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Years of Potential Life Lost due to COVID-19 according to race/color and gender in Brazil between 2020 and 2021

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Abstract *Mortality caused by the COVID-19 pandemic has impacted indicators of Years of Potential Life Lost (YPLL) worldwide. This study aimed to estimate the YPLL due to mortality caused by COVID-19, according to sex, age group, and race/color in Brazil, from March 2020 to December 2021. Deaths caused by COVID-19 were characterized, in which the rates and ratios of standardized YPLL rates, the average number of years of potential life lost (ANYPLL), and the average age at death (AAD) were estimated and compared. Overall, 13,776,969.50 potential years of life were lost, which resulted in an average loss of 22.5 potential years not lived. A greater loss of potential years of life was identified in men (58.12%) and in the age groups from 0 to 59 years in the black (58.92%) and indigenous (63.35%) populations, while in the age groups of 60 years and over, a greater loss of YPLL was observed in the white (45.89%) and yellow (53.22%) populations. Women recorded the highest ADD, with the exception of indigenous women. White men (1.63), brown men (1.59), and black men (1.61) had the highest rates when compared to white women. Although COVID-19 has a greater impact on the elderly, it was the black and indigenous populations under the age of 60 who had the greatest loss of potential years of life.*

Key words *COVID-19, Race and ethnicity, Potential years of life lost, Intersectionality*

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Introduction

The World Health Organization (WHO) declared COVID-19 a severe pandemic in March 2020. Since then, Brazil has led among Latin American countries in the number of cases and deaths accumulated from this disease, ranking second in the Americas and only behind the United States and India in global terms[1].

Mortality caused by the COVID-19 pandemic has had an impact on the indicators of Potential Years of Life Lost (YPLL) and Life Expectancy (LE) at a global level[2]. The decrease in life expectancy is directly related to the increase in mortality from COVID-19[3]. YPLL is an indicator widely used to quantify the number of years of life that a population may lose as a result of premature death, considering their life expectancy. This indicator analyzes the magnitude and transcendence of deaths in terms of potential years not lived due to disease and injuries, as well as the social damage resulting from these deaths. The higher this indicator, the worse the condition of the population under analysis[4].

It is important to note that premature mortality is a preventable event and is therefore a reflection of the insufficiency of health policies. Understood as the expression of the social value of death that occurs in a potentially productive phase of life, mortality affects not only the individual and the group in which they are inserted, but also the community, as it is deprived of its economic and intellectual potential[5].

Health research that considers race/color differences is highly significant to what was established by the World Health Organization (WHO)[6-8] when classifying racism as one of the social determinants of the health-disease process and by the National Policy for Comprehensive Health in the Black Population[9] which, in one of its specific objectives, encourages studies and research on racism and health as one of the ways to shed light on racial inequities and promote equity in health[10]. It is worth noting that, in the present study, race/color was analyzed from a historical[11] and intersectional sociopolitical perspective.

Although the relationship between race/color and health is an important marker of the lack of equity between population segments, the study of this issue is still incipient, and the simultaneous use of the variables of race/color and gender as units of analysis is even rarer[12].

To overcome this gap, some approaches to health inequalities in contemporary society have sought to understand the structuring and dynamics of processes of oppression and discrimination. The theoretical and methodological perspective of intersectionality expands explanations through social markers of differences (gender, race/color, age, among others), understood as categories that overlap, but do not merge, without precedence or prominence between them in the constituent analyses of the social determinants of health. Intersectionality highlights the interconnection between the dimensions of social inequality. Therefore, groups with multiple vulnerabilities in relation to life experiences and opportunities must be considered in both the development of social policies[13-15] and the production of knowledge.

One study[16], conducted in the USA, estimated YPLL by states and race/color in the country, reporting great variability per unit studied in terms of the magnitude of racial/ethnic disparities, suggesting that they are most often driven by social determinants of health. From this perspective, the use of the YPLL indicator is important because it enables a measurement of social inequalities regarding deaths when comparing different population segments[10], since mortality from COVID-19 shows not only a very strong risk stratification by age and clinical factors, but also by socioeconomic factors[17].

In general, the most severe cases of COVID-19 occur in the elderly, due to the higher prevalence of comorbidities in this group[18,19]. Furthermore, deaths from COVID-19 represent a more substantial proportion than those reported from other diseases, such as H1N1[20] influenza, even after adjusting for age and comorbidities[21].

In the case of COVID-19, a low YPLL in terms of general mortality from this cause would be expected, as the natural history of COVID-19 predicts a higher proportion of deaths among the elderly with comorbidities, although young people and children are also highlighted in the profile of morbidity and mortality. However, studies have shown a higher incidence among people in socially vulnerable scenarios[22,23].

Given the lack of scientific production that seeks, specifically, to evaluate YPLL according to ethnic-racial and gender groups from the viewpoint of shedding light on risk factors distributed unequally in the country, the present study aims to estimate YPLL due to COVID-19, according to sex, age group, and race/color in Brazil, from March 2020 to December 2021.

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Methodology

This descriptive study characterized the deaths caused by COVID-19, in which the rates and ratios of YPLL standardized rates, using the direct method; the average number of years of potential life lost (ANYPLL); and the average age at death (AAD) were estimated and compared. Social markers of differences among gender, age, and race/color (black, brown, white, indigenous, yellow, and black) of residents in Brazil who died from COVID-19, in the period from 2020 to 2021, were considered. The black and brown populations were also evaluated together, called *the black category*.

The 628,689 deaths from COVID-19 were extracted from the Mortality Information System (SIM) database[24] of the Department of Informatics of the Unified Health System (DATASUS). Population data[25] were obtained through the Brazilian Institute of Geography and Statistics (IBGE), also available on DATASUS. When simultaneously considering the notification of cases according to sex, age group, and race/color, a loss of 2.7% of data referring to deaths was observed, totaling 611,705 cases. However, the SIM database showed good consistency, given the 97.3% comprehensiveness of the variables selected for this study.

Deaths caused by COVID-19 were classified according to the International Classification of Diseases (ICD-10) as B34.2 – coronavirus infection of unspecified location – recommended by the WHO[26]. The criteria adopted are based on the identification codes recommended by the Ministry of Health (2020): i) U07.1 - COVID-19, identified virus; ii) U07.2 - COVID-19, unidentified virus, clinical-epidemiological; iii) U04.9 - SARS; SRAG; iv) B34.2 - coronavirus infection of unspecified location. The first two (U07.1 and U07.2) were defined by the WHO and were adopted as official markers for the pandemic in Brazil. Code U0.49 is common to designate suspected cases (which require subsequent confirmation), and B34.2 is still the most used code to identify deaths from COVID-19[26].

To characterize COVID-19 mortality in Brazil, during the period studied, the following variables were analyzed: sex, age group, race/color, marital status, education, place of occurrence and occupation.

To estimate YPLL, the same variables were used. The gender variable was classified as male and female. Age was considered in age groups with 5-year intervals, ranging from 0 to 80 years and over. The race/color analyzed was that recorded on the death certificate, while for the population, census data based on self-reporting was used.

In the data analysis, the following indicators were used: absolute number and average number of YPLL; percentage distribution of YPLL; age at which, on average, deaths occurred; YPLL rate per 100,000 inhabitants, and the rate ratio, taking the white female population as a reference. For age-standardized estimates, the direct method was adopted and, as a standard, the World Standard Population[27]. The population projection calculated by IBGE for 2020 corresponds to the total population of Brazil without detailed segmentations by race/color. For this reason, the projection of the age groups, by sex and race, of the Brazilian population in 2020 was made based on the proportions observed in the most recent Demographic Census[25]. Therefore, the percentages of the white, black, yellow, brown, and indigenous population in each of the 2010 age groups were used to estimate these same groups within the 2020 population projection carried out by IBGE.

The total YPLL value was obtained by summing the YPLL in each age group, sex, and race/color, applying the formula: $YPLL=\Sigma a_i d_i$, where: a_i represents the difference between the limit age and the midpoint of each group age, assuming uniform distribution of deaths occurring in each group; d_i is equal to the number of deaths due to a specific cause in this same age group (Equation 1)[28].

To calculate the average number of YPLL, an expression of the number of years that, on average, each death caused by COVID-19 took away from a person (years not lived), the total number of YPLL was divided by the number of deaths caused by COVID-19 (Equation 2).

The expected YPLL was defined as the ratio between the total YPLL and the standard population multiplied by the evaluated population (Equation 3).

The standardized YPLL rate is calculated based on the ratio of the expected YPLL to the standard population times 100,000 (Equation 4). The rates per 100,000 inhabitants corresponded to the YPLL accumulated between 2020 and 2021.

The standardized rate ratio was calculated considering the standardized YPLL rate by race/color category and the reference standardized YPLL rate (white race/color category) (Equation 5).

Zero (0) and 87.9 years were stipulated, respectively, as lower and upper limits to calculate the YPLL. The upper limit of 87.9 years was taken as a parameter for life expectancy based on the projections observed in the studies by Zhang and Rasali[29] and the Global Burden of Diseases (GBD)[30].

The age at which, on average, death occurred was obtained by adding the ages at which deaths occurred, divided by the total number of deaths in each age group, according to sex and race/color[6,28]. For a better understanding of the calculations carried out in the research, consider the following equations:

$$Total\ ANYPLL = \Sigma a_i\, d_i \qquad (Eq.\ 1)$$

$$Média\ ANYPLL = \frac{(Total\ ANYPLL)}{(Number\ of\ deaths)} \qquad (Eq.\ 2)$$

$$ANYPLL_{expected} = \frac{(Total\ ANYPLL)}{(Standard\ Pop.)} x\ Pop. \qquad (Eq.\ 3)$$

$$ANYPLL\ Rate_{standardized} = \frac{ANYPLL_{expected}}{(Standard\ Pop.)}\ x\ 100.000 \qquad (Eq.\ 4)$$

$$Standardized\ Rate\ Ratio = \frac{ANYPLL\ Rate_{standardized}}{ANYPLL\ Rate_{(reference\ standard)}} \qquad (Eq.\ 5)$$

The number of deaths caused by COVID-19 and the standardized YPLL rates were graphically represented by tables and age pyramids. To store the data and execute the statistical procedures of this research, the R[31] computational and statistical language and the Calc spreadsheet were used.

Given the scope of the study that used secondary data in the public domain, in accordance with Resolution No. 466/12 of the CNPb and Resolution No. 510/2016 of the Brazilian National Council for Ethics in Research (CNPb), the present study did not require approval from a Research Ethics Committee.

Results

Mortality due to COVID-19 in Brazil

In the period spanning January 2020 to December 2021, there were 628,689 deaths caused COVID-19 in Brazil. Of these, 275,970 (43.89%) occurred among women and 352,654 (56.09%) among men. The average age of the male population (65.33±15.61) who died from COVID-19 in Brazil was lower than the average age observed among the female population (67.66±16.02). When considering deaths according to race/color, it was observed that the highest average age of death occurred in the yellow population (69.88±15.00), followed by the white population (67.43±15.69). The lowest average age of death was observed among the brown population (64.90±15.98), followed by the black population (64.96±15.86) and indigenous people (64.92±21.26), with a lower average indicating an earlier occurrence of death.

The yellow population showed less variability concerning the average age of death (CV=21.47%), while the indigenous population showed greater variability concerning the average age of death (CV=32.75%), which represents a greater variation of the occurrence of deaths between age groups in this population (Figure 1).

The highest proportion of deaths caused by COVID-19 occurred among married people (44.25%), followed by widows (19.12%) and single people (17.66%). Regarding the place of death, those occurring in a hospital environment predominated (91.25%) (Table 1). The average underreporting of the occupation variable was 15.90%. The occupational categories of retired person (24.30%) and housewife (14.30%) were the most commonly reported (data not shown).

Regarding the absolute number of deaths, for which there was a simultaneous recording of the variables of age group, sex, and race/color, a total of 611,705 deaths were observed. When representing these deaths graphically, an inverted age pyramid pattern was evident with a greater magnitude of deaths among people aged 60 and over and male (Figure 1).

The results observed in the age pyramids (Figure 1) are represented proportionally. In the age groups from 0 to 59 years of age, a higher proportion of deaths was found among black people (34.46%) and indigenous people (33.13%). In the age groups of 60 years and over, the yellow (77.96%) and white (70.82%) populations showed the highest proportions. A higher proportion of deaths was found in the 0 to 19 years age group among indigenous people (4.61%), whereas in the 0 to 4 years age group, the proportion was 3.33%, when compared to the other categories (Table 2).

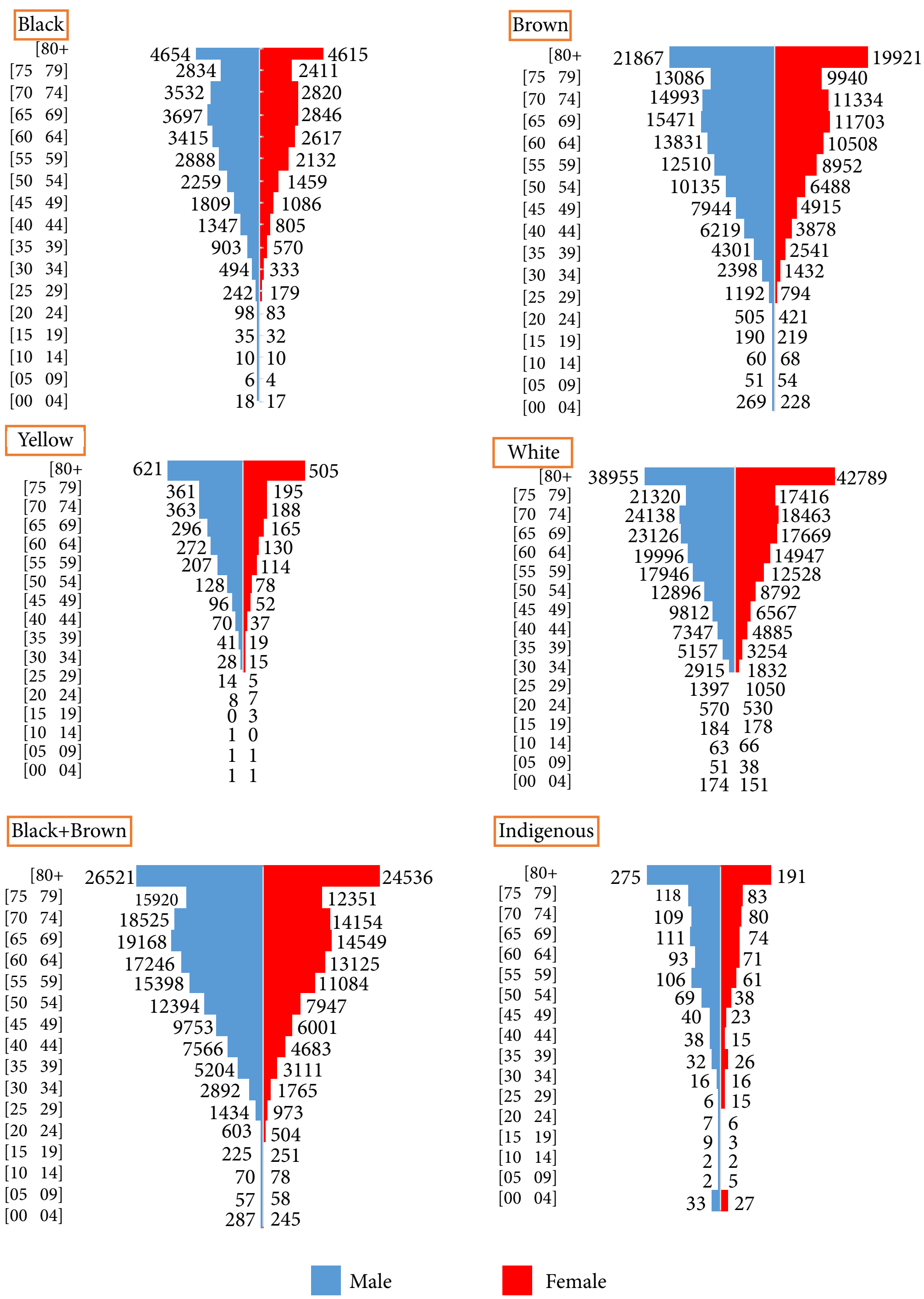

Figure 1. Distribution of mortality due to COVID-19, according to sex, age group, and race/color, in Brazil, 2020-2021.

Source: Authors.

Table 1. Characterization of mortality by COVID-19 from January 2020 to December 2021, in Brazil.

Variable	n	%	Average	SD	CV
Total	628,689	-	-	-	-
Sex	628,624	99.99	-	-	-
Male	352.654	56.10	65.33	15.61	23.89
Female	275.970	43.90	67.66	16.02	23.68
Ignored	65	0.01	-	-	-
Age Group	611,705	97.30	-	-	-
0-19	2.267	0.36	-	-	-
20-39	33.452	5.32	-	-	-
40-59	156.771	24.94	-	-	-
60+	419.215	66.68	-	-	-
Ignored	16.984	2.70	-	-	-
Race/color	611,794	97.30	-	-	-
White	337.235	53.64	67.43	15.69	23.27
Black	50.273	8.00	65.19	15.37	23.58
Yellow	4.024	0.64	69.88	15.00	21.47
Brown	218.460	34.75	64.90	15.98	24.62
Indigenous	1.802	0.29	64.92	21.26	32.75
Black (Black+Brown)	268.733	42.74	64.96	15.86	24.42
Ignored	16.895	2.69	-	-	-
Marital Status	578,140	91.96	-	-	-
Single	111.052	17.66	-	-	-
Married	278.181	44.25	-	-	-
Widow(er)	120.233	19.12	-	-	-
Separated/Divorced	47.335	7.53	-	-	-
Stable union	21.339	3.39	-	-	-
Ignored	50.549	8.04	-	-	-
Education	523,072	83.20	-	-	-
No formal education	64.787	10.31	-	-	-
Elementary I	173.540	27.60	-	-	-
Elementary II	95.131	15.13	-	-	-
High school	124.756	19.84	-	-	-
Incomplete higher educ	9.926	1.58	-	-	-
Complete higher educ	54.932	8.74	-	-	-
Ignored	105.617	16.80	-	-	-
Place of occurrence	628,619	99.99	-	-	-
Hospital	573.666	91.25	-	-	-
Outer health centers	35.643	5.67	-	-	-
Home	14.871	2.37	-	-	-
Public space	601	0.10	-	-	-
Others	3.838	0.61	-	-	-
Ignored	70	0.01	-	-	-

n: absolute number of deaths; SD: Standard deviation; CV: Coefficient of Variation. The average underreporting of all variables was approximately 5.0%.

Source: SIM/DATASUS.

Years of Potential Life Lost (YPLL) due to COVID-19 in Brazil

In the first two years of the pandemic, 13,776,969.5 potential years of life were lost, with emphasis on the white population, which totaled 7,276,666.8 potential years of life (52.8%). The percentage distribution of age-standardized YPLL, according to age group and race/color, shows that there was a greater proportion of

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YPLL in the age groups from 0 to 59 years in the black (58.92%) and indigenous (63.35%) populations, while in the age groups of 60 years and over, a greater YPLL was observed in the white (45.89%) and yellow (53.22%) populations (Table 3).

With regard to YPLL rates per 100,000 inhabitants, according to sex, age group, and race/color, an inverted pyramid pattern was also observed, with higher rates in the older population, regardless of sex and race/color. However, the indigenous population presented the highest rates in the oldest and youngest age groups (Figure 2).

In the period analyzed in this study, the average age at which deaths from COVID-19 occurred was 65.4 years, which was higher in the yellow population (68.5 years). The average ANYPLL in the general population was 22.5 years, with the highest record of this indicator appearing in the indigenous population (24.3) - data not shown.

The analysis by sex and race/color revealed that, proportionally, men showed the highest YPLL. By contrast, with the exception of indigenous race/color, women recorded the highest average age of death and the lowest rates of YPLL. Taking the YPLL rates of the white female population as a reference, the highest YPLL rate ratios were observed among white men (1.63), black men (1.61), brown men (1.60), and black and brown men (1.59); that is, all of these categories showed approximate rate ratios of above 60.0% (Table 4). It is important to highlight the fact that black women present rates 12.0% higher than white women.

Furthermore, when observing the rate ratio, it is possible to state that yellow women had a lower YPLL due to COVID-19, considering that the rate ratio (0.39) denotes a reduction of 61.0% (Table 4).

Discussion

The analysis of YPLL due to COVID-19, according to sex, age group, and race/color, showed a large YPLL for the Brazilian population. The white population lost 6.50% more potential years

Table 2. Percentage distribution of deaths due to COVID-19, according to race/color and age group from 2020 to 2021, in Brazil.

Age group	Black	Brown	Black+Brown	White	Yellow	Indigenous	Overall score
0 to 19	0.26	0.52	0.47	0.27	0.20	4.61	0.37
20 to 39	5.77	6.22	6.14	4.95	3.41	6.88	5.47
40 to 59	27.43	27.95	27.85	23.95	19.44	21.64	25.63
60 to 69	25.02	23.58	23.85	22.46	21.45	19.37	23.06
70 to 79	23.07	22.60	22.69	24.12	27.52	21.64	23.51
80 and over	18.44	19.13	19.00	24.24	27.99	25.86	21.97
Total	100%	100%	100%	100%	100%	100%	100%

Source: SIM/DATASUS.

Table 3. Percentage distribution of YPLL due to COVID-19, according to race/color and age group, from 2020 to 2021, in Brazil.

Age group	Black	Brown	Black+Brown	White	Yellow	Indigenous	Overall score
0 to 19	0.85	1.73	1.57	0.97	0.80	15.69	1.29
20 to 39	13.45	14.32	14.16	12.57	9.75	15.69	13.30
40 to 59	42.85	43.27	43.19	40.56	36.25	31.97	41.73
60 to 69	24.82	23.05	23.38	24.15	25.70	18.52	23.79
70 to 79	13.40	12.88	12.98	15.11	19.00	11.86	14.13
80 and over	4.63	4.74	4.72	6.63	8.52	6.27	5.76
Total	100%	100%	100%	100%	100%	100%	100%

Source: SIM/DATASUS.

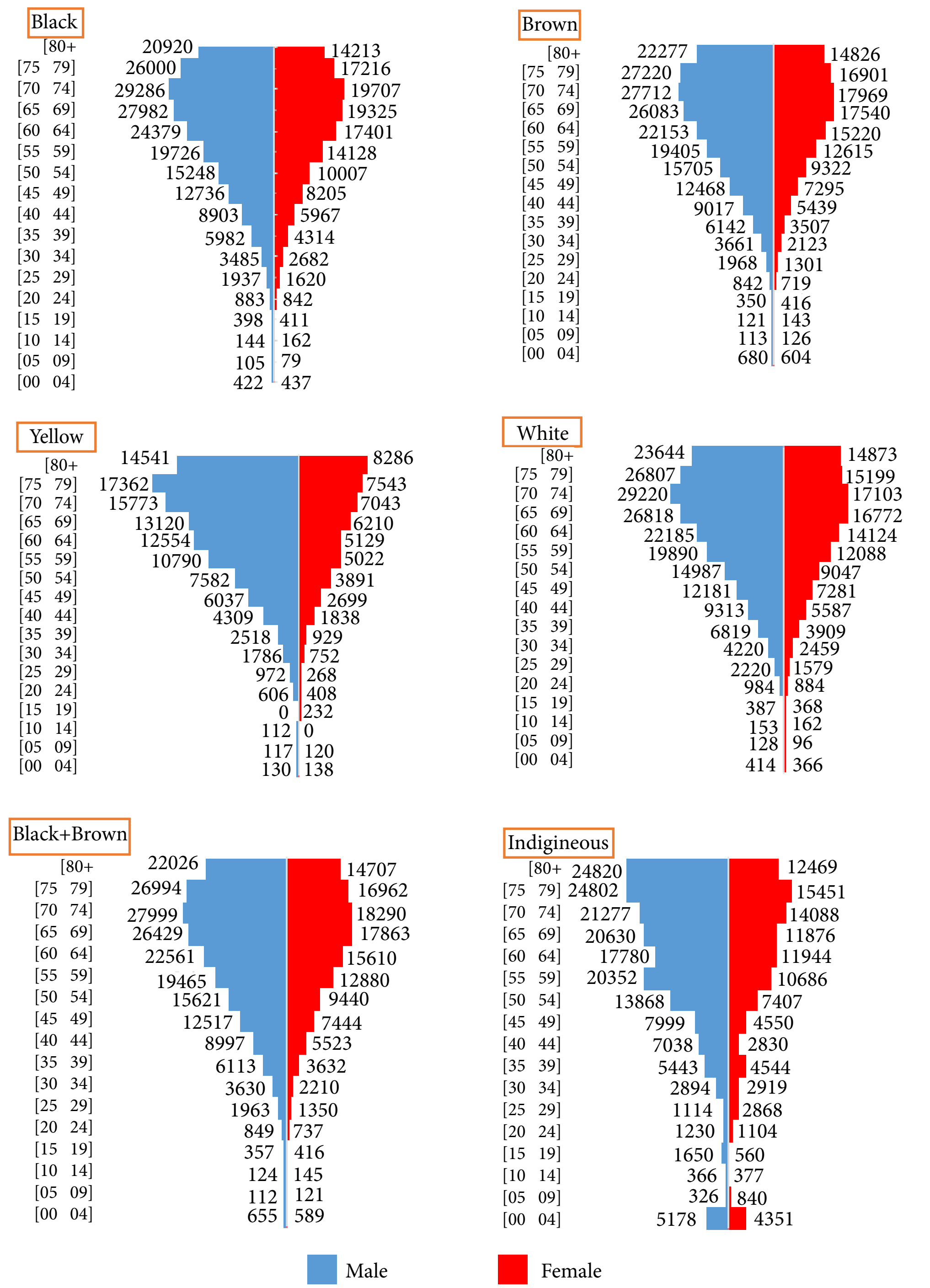

Figure 2. YPLL rate due to COVID-19, according to age group, sex, and race/color in Brazil, 2020-2021.

Source: Authors.

of life when compared to the black population; however, this result may be due to the greater longevity of the white population and the underreporting of the variables selected for this research.

Other aspects of inequalities in mortality due to COVID-19 observed in our findings refer to the higher proportion of deaths from this cause among black and indigenous people aged 0 to

Table 4. Total YPLL due to COVID-19, average ANYPLL, average age at death, rates and ratio of YPLL rates, according to race/color and sex, Brazil, 2020-2021.

Race/ skin color	Sex	YPLL	% of YPLL per sex	Average ANYPLL	Average age at death	YPLL rate	YPLL rate ratio
Black	Female	494,042.10	41.85	22.40	65.50	5,008.00	1.12
	Male	686,421.90	58.15	24.30	63.60	7,182.30	1.61
Brown	Female	2,141,526.40	41.20	22.90	65.00	4,527.10	1.02
	Male	3,056,474.80	58.80	24.40	63.50	7,090.90	1.59
Black and Brown	Female	2,635,568.50	41.32	22.80	65.10	4,609.50	1.04
	Male	3,742,896.70	58.68	24.40	63.50	7,109.20	1.60
Yellow	Female	28,008.50	35.90	18.50	69.40	1,714.80	0.39
	Male	50,007.20	64.10	19.90	68.00	3,712.10	0.83
White	Female	3,088,404.50	42.44	20.40	67.50	4,453.20	-
	Male	4,188,262.30	57.56	22.50	65.40	7,253.90	1.63
Indigenous	Female	18,182.40	41.49	24.70	63.20	4,282.10	0.96
	Masculino	25.639,40	58,51	24,10	63,80	6.575,30	1,48

Note: YPLL = Years of potential life lost; ANYPLL= average number of years of potential life lost; Average age at death = average age at which the death due to COVID-19 occurred; YPLL rate = YPLL rate per 100.000.000 hab.; YPLL rate ratio= YPLL rate ratio.

Source: SIM/DATASUS.

59 years. Indigenous people in the age group of 0 to 4 years had a higher proportion of deaths (3.33%) when compared to other race/color categories, while in the yellow and white population, higher proportions of deaths were observed in the groups over 60 years of age. Furthermore, black and indigenous men and women showed the highest YPLL averages. All of these aspects indicate earlier mortality in vulnerable groups.

In the Brazilian context, early mortality and YPLL due to COVID-19 unequally affect groups according to race/color and gender. The most significant impact of premature deaths resulting from the pandemic on black and indigenous populations is due to the combination of structural racism, social inequities, and weaknesses in health systems.

To date, there are few studies that address YPLL due to COVID-19 around the world. One study[32] on mortality and YPLL due to COVID-19 in Brazil, for the period from February 16, 2020, to January 1, 2021, showed that 47.90% of deaths occurred in the population under 60 years of age, a high proportion that suggests, as in our study, the prematurity of deaths. It is important to highlight that this study extended the period of analysis in relation to the one mentioned above and evaluated, to date, the two years that concentrated the highest number of cases and deaths due to the pandemic in Brazil.

In this study, the average age at which deaths caused by COVID-19 occurred was 65.4 years, and the average ANYPLL in the general population was 22.5 years. In an analysis of YPLL covering 17 countries, considering the period from January to August 2020, it was observed that, in general, men had a higher YPLL rate and greater loss of potential years of life than women, who, on average, died two years younger. In most countries, the highest proportion of YPLL was observed in people over 60 years of age[33].

The greatest loss of YPLL in the age groups of 60 years and over occurred in the white and yellow populations. Although unadjusted mortality from COVID-19 is higher in the white population, it must be considered that this group has a higher proportion of elderly people, due to greater longevity expressed by better socioeconomic conditions, and possibly due to the privileges arising from their racial affiliation, hence the need for age-standardized data in the analysis[34]. Because they are younger, it was expected that the black and indigenous populations would die in smaller numbers. However, standardization revealed that there was a greater chance of death among these populations.

In this sense, the oldest ages at which, on average, deaths from COVID-19 occurred were observed in yellow (69.4) and white (67.5) women; by contrast, the lowest were found in indigenous women (63.2) and black men (63.5). Yellow and white women died at an older age than did indigenous women and black men. These two categories are similar in terms of social and health indicators, which could impact the difference in the average age of death due to COVID-19.

The highest YPLL rates were observed in white men (7,253.9), followed by black men (7,182.3). The difference in YPLL rates between white and black men was close to 1.0%. It is possible that, among the 2.7% of underreporting of the race/color variable, there was an even greater underreporting of the black race/color. The lowest YPLL rates were observed among women (1,714.8) and yellow men (3,712.1), a predicted finding given the living conditions of these populations.

In the United States, mortality from COVID-19 has increased the contrasting life expectancy between blacks and whites. In 2020, it was observed that all groups considered minorities suffered significant losses in life expectancy and an increase in YPLL. Among black men, mortality under the age of 60 corresponded to 31.9% of YPLL due to COVID-19, as compared to 18.4% for white men. Among women, the proportions represented 14.7% for white women and 27.2% for black women[35]. The panorama of racial inequality in mortality in the United States could be as deadly as COVID-19[36]. Structural racism expressed in economic suppression, racial residential segregation, and inequalities in health care resulted in worse health outcomes for the black population, producing a succession of negative economic effects upon future generations[37].

In Brazil, the scale of inequality in mortality among marginalized groups before and during the pandemic is similarly shocking. Historical inequalities are exacerbated during a public health crisis, and the COVID-19 pandemic deepened social inequalities[17]. Therefore, health and social protection policies must minimize the direct and indirect impacts of a pandemic and contain long-term losses[38]. Specific policies are criticized, but they are highly effective in tackling social inequities.

The indigenous population presented data with greater variability concerning the average age of death. The distribution of the occurrence of deaths in different age groups in the indigenous population is justified by the greater relative variability of age, which denotes inequality in the occurrence of deaths according to age group, as deaths due to COVID-19 are expected to occur in more advanced age groups.

The high proportion of deaths in the 0 to 19 age group among indigenous people, the highest record of YPLL in this population and years not lived by women of this ethnic group reveal the socioeconomic and environmental vulnerability resulting from constant political attacks on the rights of this population. Indigenous territories are also marked by the phenomenon of exclusionary urbanization, which translates into peripheralization, poverty, violence, racism, and a general lack of sanitation, as well as by diminished and difficult access to health services, whose delay in diagnosis and treatment increases the probability of death due to COVID-19. In effect, the pandemic represents a threat of genocide against indigenous peoples[39-41].

Disparities in COVID-19 mortality data in Brazil are acute and exacerbated by social inequities. Many early deaths may have occurred due to the negligence of the federal government in force at the time; poor national coordination of the health system; denial of science; disrespect for the guidelines of national and international organizations; delay in negotiation, acquisition, and insufficient distribution of vaccines; fragility in the production and dissemination of data from information systems; distribution of technologies with no scientific basis; the lack of attention to traditional territories, peoples, and communities; and limited investment in technologies and measures to overcome the health crisis[42].

Study limitations

This study was conditioned by the availability and quality of data and the process of coding deaths attributable to COVID-19. The main limitation of the present study corresponds to the comprehensiveness of the data. While variables such as race/color, age, and sex showed excellent comprehensiveness (above 90%), variables such as education and professional categories showed a comprehensiveness of below 90% (Table 1). There were approximately 16,984 deaths that did not have sufficient data regarding the eligible variables to carry out this study. In this sense, these results may be underestimated.

Final considerations

In Brazil, 628,689 deaths due to COVID-19 were recorded in Brazil between March 2020 and December 2021, with a higher proportion of deaths among black and indigenous people. An average age at which death occurred was around 65.4 years, which corresponded to an average of 22.5 years not lived in the general population.

Considering race/color, a higher average ANYPLL was noted among indigenous and black

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people. Men showed the highest YPLL Women recorded the highest average age at death (ADD), with the exception of indigenous women. White, brown, and black men had higher YPLL rates than did white women. The lowest average age of death was observed among mixed-race people, followed by the black and indigenous categories.

The white population showed a low percentage of YPLL when compared to the black population; however, this result may be due to an underreporting of the variables selected for this research.

The fact that the yellow and white populations had a higher proportion of deaths in age groups over 60 years of age – which is to be expected, unlike what was observed in the black and indigenous populations – reveals a certain aspect of inequality in the distribution of deaths due to COVID-19. This was corroborated by the higher average ANYPLL among the black and indigenous populations.

These findings point to the need for political interventions on the social determinants of health, so that, during a public health crisis, coping strategies and impacts on early mortality in marginalized groups can be mitigated.

An expanded assessment of the health impact of COVID-19 must consider the YPLL and the disability burden associated with the disease. Social protection policies linked to preventive and emergency health policies make it possible to mitigate the context of socioeconomic inequity and early mortality. It is recommended that research be developed that aims to establish a relationship between inequities and ethnic-racial and gender aspects in the context of the pandemic in developing countries.

Collaborations

AM Silva Filho conceived the article, performed the write-up, statistically analyzed the data, and reviewed the various versions of the text. EM Araujo conceived the article, designed its structure, analyzed the data from an epidemiological point of view, performed the write-up, and revised the various versions of the manuscript. IM Souza participated in the writing of all topics and the final review of the manuscript. OC Luiz participated in the study design and the write-up of the methodology, results, and discussion. G Máximo participated in the discussion of the results and implemented the final formatting of the text for submission. FA Queiroz reviewed the literature, participated in the study's preparation stages, and organized the bibliographic references. L Cavalcante and V Nisida collected mortality and population data from health information systems, created spreadsheets, and contributed to statistical analyses.

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