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Impact of the COVID-19 pandemic on excess risk of dying – Brazil, 2020

Impacto da pandemia de COVID-19 no excesso do risco de morrer – Brasil, 2020

Efecto de la pandemia de COVID-19 sobre el excesivo riesgo de morir – Brasil, 2020

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Abstract

Objective: To analyze the impact of the COVID-19 pandemic on the excess risk of dying in Brazil in 2020. **Methods:** An ecological study of the exploratory type conducted with data on deaths due to all causes from the Ministry of Health's Mortality Monitoring Panel. Unadjusted rates and rate ratios (RR) of all-cause mortality were calculated according to underlying cause of death, gender and age group. A statistical association was verified by means of the Mantel Haenszel chi-square test when $p<0.05$. **Results:** There was a 13% increase in the risk of dying in 2020. The regions with the highest increase in the mortality rate were North (RR=1.24; 95%CI: 1.23-1.26), Midwest (RR=1.17; 95%CI: 1.16-1.18) and Northeast (RR=1.15; 95%CI: 1.14-1.15). Excess risk of dying was higher in males, in the North region, due to infectious and parasitic diseases, including COVID-19 (RR=4.58; 95%CI: 4.53-4.62), followed by ill-defined causes (RR=1.33; 95%CI: 1.32-1.34) and by pregnancy, delivery and puerperium (RR=1.17; 95%CI: 1.10-1.25). **Conclusion:** Excess risk of dying allowed recognizing the magnitude and impact of COVID-19 in the country and can support health authorities in organizing actions aimed at reducing the effects of this public health emergency.

Descriptors: COVID-19. Mortality. Risk Assessment. Health Information System.

Whats is already known on this?
Previous research studies have pointed to an increase in worldwide mortality due to the COVID-19 pandemic.

What this study adds?
The study describes the impact of the COVID-19 pandemic on the mortality pattern in Brazil, according to demographic and geographic aspects and to type of cause of death including deaths indirectly linked to the pandemic, such as maternal deaths and deaths due to ill-defined causes.

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Resumo

Objetivo: *Analisar o impacto da pandemia de COVID-19 no excesso do risco de morrer no Brasil em 2020.* ***Métodos:*** *Estudo ecológico do tipo exploratório, com dados de óbitos por todas as causas de morte do Painel de Monitoramento da Mortalidade do Ministério da Saúde. Calcularam-se taxas brutas e razões de taxas (RT) de mortalidade por todas as causas segundo os capítulos da causa básica de morte, sexo e faixa etária. Verificou-se associação estatística por meio do teste qui-quadrado de Mantel Haenszel quando p<0,05.* ***Resultados:*** *Houve aumento no risco de morrer de 13% em 2020. As regiões com maior incremento na taxa de mortalidade foram Norte (RT=1,24; IC95%: 1,23-1,26), Centro-Oeste (RT=1,17; IC95%: 1,16-1,18) e Nordeste (RT=1,15; IC95%: 1,14-1,15). O excesso no risco de morrer foi maior no sexo masculino, na região Norte, por doenças infecciosas e parasitárias, incluindo a COVID-19 (RT=4,58; IC95%: 4,53-4,62), seguida de causas mal definidas (RT=1,33; IC95%: 1,32-1,34), gravidez, parto e puerpério (RT=1,17; IC95%: 1,10-1,25).* ***Conclusão:*** *O excesso de risco de morrer possibilitou reconhecer a magnitude e o impacto da COVID-19 no país e pode subsidiar as autoridades de saúde na organização de ações voltadas para a diminuição dos efeitos dessa emergência de saúde pública.*

Descritores: *COVID-19; Medição de Risco; Mortalidade; Sistemas de Informação em Saúde.*

Resumén

Objetivo: *Analizar el efecto de la pandemia de COVID-19 sobre el excesivo riesgo de morir en Brasil durante el año 2020.* ***Métodos:*** *Estudio ecológico del tipo exploratorio realizado con datos de fallecimientos por todas las causas de muerte indicadas en el Panel de Monitoreo de la Mortalidad del Ministerio de Salud. Se calcularon tasas no ajustadas y razón de tasas (PT) de mortalidad por todas las causas conforme a los capítulos de causa básica de muerte, sexo y grupo etario. Se verificó asociación estadística por medio de la prueba de chi-cuadrado de Mantel Haenszel cuando p<0,05.* ***Resultados:*** *Se registró un aumento en el riesgo de morir del 13% en 2020. Las regiones con el mayor incremento en la tasa de mortalidad fueron las siguientes: Norte (PT=1,24; IC95%: 1,23-1,26), Centro-Oeste (PT=1,17; IC95%: 1,16-1,18) y Noreste (PT=1,15; IC95%: 1,14-1,15). El excesivo riesgo de morir fue mayor en el sexo masculino, en la región Norte y a raíz de enfermedades infecciosas y parasitarias, incluido COVID-19 (PT=4,58; IC95%: 4,53-4,62), seguidas por causas mal definidas (PT=1,33; IC95%: 1,32-1,34), embarazo, parto y puerperio (PT=1,17; IC95%: 1,10-1,25).* ***Conclusión:*** *El excesivo riesgo de morir permitió reconocer la magnitud y el efecto de la pandemia de COVID-19 en el país y puede ayudar a las autoridades de salud a organizar acciones dirigidas a reducir los efectos de esta emergencia de salud pública.*

Descriptores*: COVID-19; Medición de Riesgo; Mortalidad; Sistemas de Información en Salud.*

INTRODUCTION

The COVID-19 pandemic became the largest challenge faced by health authorities and society worldwide, due to the impacts on health systems, along with the economic and cultural difficulties caused by this virus.[1-2]

With increasing incidence of fatal cases attributable to the disease, health services faced difficulties related to prevention actions, diagnosing new cases, providing care and guaranteeing recovery of the infected individuals. Although these challenges were imposed on all nations, the impact was more critical in developing countries, whose health care networks are weak and present unsatisfactory and uneven results for their users.[3-4]

By May 3rd, 2023, 765.2 million confirmed cases and 6.9 million deaths due to COVID-19 had already been recorded.[5] Brazil accounted for nearly 37.4 million confirmed cases and 701,400 deaths due to the disease, only surpassed by the United States in number of deaths.[6]

Since the beginning of the pandemic, monitoring of cases and deaths has been used to measure the magnitude of their occurrence and to evaluate the prevention and control measures, in addition to subsidizing knowledge about the mortality pattern in different nations.[7-8] One of the strategies to verify the impact of COVID-19 in the mortality pattern is studying excess deaths or excess mortality.[9-10]

Excess mortality is the number of deaths beyond the expected levels for the reference period, regardless of the cause of death. The estimate of excess deaths due to all causes is used as a non-specific way to verify the impact of COVID-19 and other health emergencies,[11-12] making it possible to assess the total impact of the disease on mortality, including deaths indirectly linked to the COVID-19 pandemic, but impacted by it,[13-14] such as maternal deaths and those arising from ill-defined causes.

Such deaths are the result of the increased impact of the pandemic on society and health services, as they occurred due to changes in individual behaviors and collective social conditions. This impact differed according to the different causes of death, with some related to lack of assistance caused by the reorganization of care units and others related to changes in people's social interaction models.[15-17]

Faced with this new reality, the study can contribute to better understanding the impact exerted by the COVID-19 pandemic on the mortality pattern in Brazil, in addition to providing diverse evidence to society, health services and professionals promoting public policies in the country. Thus, the objective of this study was to analyze the impact of the COVID-19 pandemic on excess risk of dying in Brazil in 2020.

METHODS

This is an ecological study of the exploratory type, conducted with data on deaths due to all causes. The analysis units were the Brazilian Federation Units (FUs) and geographic regions.

The cases included were the deaths due to all causes in Brazil from January 1st, 2015, to December 31st, 2020. Brazil has five geographic regions covering a total of 27 FUs, including the Federal District. The total population of the country was estimated at 211,755,692 inhabitants in 2020.[18]

The data on all-cause deaths, by place of residence, were acquired from the Health Surveillance Department's Mortality Monitoring Panel with data from the Mortality Information System (*Sistema de Informações sobre Mortalidade*, SIM).[19]

All the information on estimated populations for 2019 and 2020 according to states, the Federal District, geographic regions and Brazil as a whole was obtained from population estimates by municipality, age and gender, available on the Unified Health System Informatics Department (DATASUS) website, belonging to the Ministry of Health (*Ministério da Saúde*, MS).[18]

The following explanatory variables were analyzed: gender (female, male), age group (<20, 20-59, ≥60 years old), regions (North, Northeast, South, Southeast and Midwest), underlying cause of death (chapters from the 10th revision of the Statistical International Classification of Diseases and Health-Related Problems - ICD-10), all FUs, month and year of death.

The death records were classified according to the underlying cause of death code reported in the death certificate, as per the ICD-10 chapters: infectious and parasitic diseases (A00-B99), which includes deaths due to COVID-19 (B34.2 - coronavirus infection of unspecified location – code used in 2020); neoplasms (C00-D48); blood-related diseases or in hematopoietic organs and immune disorders (D50-D89); nutritional and metabolic endocrine diseases (E00-E90); mental and behavioral disorders (F00-F99); nervous system diseases (G00-G99); diseases of the eyes and annexes (H00-H59); diseases of the ear and mastoid apophysis (H60-H95); circulatory system diseases (I00-I99); respiratory system diseases (J00-J99); digestive system diseases (K00-K93); skin and subcutaneous tissue diseases (L00-L99); musculoskeletal system and connective tissue diseases (M00-M99); genitourinary system diseases (N00-N99); pregnancy, delivery and puerperium (O00-O99); some conditions originating in the perinatal period (P00-P96); congenital malformations, deformities and chromosomal anomalies (Q00-Q99); symptoms, signs and abnormal clinical and laboratory findings (R00-R09); and external causes of morbidity and mortality (V01-Y98).

The data were organized in Microsoft® Excel® 2016 spreadsheets. Initially, the data were analyzed according to descriptive statistics, with calculation of central tendency (mean) and dispersion (standard deviation) measures for elaboration of the control diagram. The unadjusted mortality rates were obtained by the ratio between the number of deaths by place of residence and the respective resident population, multiplying the result by 100,000 inhabitants. To calculate the unadjusted mortality rate due to pregnancy, delivery and puerperium (O00-O99), the number of deaths due to this cause was divided by the number of live births, multiplying the result by 100,000 live births, according to information from the Information System on Live Births (*Sistema de Informações sobre Nascidos Vivos*, SINASC), available on the DATASUS/MS website.[18] The mortality rates were calculated according to the causes of death and disaggregated by gender, age group, FU and region of residence of the deceased.

A control diagram was prepared to verify the occurrence of excess deaths in 2020 in relation to the monthly mean of deaths in 2015 to 2019. For each month, the mean number of deaths and their standard deviation (SD) were calculated. The maximum value of expected deaths for each month was calculated using the following formula: monthly mean of deaths + (1.96 x SD corresponding to the month).

The excess risk of death in 2020 was obtained by dividing the 2020 mortality rate by the 2019 mortality rate. Calculation of the rate ratios (RR) and the respective 95% confidence intervals (95%CIs) was performed on the *Openepi* website (https://www.openepi.com/TwobyTwo/TwobyTwo.htm). The statistical associations were verified by means of the Mantel Haenszel chi-square test, with $p<0.05$ (5%) as significance level.

All data used in this study are anonymous, having been obtained from a public access platform, without the possibility of identifying the participants and not requiring approval by any Committee of Ethics in Research with Human Beings. The study complies with resolutions 466/2012 and 510/2016 of the National Health Council (*Conselho Nacional de Saúde*, CNS).[20,21]

RESULTS

In 2020, 1,530,882 deaths were recorded in Brazil, representing a 13% excess when compared to those in 2019 (n=1,349,244). In 2020, the mean and median of deaths were 56,723 and 28,580, respectively, while in 2019 the values were 49,993 and 24,431. In 2020, the mean mortality rate among the FUs was 668.56/100,000 with a median of 678.92/100,000, surpassing the valuesfound in 2019. The mean increase in the mortality rate for Brazil was 13%, varying from 3% in Rio Grande do Sul to 32% in Amazonas. The lowest increase was verified in the South region (5%) and the highest, in the North region (24%) (Table 1).

Table 1. Mortality rate (per 100,000 inhabitants) due to all causes and rate ratios according to regions, Federation Units and Federal District. Brazil, 2019-2020.

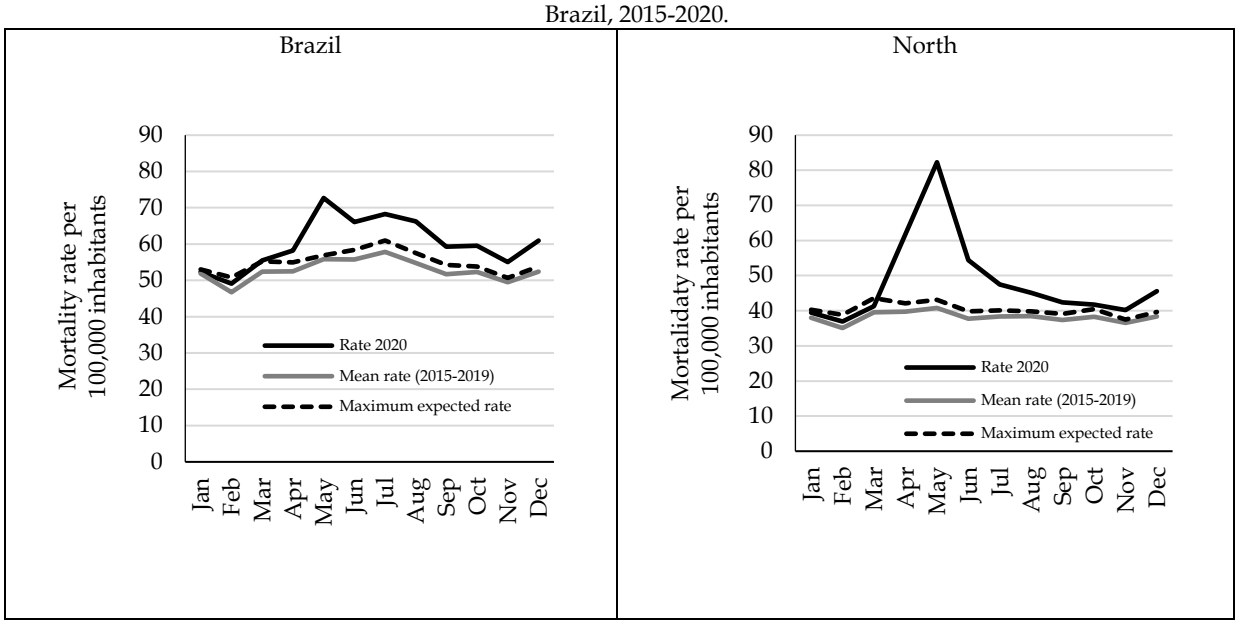
Brazil, Regions and FUs	2019		2020		Rate ratio	95%CI	p-value*
	N	Rate	N	Rate			
Brazil	1,349,244	642.31	1,530,882	723.25	1.13	1.12 - 1.13	<0.001
North	85,686	464.90	108,051	578.66	1.24	1.23 - 1.26	<0.001
Rondônia	8,338	469.16	10,162	565.67	1.21	1.17 - 1.24	<0.001
Acre	4,098	464.66	4,806	537.30	1.16	1.11 - 1.20	<0.001
Amazonas	18,327	442.19	24,616	585.02	1.32	1.30 - 1.35	<0.001
Roraima	2,779	458.76	3,485	552.14	1.20	1.14 - 1.26	<0.001
Pará	40,599	471.92	51,379	591.19	1.25	1.24 - 1.27	<0.001
Amapá	3,524	416.68	4,507	522.99	1.26	1.20 - 1.31	<0.001
Tocantins	8,021	509.96	9,096	571.99	1.12	1.09 - 1.16	<0.001
Northeast	352,801	618.17	407,656	710.52	1.15	1.14 - 1.15	<0.001
Maranhão	35,128	496.50	42,760	601.02	1.21	1.19 - 1.23	<0.001
Piauí	20,528	627.15	23,094	703.77	1.12	1.10 - 1.14	<0.001
Ceará	56,580	619.57	68,383	744.34	1.20	1.19 - 1.21	<0.001
Rio Grande do Norte	21,767	620.70	24,157	683.53	1.10	1.08 - 1.12	<0.001
Paraíba	27,378	681.36	30,467	754.27	1.11	1.09 - 1.12	<0.001
Pernambuco	64,295	672.75	76,168	792.05	1.18	1.16 - 1.19	<0.001
Alagoas	20,287	607.88	23,858	711.85	1.17	1.15 - 1.19	<0.001
Sergipe	13,473	586.11	15,743	678.92	1.16	1.13 - 1.18	<0.001
Bahia	93,365	627.75	103,026	690.03	1.10	1.09 - 1.11	<0.001
Southeast	616,243	697.33	693,050	778.60	1.12	1.11 - 1.12	<0.001
Minas Gerais	141,022	666.18	148,918	699.39	1.05	1.04 - 1.06	<0.001
Espírito Santo	24,431	607.94	28,580	703.24	1.16	1.14 - 1.18	<0.001
Rio de Janeiro	144,600	837.54	168,199	968.54	1.16	1.15 - 1.16	<0.001
São Paulo	306,190	666.80	347,353	750.40	1.13	1.12 - 1.13	<0.001
South	206,086	687.50	217,132	719.16	1.05	1.04 - 1.05	<0.001
Paraná	74,566	652.15	80,659	700.36	1.07	1.06 - 1.08	<0.001
Santa Catarina	42,282	590.14	44,584	614.74	1.04	1.03 - 1.06	<0.001
Rio Grande do Sul	89,238	784.36	91,889	804.42	1.03	1.02 - 1.03	<0.001
Midwest	88,985	546.02	105,636	640.05	1.17	1.16 - 1.18	<0.001
Mato Grosso do Sul	16,815	605.08	18,897	672.64	1.11	1.09 - 1.13	<0.001
Mato Grosso	18,341	526.36	23,069	654.21	1.24	1.22 - 1.27	<0.001

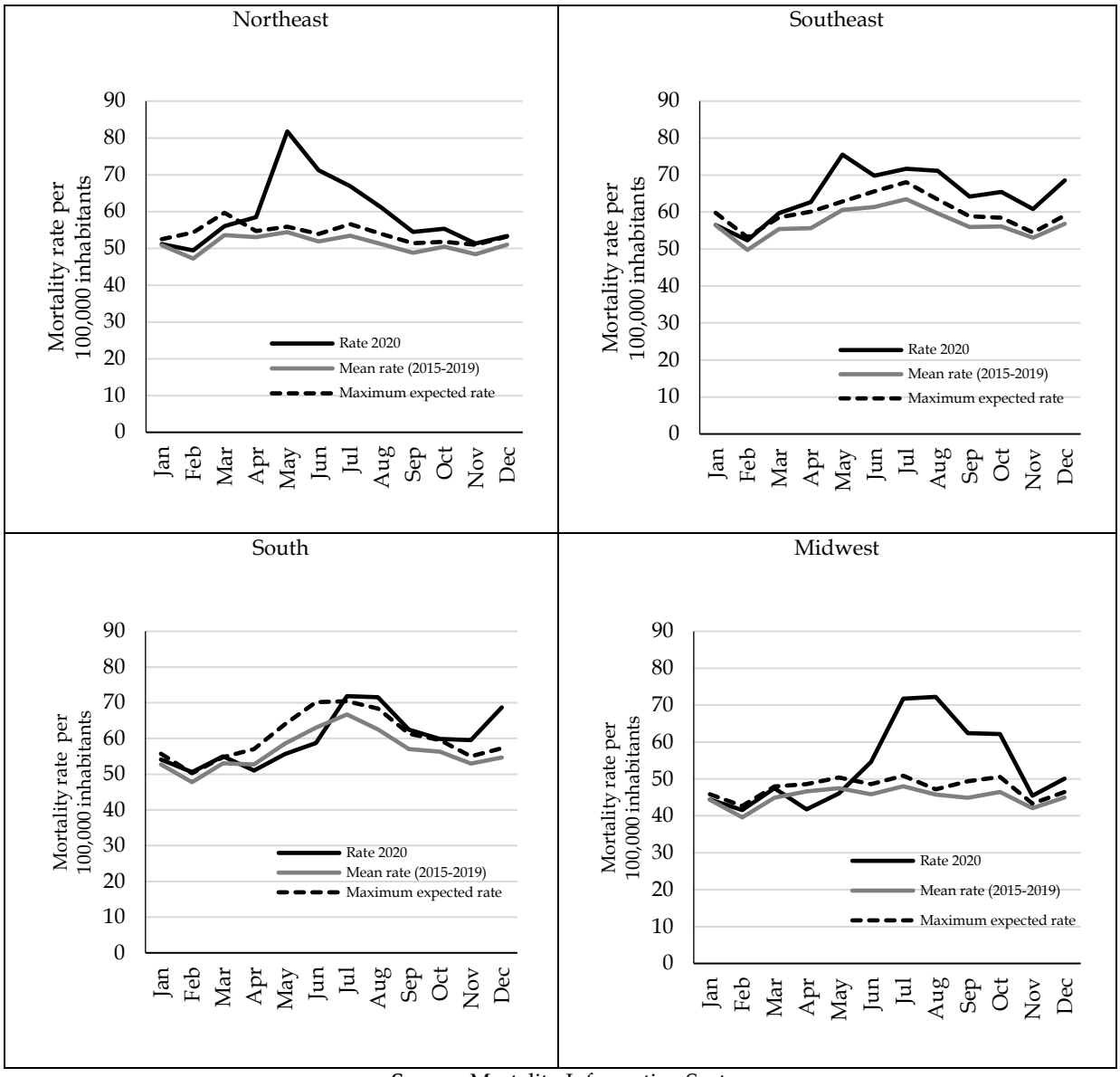
Goiás	41,025	584.54	47,500	667.74	1.14	1.13 - 1.16	<0.001
Federal District	12,804	424.64	16,170	529.27	1.25	1.22 - 1.28	<0.001
Mean#	49,993	582.18	56,723	668.56	-	-	-
Median#	24,431	605.08	28,580	678.92	-	-	-

Source: Mortality Information System.
95%CI: 95% Confidence Interval.
*Mantel Haenszel chi-square test.
#Only the values corresponding to each FU were considered.

The mortality rate exceeded the maximum expected limit from March 2020 (55.2/100,000), reaching 55.5/100,000 and with a peak in May (72.7/100,000), mainly due to the excess of deaths verified in the North (peak in May – 82.3/100,000), Northeast (peak in May – 81.8/100,000) and Southeast (peak in May – 75.5/100,000) regions. The maximum increases in the mortality rates in the South and Midwest regions were observed in July (71.9/100,000) and August (72.2/100,000), respectively (Figure 1).

Figure 1. Mortality rate (per 100,000 inhabitants) due to all causes according to the month when the deaths occurred. Brazil, 2015-2020.

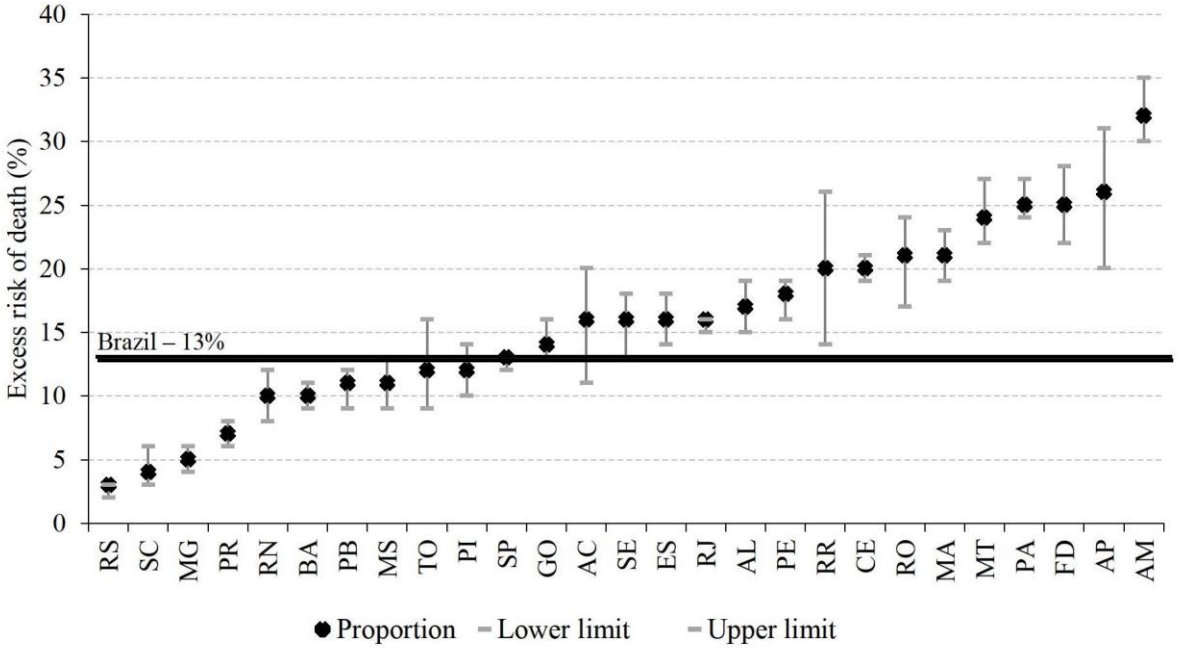




Source: Mortality Information System.

There was a 13% increase in the risk of dying in 2020 when compared to 2019 (RR=1.13; 95%CI: 1.12-1.13). Excess risk of dying was observed for all Brazilian FUs and regions. The regions with the highest increase in the mortality rate were North (RR=1.24; 95%CI: 1.23-1.26), Midwest (RR=1.17; 95%CI: 1.16-1.18) and Northeast (RR=1.15; 95%CI: 1.14-1.15). The states with the highest increase in the risk of dying were Amazonas (RR=1.32; 95%CI: 1.30-1.35), Amapá (RR=1.26; 95%CI: 1.20-1.31), Pará (RR=1.25; 95%CI: 1.24-1.27), Federal District (RR=1.25; 95%CI: 1.22-1.28) and Mato Grosso (RR=1.24; 95%CI: 1. 22-1.27) (Table 1, Figure 2).

Figure 2. Excess risk of dying due to all causes according to Federation Units. Brazil, 2020.



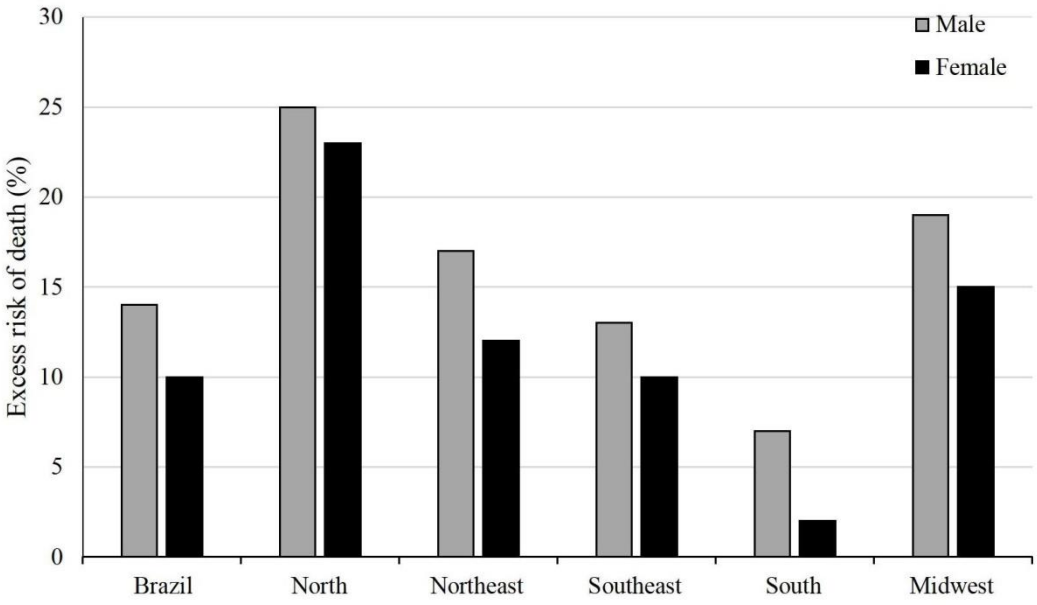
Source: Mortality Information System.

The excess risk of dying was higher in males (RR=1.14; 95%CI: 1.14-1.15). The regions with the highest increase in the risk of dying were North with 25% excess in males (RR=1.25; 95%CI: 1.24-1.27) and 22% in females (RR=1.23; 95%CI: 1.22-1.25), and Midwest with a 19% increase in males (RR=1.19; 95%CI: 1.17-1.20) and 15% in females (RR=1.15; 95%CI: 1.13-1.17) (Figure 3A).

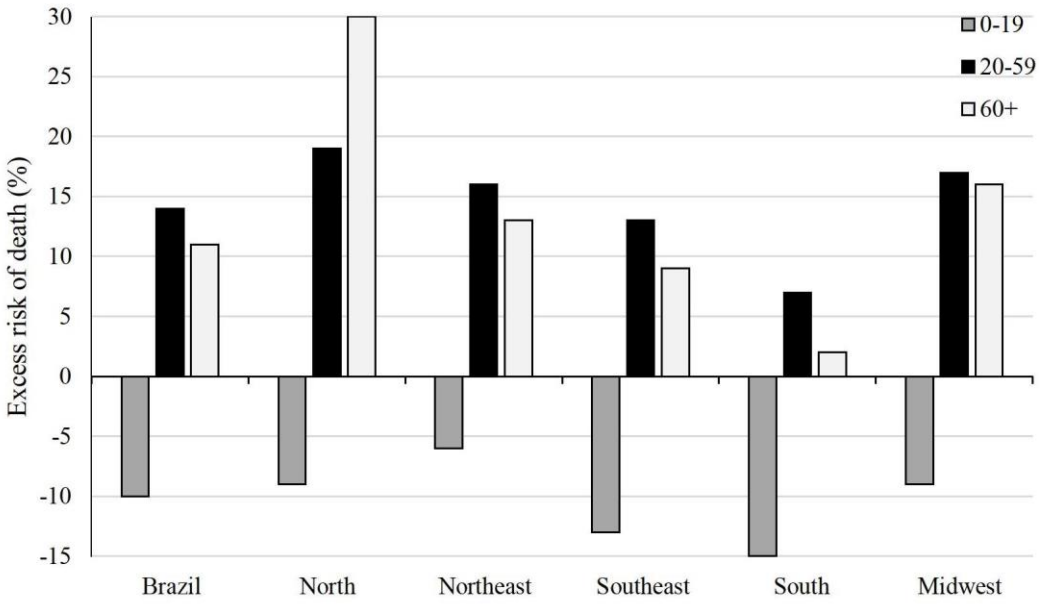
There was a reduction in the risk of dying among the population under 20 years of age in all Brazilian regions, with a greater reduction observed in the South region (-15%). For the total Brazilian population, the group aged from 20 to 59 years old presented the highest increase in the risk of dying (RR=1.14; 95%CI: 1.13-1.14), followed by the group of older adults aged at least 60 years old (RR=1.11; 95%CI: 1.10-1.11). The North (RR=1.19; 95%CI: 1.17-1.21) and Midwest (RR=1.17; 95%CI: 1.15-1.18) regions presented the highest increases in the risk of dying in the population between 20 and 59 years of age. The highest increase in the risk of dying for aged people over 60 years old was observed in the North (RR=1.30; 95%CI: 1.29-1.32) and Midwest (RR=1.16; 95%CI: 1.15-1.17) regions (Figure 3B).

Figure 3. Excess risk of dying according to gender (A) and age group (B). Brazil, 2020.

A) Gender



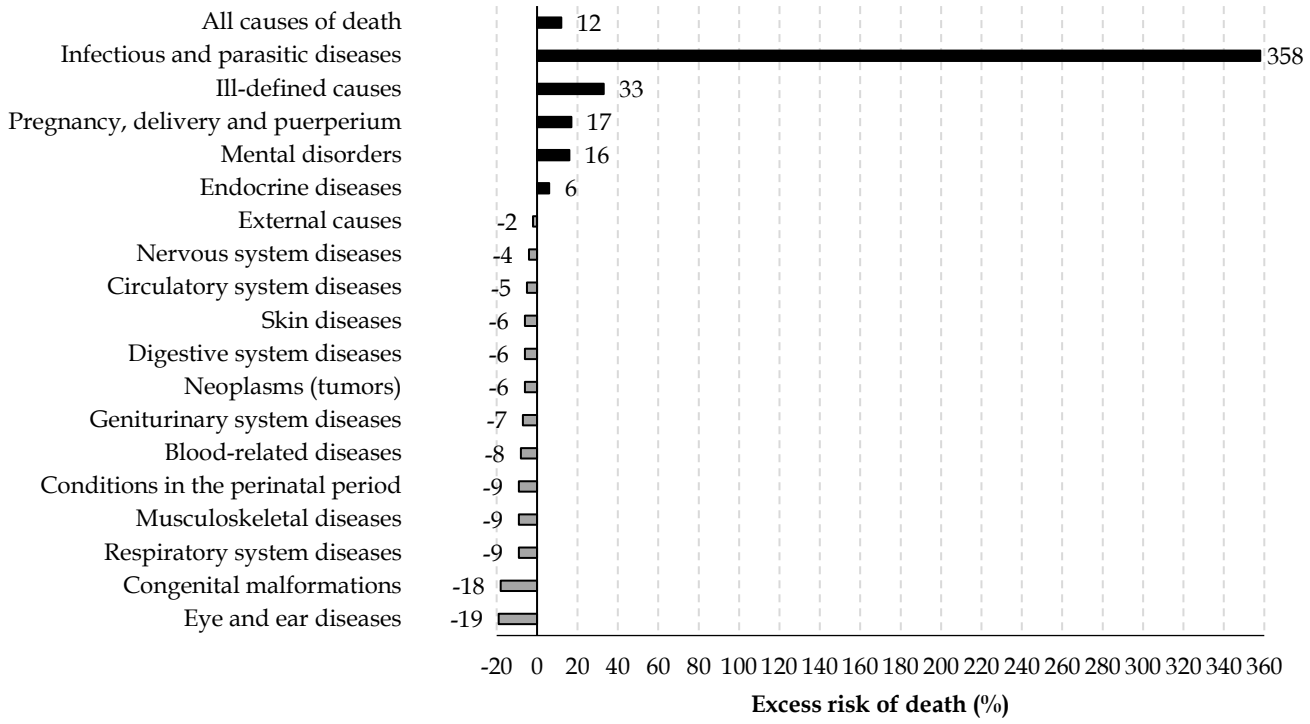
B) Age group



Source: Mortality Information System.

The highest excess risk of dying was observed in infectious and parasitic diseases with 358% (RR=4.58; 95%CI: 4.53-4.62), when compared to 2019. Excess risk of dying due to ill-defined causes (RR=1.33; 95%CI: 1.32-1.34), pregnancy, delivery and puerperium (RR=1.17; 95%CI: 1.10-1, 25) and endocrine diseases (RR=1.06; 95%CI: 1.05-1.07) was verified. The risk of dying due to eye and ear diseases (RR=0.81; 95%CI: 0.66-0.97) and congenital malformations (RR=0.82; 95%CI: 0.80-0.84) presented the highest reduction ratios (Figure 4).

Figure 4. Excess risk of dying according to underlying cause of death (ICD-10 chapters). Brazil, 2020.



Source: Mortality Information System.
ICD-10: Statistical International Classification of Diseases and Health-Related Problems - 10th revision.

DISCUSSION

In 2020, Brazil presented excess risk of dying in all its regions and FUs, in both genders and in the adult and aged population. The highest excess risks were verified in residents from the North, Midwest and Northeast regions, with the states of Amazonas, Amapá, Pará, the Federal District and Mato Grosso standing out. The underlying causes of death with the highest increase were infectious and parasitic diseases, deaths due to ill-defined causes and maternal deaths.

At the beginning of the pandemic, Brazil had 8,139 hospital institutions and 490,397 beds, of which 270,880 were general beds (clinical and surgical) and 34,464 were beds in Intensive Care Units (ICUs) for adults. Such offer corresponds to nearly 2.3 beds per 1,000 inhabitants, similar to countries such as Canada, the United Kingdom and Sweden, which suggested a number corresponding to that of countries with predominantly public and well-organized health systems.[22] However, with the rapid spread of COVID-19, the health system started to experience difficulties given the need to increase the number of beds, to purchase respirators, supplies and devices and to hire professionals, as well as managing regional differences in health care[23], which led to the death of thousands of Brazilians.

As in other countries, in Brazil there was rejection and ideological conflicts regarding the measures adopted to combat COVID-19. Since the beginning of the pandemic, some social media were used to spread misinformation and conspiracy theories, in addition to religious and political leaders delivering denialist speeches based on these issues, in which they underestimated the impact of the new coronavirus and categorized it as causing a disease with little clinical importance, which may have mistakenly led to a perception that the new pathology would be of low risk and easy to control in a significant percentage of the population.[24-25]

In this study, the occurrence of excess deaths was first evidenced in the Southeast region, followed by the Northeast and North regions. In the Southeast region, specifically in São Paulo, the first case of COVID-19 was recorded in Brazil. This metropolis, considered the fourth largest city in terms of population in the world and the one with the greatest interconnection with other regions, countries and continents through the road and air transport sectors, became the municipality with the highest number of cases and deaths due to the disease in the first months of 2020.[26-27]

There was an increase in the mortality rate throughout the country in 2020, especially in the North, Midwest and Northeast regions. These data confirm the papers that showed a context of regional differences, with greater impact on the most vulnerable health systems, especially in the North and Northeast, where the lowest technical-assistance resources are found and whose patients were more likely to evolve to death.[7-8] The situation in the North region was the most alarming one due to geographic and social inequalities reflected in its socioeconomic indicators, being a region with one of the lowest Primary Health Care coverages in Brazil, the lowest number of ICU beds, inputs, oxygen supply, medical professionals and ventilatory support devices, essential means to treat and combat COVID-19 complications.[28]

The states of Amazonas, Amapá, Pará and Mato Grosso are part of the Brazilian Amazônia, with most of their inhabitants living in remote access locations, in economic and social vulnerability, with restricted mobility and difficulty accessing health services. Such situations culminated in a higher propensity for the spread of COVID-19 and in higher mortality rates. In addition, high social inequality, ineffective public policies and weak health services in this region stood out.[29-30]

In the years analyzed, the mortality rate in males was higher than in females. A number of studies have indicated higher occurrence of deaths and a higher risk of dying due to COVID-19 among men.[31-33] The higher death rate among men can be explained by their general neglect in seeking health care, by their adopted lifestyle (tobacco use)[34] and greater resistance to following protective measures such as mask use hand hygiene, in addition to work-related issues.[35]

Adults aged from 20 to 59 years old were the most affected by the increase in mortality. A study carried out in the city of Londrina, Paraná, highlighted the greater circulation of these people in the municipality as a possible cause of the increase in cases of the disease. Non-adherence to the restrictive measures by people in the economically active age group is also another worrying factor, as they participated in crowds at parties and bars, contributing to increased infectivity and reduced protective awareness.[36] Furthermore, COVID-19 increases the possibility of evolution to death as the patient's age increases, with the "age" variable as one of the main risk factors for worse prognoses. In this context, the decrease in immunity and the presence of associated pathologies can elucidate this circumstance.[37]

Older adults constituted the second group with a considerable increase in mortality, especially in the North region. A study carried out by Barra et al.[38] points to clinical-functional frailty, high risk of chronic non-communicable diseases, comorbidities and disabilities that enable an increased risk of unfavorable outcomes in older adults' health. A higher number of deaths in this group is not the result of age alone, but of multiple factors that can accumulate over time and act simultaneously for the fatal outcome.

On the other hand, there was a decrease in the mortality rate in the age group younger than 20 years old at the national level. This result can be related to the fact that, initially, COVID-19 did not seriously affect this population segment, despite the possibility that children and young people have high viral loads, being an important source of transmission and potential contagion of the disease.[39-40] The adoption of isolation and distancing measures imposed by governmental authorities throughout the national territory to control the spread of COVID-19, such as closing and/or reducing the opening hours of schools, sports venues, gyms, restaurants, shopping malls, venues for events and/or concerts and public and private spaces for leisure in general, as well as the closure of highways and the lockdown were measures that may have contributed to the reduction in mortality among young people and children.[41]

The increase in mortality was observed in other types of causes of death, in addition to the chapter of infectious and parasitic diseases. The considerable increase in deaths due to ill-defined causes can be explained by the worldwide difficulty obtaining laboratory inputs such as diagnostic tests to confirm COVID-19 cases and deaths, by the inequality in access to complementary imaging tests and by the lack of knowledge about this new virus, in addition to the scarce evidence to attest to the infection with the new coronavirus as the underlying cause of death.[42-43]

Duration of the pandemic increased the barriers to adequate maternal and child care and food quality prenatal consultations, such as postponement of consultations in Basic Health Units and discontinuation of obstetric care, resulting in the arrival of pregnant women at hospitals with more serious conditions and unfavorable outcomes such as an increase in maternal deaths.[44] In addition, the physiology of pregnancy favors the creation of biological windows susceptible to COVID-19 attacks.[45]

Deaths due to endocrine diseases such as diabetes, increased the risk of dying, which can be explained by the consequences of suspending outpatient care. Reduced access to consultations and

hospitalizations can result in late diagnoses and treatments, deterioration of already diagnosed diseases, irregular treatments and, consequently, deaths.[46-47]

The limitations of this study consist of the unfeasibility of evaluating individualized data from the Ministry of Health database at the time of analysis, as well as the absence of more recent population data due to the impossibility to carry out the 2020 census. However, the study contributes to sizing the impact of COVID-19 on the mortality pattern in Brazil, according to the demographic and geographic aspects and the type of cause of death, which made it possible to evidence that excess mortality may have been a direct result of the emergence of COVID-19, but also of the lack of structure to face a pandemic, both by society in general and by governmental management, shown by the excess of deaths due to ill-defined causes and by deaths associated with pregnancy, delivery and puerperium.

CONCLUSION

The COVID-19 pandemic caused excess deaths in Brazil, its regions and states in 2020, starting in March and lasting until the end of the year. The highest excess risk of dying was observed in men, in the population aged from 20 to 59 years old, due to infectious and parasitic diseases including deaths due to COVID-19, as well as due to ill-defined causes, pregnancy, delivery and puerperium, and metabolic diseases.

The pandemic exposed the weakness of the country's health system and the need to strengthen public policies aimed at facing public health emergencies, valuing health professionals in combating new health challenges, and investing in effective prevention and control measures, in addition to disseminating reliable information and guidelines to mitigate spread of the disease.

The effects presented reveal the lack of governmental support at the national level, for not having led any coordinated response to this health emergency, delegating almost exclusively to states and municipalities the responsibility of confronting the new coronavirus, especially at the most critical moments of this global scale crisis. Therefore, in addition to recognizing the COVID-19 magnitude and impact in the country, disclosing the excess risk of dying makes it possible, to support health authorities in organizing actions aimed at reducing the effects of this public health emergency.

CONTRIBUITIONS

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