

COVID-19 mortality in Brazil in different age groups: differences between extreme rates in 2021 and 2022

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Jesem Douglas Yamall Orellana ¹

Lihsieh Marrero ²

Bernardo Lessa Horta ³

doi: 10.1590/0102-311XPT041922

Summary

To assess the trajectory of COVID-19 mortality rates in Brazil and compare the extreme rates in 2022 and 2021 in different age groups. This is an ecological study of deaths from severe acute respiratory syndrome due to COVID-19, with Brazil as the unit of analysis. The data was obtained from the Influenza Epidemiological Surveillance Information System. Deaths in the period from 10 January 2021 to 12 February 2022 were assessed, grouped into Epidemiological Weeks (EW). The data was analysed using R software, using Poisson models to estimate mortality rates. The level of statistical significance was 5%. A total of 408,180 deaths were analysed, with 0.34% of individuals under the age of 18 and 64.6% of those aged 60 and over. On the one hand, in the 0-1, 2-4 and 5-11 age groups, there were higher mortality rates in the SE 4-6/2022, compared to the higher rates in 2021. On the other hand, in 12-1/year-olds, a lower rate was estimated in the 4-6/2022 SE group compared to the 11-13 2021 SE group, with a mortality ratio of 0.60 (95%CI: 0.38-0.94). Opposite patterns in COVID-19 mortality were detected in Brazil among children and individuals included in the national vaccination campaign. Among the former, mortality rates were the same or worse than in previous phases of the epidemic, as opposed to a consistent and strong drop among the latter, reinforcing the effectiveness of the COVID-19 vaccine.

COVID-19 Vaccines; Mass Vaccination; Mortality; COVID-19

Correspondence

J. D. Y. Orellana

Leônidas and Maria Deane Institute, Oswaldo Cruz Foundation. Rua Teresina 4/6, 1st floor, room 105, Manaus, AM

6905/-0/0, Brazil.

jesem.orellana@fiocruz.br

¹ Leônidas e Maria Deane Institute, Oswaldo Cruz Foundation, Manaus, Brazil.

² Amazonas State University, Manaus, Brazil.

³ Faculty of Medicine, Federal University of Pelotas, Pelotas, Brazil.



Introduction

By May 2022, there were around 6.3 million direct deaths attributed to the COVID-19 pandemic, with Brazil exceeding 665,000 deaths ¹. Despite record highs in March and April 2021 in Brazil, deaths fell sharply in December ¹, due to vaccination, especially in higher risk groups ².

Children aged 5-11 began to be vaccinated against COVID-19 on 15 January 2022 ³, during the explosive spread of the Omicron variant ⁴ and in the same period in which those aged 11 and over should have already received two doses. Therefore, as there is evidence that vaccination reduces the risk of mortality from COVID-19 ², it is expected that mortality rates from the disease will have shown a distinct pattern between age groups after the vaccination campaign has progressed. The aim of this study was to assess the trajectory of COVID-19 mortality rates in Brazil and compare the extreme rates in 2022 and 2021 in different age groups.

Methods

Ecological study with mandatory notifications of deaths from severe acute respiratory syndrome (SARS) due to COVID-19 in Brazil, extracted from the Influenza Epidemiological Surveillance Information System (SIVEP/Gripe), 90 days after 12 February 2022 ⁵.

Resident population data for 2021 and 2022 reflect official estimates ⁶. Deaths are by place of residence and date of occurrence, with final classification and closure by laboratory, clinical-epidemiological, clinical or clinical-imaging criteria ⁵.

If it was impossible to calculate the age from the dates of death and birth, the age field in Sivep/Gripe was used instead. If the difference between the dates of death and birth was zero or the age field was zero days, the record was excluded due to inconsistency.

Ages were presented according to age group, < 18 years (0-1; 2-4; 5-11 and 12-17) and > 17 years (18-39; 40-59; 60 and over).

Deaths were assessed between 10 January 2021, Epidemiological Week (EW) 2/2021 and 12 February 2022 (EW 6/2022), to optimise the comparison of extreme data between the 2021 and 2022 EW groups. The first group of SEs comprises SE 2-4 (10 to 30 January 2021), representing part of the period of sustained recovery in mortality. The last group is SE 4-6/22 (23 January to 12 February 2022), a period of rising deaths in 2022.

In < 18 years, mortality in SE 4-6/2022 was compared to extreme values in 2021. Each SE group corresponded to the aggregation of three weeks, in order to minimise the effect of random fluctuations associated with the low daily or weekly number of deaths and interpretative distortions.

Poisson models were used to estimate mortality rates for one million inhabitants aged < 18 years and for 100,000 inhabitants aged > 17 years, controlling for the interaction between age groups and SE groups, in order to assess mortality patterns. In those aged <18 years, the four extreme values of the 2021 SE were compared with the 4-6/2022 SE group in each of the age groups and by inspecting the width of the confidence intervals (two larger and two smaller). In addition, mortality rate ratios were estimated by comparing the SE 4-6/2022 with the highest values in 2021, namely: SE 11-13 in children aged 0-1 year; SE 14-16 in those aged 2-4; SE 8-10 in those aged 5-11; and SE 11-13 in those aged 12-17.

The level of statistical significance was 5%, and the analyses were carried out using R software, version 3.6.1 (<http://www.r-project.org>) and RStudio, version 1.2.1335 (<https://www.rstudio.com/products/rstudio/download/>).

Approval of this study by the Human Research Ethics Committee was not necessary, due to the use of unidentified and publicly available data.

Results

A total of 408,180 deaths were assessed and 60 were excluded due to inconsistent age. The final sample was 408,120, with 0.34% (1,407) occurring in those aged <18 and 64.6% (263,771) in those aged 60 and over. According to Figure 1, in the 0-1 age group, the highest rates in 2021 occurred in SE 11-13 (14 March to 3 April 2021) and 14-16 (4 to 24 April 2021), and the two lowest, in SE 35-37 (29 April 2021).

August to 18 September 2021) and 44-46 (31 October to 20 November 2021). In 2-4 years, the two largest occurred in SE 14-16 (4 to 24 April 2021) and 20-22 (16 May to 5 June, 2021). The two lowest were in SE 44-46 (31 October to 20 November 2021) and SE 47-49 (21 November to 11 December 2021). In the 5-11, the two highest values in 2021 occurred in the SE 8-10 (21 February to 13 March 2021) and 20-22 (16 May to 5 June 2021), and the two lowest in the SE 8-10 (21 February to 13 March 2021) and 20-22 (16 May to 5 June 2021). the smallest, in SE 38-40 (19 September to 9 October 2021) and 47-49 (21 November to 11 December 2021). In the 12-17 age group, the two largest occurred in SE 11-13 (14 March to 3 April 2021) and 20-22 (16 May to 5 June 2021), and the two smallest in SE 41-43 (10 to 30 June 2021). October 2021) and SE 44-46 (31 October to 20 November 2021).

In the 0-1, 2-4 and 5-11 age groups, the rates were higher in SE 4-6/2022, compared to those older than 2021 (Figure 2). In those aged 12-17, the mortality ratio was 0.60 (95%CI: 0.38- 0.94), comparing the SE 4-6/2022 group with SE 11-13/2021 (Table 1).

Discussion

Substantial heterogeneity was observed in COVID-19 mortality rates between age strata in Brazil, with a sharp drop in adults, especially those aged 60 and over, as well as a substantial increase in those < 12 years old, in the first weeks of 2022, compared to the highest rates in 2021.

Between January 2021 and mid-February 2022, about two-thirds (408,120/638,608) of COVID-19 deaths occurred in Brazil, highlighting the strong impact of the disease on mortality, especially in socially vulnerable groups and in the first four months of 2021 ⁷, when the national percentage of vaccinated with two doses or a single dose was < 8% ⁸. By the end of December 2021, this percentage reached approximately 68% of the total population and increased modestly until 12 February 2022, to 72%, during the explosive viral spread of early 2022 ⁸, with a predominance of contagions by the Omicron ⁴ variant.

Around 65% of deaths occurred in those aged 60 and over, reinforcing advanced age as an independent risk factor for COVID-19 mortality ⁹. In adults, mortality was lowest between 18-39 years and with rates consistently below 5/100,000 inhabitants, especially from SE 35-37/2021, with values below 1/100,000 inhabitants. This period coincides with the slowdown in the epidemic and the beginning of the rapid increase in the percentage of vaccinated people in Brazil ⁸.

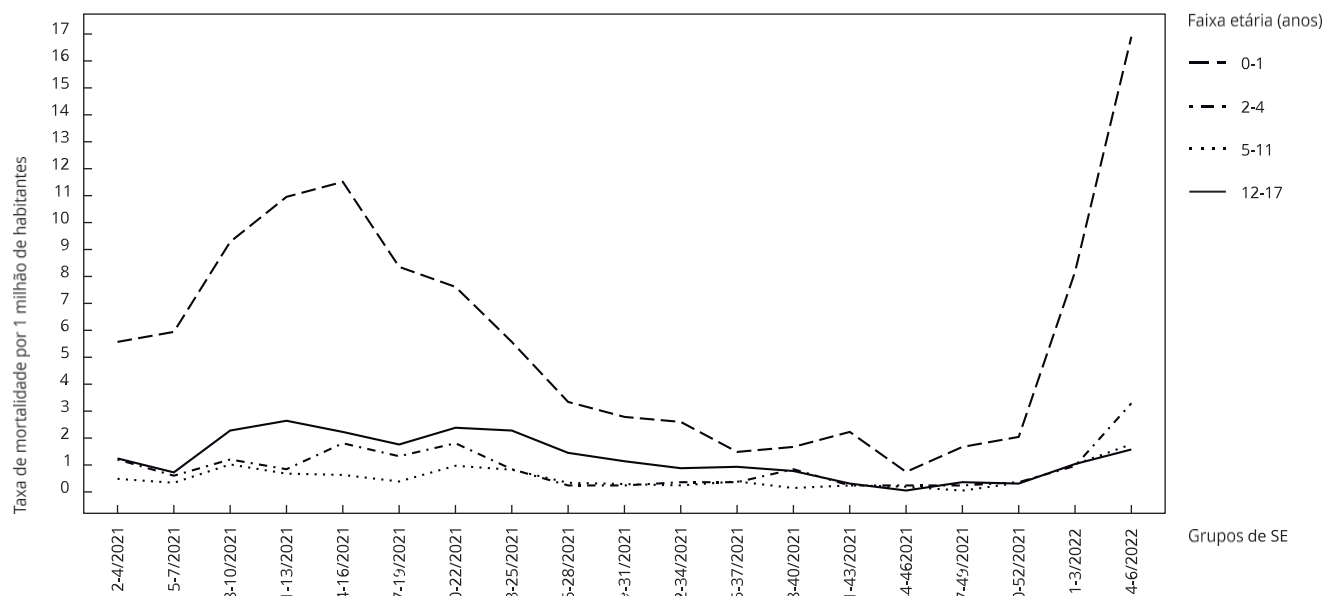
Considering those <18 years old, the opposite pattern to adults was observed, with the exception of adolescents aged 12-17, with a significant reduction in mortality in the SE 4-6/2022 group, compared to the SE 11-13 group (60%). The start of vaccination in < 18 year olds, although slow and asynchronous in Brazil, began in July 2021 and progressed in the following months, which may have limited mortality ¹⁰, especially in adolescents ¹¹. In < 12 year olds, with less than 15% having received the first dose in early February 2022 ³, the mortality pattern was clearly and consistently high in the 4-6/2022 SE, compared to the higher rates in the 2021 SE, regardless of age group. In general, the point estimates in the SE 4-6/2022 group were higher than in the SE 2021 groups, but with similar interval estimates. Evaluation of COVID-19 mortality in hospitalised children and adolescents in Brazil suggests that, as in adults, comorbidities such as diabetes are an important risk factor for death, especially in the context of poor socioeconomic conditions and inadequate medical and hospital support ¹².

As limitations, we highlight the uncertainties related to the etiological diagnosis of COVID-19, since the criteria used in health services can result in the incorrect classification of deaths. There is also the possible problem of coverage of deaths, although we updated our database 90 days after the end of SE 12/2022.

Figure 1

Trajectory of COVID-19 mortality rates, according to Epidemiological Week (EW) groups and age groups. Brazil, 2021/2022.

1a) Faixas etárias menores de 18 anos



1b) Faixas etárias maiores ou iguais a 18 anos

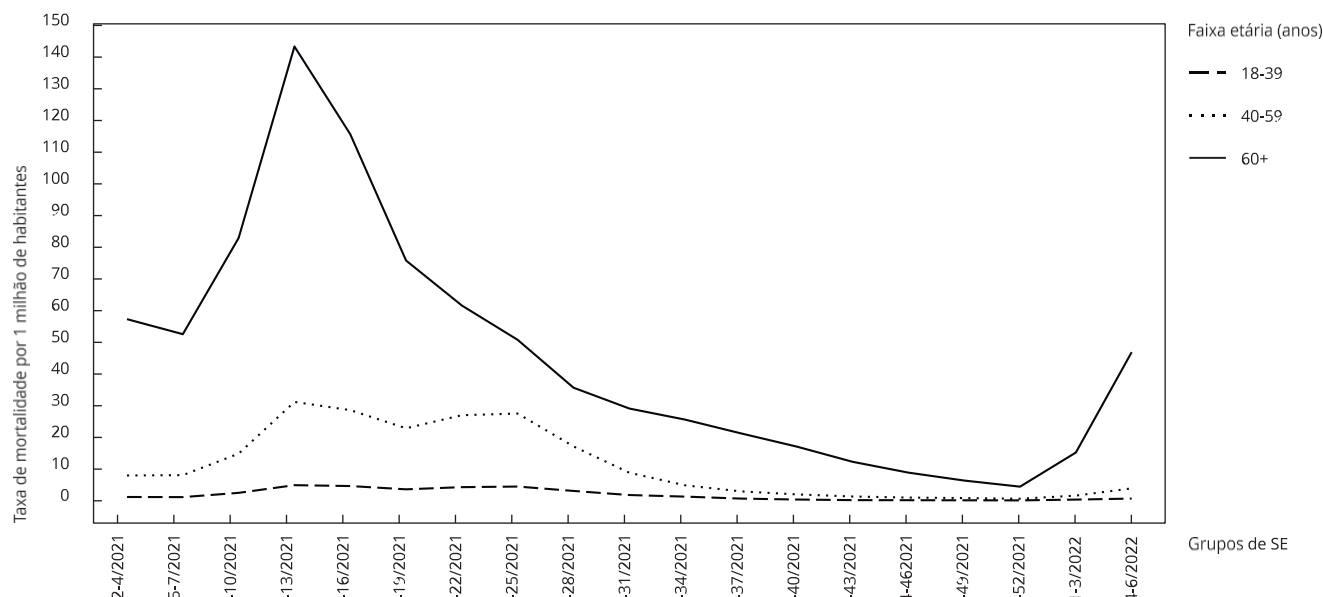
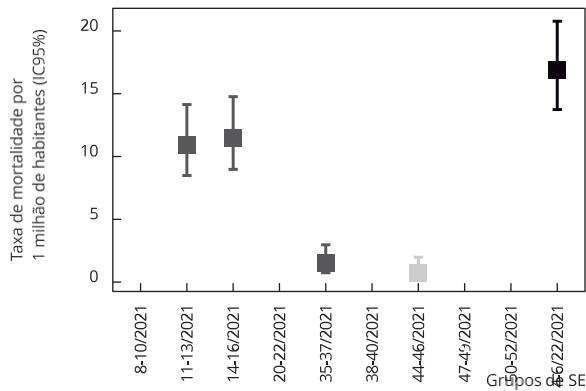


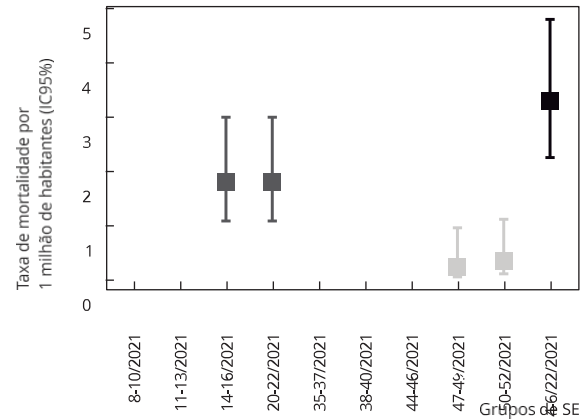
Figure 2

Comparison of COVID-19 mortality rates, according to Epidemiological Week (EW) groups and age groups, under 18 years of age. Brazil, 2021/2022.

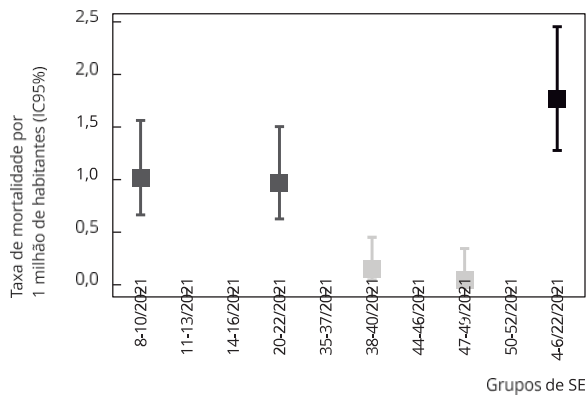
2a) 0-1 anos



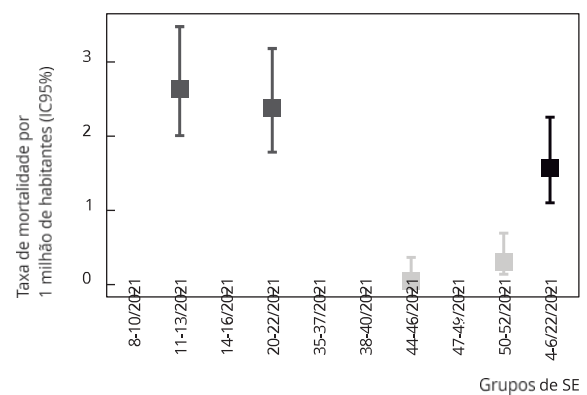
2b) 2-4 anos



2c) 5-11 anos



2d) 12-17 anos



95%CI: 95% confidence interval.

Opposite patterns of COVID-19 mortality were observed in Brazil, with children largely unvaccinated or insufficiently protected by mass vaccination on the one hand and showing mortality rates equal to or higher than in previous phases of the epidemic, and on the other, a consistent and strong pattern of decline in individuals included in the national vaccination campaign, evidence that reinforces the effectiveness of the COVID-19 vaccine.

Table 1

Demographic and temporal characteristics and ratios of COVID-19 mortality rates in children and adolescents (< 18 years), according to Epidemiological Week (EW) groups and age groups. Brazil, 2021/2022.

SE groups	Deaths	Population	Mortality rate/ 1 million of inhabitants	Rate ratio	95%CI
0-1 year				1,54	
4-6/2022	90	5.326.117	16,90		1,11-2,14
11-13/2021	59	5.385.924	10,95		
2-4 years				1,82	
4-6/2022	27	8.202.505	3,25		0,97-3,42
14-16/2021	15	8.298.617	1,81		
5-11 years				1,74	
4-6/2022	36	20.330.696	1,77		1,01-2,98
8-10/2021	21	20.598.959	1,02		
12-17 years				0,60	
4-6/2022	30	19.030.542	1,58		0,38-0,94
11-13/2021	51	19.304.353	2,64		

95%CI: 95% confidence interval.

Employees

J. D. Y. Orellana participated in the conception of the study, data collection and interpretation, writing and final revision of the manuscript. L. Marrero participated in the writing, data interpretation and final revision of the manuscript. B. L. Horta participated in the conception of the study, data interpretation, writing and final revision of the manuscript. All the authors approved the final version.

Additional information

ORCID: Jesem Douglas Yamall Orellana (0000-0002-5607-2615); Lihsieh Marrero (0000-0002-2856-5682); Bernardo Lessa Horta (0000-0001-9843-412X).

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Abstract

This ecological study evaluated the trajectory of COVID-19 mortality rates in Brazil and compared the extreme rates of 2022 and 2021, in different age groups. Data on deaths due to severe acute respiratory syndrome by COVID-19 were obtained from the Influenza Epidemiological Surveillance Information System. Deaths were evaluated from January 10, 2021 to February 12, 2022, grouped into Epidemiological Weeks (EW). Data analysis was conducted in the R software, using Poisson models to estimate mortality rates. Statistical significance level was set at 5%. A total of 408,180 deaths were evaluated, 0.34% of whom were under 18 years old, and 64.6% of whom were 60 years old and over. On the one hand, in the 0-1, 2-4 and 5-11 age groups, higher mortality rates were observed in EW 4-6/2022, compared to the higher ones in 2021. On the other, in the 12-1/ age group, a lower rate was estimated in the EW 4-6/2022 group compared to the EW 11-13 group in 2021, with a mortality ratio of 0.60 (95%CI: 0.38-0.94). Opposing patterns were detected in COVID-19 mortality in Brazil among children and individuals included in the national vaccination campaign. Among the former, mortality rates equal to or worse than in previous phases of the epidemic were observed, contrasting with the consistent and strong decline registered in the latter, reinforcing the effectiveness of COVID-19 vaccines.

COVID-19 Vaccines; Mass Vaccination; Mortality; COVID-19

Summary

The objectives were to evaluate the trajectory of COVID-19 mortality rates in Brazil and to compare the extreme rates of 2022 and 2021, in different age groups. Ecological study of deaths from severe acute respiratory syndrome due to COVID-19, with Brazil as the unit of analysis. The data were obtained from the Influenza Epidemiological Surveillance Information System. Defunctions from 10 January 2021 to 12 February 2022 were evaluated, grouped into Epidemiological Weeks (EW). The data was analysed using R software, using Poisson models to estimate mortality rates. The level of statistical significance was 5%. A total of 408,180 deaths were evaluated, 0.34% were individuals under 18 years of age and 64.6% were individuals aged 60 years or over. On the one hand, in the 0-1, 2-4 and 5-11 age groups, higher mortality rates were observed in SE 4-6/2022, compared to the highest rates in 2021. On the other hand, in individuals aged 12-1/years, a lower rate was estimated in the SE 4-6/2022 group, compared to the SE 11-13 of 2021 group, with a mortality ratio of 0.60 (95%CI: 0.38-0.94). Opposite levels of COVID-19 mortality were detected in Brazil among children and individuals included in the national vaccination campaign. Among the former, mortality rates were the same or lower than in previous stages of the epidemic, in contrast to a consistent and strong reduction in the latter, which reinforced the effectiveness of the COVID-19 vaccine.

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Received on 05/Mar/2022

Final version resubmitted on 14/May/2022

Approved on 13/Jun/2022