



## Evaluation of maternal mortality rates in the Southern Region of Brazil from 2015 to 2022: our progress towards the un sdgs

*Avaliação das taxas de morte materna na Região Sul do Brasil, de 2015 a 2022: como estamos em relação aos ODS-ONU*

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### ABSTRACT

**OBJECTIVE:** Analyze maternal mortality (MM) rates in the southern region of Brazil from 2015 to 2022 in relation to the Sustainable Development Goals (SDGs). **METHOD:** This is a cross-sectional study on maternal mortality (MM) rates in the southern region of Brazil. The data were evaluated concerning the achievement of the SDG target of a maximum of 30 maternal deaths per 100,000 live births. **RESULTS:** The state that came closest to achieving the SDGs was Santa Catarina (SC), with MM rates ranging from 30.4 in 2016 to 38.6 in 2017. The second-best performing state was Rio Grande do Sul (RS), with rates varying from 35.7 in 2015 to 41.3 in 2020. Paraná (PR) had the worst results, with the lowest rate being 31.7 in 2017 and the highest being 52.6 in 2020. During the pandemic, PR also showed the worst performance with a rate of 128.6, followed by SC with 88.35 and RS with 89.2. **CONCLUSION:** No state achieved the SDGs, revealing the low quality of healthcare in Brazil.

**Keywords:** Maternal Mortality. Reproductive Rights. Sustainable Development Goals.

### RESUMO

**OBJETIVO:** Analisar taxas de morte materna (MM) no sul do Brasil, de 2015 a 2022 em relação aos Objetivos do Desenvolvimento Sustentável (ODS). **METÓDO:** Estudo transversal referente às taxas de MM na região sul. Os dados foram avaliados quanto ao alcance dos ODS de no máximo 30 óbitos maternos por 100 mil nascidos vivos. **RESULTADOS:** O estado que mais se aproximou dos ODS foi SC, com taxas de MM entre 30,4, em 2016, a 38,6 em 2017. O segundo estado com melhor desempenho foi o RS variando entre 35,7 em 2015 a 41,3 em 2020. O PR apresentou os piores resultados, a menor taxa foi em 2017 com 31,7 e a maior em 2020 com 52,6. No contexto pandêmico, o PR também apresentou o pior desempenho com uma taxa de 128,6; SC com 88,35 e o RS 89,2. **CONCLUSÃO:** Nenhum estado alcançou os ODS, revelando a baixa qualidade da assistência à saúde no Brasil.

**Palavras-chave:** Direitos Reprodutivos. Morte Materna. Objetivos do Desenvolvimento Sustentável.

## INTRODUCTION

Maternal mortality (MM) is defined as the death of a woman during pregnancy, or within a period of up to 42 days after its termination, due to any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.<sup>1</sup>

Hemorrhage, hypertensive disorders, and infections are the leading causes of maternal mortality in Brazil and other underdeveloped countries.<sup>2</sup> The vast majority of maternal deaths are potentially preventable, highlighting maternal mortality as a serious violation of human rights. This reflects the social, economic, and quality of life conditions of people living in a particular area.<sup>3</sup> Most of these deaths would be prevented if women had access to proper treatment and care, including prenatal care provided by well-trained healthcare professionals, as well as care during childbirth and in the weeks following delivery.<sup>3</sup>

Maternal mortality is a matter of utmost seriousness in public health, entailing significant implications both in terms of health and economics for families and communities. This is due to the crucial role that women play not only within the family but also in the context of social and economic development of the region.<sup>4</sup> MM does not distribute indiscriminately among women, highlighting the profound inequality within the populations where it occurs. These disparities tend to concentrate in developing nations, disproportionately affecting women of black ethnicity with lower levels of income and education.<sup>5,6</sup>

In Brazil, approximately 70 women die per 100,000 live births, and over the past decade, this rate has remained stable.<sup>7</sup> Maternal mortality remains a significant global health issue, particularly in less developed countries. In 2015, the estimated global maternal mortality ratio was 216 per 100,000 live births, ranging from 542 deaths per 100,000 live births in Africa to 16 deaths per 100,000 live births in Europe. The Pan American Health Organization (PAHO) estimates approximately 830 maternal deaths daily, with 99% of these occurring in underdeveloped countries.<sup>8</sup> Given the importance of the issue and aiming to reduce and alleviate this serious public health problem, the United Nations (UN) ratified a new global agenda through the Sustainable

Development Goals (SDGs) in 2015. Among these goals, the reduction of maternal mortality was reaffirmed with the aim to reduce the global maternal mortality ratio to less than 70 deaths per 100,000 live births by 2030. Nevertheless, the Brazilian Federal Government has committed to aligning with the UN-established targets, aiming to reduce maternal mortality to a maximum of 30 deaths per 100,000 live births. Despite the belief that Brazil has the capacity to exceed the challenges set by the UN, maternal mortality in the country exhibits a widespread distribution across the national territory, with significant inequality both within and among federal units.<sup>9</sup> Furthermore, starting in 2020, the situation significantly worsened due to the direct and indirect impacts of the COVID-19 pandemic, resulting in considerable setbacks in the progress toward eliminating preventable maternal deaths.<sup>4</sup>

In this context, maternal mortality remains a serious public health issue in our country, even in states with good socio-economic development indices. Therefore, the motivation behind this study was to analyze maternal mortality rates in the states of Santa Catarina, Paraná, and Rio Grande do Sul from 2015 to 2022, and assess these data in relation to the targets set by Brazil under the Sustainable Development Goals (SDGs) established with the UN in 2015. Additionally, the study aimed to identify the main causes of death, their distribution by race, education level, and marital status of women, thereby understanding the epidemiological situation regarding maternal deaths in the southern states of Brazil.

## METHODOLOGY

This is a cross-sectional study involving descriptive and quantitative analysis of maternal mortality rates in the states of Paraná (PR), Santa Catarina (SC), and Rio Grande do Sul (RS) from 2015 to 2022. The methodology adhered to the STROBE guidelines, following the step-by-step approach outlined by Sarah Cuschieri (2019).<sup>10</sup> Data were extracted from the Mortality Information System (SIM) and the Live Births Information System (SINASC), available through DATASUS. The maternal mortality rate was calculated for each state and year analyzed by dividing the number of maternal deaths by the number of live births, multiplied by 100,000. Results were

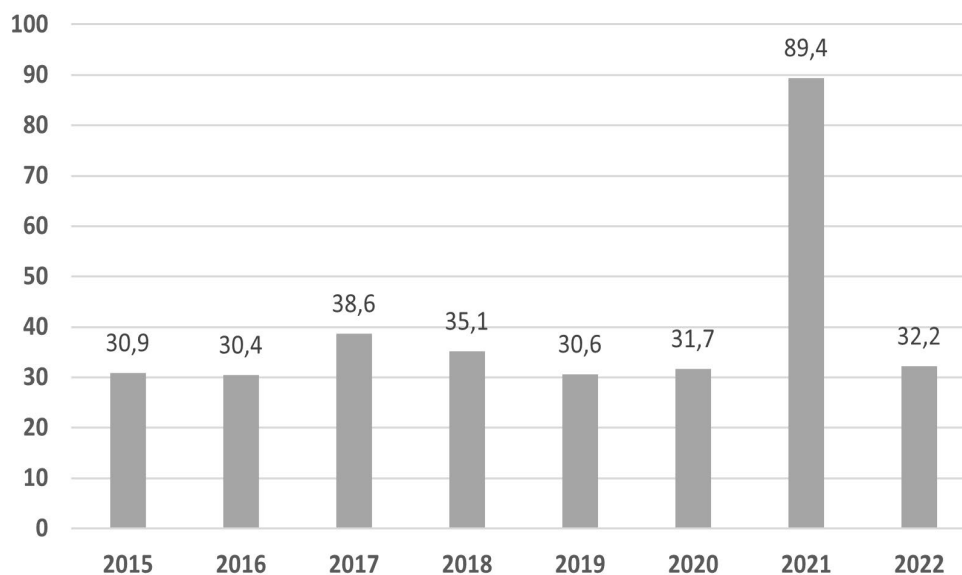
tabulated in spreadsheets and evaluated against the Sustainable Development Goals (SDGs) targets set by Brazil with the UN in 2015, aiming for a maximum of 30 maternal deaths per 100,000 live births. The search utilized descriptors: maternal mortality, Sustainable Development Goals, and reproductive rights, combined with Boolean operators: or and and. The study included articles from the past five years (2018-2023) in Portuguese, Spanish, and English, excluding articles 2 and 24 published earlier but deemed essential for their national relevance in maternal mortality. As a cross-sectional study using only public databases, ethical committee approval was not required.

## RESULTS

The main causes of maternal death in the three states were gestational hypertension,

eclampsia, urinary tract infections, postpartum hemorrhage, puerperal infection, and obstetric embolism. Hypertensive disorders/eclampsia accounted for the highest number of deaths, totaling 153 between 2015 and 2021, followed by 70 deaths due to obstetric embolic events. Data for 2022 are preliminary, and the exact causes of these deaths have not yet been recorded.<sup>11</sup>

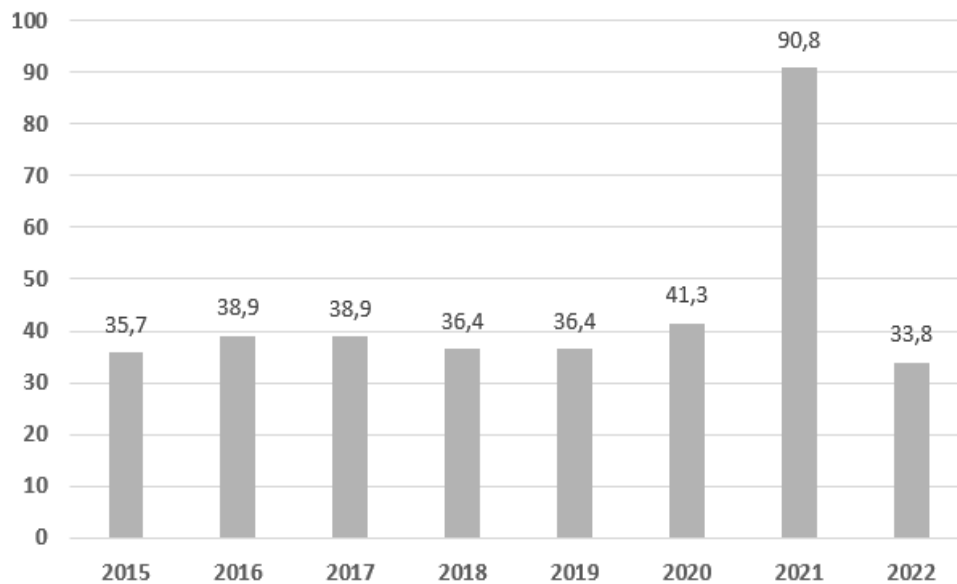
Regarding the calculated maternal mortality rates from 2015 to 2022, excluding the year 2021 due to the pandemic context, Santa Catarina was the state that came closest to the Sustainable Development Goals agreed upon by Brazil. The mortality rates ranged from 30.4, the lowest rate achieved during the analyzed period in 2016, to 38.6 in 2017, which was the highest rate during the period, as shown in figure 1.<sup>11</sup>



**Figure 1.** Maternal Mortality Rate in the state of Santa Catarina (Brazil) from 2015 to 2022. Source: Authors.

Similarly, excluding the year 2021 due to the COVID-19 pandemic, the second state with the best rates was Rio Grande do Sul, which varied its maternal mortality rate from 35.7 in 2015 to

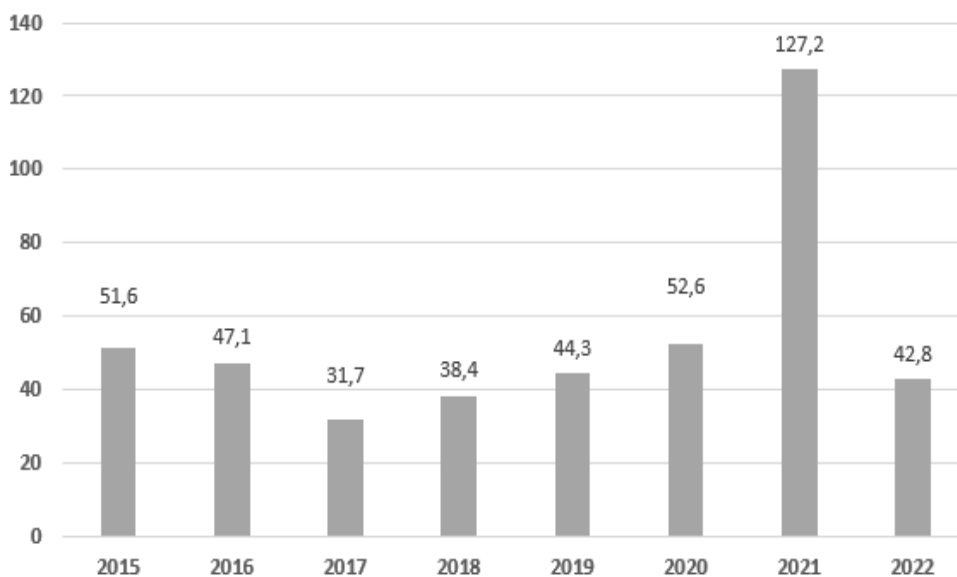
41.3 in 2020, as shown in Figure 2. O Rio Grande do Sul exhibited the least variation among the analyzed years, indicating consistency in public health actions implemented.<sup>11</sup>



**Figure 2.** Maternal Mortality Rate in the state of Rio Grande do Sul (Brazil) from 2015 to 2022. Source: Authors.

As shown in figure 3, the state of Paraná exhibited the poorest results during the analyzed period, achieving its lowest maternal mortality

rate in 2017 at 31.7 and its highest rate in 2020 at 52.6.



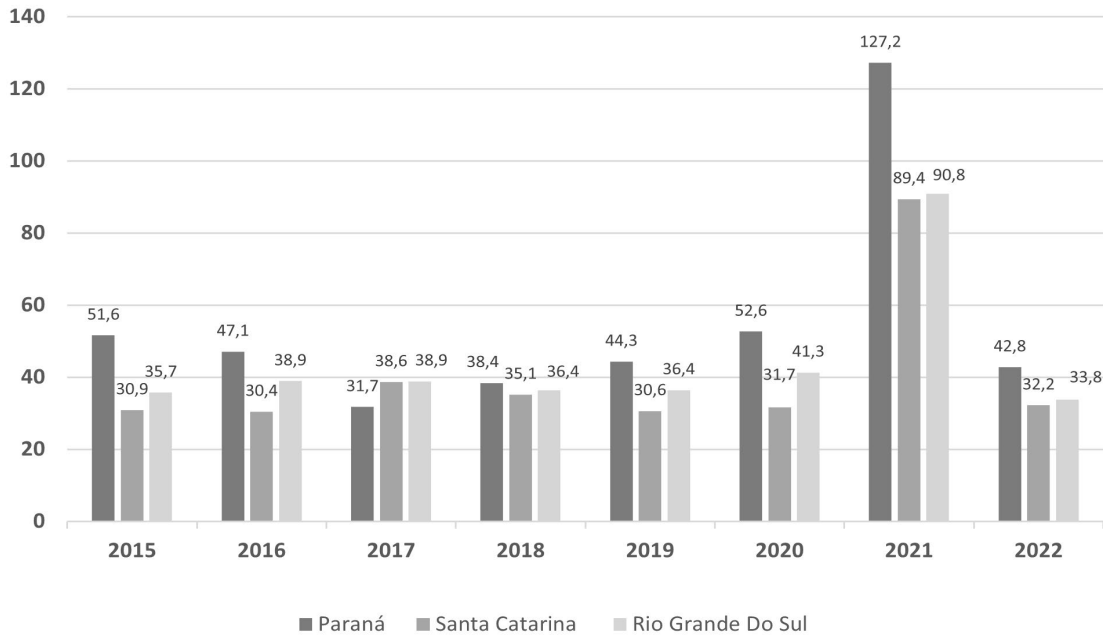
**Figure 3.** Maternal Mortality Rate in the state of Paraná (Brazil) from 2015 to 2022. Source: Authors.

Apart from the favorable outcome in 2017, Paraná consistently had higher rates compared to the other states in all other evaluated years, displaying significant variations in rates even within the relatively short historical series considered, as depicted in figure 4.<sup>11</sup>

In 2021, all states experienced a significant increase in maternal mortality rates, possibly associated with the COVID-19 pandemic. However, the precise factors contributing to this increase—whether direct complications of the disease on maternal health or simply the strain on the healthcare system unable to provide adequate

care to pregnant women, or even delays in seeking care due to fear of contagion in healthcare facilities—are not yet fully understood.<sup>9,12,13</sup> During the pandemic, Paraná also exhibited the poorest performance among the three states, with

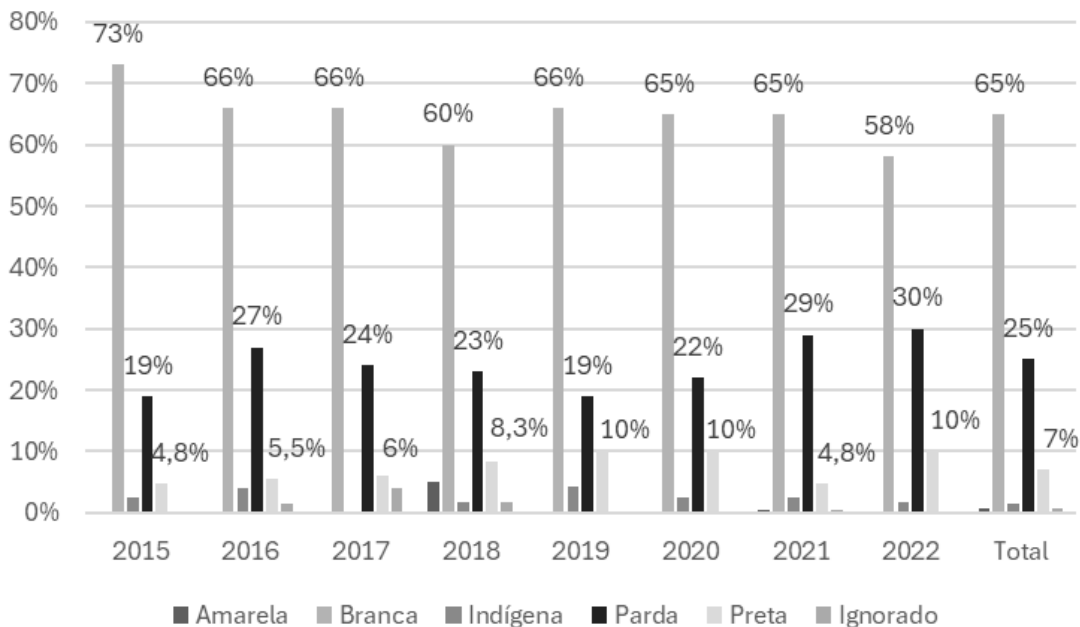
a maternal mortality rate of 128.6; Santa Catarina had a rate of 88.35, and Rio Grande do Sul had a rate of 89.2, as depicted in the comparative graph shown in figure 4.<sup>11</sup>



**Figure 4.** Comparative maternal mortality rates among the states in the southern region of Brazil. Source: Authors.

Regarding the classification of maternal death by race/color, it is observed that in the southern region, the absolute number of deaths among white women is higher, reflecting the

predominant ethnic composition of this region of Brazil. In Paraná, 65% of deaths occur in white women, 25% in brown-skinned women, and 7% in black women, as shown in figure 5.



**Figure 5.** Percentage of maternal deaths by race/color in the state of Paraná. Source: Authors.

In Santa Catarina, 72% of deaths occurred in white women, 13% in brown-skinned

women, and 12% in black women, as shown in figure 6.

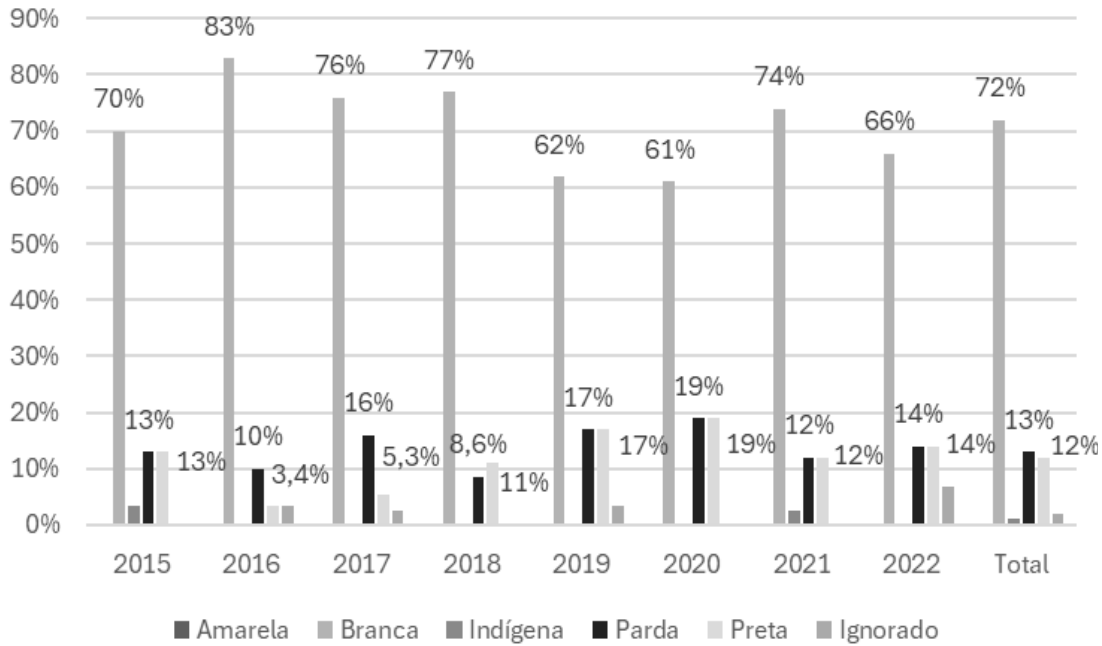


Figure 6. Percentage of maternal deaths by race/color in the state of Santa Catarina. Source: Authors.

Similarly, in Rio Grande do Sul, 71% of the women who died were white, 11% were

brown-skinned, and 15% were black, as shown in figure 7.<sup>11</sup>

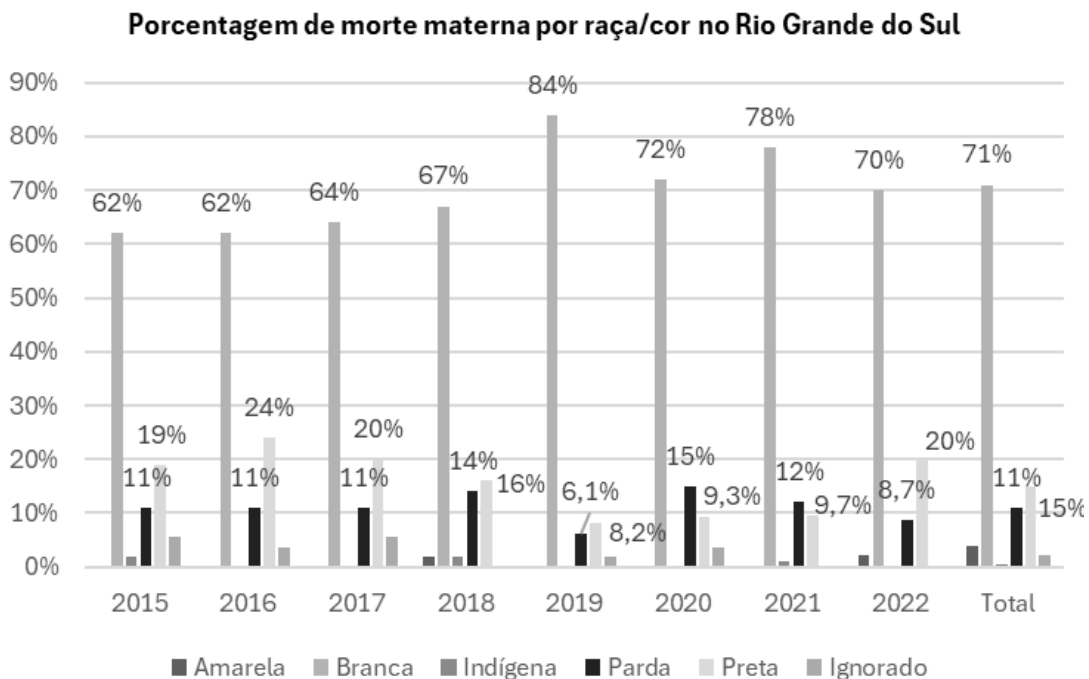


Figure 7. Percentage of maternal deaths by race/color in the state of Rio Grande do Sul. Source: Authors.

In terms of education, data is missing in 49% of records. As for marital status, 45% of deaths occurred in single women, and 90% of them received medical assistance before death.<sup>11</sup>

## DISCUSSION

It is important to note that the southern states have the highest Human Development Index (HDI) values in Brazil, and thus positive outcomes would be expected to be achieved promptly, which did not happen.<sup>14</sup> While Santa Catarina (SC) came close in some years within the analyzed period, Paraná did not perform as well, highlighting the need for improvement in public policies aimed at reducing maternal mortality in our region.

Furthermore, it is important to consider that these numbers may be even higher as cases could be underreported and poorly documented, a common practice not only in Brazil but also in other countries.<sup>2,15</sup>

The two main issues related to underreporting of deaths are the underreporting of deaths in the Mortality Information System (SIM) and inadequate completion of causes of death on death certificates. Often, the underlying cause is recorded without specifying if it is related to pregnancy, childbirth, or the puerperium, resulting in incomplete information. In an effort to address this issue, Ordinance MS No. 1,119, dated June 5, 2008, mandates surveillance of maternal deaths and deaths among women of reproductive age (10-49 years), reinstating procedures and timelines to expedite information availability through the SIM. The ordinance makes it mandatory to investigate these events regardless of the cause of death. Underreporting of maternal causes of death is a universal problem that is challenging to eliminate, underscoring the need to investigate all deaths of women of reproductive age. This death investigation retrieves omitted information on death certificates, facilitating the identification of maternal deaths not reported to the SIM.<sup>16,17</sup>

The lack of quality information compromises the planning, monitoring, and evaluation of maternal health within public health. When data is not adequately recorded and collected, analyses become unfeasible, hindering

the acquisition of information on causal determinants and impeding the establishment of actions aimed at reducing these causes of death.<sup>16,17</sup>

When analyzing race on a national scale, the highest number of deaths occurs among black and brown-skinned women, with the southern region, the focus of this study, being an exception to this rule. In this region, the number of deaths among white women is higher due to the ethnic characteristics of the area.<sup>11,18, 19</sup> However, according to other evidence, maternal mortality is indeed more frequent among Black women. This condition is explained by the association of poor blood pressure control in hypertensive diseases within this population, difficulty in accessing healthcare services, and the low quality of care available to them.<sup>3,20</sup> Nonetheless, in some ways, the data from the state of Rio Grande do Sul corroborate the literature, as a higher number of deaths among black women—15% of the total—was observed compared to brown-skinned women.

Regarding marital status, 44%, or nearly half of the studied sample, were single. Researchers agree that the presence of a partner has been interpreted as providing greater emotional support during pregnancy and childbirth, which is reflected in lower maternal mortality rates.<sup>3</sup>

In terms of education, it is evident that few years of schooling contribute to low family income, which hinders breaking the cycle of poverty, limits access to information and healthcare services, and increases mortality rates. Other Brazilian studies show a relationship between low education levels and higher maternal mortality rates. However, in our study, this data was missing in 49% of the records, making it impossible to draw any parallels between education level and maternal mortality rates in this region.<sup>21,22</sup>

The negative results obtained in states with good socioeconomic indices lead us to believe that other Brazilian states, which have even more precarious healthcare conditions, likely have higher maternal mortality rates. This is indeed demonstrated by other studies that encompassed all the federative units.<sup>2</sup>

According to the Observatory of Maternal Deaths, from 2015 to 2022, Brazil recorded a total

of 14,710 maternal deaths, with 3,025 deaths in 2021 alone, the highest number in the historical series. This finding aligns with the results of this study, as 2021 was significantly influenced by the COVID-19 pandemic. The data also indicate that the Northeast region has the highest maternal mortality rate in the country, with an absolute number of 4,586 deaths, resulting in a maternal mortality rate of 72.24 from 2015 to 2022.<sup>23</sup>

The stark socioeconomic differences between Brazilian regions can explain some of the disparities found. The Northeast of Brazil has one of the highest rates of underreporting, the highest percentage of illiteracy, a larger population in economic vulnerability, and difficulties in accessing and utilizing healthcare services.<sup>24</sup>

It is worth noting that the entire Brazilian territory is marked by deep regional inequalities stemming from historical legacies, which shape its uses and the political and economic structure of the country. Recent surveys indicate the concentration of medium and high complexity healthcare facilities in a limited number of cities, as well as the necessity of extensive travel between macroregions and states to access certain services. This highlights the heterogeneity of healthcare services available throughout the country.<sup>15</sup>

Socioeconomic factors remain a determining factor when comparing maternal mortality rates among Brazilian states.<sup>19</sup> Previous studies conducted in Brazil have shown that lower human development (HDI) and lower per capita income are associated with higher maternal mortality rates.<sup>25,26</sup>

To understand the variations in maternal mortality rates in the southern region, which have very similar overall HDI, it is essential to analyze the nuances within each state. As mentioned, Brazil is marked by profound inequalities even within microregions. For instance, in Curitiba, the capital of Paraná state, the HDI in 2010, the latest publicly available data, was 0.823, very close to values seen in developed countries. However, in Dr. Ulysses, a municipality in the metropolitan region of Curitiba, the calculated HDI in the same year was only 0.546. This demonstrates that even within a microregion, there can be significant variability in socioeconomic indicators, which directly affects morbidity and mortality rates.<sup>14,27</sup>

Official data released by the three states studied reveal significant disparities in maternal

mortality within their microregions.<sup>28,29,30</sup> For example, data from the government of Paraná state in 2022 show a maternal mortality rate of 62 deaths per 100,000 live births in the Northern Pioneer region, while the Curitiba Metropolitan region has a rate of 37.7 and the Southwest region a rate of 22.4.<sup>28</sup>

This reveals that more than overall socioeconomic indicators, numerous other factors contribute to the better performance of one state compared to another. For instance, according to data from the Prenatal Care Monitoring and Evaluation System (SIS-Pré-Natal) in 2022, 29% of pregnant women in Paraná had received prenatal care before the 20th week of pregnancy, whereas in Santa Catarina this number was 36%, and in Rio Grande do Sul it was around 35%. Studies indicate that earlier initiation of prenatal care allows for earlier detection of potentially reversible pregnancy-related issues, thus preventing future complications.<sup>31,32,33</sup>

Additionally, the availability of healthcare facilities and adequate training of teams in prenatal care are factors that directly influence mortality rates.<sup>21</sup>

It is a consensus among specialists that the best way to prevent high maternal mortality rates is through prevention and health promotion actions for pregnant women. All women need access to prenatal care during pregnancy, specialized care during childbirth, and support and care in the weeks following childbirth.<sup>26,31,32</sup>

In Brazil, it is recommended to have at least 6 prenatal visits, a number that remains below what some health organizations recommend. Furthermore, the quality of this care is a challenge that goes beyond a simple quantitative indicator. Healthcare teams must be intensively trained to identify and manage social and clinical conditions that pose risks for complications during pregnancy, childbirth, and the postpartum period.<sup>25,34,35</sup>

In addition to primary care, systemic actions are also necessary to improve emergency and tertiary care for pregnant women, ensuring their access to these services. Ultimately, interventions to prevent and reduce maternal deaths in the country are not solely the responsibility of the health sector. Promoting maternal health extends far beyond basic aspects of pregnancy, childbirth, and the postpartum



period, requiring a focus on social determinants such as education, income, women's health education, and appropriate family planning.<sup>24,34,35</sup>

Unfortunately, an assessment of all the Sustainable Development Goals (SDGs) targets in Brazil and its states, using a score based on disease burden, confirms that maternal mortality is one of the indicators with the lowest likelihood of achieving the established target.<sup>20</sup>

In this regard, our study highlights the complexity and inequality in the profile of maternal mortality in our country. Despite numerous limitations such as neglected data, incorrect records, small sample size, and state-level cross-sectional analysis — which prevent us from providing information on variation within each municipality — our findings suggest that a deeper analysis within each federal unit, and possibly within each municipality, is urgently needed. We have identified numerous local and regional inequalities. Analyzing geographic inequality is crucial to realign priorities for prevention and treatment of the causes leading to maternal mortality.<sup>25,26</sup>

Thus, we hope to contribute to supporting the organization and planning of multi-sectoral actions and strategies to address the phenomenon of maternal mortality.

## CONCLUSION

Therefore, it can be observed that, despite the atypical number of deaths in 2021 when maternal mortality rates sharply increased, possibly due to the COVID-19 pandemic, which contributed to a worse scenario regarding maternal mortality, none of the previous years analyzed saw the southern states, which are among the federative units with the best socioeconomic indicators in Brazil, achieving the targets established by the UN SDGs of a maximum of 30 maternal deaths per 100,000 live births. These data thus reveal the poor quality of healthcare and the serious violation of women's reproductive rights in our country. Therefore, it is imperative that public policies be reviewed and implemented across all regions of Brazil, respecting the specific differences and needs of each locality.

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