

Public expenses with hospitalization for the treatment of COVID-19 in maranhão in 2020: Analysis by geoprocessing

Gastos públicos com internações para tratamento da covid-19 no maranhão em 2020: Análise por geoprocessamento
Gasto público con hospitalización para el tratamiento de covid-19 en maranhão en 2020: Análisis por geoprocementamiento

RESUMO

Objetivo: descrever os gastos públicos com internações para tratamento da Covid-19 no Maranhão. Métodos: estudo descritivo, referente aos meses de março e dezembro de 2020, com dados do Sistema de Informações Hospitalares do Sistema Único de Saúde (SIH-SUS). Resultados: No período, ocorreram 19.150 internações hospitalares, sendo 4,9% para tratamento de usuários com coronavírus. O gasto total foi superior a 55 milhões de reais, sendo 83% destinados a serviços hospitalares e 15% a serviços profissionais. Os gastos para o tratamento da covid-19 se distribuíram de forma distinta entre as regiões do Estado. A região de São Luís teve o maior número de internações, maior valor total gasto, maior média de permanência em dias e maior taxa de letalidade. Conclusão: Disparidades nos gastos de internação foram ratificadas entre as regiões do Maranhão, evidenciando a vulnerabilidade e necessidade de estratégias para diminuir as diferenças no acesso, uso e distribuição de recursos do SUS.

DESCRIPTORIOS: Infecções por Coronavírus; Hospitalização; Custos Hospitalares; Gastos Públicos com Saúde; Sistema Único de Saúde.

ABSTRACT

Objective: to describe public spending on hospitalizations for the treatment of Covid-19 in Maranhão. Methods: descriptive study, referring to the months of March and December 2020, with data from the Hospital Information System of the Unified Health System (SIH-SUS). Results: In the period, there were 19,150 hospital admissions, 4.9% for the treatment of users with coronavirus. The total expenditure was over 55 million reais, 83% of which were allocated to hospital services and 15% to professional services. Expenses for the treatment of covid-19 were distributed differently among the regions of the state. The São Luís region had the highest number of hospitalizations, the highest total amount spent, the highest average length of stay in days and the highest fatality rate. Conclusion: Disparities in hospitalization expenses were ratified between the regions of Maranhão, highlighting the vulnerability and need for strategies to reduce differences in access, use and distribution of SUS resources.

DESCRIPTORS: Coronavirus infections; Hospitalization; Hospital Costs; Public Expenditures on Health; Unified Health System.

RESUMEN

Objetivo: describir el gasto público en hospitalizaciones para el tratamiento de la Covid-19 en Maranhão. Métodos: estudio descriptivo, referente a los meses de marzo y diciembre de 2020, con datos del Sistema de Información Hospitalaria del Sistema Único de Salud (SIH-SUS). Resultados: En el período, hubo 19.150 ingresos hospitalarios, el 4,9% para el tratamiento de usuarios con coronavirus. El gasto total superó los 55 millones de reales, de los cuales el 83% se destinó a servicios hospitalarios y el 15% a servicios profesionales. Los gastos por el tratamiento del covid-19 se distribuyeron de manera diferente entre las regiones del estado. La región de São Luís tuvo el mayor número de hospitalizaciones, el mayor monto total gastado, el mayor promedio de estancia en días y la mayor tasa de letalidad. Conclusión: Se ratificaron las disparidades en los gastos de hospitalización entre las regiones de Maranhão, destacando la vulnerabilidad y la necesidad de estrategias para reducir las diferencias en el acceso, uso y distribución de los recursos del SUS.

DESCRIPTORIOS: Infecciones por coronavirus; Hospitalización; Costos de Hospital; Gasto Público en Salud; Sistema Único de Salud.

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1 INTRODUCTION

The SARS-CoV-2 infection has been presenting itself as one of the biggest challenges for health systems around the world. Since its emergence in December 2019 in China, the disease caused by the new coronavirus has already totaled more than 351,862,481 cases and 5,597,941 deaths worldwide, as of January 24th, 2022. In the Brazilian context, data from the Ministry of Health attest to the occurrence of 24,044,255 cases and 623,097 deaths.¹

Covid-19 belongs to the group of acute respiratory infections (ARI), clinical syndromes whose most common infectious agents are respiratory viruses, such as syncytial virus, or bacteria, such as *Streptococcus pneumoniae* and *Haemophilus influenzae*.² Although the majority of people with Covid-19 develop mild or moderate symptoms (80%), about 15% may develop severe symptoms, requiring oxygen support and, about 5% may have the critical form of the disease, with complications such as respiratory failure, sepsis and septic shock, thromboembolism and/or multiple organ failure, including acute liver or heart damage, and require intensive care.³

It should be noted that Brazil is one of the few countries in the Americas to have a free and universal health system, on which approximately 75% of the population

depends exclusively, and which is recognized as one of the most important national public policies.² In the context of the Covid-19 pandemic, the role played by the Unified Health System (SUS) is notorious, especially in hospital care. Bed occupancy rates rose significantly during the first year of the pandemic in Brazil, particularly in Maranhão and Pará, in addition to paying attention to the pressure generated on the health system, it is important to observe and analyze the expenses represented for the SUS and how they were distributed throughout the territory.

An immediate response observed during the course of the pandemic was the increase in health expenditures.⁴ However, in this aspect, the Brazilian scenario is not favorable. Studies have reported that in the last five years the underfunding of the SUS is structural, with no strong political support for allocating greater resources to the system. In the same sense, they show that fiscal changes and the economic crisis have been reducing the amounts available for the SUS.^{5,6}

Conducting research that allows estimating the direct medical-hospital costs demanded becomes essential to support decision-making, with regard to meeting the demands in the services and the development of operational strategies by the national health systems. There is no record in the literature of studies that describe

the costs to the SUS arising from hospital admissions for clinical treatment of users confirmed for Covid-19 in Maranhão. It appears that research on these expenses is still incipient in the literature, although the approach to this theme is extremely relevant to understand the costs to the public health system. Thus, the objective of the present study was to describe public spending on hospitalizations for clinical treatment of users hospitalized with Covid-19 by the SUS in Maranhão, between March and December 2020.

2 METHODS

This is a descriptive study, with secondary data on public spending on hospital admissions for clinical treatment of people diagnosed with Covid-19 in the state of Maranhão from March to December 2020. Data on hospitalizations and their respective costs were collected from the Hospital Information System of the Unified Health System (SIH-SUS), available on the website of the Department of Informatics of the SUS (DATASUS).

The selected hospitalizations had as their main procedure the code 03.03.01.022-3 (treatment of infection by the coronavirus) - which concerns the actions necessary for the clinical treatment of a person hospitalized with a diagnosis of infection by the coronavirus, according to Ordinance No.

245 of March 24, 2020, and in accordance with the Technical Guidelines for the operationalization of the SIH-SUS during the state of public health emergency caused by the coronavirus.

Hospitalization for treatment comprises actions and procedures necessary to stabilize and prevent the worsening of the user's clinical condition. However, such interventions can vary substantially depending on the clinical condition of each user (considering the associated comorbidities and degree of pulmonary impairment), between the clinical protocols adopted by each state and municipality and between the clinical practices adopted.

Maranhão is one of the states belonging to the Northeast region and covers an area of 329,651,495 km², has an estimated population of 7,153,262 inhabitants, with a population density of 21.46 inhab/Km². As for its political-administrative organization, it has 217 municipalities and 19 Health Regions.⁷

The study variables of interest taken from the SIH-SUS included: number of hospitalizations, total value of hospitalizations, value of professional services, value of hospital services, average hospitalization value, average stay (average of total hospitalization days referring to approved AIH in the period). For expenses, the values in reais were considered, and the average stay was recorded in days.

For the tabulation of data from the SIH-SUS, the Microsoft Excel program was used and descriptive statistical analysis was performed. For the elaboration of choropleth maps of the spatial distribution of the variables, the municipalities of Maranhão were used as the unit of analysis, being made using the QGIS software. The cartographic grid was obtained from the website of the Brazilian Institute of Geography and Statistics (IBGE).

The analysis was performed on secondary data, of public access, without the possibility of individual identification of the information. Thus, in compliance with the guidelines of the Resolution of the National Health Council (CNS) No. 466, of December 12, 2012, this research does not

require approval by the Research Ethics Committee.

3 RESULTS

Between March and December 2020, 19,150 hospital admissions were registered in the SIH-SUS, in Maranhão, whose main procedure was the treatment of coronavirus infection, corresponding to a total expense of BRL 55,805,266.75. It is worth considering that 83% of this amount was spent on hospital services and 15% on professional services.

Among all health regions in Maranhão,

it was found that the largest share of expenditures occurred in the region of São Luís, representing about 39.5% of the total, followed by the region of Imperatriz (R\$ 5,251,253.10) and the region of Codó (R\$ 2,961,779.86). The health regions of São Luís and Zé Doca had, respectively, the highest (R\$ 5,181.96) and the lowest (R\$ 1,506.67) average value per hospitalization (Table 1).

Regarding the spatial distribution of expenses (in reais) of hospital admissions for clinical treatment of coronavirus infection, according to the municipality of Maranhão, in the period from March to

Table 1. Expenses (in reais) of hospital admissions for clinical treatment of coronavirus infection according to the health region of Maranhão, from March to December 2020.

| Health Region | Total amount of expense (R\$) | Value of hospital services (R\$) | Value of professional services (R\$) | Average value per hospitalization (R\$) |
|--------------------|-------------------------------|----------------------------------|--------------------------------------|---|
| Açailândia | 2.476.547,45 | 2.021.227,66 | 455.319,79 | 2.151,65 |
| Bacabal | 1.629.336,33 | 1.318.828,45 | 310.507,88 | 1.671,11 |
| Balsas | 2.022.738,54 | 1.668.101,69 | 354.636,85 | 2.393,77 |
| Barra do Corda | 1.606.045,52 | 1.320.780,61 | 285.264,91 | 2.513,37 |
| Caxias | 2.917.233,69 | 2.427.672,62 | 489.561,07 | 3.074,01 |
| Chapadinha | 1.141.342,96 | 923.015,93 | 218.327,03 | 1.775,03 |
| Codó | 2.961.779,86 | 2.483.762,17 | 478.017,69 | 3.933,31 |
| Imperatriz | 5.251.253,10 | 4.328.577,81 | 922.675,29 | 2.506,56 |
| Itapecuru Mirim | 618.831,98 | 494.491,90 | 124.340,08 | 1.513,04 |
| Pedreiras | 2.197.685,82 | 1.764.101,15 | 433.584,67 | 1.631,54 |
| Pinheiro | 1.538.950,70 | 1.251.085,96 | 287.864,74 | 1.881,36 |
| Presidente Dutra | 2.729.612,32 | 2.258.682,05 | 470.930,27 | 2.602,11 |
| Rosário | 252.277,65 | 204.247,30 | 48.030,35 | 1.627,60 |
| Santa Inês | 2.222.902,39 | 1.843.369,02 | 379.533,37 | 2.374,90 |
| São João dos Patos | 706.629,80 | 564.657,13 | 141.972,67 | 1.513,13 |
| São Luís | 22.069.982,02 | 18.640.539,57 | 3.429.442,45 | 5.181,96 |
| Timon | 2.106.216,03 | 1.747.574,31 | 358.641,72 | 2.764,06 |
| Viana | 263.567,60 | 210.973,87 | 52.593,73 | 1.523,51 |
| Zé Doca | 1.092.332,99 | 871.925,75 | 220.407,24 | 1.506,67 |
| Total | 55.805.266,75 | 46.343.614,95 | 9.461.651,80 | 2.914,11 |

Source: Own elaboration based on SIH-SUS data.

December 2020, the municipality of São Luís spent the largest amount on clinical care for patients diagnosed with Covid-19 (R\$ 22,052,610.04), followed by the municipality of Imperatriz (R\$ 4,372. 161.10) while the lowest expenditure was observed in Axixá, Humberto de Campos, São Raimundo do Doca Bezerra and Senador Alexandre Costa – all with an expense of R\$ 1,500.00 (Figure 2).

As for the number of hospitalizations for clinical treatment of Covid-19, it is observed that the health regions of São Luís (n=4259), Imperatriz (n=2095), Pedreiras (n=1347), Açailândia (n=1151) and Presidente Dutra (n=1049), were the ones with more than 1000 hospitalizations for Covid-19 in the state. Regarding the average number of days of hospitalization, the regions with the highest average were: São Luís (10.1 days) and Caxias (7.6 days). On the other hand, the health regions of São João dos Patos (3.6 days) and Chapadinha (4.0 days) had the lowest averages of hospitalization (Table 2).

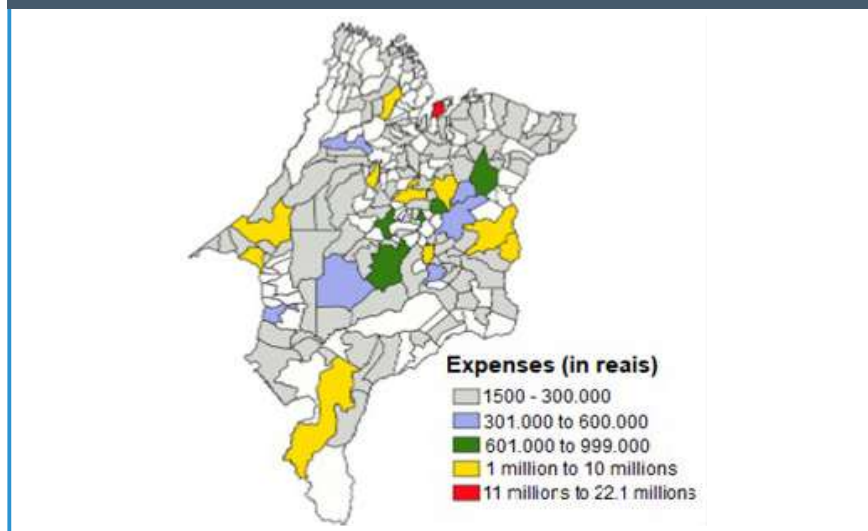
Extending the observation to the municipalities, it was found that São Luís (n=4248), Imperatriz (n=1518) and Caxias (n=882) had the highest number of hospitalizations and Alto Alegre do Maranhão, Santana do Maranhão, Axixá, Humberto de Campos, São Raimundo do Doca Bezerra and Senador Alexandre Costa the smallest (n=1) (Figure 3).

Finally, regarding the average length of stay, in days, of hospital admissions for clinical treatment of Covid-19, it was observed that the only patient hospitalized in the municipality of Humberto de Campos remained in need of clinical assistance for 36 days, representing the highest average stay in the state. The municipalities of Santa Inês and São José de Ribamar had an average of 10.2 days and São Luís 10.1 days. The lowest averages were observed in the municipalities of Matões (1.2 days), Sucupira do Riachão (1.2 days) and Icatu and Cidelândia (1.5 days each) (Figure 4).

4 DISCUSSION

As is known, COVID-19 can present

Figure 2. Spatial distribution of expenses (in reais) of hospital admissions for clinical treatment of coronavirus infection, according to the municipality of Maranhão, March to December 2020.



Source: Own elaboration based on SIH-SUS data.
Note: blank units correspond to the municipality in which there was no expenditure on clinical hospitalization of patients with Covid-19.

Table 2. Number of hospitalizations for clinical treatment of coronavirus infection and average length of stay (in days), according to the health region of Maranhão, from March to December 2020.

| Health Region | Number of hospitalizations for treatment of Covid-19 | Average stay (in days) |
|--------------------|--|------------------------|
| Açailândia | 1151 | 4,7 |
| Bacabal | 975 | 5,2 |
| Balsas | 845 | 6,0 |
| Barra do Corda | 639 | 4,4 |
| Caxias | 949 | 7,6 |
| Chapadinha | 643 | 4,0 |
| Codó | 753 | 6,5 |
| Imperatriz | 2095 | 6,7 |
| Itapecuru Mirim | 409 | 4,2 |
| Pedreiras | 1347 | 7,2 |
| Pinheiro | 818 | 6,3 |
| Presidente Dutra | 1049 | 5,9 |
| Rosário | 155 | 5,4 |
| Santa Inês | 936 | 7,1 |
| São João dos Patos | 467 | 3,6 |
| São Luís | 4259 | 10,1 |
| Timon | 762 | 6,5 |
| Viana | 173 | 4,2 |

as a Severe Acute Respiratory Syndrome (SARS), characterized by a critical symptom that requires hospitalization and/or intensive care. Therefore, there tends to be greater investment in hospital and outpatient care resources, due to the need to acquire equipment and supplies for care and to make beds available through the construction and expansion of hospital units for the care of severe cases.⁸

In addition, the financial investment in a lower percentage in human resources in the context of the COVID-19 pandemic can impact the health area, since a lower professional qualification harms the progress of health care, since the emergency situation demands a greater number of professionals trained to provide care.^{2,8}

In this study, the results showed that public spending on hospital admissions for the treatment of Covid-19 was distributed differently among the health regions of Maranhão.

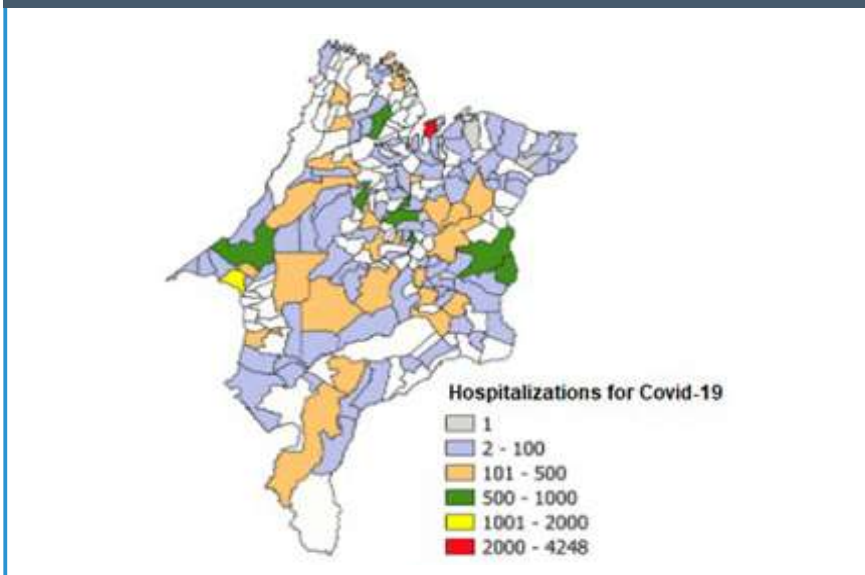
Taking into account the number of hospitalizations for clinical treatment of people infected with the coronavirus from March to December 2020, in Maranhão, the impact that such hospitalizations generate on the state health system is evident. Although hospitalizations paid for by the SUS do not represent the totality of cases that require hospitalization (since in Brazil there is a supplementary health system – private hospitals), the character of progressive evolution with which the clinical picture of the infected person unfolds gives great coverage of assistance to the SUS for these hospitalizations. Geographical variations around the average amount paid for hospitalization in Maranhão, evidenced by the significant differences in expenditures between the 19 health regions, were also reported in other studies.^{9,8}

The literature indicates that the average cost of hospitalization for Covid-19 is higher when compared to that of all causes of hospitalization and, more specifically, when compared to cases of treatment for pneumonia or influenza. This fact allows us to affirm that hospitalizations for the clinical treatment of Covid-19 are more expensive than those for other causes, cer-

| | | |
|--------------|--------------|------------|
| Zê Doça | 725 | 4,6 |
| Total | 19150 | 6,8 |

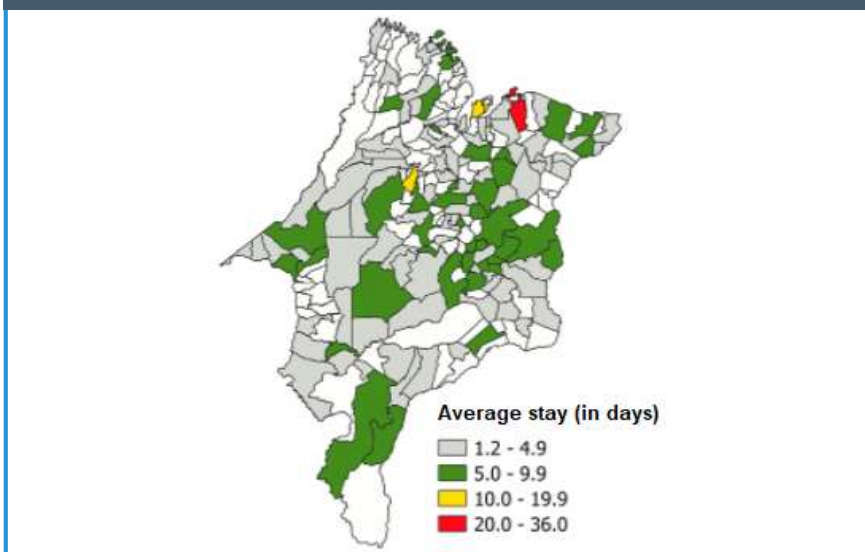
Source: Own elaboration based on SIH-SUS data.

Figure 3 – Spatial distribution of the number of hospital admissions for clinical treatment of coronavirus infection, according to the municipality of Maranhão, March to December 2020.



Source: Own elaboration based on SIH-SUS data.
Obs.: blank units correspond to municipalities where there was no clinical hospitalization of patients with Covid-19.

Figure 4 – Spatial distribution of mean length of stay (in days) of hospital admissions for clinical treatment of coronavirus infection, March to December 2020.



Source: Own elaboration based on SIH-SUS data.
Obs.: blank units correspond to the municipality in which there was no clinical hospitalization of patients with Covid-19.

tainly due to the need for oxygen support and intensive care that patients need due to the progression of the clinical condition. However, it is necessary to emphasize that the variations between the average value of hospitalization and the average length of stay result from socioeconomic, epidemiological and demographic factors, which determine the profile of hospital demand by the SUS, in addition to public health care policies.^{8,9}

In the current scenario, fiscal austerity measures and revenue restriction at the federal level, which are the main source of funds for the execution of services in the SUS, are also pointed out as an obstacle in the current scenario. Even with the transfer of federal resources to states and municipalities in the face of the public health emergency that is the Covid-19 pandemic, recent regulatory changes in the financing of actions, with the absence of discretion in the application of resources by state and municipal federated entities, have intensified regional inequality in the provision of actions and services by the SUS, including outpatient and hospital care. Constitutional Amendment (EC) No. 95, approved in 2016, which established a spending ceiling for the Federal Government, caused the SUS to lose almost 22.5 billion reais between 2018 and 2020. In this aspect, the pandemic imposed new challenges on the system, due to the characteristics of community transmissibility of the disease and the higher cost of hospitalizations, as observed in this research.^{2,8,10,11}

It is known that most of those infected by Covid-19 have an asymptomatic or oligosymptomatic clinical picture. However, around 15% of diagnosed cases progress to a condition that requires hospitalization and/or oxygen therapy, and 5% require hospitalization in Intensive Care Units (ICU) requiring ventilatory support.³ Factors such as age structure, population mobility, percentage of people in situations of vulnerability and prevalence of comorbidities are factors that can contribute to the evolution of more severe conditions of infection by Sars-CoV-2. In addition, it is also worth mentioning the effects of the coping

measures applied by each municipality, which are directly related to the incidence of cases.^{2,8,12}

The inequalities observed in this research in relation to public expenditures for the treatment of Covid-19 constitute historical differences in the capacity and coverage of the health system. In this research, the São Luís health region had the highest number of hospitalizations and the highest total expenditure for hospitalizations for the

The literature indicates that the average cost of hospitalization for Covid-19 is higher when compared to that of all causes of hospitalization and, more specifically, when compared to cases of treatment for pneumonia or influenza.

treatment of coronavirus infection, these findings are possibly related to the higher numbers of infected people concentrated in this region and the greater availability of beds.

It is essential to analyze the gaps in the process of standardization of clinical and

care practices and to elucidate the difficulties and differences found in each location that justify such disparities. In addition, it is a challenge for the state health system to list which strategies, in the medium and long term, can be implemented with a view to reducing differences in access, use and distribution of resources, aiming to reduce the financial impact on the public health system bills.

Authors¹¹ indicate that the SUS funding model was not modified in view of the needs to face COVID-19. In the national context, the logic of preexisting inequality and the political bias are repeated, as already documented by other authors.¹³⁻¹⁶ Even with the magnitude of the crisis imposed by the pandemic, there was no qualitative change in the design of the funding rules, which also intensified the problems of underfunding. It is true that there were adjustments in the rules of application in the blocks of financing to allow more agility in the adaptation of the structure of confrontation and release of resources. However, compared to measures taken by other countries, strongly coordinated actions in Brazil seem to be insufficient in the face of the challenge faced by its society.¹¹ It is reiterated that the set of economic policies aimed at the essential areas of health, science and technology, education and social protection, must be reviewed in order to increase the protection of the population.¹⁷

5 CONCLUSION

It was identified that public spending resulting from hospitalizations for the treatment of coronavirus infection, between March and December 2020, cost more than 55 million reais. The data presented allow us to conclude that hospitalizations for this purpose were more expensive in the region of São Luís.

New studies with cost analyzes that consider other approaches are needed to monitor the long-term economic impact of the pandemic on the state health system, in addition to building and executing responses that consider local, social and demographic characteristics.

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