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# COPING WITH COVID-19 BY MUNICIPALITIES WITH LOW HDI IN MARANHÃO: A RESILIENT RESPONSE?

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## ABSTRACT

This article aimed to analyze the response of the poorest municipalities in the state of Maranhão to the COVID-19 pandemic, from the perspective of resilience. This is an ecological, observational and analytical study. The data were extracted from the original research "Facing the COVID-19 pandemic: reorganization of the Health Care Network in Maranhão", in 2021 and DATASUS of the Ministry of Health, 2021. The results indicated that 97% of the municipalities had coverage of Family Health Strategy teams, from 80 to 100%, and 57% of these exclusively offer PHC services; 100% registered suspected and confirmed cases of Covid-19; 97% have adopted measures to contain the transmissibility of the virus and implemented a flow of care for suspected and confirmed cases of Covid-19. The response of the municipalities indicates that PHC was active, although it has weaknesses in support and logistical support. Actions of the governance system were

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verified with the implementation of restrictive measures with community participation. No significant correlations were found between HDI-M and the outcome of confirmed cases. The results suggest that the poorest municipalities in the state responded resiliently to the COVID-19 pandemic.

**Keywords:** Human Development Indicators. COVID-19. Health Care Networks.

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## INTRODUCTION

The COVID-19 pandemic, caused by the SARS-CoV-2 virus, began in Wuhan, China, in December 2019 (PAHO, 2020).

The pandemic crisis has taken on unimaginable proportions, the world has had to reinvent itself. Systems had to reorganize themselves to face the pandemic crisis, being severely tested in their ability to respond to the magnitude of the pandemic, in a resilient way. As a result, the term resilience has been highlighted in studies on health systems' capacities to prepare, adapt, and transform in crisis situations (BISPO JUNIOR, 2022).

Several scientific studies have already proven the close relationship between social development and the health of a population, as shown by Bucchianeri (2010) when assessing the incidence of H1N1 and socioeconomic conditions in Hong Kong, China. Albuquerque *et al.* (2017) revealed a strong association between socioeconomic development and the health conditions of the Brazilian population and its regions. Thus, poverty, inequality, and social determinants of health create conditions for the transmission of infectious diseases, and existing health inequalities can contribute to unequal burdens of morbidity and mortality (WHO, 2012).

The term resilience has originally been used by engineering and physics to refer to the ability of bodies to return to their original shape, denoting flexibility, after suffering abrupt shocks. The concept is also widely used by Psychology to refer to individual and/or group characteristics of overcoming after traumatic events (LOBATO, 2022; BRANDÃO; MAHFOUD; GIANORDOLI-NASCIMENTO, 2011).

For the WHO, the concept of resilience corresponds to "the capacity of the health system to prepare, manage (absorb, adapt and transform) and learn from a sudden and extreme disruption" such as the COVID-19 pandemic (THOMAS *et al.,* 2020). For this, it is not enough to respond to the crisis, it is necessary to develop the capacity to face future crises. Pap smears *et al.* (2022) and Topp (2020) understand resilience as a characteristic associated with the main functions of the health system, which is in line with the conception adopted by the WHO (2010) for the analysis of the functions of health systems and which has been used to analyze characteristics of resilience in several countries (HALDANE *et al.,* 2021). This model, called building *blocks*, has the following components: service delivery, strategic health products, workforce, health information, leadership and governance, financing.

The application of the concept of resilience in the area of public health is relatively

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new, and there is no single definition. There are authors who understand resilience beyond overcoming a shock or traumatic situation, but that it necessarily has to result in a situation of improvement in relation to the previous situation (BRANDÃO; MAHFOUD; GIANORDOLI-NASCIMENTO, 2011). Considering these aspects, scholars expand the concept of resilience by adding aspects to assess resilient capacity such as: social vulnerability, Social Determinants of Health (SDH), financing, the role of Primary Health Care in the functions and components of health systems, in addition to community participation in all health system activities (HALDANE *et al.,* 2021; BHANDARI; ALONGE, 2020; JATOBA; CARVALHO, 2022).

Taking as an example the Brazilian Unified Health System (SUS), which is universal, regionalized, Jatobá and Carvalho (2022) reinforce these aspects, as they highlight the continental dimension of the country, marked by regional disparities and deep social inequalities, in which the SUS is routinely tested in its ability to respond resiliently not only in situations of extreme crises such as the COVID-19 pandemic, but above all in the daily challenges to meet the demands and health needs of the population.

Maranhão, one of the states in the northeast of Brazil, occupies the penultimate place, among the states, in relation to the Human Development Index (HDI). In the income indicator, Maranhão is in last place, with an index of 0.612 (UNDP, 2013).

Twenty-three (23) cities in Maranhão are among the one hundred (100) cities in Brazil with the worst HDI, but among the 200 Brazilian cities with the best HDI, none is from Maranhão. Of the 217 municipalities, about 140 have a low HDI. Thus, while the extreme poverty rate has fallen to 6% in the country, in Maranhão this condition still affects more than 20% of the population. About 60% of households in Maranhão are at some level of food insecurity (IBGE, 2013).

To face this situation, which precedes the COVID-19 pandemic, in 2015 the state government created through Decree No. 30612/2015 the "More HDI Action Plan" (MARANHÃO, 2015). This plan was the government's main program to combat extreme poverty and social inequalities in the state. It consists of programs and projects in different areas of social and economic development.

The municipalities that participate in the project are the 30 municipalities in the state with the lowest HDI, namely: Afonso Cunha, Água Doce do Maranhão, Aldeias Altas, Amapá do Maranhão, Araioses, Arame, Belágua, Brejo de Areia, Cajarí, Centro Novo do Maranhão, Conceição do Lago Açu, Fernando Falcão, Governador Newton Bello, Itaipava

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do Grajaú, Jenipapo dos Vieiras, Lagoa Grande do Maranhão, Marajá do Sena, Milagres do Maranhão, Pedro do Rosário, Primeira Cruz, Santa Filomena, Santana do Maranhão, Santo Amaro do Maranhão, São Francisco do Maranhão, São João do Carú, São João do Soter, São Raimundo do Doca Bezerra, São Roberto, Sabutinha and Serrano do Maranhão (MARANHÃO, 2021).

In March 2020, the state had the first confirmed case of COVID-19, which led health authorities to be on alert and immediately vigilant. It was one of the Brazilian states that adopted several initiatives independently of the federal government, to control the advance of the disease and the collapse of the hospital network (MARANHÃO, 2020). It is known that with the COVID-19 pandemic there was a deepening of inequalities and that the poorest were severely impacted (BÓGUS; MAGALHÃES, 2022).

Studies on the resilience of health systems in response to the COVID-19 pandemic have been carried out in several countries, but in relation to the SUS this characteristic has been little analyzed (BISPO JUNIOR, 2022). In this sense, the present study intends to analyze the response of the poorest municipalities in the state of Maranhão and Brazil, in the face of the COVID-19 pandemic, from the perspective of resilience.

## METHODOLOGY

This is an ecological, observational and analytical study, carried out in 30 municipalities in the state of Maranhão, with low HDI.

Maranhão has a territorial area of 329,651.495 km2 distributed in 217 municipalities, with more than 60% of the 7,153,262 inhabitants living in urban areas. The state has an HDI of 0.639, occupying the 26th in the ranking among the states of the Federation. More than 70% of the municipalities have a low Human Development Index (HDI), that is, less than 0.599 (UNDP, 2021). It has three macro-regions: North (MCR-North); South macro-region (MCR-South); and East macro-region (MCR-East) (MARANHÃO, 2021).

The state has a program called "More HDI", which consists of an action plan in various areas of development, aimed at the 30 municipalities with the lowest HDI, among others. The study sample consisted of these 30 municipalities with a total of 443,535 inhabitants, corresponding to 6.2% of the total population of the state (IBGE, 2021). These municipalities were included in the program because they have a low and very low HDI-M as shown in Chart 1.

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**Chart 1** - Classification of municipalities according to HDI-M.

| Municipality | HDI M – ~ classification | Municipality | HDI M – classification |
|---|---|---|---|
| Afonso Cunha | 0.529 – low | Jenipapo dos Vieiras | 0.490 – very low |
| Fresh water from Maranhão | 0.500 – low | Lagoa grande do Maranhão | 0.502 – low |
| High Villages | 0.513 – low | Maharaja of the Seine | 0.452 – very low |
| Amapá do Maranhão | 0.520 – low | Miracles of Maranhão | 0.527 – low |
| Araioses | 0.521 – low | Pedro do Rosário | 0.516 – low |
| Wire | 0.512 – low | First Cross | 0.512 – low |
| Belagua | 0.512 – low | Santa Filomena do Maranhão | 0.525 – low |
| Brejo de Areia | 0.519 – low | Santana do Maranhão | 0.510 – low |
| Cajari | 0.523 – low | Santo Amaro do Maranhão | 0.518 – low |
| New Center of Maranhão | 0.518 – low | São Francisco do Maranhão | 0.528 – low |
| Conceição do Lago Açu | 0.512 – low | São João do Caru | 0.509 – low |
| Fernando Falcão | 0.443 – very low | São João do Sóter | 0.517 – low |
| Governor Newton Bello | 0.521 – low | São Raimundo do Doca Bezerra | 0.516 – low |
| Itaipava do Grajaú | 0.518 – low | Saint Robert | 0.517 low |
| Serrano do Maranhão | 0.529 – low | Satubinha | 0.493 – very low |

**Source:** Maranhão (2021).

The variables related to the components of the RAS originated from the research "Facing the COVID-19 pandemic: reorganization of the Health Care Network in Maranhão" (VIANA, 2023), carried out in 2021 in 198 municipalities out of a total of 217 in the state. The research aimed to analyze the State's response to the pandemic based on the structure of the Health Care Network (RAS). The following were considered for analysis:

1) The responses of the 30 municipalities regarding the components of the operational structure of the RAS: APS; secondary and tertiary care points; support systems; logistics systems; and governance system (MENDES, 2011). For the purpose of adjustments, a correspondence was established between the components of the Operational Structure (EO) of the RAS with the components of the structuring blocks, as follows: PHC: provision of services and workforce (variables: ESF population coverage; identification of the population by health conditions; services offered, updating of the population's registration by the ESF); logistical and support system (variables: scheduling and receiving test results at the Basic Health Units (UBS), presence of Electronic Medical Records at the UBS, distribution of medications); strategic products for health and health information (variables: testing of the population, registration of suspected and confirmed cases of COVID-19, distribution of Personal Protective Equipment (PPE) to the population); governance

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and leadership system, governance (variables: technical notes and inspection Health Surveillance, measures such as lockdown, decrees prohibiting agglomerations, campaigns for the use of PPE, reduction of the flow of people, sick leave of workers with comorbidities and over 60 years of age) financing (Due to the fact that we did not find official data on financing in the period, it was considered that this block is embedded in the leadership and governance block, since for decision-making for the confronting COVID-19, necessarily involves the contribution of resources).

2) The outcomes of COVID-19 cases occurred in the municipalities during the research period.
3) The role of PHC, through the Family Health Teams (FHS) in the municipalities related to the period surveyed.

To this end, it is based on the concept of resilience adopted by the WHO, considering the context of social vulnerability and the role of PHC in facing the COVID-19 pandemic (THOMAS *et al.,* 2020).

The data obtained were organized, checked and coded in an Excel spreadsheet. The component variables of the RAS were presented by means of absolute and relative frequencies. To analyze the outcomes, the following were calculated:

$$\text{Confirmed cases per 100,000 inhabitants} = \frac{\text{confirmed cases} \times 100{,}000}{\text{total population}}$$

$$\text{Confirmed deaths per 100,000 inhabitants} = \frac{\text{confirmed deaths} \times 100{,}000}{\text{total population}}$$

$$\text{Fatality rate} \quad \frac{\text{confirmed deaths} \times 100}{\text{Confirmed cases}}$$

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The correlation between confirmed cases and deaths per 100 thousand inhabitants and the lethality rate was performed using Pearson's correlation (r).

## RESULTS

Table 1 presents the results regarding components of the RAS structure that were answered by the municipalities surveyed. Among the 30 municipalities, 97% had FHS population coverage of 80 to 100%.

In addition, 99.7% of the municipalities claim to identify and stratify the population assisted by the UBS by health condition (hypertensive, diabetic, pregnant women, etc.). However, 73% updated the registration of the population under the responsibility of the ESF in 2021 and 20% in 2020.

Regarding the supply of services, 43% of the municipalities with the low HDI-M in Maranhão have medium complexity services and 57% offer exclusively services at the primary care level. Regarding the support systems and logistical system of the municipalities studied, only 44% provide scheduling for complementary exams (x-ray, blood count, EAS I, etc.) in the UBS themselves.

Of the 30 municipalities, only 02 stated that they had Electronic Medical Records in the UBS, and only one of these municipalities stated that they had medical records available in all offices.

It is noted that 100% of the municipalities carried out some registration or registration, but there was no standardization and different instruments were used by the same municipality. However, the majority (80%) registered using the notification form.

Only 33% of the municipalities carried out diagnostic tests. In addition, 67% of the municipalities claimed to provide some PPE (masks and hand sanitizer) to the general population and 97% of the municipalities distributed PPE to health workers. Among the support measures, 60% distributed early pharmacological treatment kits (covid-kit).

**Table 1** - Variables corresponding to the operational structure of the RAS. APS, support, logistical and governance systems. Municipalities "More HDI" Maranhão. Brazil, 2021.

| Component | Aspects | N | % |
|---|---|---|---|
| APS | ESF population coverage | | |
| | 50 a 80 % | 01 | 3% |
| | 80 a 100% | 29 | 97% |
| | Population Registry by Cond. Health | | |
| | Yes | 29 | 97% |
| | No | 00 | |
| | I don't know how to answer | 01 | 3% |

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| | | | |
|---|---|---|---|
| | Registration update of the SOP under the responsibility of the ESF | | |
| | 2021 | 22 | 73% |
| | 2020 | 06 | 20% |
| | 2010 | 02 | 7% |
| | Services offered by the municipality | | |
| | Primary care only | 17 | 57% |
| | Primary and medium complexity care | 13 | 43% |
| | COVID-19 suspected patient flow | | |
| | Yes | 29 | 97% |
| | No | 01 | 3% |
| | Home isolation; Guidance Use of masks, sanitization, social distancing | 29 | 97% |
| | Attend UBS in the face of more severe symptoms; Social distancing | 29 | 97% |
| | Fluxo confirmed COVID-19 patient | | |
| | Yes | 29 | 97% |
| | Mild cases - consultation at UBS and home treatment | 29 | 97% |
| | Didn't adopt flow or didn't know how to answer | 01 | 3% |
| | Yes, moderate cases – hospital admission | 12 | 40% |
| | Yes, serious cases transfer to a reference municipality | 18 | 60% |
| SUPPORT AND LOGISTICS SYSTEMS | Scheduling complementary exams at the UBS | | |
| | Yes, in some | 08 | 27% |
| | Yes, in all | 05 | 17% |
| | No | 16 | 53% |
| | I don't know how to answer | 01 | 3%% |
| | Delivery of results of complementary exams at the UBSs | | |
| | Yes | 13 | 44% |
| | No | 17 | 56% |
| | Electronic Medical Records in the UBSs | | |
| | Yes, in all offices | 01 | 3% |
| | Yes, in a room for all teams | 01 | 3% |
| | No | 28 | 94% |
| | Population Testing | | |
| | Yes | 10 | 33% |
| | No | 20 | 67% |
| | Types of registration for suspected and confirmed COVID-19 patients | | |
| | Notification form | 24 | 80% |
| | Medical records, e-SUS + notification form | 30 | 100% |
| | Distribution of PPE (mask, alcohol gel) to the population | | |
| | Yes | 10 | 67% |
| | No | 20 | 33% |
| | Distribution of PPE (mask, alcohol gel) for health workers | | |
| | Yes | 29 | 97% |
| | No | 01 | 3% |
| | Distribution of drugs for early treatment (covid kit) for suspected and confirmed patients | | |
| | Yes | 18 | 60% |
| | No | 12 | 40% |
| GOVERNANCE SYSTEM | Strategy | | |
| | Lockdown | 11 | 37% |
| | Municipal decrees prohibiting agglomerations | 28 | 94% |
| | Campaigns for the use of PPE | 28 | 94% |
| | Prohibition of access in certain areas | 20 | 67% |
| | Surveillance | 28 | 94% |
| | Reduction of the flow of people in establishments/commerce | 29 | 97% |
| | Leaves of workers over 60 years of age and/or with comorbidities | 29 | 97% |

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| | | | |
|---|---|---|---|
| | (public and private sector) | | |
| | I don't know how to answer | 01 | 3% |

**Source:** Adapted from Viana (2023).

The data from the governance system showed that more than 90% of the municipalities supported their actions in technical notes from the State Health Surveillance and Ministry of Health; 96% adopted inspection methods in businesses to control the flow of people and use masks. In addition, 97% implemented a flow of care for suspected and confirmed COVID-19 patients, and this flow basically consisted of the following actions: seeking care at the UBS in mild cases followed by guidance for social isolation and use of PPE, and referring severe cases to the appropriate levels of care according to the reference municipality.

Table 2 presents data regarding the epidemiological outcomes of COVID-19 (confirmed cases / 100 thousand inhabitants; confirmed deaths / 100 thousand inhabitants; lethality rate).

**Table 2** - Cases, confirmed deaths from COVID-19, tx. of lethality by municipality. Municipalities "More HDI". Maranhao. Brazil, 2021.

| Municipalities | Confirmed cases/ 100 thousand inhabitants | Confirmed deaths/ 100 thousand inhabitants | Case fatality rate |
|---|---|---|---|
| Afonso Cunha | 4093 | 31 | 0,75 |
| Água Doce do Maranhão | 5481 | 72 | 1,31 |
| Aldeias Altas | 3682 | 53 | 1,43 |
| Amapá Do Maranhão | 2471 | 57 | 2,32 |
| Araioses | 1479 | 32 | 2,18 |
| Arame | 4780 | 128 | 2,68 |
| Belagua | 5530 | 54 | 0,96 |
| Brejo de Areia | 3483 | 120 | 3,43 |
| Cajari | 1455 | 41 | 2,83 |
| Centro Novo do Maranhão | 5356 | 60 | 1,12 |
| Conceição do Lago Açu | 1829 | 68 | 3,70 |
| Fernando Falcão | 8301 | 19 | 0,23 |
| Governador Newton Bello | 7937 | 98 | 1,23 |
| Itaipava do Grajaú | 6477 | 81 | 1,25 |
| Jenipapo dos Vieiras | 6982 | 133 | 1,90 |
| Lagoa Grande do Maranhão | 2431 | 88 | 3,61 |
| Marajá do Sena | 3350 | 90 | 2,68 |
| Milagres do Maranhão | 2824 | 0 | 0 |
| Pedro do Rosário | 449 | 32 | 7,07 |
| Primeira Cruz | 535 | 13 | 2,43 |
| Santa Filomena do Maranhão | 656 | 13 | 1,96 |
| Santana do Maranhão | 1584 | 52 | 3,30 |
| Santo Amaro do Maranhão | 2007 | 44 | 2,20 |
| São Francisco do Maranhão | 3423 | 188 | 5,50 |
| São João do Caru | 3460 | 57 | 1,64 |
| São João do Sóter | 6795 | 32 | 0,47 |
| São Raimundo do Doca | 3132 | 57 | 1,82 |

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| | | | |
|---|---|---|---|
| Bezerra | | | |
| São Roberto | 11267 | 74 | 0,66 |
| Satubinha | 2501 | 22 | 0,87 |
| Serrano do Maranhão | 2029 | 49 | 2,40 |

**Source:** Prepared by the Authors (2024).

The municipality of São Roberto (HDI-M 0.517) had the highest number of confirmed cases per 100 thousand inhabitants and the municipality of São Francisco do Maranhão, (HDI-M 0.528), had the highest number of confirmed deaths per 100 thousand inhabitants.

Milagres do Maranhão (HDI-M 0.527) was the only municipality that did not record any deaths from COVID-19 in the period studied. Probably the residents of this municipality had their death records in another municipality. Regarding the lethality rate, the municipality with the highest value was Pedro do Rosário (HDI-M 0.516).

Finally, when analyzing the Pearson correlation (r) of the epidemiological variables mentioned with the HDI-M, as shown in Table 3, a non-zero and negative correlation was found between confirmed cases of COVID-19 per 100 thousand inhabitants (r=-0.252, p=0.179), confirmed deaths from COVID-19 per 100 thousand inhabitants (r=-0.004, p=0.984) and a non-zero correlation, but positive in relation to the lethality rate. (r=0.142 and p=0.454). All the correlations performed in the present study are at the weak correlation level according to Cohen (1988) because they are between the interval 0.11 and 0.29. However, these results had p > 0.05, thus not presenting statistical significance.

**Table 3** - Pearson's correlation between HDI-M and COVID-19 outcomes. Municipalities "More HDI". Maranhao. Brazil, 2021.

| | | Confirmed cases/ 100 thousand inhabitants | Confirmed deaths/ 100 thousand | Case fatality rate |
|---|---|---|---|---|
| **IDH-M** | **Pearson's correlation (r)** | -0,252 | -0,004 | 0,142 |
| | **(P)** | 0,179 | 0,984 | 0,454 |
| | **(N)** | 30 | 30 | 30 |

**Source:** Prepared by the Authors (2024).

When placing these measurements in a graph, as shown in Figure 1, it is clear that there is no trend of linearity, showing the absence of correlation between the variables.

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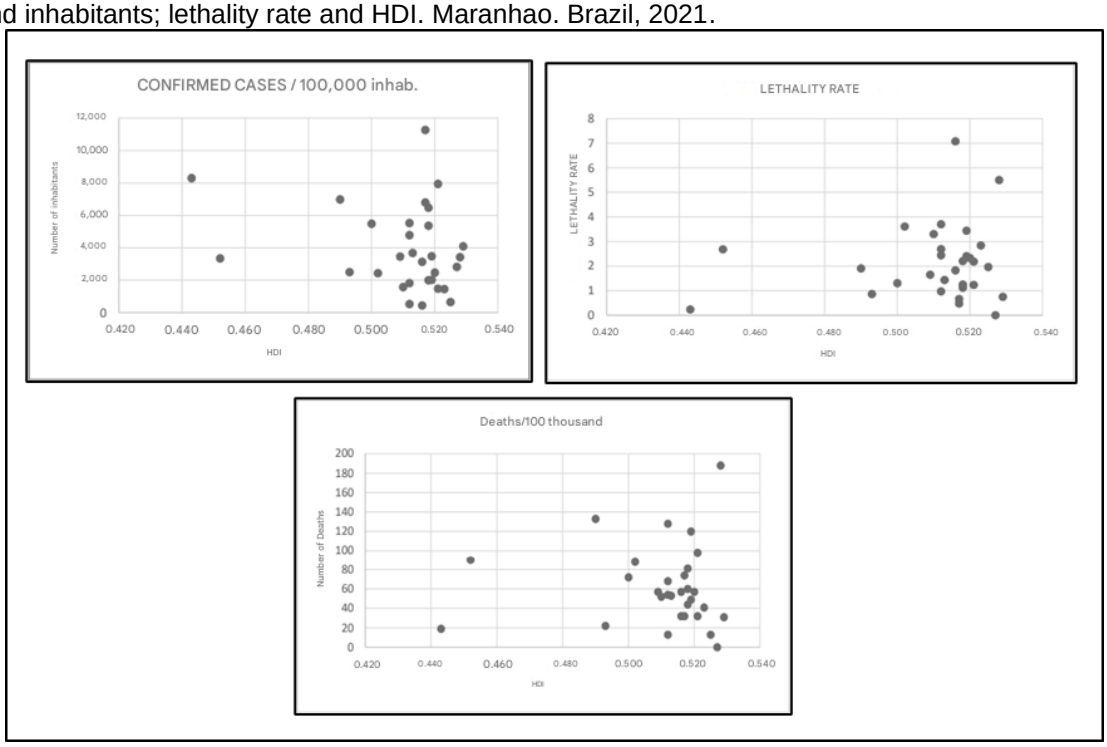
**Figure 1** - Relationship between confirmed cases / 100 thousand inhabitants; confirmed deaths / 100 thousand inhabitants; lethality rate and HDI. Maranhao. Brazil, 2021.




**Source:** Prepared by the Authors (2024).

## DISCUSSION

By analyzing the data, it was found that the PHC of the municipalities developed actions focused on organizing the flow and registration of suspected and confirmed cases, in addition to registering the population by health conditions. Among the guidelines of the National Primary Care Policy, such actions are expressed in the coordination of care, which consists of the elaboration and monitoring of the flows of these users, while articulating and coordinating communication between the different points of care in the RAS (BRASIL, 2017).

According to the Viana study (2023), there was an implementation of 69% in the number of family health teams in the municipalities of the state, until August 2021, compared to the period of December 2019. In relation to the municipalities surveyed, all had expansion, with coverage of 100% or very close, except for one municipality that, even expanding, had coverage of less than 80%. As these are municipalities with characteristics of social vulnerability, it is recommended that the increase in the number of teams should reach 100% population coverage (NEVES *et al.,* 2018). It is noteworthy that in relation to the attributions of the FHS, registering the population by health condition, was carried out by almost all municipalities, except for the one that had FHS coverage below 80%. These data are in line with the research carried out by Neves *et al.* (2018), which showed that the

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population coverage of the FHS in Maranhão evolved from 73.5% to 80.2% from 2006 to 2016, with an increasing trend. The survey carried out in the state, which served as the basis for this work, also revealed this percentage in 98% of the municipalities in MA. In addition, it demonstrated that the increase in the number of family health teams occurred significantly during the pandemic period, covering all municipalities with low HDI. Massuda *et al.* (2022), in a study on resilience, highlights the role of PHC in improving the population's access to health services, with positive impacts on reducing inequalities. Researchers report experiences of countries that focused on PHC and the community to face the pandemic, and that had better results compared to others (HALDANE *et al.,* 2021; BHANDARI; ALONGE, 2020).

Scenarios of inequalities are expressed in various ways and when it comes to public health, through the intense fragmentation of actions and services that hinders access and has repercussions on the integrality of care (ALBUQUERQUE *et al.,* 2017). Most of the municipalities studied do not schedule complementary exams at the UBS, and also do not deliver the results, which probably leads patients to travel to other municipalities, increasing waiting time and making access difficult (MAGNO *et al.,* 2020).

It is possible that this situation may reflect the supply of services in these municipalities, where about 40% only have a medium complexity structure. The supply and delivery of services is one of the functions of the health system included in the concept of resilience, as well as community involvement (PAPANICOLAS *et al.,* 2022; TOPP, 2020). In the case of municipalities with a predominance of exclusive primary care offer, and remembering that PHC in Brazil is community-centered, the actions were directed to this level of care in the fight against the pandemic.

The measures related to the support and logistics systems have weaknesses, such as the low testing of the population, since the present study revealed that most of the municipalities studied tested less than 20% of the population. It is known that widespread population testing was crucial in combating the pandemic in countries such as Singapore, Hong Kong, New Zealand, and even Italy, after the initial collapse of their health system (MAGNO *et al.,* 2020).

However, the limitations for the diagnosis and screening of COVID-19 in Brazil were extensive, and lay in the testing techniques used, which require infrastructure with an adequate level of biosafety, the difficulty of obtaining supplies in the face of a global health crisis, the dependence on the importation of many materials, and the clinical manifestation

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of the disease itself, since 80% of cases are asymptomatic or oligosymptomatic (WHO, 2020). It is reasonable to infer that the fact that they are the poorest municipalities within a state with one of the worst HDI in the federation contributed to the low supply of testing methods for the population (COSSA *et al.* 2021).

The municipalities under analysis focused their actions to respond to the demands by complying with guidelines from the Ministry of Health. In this sense, 100% of them carried out some registration of suspected and confirmed patients, 97% implemented a flow of care for these patients, which consisted mainly of home isolation, use of protective masks; hand hygiene, social distancing, presentation at the UBS for mild cases and referral of cases considered severe to municipalities with care capacity for more complex cases (BRASIL, 2020).

Regarding the records of information, most municipalities used the Notification Form and in some cases, manually, so as not to lose the information. This fact suggests the existence of internet connection problems, or even the absence of connectivity, which has been common in small municipalities, especially in the northeast region (GIOVANELLA *et al.,* 2022).

For PHC to become resolute, the ESF needs to have logistical support and support for its actions, which requires investment in the digital area. Health information as one of the functions of the health system, in this study is deficient, as observed in the absence of the Citizen's Electronic Medical Record (PEC), which was not implemented in most municipalities and has repercussions on the storage of the patient's clinical information that can be shared by professionals for decision-making on a given case.  and in the organization of the flow of care, so necessary in the fight against the COVID-19 pandemic (ALVES *et al.,* 2021).

One of the support measures adopted by 60% of the municipalities studied was the distribution of drugs for early treatment that make up the "covid-kit". It was not asked about the period in which such distribution occurred. However, the scientific community recommended not using this kit due to lack of scientific proof of its efficacy proven in the literature. Such action results in the waste of public resources, which could have been used in greater testing of the population, in addition to the exposure of Maranhão residents to potential risks of irregular use of ineffective medications (SANTOS-PINTO *et al.,* 2021).

Governance actions have the role of facilitating the functions of the health system and its articulations with other systems and socio-political contexts (WHO, 2021). The

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pandemic became an example, which although it constituted a public health problem, given its magnitude, its confrontation required articulation with all other sectors. Even in conditions of vulnerability, the response of the municipalities in the study demonstrated that there was a strengthening of PHC, and that governance actions were essential for controlling the pandemic, since there was no availability of more complex structures to care for the affected people. Thus, despite the denialist position of the Federal Government, the state was the first to institute the lockdown in areas of higher population density, with a retraction of flows of people. This measure impacted all municipalities, as it involves the capital that concentrates most of the flow of people in the state. All 30 municipalities have drafted decrees prohibiting agglomerations, reducing the flow of people in establishments, removing workers belonging to the risk group, among other measures already mentioned (AQUINO *et al.,* 2020; KERR *et al.,* 2020).

Although there is no universal concept of health system governance, it is decisive to know whether health systems are resilient in the face of a situation of shock or abrupt crisis (WHO, 2021). The governance capacity of a country, state or municipality determines the way in which confrontations will be given in certain situations. For example, systems such as workforce, strategic product procurement, financing, and other functions will be carried out in conjunction with other sectors by governance decisions.

The COVID-19 pandemic has demonstrated that all countries have used leadership and governance actions to respond to the demands caused by the pandemic crisis. In this study, the municipalities, even in situations of extreme poverty, adopted governance measures that involved the community to control the transmission of the virus, such as the elaboration of decrees prohibiting agglomerations, reduction of the flow of people, inspection of the use of sanitary measures, distribution of PPE to the population and removal of people over 60 years of age and people with comorbidities from work activities. In addition, expanding teams to work in PHC and compose the frontline workforce during the pandemic requires a governance decision.

The results on the outcome revealed that there is no statistically significant relationship between the socioeconomic conditions of the municipalities (HDI-M) and the COVID-19 outcome variables.

Groppo (2021), in a study in the southeast region of the country in 2020, showed that the case fatality rate had no statistical difference between municipalities with medium and high (p=0.3907) and very high (p=0.9967) MDI-M, and that it was higher in

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municipalities with high HDI-M than low and very low HDI-M.

Alberti *et al.* (2020) demonstrated in a similar study in the municipalities of Santa Catarina that the municipality's HDI is related to the higher number of deaths from COVID-19 when the number of cases is taken into account, as municipalities with low HDI had a higher lethality rate.

However, Santos *et al.* (2021) found in their study in the municipalities of Pará that socioeconomic conditions do not have a strong correlation with the epidemiological variables of COVID-19, as did Cossa *et al.* (2021), who carried out the comparative research between Brazil, the USA, and Italy and did not find a relationship between the incidence of COVID-19 and HDI and stated that it was not possible to conclude that HDI influences the performance of countries in the face of the pandemic. However, studies carried out in northeastern Brazilian states such as Ceará and Piauí show that socioeconomic vulnerability factors influenced the incidence and mortality from COVID-19 (SILVA *et al.,* 2022; CÂMARA *et al.,* 2020).

## CONCLUSION

Considering that aspects of resilience involve health system functions such as workforce, service delivery, governance, and leadership, it is possible to suggest that Primary Health Care through Family Health teams played a leading role in confronting the pandemic in these municipalities, even because most did not have other services of greater complexity. Even in the face of the precariousness of the logistical and support support presented, it is noted that there were governance decisions, especially in the implementation of a set of actions from various sectors of development and management, such as non-pharmacological intervention measures and municipal decrees aimed at controlling the transmission of the virus.

Although the present study did not show a correlation between the HDI-M and the epidemiological variables mentioned, the limitations of the sample consisted of only 30 municipalities with the lowest HDI in the state, and there was no comparison between high and low HDI-M. In addition, there may have been underreporting of data in relation to outcomes.

However, according to the data presented, inserted in a context of socioeconomic vulnerability, it is pertinent to consider that the confrontation of the COVID-19 pandemic carried out by the SUS in the municipalities with the lowest HDI levels in the state and in

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Brazil, has characteristics of resilience.

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