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Commentary
COVID-19 in Brazil: 150,000 deaths and the Brazilian underreporting

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A B S T R A C T
Brazil is one of the epicenters of the COVID-19 pandemic and has reported 5,113,628 cases and 150,998 deaths by the disease. Comparing the deaths by natural causes expected and the excess mortality rate, there is a 22% increase in deaths mainly of male patients and individuals over 60 years old. Comparing the deaths by natural causes expected and the excess mortality rate, there is a 22% increase in deaths mainly of male patients and individuals over 60 years old. Demonstrated a higher excess death percentage compared to deaths by natural causes expected for 2020.

On October 12, 2020, Brazil reported a total of 5,113,628 confirmed cases of COVID-19, being 4,526,975 recovered, 435,655 active COVID-19, and 150,998 deaths, besides, on this same date, in a 24-hour period, Brazil also reported 10,220 new confirmed cases and 309 deaths (Painel COVID-19, 2020a, 2020b). The incidence (ratio between the number of cases and the number of individuals in the population) and mortality (ratio between the number of deaths and the number of individuals in the population) rate were, respectively, 0.001; (2) number of deaths by COVID-19 (CC = 0.862; P value ≤0.001); (1) number of COVID-19 cases (CC = 0.765; P value ≤0.001); (2) number of deaths by COVID-19 (CC = 0.862; P value ≤0.001); (2) number of deaths by COVID-19 (CC = 0.862; P value ≤0.001); (2) number of deaths by COVID-19 (CC = 0.862; P value ≤0.001).
Table 1

Epidemiologic data for COVID-19 cases including deaths, case fatality rate, incidence, and mortality and for deaths by natural causes in Brazil.

| Location | COVID-19 cases | Death by COVID-19 | Case fatality rate | Incidence per 100,000 inhabitants | Mortality per 100,000 inhabitants | Excess mortality rate (deaths) by natural causes | Deaths by natural causes expected according to previous years | Excess mortality rate (%) |
|----------|----------------|------------------|-------------------|----------------------------------|----------------------------------|-----------------------------------------------|-------------------------------------------------|------------------------|
| Brazil   | 5,113,628      | 150,998          | 3.0               | 2,433.40                         | 71.9                             | 118,406                                       | 529,659                                         | 22                     |
| Midwest  | 638,750        | 13,731           | 2.1               | 3,919.40                         | 84.3                             | 8,521                                         | 33,974                                          | 25                     |
| MS       | 75,076          | 1,449            | 1.9               | 2,701.60                         | 52.1                             | 746                                           | 6,758                                           | 35                     |
| GO       | 230,184         | 5,211            | 2.3               | 3,277.10                         | 74.2                             | 3,345                                         | 14,601                                          | 23                     |
| DF       | 201,230         | 3,466            | 1.7               | 6,673.70                         | 114.9                            | 2,058                                         | 5,791                                           | 36                     |
| MT       | 132,260         | 3,605            | 2.7               | 3,795.70                         | 103.5                            | 2,372                                         | 6,824                                           | 11                     |
| South    | 638,065         | 12,899           | 2.0               | 2,128.60                         | 43.0                             | 3,912                                         | 84,318                                          | 5                      |
| PR       | 194,829         | 4,005            | 2.1               | 1,787.90                         | 40.9                             | 1,964                                         | 29,642                                          | 7                      |
| SC       | 228,403         | 2,927            | 1.3               | 3,187.90                         | 40.9                             | 746                                           | 17,213                                          | 7                      |
| RS       | 214,970         | 5,167            | 2.4               | 1,889.50                         | 45.4                             | 826                                           | 37,463                                          | 2                      |
| North    | 656,821         | 15,401           | 2.3               | 3,563.70                         | 83.6                             | 11,906                                       | 32,286                                         | 48                     |
| RO       | 68,126          | 1,406            | 2.1               | 3,833.30                         | 79.1                             | 868                                          | 3,065                                          | 28                     |
| TO       | 71,269          | 1,012            | 1.4               | 4,531.20                         | 64.3                             | 639                                          | 2,870                                          | 22                     |
| AM       | 147,864         | 4,254            | 2.9               | 3,567.60                         | 102.6                            | 4,939                                        | 6,675                                          | 74                     |
| AC       | 29,272          | 675              | 2.3               | 3,191.90                         | 76.3                             | 533                                          | 1,702                                          | 31                     |
| AP       | 49,593          | 727              | 1.5               | 5,863.90                         | 86.0                             | 533                                          | 1,306                                          | 41                     |
| RR       | 52,701          | 670              | 1.3               | 8,700.00                         | 110.6                            | 462                                          | 996                                           | 46                     |
| PA       | 237,996         | 6,657            | 2.8               | 2,768.50                         | 77.4                             | 745                                          | 10,801                                         | 47                     |
| Northeast| 1,391,655       | 40,492           | 2.9               | 2,438.40                         | 70.9                             | 47,055                                       | 133,376                                         | 35                     |
| BA       | 327,327         | 7,188            | 2.2               | 2,200.80                         | 48.3                             | 10,708                                       | 33,967                                         | 32                     |
| PB       | 126,073         | 2,944            | 2.3               | 3,137.60                         | 73.3                             | 1,525                                       | 10,801                                         | 14                     |
| AL       | 88,954          | 2,151            | 2.4               | 2,650.70                         | 64.5                             | 2,687                                       | 7,196                                          | 40                     |
| PE       | 153,299         | 8,417            | 5.5               | 1,604.00                         | 88.1                             | 8,652                                       | 23,700                                         | 37                     |
| SE       | 80,234          | 2,107            | 2.6               | 3,490.40                         | 91.7                             | 1,459                                       | 5,206                                          | 28                     |
| PI       | 102,813         | 2,237            | 2.2               | 3,141.00                         | 68.3                             | 671                                          | 8,480                                          | 8                       |
| MA       | 179,170         | 3,885            | 2.2               | 2,532.40                         | 54.9                             | 8,137                                       | 14,148                                         | 58                     |
| RN       | 73,143          | 2,432            | 3.3               | 2,085.70                         | 69.1                             | 1,093                                       | 8,550                                          | 20                     |
| CE       | 260,642         | 9,140            | 3.5               | 2,854.00                         | 100.1                            | 11,319                                      | 21,328                                         | 53                     |
| Southeast| 1,788,337       | 68,475           | 3.8               | 2,023.70                         | 77.5                             | 43,514                                      | 245,705                                        | 18                     |
| SP       | 1,039,029       | 37,314           | 3.6               | 2,262.70                         | 81.3                             | 18,444                                      | 122,812                                        | 15                     |
| ES       | 140,629         | 3,680            | 2.6               | 3,459.60                         | 91.6                             | 2,947                                       | 9,282                                          | 32                     |
| RJ       | 284,053         | 19,336           | 6.8               | 1,645.30                         | 11.2                             | 16,086                                      | 57,779                                         | 28                     |
| MG       | 324,626         | 8,145            | 2.5               | 1,533.50                         | 38.5                             | 6,037                                       | 56,821                                         | 11                     |

Excess mortality rate (number of deaths) by natural causes (and percentage representing each group) and excess mortality rate (%) according to sex and age groups

| Region* | Excess mortality rate (%) | Male <59 years old | Male ≥60 years old | Female <59 years old | Female ≥60 years old |
|---------|---------------------------|--------------------|--------------------|----------------------|----------------------|
| Brazil  | 27%                       | 18%                | 19%                | 28%                  | 21%                  |
| Midwest | 30%                       | 20%                | 22%                | 32%                  | 25%                  |
| South   | 36%                       | 25%                | 27%                | 35%                  | 29%                  |
| North   | 45%                       | 33%                | 37%                | 45%                  | 39%                  |
| Northeast| 41%                      | 30%                | 33%                | 40%                  | 34%                  |

Excess mortality rate (%) was calculated based on the ratio between excess number of deaths by natural causes and the expected number of deaths by natural causes to date.

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* Last update and data collection was carried out on October 13, 2020. The data were retrieved from https://www.conass.org.br/painelconasscovid19/.

b Last update was carried out on September 21, 2020 and the data collection was carried out on October 13, 2020. The data were retrieved from https://www.conass.org.br/indicadores-de-obitos-por-causas-naturais/.

c The first line for each region represents the excess mortality rate (number of deaths) by natural causes and the percentage at each group according to sex and age. The second line for each region represents the excess mortality rate (%) according to sex and age groups. The number of expected deaths by natural causes in 2020 was projected according to the data collected from Sistema de Informações sobre Mortalidade (Mortality Information System) of the Brazil between 2015 and 2019. The data on deaths in 2020 were obtained from Portal da Transparência do Registro Civil (Civil Registry Transparency Portal). Both datasets were compiled by the National Council of Health Secretary of Brazil.
continuous engagement by Brazilian society as a whole to secure the authors concluded: indirect effects of the COVID-19 pandemic (World Health Organization, 2020). However, the excess deaths should not be associated as a direct cause of the COVID-19 pandemic; even though, they might be indirectly associated with it, due to overload in health services, interruption of chronic disease treatments, and patient’s resistance to seek health assistance due to fear of SARS-CoV-2 virus infection.

In our data, the high number of unexpected deaths by natural causes during the COVID-19 pandemic is evident. Perhaps our data represent under reporting by the Brazilian government for severe patients affected by COVID-19 due limitations to perform the SARS-CoV-2 screen by RT-PCR (Marson, 2020). The Brazilian regions with the highest percentage of unexpected deaths by natural causes had the lowest availability for RT-PCR tests and intensive care units during the pandemic, mainly, in the North region (Palamim and Marson, 2020). In brief, Brazil should improve the COVID-19 diagnosis, implement better clinical policy guidelines by the government to treat patients with COVID-19 mainly for severe cases when the intensive care unit beds and intubation are needed, improve the adherence to social distancing, improve awareness of the severity of the disease to residents and optimize the acquisition of drugs and personal protective equipment necessary for the management of COVID-19, mainly anesthetics and muscle relaxants that are lacking in the Brazilian market as well as other drugs such as Dexamethasone, Remdesivir, and Tocilizumab that showed efficacy to treat patients with COVID-19 (Beigel et al., 2020; Guaraldi et al., 2020; Horby et al., 2020). So what? As discussed in the Lancet editorial, in Brazil, the authors concluded: “The challenge is ultimately political, requiring continuous engagement by Brazilian society as a whole to secure the right to health for all Brazilian people.” (The Lancet, 2020). At the same time, it is necessary to have transparency and clarity in the data about COVID-19, which includes the real rate of deaths and cases associated with the disease.

1. What is already known on this subject?
(i) Monitoring of death indicators is a strategy recommended by the World Health Organization to assess the direct and indirect effects of the COVID-19 pandemic.
(ii) The global underreporting is a challenge to deal with the COVID-19 pandemic and it is associated with political, technological, and economic burden associated with different territories.

2. What does this study add?
(i) In our data, the high number of unexpected deaths by natural causes during the COVID-19 pandemic is evident.
(ii) A total of 118,406 unexpected deaths by natural causes was observed during the COVID-19 pandemic.
(iii) Maybe, our data represent the Brazilian underreporting for severe patients affected by COVID-19 due to limitations to perform the SARS-CoV-2 screen by RT-PCR.

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Authors’ contributions
All authors have approved the manuscript and agreed with its submission to the journal. Also, all authors wrote and revised the manuscript. Tatiana Aline Carvalho, Matheus Negri Boschiero, and Fernando Augusto Lima Marson approved the manuscript and agreed with its submission. Also, all authors contributed equally to this study in conceptualization; data curation; formal analysis; methodology; validation; writing the original draft; and writing the review.

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P value = 0.015).