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SPECIAL ARTICLE/*ARTIGO ESPECIAL*

Income inequality and risk of infection and death by COVID-19 in Brazil

Desigualdade econômica e risco de infecção e morte por COVID-19 no Brasil

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ABSTRACT: ***Objective:*** To assess, through space-time analyses, whether the income inequality of the Federative Units (FUs) in Brazil can be associated with the risk of infection and death by COVID-19. ***Methods:*** This was an ecological study, based on secondary data on incidence and mortality rates for COVID-19. Data were analyzed at the state level, having the Gini coefficient as the main independent variable. Records of twelve days were used, spaced one week each, between April 21th and June 7th, 2020. The weekly variation in the rates was calculated through Prais-Winsten regression, aiming at measuring the evolution of the pandemic in each FU. Spearman's correlation test was used to assess correlation between the rates and their weekly evolution and the independent variables. Lastly, a spatial dependence diagnosis was conducted, and a Spatial Regression lag model was used when applicable. ***Results:*** Incidence and mortality rates of COVID-19 increased in all Brazilian FUs, being more pronounced among those with greater economic inequality. Association between Gini coefficient and COVID-19 incidence and mortality rates remained even when demographic and spatial aspects were taken into account. ***Conclusion:*** Income inequality can play an important role in the impact of COVID-19 on the Brazilian territory, through absolute and contextual effects. Structural policies to reduce inequality are essential to face this and future health crises in Brazil.

Keywords: COVID-19. Pandemic. Health status disparities. Social determinants of health. Gini coefficient.

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RESUMO: ***Objetivo:*** Avaliar, por meio de análise espaçotemporal, se a desigualdade econômica das Unidades Federativas (UF) do Brasil pode estar associada com o risco de infecção e morte por COVID-19. ***Métodos:*** Trata-se de um estudo ecológico, baseado em dados secundários das taxas de incidência e mortalidade para COVID-19. Os dados foram analisados em nível estadual, tendo como principal variável independente o coeficiente de Gini. Foram utilizados os registros de 12 dias, espaçados em uma semana cada, entre 21 de abril e 7 de julho de 2020. A variação semanal das taxas foi calculada pela regressão de Prais-Winsten, com o objetivo de medir a evolução da pandemia em cada UF. O teste de correlação de Spearman foi empregado para avaliar a correlação entre as taxas e suas evoluções semanais e as variáveis independentes. Por fim, realizou-se diagnóstico de dependência espacial dos dados e usou-se o modelo de defasagem da regressão espacial, quando aplicável. ***Resultados:*** As taxas de incidência e mortalidade por COVID-19 foram crescentes em todas as UF brasileiras, tendo sido mais acentuada entre aquelas com maior desigualdade econômica. A associação entre coeficiente de Gini e incidência e mortalidade por COVID-19 manteve-se mesmo quando levados em consideração aspectos demográficos e espaciais. ***Conclusão:*** A desigualdade econômica pode exercer papel importante no impacto da COVID-19 em território brasileiro, por meio de efeitos absolutos e contextuais. Políticas estruturais para a redução da desigualdade são fundamentais para o enfrentamento dessa e de futuras crises sanitárias no Brasil.

Palavras-chave: COVID-19. Pandemia. Desigualdade em saúde. Determinantes sociais da saúde. Coeficiente de Gini.

INTRODUCTION

Humanity faces one of the greatest public health challenges in contemporary history when dealing with the disease caused by a new type of coronavirus, called coronavirus disease 2019 — COVID-19. The disease emerged in China, rapidly spreading across the globe and causing the World Health Organization (WHO) to recognize it as a pandemic[1,2]. It is a highly transmissible disease and of high clinical severity[3]. On July 7, 2020, 15 million cases and 500 thousand deaths due to COVID-19 were recorded around the world[2]. In Brazil, official data point to 1.7 million cases of infection and 66 thousand deaths[4], and the numbers keep increasing.

Since treatments and vaccines for COVID-19 have not yet been developed, strategies to contain the spread of the virus have been implemented such as encouraging social distancing and, in the most affected regions, mandatory population confinement[5]. The main objective of adopting such measures is limiting the number of infected people to a threshold at which the healthcare system and services are able to meet the demand, distributing the total number of cases over time, a phenomenon that has been popularly called flattening the curve[6]. Countries, such as Italy and Spain, which reached a high number of cases and deaths from this disease very quickly, managed to control the situation by adopting these strategies[2].

In addition to the impact on the health of populations worldwide, health crises involving infectious agents often have an even more damaging impact: they unevenly affect population subgroups[7]. Based on the assumption that the COVID-19 pandemic is a global phenomenon, people are believed to be equally likely of being infected; however, pandemics occur in a local context, with different impacts among socially different populations[7]. Failure to recognize this aspect has already led to various plans and policies for coping with health crises to exacerbate preexisting biological, social, and economic disadvantages[8].

In the last decades, Brazil has achieved impressive advances in its health indicators as a result of its development and the project to universalize the access to health in the country[9,10]. However, since rankings on income concentration of nations have been released, Brazil remains among the 10 countries with the greatest inequality in the world[11]. Advances in health are also uneven, with less progress among the subgroups in the worst socioeconomic position[12-14].

Considering both the Brazilian experience with dengue[15], tuberculosis[16], and HIV/AIDS[17] and the international experience with the H1N1, SARS, and Ebola pandemics[7], it is assumed that there will be differences in the incidence and mortality rates due to COVID-19 related to income inequality in Brazil. Therefore, the objective of this study was to evaluate, based on space-time analyses, whether there is a relationship between income inequality and infection and death by COVID-19 in the Federative Units (FUs) of Brazil.

METHODS

This is an ecological study carried out with secondary data obtained from publicly-accessible databases in Brazil, which used Brazilian FUs as a unit of analysis. The evaluated outcomes were the incidence and mortality rates of COVID-19, with income concentration as the main independent variable. In addition, taking into account the possibility that the rates of infection and death by COVID-19 may be correlated with the population density of each FU, this variable was included in the model to control the confounding effect.

The outcomes were obtained from data on the number of infected people and deaths by COVID-19 and the total population of each FU, which were extracted from *Painel Coronavírus* portal[4] on July 7, 2020. With this information, the incidence (cases ÷ population) and mortality (deaths ÷ population) rates were calculated, which were expressed in the proportion of cases/deaths per 1 million inhabitants. For this study, data recorded on twelve different days were used, with an interval of one week between each, namely: April 21st and 28th; May 5th, 12th, 19th, and 26th; June 2nd, 9th, 16th, 23rd, and 30th; and July 7th.

The Gini coefficient, a measure adopted for estimating the degree of income concentration of the population of each FU, was also extracted from data from the Brazilian Institute for Geography and Statistics (IBGE)[18]. This coefficient can vary between 0 and 1, and the higher the value, the greater the concentration of income. Population density was calculated by dividing the total population and the territorial area (in km^2) of each FU (data from IBGE[19]).

The weekly temporal evolution of the incidence and mortality rates due to COVID-19 was evaluated using the Prais-Winsten regression[20], based on the Durbin-Watson test, with the STATA 13.1 software. From this analysis, it was possible to extract the magnitude of the average weekly growth of these rates for each FU in the selected period. In addition, an analysis of the association between incidence and mortality recorded on each of the 12 dates included in the respective weekly evolutions (Prais-Winsten regression coefficient) was performed with the Gini coefficient; and the population density of each FU, by the Spearman's correlation test.

Finally, the hypothesis of spatial autocorrelation between the outcomes (incidence and mortality due to COVID-19) and the independent variables (Gini coefficient and population density) was considered. For this purpose, a diagnosis of spatial autocorrelation of two regression models was conducted, one using the weekly variation in incidence as the outcome and the other, the weekly variation in mortality. This procedure was conducted using the GeoDa software, employing the mesh of Brazilian states as a weighting matrix, with queen-type contiguity[20]. Moran's and Lagrange Multiplier tests (of the types of lag and errors, including robust tests for testing the spatial autocorrelation) were performed[21,22]. All statistical tests were performed considering a 5% significance level for two-tailed tests.

RESULTS

Brazil is a country characterized by wide social, geographical, and economic diversity. According to data obtained from the accessed databases, São Paulo is the most populous state (45,919,049 inhabitants), whereas Rio de Janeiro accounts for the highest population density (394.62 inhabitants/km^2). On the other hand, Roraima is the state with the lowest number of inhabitants (605,761) and Amazonas has the lowest population density (2.65 inhabitants/km^2). The FU with the highest income inequality, according to the Gini coefficient, is Amazonas (0.6664), followed by Roraima (0.6398) and Acre (0.6394), whereas the one with the lowest concentration is Santa Catarina (0.4942), followed by Paraná (0.5416) and Rio Grande do Sul (0.5472).

Table 1 shows the incidence and mortality rates recorded at the beginning (April 21th) and at the end (July 7th) of the studied period as well as the weekly variation in this indicator obtained by the Prais-Winsten regression. In the first week, recorded on April 21th, the states with the highest incidence rates were Amazonas (547.7/1 million inhabitants), Amapá (540.36/1 million inhabitants), and Roraima (407.75/1 million inhabitants); conversely, Tocantins (23.52/1 million inhabitants), Sergipe (40.02/1 million inhabitants), and Mato Grosso (51.94/1 million inhabitants) had the lowest rates on that day. In the last week included, recorded on July 7th, the FUs with the highest incidence rates were Amapá (35,819.90/1 million inhabitants), Roraima (31,510.78/1 million inhabitants), and the Federal District (20,792.18/1 million inhabitants). On the other hand, the states with the lowest incidence on that date were Minas Gerais (2,876.73/1 million inhabitants), Rio Grande do Sul

Table 1. Characteristics of Federative Units (FUs) and their respective incidence and mortality rates due to COVID-19#. Brazil, 2020.

	FU	Population density†	Gini	Incidence 04/21	Incidence 07/07	Incidence Variation$	Mortality 04/21	Mortality 07/07	Mortality Variation$
North	AC	5.37	0.6394	221.10	16,941.16	+1,539.90**	9.07	452.41	+40.66**
	AM	2.65	0.6664	547.70	19,101.25	+1,727.84**	46.57	712.25	+61.08**
	AP	5.94	0.6157	540.36	35,819.90	+3,280.05**	15.37	538.00	+48.48**
	PA	6.91	0.6260	119.26	13,501.55	+1,222.89**	4.42	596.08	+56.38**
	RO	7.47	0.5686	111.97	13,821.55	+1,247.48**	2.25	324.66	+29.42**
	RR	2.71	0.6398	407.75	31,510.78	+2,807.82*	4.95	620.71	+55.74**
	TO	5.67	0.6099	23.52	8,267.71	+750.64**	0.64	144.96	+13.25**
Northeast	AL	119.86	0.6343	62.92	12,442.18	+1,127.55**	5.69	357.17	+32.10**
	BA	26.34	0.6278	100.11	6,182.59	+549.76*	3.16	148.99	+13.25**
	CE	61.33	0.6193	406.92	13,682.76	+1,211.94**	23.54	717.91	+64.54**
	MA	21.46	0.6291	197.31	13,015.64	+1,176.63**	8.48	323.10	+28.68**
	PB	71.16	0.6139	65.45	13,638.69	+1,236.05**	8.21	284.96	+25.17**
	PE	97.45	0.6366	304.28	6,921.68	+609.44**	27.20	547.66	+48.29**
	PI	13.00	0.6193	56.82	8,405.77	+755.18*	4.28	254.79	+22.73*
	RN	66.40	0.6074	173.37	10,214.29	+909.56*	7.98	368.14	+32.64*
	SE	104.84	0.6288	40.02	13,764.33	+1,245.36**	2.18	370.21	+33.39*
Midwest	DF	523.48	0.6370	292.18	20,792.18	+1,857.97*	7.96	254.37	+22.34*
	GO	206.30	0.5588	59.99	4,460.88	+398.50*	2.71	99.88	+8.69*
	MS	7.78	0.5650	62.25	3,845.65	+342.24*	2.16	46.06	+3.85*
	MT	3.86	0.5652	51.94	6,430.25	+574.63*	1.72	242.79	+21.72*
Southeast	ES	87.22	0.5723	301.59	14,108.72	+1,254.20**	8.46	467.82	+41.85**
	MG	36.09	0.5634	58.10	2,876.73	+254.27*	2.08	60.56	+5.28*
	RJ	394.62	0.6116	307.33	7,187.17	+631.68**	26.70	630.24	+55.94**
	SP	184.99	0.5768	335.05	7,245.53	+627.96**	23.80	358.78	+30.48**
South	PR	57.37	0.5416	89.56	3,000.54	+261.13*	4.46	74.43	+6.32*
	RS	40.39	0.5472	79.46	2,970.84	+262.33**	2.37	69.52	+6.07**
	SC	74.84	0.4942	148.36	4,932.73	+430.87*	4.89	58.48	+4.85**

#Incidence and mortality rates per 1 million inhabitants; $weekly variations extracted by using the Prais-Winsten regression (+ = increasing variation); †population density in people/km^2; *$p < 0.05$; **$p < 0.001$.
Source: Brasil[4], Brazilian Institute for Geography and Statistics – (IBGE)[18,19].

(2,970.84/1 million inhabitants), and Paraná (3,000.54/1 million inhabitants). In all Brazilian FUs, an increase in the incidence rate was verified, which was more prominent in Amapá (+3,280.05/1 million inhabitants per week), Roraima (+2,807.82/1 million inhabitants per week), and the Federal District (+1,857.97/1 million inhabitants per week), and less remarkable in Minas Gerais (+254.27/1 million inhabitants per week), Paraná (+261.13/1 million inhabitants per week), and Rio Grande do Sul (+262.33/1 million inhabitants per week).

Regarding mortality rates, in the first week, registered on April 21th, the states with the highest mortality rates were Amazonas (46.57/1 million inhabitants), Pernambuco (27.2/1 million inhabitants), and Rio de Janeiro (26.7/1 million inhabitants), whereas Tocantins (0.64/1 million inhabitants), Mato Grosso (1.72/1 million inhabitants), and Minas Gerais (2.08/1 million inhabitants) accounted for the lowest rates on that day. In the last week included in the analysis, July 7th, the FUs with the highest mortality rates were Ceará (717.91/1 million inhabitants), Amazonas (712.25/1 million inhabitants), and Rio de Janeiro (630.24/1 million inhabitants), whereas those with the lowest rates were Mato Grosso do Sul (46.06/1 million inhabitants), Santa Catarina (58.48/1 million inhabitants), and Minas Gerais (60.56/1 million of inhabitants). There was an increasing mortality rate in all Brazilian FUs, with a greater increase in Ceará (+64.54/1 million inhabitants per week), Amazonas (+61.08/1 million inhabitants per week), and Pará (+56.38/1 million inhabitants per week); and with a modest increase in Mato Grosso do Sul (+3.85/1 million inhabitants per week), Santa Catarina (+4.85/1 million inhabitants per week), and Minas Gerais (+5.28/1 million inhabitants per week).

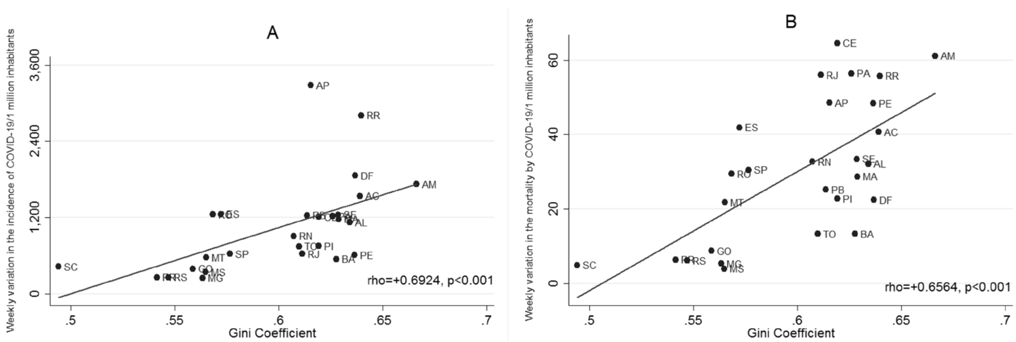
Table 2 shows the results of the correlation analyses. Population density was not correlated with any of the rates. The Gini coefficient, in its turn, was correlated with both rates in all recorded periods. As for the incidence rate, the association evolved from a weak positive correlation on April 21th (*rho* = +0.4115, p = 0.033), reaching strong correlations (greater than +0.7) in May and June, to a moderate positive (though almost strong) correlation on July 7th (*rho* = +0.6906, p < 0.001). The mortality rate was also correlated with the Gini coefficient, evolving from a weak positive correlation on April 21th (*rho* = +0.4760, p = 0.012) to a moderate positive correlation on July 7th (*rho* = +0, 6564, p < 0.001). The visual dispersion between the weekly variation in the incidence and mortality rates of each state, according to the respective Gini coefficients, can be seen in Figure 1.

By assessing the spatial dependence diagnosis conducted, it was observed that the model for the weekly variation in the incidence rate did not show spatial autocorrelation (*Moran's I* = 0.724, p = 0.469; *Lagrange Multiplier* (lag) = 0.605, p = 0.437; *Lagrange Multplier* (error) = 0.02, p = 0.875). In turn, the model for the weekly variation in the mortality rate showed spatial autocorrelation (*Moran's I* = 2.051, p = 0.040; *Lagrange Multiplier* (lag) = 3.288, p = 0.069, *Lagrange Multipler* (error) = 1,792, p = 0.180). Based on these results, the spatial regression with a lag model was chosen to be used, and the results are shown in Table 3. In both models (linear and spatial), even with the control for population density of the FUs, the Gini coefficient remained associated with both the evolution of incidence and mortality due to COVID-19.

Table 2. Correlation between incidence and mortality rates due to COVID-19 and their weekly variation in the observed period (April 21th to July 7th), with population density and Gini coefficient# of the Federative Units (FUs) of Brazil, 2020.

Period	Incidence		Mortality	
	Population density	Gini coefficient	Population density	Gini coefficient
04/21	+0.0617	+0.4115*	+0.2821	+0.4760*
04/28	+0.1233	+0.5892*	+0.2088	+0.5199*
05/05	+0.0299	+0.6582*	+0.1758	+0.5846*
05/12	-0.0342	+0.6955**	+0.1306	+0.6164**
05/19	-0.0745	+0.7474**	+0.0360	+0.6384**
05/26	-0.1306	+0.7834**	+0.0195	+0.6350**
06/02	-0.1441	+0.7816**	+0.0049	+0.6613**
06/09	-0.1886	+0.7608**	-0.0360	+0.6640**
06/16	-0.1917	+0.7639**	-0.0409	+0.6652**
06/23	-0.1947	+0.7538**	-0.0427	+0.6616**
06/30	-0.2265	+0.7226**	-0.0110	+0.6475**
07/07	-0.1636	+0.6906**	-0.0140	+0.6558**
Weekly variation	-0.1685	+0.6924**	-0.0330	+0.6564**

#Coefficients were extracted by using Spearman's correlation test; *p < 0.05; **p < 0.001.



rho: Spearman's Correlation Coefficient

Figure 1. Scatter plots between COVID-19 and Gini Coefficient of Federative Units (FUs) in Brazil, 2020: (A) Dispersion of the correlation between the weekly variation in incidence rates by COVID-19 and the Gini coefficient of FUs; (B) Dispersion of the correlation between the weekly variation in mortality rates due to COVID-19 and the Gini coefficient of FUs.

Table 3. Analysis of simple and spatial linear regression (lag model) of the outcomes weekly variation in incidence and in mortality rates due to COVID-19 in the observed period (April 21th to July 7th)*. Brazil, 2020.

Outcome	Variables	Simple Linear Regression			Spatial Regression (lag model)		
		Coefficient	SE	p-value	Coefficient	SE	p-value
Weekly variation in incidence	Constant	-5,167.34	1,875.32	0.011	-4,401.26	1,810.33	0.015
	Gini coefficient	10,406.80	3,121.57	0.003	8,648.91	3,160.19	0.006
	Population density	-0.42	1.01	0.682	0.03	0.95	0.974
	Aut. Coef.	–	–	–	0.289	0.196	0.140
Weekly variation in mortality	Constant	-161.33	43.84	0.001	-116.12	39.77	0.004
	Gini coefficient	319.122	72.87	< 0.001	218.65	69.91	0.002
	Population density	-0.01	0.02	0.916	0.02	0.02	0.276
	Aut. Coef.	–	–	–	0.448	0.166	0.006

*Weekly variations in incidence and mortality rates extracted from time series data using Prais-Winsten regression; SE: standard error; Aut. Coef.: Autoregressive coefficient of the lag model.

DISCUSSION

The results of this study indicate a possible negative reflection of income inequality on facing the COVID-19 pandemic in Brazil. This result seems to be consistent because, in addition to the correlation observed in 12 different weeks, there was an increase in the strength of the correlation during the evaluated period, considering that the associations evolved from weak positive correlations to practically strong ones[23]. Furthermore, among the most unequal states, the progression in the incidence and mortality rates due to COVID-19 was more prominent, whereas among the less unequal states there were modest increases. Finally, even considering demographic (population density) and spatial (spatial autocorrelation) aspects, it can be stated that the Gini coefficient was associated with an increase in the incidence and mortality rates of this disease.

Thus, the findings regarding the association between economic inequality and infection and death by COVID-19 seem to be true, and provide a plausible explanation for the differences between Brazilian states concerning the COVID-19 pandemic. Economic inequality can have a significant impact on the health of populations, in addition to the effect of poverty itself. In the case of COVID-19, this seems to occur due to at least two distinct effects: the absolute and the contextual[24].

The *absolute effect* concerns the direct impact of income *distribution* on health outcomes. Small changes in the income of poorest individuals produce significant changes in health outcomes, whereas among the wealthier individuals the same changes in income (higher or lower) do not produce a major change in health standards[24]. For example, according to estimates based on data from 1.3 million New Zealanders of working age monitored for three years, if it was possible to transfer the income of 10% of the population to meet the average (which would correspond to a 10% reduction in the Gini coefficient), mortality rates for the entire population would decrease by at least 4% (over 1,100 deaths avoided per year)[25]. It may seem a slight reduction, but it is equivalent to three times the number of deaths per year from traffic accidents in that country[25], which also has less economic inequality than Brazil.

Within the Brazilian context, among the 20% poorest individuals of the population, 94.4% have no health insurance and 10.9% rate their health as fair, poor, or very poor; conversely, among the 20% richest individuals, only 35.7% do not have health insurance and 2.2% evaluate their health likewise[26]. Moreover, the availability of beds in intensive care units (ICU) for users of the Brazilian Unified Health System is almost five times lower than for those who have access to the private health network[26]. International data indicate that, in more unequal regions, the proportion of individuals with impaired health is greater[27], including chronic diseases that are currently recognized as risk factors for COVID-19. Therefore, in more unequal FUs, the burden of morbidity is likely to be greater, making them structurally more vulnerable to the COVID-19 pandemic.

The *contextual effect*, in turn, demonstrates that people (regardless of socioeconomic status) who live in unequal societies end up paying a health fee. It is like air pollution: it is difficult for individuals to completely escape from the negative effects of air pollution in the place where they live. In uneven locations, the public structures of health, safety, sanitation, and urban planning are worse. Such conditions degrade everyone's quality of life, but the poorest people are more severely affected within the social structure[24].

The unequal distribution of opportunities can allocate individuals in different socioeconomic positions according to their social group, sex, gender, and ethnicity, creating cascading difficulties in the access to education, work, and income[28] . People at greater socioeconomic disadvantage tend to have differential exposure to the virus (because they have poor housing conditions, live with a larger number of people in smaller residences, use public transport with greater agglomeration, and have job insecurity, which makes social distancing difficult); differential susceptibility (due to food insecurity and poorer nutritional quality, increased psychological stress, and difficulty of access to healthcare professionals); and differential consequence (less social capital and reduced options of primary prevention and treatment)[7,28-32]. Altogether, differential exposure, susceptibility, and consequence can produce higher rates of illness and death in these subgroups. Such an effect has already been observed in the National Household Sample Survey (PNAD) to assess the impact of COVID-19, which showed that black and mixed-race, poor and uneducated people, in addition to being more likely to be infected, were also more severely affected by the pandemic in terms of economy[33].

It is estimated that the risk of dying from COVID-19 may be up to 10 times higher among individuals living in the most vulnerable neighborhoods in the same city, and that black people are 62% more likely to be victims of the virus[34]. These contextual effects, which impact everyone by the degradation of the public structure, but affect poorest individuals in a more severe way, can be a plausible explanation for the greater increase in incidence and mortality rates in more unequal states in the evaluated period (and in less unequal states, this increase was smaller or almost stable).

However, the results should be carefully interpreted considering the limitations of this study. Taking into account that these are secondary data, it is not possible to state that the most economically vulnerable people are the most affected ones, but rather that in more unequal locations the impact of the pandemic is likely to be more severe for the entire population. Secondly, considering that Brazil does not carry out mass testing, the underreporting of cases and deaths by COVID-19 may influence the results of this study. Thirdly, considering the speed at which the disease has been changing in Brazil, the results may change. For instance, the results of temporal analysis, as well as the correlations, indicate stronger associations in mid-June, with a slight reduction from July onward. This finding may reflect the fact that FUs that experienced a more prominent advance of the disease (those with greater economic inequality) managed to reduce the speed of infections and deaths over time. Finally, association does not mean causality, in such a way that investigations are required to identify the causal paths of these results. Multilevel studies that simultaneously evaluate variables at the individual level (for example, skin color/ethinicity, occupation, presence of risk factors for COVID-19 etc.) and at the contextual level (such as social, demographic, and economic aspects of the place of residence in regional, municipal, or state levels) will be able to identify the specific contributions of individuals' socioeconomic position and the inequality of the context in which they live to being affected by COVID-19.

Hence, it is concluded that income inequality can play an important role in the impact of COVID-19 on the Brazilian population, either by the unequal distribution of opportunities, which has negative cascading impacts on those at greater socioeconomic disadvantage, or by contextual effects that hinder the capacity of a locality to adequately respond to this health crisis. This finding highlights the urgency of formulating intersectoral policies aimed at reducing economic inequality. In the pandemic context, the emergency financial assistance for the most vulnerable people[35] seems to have been a positive short-term measure. Nevertheless, long-term structural measures are paramount for this and future health crises to have a reduced impact on the Brazilian population.

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