

The evolution of the Covid-19 pandemic in southern and northeastern states of Brazil: a descriptive study of the response of health systems from the dissemination of epidemiological data and coping measures decreed

A evolução da pandemia por Covid-19 em estados do Sul e Nordeste do Brasil: um estudo descritivo da resposta dos sistemas de saúde a partir da divulgação de dados epidemiológicos e das medidas de enfrentamento decretadas

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ABSTRACT: After the pandemic caused by SARS COV-2 reached Europe, Brazil became one of the epicenters. Considering historical differences in health indicators between the South and Northeast regions of the country, governed by the same health system, this study aims to describe the initial evolution of the pandemic in these regions based on information from the digital platforms of the state health departments. We analyzed the number of cases, deaths and tests performed, from February 2020 to May 2021. The data were related to the measures to cope with the pandemic taken by the states, collected from the decrees of restrictions and flexibilities of services and commerce. In the South, the state with the most cases was Santa Catarina (13350/100,000hab), Rio Grande do Sul had the highest mortality rate (246.8/100,000hab) and more tests (32378/100,000hab). In the Northeast, Sergipe had more cases (10216/100,000hab), Piauí more tests (23,917/100,000hab) and Ceará had the highest mortality rate (222.8/100,000hab). The measures to cope with coronavirus in Brazil were not uniform between the states, nor the application of the tests, evidencing the lack of national coordination in the actions.

Keywords: COVID-19; Pandemic; Mortality; Decrees; Serological tests.

RESUMO: Após a pandemia provocada pelo SARS COV-2 atingir a Europa, o Brasil tornou-se um dos epicentros. Considerando diferenças históricas nos indicadores de saúde entre as regiões Sul e Nordeste do país, regidas pelo mesmo sistema de saúde, este estudo tem como objetivo descrever a evolução inicial da pandemia nestas regiões a partir de informações das plataformas digitais das secretarias estaduais de saúde. Foram analisados número de casos, óbitos e testes realizados, de fevereiro de 2020 a maio de 2021. Os dados foram relacionados com as medidas de enfrentamento à pandemia tomadas pelos estados, coletadas a partir dos decretos de restrições e flexibilizações dos serviços e comércio. No Sul, o estado com mais casos foi Santa Catarina (13350/100.000hab), o Rio Grande do Sul teve maior taxa de mortalidade (246,8/100.000hab) e mais testagens (32378/100.000hab). No Nordeste, Sergipe teve mais casos (10216/100.000hab), Piauí mais testagens (23.917/100.000hab) e Ceará teve maior taxa de mortalidade (222,8/100.000hab). As medidas de enfrentamento ao coronavírus no Brasil não foram uniformes entre os estados, nem a aplicação das testagens, evidenciando a falta de coordenação nacional nas ações.

Palavras-chave: COVID-19; Pandemia; Mortalidade; Decretos; Testes sorológicos.

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INTRODUCTION

In early December 2019, the occurrence of pneumonia of unknown cause in Wuhan, a district located in China, led to the discovery of a new type of coronavirus, SARS-CoV-2¹. It was known that most of the infected developed mild to moderate flu-like symptoms, with complete recovery^{2,3}, and lethality around 3%. However, due to its high transmissibility, the World Health Organization (WHO) declared a pandemic on March 11, 2020^{4,5}. Considering that its transmission occurs primarily by contaminated droplets originated in the secretion of the oropharynx of infected people, the various countries immediately implemented numerous measures to contain the rapid evolution of the disease, with marked heterogeneity between interventions⁶.

In Germany, the onset of the pandemic was well controlled, with emphasis on large-scale testing for early detection of the virus, containment measures and social distancing. New Zealand adopted strict measures before it even reached a hundred confirmed cases. Border closures, the imposition of a quarantine regime of almost two months and investment in testing and contact tracking were made, reaching zero the number of new cases^{7,8}. The virus has advanced rapidly in Italy and, after an increase in the number of deaths from COVID-19, there was an expansion of lockdown for the whole country in order to prevent the progression of the chaotic scenario⁹. At the same time, Latin American countries became the epicenter of the pandemic around the second half of 2020. In these, it is evident the lack of unity among the governmental entities responsible for health management in each country, with statements divergent from those recommended by the WHO - especially Mexico and Brazil¹⁰.

Until November 2020, Brazil ranked second among the countries with the highest incidence of confirmed cases and coronavirus deaths worldwide¹¹. The first case in the country was confirmed on February 26, 2020, in São Paulo, while the first death was announced on March 17¹². Since then, the absolute numbers of daily deaths have taken on gigantic proportions, causing a serious health crisis in the country¹³. This was accentuated by the President of the Republic of Brazil, Jair Bolsonaro, who propagated recommendations discrepant to those issued by the WHO to the population. Therefore, the Supreme Court gave administrative autonomy at the state and municipal level to implement measures appropriate to local situations, which resulted in several interventions in each region of the country and a non-unanimous acceptance to health policies. From the beginning of the crisis until July 2021, there were two substitutions in the post of Minister of Health and Brazil became the epicenter of the pandemic^{11,14}.

The objective of this work is to analyze the progress of the pandemic and the coping measures adopted by

different states in the face of their self-government, a feat that differs from the precepts of the Unified Health System (SUS), which governs - not only, but also - preventive actions in public health in the country. As already observed in other analyses, socioeconomic inequities influence pandemic results¹⁵. Thus, the Brazilian regions Northeast and South were chosen because they presented marked differences in health and development indicators.

Thus, the aim is to observe which strategies were applied, relating them to the situation of the pandemic in the different states. The absolute number and proportion of cases and deaths, the performance of tests for the detection of coronavirus, in addition to the sanitary policies published in state decrees will be studied. In addition, given the importance of access to information to cope with the pandemic and the evidence of lack of transparency at times during its conduct, we sought to analyze the way data are disclosed in the official bulletins of the states, made available online by the Health Secretariats¹⁶. To understand the progress of the pandemic since its initial moment, the time frame from February 2020 to May 2021 was used in order to understand the response of the states to the emergence of the new coronavirus in the national territory.

In order to include in the analysis the socioeconomic conditions of each federative unit, the Human Development Index (HDI) was used. It analyzes long-term aspects such as income, health and education, in order to reveal a partial perspective of the living conditions of the population of a given geographical space.

METHODS

This is a cross-sectional descriptive study. Data available to the public were collected on the websites of the State Health and Planning Secretariats of all states in the Southern region (Paraná, Santa Catarina and Rio Grande do Sul) and Northeast (Bahia, Rio Grande do Norte, Alagoas, Ceará, Pernambuco, Piauí, Paraíba, Maranhão and Sergipe). Information on the number of cases and deaths due to COVID-19 was sought; number of tests carried out from February 2020 to May 2021; and decrees concerning measures to combat the new coronavirus. When the data were not available, the secretariats were contacted and the numbers requested.

The numerical data were passed on to an Excel spreadsheet and, later, graphs and tables were elaborated from them. We chose to collect these at a periodicity of 15 days. The information regarding the number of tests performed in each state was consulted in the epidemiological bulletins and platforms on coronavirus of the respective state departments. These were divided, according to their availability, into: Rapid Tests, RT-PCR or Undefined Serological Tests - when there was no distinction in the data of the secretariats. States that did

not discriminate the numbers on testing were investigated as to how to disseminate information about the tests in bulletins and platforms.

The measures to cope with the pandemic were obtained from the reading of state decrees. The information of these were summarized in: closing of the trade; flexibilisation of restriction measures; trade opening and restriction measures (partial closing of trade on specific days or times or type of trade). The number of cases and measurements were grouped and presented as a time graph for each of the states, showing their specificities and, later, addressed according to their importance and relevance in the results. The HDI value of each federative unit mentioned in the study was obtained from the platform of the Brazilian Institute of Geography and Statistics (IBGE).

RESULTS

As of May 31, 2021, Brazil had 16,515,120 confirmed cases of coronavirus and 461,931 deaths by COVID-19. Lethality in the country at this time was 2.79%, and the total number of tests was about 49 million^{11,12}. According to the last evaluation present in the IBGE platform, carried out in 2010, the states of the Northeast and their respective HDI are decreasingly cited in the following order: Rio Grande do Norte (0.684); Ceará (0.682); Pernambuco (0.673); Sergipe (0.665); Bahia (0.660); Paraíba (0.658); Piauí (0.646); Maranhão (0.639); Alagoas (0.631). In the South region, Santa Catarina has the highest HDI (0.774), followed by Paraná (0.749) and Rio Grande do Sul (0.746)^{17,18}.

Table 1. Estimated population, number of cases and absolute deaths per 100,000 inhabitants of COVID-19, number of tests for detection of infection by SARS-COV-2 per 100,000 inhabitants and Lethality (%) in the southern and northeastern states of Brazil

State	Estimated Population in 2020*	N. of cases	N. of deaths	N. of cases by 100.000 inhabitants	N. of deaths by 100.000 inhabitants	N. of tests by 100.000 inhabitants	Mortality (%)
RS	11,422,973	1,085,523	28,192	9,503	246.4	32,378	2.6
SC	7,252,582	968,244	15,276	13,350	210.6	30,730	1.6
PR	11,516,840	1,093,490	26,421	9,495	229.4	28,096	2.4
Total (S)	30,192,315	3,147,257	69,889	10,424	231.5	30,349	2.2
CE	9,187,103	801,735	20,474	8,727	222.8	13,081	2.5
BA	14,930,634	1,012,200	21,241	6,779	142.2	8,258	2.1
SE	2,318,822	236,905	5,091	10,217	219.5	23,296	2.1
PE	9,616,621	482,157	15,862	5,014	164.9	19,338	3.3
RN	3,534,165	269,685	6,149	6,876	173.9	15,657	2.3
MA	7,114,598	290,299	8,140	4,080	114.4	9,693	2.8
PI	3,281,480	273,756	5,952	8,342	181.4	23,917	0.7
PB	4,039,277	330,965	7,672	8,194	189.9	12,112	2.3
AL	3,351,543	193,046	4,751	5,760	141.7	14,126	2.5
Total (NE)	57,374,243	3,890,748	95,332	6781	166.1	13,639	2.4

* According to data from the Brazilian Institute of Geography and Statistics (www.ibge.gov.br)

Table 1 shows that in the Southern region, Santa Catarina was the state with the most confirmed cases, being 13,350/100,000 inhabitants, followed by Rio Grande

do Sul with 9,503/100,000 inhabitants and Paraná with 9,495/100,000 inhabitants. In addition, the RS showed a higher mortality rate being 246.8/100,000 inhabitants,

followed by PR with 229.4/100,000 inhabitants and SC with 210.6/100,000 inhabitants. RS had the highest lethality in the southern region (2.6%). Based on the available official reports, this state stood out for being the one that most conducted tests for detection of SARS-COV-2, being 32,079/100,000 inhabitants. followed by 30,730/100,000 inhabitants in SC and 28,096/100,000 inhabitants in PR.

In the Northeast, the highest number of cases occurred in Sergipe (10,216/100,000 inhab), followed by Ceará (8,727/100,000 inhab), Piauí (8,342/100,000 inhab), Paraíba (8,194/100,000 inhab), Rio Grande do Norte (6,876 inhab./100,000 inhab), Bahia (6,779/100,000 inhab), Alagoas (5,760/100,000 inhab), Pernambuco (5,014//100,000 inhab) and Maranhão (4,080/100,000 inhab). The state with the highest mortality rate was CE (222.8/100,000 inhab) followed by SE (219.5/100,000 inhab), PB (190.1/100,000 inhab), PI (181.4/100,000 inhab), RN (174.0/100,000 inhab), PE (164.9/100,000

inhab), BA (142.3/100,000 inhab), AL (141.7/100,000 inhab) and MA (114.4/100,000 inhab). The state of Pernambuco was the one with the highest lethality (3.3%). Regarding testing, the state that carried out the most tests for the detection of SARS-COV-2 was PI (23,917/100,000 inhab), followed by SE (23,295/100,000 inhab), PE (19,338/100,000 inhab), RN (15,657/100,000 inhab), AL (14,126/100,000 inhab), CE (13,081/100,000 inhab), PB (12,112/100,000 inhab), MA (9,693/100,000 inhab) and BA (8,258/100,000 inhab).

Tables 2 and 3 show the number of tests for detection of SARS-COV-2 performed monthly from February 2020 to May 2021, broken down by method. The states of Ceará, Maranhão and Alagoas did not distinguish in their bulletins the type of test performed, while the state of Bahia provided information only from RT-PCR. The other states discerned the data in bulletins or platforms.

Table 2. Total of tests for diagnosis of SARS-COV2 infection performed in the South and Northeast regions of Brazil between February and December 2020

State	Test	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Northeast												
CE	ND**	-	5,218	21,328	63,060	96,969	136,353	208,740	256,657	319,218	413,464	507,805
BA	RT*	-	1,610	10,546	57,193	209,980	418,577	261,366	344,636	436,433	522,805	-
SE	RT-PCR	-	-	2,122	12,646	31,023	56,725	79,598	171,100	192,449	210,612	249,373
	RT*	-	-	390	3,455	16,309	39,269	60,630	-	-	-	-
PE	RT-PCR	8	-	-	42,455	59,903	100,184	156,953	233,088	322,572	430,449	539,414
	RT*	-	-	-	17,221	55,012	116,346	180,999	234,789	287,353	331,127	396,260
RN	RT-PCR	3	-	4,382	12,113	33,203	61,548	76,110	87,970	148,018	174,976	205,269
	RT*	-	-	925	7,812	44,702	77,683	81,300	91,078	105,603	152,444	180,000
MA	ND**	-	1,484	7,837	56,177	164,067	265,983	334,243	386,147	423,208	454,559	480,860
PI	RT-PCR	-	-	-	-	-	-	-	-	-	-	-
	RT*	-	-	-	-	-	-	-	-	-	-	-
PB	RT-PCR	-	162	459	-	15,975	21,376	25,327	31,421	37,444	50,955	75,885
	RT*	-	-	132	-	124,118	220,500	280,360	-	-	-	-
AL	ND**	-	-	-	-	75,274	120,333	162,482	183,225	197,343	209,731	238,704
South												
RS	RT-PCR	-	-	-	-	-	-	-	-	-	-	-
	RT*	-	-	-	-	-	-	-	-	-	-	-
SC	RT-PCR	-	-	-	9,516	38,171	106,101	214,377	303,803	424,594	463,818	577,283
	RT*	-	-	10,118	32,724	62,300	210,796	276,972	342,192	375,655	553,090	680,765
PR	RT-PCR	9	3,666	17,771	33,682	106,031	283,791	487,574	671,965	830,780	1,070,110	1,407,870
	RT*	*427,980 One Step Test received from the Ministry of Health and made available to the State network										

* RT: rapid tests; ** ND: not determined

Table 3. Total of tests for diagnosis of SARS-COV2 infection performed in the South and Northeast regions of Brazil between January and May 2021

State	Test	Jan	Feb	Mar	Apr	May	Total
Northeast							
CE	ND**	591,916	745,524	907,428	1,081,224	1,201,799	1,201,799
BA	RT*	734,431	834,800	964,371	1,079,516	1,233,025	1,233,025
SE	RT-PCR	287,231	317,813	371,034	425,355	479,562	540,192
	RT*	-	-	-	-	-	
PE	RT-PCR	646,661	731,597	850,675	965,842	1,077,581	1,859,690
	RT*	454,155	494,931	573,046	678,978	782,109	
RN	RT-PCR	202,624	224,645	237,296	264,303	326,853	553,360
	RT*	183,125	194,618	204,655	213,767	229,933	
MA	ND**	503,841	537,774	589,136	643,010	689,642	689,642
PI	RT-PCR	-	-	-	-	442,367	784,838
	RT*	-	-	-	-	306,071	
PB	RT-PCR	92,206	109,006	142,248	173,273	208,892	489,252
	RT*	-	-	-	-	-	
AL	ND**	239,647	309,648	363,569	415,052	473,449	473,449
Total (NE)							7,825,247
South							
RS	RT-PCR	-	-	-	-	1,559,123	3,698,623
	RT*	-	-	-	-	2,139,500	
SC	RT-PCR	667,638	769,307	908,511	1,019,159	1,137,145	2,228,683
	RT*	772,913	866,554	960,605	1,027,974	1,091,538	
PR	RT-PCR	1,697,455	1,947,876	2,309,525	2,552,396	2,762,774	3,235,754
	RT*	*427,980 One Step Test received from the Ministry of Health and made available to the State network					
Total (S)							9,163,060

* RT: rapid test; ** ND: not determined

The state of Ceará, according to the epidemiological bulletin data, began to guide the use of rapid serological tests (antibody) on May 5, 2020, in addition to the RT-PCR tests already used, for the diagnosis of the new coronavirus in cases of flu syndrome. In a bulletin of 01/07/2020, the rapid tests available for use are differentiated in serological (antibody) and antigen, even if its accounting is not presented in a discriminated way. In a bulletin of 13/08/2020, the health department reports 100% of testing of cases with severe acute respiratory syndrome in hospitals and cases of influenza syndrome (IS) in IS care units, according to the availability of tests (not discriminated) in them. In a bulletin of 10/09/2020, the beginning of mass testing of education professionals, students and asymptomatic people was informed of their inclusion in the notification system

The state of Maranhão did not discriminate the tests in the bulletins, nor in the data disclosed. From October, the state began to present the daily average and accumulated historical tests since February 2020, being possible, since then, to consult the data retrospectively. Two test peaks were observed in the first half of June 2020, with more than 3,000 daily tests. In the second year of the pandemic, two peaks were observed, in the second week of May and the second of June 2021, both with more than 2,000 daily tests.

The state of Alagoas, during the analyzed period, reported in the bulletins only the number of positive tests performed as confirmation criteria (broken down between TR, RT-PCR), not presenting the total number of tests applied. Latest updates of the platform began to present the total cumulative number of tests performed updated daily through the Covid-19 Panel platform in Alagoas.

In Rio Grande do Sul, 57.8% of the tests were of the fast type (of antibodies), in Santa Catarina this test corresponded to 49.0% of the total tests and in Paraná to 13.2%. This state, however, disclosed only the total of rapid tests received by the Ministry of Health, not to mention in the bulletins the total performed. In the Northeast, 57.3% of the tests performed in Paraíba were fast, followed by 42% in Pernambuco, 41.5% in Rio Grande do Norte, 39% in Piauí and 11.2% in Sergipe.

In turn, the state of Rio Grande do Sul, during the analyzed period, daily updated the accumulated number of tests performed on its online platform, discriminating the test method performed, percentages of positive and negative results. However, by not inserting this data in their bulletins, the retrospective consultation through the Health Department's website was impossible.

Considering the South and Northeast regions, the state with the highest number of cases due to SARS-COV-2 was Santa Catarina, the highest mortality rate was Rio Grande do Sul, as this was the state that performed the most tests. The Southern region had 10,424 cases/100,000 inhabitants; 231.5 deaths/100,000 inhabitants; 30,349 tests/100,000 inhabitants and lethality of 2.2%. The Northeast region had 6,781/100,000 inhabitants; 166.1 deaths/100,000 inhabitants; 13,639 tests/100,000 inhabitants and lethality of 2.4%.^{16,19}

Figure 1 shows the graphs of the distance measures adopted in the states and the number of cases recorded between February 2020 and May 2021. Regarding the closure of shopping centers, the graphs show that the restriction occurred in Rio Grande do Sul, Paraná and Santa Catarina from March 19, 20 and 23, 2020, respectively. In June 2020, commercial activities in Santa Catarina resumed, as well as in Paraná. In the latter, there were restrictions of hours for operation, and activities were suspended again in July. In Rio Grande do Sul, the closure of commercial establishments was extended until the end of April, and its opening was dependent on the flag system. Throughout the pandemic, Rio Grande do Sul and Paraná adopted the co-management model, with measures to cope with the opening and closing of trade in charge of the situation of the municipalities, based on the evolution of coronavirus in each region and its capacity to assist those infected by Covid-19. After a year of pandemic, Santa Catarina loosened the measures of closing shopping centers and the like, while Rio Grande do Sul and Paraná presented a greater global restriction in the same period.

In the Northeast region, the first measures to close trade focused mainly on shopping malls and shopping centers, with differences at this point regarding the beginning of restrictions for all trade and the inclusion of non-essential services in the bans. The states of Piauí and Paraíba initiated restrictions by the malls, gradually extending to general commerce and service provision. In the other, the measures to close the trade followed the closure of the malls and the prohibition of the provision of face-to-face services. At this point, restaurants had particularities in some states, as previously mentioned. The reopening of trade was observed from June 2020 - mainly from June to July - being mostly carried out gradually (with the specificities of the beaches). There were exceptions to this pattern, especially Paraíba, Maranhão, Pernambuco and Sergipe, which began to resume before this period.

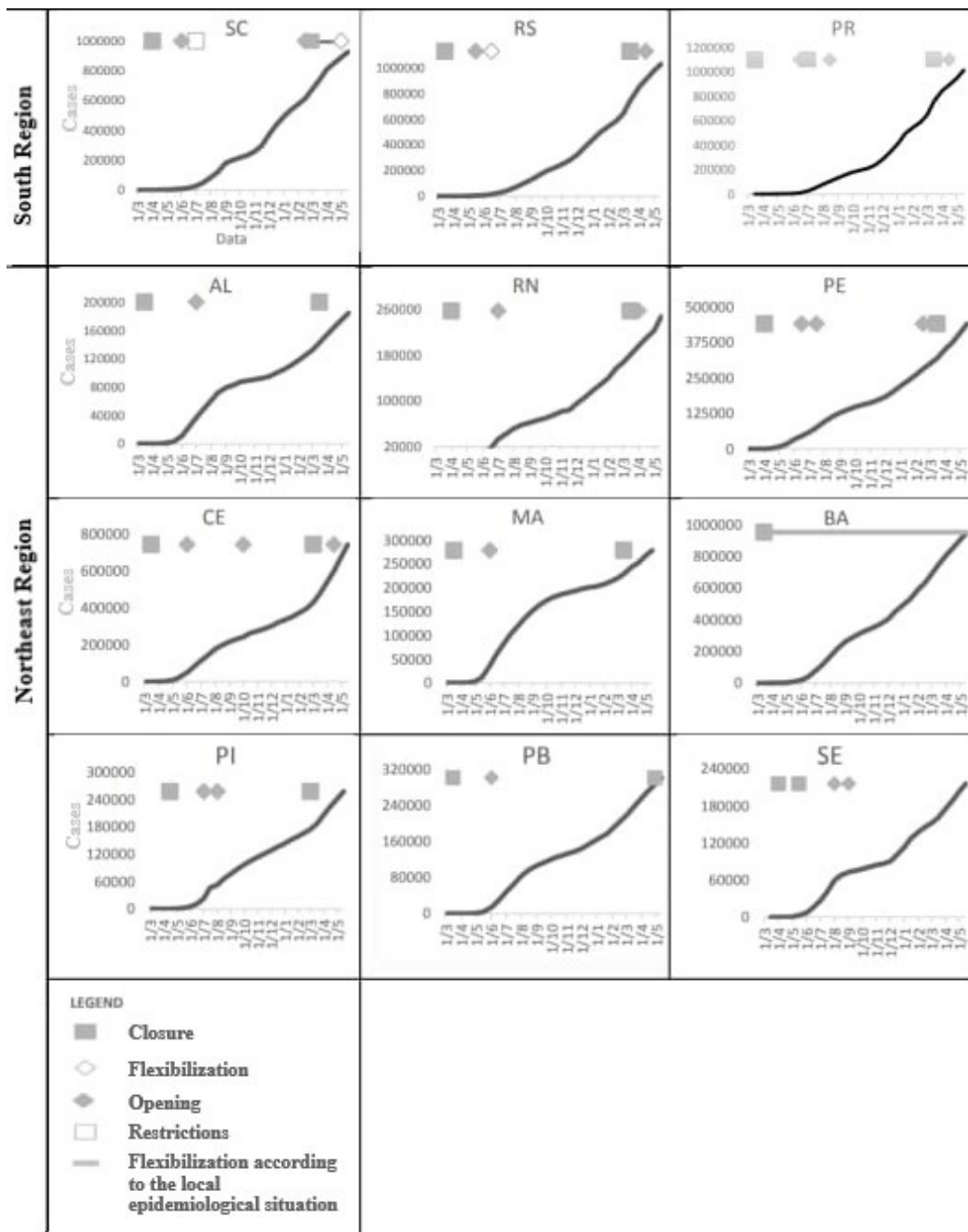


Figure 1. Social distancing measures in the South and Northeast regions of Brazil between February 2020 and May 2021.

DISCUSSION

The information collected in the present study was searched in the digital platforms developed by the State Health Secretariats to update the situation of COVID-19 in their states. There was no pattern in the information between the states and, although they were updated daily, states such as Rio Grande do Sul and Piauí did not provide complete bulletins that would allow retrospective consultation of specific data, such as the number of tests performed, in the case of RS. As the data were gradually

collected, it was possible to identify changes in the pattern of dissemination of information throughout the progress of the pandemic. The difficulty in accessing the data was observed in most states in the first months of evaluation, so that all departments were contacted by e-mail to search for data, but none returned the messages.

This difficulty occurred initially due to the lack of dissemination of epidemiological bulletins electronically, since the secretariats were recently developing platforms that disclosed this large flow of information. In a second moment, there was significant improvement in almost

all information systems and platforms, with greater dissemination of bulletins (mostly daily or weekly). However, the lack of uniformity in the dissemination of data was a hindrance in obtaining the information and in clarifying the understanding of the data disclosed. In addition, the government's website for the dissemination of data on COVID-19 was no longer updated in full in November 2020, no longer presenting individualized data from the states, which made it even more difficult to access important information, especially for health managers and epidemiologists.

In the light of the above, it is important to consider in the analysis the limitation of the data obtained, since the information about the pandemic was not homogeneously or coordinated. It is emphasized the creation of their own databases by the press vehicles for the collection and analysis of these data, being exposed to clear uncertainty about them during the pandemic. Therefore, we considered the relevance of a descriptive study in the context of searching for available information regarding the situation of the pandemic and its coping.

Regarding the tests, the most performed in Brazil, in the period analyzed, were the one that used the RT-PCR method, serological tests (antibody) to identify antibodies and antigen test^{20,21}. The latter two are described as rapid tests. The test considered the gold standard for the detection of SARS COV-2 is what identifies the virus by the RT-PCR method, as it is able to detect parts of the viral genome at the beginning of infection. Antibody tests mimic the virus so that ige and IgM immunoglobulin concentrations can be identified in the blood. These tests are more accurate around the 15th day of SARS COV-2 infection²². Antigen testing detects the virus at the beginning of infection, however, it has lower accuracy than RT-PCR²². No state discriminated in its means of information, during the period analyzed, the type of rapid test performed.

The State Health Departments of Ceará, Maranhão and Alagoas did not report the type of test performed. In addition, the test numbers began to be made available by most states only from May 2020, and the state of Piauí did not fully make these numbers available during the period addressed in this study. In some states, only data for the day consulted could be analyzed, and then only the number referring to the end of May 2021 could be computed. As an example, we mention the case of Rio Grande do Sul, which although it published daily on the platform the number of tests in a discriminated way, it is not contained in bulletins or the like, making it impossible for the data to be analyzed retrospectively. The type of test performed is extremely important for the management of the health crisis, since the provision of tests capable of early detection of SARS-COV-2 allows isolation measures to be taken, ensuring the identification of contactants and, consequently, blocking the spread of the virus.

Data from the southern states show that Rio Grande

do Sul performed the highest percentage of rapid tests in relation to the total number of tests performed, while Santa Catarina had a slightly lower number of rapid tests compared to the RT-PCR test. In Paraná, according to the data available, RT-PCR (86.8%). All states in the Northeast performed, predominantly, tests by the RT-PCR method.

The temporal presentation of the number of tests shows us, in both regions, an increase in tests as the pandemic progresses, and may be related to the increase in cases; less underreporting of infected; with the expansion of tests by governments and/or the result of a greater supply of tests to the states by the Ministry of Health, according to the increase in demand due to the greater number of confirmed cases. In the states of the Southern region, with the exception of Paraná, the use of rapid tests was significant, and may be related to the application of rapid testing strategies - which early identifies the virus, reducing its spread. In the Northeast, the use of rapid tests was less remarkable, and may be related to different testing strategies and/or discrepancies in the distribution of tests by the Ministry of Health.

Countries that conducted the health crisis better had, as one of their strategies, expanded testing for early diagnosis of the disease and monitoring the isolation of cases and contacts. Taiwan, New Zealand and South Korea are some of these countries. By the end of August 2021, Taiwan had a total of 15,926 cases and 828 deaths from COVID-19; South Korea, 237,782 cases and 2,222 deaths; and New Zealand, 3,055 cases and 26 deaths^{23,24}. South Korea, at the very beginning of the pandemic, invested in the rapid development of testing kits for early detection of SARS-COV-2 and in the surveillance and monitoring of cases²³. Taiwan has also invested in extensive population testing and systematized the investigation of detected case contacts. The investigation occurred through the search for information regarding: travel, occupation, contact and agglomeration, called TOCC (initials of the English words Travel, Occupation, Contact and Cluster)²⁴. In addition, high penalty amounts were charged to people who did not comply with the quarantine. This strategy was also used in Hong Kong and South Korea^{23,25}. At the end of August 2020, South Korea was conducting 37,236 tests per million people and Taiwan 3,651 per million people, with a positive case rate of 1.02% and 0.55%, respectively. The number of positive cases per million people in this period was 378 cases in South Korea and 20 cases in Taiwan^{23,24}.

When comparing the number of tests applied per million inhabitants in Brazil with other countries that present nearby socioeconomic realities, such as Peru and Mexico, there is an expansion in the number of cases in a similar way. It is observed that in August 2020, the aforementioned tests maintained around 100 and 50,000 tests per million people, respectively.²⁶ Numerically these data represent high rates when compared to other Latin American countries. However, these means are not

expressive when compared to the average test performed in developed countries, such as Portugal, Italy and the United States, which had an explosion of cases comparable to that occurred in Brazil.

To understand the Brazilian response to the new coronavirus, it must also be observed within the context of Latin American countries. Despite the existence of different public health systems, these nations share similarities regarding inequities in access to health, socioeconomic disparities and political instability. The existence of peripheral population conglomerates, added to political issues that prevent coordinated actions in public health, were determining factors in the low response of some nations, as in the case of Brazil²⁷. In our country, there was a decentralization of public health actions and the absence of a coordinated response at the national level of the health system, despite its universal scope. According to Garcia et al.²⁷, when comparing the speeds of initial measures to contain the virus, it is evident that they are delayed, since other governments, such as Peruvian, Argentine and Colombian, enacted measures of social distancing before Brazil, taking into account that this was the first country to confirm the presence of coronavirus in Latin America.

Regarding state decrees, it was observed when comparing the data obtained with the information conveyed by the bulletins and decrees that the states considered for decision making, in addition to the number of cases, the rate of bed occupancy in the ICUs. The latter was so important that the flexibilization and restriction of activities were based on the capacity of health services and/or forecasting agglomerations. In addition, the regionalization of the measures - with adaptation of these according to the situation of each municipality - was widely used, often creating different situations between them, as in the case of Bahia and Maranhão, in which the rapid advance in the capitals and the subsequent internalization of COVID-19 led to different measures between the capitals and the smaller municipalities. In this sense, Maranhão also differed by the implementation of a plan for the resumption of activities by sectors of the economy, with guidelines centered on state decrees. Alagoas, Rio Grande do Norte and Rio Grande do Sul presented strategies for the resumption of similar economic activities, although initiated in different periods, functioning through the constant classification of their sub-regions according to local pandemic realities.

At the beginning of the pandemic, prior to the emergence of vaccines, non-pharmacological interventions (INFs) to cope with this were considered the best way to prevent and contain the new coronavirus.²⁸ When analyzing the measurement graphs (Figure 1), linked to the reading of state decrees and epidemiological bulletins, it is possible to observe that most states declared a state of public calamity soon after the first recorded cases, then declaring measures of social restriction and the establishment of

official committees to cope with the pandemic in March. As for the measures taken by the Federal Government, on March 20, 2020, a public calamity is declared, almost 30 days after the confirmation of the first case on February 26, 2020.

This rapid response of the states may be related to a previous planning based on the observation of the experience of other regions of the globe. Thus, the divergence between the actions of federal governance and state governance is emphasized from the Provisional Measure Nr. 926 of March 20, 2020, which assigns to the Presidency of the Republic the decisions on measures of isolation, quarantine, restriction of locomotion and activity of essential services in the context of the pandemic²⁹. This was reviewed by the Supreme Court in April 2020.³⁰

Still related to the initial measures taken by the federative units, the closure of schools and the restriction of non-essential trade were also enacted in March in almost all states of both regions. Piauí and Maranhão, in the Northeast region, stand out, which were anticipated in the measure of closing of public schools, declaring it before the first confirmed case. This pattern was also observed by Schaefer³¹.

Regardless of the coping strategies developed by the states in both regions of the country, Brazil experienced problems little seen in other countries. Although some state leaders downplayed the effects of the virus at the beginning of the pandemic and this has cost thousands of lives in their countries, over time they have adapted their discourse and actions to try to mitigate the pandemic. This did not occur in Brazil. The President of the Republic, in addition to reducing the severity of the pandemic, campaigned against the use of masks, discouraged social distancing, disparaged science and headed a campaign for the use of medicines that were not effective in the treatment of COVID-19. It conflicted with its Minister of Health at the time of the beginning of the pandemic, and at the end of August 2021 Brazil presented its fourth minister only during the pandemic period. At various times of the health crisis, the president did not wear masks and promoted agglomerations, even encouraging popular demonstrations. Currently, a Parliamentary Committee of Inquiry (CPI) is investigating government irregularities, including fake news disseminated by government allies about the pandemic. Some countries have invested heavily in combating fake news, such as Taiwan, which has created an official news channel about COVID-19 and has teamed up with Youtubers to disseminate true news³².

CONCLUSIONS

The measures to cope with coronavirus in Brazil were not uniform between states for several reasons, such as disagreement among government members regarding

decisions related to the pandemic period. Thus, state governments were given autonomy to deal with the confrontation of the pandemic according to their local reality. It is noticed that, initially, the federative units of the Northeast and South regions acted in a similar way with regard to the beginning of restrictive measures, establishment of the emergency situation and public calamity, in addition to decrees ordering the closure of trade and the like. From the second half of 2020, measures to cope with coronavirus were noted, both inter- and intraregionally.

Analyzing in isolation the states with the highest number of cases per 100,000 inhabitants, SC, SE, RS and PR stand out. Also in this area, the states with the lowest incidence were MA, PE, AL and BA. Regarding the number of deaths per 100,000 inhabitants, SC, RS and PR also have high numbers, as well as CE. On the other hand, the lowest rates were perceived in MA, AL, BA and PE, again. However, the values do not represent the local epidemiological reality, and it is necessary to consider the number of tests performed. Similarly, the major obstacle stemming from the different methods of dissemination of this information in each online platform of its respective state should be taken into account, in addition to the problems seen during the period in the feeding of national health data systems, making the results contestable.

According to the data presented, the states that performed the most tests per hundred thousand inhabitants were RS, SC and PR, followed by PI and SE with substantially lower values. On the other hand, BA, MA, PB, CE and AL performed fewer tests in the population. Thus, it cannot be considered that the states with lower incidence of cases and deaths are better leading to the pandemic, since the number of tests proportional to the population was considerably lower in these cases. This may reflect a large underreporting of real cases, with consequent spread of coronavirus and preventive measures not based on epidemiological data reliable to the local reality. The states with the highest lethality were PE, MA, RS, CE, AL and PR. Taking into account the lower testing observed in MA, CE and AL, this could be a factor with a worse prognosis in the face of a pandemic. RS and PR have a high HDI, which makes life expectancy longer and, consequently, present a higher population at risk for negative outcomes. On the other hand, the expressive testing of the population

in these states was highlighted.

Due to the various obstacles encountered in the dissemination of data on state online platforms, making the collection of the same uneven, in addition to the disproportionate testing among the states, considering only epidemiological data to determine the best prevention measures is unfeasible. However, with regard to the measures taken, it was observed in the temporal graphs a more delayed pandemic evolution in the states that maintained the closure of commercial activities for longer periods or return strategies compatible with the epidemiological situation of the subdivisions of each state. As an example, the Southern states will be used: SC reached 200,000 confirmed cases in early September 2020, being one of the states that least restricted its commercial activities throughout the pandemic; in addition, RS and PR, which developed their closing measures according to the epidemiological data of each region of their states, reached the same number of cases after one month. Therefore, it is concluded that large-volume testing is applied so that measures of restrictions on the movement of people are elaborated according to epidemiological data that are more reliable to reality.

The expressive testing approach tied to effective epidemiological surveillance strategies applied in countries such as New Zealand and Taiwan obtained a significant degree of success in controlling the spread of coronavirus. In view of this, it is observed that Brazil faced difficulties in the application of a structured and coordinated epidemiological testing and surveillance strategy at the national level evidenced by the lack of uniformity in the application of the tests and in their distribution, as well as in the dissemination of the results. Therefore, it is evident the lack of centralization in actions, which should be guided by the government and, thus, end up exacerbating regional discrepancies regarding public health outcomes.

Restrictive measures of trade and social distancing should not be based on the capacity of health services to absorb the demands arising from Covid-19. Faced with the biggest health crisis on the planet and Brazil, the mistaken leadership in the country, allied to a Ministry of Health in crisis, never focused on the elimination of the virus, which resulted in the loss of thousands of lives.

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