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Profile of suicide in a Decentralized Health Area, Ceará, 2013-2023

Perfil do suicídio em área descentralizada de saúde, Ceará, 2013-2023

Perfil del suicidio en un Área Descentralizada de Salud, Ceará, 2013-2023

ABSTRACT

This study aimed to describe the epidemiological profile and geographical distribution of suicide mortality in the Decentralized Health Area (ADS) of Crateús, Ceará, Brazil, from 2013 to 2023. It is a descriptive, retrospective epidemiological study based on data from the Mortality Information System (SIM/DATASUS - *Sistema de Informações sobre Mortalidade* in Portuguese), including deaths due to suicide (ICD-10 X60–X84) in the 11 municipalities of the region. Analyses included sociodemographic characteristics, circumstances of death, municipality, year, and the calculation of average rates. Higher frequencies were observed among men, particularly adults aged 30–49 years and individuals with lower educational levels, with most deaths occurring at home, mainly by hanging. Poranga and Quiterianópolis presented the highest average rates, while the regional average rate was 10.7 per 100,000 inhabitants. Comparison between the pre-pandemic (2013–2019) and pandemic (2020–2022) periods showed increased suicide rates in 9 municipalities, notably Iraporanga and Poranga, indicating relevant territorial inequalities.

Keywords: *Suicide; Mortality; Epidemiology; Health Information Systems; Public Health Surveillance.*

RESUMO

Este estudo teve como objetivo descrever o perfil epidemiológico e a distribuição geográfica da mortalidade por suicídio na Área Descentralizada de Saúde (ADS) de Crateús, Ceará, entre 2013 e 2023. Trata-se de um estudo epidemiológico descritivo e retrospectivo, baseado em dados do Sistema de Informações sobre Mortalidade (SIM/DATASUS), incluindo óbitos por suicídio (CID-10 X60–X84) ocorridos nos 11 municípios da região. As análises contemplaram características sociodemográficas, circunstâncias do óbito, município, ano e o cálculo das taxas médias. Observou-se maior frequência entre homens, sobretudo adultos de 30 a 49 anos e indivíduos com menor escolaridade, com predomínio de óbitos no domicílio, principalmente por enforcamento. Poranga e

Quiterianópolis apresentaram as maiores taxas médias, enquanto a taxa média regional foi de 10,7 por 100 mil habitantes. Na comparação entre os períodos pré-pandemia (2013-2019) e pandêmico (2020-2022), identificou-se aumento das taxas em 9 municípios, destacando-se Ipaporanga e Poranga, evidenciando desigualdades territoriais relevantes.

Descritores: *Suicídio; Mortalidade; Epidemiologia; Sistemas de Informação em Saúde; Vigilância em Saúde.*

RESUMEN

Este estudio tuvo como objetivo describir el perfil epidemiológico y la distribución geográfica de la mortalidad por suicidio en el Área Descentralizada de Salud (ADS) de Crateús, Ceará, Brasil, entre 2013 y 2023. Se trata de un estudio epidemiológico descriptivo y retrospectivo, basado en datos del Sistema de Información sobre Mortalidad (SIM/DATASUS), que incluyó muertes por suicidio (CIE-10 X60–X84) en los 11 municipios de la región. Los análisis consideraron características sociodemográficas, circunstancias del fallecimiento, municipio, año y el cálculo de tasas medias. Se observó mayor frecuencia entre hombres, especialmente adultos de 30 a 49 años y personas con menor nivel educativo, con predominio de muertes en el domicilio, principalmente por ahorcamiento. Poranga y Quiterianópolis presentaron las tasas medias más elevadas, mientras que la tasa media regional fue de 10,7 por 100 mil habitantes. La comparación entre períodos prepandémico y pandémico mostró aumento de las tasas en 9 municipios, evidenciando desigualdades territoriales.

Descriptores: *Suicidio; Mortalidad; Epidemiología; Sistemas de Información en Salud; Vigilancia en Salud.*

INTRODUCTION

Suicide is a complex and multifaceted phenomenon involving the deliberate intention to take one's own life¹. Considered a major public health issue, its occurrence is influenced by a multitude of individual, social, cultural, and economic factors^{2,3,4}. Among the key references on the subject, Durkheim⁵ (2024) emphasizes that suicide cannot be reduced to merely individual or psychological explanations. Instead, it is necessary to consider the influence of social and cultural structures to achieve a more complete and contextualized understanding of the phenomenon⁵.

Globally, suicide is recognized as a public health problem due to its significant impact on worldwide mortality and mental health issues⁴. Every year, approximately 703,000 people worldwide take their own lives; consequently, suicide is one of the leading causes of death globally, with rates exceeding those of diseases such as malaria, HIV/AIDS, and breast cancer⁶. In 2019, suicide accounted for more than 1.3% of deaths worldwide; among young people aged 15 to 29, it was the fourth leading cause of death, surpassed only by deaths resulting from road traffic accidents, tuberculosis, and interpersonal violence⁶.

In a global context, Brazil ranks 155th in suicide rates, according to a study conducted by the Institute for Health Metrics and Evaluation (IHME) across 214 countries⁷. Although Brazil does not exhibit alarming rates on a global scale, a rise in suicide rates is observed domestically, showing an average annual increase of 1.4% between 2000 and 2018⁷. According to the Mortality Information System (SIM), suicide is classified as the second leading cause of death among young people aged 15 to 19 and the fourth leading cause for those aged 20 to 29⁷, a finding that aligns with global data⁶. In 2021, 15,507 deaths by suicide were recorded; 77.8% of the victims were men, a group that typically accounts for the highest number of fatalities, given their tendency to use more lethal methods—such as hanging, firearms, and jumping from heights.

In the state of Ceará, the situation mirrors the national trend, showing a significant rise in both suicide deaths and reported cases of self-inflicted injury. A total of 9,610 suicide deaths occurred between 2010 and 2024. The peak of this time series was reached in 2021 with 823 recorded cases, a 35.5% increase over the previous year, with the highest incidence observed among males and individuals aged 20 to 59. These data underscore not only the magnitude of the problem but also the need for approaches tailored to specific territories, taking local nuances into account, when conducting epidemiological surveillance and formulating public policies.

Regarding the specific territorialized approach to suicides based on Ceará's health regions, the state exhibits striking epidemiological disparities across different areas; regions such as the Sertão Central and the North show average rates higher than those of other regions, such as Fortaleza, which, despite accounting for the highest absolute number of deaths, has a lower suicide rate⁹. These findings indicate that suicide occurrence is not uniform across Ceará's territory and that local factors, such as population density, socioeconomic

vulnerabilities, and differences between urban and rural contexts, can strongly influence mortality patterns⁹, given that conditions like socioeconomic inequality, precarious employment, weak social protection networks, and social exclusion processes are associated with increased vulnerability to suicidal behavior^{10,11}. In rural territories, these risks tend to be exacerbated by factors such as geographic isolation, difficulties in accessing mental health services, and limited availability of specialized care¹².

Although epidemiological analyses of suicide mortality in Ceará exist, the literature has primarily focused on state-level data or broad health regions⁹, without delving into the specific characteristics of the state's individual regions. Consequently, information remains scarce regarding the geographic distribution of deaths, differences among municipalities within the region, and the historical evolution of this health issue at the local level.

Against this backdrop, a specific analysis of data from the 11 municipalities comprising the Crateús Decentralized Health Area (ADS-Crateús – *Área Descentralizada de Saúde* in Portuguese)¹³, Ararendá, Crateús, Independência, Ipaporanga, Ipueiras, Monsenhor Tabosa, Nova Russas, Novo Oriente, Poranga, Quiterianópolis, and Tamboril, is warranted. This analysis addresses the need to understand the regional particularities of this issue, identify local risk determinants, and support the formulation of more effective, territory-specific prevention policies and interventions tailored to the reality of the state's interior. It is also worth noting that the municipality of Crateús, a regional hub, has increasingly become a center for medium- and high-complexity health services serving the entire region, as well as for higher education institutions. This occurs within a context of continuous socioeconomic growth that impacts surrounding municipalities, reinforcing the need to direct specific analyses and public policies toward this territory.

In this context, this study aims to describe the epidemiological profile and geographic distribution of suicide mortality in the Crateús Health Development Area (ADS-Crateús), Ceará, between 2013 and 2023.

METHODS

This is a retrospective, descriptive epidemiological study based on data from the Mortality Information System (SIM), made available by the Ministry of Health via the DATASUS platform, covering the period from 2013 to 2023.

To ensure the procedure's reproducibility in future research, data extraction followed a specific step-by-step process within the system: using the TabWin tool, the "Mortality Information System (SIM)" option was selected in the "Source" field; "Data" was selected under "Modality"; and "Death Certificate" (DO – *Declaração de Óbito* in Portuguese) was selected under "File Type." Subsequently, the year corresponding to the analysis and the state of Ceará were selected.

Following the download, the databases were organized, checked for consistency, and prepared for statistical processing. Records were classified

according to the International Classification of Diseases – 10th Revision (ICD-10), specifically codes X60 through X84 (covering intentional self-harm); only deaths by suicide occurring within the 11 municipalities belonging to ADS-Crateús during the analyzed period were retained.

The analysis was conducted using the Statistical Package for the Social Sciences (SPSS, version 20) software, involving the creation of tables, time series, and graphical representations. Variables of interest included sex, age group, race/skin color, marital status, education level, occupation, location of death, and method used, as well as the municipality of residence and year of death; this allowed for the characterization of the sociodemographic and epidemiological profile of suicide deaths in the ADS-Crateús region.

To estimate suicide mortality rates, official population data from the Brazilian Institute of Geography and Statistics (IBGE – *Instituto Brasileiro de Geografia e Estatística* in Portuguese) were used as denominators. Population estimates were employed for the years 2013 to 2021, while data from the 2022 Demographic Census were used for 2022 and 2023. Rates were calculated by municipality and year, expressed per 100,000 inhabitants. Specifically for comparing average suicide rates between the pre-pandemic (2013–2019) and pandemic (2020–2022) periods, the year 2023 was excluded; this was due to the absence—at the time the study was conducted—of a consolidated subsequent time series in the information systems that would allow for the definition of a post-pandemic period spanning more than one year, a requirement for calculating comparable averages.

Thus, the geographic distribution of suicide mortality was analyzed by considering both the absolute number of deaths and the average suicide mortality rates in each municipality during the study period.

It should be noted that this study was not submitted to a Research Ethics Committee, as it involved the analysis of secondary data that had been duly anonymized and made publicly available.

RESULTS

During the period analyzed, 332 deaths by suicide were recorded across the 11 municipalities of the Crateús Health District (ADS-Crateús), corresponding to an overall average suicide rate of 10.17 per 100,000 inhabitants. A predominance of males was observed, accounting for 75.6% (n = 251) of the deaths, while females represented 24.4% (n = 81). The male-to-female mortality ratio was 3:1. It is also noted that, throughout the period analyzed, men exhibited a higher incidence of suicide than women (table 1).

Table 1 - Number of deaths by suicide in ADS-Crateús, by year and sex

Year	Sex		Total
	Male	Female	
2013	18	9	27
2014	21	6	27
2015	20	8	28
2016	15	4	19
2017	21	5	26
2018	26	7	33
2019	26	8	34
2020	24	5	29
2021	26	9	35
2022	31	8	39
2023	23	12	35
Total	251	81	332

Fonte: Mortality Information System (SIM), accessed in November 2025.

An analysis of the individuals' ages revealed a range of 13 to 94 years, with a mean age of 44 years (SD = 18). Deaths were concentrated in the 30–49 age group (41.7%, n = 139); specifically among men, deaths were concentrated in the 35–39 (12.7%, n = 32) and 40–44 (12%, n = 30) age ranges. Among women, suicides were concentrated in the 30–34 (12.3%, n = 10), 45–49 (11.1%, n = 9), and 55–59 (12.3%, n = 10) age ranges.

Regarding race/skin color, the highest occurrence was observed among individuals classified as brown, who accounted for 76.8% (n = 255) of the deaths. The White, Black, and Indigenous categories corresponded to 16.9%, 1.5%, and 0.3%, respectively. Records with no data on race/skin color totaled 4.5% of cases (n = 15). When comparing distributions by sex, mixed-race individuals constituted the majority in both groups. Regarding the White category, a higher proportion of deaths was observed among women than among men, 28.4% (n = 28) and 13.1% (n = 33) of cases, respectively (Table 2).

Regarding marital status, the highest frequency of suicides was found among single individuals (51.2%; n = 170), followed by married individuals (24.4%; n = 81). Widowed, legally separated/divorced, and those in stable unions accounted for 3.6% (n = 12), 4.5% (n = 15), and 4.8% (n = 16) of the sample, respectively. Records marked as “unknown” or with no response totaled 11.4% (n = 38). Stratification by sex revealed that, among both men and women, the majority of deaths occurred among single individuals (51.8% and 49.4%, respectively).

Table 2 - Number of deaths by suicide in ADS-Crateús, by race/skin color and sex

Race/Skin color	Sex		Total
	Male	Female	
White	33	23	56
Black	5	0	5
Brown	200	55	255
Indigenous	1	0	1
No answer	12	3	15
Total	251	81	332

Source: Mortality Information System (SIM), accessed in November 2025.

Regarding education, a higher proportion of deaths was observed among individuals with no formal education (14.8%; n = 49) or with education up to the primary level (grades 1–5) (26.5%; n = 88). The proportion of “unknown” or no-response cases was 25.3% (n = 84). It was also observed that men had lower levels of education compared to women (Table 3).

Table 3 - Number of deaths by suicide in ADS-Crateús, by education level and sex

Education	Sex				Total	
	Male		Female			
	Qtde	%	Qtde	%	Qtde	%
No education	40	15,9	9	11,1	49	14,8
Elementary I (1 st - 4 th grade)	75	29,9	13	16	88	26,5
Elementary II (5 th - 8 th grade)	46	18,3	18	22,2	64	19,3
High school (former 2 nd degree)	25	10	13	16	38	11,4
Incomplete college	3	1,2	1	1,2	4	1,2
Complete college	1	0,4	4	4,9	5	1,5
Ignored	40	15,9	15	18,5	55	16,6
No answer	21	8,4	8	9,9	29	8,7
Total	251	100%	81	100%	332	100%

Source: Mortality Information System (SIM), accessed in November 2025.

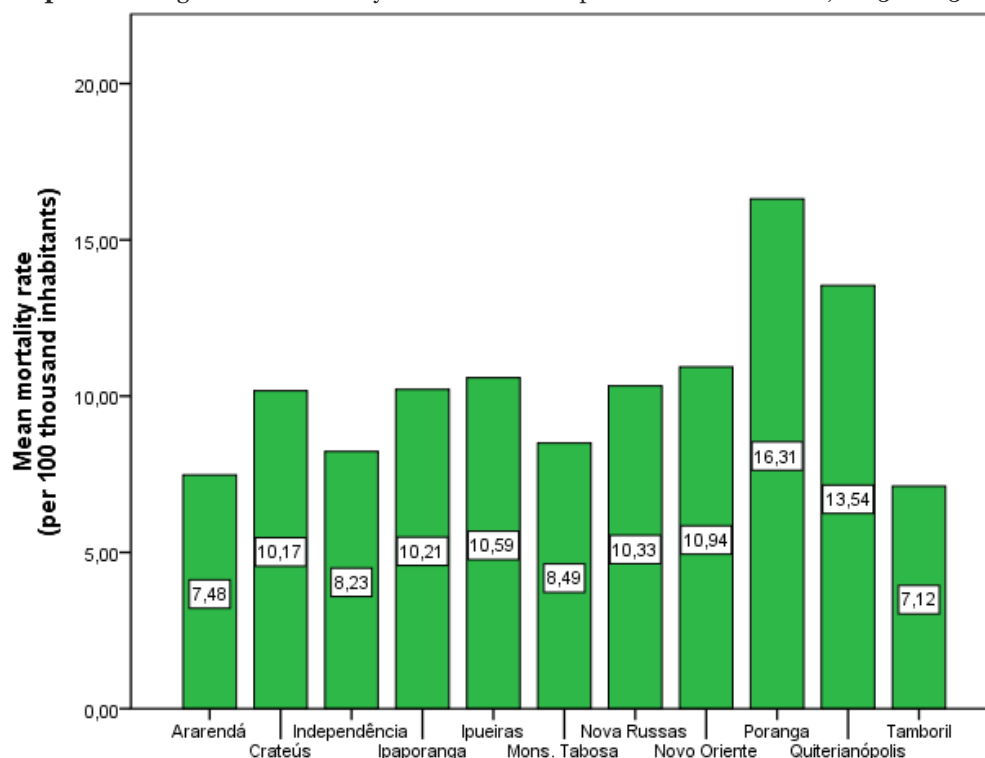
Regarding occupation, a higher frequency of deaths was observed among individuals classified as itinerant agricultural workers (21.1%, n = 70) or general agricultural producers (13.6%, n = 45), as well as among those with no recorded occupation (21.7%, n = 72). When comparing the distribution by sex, itinerant agricultural worker (20.7%, n = 52) and general agricultural producer (15.5%, n = 39) were the most prevalent occupations among men, whereas itinerant agricultural worker (22.2%, n = 18) and homemaker (22.2%, n = 18) were the most common among women.

Analysis of the location of occurrence revealed that suicides were predominantly concentrated in the home, where 226 cases (68.1%) took place. To a lesser extent, deaths were recorded in the categories of “other” (19%), hospital (8.7%), public thoroughfare (2.4%), and other health facilities (0.3%). Records where the location of occurrence was marked as “unknown” accounted for 1.5% of the total ($n = 5$). Stratification by sex did not indicate distinct patterns of occurrence.

Regarding the method used, hanging was the most frequent, accounting for 77.4% ($n = 257$) of all suicides. This method was predominant among both men (82.9%; $n = 208$) and women (60.5%; $n = 49$). Furthermore, regarding the distribution of other methods used by sex, it was observed that men primarily used firearms (ICD 72 and ICD 74), accounting for 2.8% in each category, as well as exposure to pesticides (ICD 68) and other unspecified chemicals and harmful substances (ICD 69), with 2.4% observed in each of these categories. Among women, the use of medications (ICD 64) and pesticides (ICD 68) were the most common methods, each accounting for 9.9% of cases.

Regarding the geographic distribution of deaths during the analyzed period, the municipality of Crateús accounted for 25.3% ($n = 84$) of the cases. The municipalities of Ipueiras, Nova Russas, and Novo Oriente recorded 13.3% ($n = 44$), 10.8% ($n = 36$), and 10.2% ($n = 34$) of the cases, respectively. Specifically, when considering suicide rates by municipality, the cities of Poranga and Quiterianópolis showed the highest average suicide rates, at 16.31 and 13.54 per 100,000 inhabitants, respectively (Graph 1).

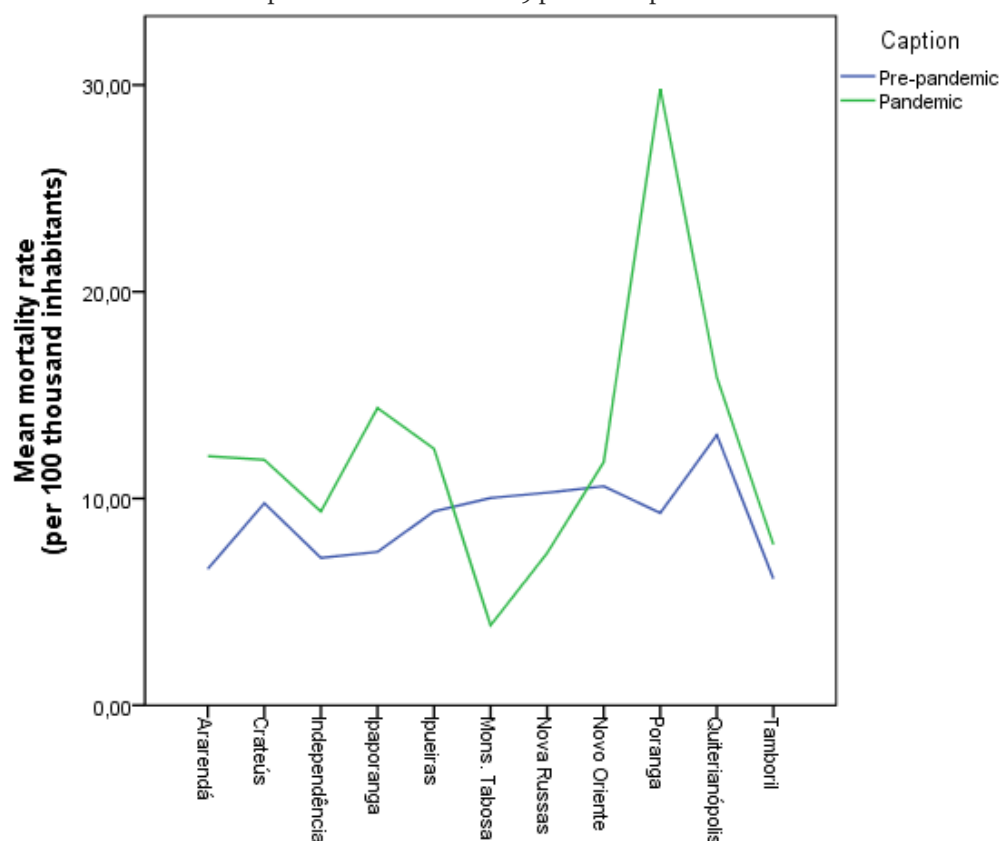
Graph 1 - Average suicide mortality rate in the municipalities of ADS-Crateús, 2013–2023



Source: Created by the authors.

Finally, comparing the average suicide mortality rates from the pre-pandemic period (2013–2019) with the pandemic period (2020–2022), an increase in the average suicide rate was observed in 9 of the 11 municipalities analyzed. Only the municipalities of Nova Russas and Monsenhor Tabosa showed a decrease in the average suicide rate (Graph 2).

Graph 2 - Average suicide mortality rate in the municipalities of ADS-Crateús, considering the pre-pandemic and COVID-19 pandemic periods



Source: Created by the authors.

It is also noted that the municipalities of Ipaporanga and Poranga show the largest increases in average suicide rates; the average rose from 7.4 to 14.4 per 100,000 inhabitants in Ipaporanga and from 9.3 to 29.8 per 100,000 inhabitants in Poranga, representing increases of 1.9-fold and 3.2-fold, respectively.

Furthermore, greater heterogeneity in average suicide mortality rates was observed among the analyzed municipalities during the pandemic period compared to the pre-pandemic period. While rates showed a more homogeneous distribution in the earlier period, the pandemic saw greater dispersion of values—with significantly higher rates in certain municipalities—highlighting distinct patterns of suicide mortality in the region.

DISCUSSION

The results of this study showed that suicide in the analyzed municipalities presents a profile characterized by a predominance of males and a higher frequency among individuals who are single, of brown, have low levels of education, and are primarily employed in agricultural occupations. It was also observed that hanging was the most common method used and that the majority of deaths occurred at home. These findings reveal a convergence of sociodemographic, occupational, and contextual determinants that shape a specific pattern of suicide vulnerability in the region under study—a pattern analyzed in light of existing literature throughout this discussion.

Higher mortality was observed among males, a result similar to that reported at the state level⁹, in other locations in Brazil^{18,19,20}, and in international studies^{6,21}. This higher suicide mortality among men observed in the literature can be interpreted through the lens of a "gender paradox" associated with socially constructed norms of masculinity²². Although men make fewer suicide attempts, they more frequently use highly lethal methods and are less likely to seek mental health services, a pattern linked to models of masculinity that discourage the expression of emotional distress. Furthermore, greater exposure to alcohol use, occupational instability, and pressures associated with the "provider" role contributes to the heightened risk and lethality of suicide within this group²².

The wide age range of the victims, from 13 to 94 years old, indicates that suicide affects various stages of the life course, though it is predominantly concentrated among adults aged 30 to 49. This age group is considered economically active and comprises the largest share of the "employed population" in Brazilian society¹⁰. This finding aligns with Brazilian literature, which identifies this age group as accounting for a significant number of deaths nationwide^{11,23}. This pattern is also supported by international literature, such as a study conducted in Hong Kong, which identified, among adults aged 30 to 49, a higher risk of suicide associated with factors such as psychiatric disorders, unemployment, indebtedness, living alone, and the absence of a marital bond²⁴.

The predominance of single individuals among the observed deaths is consistent with epidemiological literature findings indicating a higher frequency of suicide among people without a marital bond^{19,25}. The absence of a marital bond and lower social integration associated with non-married statuses can contribute to the weakening of support networks and an increased risk of suicide, particularly during life stages marked by greater socioeconomic pressure and social expectations²⁴.

Regarding the race/color variable, the predominance of suicide deaths among brown individuals is also observed in other studies^{9,25}. Research also indicates that the "Black" category, comprising both black and brown individuals, accounts for the highest number of victims^{26,27}. It should be noted that, although the number of deaths among Black men in the present study was low ($n = 5$) and there were no occurrences among Black women, this finding must be interpreted with caution; it may reflect processes of racial invisibility and underreporting in

official records. Notably, the way this information is recorded on death certificates, with a tendency toward the "whitening" of records, especially regarding brown and black, can result in biased estimates of racial health inequalities in Brazil²⁸.

Analysis of educational attainment reveals a predominance of low education levels among the recorded deaths, a finding consistent with epidemiological profiles in the literature, which indicate a higher frequency of suicide within this population stratum^{8,9,18}. The higher incidence of suicide among rural workers aligns with literature identifying this group as particularly vulnerable due to economic instability, precarious working conditions, social isolation, adverse weather conditions, and external pressures¹². Observed gender-based differences, with men concentrated in more formal agricultural occupations and women more frequently engaged in domestic or less formalized activities, reinforce that occupational determinants interact with gender roles, creating distinct patterns of exposure to psychosocial stressors in rural settings¹².

Regarding the methods employed, this study found a predominance of hanging, a method frequently identified in other research as the most common^{8,9,18}. Although hanging was the primary method for both men and women, an analysis of all methods revealed that men more frequently use highly lethal means (such as hanging and firearms), whereas women more often resort to poisoning; this corroborates research describing gender-based patterns in method selection, linked to both differential access to means and trajectories of care and mental ill-health^{7,22}. These results reinforce that the choice of method is not random but is, in fact, socially mediated.

Regarding the average suicide mortality rates observed across the 11 municipalities between 2013 and 2023, a pattern of territorial heterogeneity is evident, with some municipalities exhibiting substantially higher rates than others. When compared to the 2023 estimate for Brazil, 7.8 per 100,000 inhabitants, and to the state of Ceará, where rates have been similar or slightly higher in recent years, some of the municipalities analyzed show figures that approach or exceed these benchmarks. However, interpreting these results requires considering the municipalities' population sizes: although Crateús records the highest absolute number of deaths, its rates do not rank among the highest because it is the most populous municipality in the region; conversely, Poranga, one of the smaller municipalities, shows one of the highest mortality rates, indicating a greater proportional risk. A comparison of average suicide mortality rates between the pre-pandemic (2013–2019) and pandemic (2020–2022) periods, using the timeframe recommended in Fiocruz reports to capture potential COVID-19 effects on mental health indicators, revealed that most of the municipalities analyzed saw an increase in average suicide rates, with the exceptions of Nova Russas and Monsenhor Tabosa.

Nascimento and Maia note that the COVID-19 pandemic intensified various psychosocial factors associated with suicidal behavior, such as social isolation, domestic violence, unemployment, and psychopathological conditions,

which can exacerbate psychological distress in vulnerable populations. However, it is important to note that this study cannot establish a direct link regarding the high suicide rates observed in the analyzed municipalities during the pandemic; analyzing the impact of COVID-19 requires a prolonged observation period, as the pandemic's effects on social, emotional, and economic dynamics are likely to manifest only in the medium to long term.

In summary, the discussion of the study's results provides a more consistent understanding of the pattern of suicide mortality in the municipalities of the Crateús Health Micro-region (ADS-Crateús), highlighting the importance of approaches that simultaneously consider the sociodemographic, territorial, and temporal aspects described throughout this discussion.

CONCLUSION

The findings of this study indicate that suicide mortality in the Crateús Health Micro-region (ADS-Crateús) between 2013 and 2023 was not evenly distributed across municipalities or population groups. A relatively stable pattern was observed throughout the historical series, though with significant year-to-year differences—including changes during the COVID-19 pandemic, when variations in the number of deaths and suicide rates were noted in certain municipalities. Throughout the period, a higher concentration of deaths was consistently observed among men, working-age adults, and individuals with lower levels of education; differences were also noted regarding race/skin color, marital status, and occupation.

Analysis of the location of occurrence indicated that most deaths took place at home, while the distribution of methods revealed a predominance of highly lethal means. These results help to understand how suicide manifests within the territory, although this study design does not allow for the establishment of causal relationships.

When analyzed by municipality, both absolute numbers and average mortality rates showed significant variation within the ADS-Crateús region itself. Certain municipalities exhibited higher rates throughout the period, underscoring the importance of avoiding a view of the region as a homogeneous block and highlighting the need to consider local specificities when analyzing the issue.

Study limitations include the use of secondary data from the Mortality Information System (SIM), which is subject to underreporting, incomplete data entry, and potential errors in determining the underlying cause of death. Incomplete data regarding variables such as education, occupation, and race/skin color also limits the depth of analysis. Furthermore, as this is a descriptive study, it is not possible to infer individual risk or establish causal relationships.

Despite these limitations, the study contributes by providing a systematic, geographically specific description of suicide mortality in ADS-Crateús over the course of more than a decade. The results make it possible to identify municipalities and population groups with the highest numbers of deaths and the

highest rates, providing useful information for epidemiological surveillance and for planning mental health prevention and care actions at the regional level.

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