Contents lists available at ScienceDirect

Diagnostic Microbiology and Infectious Disease

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.

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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, 2,433.4 and 71.9 individuals per 100,000 inhabitants. Moreover, the case fatality rate (CFR; ratio between the number of deaths and the number of cases in the population) was 3.0 (Painel COVID-19, 2020b). In the same period, the total deaths by natural causes expected were 529,659 and the excess mortality rate (deaths) by natural causes was 118,406, thus, an increase of 22% in deaths by natural causes was observed by official government agencies (Painel de análise do excesso de mortalidade por causas naturais no Brasil, 2020). Brazil has an annual increase in deaths by natural causes ~1,000 to 2,000 new deaths, mainly related to an aging population.

Brazilian regions presented a rise in the percentage of excess deaths, with the lowest rates in the South region (5%) and the highest in the North region (48%). Regarding Brazilian states and the Federal District, the lowest percentage of excess deaths was 2%, observed in the state of Rio Grande do Sul (RS). Furthermore, the highest percentage of excess deaths among states occurred in the state of Amazonas (AM), which reached 74%. Curiously, both males and individuals over 60 years old demonstrated a higher excess death percentage, compared to deaths by natural causes expected for 2020.

In this context, a data analysis was performed for the COVID-19 pandemic epidemiology and for the number of deaths in Brazil. The following markers were evaluated: COVID-19 cases with diagnoses by SARS-CoV-2 real-time polymerase chain reaction (RT-PCR); deaths by COVID-19; CFR; 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 and excess mortality rate (%). The expected deaths by natural causes in 2020 were projected according to data collected from the *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 (Painel de análise do excesso de mortalidade por causas naturais no Brasil, 2020).

The main findings included: data for confirmed COVID-19 cases; deaths by COVID-19; CFR; incidence and mortality per 100,000 inhabitants; excess mortality rate (deaths) by natural causes; deaths by natural causes expected according to previous years and its percentage (excess deaths by natural causes per expected deaths by natural causes). These data are presented according to gender and age for Brazilian States and the Federal District and geographic regions (Table 1).

A significant Spearman correlation coefficient (CC) was found between the excess mortality rate by natural causes (number of cases) and (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

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[a]	Death by COVID-19[a]	Case fatality rate[a]	Incidence per 100,000 inhabitants[a]	Mortality per 100,000 inhabitants[a]	Excess mortality rate (deaths) by natural causes[b]	Deaths by natural causes expected according to previous years[b]	Excess mortality rate (%)[b]
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	3,279.70	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	194,692	4,805	2.5	1,702.80	42.0	1,964	29,642	7
SC	228,403	2,927	1.3	3,187.90	40.9	1,121	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	15,405	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	3,319.10	76.5	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	2,766.50	77.4	1,525	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	2,665.40	64.5	2,887	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	2,423	3.3	2,085.70	69.1	1,696	8,550	20
CE	260,642	9,140	3.5	2,854.10	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	121,822	15
ES	140,629	3,680	2.6	3,499.40	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[c]	Male	Female	<59 years old	≥60 years old	Male and <59 years old	Male and ≥60 years old	Female and <59 years old	Female and ≥60 years old
Brazil	73,464 (62%)	44,941 (38%)	35,282 (30%)	83,124 (70%)	23,376 (20%)	50,088 (42%)	11,906 (10%)	33,036 (28%)
Excess mortality rate (%)	27%	18%	28%	21%	32%	25%	23%	16%
Midwest	5,484 (64%)	3,037 (36%)	2,918 (34%)	5,603 (66%)	2,016 (24%)	3,468 (41%)	902 (11%)	2,135 (25%)
Excess mortality rate (%)	30%	20%	32%	23%	38%	26%	23%	18%
South	2,493 (64%)	1,418 (36%)	2,267 (58%)	1,644 (42%)	1,505 (38%)	988 (25%)	762 (19%)	656 (17%)
Excess mortality rate (%)	6%	4%	13%	2%	15%	3%	11%	2%
North	10,252 (67%)	5,153 (33%)	3,471 (23%)	11,933 (77%)	2,381 (15%)	7,871 (51%)	1,091 (7%)	4,063 (26%)
Excess mortality rate (%)	57%	36%	31%	56%	36%	68%	24%	42%
Northeast	28,499 (61%)	18,566 (39%)	12,436 (26%)	34,619 (74%)	8,286 (18%)	20,206 (43%)	4,153 (9%)	14,413 (31%)
Excess mortality rate (%)	41%	29%	35%	35%	40%	41%	29%	29%
Southeast	26,747 (61%)	16,767 (39%)	14,189 (33%)	29,324 (67%)	9,191 (21%)	17,556 (40%)	4,999 (11%)	11,768 (27%)
Excess mortality rate (%)	21%	14%	26%	15%	29%	19%	22%	12%

[a] 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. 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.

≤0.001); (3) CFR (CC = 0.664; *P* value ≤0.001); and (4) incidence per 1000,000 inhabitants for COVID-19 (CC = -0.530; *P* value = 0.004); as well as, excess deaths by natural causes per expected deaths by natural causes with the mortality per 100,000 inhabitants due COVID-19 (CC = 0.464; *P* value = 0.015).

Currently, 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 (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.

Funding

Declaration of competing interest

The authors report no conflicts of interest relevant to this article.

Ethics approval

Not applicable.

Consent to participate

Not applicable.

Consent for publication

All authors have approved the manuscript and agreed with its submission.

Availability of data and material

Not applicable.

Code availability

Not applicable.

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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