TEMPORAL TREND OF SUICIDE MORTALITY IN THE STATE OF PARAÍBA BETWEEN 2012 AND 2022

TENDÊNCIA TEMPORAL DA MORTALIDADE POR SUICÍDIO NO ESTADO DA PARAÍBA ENTRE 2012 E 2022

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Abstract. Suicide refers to the act of consciously ending one's own life. This phenomenon, which persists over time, is a serious public health problem. Therefore, the aim of this study is to analyze the temporal trends in suicide mortality coefficients in the state of Paraíba, Brazil, between 2012 and 2022, by population subgroups, considering gender, age groups and race/color. To this end, public data sources were used, made available by the Department of Informatics of the Unified Health System (DATASUS), to extract suicide mortality data (X60.0 to X84.0), as well as data from the Brazilian Institute of Geography and Statistics (IBGE) for population estimates. Time trend analysis was carried out using the Prais-Winsten regression and the Annual Percent Change (APC) calculation to identify the percentage of annual variation over the period and classify the trends found. The trends in mortality coefficients in the different population subgroups were increasing over the period analyzed. The coefficients increased significantly, especially during the Covid-19 pandemic.

Keywords: Sociodemographic factors. Mental health. Suicide. Pandemics.

Resumo. O suicídio refere-se ao ato de encerrar a própria vida de maneira consciente. Esse fenômeno, que perdura ao longo do tempo, configura-se como um grave problema de saúde pública. Portanto, este estudo tem como objetivo analisar as tendências temporais dos coeficientes de mortalidade por suicídio no estado da Paraíba, Brasil, entre os anos de 2012 e 2022, por subgrupos populacionais, considerando sexo, faixas etárias e raça/cor. Para tanto, foram utilizadas fontes de dados públicos, disponibilizadas pelo Departamento de Informática do Sistema Único de Saúde (DATASUS), para a extração de dados sobre mortalidade por suicídio (X60.0 a X84.0), além de dados do Instituto Brasileiro de Geografia e Estatística (IBGE) para as estimativas populacionais. A análise da tendência temporal foi realizada por meio da regressão Prais-Winsten e do cálculo do Annual Percent Change (APC) para identificar o percentual de variação anual no período e classificar as tendências encontradas. As tendências dos coeficientes de mortalidade nos diferentes subgrupos populacionais foram crescentes no período analisado. Os coeficientes tiveram expressivo aumento principalmente durante a pandemia de Covid-19.

Palavras-chave: Fatores sociodemográficos. Saúde mental. Suicídio. Pandemias.

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INTRODUCTION

Suicide, or death by self-harm, refers to the act of consciously ending one's life, evidenced by implicit or explicit signs of will over time, which can range from weeks to years. This phenomenon, which has persisted throughout history, constitutes a serious public health problem, internationally, nationally and regionally. Its complexity is influenced by a variety of social, genetic, and psychological factors, characterizing a biopsychosocial aspect[1, 2].

Currently, approximately 730,000 suicide deaths occur annually worldwide, with 73% of these cases registered in low- and middle-income countries. In Brazil, there has been a continuous and persistent increase in these numbers, with 15,507 suicides registered in 2021. For individuals up to 49 years old, suicide is among the ten leading causes of death in the country. In the Northeast, the standard suicide mortality rate rose from 4.39 in 2010 to 6.80 in 2021, resulting in a percentage change of 54.9% between 2010 and 2021, and of 19.9% between 2019 and 2021. In the state of Paraiba, the data indicate an increase from 4.55% in 2010 to 6.98% in 2021 , with changes of 53.4% between 2010 and 2021 and of 7.3% between 2019 and 2021[3.4] .

The Covid-19 pandemic, which officially lasted from 2020 to mid-2023 brought an unprecedented expansion in mental illness levels, affecting both previously diagnosed individuals and increasing the incidence of new cases[5,7]. Although there was an alarming enlargement in psychological stress levels during the pandemic, it is not yet possible to say with certainty whether this resulted in a significant growth in suicide cases globally, highlighting the need for more comprehensive studies on the topic[8]. However, there is evidence of an increase n suicidal ideation and suicidal attempts.

In Brazil, a study using data from 2015 to 2021 revealed 79,054 registered suicides, with 78.6% of cases among men and 21.4% among women, with no significant increase in the first months of the pandemic[10]. Another study, covering data from 2010 to 2020, presented that the first year of the pandemic resulted in a significant growth in deaths among women and people over 60. Considering the Northeast region was also experiencing an increase in cases, which highlights the variation in the impact of the pandemic at the regional level[11]. This exacerbates considering that low-income and non-white populations were more likely to die from Covid-19 12 , worsening fear and distress in these communities, especially in the Northeast, where 82% of Covid-19 deaths occurred among these populations[13].

Therefore, taking into account the profound social inequalities and health inequities that Brazil faces, both at the inter-regional and inter-state levels[14,15] , and the scarcity of studies that analyze mortality and its tendency in different population subgroups , this study aims to analyze the temporal tendency of suicide mortality in the state of Paraiba, located in the Northeast region of the country, within the years 2012 and 2022, considering sex, age groups and race/color.

METHODS

This study is characterized by being an ecological time series study and follows the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) protocol[16]. This type of study aims to observe the behavior of a population according to certain aspects over time[17], being of utmost importance to predict the distribution of diseases and injuries and identify factors that contribute to intensifying or mitigating these distributions in a given period.

Here, we analyzed all reported deaths by suicide from 2012 to 2022 in the state of Paraiba. Paraiba has a population of 3,974,687 people, 223 municipalities spread over a territorial area of 56,467,242 km², and a Gini index of 0.558, considered the highest in the Northeast[18].

Data collection, extraction, and analysis were performed using R software, version 4.3.3[19] . After installing and loading the microdatasus package[20] , data were extracted in June 2024 from the Mortality Information System (SIM) using the fetch_datasus function. The time limit, status, and information system were then defined as "SIM-DC," indicating that data should be extracted from death certificates (DC) existing in the SIM.
Therefore, deaths classified as X60.0 to X84.0 (intentional self-harm) of the International Statistical Classification

of Diseases and Related Health Problems – 10th revision (ICD-10) were filtered, yielding a total of 2,552 cases. The variables chosen to answer the research question were sex, age, and race/ethnicity. For analysis purposes, we chose to categorize ages into age groups considering the calculation of quartis and minimum and maximum values. Three cases were excluded because they did not have a date of birth, making it impossible to calculate age.

Descriptive data analysis was performed using the distribution of absolute and relative frequencies (*n*) (%) in tables, considering the entire universe of cases (N = 2,549). Then, the raw specific suicide mortality rates for the subgroups of interest were calculated using the population of the state of Paraiba as provided by the most recent census survey. .We did not consider mid-year adjusted population estimates because we could not locate them in the IBGE databases and there was no significant population change over the period. Rate tendencies were presented using line graphs and tables.

The temporal tendency analysis of the mortality coefficient was obtained using the Prais-Winsten generalized linear model, through the "prais" package [22] , used to correct first-order serial autocorrelation, often found in time series with population data and verified by the Durbin-Watson test.

To obtain the tendencies in percentage terms from the regression results, we estimated the *Annual Percent Change* (APC) through the formula and its confidence intervals, given, respectively, by: APC = $[-1 + 10^{\beta 1}] \times 100$; and $_{95\%}$ CI = $[-1 + 10^{\beta 1 \pm t \times se}] \times 100$, as proposed by Antunes and Cardoso [17] . The trends were classified as increasing when their coefficient was positive, decreasing when it was negative, and stable when it was not significantly different from zero, therefore, when p>0.05 or 95% CI includes zero.

This study complies with the recommendations of the National Health Council (NHC) in its resolution no. 466/2012. Furthermore, considering the public nature and anonymization of the data, belonging to the Department of Informatics of the Unified Health System (DATASUS), maintained by the Brazilian Ministry of Health, the approval by a Research Ethics Committee (CEP) was not necessary.

RESULTS

During the period analyzed here, which spans 2012 to 2022, deaths resulting from suicide totaled 2,549 cases in the state of Paraiba. The data in Table 1 detail these numbers in absolute and relative terms, highlighting the predominance of males, with almost four times as many deaths. Regarding age groups, the analyses revealed a higher incidence among those aged 30 to 56. Regarding race/color, 84.7% were considered mixed race, as presented in Table 1. It is worth noting that, although suicide in populations under 10 years old is rare, two deaths of children under 10 years old were recorded during the period, facts that became public due to widespread media coverage.

Table 1 – Absolute and relative distribution of cases of death by suicide according to sex, age group and race/color between 2012 and 2022 (N = 2,549). Paraiba, Brazil, 2024.

Variables	n	(%)
Sex		
Male	2.007	78,7
Female	542	21,3
Age groups		
8-29	644	25,3
30-42	659	25,9
43-56	634	24,9
57-101	612	24,0

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Race/color		
Brown	2.058	84,7
White	318	13,1
Black	53	2,2
Indigenous	2	0,1
Not available	118	4,6

Source: the authors (2024), based on MS/SVS/DATASUS/SIM; IBGE.

Table 2 shows the evolution of the mortality rate by subgroup over the years. It shows that among males and females, there was a 70.1% and 83.8% increase, respectively. Regarding age groups, the one with the largest percentage increase was between 57 and 101 years old, representing a 124.1% increase, with the rate rising from 5.51 in 2012 to 12.35 in 2022. Regarding race/color, mixed-race individuals had the highest mortality rates, but white individuals saw a considerable increase in 2022 compared to the first year of the series.

Table 2 – Distribution of the absolute number and mortality rates by suicide according to sex, age group and race/color between 2012 and 2022. Paraiba, Brazil, 2024.

Variables	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sex											
Male	147	157	130	163	147	197	182	198	209	227	250
	7,66	8,18	6,77	8,49	7,66	10,27	9,48	10,32	10,89	11,83	13,03
Female	42	42	28	57	34	53	55	52	49	53	77
	2,04	2,04	1,36	2,77	1,65	2,58	2,68	2,53	2,38	2,58	3,75
Age Groups											
8-29	57	47	38	60	45	55	60	81	56	66	79
	4,42	3,64	2,95	4,65	3,49	4,26	4,65	6,28	4,34	5,12	6,12
30-42	48	55	46	56	39	76	64	48	71	76	80
	6,01	6,88	5,75	7,01	4,88	9,51	8,01	6,01	8,88	9,51	10,01
43-56	43	52	36	51	49	61	63	69	68	66	76
	6,06	7,32	5,07	7,18	6,90	8,59	8,87	9,72	9,58	9,30	10,70
57-101	41	45	38	53	48	58	50	52	63	72	92
	5,51	6,04	5,10	7,12	6,44	7,79	6,71	6,98	8,46	9,67	12,35
Race/color											
White	26	17	13	33	23	28	34	23	28	35	58
	1,83	1,20	0,92	2,32	1,62	1,97	2,39	1,62	1,97	2,47	4,09
Brown	147	164	129	164	143	212	195	208	216	227	253
	6,66	7,43	5,84	7,43	6,48	9,60	8,83	9,42	9,78	10,28	11,46
Black	7	4	2	9	1	5	4	6	2	7	6
	2,21	1,26	0,63	2,84	0,32	1,58	1,26	1,90	0,63	2,21	1,90
Indigenous	-	-	-	-	-	-	-	-	2	-	-
									7,85		

Source: the authors (2024), based on MS/SVS/DATASUS/SIM; IBGE.

The figure below presents a graph for each subgroup representing the behavior of mortality rates per 100,000 inhabitants. It is worth mentioning the large distance between the two lines, indicating a significant difference in mortality. Regarding age groups, the 57-101 age group had the highest suicide mortality rate in 2022, followed by the 43-56 age group and the 30-42 age group. Regarding race/color, the discrepancy is undeniable, especially among mixed-race individuals, who had the highest rates since the beginning of the series, reaching 2022 with the highest rate in the period.

Figura 1 – Evolução anual dos coeficientes de mortalidade por suicídio segundo sexo, faixas etárias e raça/cor entre 2012 e 2022. Paraíba, Brasil, 2024.
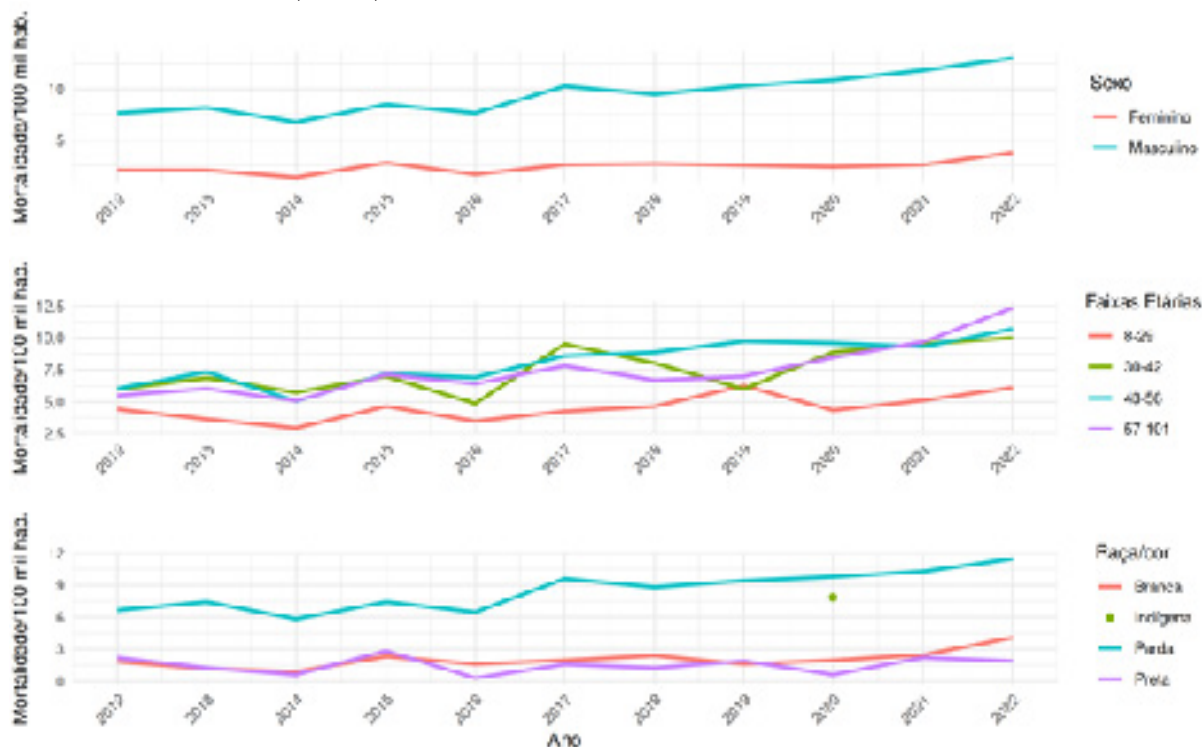
Source: the authors (2024), based on MS/SVS/DATASUS/SIM; IBGE.

According to table 3, there was a significant increase in suicide mortality in the subgroups analyzed, with emphasis on the elderly (57 to 101 years old), who presented a higher APC (6.92%), possibly aggravated by the effects of the pandemic period.

Regarding race/color, brown people had the highest average coefficients (8.47), indicating a high absolute death burden, while white people had a higher APC, suggesting a more rapid increase during the period. These results corroborate and measure what could had already been the subjectivity observed in the graphs with reasonable ease. It is crucial to understand how suicide mortality has been increasing over the years in subpopulations and how it reached high levels during the pandemic.

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Table 3 – Average rate and *annual percent change* in suicide mortality rates by sex, age group, and race/color between 2012 and 2022. Paraiba, Brazil, 2024.

Variables	TMM[a]	APC[b]	IC$_{95\%}$	p-value	Classification
Sex					
Masculine	9,51	5,81	4,37-7,27	<0,001	Crescente
Feminine	2,40	5,39	2,78-8,08	0,001	Crescente
Age groups					
8-29	4,54	4,90	1,98-7,91	0,004	Crescente
30-42	7,50	4,92	1,94-7,99	0,004	Crescente
43-56	8,12	6,19	4,15-8,27	<0,001	Crescente
57-101	7,47	6,92	4,21-9,70	<0,001	Crescente
Race/color					
Branca	2,04	8,39	2,83-14,25	0,007	Crescente
Parda	8,47	5,99	4,21-7,81	<0,001	Crescente
Preta	1,52	2,67	-5,82-11,95	0,507	Estável

[a] Average mortality rate
[b] *Annual percentage change*
Source: the authors (2024), based on MS/SVS/DATASUS/SIM; IBGE.

DISCUSSION

This research shed light on the behavior of suicide mortality rates in the state of Paraiba, enabling the detection of tendencies across different population subgroups over an 11-year period. This fills a gap in the literature due to the absence of such analyses for the state, particularly by age group and race/color. During this period, there was an upward tendency across virtually all subgroups, with a particular impact beginning in 2020, which was marked by the onset of the COVID-19 pandemic in the first quarter of the year.

An analysis of the negative impacts of the pandemic on suicide behavior in Brazil reveals significant differences between regions. Nationally, there was no significant increase in the incidence of suicide deaths during the first months of the pandemic—that is, there was no statistically significant variation in the incidence of recorded deaths and what was expected. Although national analyses yielded similar results, the Northeast region saw a considerable increase, particularly among white males aged 40 to 59, and those over 60. [11]

In Paraiba, mortality rates stood out, being consistently higher than the regional average, with men having higher mortality rates compared to women. However, although this inequality exists, it is already known and expected, representing what the specialized literature calls the gender paradox in suicide, as while women attempt suicide more often, men die more often [4, 23] .

The fact that young people up to 29 years of age had the lowest mortality rates may be related to restrictions imposed to contain the spread of Covid-19, such as lockdowns, which may have strengthened family ties and acted as a protective factor for this age group, at least in the initial months of the pandemic. [24,25] However, mortality among young people began to rise again in 2021 and 2022, surpassing pre-pandemic levels, which is consistent with the literature that documents a gradual recovery in suicide rates after catastrophic events, even if rates increase afterward. [26]

International studies, such as the one conducted in Maryland, USA, confirms that the pandemic had a more severe impact on suicide mortality among more vulnerable populations, such as black, mixed-race, and indigenous people, while white people saw a reduction compared to previous years. [27] In Brazil, more specifically in the state of Paraiba, this dynamic was reflected in the growth in mortality among mixed-race people, contributing to the upward tendency observed in this study. However, white people also reached higher rates here, reaching the highest rate observed since the beginning of the series in 2022.

The psychological burden among middle-aged and elderly people during the pandemic was exacerbated by factors such as fear of infection, social isolation without family support, and financial difficulties, which contributed to increased mortality in these groups. [28]

Among the study's limitation is the use of public data, which is subject to underreporting and errors in completing death certificates, which may be due to social stigma, religious beliefs, or the subjective aspects of the person making the notification. Even so, the data used come from official sources widely used to support public health policies in Brazil, ensuring good accuracy and validity for the purposes of this study. Thus, the data were sufficient to meet the research objectives and demonstrate the necessity to address taboos related to the topic and assist in the formulation of stronger prevention policies. After all, many lives are still lost each year, especially in Latin America, while other regions of the globe are moving in the opposite direction.

CONCLUSIONS

This study provides the academic-scientific community with insight into suicide mortality in the state of Paraiba, estimating temporal trends by sex, age group, and race/color. It also establishes intersections regarding the impact of the pandemic on different subgroups, considering the significant increase during this period. We hope that the results are useful to guide the formulation of public policies aimed at suicide prevention, especially in the post-pandemic period, with a particular focus on the population subgroups most at risk, in accordance with the principles of the Brazilian Unified Health System.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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