



# The relation between vaccination against Covid-19 and mortality in Brazil

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## ABSTRACT

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### OBJECTIVE

The WHO classified Covid-19 as a pandemic in March 2020, immunization being the best option to prevent its spread. In Brazil, vaccination has been carried out since January 2021. This study aims to investigate if mass immunization against Covid-19 has brought mortality reduction.

### METHODS

An original, quantitative, and documentary research. For theoretical basis, a narrative literature review was performed. The inclusion criteria were articles published between 2020 and 2021, in English, Portuguese and Spanish. The database used was the Virtual Health Library, using the following descriptors: "Vaccination", "Efficacy", "Mortality", "Coronavirus".

### RESULTS

Mortality rates increased between February and April, with a peak of 12.86% deaths per million inhabitants. During this period, even though population vaccination had started, the arrival of new viral variants, alike Delta, and the lack of compliance with social isolation measures contributed so that mortality remained high. From June onwards, the Covid-19 mortality rate declined continually. This is related to the increase in vaccination, going from 12.11% at the beginning of June to 31.05% of individuals partially vaccinated at the end of September.

### CONCLUSION

The Covid-19 pandemic is a serious public health problem, with Brazil being one of the most affected countries. Only in mid-April, with the expansion of the distribution of immunizing agents, mortality rates started dropping. However, we cannot minimize the number of deaths, which so far reaches 500 deaths per day. Thus, it is necessary to maintain protective measures and population vaccination so that the pandemic can come to an end.

### DESCRIPTORS

Coronavirus, Vaccination, Morbidity and Mortality Indicators.

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## INTRODUCTION

The disease caused by the new coronavirus (Sars-Cov-2), which emerged in late 2019, had its epicenter in Hubei province, China, later spreading across the globe<sup>1</sup>. On January 30<sup>th</sup>, 2020, the World Health Organization (WHO) Emergency Committee declared the disease as a global health emergency, and in March 2020 classified it as a pandemic<sup>1</sup>. Since then, mass vaccination has been considered the greatest strategy for combating the coronavirus, in view of the exponential increase in contamination rates worldwide<sup>1,2</sup>. In 2020, Brazil was one of the five nations with the most confirmed cases of Covid-19, reaching an average of 30,000 notified cases every 7 days<sup>3</sup>. The vaccines used in Brazil so far are: ChAdOx1 (Oxford/Astrazeneca) and BNT162b (Pfizer/Biontech), which are definitely registered, while Ad26.COVS.2 (Johnson & Johnson), CoronaVac (Sinovac), and mRNA-1273 (Moderna) are authorized for emergency use, while Sputnik V (Gamaleya) and Covaxin (Bharat Biotech) are for exceptional import only<sup>4</sup>.

Currently, around 80 million Brazilians are fully vaccinated against Covid-19 and around 65 million are partially vaccinated<sup>5</sup>. With the start of mass vaccination, it was believed that mortality would reduce its rates in the country immediately, but with the emergence of new variants, such as Delta, and the inefficiency of social isolation, the effectiveness of this process ended up being reduced in the Brazilian scenario<sup>6</sup>. Therefore, this study seeks to demonstrate the relation between mortality rate and the administration of vaccines against Covid-19.

## METHODS

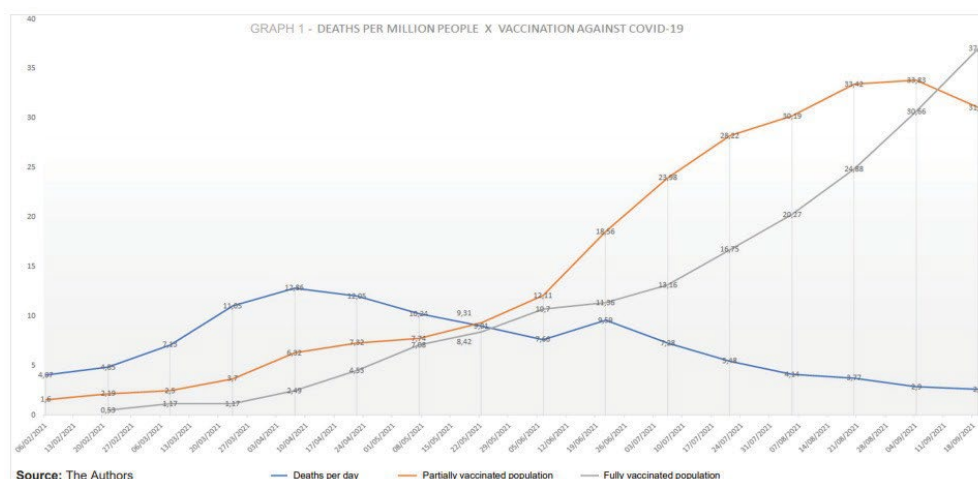
This is an original research, documentary and quantitative, that investigated the relation between mass vaccination against Covid-19 and mortality. The data regarding share of people vaccinated against COVID-19 and mortality in Brazil, during the period 06-02-2021 to 19-09-2021, was obtained and extracted from the Our World in Data (<https://ourworldindata.org/>) dataset with recent official numbers. To support the theoretical framework, a narrative literature review was carried out. A search was performed in the Virtual Health Library database, using the following keywords: "Vaccination", "Efficacy", "Mortality", "Coronavirus". To assist in the searches, the following Boolean operator was used: AND. The inclusion criteria applied were all bibliographic productions published between 2020 and 2021, in English, Portuguese and Spanish. Letters to the editor, documents and audiovisual materials and books were not considered for the searches. Three inde-

pendent authors performed a non-systematic analysis of the results found.

## RESULTS AND DISCUSSION

Figure 1 shows the correlation between the three variables considered in this study: the percentage of deaths per million people, the percentage of partially vaccinated individuals, and the percentage of fully vaccinated individuals in Brazil. An exponential increase in mortality values was registered between February and April 2021, with a peak, in this last month, of 12.86% deaths per million people. During this period vaccination had already started in the country, but only 6.32% of the population was partially vaccinated and 2.49% fully vaccinated. The increase in mortality rate after the vaccination had already started can be explained by relaxation of social isolation measures and the emergence of new variants of the coronavirus<sup>6,7</sup>. From June onwards, the Covid-19 mortality rate began to decline. This fact is related to the significant increase in partially vaccinated individuals, going from 12.11% at the beginning of June to 18.56% at the end of this month. Over time with the advance of vaccination, there was a great reduction in the number of daily deaths, reaching 2.6 per million people in September, with 31.05% of the population being partially vaccinated and 37.08% fully vaccinated, totaling 68.13% of vaccinated individuals. Studies show that the first dose alone of any Covid-19 immunizer can significantly reduce the risk of passing the infection from one person to another, thus also reducing the associated mortality<sup>7</sup>. Most vaccines used to fight the pandemic are given in two doses<sup>7,8</sup>. The second dose works as a "prime-boosting", since it maximizes immune protection and memory<sup>7</sup>. When the Pfizer, Moderna and Astrazeneca vaccines were first being tested, it was shown that the first dose caused an immune weak response, with a lower number of antibodies, compared to a very effective response after the "prime-boosting" dose was administered<sup>7,8</sup>. Another study shows that the immune response after the second dose of the Pfizer vaccine also increases protection against Alpha and Delta variants<sup>9</sup>. It is necessary to consider the time of seroconversion, that is, the real time of immunization, which occurs 14 days after the vaccine application<sup>8,9</sup>. Thus, when analyzing the graph, one should consider that people are only effectively immunized two weeks after the last dose, causing a delay on how the vaccination data impacts on the mortality rate.

**Figure 1.** Correlation between the three variables considered in this study: the percentage of deaths per million people, the percentage of partially vaccinated individuals, and the percentage of fully vaccinated individuals in Brazil.



## CONCLUSION

The Covid-19 pandemic is a serious public health problem that has caused the death of millions of people worldwide, with Brazil being one of the most affected countries. Thus, a relentless search for the discovery of an immunizing agent capable of reversing this scenario began. However, after the vaccination of the population had started, the mortality rate didn't drop as expected. Only in mid-April, with the expansion of the distribution of immunizing agents, was it possible to observe the beginning of the decrease in numbers, which continues until the month of September. Although mortality rates have reduced considerably in the country, we cannot minimize the number of deaths, which to date, surpass the mark of 500 deaths per day. Thus, it is necessary to maintain protective measures of social distancing, wearing masks, and that people complete their vaccination schedule so that the pandemic can come to an end.

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## REFERENCES

1. Velavan TP, Meyer CG. The COVID-19 epidemic. *Tropical medicine & international health*. 2020 Feb 16;25(3):278.
2. Ciotti M, Ciccozzi M, Terrinoni A, Jiang WC, Wang CB, Bernardini S. The COVID-19 pandemic. *Critical reviews in clinical laboratory sciences*. 2020 Jun 09;57(6):365-388.
3. Tsallis C, Tirnakli U. Predicting COVID-19 peaks around the world. *Frontiers in Physics*. 2020 May 29;8:217.
4. Victora CG, Castro MC, Gurzenda S, Medeiros A, Franca GV, Barros AJ. Estimating the early impact of immunization against COVID-19 on deaths among elderly people in Brazil: analyses of routinely-collected data on vaccine coverage and mortality. *medRxiv*. 2021 Apr 30.
5. DeRoo SS, Pudalov NJ, Fu LY. Planning for a COVID-19 vaccination program. *Jama*. 2020 May 18;323(24):2458-2459.
6. Kupek, E. Low COVID-19 vaccination coverage and high COVID-19 mortality rates in Brazilian elderly. *Revista Brasileira de Epidemiologia*. 2021;24.
7. Livingston EH. Necessity of 2 doses of the Pfizer and Moderna COVID-19 vaccines. *JAMA*. 2021 Feb 03;325(9):898-898.
8. Polack FP, Thomas SJ, Kitchin N, Absalon J, Gurtman A, Lockhart S et al. Safety and efficacy of the BNT162b2 mRNA Covid-19 vaccine. *New England Journal of Medicine*. 2020 Dec 10;383:2603-2615.
9. Wall EC, Wu M, Harvey R, Kelly G, Warchal S, Sawyer C. et al. Neutralising antibody activity against SARS-CoV-2 VOCs B. 1.617. 2 and B. 1.351 by BNT162b2 vaccination. *The Lancet*. 2021 Jun 13;397(10292):2331-2333.