2.686.612	343.132	699.097
HDI **	0.754	0.739	0.789
Life expectancy *	75.2	75.6	78.1
Proportion of older adults in the population *	14.1	24.4	16.7
Health care network (%)			
Supplementary healthcare coverage *	37.2	16.4	35.5
Family health coverage ***	54.6	64.2	40.9
Professionals (/10.000 inhabitants)			
Nurses ☨	17.0	19.3	17.1
Physical therapists ☨	5.7	5.0	5.5
Doctors ☨	28.4	41.3	38.3
Nursing technicians †	31.6	58.6	47.9
Beds (/10.000 inhabitants)			
Other beds ☨	33.5	33.9	20.2
ICU beds ☨	2.1	2.1	2.5
Procedures (/10.000 inhabitants)			
Appointments and clinical treatments †	9122.1	7341.6	13060.6
Deliveries ☨	11.1	12.5	9.8
External causes †	3.8	1.8	2.4
Irrepressible diseases ☨	366.2	459.9	411.3
Screening procedures †	378.5	283.1	604.8
Low and medium-complexity surgeries †	127.3	155.8	275.9
Diagnostic procedures †	773.8	960.5	1009.00
High-complexity surgeries †	86.2	71.2	76.9
Transplants ☨	0.9	0.0	0.3

Source: Elaborated from information of databases *Tabnet, **Atlas Brasil, *** E-Gestor AB; ☨: Microdados Datasus.

According to the last census, Uberlândia is the selected city with the highest Human Development Index (0.789), while Pelotas has the lowest (0.739). Besides their distinct population size, cities have varying demographic patterns. While Fortaleza and Pelotas have similar life expectancies – 75.2 and 75.6 years, respectively – the population of Uberlândia has a life expectancy of 78.0 years. Despite the lower life expectancy, Pelotas has a higher proportion of older adults than the other two cities. In 2019, Pelotas and Fortaleza had 2.1 Intensive Care Unit (ICU) beds per 10,000 inhabitants, while Uberlândia had 2.5. A different profile is found for other beds: Pelotas and Fortaleza have approximately 33 non-ICU beds per 10,000 inhabitants, while Uberlândia has only 20.2. Regarding the Family Health Strategy, Pelotas has the most significant population coverage, with 64.2%, followed by Fortaleza, with 54.6%, and Uberlândia, with 40.9%. On the other hand, Pelotas has the lowest supplementary health coverage, with 16.4% of the population, followed by Uberlândia, with 35.5%, and Fortaleza, with 54.6%.

The difference in the proportion of bed types between the cities portrays the different care capacities. Uberlândia has higher rates of diagnostic procedures, low and medium-complexity surgeries, and screening procedures. Fortaleza has higher rates of high-complexity surgeries and transplants. Pelotas has the highest number of nurses and doctors per 10,000 inhabitants. However, Pelotas also has the lowest number of medical appointments and clinical treatments. The three cities have an academic structure, which includes federal universities.

The pandemic course in the municipalities in 2020

The pandemic course in the three cities analyzed was heterogeneous in 2020, as per data shown in *table 2*.

Table 2. Epidemiological aspects of the Covid-19 pandemic

	Fortaleza	Pelotas	Uberlândia
Date of first case	March 16	March 25	March 17
Date of 1,000th case	April 7	August 4	June 3
Total deaths 2020	4,153	265	737
Total cases 2020	82,294	10,092	42,420
Cases per 100,000 inhabitants 2020	3,063.1	2,941.1	6,067.8
Deaths per 100,000 inhabitants 2020	154.0	77.2	105.4

Source: Ministry of Health[2].

Despite recording the first Covid-19 cases on close dates, the pandemic spread more quickly in Fortaleza. The virus arrival in the city is associated with the fact that it receives a high number of flights connecting the Northeast with Europe. As in other Brazilian cities, the first concentration of cases was identified in the city's most affluent areas. However, the virus has spread explosively to the most densely populated slum areas. About 1 million of the 2.6 million inhabitants live in substandard settlements, which facilitated the rapid spread of the epidemic. The Municipality registered the thousandth case on April 7. It totaled 82,294 cases and 4,153 deaths from the disease in 2020. In the opposite situation, Pelotas was the last city with more than 200 thousand inhabitants to register the thousandth Covid-19 case on August 4. It recorded 10,092 cases and 265 lives lost to the disease in 2020. In an intermediate situation, Uberlândia recorded the first case on July 3. It totaled 42,420 cases and 737 deaths caused by Covid-19.

Municipalities' responses to the pandemic

Box 1 summarizes the main response actions reported by managers according to the governance-surveillance-health services analytical framework.

Box 1. Main actions to respond to the pandemic

	Fortaleza / CE	**Pelotas / RS**	**Uberlândia / MG**
Municipal governance and coordination			
Response planning	– The early onset and rapid spread of the epidemic hampered planning, but experience with previous epidemics helped to take the first measures	– Regional contingency plan, articulated with SES – Built in dialogue with universities and SUS service providers, with the participation of the Health Council	– Participation of the OSSs that coordinate 80% of the services of the municipality
Crisis Committee *Coordination, Composition and Operation*	– Integrated between SMS and SES – Members of municipal and state health management – Weekly meetings – Weekly publications of decrees	– Mayor's Office – SMS, universities, health council, and representatives of trade, union, and industry – Weekly meetings – Municipal decrees discussed in this group	– Mayor's office – SMS, representatives of the police, fire department, and commerce – Weekly meetings – Decisions published through decrees
Response management	– Partnerships with SES and academia enabled the epidemiological monitoring and weekly simulations, with the calculation of the TR and projections	– Shared management from the beginning to the present – Very close dialogue with the team	– Focus given on monitoring indicators of services contracted by OSS
Communication	– Technical notes to guide professionals and the population. – Use of social networks	– Use of technical notes for teams and clarify the population – Use of social networks	– Use of decrees and technical notes to guide professionals and the population – Use of social networks
Supplies management	– Difficulty in accessing supplies due to the rapid peak of cases – Small laboratory capacity	– Difficulty in acquiring PPE and supplies in general – Huge price increase and bureaucracy for purchases, despite the relaxed legislation	– Greater agility for the acquisition of supplies through the OSS partnership
Prevention and surveillance			
Restricted mobility	– Strict lockdown – Social distancing with the closing of schools and commerce on March 19	– Strict lockdown – Questioning whether it was not early – Election campaign hindered the restricted mobility	– Restrictive measures adopted
Surveillance	– Scarcity of tests required rethinking sensitive indicators to track the epidemic – Created a system that integrates PHC, secondary and tertiary information with surveillance to monitor bed occupancy rate and Sars cases – Enabled geocoding – of all emergency care units, hospitals, and basic units concerning suspected and confirmed patients	– Reinforcement of the team with technical supporters of PHC – increased knowledge of UBS operations – Integration of surveillance (epidemiological, health, and occupational health), articulating with primary care – Monitoring of Long-Term Care Institutions for Older Adults, prison population, therapeutic communities, and occupational health – Heat map of the pandemic behavior within the municipality	– Creation of IBs to notify the Sars of all public and private hospitals for monitoring severe patients and deaths – Use of e-Notifica for Sars notification by the PHC team – Use of phone and WhatsApp employed with patients to ensure access and tracking

Box 1. (cont.)

	Fortaleza / CE	Pelotas / RS	Uberlândia / MG
Testing	– Initial testing limitation delayed higher volume testing – Need for post-mortem testing	– Training of nursing professionals to collect PCR at home – UBS did a quick test – Creation of a triage center (Toll-free) to assist people with any symptoms. If suspected positive, home PCR was collected, and people were instructed to stay in isolation – Partnership with the University to expedite test results – Working closely with private labs	*– Drive-thru PCR testing strategy* *– Call center to schedule testing by time block at the drive-thru*
Distancing	– Difficult to implement because more than 1 million people live in substandard settlements, with great socioeconomic inequality	– Monitoring of all cases, contractors, contractors in isolation, which delayed community transmission – Schools were offered for those who could not do home isolation. However, it was not used	– In a hospital environment, when necessary
Health care			
Covid-19 care organization	– Organization of a Covid care line, articulating 12 UPA with Covid bed hospitals – Adoption of severity criteria to guide the most appropriate place for patient care. – Creation of community transport, different from Urgent Mobile Care Units (Samu), to allow the patient to travel during social distancing	– Zoning strategy to avoid cross-contamination, with the definition of Covid-19 exclusive beds – Offer of teleconsulting in partnership with universities for appointments with doctors – Temporary suspension of elective procedures, e.g., oral health	– Teleconsulting support and ongoing education for clinical supervision of Covid-19 cases, integrating PHC, UPA, the Best at Home program, and the hospital
PHC	– Lack of PPE at the onset limited the work of PHC and Community Health Workers (ACS) – Gradually, the 120 UBS were involved in the response – PHC maintained routine activities and started offering oximeters – Geocoding started to guide ACS visits to patients – Reduced mortality and complications after PHC on the frontline – Problem with medical professionals prescribing the 'preventive treatment' of the Covid kit, with hydroxychloroquine	– PHC serviced Covid-19 and non-Covid-19 patients: patients with flu-like symptoms in the morning and all other demands in the afternoon – PHC articulation with epidemiological surveillance to monitor all notifications of flu-like syndromes in the municipality – Difficulties with the unsafe conditions of health teams regarding the lack of knowledge of the virus – Maintenance of services aimed at children, newborns, women, and older adults, precisely for this most vulnerable population	– PHC assumed a leading role, coordinating the care network – Effective integration of PHC with surveillance for case reporting – Establishment of flow for symptomatic and respiratory in all care units – UBS with regular working hours attended symptomatic, pregnant respiratory, children, and chronic patients who required urgent care
Hospital care	– Expansion of about 400 beds for Covid-19 patients. – Opening of a field hospital and leasing of a private hospital	– Organization of ICU and Covid-19 beds at the teaching hospital	– Field hospital was not implemented – Activation of a hospital in the central region of the city that will remain after the pandemic

Source: own elaboration.

MUNICIPAL GOVERNANCE AND COORDINATION

Very little was still known about Covid-19 during the initial peak of the pandemic in Fortaleza; there was competition for all kinds of supplies with Europe and the U.S. However, experience with previous epidemics facilitated the first response measures. The SMS quickly articulated with the SES/CE and installed a crisis committee, which held weekly meetings and published decrees to guide professionals, health services, and the population. SMS management was practically confused with crisis management. Partnerships established with universities were crucial to incorporate epidemiology as a management tool, guiding decision-making based on the evolution of the epidemic's weekly situation and estimating the level of transmissibility of the disease (TR) in different city regions and the projection of settings.

In Pelotas, the previous planning work developed for 2021, involving all areas of the SMS, and the planned expansion of the PHC in a project of the SES/RS government, helped the city elaborate a regional contingency response plan. A committee was created to address the pandemic, coordinated by the mayor's office, which gathered health managers, universities, the municipal health council, and commerce representatives, unions, and industries. This committee discussed the contingency plan and all municipal decrees. The committee was also responsible for communicating with the population using social networks and the SMS portal. For the management of services, a partnership was established with universities in the region, which manage part of the health services in the Municipality. Since the onset of the epidemic, the shared management of services and the participation of various segments were decisive to increase the municipal response capacity.

In Uberlândia, a municipal committee was formed by the mayor, the Health Secretary, and representatives of the police, fire department, and commerce. Decisions were made in weekly meetings and published as decrees on the Municipality's portal and social networks. Communication with the network occurred directly through technical notes, and social networks were used to show graphs, indicators, and lethality with transparency for communicating with the population.

Contracts with two OSS responsible for managing about 80% of the network's services were reported as facilitators for the Municipality to implement care actions defined by the municipal management and speed up the procurement of supplies. As a result, SMS focused the response management on monitoring indicators of services contracted by the OSS.

PREVENTION AND SURVEILLANCE

Fortaleza adopted a strict lockdown early on in response to the pandemic. However, due to the scarcity of diagnostic tests – in the beginning, it was necessary to carry out post-mortem viral identification – the indicators were revised to monitor the evolution of the epidemic and identify regions with the highest number of cases. Thus, with support from the Information Technology area of the SES/CE, a system was created to integrate information from PHC, secondary and tertiary care with surveillance, monitoring the rate of Severe Acute Respiratory Syndromes (Sars) cases, bed occupation, and deaths. The use of a geocoding system guided the visits of Community Health Workers (ACS) to patients. However, adopting measures such as social distancing was a challenge due to the substandard socioeconomic conditions in which a substantial part of the city's population lives. On the other hand, priority was given to protecting vulnerable populations, such as those deprived of their liberty, residents in asylum institutions, and health professionals.

Pelotas also adopted a strict lockdown, which was questioned as to whether its implementation was not too early. Professionals from the technical support to

PHC were requested to strengthen the surveillance area, increasing the surveillance-PHC integration. Testing was emphasized, and universities established partnerships to achieve greater agility in the results, besides private laboratories. An articulation of epidemiological, health, and occupational health surveillance was established to carry out work in industries, slaughterhouses, and commerce. At the outset, all Sars notifications in the Municipality were monitored, all cases were followed up, and contacts were placed in isolation. Schools were offered to isolate suspected cases unable to do home isolation, but they were practically unused.

Also, priority was given to monitoring vulnerable populations, such as in Long-Term Care Institutions for older adults (LTCI), prisons, and therapeutic communities with residents. These measures slowed the progress of the epidemic in the Municipality. However, the electoral campaign period hindered restrictive mobility measures, and rapid growth in the number of cases was observed afterward. In December 2020, the demand could no longer be met even with three work shifts, and it took three days to call a patient and investigate cases.

Mobility restrictive measures were adopted in Uberlândia, and testing was a priority strategy in 2020. At first, PCR was performed only for severe cases, but soon it was performed for mild cases. A call center was created to schedule PCR testing in drive-thru time blocks. This measure quickly increased the number of tests. Positive cases were instructed to stay in isolation. Older adults were vaccinated against influenza, reaching 100% coverage. The Municipality created a system for notifying Sars, hospitalized patients, and deaths, which considered all hospitals, public and private, to manage beds. The PHC coordination received in Excel® format the list of patients to be referred to the units for monitoring and tracking of contacts. The PHC teams notified the Sars through the e-Notifica, speeding up the information. Cases of older adults with respiratory symptoms reported in an LTCI were sent to the Covid hospital and tested. If positive, patients remained in the hospital for isolation and care, and the other LTCI residents of the Ilpi were tested.

ORGANIZATION OF HEALTH SERVICES

Fortaleza organized a line of care for Covid-19 patients, articulating 12 Emergency Care Units (UPA) with hospitals that allocated beds for the disease. Severity criteria were adopted to define the most appropriate place for patient care, and a community transport system, different from the Mobile Emergency Care Service (Samu), was established to allow patient transport during social isolation. The lack of Personal Protective Equipment (PPE) initially limited PHC and ACS work. However, the 120 Basic Health Units (UBS) gradually became involved in the response, albeit under different conditions. The PHC maintained its routine activities and started to perform oximetry on suspected patients. The use of a case geocoding system guided ACS visits to patients. There was a reduction in mortality and complications after PHC entered the response's frontline. However, a problem was recorded, where medical professionals prescribed 'preventive treatment' without evidence of efficacy. The Municipality had to increase the number of hospital beds, opening a field hospital, and leasing a private 300-bed hospital.

In Pelotas, a zoning strategy was established to avoid cross-contamination, with the definition of exclusive beds for Covid-19. PHC has 50 basic units, of which ten are under shared management with the two universities, and care was divided into shifts: patients with flu-like symptoms in the morning and all other demands in the afternoon. Some services have been suspended or performed at home. A triage center (toll-free) was set up for people who had any symptoms. Home PCR was collected

if they met the criteria for suspected cases. When Rio Grande do Sul announced the community transmission place and moved to the mitigation phase, the Municipality's triage center became a teleconsulting center, which offered medical care in partnership with universities. The most significant challenge was the lack of professionals – care providers and administrative personnel. ICU and Covid-19 ward beds were opened at the teaching hospital.

In Uberlândia, PHC spearheaded the response, coordinating the care network and promoting effective integration with surveillance for case reporting. Teleconsulting support and continuing education were adopted to provide clinical supervision of Covid-19 cases, integrating PHC, UPA, the Better at Home Program, and the hospital. All PHC units serviced both Covid-19 and the usual demand. A flow was established for symptomatic patients and patients with respiratory problems in all care units to avoid cross-contamination. Thus, the opening hours were maintained, serving patients with respiratory symptoms and pregnant women, children, and the chronically ill. Field hospitals were not used, but a hospital was activated in the center of the Municipality for Covid-19 care, whose beds will remain a legacy after the pandemic.

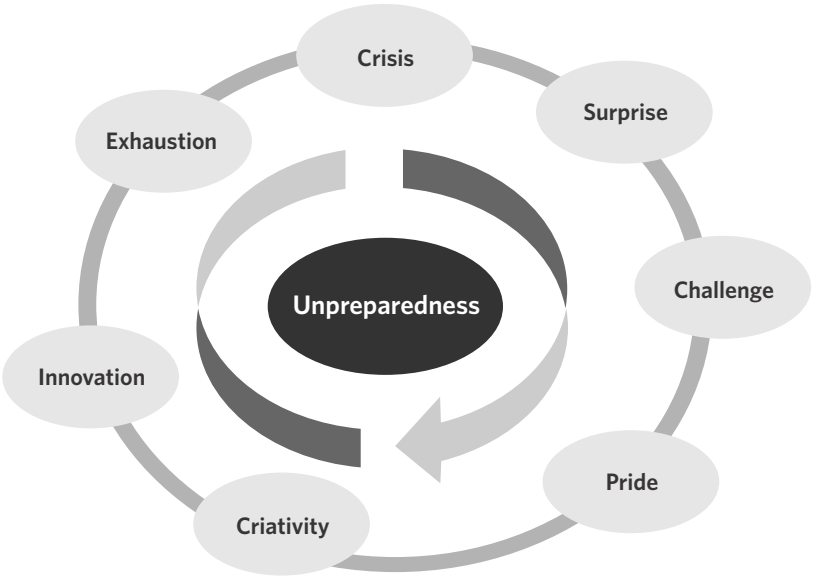
Municipal SUS response in the pandemic

The results of the analysis of the managers' reports show that the criteria for choosing actions and the modalities of implementing measures to combat Covid-19 were quite different between the three municipalities. These differences were determined by the different epidemiological, social, and political contexts of each city, besides the installed capacity of the local network of health services and the experience with previous epidemics. Even so, despite the heterogeneous actions in the cases considered, we identified common patterns of behavior among the managers interviewed, especially in the initial stages, when the health system's resilience was put to the test.

In the three municipalities, due to the lack of national guidance on response planning, we observed that the first pandemic wave surprised managers, creating widespread insecurity. As demonstrated by some recent surveys on the perception of health professionals in the emergency, health teams stated that they did not feel technically prepared and did not receive clear guidance from the competent bodies[28,29]. This organizational disorientation was marked by indecision and insecurity, leading to delayed implementation of non-pharmacological measures, lack of qualified human resources, and scarcity of supplies and equipment, thus increasing the impact of the pandemic on the population[25,26].

In this situation, without planning guiding mechanisms or response coordination instances established at state and national levels, it would be challenging to expect proactive responses from municipal managers. However, driven by the pressure of problems requiring immediate responses, managers were forced to act, triggering a reactive response cycle to Covid-19, summarized in *figure 1*, which consists of feelings, motivations, and outcomes, such as surprise, challenge, pride, creativity, and innovation, until exhaustion, for a new immersion in the crisis and restarting the cycle.

Figure 1. 'Reactive' cycle of the municipal response to the Covid-19 pandemic



Source: Own elaboration.

The following paragraphs describe the phases of this 'reactive cycle' using selected quotes from respondents. The managers' reports reveal the surprise, disorientation, and frustration caused by the unexpected crisis. A pervasive feeling that something was approaching and could cause the municipal health system to collapse was in the air:

[...] In February, the pandemic came and ended our planning [...].

[...] when the epidemic took hold here, very little was known about the response, and there was enormous competition for all types of supplies [...].

[...] it was challenging to put our primary care to work properly. In the beginning, we did not have PPE, and there was much fear. We are talking about the beginning of March. It was challenging at that moment... the community health workers had their actions blocked [...].

[...] if you had a substantial testing limitation, you had neighborhoods where there were deaths before having the first case [...].

[...] it was not known what medication was used, not used, how was the behavior of this virus, the difficulty in acquiring PPE, supplies..., the prices that increased enormously, the difficulties to buy, the bureaucracy [...].

[...] we did not have a team in the epidemiological surveillance in sufficient numbers and technical capacity, even coping with all this [...].

[...] one of the most significant difficulties I felt was the insecurity of the health teams, the lack of knowledge about this virus, and the insecurity of this team that would be exposed [...].

Surprised, managers realized the impacts of inequalities and the consequences of preexisting organizational failures and inconsistencies:

[...] when it dispersed to the most densely populated and favela areas, it was explosive... it was essential to capture the dynamics of the virus spatial and temporal propagation [...].

[...] systems do not communicate, the notifications are made in a system, but then the other service does not access that system [...].

[...] in the beginning, we had a lot of fake news, which got in our way a lot. It gave us a tremendous amount of work, which generated panic in the workers and the community [...].

[...] regarding surveillance, we had an immediate problem: integrating systems [...].

Response actions focused on solving urgent, concrete, technical, and critical problems, such as distancing measures, PPE correct use, expansion of ICU beds, and search for qualified professionals:

[...] On March 19, we issued the first closing decree; we closed it rigorously... sometimes we even wonder if we did not close too early [...].

[...] the first challenge was to make the technical note of the rational use of PPE. So, we had the surgical mask issue: who will use it in which situation [...].

[...] another moment was when we managed to improve access and have equipment, PPE... Fortaleza alone opened more than 400 beds just for Covid-19 [...].

[...] so the first thing we did was relocate people from other areas [...].

After the feeling of disorientation of the first few weeks, the commitment of health managers grew, and they assumed their responsibilities with a sense of belonging to the SUS:

[...] communication and decision sharing, ... high point of the experience, sharing and the process of making decisions together, involving other areas of the Municipality [...].

[...] we created WhatsApp groups with the teams. I participated. I know that the Secretary talking to the community worker at the frontline made a difference [...].

[...] I believe the positive thing was this shared management from the beginning to date [...].

[...] The production of technical notes was fundamental to train the teams and clarify the population as to why these technical notes were disseminated [...].

The commitment to the SUS and the widespread pride among the health teams allowed facing the rising challenges. Despite the flaws and inconsistencies, there was a good ability to adapt to the new reality, with creative solutions and innovative practices:

[...] patients with flu-like symptoms in the morning and all other demands in the afternoon, ... we were able to meet the two needs... of primary care [...].

[...] the prenatal visits, ... we were able to keep these face-to-face visits scheduled, keeping an entire flow in the unit [...].

[...] we had to adapt, ... we made a parallel system that gathered the UPAs, ... with the Covid hospital beds [...].

[...] we did work very close to epidemiological surveillance with private laboratories in the city [...].

[...] an entire team to monitor the LTCIs, the Long-Term Care Institutions for Older Adults, the prison, the therapeutic communities, [...].

[...] they created an IT department at the state secretariat, set up this entire system to integrate this data, and tried every week to make these decisions based on data integration, the spread of the virus, and the care demand [...].

[...] this telehealth technology allowed primary care to fulfill access [...].

[...] the influenza vaccination campaign... the possibility for older adults to schedule this vaccine at home, ... primary care spearheaded this action. It was a colossal action; more than ten thousand older adults were vaccinated at home [...].

[...] we set up a triage center, a toll-free number so that people who had any symptoms, coming from outside, [...].

[...] we also bought tests... Today, the federal university has a laboratory that returns the results in 24 hours [...].

However, the spread of the virus persisted, increasing the pressure on health services, leading to exhaustion and burnout, with many professionals on leave, exacerbating the crisis:

[...] we had very high mortality because social distancing was impossible in a house with no windows. How do you do social distancing in an area with 34 thousand people per square kilometer? So, there is no social distancing there [...]

[...] Today, we have more than 300 new cases every day. We have more than ten people working on investigations into these cases. We have three work shifts, and still, we cannot handle it. So, sometimes a case arrives Today, and we will only be able to call that patient to carry out an investigation in two or three days, which is a long time. We understand that it is a long time [...].

[...] we had days... 135 admissions of hospitalized patients in a single night and... 106 people died, just in the city and in just one day... it was very close to calamity [...].

[...] we are in a moment... it is challenging to be in the worst moment because there is (sic) a whole team of already exhausted professionals... many professionals are on leave and sick. Those on the frontline are tired [...].

[...] we will now have to think if we are going to have to close some primary units, if we are going to have to possibly join two units into one because we no longer have a team, ... teams are incomplete... we are experiencing the worst phase.

[...] the most significant difficulty we have is this lack of personnel everywhere [...].

[...] the group... of management is exhausted because it is doing all the management work and many operational issues due to lack of people [...].

The managers interviewed stated that, in general, they had a good capacity to respond. Many services did not collapse and reorganized themselves per the new requirements, showing the resilience of the analyzed systems. However, some of the advances made by the management teams interviewed were primarily lost by the even more overwhelming force of the second wave in 2021.

The initial reactive cycle allowed the interviewed managers to achieve good results, which could prevent even worse outcomes. However, these experiences reveal the fragility of an organizational model driven by pressure and immediacy instead of adequate planning and supported by solid coordination devices. Municipal managers faced severe hardships in building, governing, and sustaining a set of actions that could contain the pandemic, even more so in a context dominated by the lack of the Federal Government's coordination.

Conclusions

In this article, we presented preliminary reflections of ongoing research on the response of the Brazilian health system to

Covid-19. The findings derive mainly from the report of SUS managers in three medium and large Brazilian cities, from different country regions, about their 2020 experience, limiting the scope of our analysis. Furthermore, we did not aim to judge or assess the actions taken. Instead, we explored response patterns that may be useful for analyzing the resilience of the SUS in the face of Covid-19.

From this analysis, we can observe that, despite its structural weaknesses, the SUS at the municipal level has some points that can provide resilience in the face of the impact of shocks caused by epidemics. Despite initial difficulties, the three cities reported strong involvement of PHC and health surveillance teams in response actions and promoting the rapid expansion of hospital beds. The limited number of diagnostic tests was faced by adopting strategies to integrate different information systems that are available but unused.

We should highlight the different options of shared management of the response to the pandemic within the system management. The partnership with universities helped both the greater use of epidemiology as a management tool and the expanded offer of services, from laboratory to hospital care. The articulation with the SES was crucial to organizing the response in the region. The limitations of direct administration were reported as a hindrance, while the experience with OSS ensured swift response actions.

However, despite the points that could provide the SUS with greater resilience in the Covid-19 response, the sum of very disparate municipal responses has limitations. The lack of planning and robust mechanisms for coordinating the response, especially by the Federal Government, increased the difficulties of managing the pandemic at the local level, limiting the articulation with other sectors, and hindering more proactive and strategic attitudes by health managers.

While counting on committed, competent professionals with innovation potential, we found that the analyzed municipal health systems struggled to implement necessary governance, surveillance, and health care actions.

These limitations could be overcome through harmonic, intense, continuous, and incisive multisectoral actions that improve planning and strengthen health management in municipalities to make them more prepared to face a crisis of the magnitude of the Covid-19 pandemic. These actions should be promoted, articulated, and encouraged by the Federal and State governments, with the full participation of all the actors involved.

Collaborators

Massuda A (0000-0002-3928-136X)* and Malik AM (0000-0002-0813-8886)* contributed to the design and planning, elaboration of the draft and final version of the manuscript. Carrera MBM (0000-0002-8785-7730)*, Schiesari LMC (0000-0002-9190-8166)*, and Renato Tasca (0000-0002-1407-5914)* contributed to the methodology, data analysis and interpretation, and the review. Bigoni A (0000-0002-2483-3299)* and Costa CF (0000-0002-9356-9794)* contributed to data analysis and interpretation and the review. ■

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