

# Proportional mortality in Brazil's indigenous population in the years 2000, 2010, and 2018

*Mortalidade proporcional nos povos indígenas no Brasil nos anos 2000, 2010 e 2018*

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**ABSTRACT** This study aims to analyze indigenous mortality in Brazil in 2000, 2010, and 2018. This is a descriptive study with data from the Mortality Information System (SIM, in Portuguese). Proportional mortality among indigenous people and the remaining Brazilian population was calculated according to age, sex, cause, and regions of Brazil. The proportion of deaths among indigenous people, for individuals younger than one year of age, in 2000, 2010, and 2018 was 15.3%, 17.7%, and 16.2%, respectively. The proportions for the general Brazilian population were 7.2%, 3.5%, and 2.7%, respectively. For indigenous people aged 50 years and over, the proportions in the same years were 47.0%, 48.1%, and 52.0% and in the rest of Brazil, 66.8%, 74.4%, and 79.4%, respectively. In 2018, indigenous children under 1 year of age died more from perinatal disorders (39.4%), infectious and parasitic diseases (10.1%), and external causes (9.8%). In children under 1 year of age, from the non-indigenous Brazilian population, these causes corresponded to 57.8%, 3.8%, and 2.8%, respectively. Indigenous people over 50 years of age died more from circulatory diseases (28.6%), respiratory diseases (15.4%), and neoplasms (14.6%), and in the remaining Brazilian population, these causes represented 31.5%, 13.6%, and 19.0%, respectively. Health inequalities and worse indicators among indigenous peoples in Brazil are evident.

**KEYWORDS** Mortality. Health of indigenous populations. Information system. Epidemiology. Brazil.

**RESUMO** O objetivo do estudo foi analisar a mortalidade indígena no Brasil em 2000, 2010 e 2018. Estudo descritivo com dados do Sistema de Informação sobre Mortalidade. Calculou-se a mortalidade proporcional entre indígenas e restante da população brasileira, segundo idade, sexo, causa e regiões do Brasil. A proporção de óbitos em indígenas menores de 1 ano em 2000, 2010 e 2018 foi de 15,3%, 17,7% e 16,2%; e no restante do Brasil, foi de 7,2%, 3,5% e 2,7% respectivamente. A proporção de óbitos a partir de 50 anos nos indígenas nos mesmos anos foi de 47,0%, 48,1% e 52,0%; e no restante do Brasil, foi de 66,8%, 74,4% e 79,4%. Em 2018, indígenas menores de 1 ano morreram mais de afecções perinatais (39,4%), doenças infecciosas e parasitárias (10,1%) e causas externas (9,8%). Em menores de 1 ano do restante da população brasileira, essas causas corresponderam a 57,8%, 3,8% e 2,8%. Indígenas acima de 50 anos morreram mais por doenças circulatórias (28,6%), respiratórias (15,4%) e neoplasias (14,6%); e no restante da população brasileira, essas causas representaram 31,5%, 13,6% e 19,0%. Evidenciaram-se desigualdades em saúde e piores indicadores nos povos indígenas no Brasil.

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**PALAVRAS-CHAVE** Mortalidade. Saúde de populações indígenas. Sistema de informação. Epidemiologia. Brasil.



## Introduction

Indigenous people in Brazil face unfavorable situations in terms of health, reflected in higher rates of mortality for these individuals in comparison to the rest of the Brazilian population<sup>1,2</sup>.

According to population data in Brazil, the last census done by the Brazilian Institute of Geography and Statistics (IBGE) revealed that the indigenous population corresponds to 896,900 people (0.4% of the Brazilian population) distributed throughout all states of the country<sup>3</sup>. Although a small contingent of the Brazilian population, indigenous peoples represent an enormous socio-cultural expression. There are 305 different ethnic groups, speaking 275 languages<sup>3,4</sup>. It is important to understand and value their many lifestyles, respect their traditional knowledge, and guarantee that they participate in the management of health care for their own communities.

Among the causes of morbimortality of indigenous people in Brazil, historically, there is a predominance of infectious and parasitic diseases<sup>5</sup>. Currently, what can be observed is an epidemiological transition taking place in this population, a double burden of diseases which include infectious and parasitic, as well as noncommunicable diseases (NCDs)<sup>5,6</sup>. This transition is being caused by intense changes in lifestyle, associated with civilizing patterns which deny plural lifestyles, especially those which value living closer to nature, imposing life in artificial environments<sup>7</sup>.

In the last few years, there has been an increase in the number of surveys about inequalities in health for indigenous people<sup>2,8-10</sup>. However, recent studies that focus on the mortality of the indigenous population in Brazil are still scarce<sup>11</sup>. Few surveys have focused on rates of mortality for specific age groups<sup>1,2,12-14</sup>, and the available ones indicate that mortality rates for indigenous people have not diminished at the same pace as the rates for the rest of the Brazilian population<sup>12-14</sup>.

Therefore, this study proposes to analyze the following question: what is the evolution

in mortality for the indigenous population and how does it compare with the population of Brazil in general, for the years 2000, 2010, and 2018, according to sex, age group, region of Brazil, and causes of death? Thus, the objective of this study was analyze indigenous mortality in Brazil in the years 2000, 2010 and 2018. We hope that the understanding of different aspects of mortality in the indigenous population, its basic causes, its variation in terms of region, sex, and age groups, may provide subsidies to guide public health policies and reduce inequalities.

## Material and methods

This is a descriptive study with data from the Mortality Information System (SIM, in Portuguese) from the Brazilian Ministry of Health, related to deaths of indigenous people in Brazil and of the Brazilian population in general, for the years 2000, 2010, and 2018. The data is available at the site of the Computer Department of the Unified Health System (Datasus) (<https://datasus.saude.gov.br/>).

In this study, the years used as reference were chosen for the following reasons: 2000, being the year when the Indigenous Healthcare Information System (Siasi, in Portuguese) was created, which is considered an important political-institutional moment in terms of monitoring the health of indigenous peoples<sup>15</sup>. The year 2010 was chosen, as it is the year when the Special Secretariat of Indigenous Health (Sesai, in Portuguese) was created, which is the first institution exclusively responsible for the management and promotion of indigenous health<sup>16</sup>, and it is also the year when the identification of 'indigenous' became a self-declared question in the census<sup>3</sup>. Finally, 2018 was chosen, as it is the last available year in the Datasus database. This study includes the following variables:

- a. Outcome variable: proportional mortality among both the indigenous and the rest of the Brazilian population.

b. Explanatory variables: Sex (male or female); age group, categorized according to the 'Saúde Brasil 2015/2016'<sup>17</sup>; regions of Brazil (North, Northeast, Southeast, South, Midwest); underlying causes of death according to the International Statistical Classification of Diseases and Health-Related Problems from the World Health Organization (WHO), 10th version (ICD-10)<sup>18</sup>. The chapters used were: I: Some infectious and parasitic diseases; II: Neoplasms (tumors); IV: Endocrine, nutritional, and metabolic diseases; IX: Circulatory system diseases; X: Respiratory system diseases; XVI: Some disorders originating in the perinatal period; XVIII: Ill-defined and unknown mortality causes; and XX: External causes of morbidity and mortality. From the category 'Other', more chapters were included: Blood or hematopoietic organ diseases and immunity disorders (III); Mental and behavioral disorders (V); Diseases of the nervous system (VI); Diseases of the digestive system (XI); Skin and subcutaneous tissue diseases (XII); Osteomuscular and conjunctive tissue diseases (XIII); Genital-urinary diseases (XIV); Pregnancy, delivery, and puerperium (XV); and Congenital malformations, deformity, and chromosome anomalies (XVII). Chapters VII (Eye diseases and related issues) and VIII (Ear and apophysis-mastoid diseases) were included in the SIM database only in 2018 for the total sum of Brazil, not included in the analysis of the indigenous population.

Proportional mortality (%) was calculated according to age group, sex, underlying cause and region of residence, by means of absolute and relative frequencies. The calculation of proportional mortality for the indigenous population is given by a ratio in which the numerator was the fraction of analyzed deaths among indigenous populations ( $y$ ) according to sex, age group, region, and underlying cause of death, multiplied by 100; and the denominator was the total number of deaths analyzed, according to the following formula:

$$\frac{\text{fraction of deaths } y \times 100}{\text{total deaths } y}$$

The same formula was used to calculate proportional mortality for the general population of Brazil, with the denominator being the total number of deaths in the Brazilian population, not including the deaths of indigenous people. The two groups (indigenous and general Brazilian population) were compared for the curves of proportional mortality (%) of the causes of death, according to the chapters of the ICD-10, by age group. In addition, the analysis of mortality according to sex and age group was performed. The organization and data analysis was carried out using Microsoft Office Excel (Microsoft©, 2016).

Due to the nature of this study, there was no need to submit it to the Research Ethics Committee.

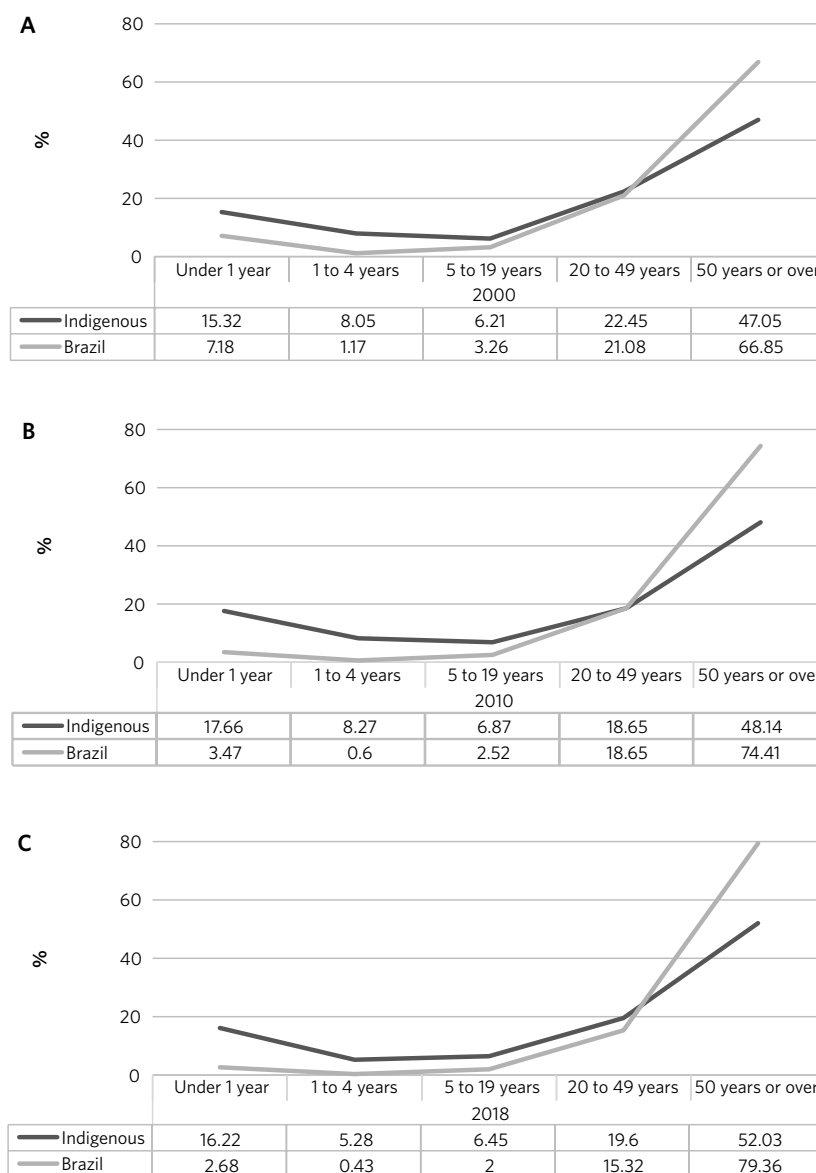
## Results

Figure 1 represents the age distribution curves of the deaths of indigenous people and the general Brazilian population for the years 2000, 2010, and 2018. For those three years, the mortality of infants younger than 1 year of age was high, reaching 15.3% (2000), 17.7% (2010), and 16.2% (2018). Meanwhile, for the remaining Brazilian population, the rates were in decline, corresponding to 7.2% (2000), 3.5% (2010), and 27% (2018). The proportions of deaths in the general population, for the age group of 1 to 4 years were 1.1% (2000), dropping to 0.6% in the other two years (2010 and 2018); whereas among the indigenous population, it was approximately 8% (2000 and 2010) and 5.3% (2018). For the age group of 5 to 19 years, mortality was above 6% among indigenous people (2000, 2010, and 2018), and for the rest of the population, 3.3% (2000), 2.5% (2010), and 2.0% (2018). The proportions of deaths for the age group of 20 to 49 years, among the indigenous population,

were 22.5% (2000), 18.6% (2010), and 19.6% (2018), while for the Brazilian population in general, the proportions were 21.1% (2000), 18.6% (2010), and 15.3% (2018). Approximately half of the deaths among indigenous populations occurred among adults aged 50 years

and older, reaching 47.05% (2000), 48.1% (2010), and 52.03% (2018), whereas for the remaining Brazilian population in the same age group, those proportions increased and reached 79.36% in 2018 (figures 1 A, B, and C).

Figure 1. Proportional mortality (%) of indigenous population and in the general Brazilian population according to age group. Mortality Information System, Brazil, 2000 (A), 2010 (B), and 2018 (C)



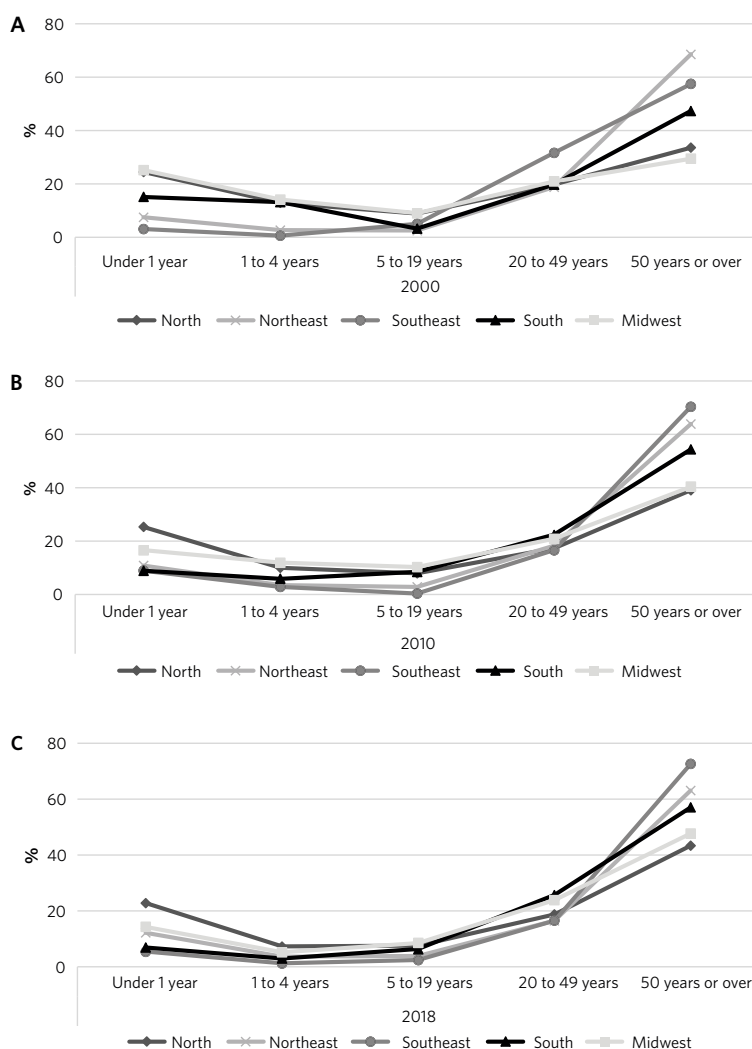
Source: Own elaboration.

Note: The ignored age category was not presented in the graphs; however, it corresponds to: 1.38% in figure A, 0.76% in figure B, and 0.63% in figure C.

Figure 2 shows the distribution of deaths among the indigenous population by age group, according to the region of residence. One can observe that mortality for children younger than 1 year of age was greater in the North region (2000: 24.5%; 2010: 25.4%; and 2018: 22.8%) and Midwest region (2000: 25.2%; 2010: 16.5%; 2018: 14.3%). For the age group of 1 to 4 years, it was also higher in the North region (2000: 12.9%; 2010: 9.9%; 2018: 7.3%) and in the Midwest region

(2000: 14.1%; 2010: 11.86%; 2018: 5.25%). In the age group of 5 to 19 years, the Midwest region once again stood out (2000: 8.9%; 2010: 10.2%; 2018: 8.6%). For the age group of 20 to 49 years, the Southeast region stands out, with proportions of 31.7% (2000) and above 20% (2010 and 2018). Mortality for the age group of 50 years and older was higher in the Northeast region (68.58%) in 2000, Southeast (above 70%) in 2010, and North (42%) in 2018 (figures 2 A, B, and C).

Figure 2. Proportional mortality (%) of indigenous population according to region of residence and age group. Mortality Information System, Brazil, 2000 (A), 2010 (B), and 2018 (C)



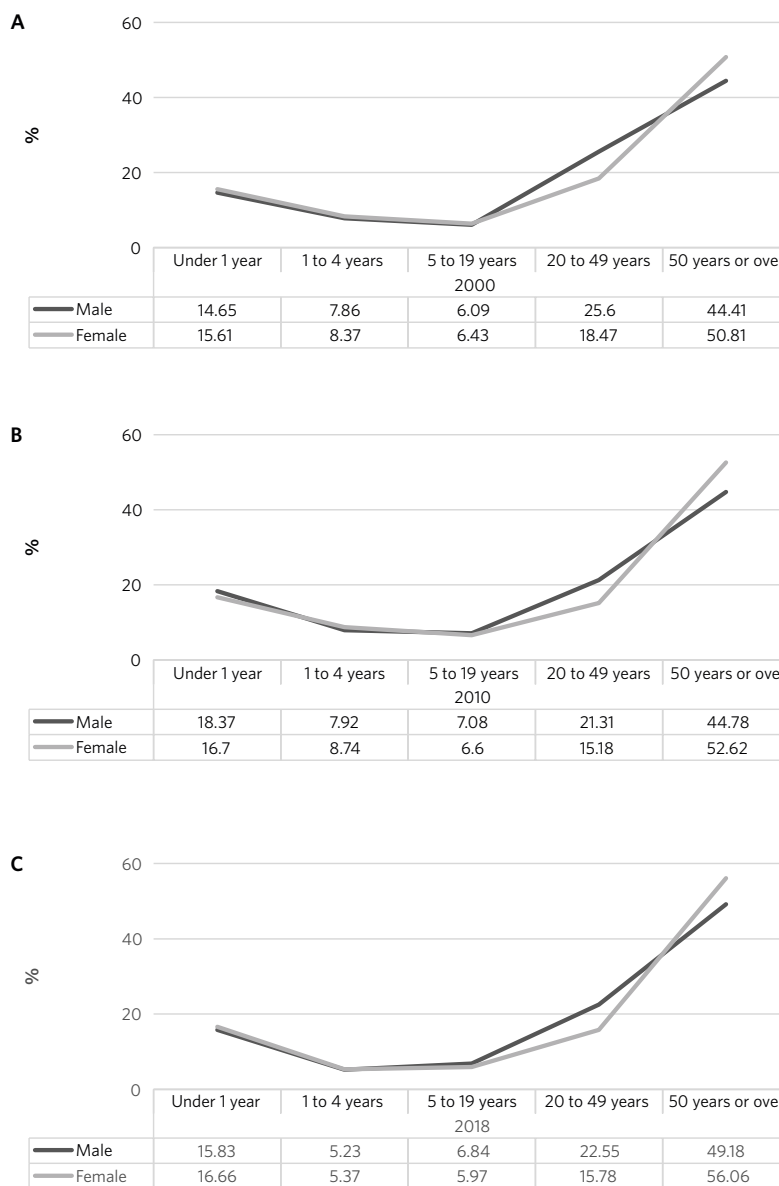
Source: Own elaboration.

Note: The ignored category, including all regions of Brazil, was not presented in the graphs; however, it corresponds to: 5.05% in figure A, 2.15% in figure B, and 3.51% in figure C.

Figure 3 displays the distribution of deaths according to sex – male and female – among indigenous populations. The curves are similar in the distribution by sex and by period. A high proportion of deaths can be observed among indigenous children younger than 1 year of age, between 1 and 4 years of

age, and between 5 to 19 years of age. The differences between males and females occur among adults aged 20 to 49 years, predominantly males, and among adults above 50 years of age, especially females (above 50%) in the three years (2000, 2010, and 2018) (figures 3 A, B, and C).

Figure 3. Proportional distribution (%) of deaths in the indigenous population according to sex and age group. Mortality Information System, Brazil, 2000 (A), 2010 (B), and 2018 (C)



Source: Own elaboration.

Note: The ignored category, including the male and female sexes, was not presented in the graphs; however, it corresponds to: 1.7% in figure A, 0.7% in figure B, and 0.53% in figure C.

Figure 4 shows the proportion (%) of indigenous mortality according to the chapters of ICD-10. In terms of the underlying causes of death among indigenous people, it is noticeable that in the year 2000, the ill-defined and unknown causes of mortality predominated (22%), followed by circulatory system diseases (17%), infectious and parasitic diseases (12%), and external causes (12%). In 2010, the most frequent causes of death were circulatory system diseases (18%). There was also a reduction of ill-defined and unknown causes (14%) and of external causes (14%), infectious and parasitic diseases (11%), and respiratory system diseases (11%). In 2018,

external causes were predominant (17%) and circulatory system diseases as well (17%), followed by respiratory system diseases (12%), neoplasms (10%), ill-defined and unknown causes (9%) and infectious and parasitic diseases (8%). The results show a reduction in infectious and parasitic diseases (from 12% in 2000 to 8% in 2018), as well as ill-defined and unknown causes of mortality (from 22% in 2000 to 13% in 2018). On the other hand, neoplasms, respiratory system diseases, and external causes of mortality increased in the period. The circulatory system diseases remained stable during the studied period (figures 4 A, B, and C).

Figure 4. Proportional mortality (%) of indigenous population according to ICD-10 chapters. Mortality Information System, Brazil, 2000 (A), 2010 (B), and 2018 (C)

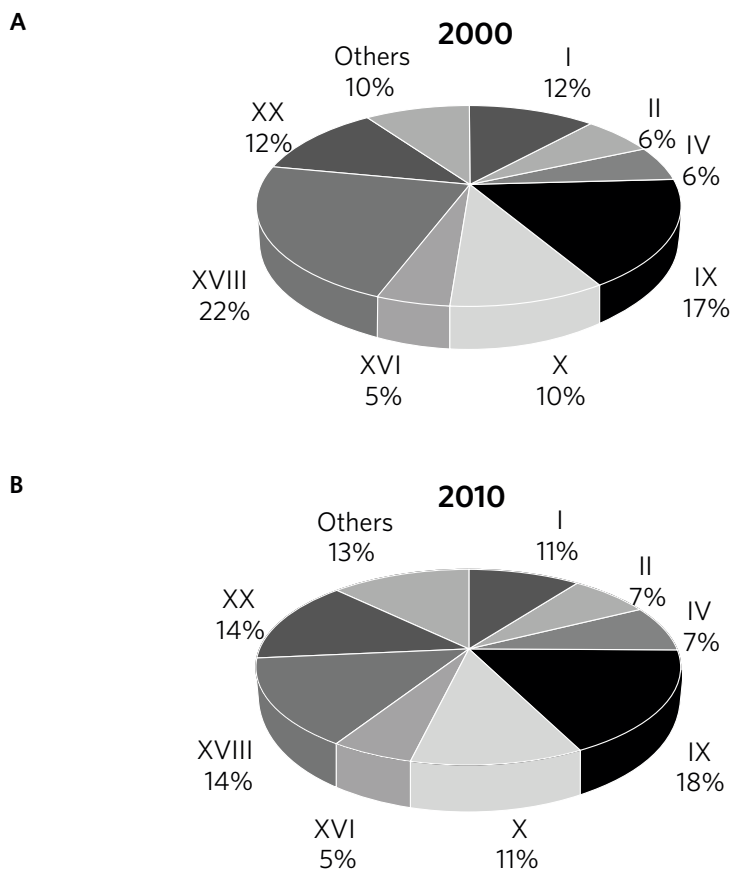
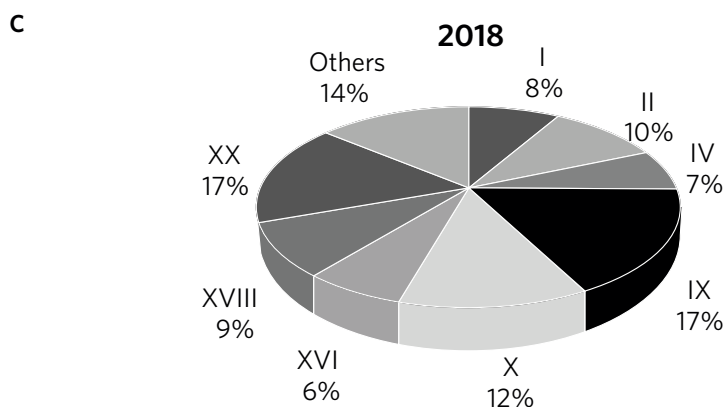


Figure 4. (cont.)



Source: Own elaboration.

Note: I: Some infectious and parasitic diseases; II: Neoplasms (tumors); IV: Endocrine, nutritional, and metabolic diseases; IX: Circulatory system diseases; X: Respiratory system diseases; XVI: Some disorders originating in the perinatal period; XVIII: Ill-defined and unknown mortality causes; and XX: External causes of morbidity and mortality.

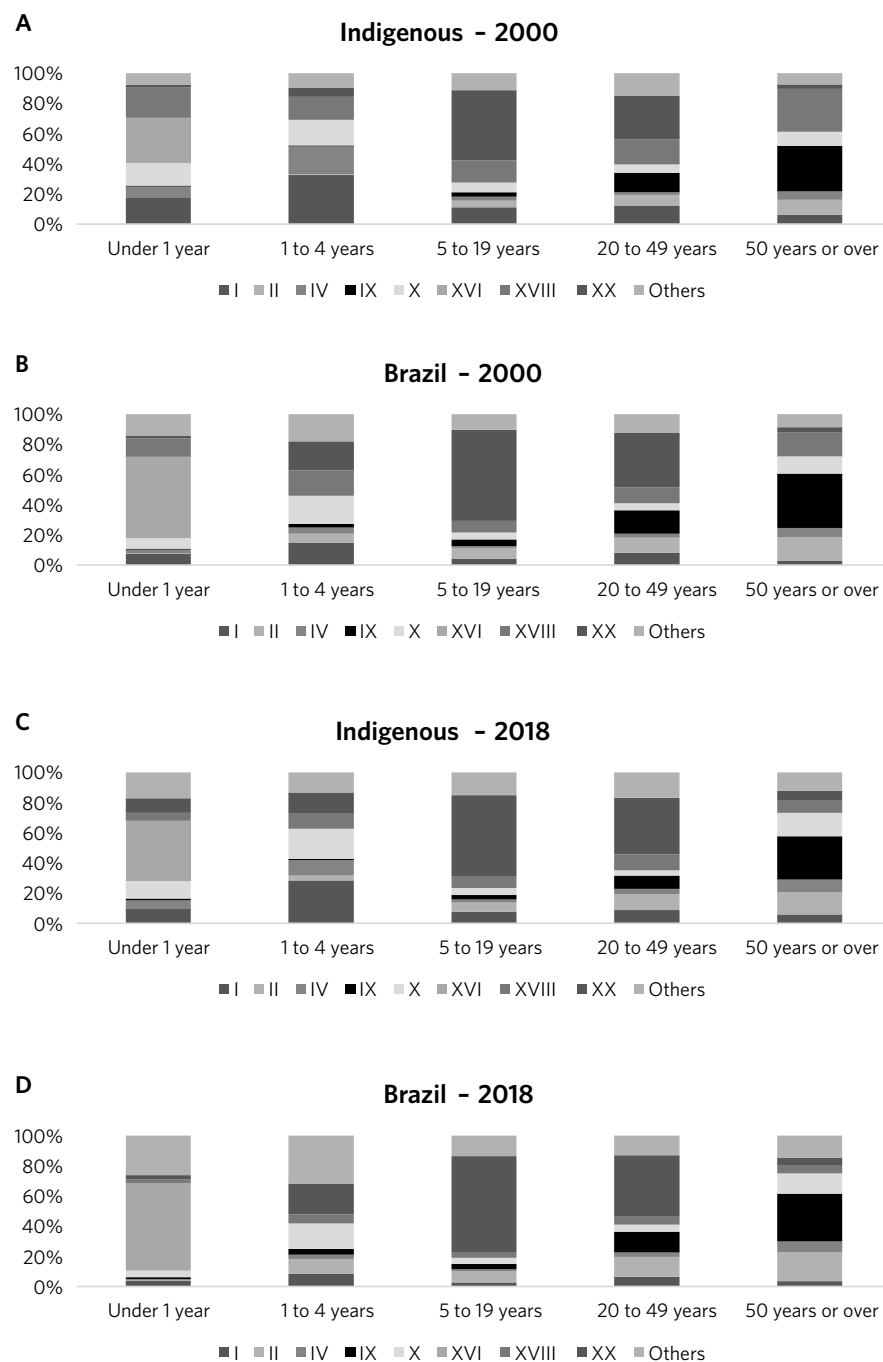
The category others includes: Blood or hematopoietic organ diseases and immunity disorders (III); Mental and behavioral disorders (V); Diseases of the nervous system (VI); Diseases of the digestive system (XI); Skin and subcutaneous tissue diseases (XII); Osteomuscular and conjunctive tissue diseases (XIII); Genital-urinary diseases (XIV); Pregnancy, delivery, and puerperium (XV); and Congenital malformations, deformity, and chromosome anomalies (XVII).

Figure 5 shows the causes of death among indigenous people and among the remaining Brazilian population according to the chapters of ICD-10 and for age groups. In 2000, the main causes of death among indigenous people were: for the age group of younger than 1 year, perinatal affections (29.7%), ill-defined and unknown causes (20%), and infectious and parasitic diseases (17.4%); for the age group of 1 to 4 years, infectious and parasitic diseases (32.6%) and endocrine, nutritional, and metabolic diseases (18.5%). In the age group of 5 to 19 years and in the age group of 20 to 49 years, the main causes were death by external causes (46.5% and 28.8%, respectively), while for those above 50 years of age, the main causes were circulatory system diseases (30.0%) and ill-defined and unknown causes (28.3%). In the remaining Brazilian population: for the age group of younger than 1 year, perinatal affections (53.8%); for those between 1 and 4 years of age, external causes (19.25%) and respiratory system diseases (18.5%); for age groups of 5 to 19 years and 20 to 49 years, death by external causes (60.1% and 36.0% respectively); and for

the age group of 50 years and over, circulatory system diseases (36%) (figures 5 A and B). In 2018, the main causes of death among the indigenous population were: for the age group of younger than 1 year, perinatal affections (39.3%), infectious and parasitic diseases (10.3%), and external causes (9.3%); for the age group of 1 to 4 years, infectious and parasitic diseases (28.4%) and respiratory system diseases (20%); for the age groups of 5 to 19 years and 20 to 49 years, external causes (53.5% and 37.4%, respectively); for the age group of 50 years and over, circulatory system diseases (28.6%), respiratory system diseases (15.4%), and neoplasms (14.6%). For the remaining Brazilian population, in 2018, the following causes stood out: for the age group of younger than 1 year, perinatal affections (57.8%); for the age groups of 1 to 4 years, 5 to 19 years, and 20 to 49 years, deaths by external causes (20.5%, 63.3% and 40.5%, respectively). For the age group of 50 years and over, the main causes were circulatory system diseases (31.5%), respiratory diseases (13.6%), and neoplasms (19.0%) (figures 5 C and D).



Figure 5. Proportional distribution (%) of the causes of deaths of indigenous people, according to the ICD-10 chapters, by age group. Mortality Information System, Brazil, 2000 and 2018



Source: Own elaboration.

Note: The category others includes: Blood or hematopoietic organ diseases and immunity disorders (III); Mental and behavioral disorders (V); Diseases of the nervous system (VI); Diseases of the digestive system (XI); Skin and subcutaneous tissue diseases (XII); Osteomuscular and conjunctive tissue diseases (XIII); Genital-urinary diseases (XIV); Pregnancy, delivery, and puerperium (XV); and Congenital malformations, deformity, and chromosome anomalies (XVII).

I: Some infectious and parasitic diseases; II: Neoplasms (tumors); IV: Endocrine, nutritional, and metabolic diseases; IX: Circulatory system diseases; X: Respiratory system diseases; XVI: Some disorders originating in the perinatal period; XVIII: Ill-defined and unknown mortality causes; and XX: External causes.

## Discussion

The present study showed worse health indicators in the indigenous population in comparison to the rest of the Brazilian population, evidenced by the high proportion of mortality during childhood and by the expressive proportion of premature deaths among young adults – less than half of all indigenous individuals are able to live beyond 50 years of age. Among indigenous people, there is a higher proportion of ill-defined causes of death and of death by infectious and parasitic diseases, indicating a worse quality of health care and information, as well as worse living conditions.

The production of mortality indicators provides information on the social development of a society and its economic and political aspects<sup>19</sup>. Identifying that there is inequality in mortality among vulnerable groups, such as indigenous peoples, reiterates the importance of understanding this information and applying it into policies and programs of public health that are more efficient. Therefore, it is important to improve the quality of information regarding the indigenous population of Brazil, according to their racial, ethnic, and regional characteristics, in order to overcome social-regional inequalities which impact health indicators<sup>12,17,20,21</sup>.

The results in this study are in line with a survey conducted in 2012 in Brazil, which indicated higher mortality among the indigenous population, in comparison with the rest of the Brazilian population<sup>17</sup>. In that study, proportional mortality in children younger than 1 year of age was 25.84%, and only 37.56% among adults 50 years of age and over. The study also found that there were more deaths of indigenous children and young adults<sup>17</sup>.

In the present study, it is alarming that there is such a high number of deaths among indigenous children younger than 1 year of age, since this is one of the most important health indicators, reflecting the living conditions of a given population and the quality and effectiveness of the health care provided to that

population<sup>22,23</sup>. In Brazil, in recent decades, there has been an expressive decline in infant mortality in every region of the country<sup>12,24</sup>. In the period between 2000 and 2010, the Infant Mortality Rate (IMR) dropped from 29.7 to 15.6 deaths per 1,000 live births in Brazil. However, among indigenous children, the decline was from 74.6 to 41.9 deaths for every 1,000 live births<sup>13</sup>. It is important to mention that the results of this study are aligned with the literature, since they confirm that the reduction in the proportion of infant deaths among indigenous people did not occur at the same pace as it did in the general Brazilian population<sup>12-14</sup>, reinforcing the huge disparities between indigenous children and children of other races/colors in the country.

The continued higher percentage of deaths of indigenous children of 1 to 4 years of age, in comparison to the rest of Brazil, can be explained by the unequal living conditions that those children are exposed to, expressed by the high concentration of deaths among children under 5 years of age. Among those unequal living conditions, we can highlight a lack of public sanitation, no access to basic health care, and precarious access to decent living conditions<sup>21</sup>, resulting in a high prevalence of infant malnutrition and infections<sup>1</sup>. There is a pressing need for more investments in basic areas, such as health, education, housing, and sanitation<sup>21</sup>, and specifically in obstetric and neonatal care in prenatal care, delivery and birth, and care in the infant's first year of life<sup>23</sup>.

The present study also identifies the higher proportion of mortality among young adults, similar to a survey conducted in the state of Mato Grosso, which showed higher mortality rates among indigenous people up to 19 years of age, as well as between 20 and 39 years of age<sup>1</sup>.

Furthermore, evidence shows that in 2018 only half of the indigenous individuals reached the age of 50 years old, an indication of high premature mortality among that population, which remained consistent in the 20-year period of this study. A similar result was obtained by a research done in the state of

Paraná in 2002, which found a proportion of more than 70% of deaths among indigenous people up to 50 years of age, using the same Swaroop-Uemura indicator<sup>26</sup>. This situation reinforces the restriction to the right to healthy aging among indigenous people, reiterating the inequalities in living conditions and constituting a threat to their way of life, bearing in mind that, for the majority of the indigenous population, the elders are the main keepers of traditional culture.

In Brazil, between 1990 and 2015, a time frame corresponding to most of the existence of the Brazilian Unified Health System (SUS, in Portuguese), many positive changes took place in the health/disease profile of the Brazilian population, with a decline in the inequalities in health indicators in the Brazilian states<sup>27</sup>. Inequalities were reduced in terms of mortality by communicable diseases, maternal-infant morbimortality, and avoidable causes of death, resulting in an increase in life expectancy and longevity of the population, with an increase in healthy years of life<sup>27</sup>. It should be highlighted that even with all the improvements and progress in health services, the results of the current study show a large proportion of deaths in the indigenous population, for most age groups, with the exception of the age group of 50 years and over. There are also regional differences in Brazil, indicated by the worst results in the North and Midwest regions, where there is a higher concentration of the indigenous population<sup>21</sup>, as well as poor access to health services and little attention from the government to the demands of the indigenous population<sup>28,29</sup>.

Concerning the high proportion of infant mortality in the North and Midwest regions, it is important to reiterate the difficulty in access to specialized health services for births in at-risk situations, precarious prenatal care<sup>23,30</sup>, and increasing fragility of self-care practices for delivery, birth, and postpartum. In addition, although the Midwest region has the highest number of obstetric facilities, it does not have

enough neonatal Intensive Care Units<sup>30</sup>, a fact that might have contributed to the results verified in our study.

This precarious access to health services shows evidence of the inequalities and vulnerabilities throughout the entire social structure<sup>31,32</sup>, which have a great impact on indigenous mortality in Brazil. One study identified the lack of availability and quality of health services in the North and Midwest regions<sup>33</sup>. Another study, conducted in the city of Cuiabá among indigenous people, also verified difficulties in access to health care by the local indigenous population, such as social-organizational, cultural, and geographic barriers, of medium and high complexity<sup>34</sup>, reinforcing the results of the present study.

It is important to emphasize that, regardless of the fact that the National Policy for Indigenous Healthcare guarantees access of indigenous people to full health care, according to the principles of SUS<sup>35</sup>. The lack of continuity in care, the lack of professionals, and the prevalence of care focused on emergency care, based on patient relocation<sup>4</sup>, are emerging bottlenecks in providing full health care to indigenous populations. There is a need to promote intercultural dialogue in order to promote self-care and articulation with traditional knowledge, allowing the promotion of health beyond curative and biomedical services. This is one of the main challenges in providing effective health care to indigenous people<sup>4</sup>.

As far as mortality according to sex is concerned, it is evident that there is a difference between men and women in terms of age of death. Male individuals in the age group of 20 to 49 years have a higher proportion of deaths than women of the same age. Such results can provide evidence of violence experienced by indigenous males<sup>36,37</sup> and, possibly, reflect a higher vulnerability resulting from conflicts for the protection of their land (often invaded by gold miners), as well as resulting from excessive alcohol consumption<sup>38</sup>. One study conducted with data from the Interpersonal and

Self-Inflicted Violence Surveillance System (Viva/Sinan, in Portuguese), from 2006 to 2017, also indicated a gradual and increasing growth in the cases of violence against indigenous peoples<sup>39</sup>. The increased mortality by external causes also subsidizes the hypothesis that the increase in conflicts and violence against the indigenous population also relates to problems already mentioned in literature, such as indigenous suicide and alcoholism<sup>39-43</sup>.

The causes of death among the indigenous population also indicate the occurrence of a triple burden of disease, with the predominance of NCDs, the continuance of infectious and parasitic diseases, and the increase of external causes, which reflect the epidemiological, demographic, and nutritional transition of that population. Although there has been a reduction in mortality by infectious and parasitic diseases, its occurrence illustrates persisting inequalities, which translate into social and welfare gaps: the lack of water supply, sanitation, garbage collection, and no access to health services<sup>44-46</sup>. Moreover, there is evidence of metabolic and anthropometric alterations in indigenous populations, which may well account for the high proportion of deaths by neoplasms and circulatory system diseases, closely related to changes in diet and patterns of physical activity related to the significant changes in humanity's life style and social interactions<sup>5,7,39,46-49</sup>.

Despite a reduction in the causes of ill-defined mortality among indigenous populations, as a consequence of the improvement in SIM coverage<sup>50</sup>, it is important to remember that Brazil has been classified as intermediate in terms of coverage and completion of registry of vital events<sup>51</sup>. The proportion of ill-defined mortality causes is still high among indigenous people.

The results of this study prove the relevance of knowing the epidemiological profile of indigenous people, considering their wide ethnic and regional social diversity. This knowledge is vitally important to

guide the organization, as well as in planning for and improvement of healthcare quality. In general, given the history of higher morbidity-mortality by infectious and parasitic diseases among the indigenous population, health care is generally aimed at these diseases; however, the present study highlighted the magnitude of chronic NCDs and of the external causes. Therefore, the planning and reorganization of health services are imperative in order to address all the healthcare needs of that population when faced with the changes brought about by epidemiological, nutritional, and demographic transition.

Among the limitations of this study, one must consider that the method of proportional mortality analysis does not allow for the estimation of rates, since it does not use the denominator (reference population). Consequently, caution must be taken when interpreting the data, since it measures proportion of deaths, not risks. Likewise, the data from the SIM was not adjusted, and might be under-reported, especially in relation to indigenous people. Moreover, errors in the registration of deaths related to the underlying causes might compromise the consistency of this indicator, which may also be influenced by the age and gender structure of the population.

## Conclusions

In the years analyzed in this study, proportional mortality in indigenous people was higher than in the rest of the Brazilian population. This study revealed persistent inequalities in the living conditions of this population, which are reflected in worse conditions of birth, life, illness, and death. An epidemiological, demographic, and nutritional transition is currently ongoing, as is a triple burden of diseases in the indigenous population, with the predominance of NCDs, concomitantly with infectious and parasitic diseases, together with an increase in external causes.

The fact that the indicators related to the indigenous population did not improve in the studied period indicates the persistence of problems which are inadmissible and avoidable, such as the high mortality of children under 1 year of age, premature deaths among young adults, and the small proportion of deaths among the elderly. Public policies must guarantee the right to life and cultural diversity, as a means through which to achieve a fairer and more diverse society. Furthermore, it is imperative to make progress in terms of reducing health inequalities, and in so doing, justify the motto of the 2030 Agenda's Sustainable Development Goals to leave no one behind<sup>52</sup>.

## Collaborators

Alves FTA (0000-0001-8886-8514)\*, Prates EJS (0000-0002-5049-186X)\*, Carneiro LHP (0000-0001-5180-9182)\* and Sá ACMGN (0000-0002-0122-2727)\* substantively contributed to the design and planning, as well as to data collection, data analysis and interpretation, draft preparation and approval of the final version. Pena ED (0000-0003-1220-6041)\* and Malta DC (0000-0002-8214-5734)\* contributed to the study planning, manuscript preparation, critical review of the content, approval and final version of the article ■

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