Mortality from Malignant Breast Neoplasms in Women Aged 20 Years and Older, Piauí, 2010-2023

Mortalidade por Neoplasias Malignas da Mama em Mulheres ≥ 20 Anos, Piauí, 2010-2023

Mortalidad por Neoplasias Malignas de Mama en Mujeres ≥ 20 Años, Piauí, 2010-2023

RESUMO

Objetivo: analisar a mortalidade por NMM em mulheres (≥ 20 anos) residentes no Piauí de 2010 a 2023. **Metodologia:** estudo transversal e ecológico com do Sistema de Mortalidade tabulados via Tabwin. Foi analisado a distribuição espaço-temporal e perfil epidemiológico. Calculou-se as taxas por 100.000 pelo Excel, confeccionou-se os mapas com número de casos por municípios e calculou-se o teste Qui-quadrado de Pearson com significância de 5%. **Resultados:** foram registrados 2.617 óbitos por NMM no Piauí. Verificou-se aumento nas taxas de mortalidade (12,5 a 17,6%), maior concentração de óbitos nos municípios mais populosos, elevadas proporções de mulheres com 50 a 59 anos (25,8%), pardas (58,9%) e casadas (37,6%). Observou-se significância estatística com todas as variáveis analisadas entre adultas e idosas. **Conclusão:** A mortalidade por CMM apresentou distribuição temporal crescente, concentrada em municípios populosos e com fatores sociodemográficos proporcionalmente elevados e estatisticamente significativos quando comparados entre grupos etários distintos.

DESCRITORES: Neoplasias da Mama. Mortalidade. Monitoramento Epidemiológico. Distribuição Espacial.

ABSTRACT

Objective: to analyze mortality from NMM in women (≥ 20 years) residing in Piauí from 2010 to 2023. **Methodology:** cross-sectional and ecological study using mortality data tabulated via Tabwin. The spatial-temporal distribution and epidemiological profile were analyzed. Rates per 100,000 were calculated using Excel, maps were created with the number of cases per municipality, and Pearson's chi-square test was calculated with a significance level of 5%. **Results:** 2,617 deaths from NMM were recorded in Piauí. There was an increase in mortality rates (12.5 to 17.6%), a higher concentration of deaths in the most populous municipalities, and high proportions of women aged 50 to 59 (25.8%), brown-skinned (58.9%), and married (37.6%). Statistical significance was observed for all variables analyzed among adults and the elderly. **Conclusion:** Mortality from breast cancer showed an increasing temporal distribution, concentrated in populous municipalities with proportionally high and statistically significant sociodemographic factors when compared between different age groups.

DESCRIPTORS: Breast Neoplasms. Mortality. Epidemiological Monitoring. Spatial Distribution.

RESUMEN

Objetivo: analizar la mortalidad por NMM en mujeres (≥ 20 años) residentes en Piauí entre 2010 y 2023. Metodología: estudio transversal y ecológico con datos del Sistema de Mortalidad tabulados mediante Tabwin. Se analizó la distribución espacio-temporal y el perfil epidemiológico. Se calcularon las tasas por 100 000 mediante Excel, se elaboraron mapas con el número de casos por municipios y se calculó la prueba de chi cuadrado de Pearson con una significación del 5 %. Resultados: se registraron 2617 muertes por NMM en Piauí. Se observó un aumento en las tasas de mortalidad (12,5 a 17,6 %), una mayor concentración de muertes en los municipios más poblados, altas proporciones de mujeres de 50 a 59 años (25,8 %), de raza mestiza (58,9 %) y casadas (37,6 %). Se observó significación estadística con todas las variables analizadas entre adultas y ancianas. Conclusión: La mortalidad por CMM presentó una distribución temporal creciente, concentrada en municipios poblados y con factores sociodemográficos proporcionalmente elevados y estadísticamente significativos cuando se comparan entre distintos grupos de edad.

DESCRIPTORES: Neoplasias mamarias. Mortalidad. Vigilancia epidemiológica. Distribución espacial.

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INTRODUCTION

Breast neoplasia, especially malignant breast cancer, represents one of the main public health challenges in Brazil and worldwide, being the most common malignant neoplasm among women. Thus, estimates for the year 2022 were 66,280 new cases, representing an adjusted incidence rate of 43.74 cases per 100,000 Brazilian women [1].

In Brazil, breast cancer ranks first among the most common types of malignant neoplasms in women, followed by cervical cancer, with high incidence and mortality rates, highlighting efforts to adopt effective strategies for early detection and timely access to appropriate treatment for the affected population. Between 2005 and 2019, Brazil recorded 207,683 deaths from breast cancer in women aged 20 years or older, with the Northeast region accounting for 17.8% (n = 36,910) of cases and an average rate of 16.43 per 100,000 women [3].

Over the last few decades, breast cancer control in Brazil has evolved significantly, reflecting a growing commitment by public health authorities to this type of cancer. Starting in the 1980s, with the creation of the Unified Health System (SUS), there was an expansion in actions aimed at early detection and treatment, consolidating public policies, reaffirming breast cancer as a priority on the national agenda, and establishing guidelines and protocols to expand access to exams, procedures, and treatments for women throughout the country [1].

The treatment and hospitalization for malignant breast neoplasia (MBN) have costs that vary according to the stage of the disease, the type of intervention performed (surgery, chemotherapy, or radiotherapy), and the health system responsible for care (SUS or supplementary). According to the Oncology Observatory [4] , the costs of breast neoplasms amounted to almost 4 million in 2016, highlighting the significant economic impact of this disease on the Brazilian healthcare system.

Mortality from breast cancer in Brazil remains a significant challenge for public health. Despite advances in public policies for cancer screening and treatment, regional inequalities in access to healthcare compromise access to healthcare services, especially in the most socially vulnerable regions. According to the mortality panel prepared by INCA, although technological advances and screening policies have contributed to improvements in indicators, significant death rates are still observed, especially f s among women with late diagnosis, directly affecting their quality of life and survival [5].

Analyzing information about deaths from breast cancer in women in the state of Piauí is justified by the epidemiological and social relevance of this disease, which represents one of the leading causes of cancer death among the Brazilian female population. Studying breast cancer mortality in the context of Piauí, in addition to its relevance, is unprecedented and fundamental to highlight patterns, distributions, and profiles, given that the literature presents gaps when it comes to this topic of deaths among women in Piauí.

Thus, the objective of this study was to analyze the spatial-temporal distribution and epidemiological profile of deaths from breast cancer in women in Piauí from 2010 to 2023.

METHODOLOGY

This was a mixed cross-sectional and ecological study that evaluated data on deaths from malignant breast neoplasms in females in the state of Piauí from January 2010 to December 2023 (6). The information was tabulated using the Tabwin tool available on the website of the Department of Informatics of the Unified Health System (DATASUS), which stores data from the Mortality Information System (SIM) [7].

Data collection took place on the DATASUS website under the link "access to information" in the item "health information (Tabwin)," importing data from the Mortality Information System (SIM) on deaths of residents of Piauí from 2010 to 2023 into the computer. In the Tabwim application, tabulation was performed by selecting and filtering the variables. The filter criteria were: federal unit of residence Piauí, female gender, age groups ≥ 20 years, and ICD-10 = C50: Malignant neoplasms of the breast. The other variables were organized by rows and columns [8] .

In addition, population projection estimates were collected from the Brazilian Institute of Geography and Statistics (IBGE) for the state of Piauí for each year and for the population of women aged ≥ 20 years.

The variables selected for this study were: deaths from malignant

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breast neoplasms; age group (20 years), race/color (white, brown, and others), education (in years), marital status (single, married, and others), mortality rate (per 100,000 women), years (2010 to 2023), and municipalities.

The data were imported on July 5, 2025. The organization of the initial data and final information was performed in Excel 2016 to create tables, graphs, and frequency and rate calculations [9].

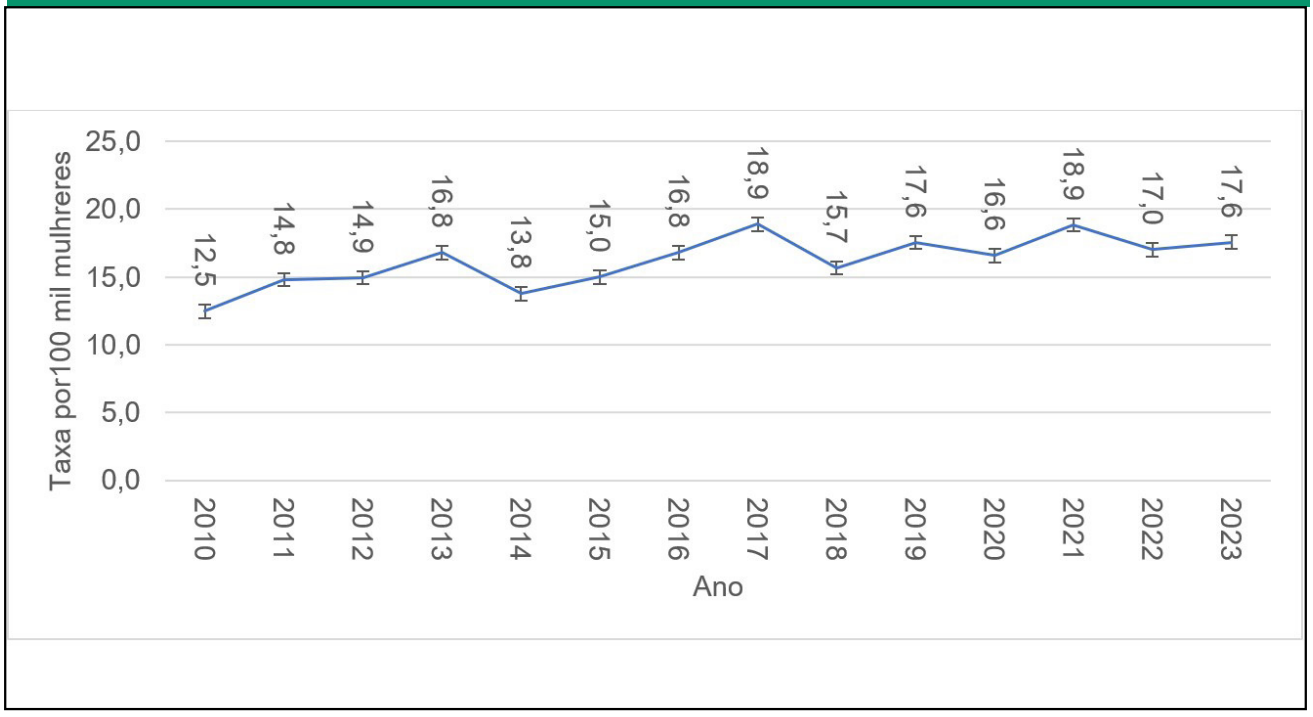
The rates were calculated using the constant 100,000. The maps were created using the Tabwin application based on the frequency (n) of cases in each municipality in the state. The other analyses were performed in SPSS version 25 to calculate descriptive statistics, *Pearson's chi-square* test, and p-value, significant when <0.05.

This study uses secondary data from SIM/Datasus, which stores public domain data without identification, and therefore does not require approval from the Research Ethics Committee (CEP) for its implementation, as provided for in Resolution 510/2016 of the National Health Council.

RESULTS

Between 2010 and 2023, there were 2,617 deaths from NMM in women aged ≥ 20 years residing in the state of Piauí, with annual variations in both the absolute number of deaths and the rates adjusted per 100,000 women. According to Graph 1, the mortality rate fluctuated from 12.5 in 2010 to 17.6 in 2023 per 100,000 women, representing an increase of approximately 40.9% in the period analyzed. There has been an upward trend over the years, with notable peaks in 2017 (18.9 per 100,000) and 2021 (18.9 per 100,000).

Graph 1. Temporal rate of deaths from NMM in women (≥ 20 years), Piauí, 2010 and 2023.



Source: prepared by the authors. Data: SIM - DATASUS/Tabnet, 2025; IBGE – population estimates, 2025.

Table 1 shows the distribution of 2,617 death records according to sociodemographic characteristics. There is a higher concentration in the 50-59 age group (25.8%), followed by 60-69 (21.9%) and 40-49 (18.4%), indicating a predominance of middle-aged and elderly individuals. In terms of race/skin color, brown individuals (58.9%) and white individuals (25.1%) predominate. In terms of education, there was a relatively homogeneous distribution among the strata of no schooling (18.5% to 18.1%), 1 to 11 years of schooling, with a lower proportion among those with 12 or more years of schooling (10.2%). In terms of marital status, the highest frequency was among married individuals (37.6%).

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Table 1. Profile of deaths by NMM in women (≥20 years) according to sociodemographic characteristics (age group, race/skin color, education, and marital status), Piauí, 2010 and 2023.

Variables	Frequência	
	n	%
Age group		
20 to 29	24	0,9
30 to 39	211	8,1
40 to 49 years old	481	18,4
50 to 59 years old	674	25,8
60 to 69 years old	572	21,9
70 to 79 years old	356	13,6
80 years and older	299	11,4
Race/Skin color		
White	658	25,1
Black	245	9,4
Brown	1541	58,9
Other	14	0,5
Education		
None	483	18,5
1 to 3 years	467	17,8
4 to 7 years	472	18,0
8 to 11 years	473	18,1
12 years and older	268	10,2
Marital status		
Single	610	23,3
Married	984	37,6
Widowed	451	17,2
Legally separated	131	5,0
Other	129	4,9
Total	2617	100,0

Source: prepared by the authors. Data: SIM - DATASUS/Tabnet, 2025.

During the period analyzed, there were more deaths among adult women (1,300; 49.7%) than among elderly women (1,158; 44.2%). In terms of race/skin color, mortality was higher among black/brown women in both age groups, being higher among adults (37.7%) than among elderly women (30.6%). White women had lower proportions, but slightly higher among elderly women (13.3%) than among adult women (11.8%). This distribution showed a statistically significant association (p=0.001).

Regarding education, it is noteworthy that the absence of education was more frequent among elderly women (13.1%) than among adult women (5.3%). The highest proportions of deaths among women with 8 or more years of education occurred in the adult group (18.7%), while among elderly women this proportion was considerably lower (9.6%). The differences according to education level were statistically significant (p<0.001), suggesting social inequalities associated with mortality.

With regard to marital status, a higher proportion of deaths was observed among widows/separated women, especially among adults (25.4%), followed by elderly women (17.1%). Women in a relationship had a higher proportion of deaths in the elderly group (16.3%) when compared to adults (5.9%). Among single women, mortality was higher among adults (14.4%). The differences were also statistically significant (p<0.001).

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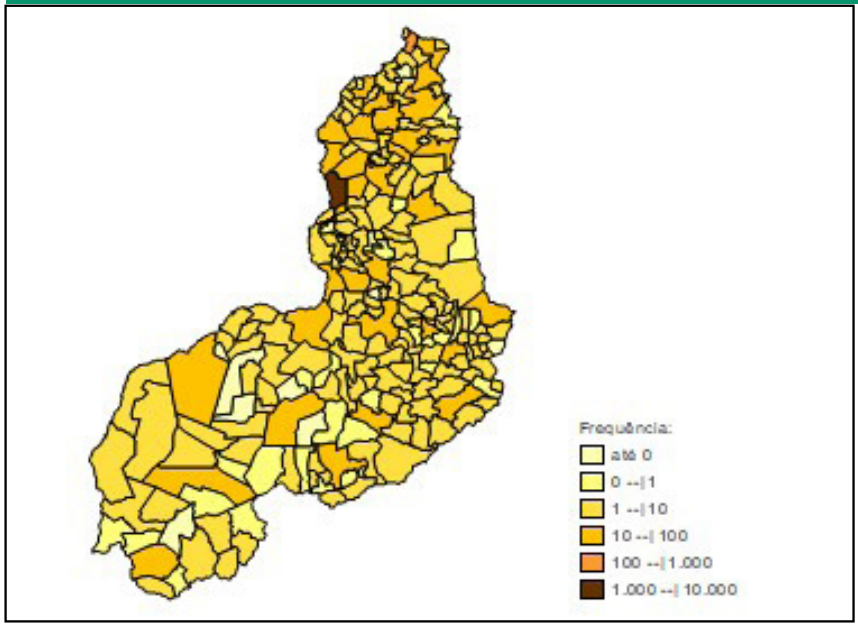
Table 2. Profile of deaths by NMM in women according to age group and associated sociodemographic factors, Piauí, 2010 and 2023.

Variables	Adults		Elderly		p-value
	n	%	n	%	
Total	1300	49,7	1158	44,2	
Race/Skin color					
White	309	11,8	349	13,3	0,001
Black/Brown	986	37,7	800	30,6	
Other	5	0,2	9	0,3	
Education					
None	140	5,3	343	13,1	<0,001
1 to 8 years	498	19,0	441	16,9	
8 and over	490	18,7	251	9,6	
Marital status					
Single	378	14,4	232	8,9	<0,001
Widows/Separated	665	25,4	448	17,1	
In a relationship	155	5,9	427	16,3	

Source: prepared by the authors. Data: SIM - DATASUS/Tabnet, 2025.

The spatial distribution of the frequency of deaths by NMM in the state of Piauí, as shown in Figure 1, reveals a strong concentration of cases in hub municipalities with greater health infrastructure, notably Teresina with 1,039 deaths, followed by Parnaíba (133), Picos (68), Campo Maior (60), Floriano (57), and Piripiri (47). In contrast, several municipalities had very low numbers or no records, such as Caldeirão Grande do Piauí, Manoel Emídio, Pavussu, and Tamboril do Piauí, possibly reflecting underreporting or a lack of specialized services.

Figure 1. Spatial distribution of deaths due to NMM in women (≥20 years) , Piauí, 2010 and 2023.



Source: prepared by the authors. Data: SIM - DATASUS/Tabnet, 2025; IBGE – population estimates, 2025.

DISCUSSIONS

Between 2010 and 2023, 2,617 deaths from NMM were recorded in women ≥ 20 years old, residing in the state of Piauí. Increasing mortality rates were observed, showing an association between age groups and sociodemographic profile. Higher proportions were found in women aged 50 to 59 years, brown-skinned, with no schooling, and married. The analysis between adult and elderly groups showed statistically significant proportions with race/skin color, schooling, and marital status.

National [3;10] and international [11;12] studies corroborate the findings of this research, as they show an increase over time in mortality indicators for breast cancer in women. However, in the study by Pecinato, Jacobo, and Silva ([13]), this trend was stationary. Despite small occasional reductions in years such as 2014, 2018, 2020, and 2022, the data suggest a consistent increase in mortality, which may be related to factors such as population aging, increased incidence, difficulties in accessing early diagnosis and timely treatment, and possible failures in screening programs. These data reinforce the need for more effective strategies for prevention, early detection, and comprehensive care for

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women, especially in regions with higher rates.

The findings revealed that in municipalities where the main cancer diagnosis and treatment services are concentrated, this may indicate both greater detection of the disease and the registration of deaths of patients from other locations [14].

Thus, these findings show that central municipalities with greater socioeconomic segregation tend to have higher breast cancer mortality rates, and that healthcare and access to health services policies are needed in areas that are more vulnerable to this problem [15].

The age group was proportionally related to the number of deaths, as in the studies by Silva *et al*. (2021), which found that between 1990 and 2011, women of all age groups (20–39; 40–49; 50–69; ≥ 70) showed an increase in mortality, with a more pronounced increase in the 50–69 age group, and Oliveira *et al*. [16]on overall survival from breast cancer. However, in the study by Pecinato, Jacobo, and Silva [13], there was a downward trend in these age groups. These data reinforce that, although breast cancer can affect women at different stages of life, it affects those of advanced working age and the elderly more significantly, highlighting the importance of screening and early diagnosis strategies from the age of 40, as recommended in public health guidelines.

Regarding ethnic and racial issues, studies have pointed to a strong relationship with the following issues: an increase in rates over time [17] and an increased risk of death for black women compared to white women [10] . This predominance among brown women reflects, in part, the demographic profile of the population of Piauí, but may also be related to inequalities in access to health services, diagnosis, and timely treatment. The color/race variable, therefore, constitutes an important social marker and should be considered in the formulation of public policies aimed at equity in the fight against breast cancer .

In this study, educational attainment was inversely proportional to the number of deaths from breast cancer. However, in a study conducted in southern Brazil, breast cancer mortality was consistently higher among women with ≤7 years of schooling, with almost eight times more deaths than those with ≥8 years of schooling [13]. Educational attainment, therefore, is a social determinant of health and should be considered in the formulation of public policies aimed at equity in the fight against breast cancer and lower educational levels, which may reflect inequalities in access to information, prevention, early diagnosis, and adequate treatment.

Marital status has been shown to be a significant epidemiological variable associated with breast cancer mortality and survival in previous studies [16]. In this study, however, the predominance of deaths was among married women, which may be associated with age group or health care issues. These data reinforce the importance of considering marital status as a relevant social variable in the analysis of determinants of breast cancer mortality.

The use of secondary data, although widely adopted due to its accessibility and comprehensiveness, has important limitations, especially with regard to the quality and completeness of information. Studies indicate that systems such as SIM are subject to underreporting and inconsistencies in records, which can compromise the accuracy of results.

In the context of Piauí, these limitations are aggravated by regional inequalities in access to health services, especially reflected in socioeconomic indicators in health [20]. COVID-19 has intensified these problems: there has been a significant drop in the number of tests and consultations during the pandemic, reinforcing barriers to the early diagnosis of diseases such as breast cancer [20] . Such structural factors increase the risk of underreporting of cases and poorer health outcomes. Another limitation is related to the study design, since the data analyzed are aggregated by populations, all inferences made are at the ecological level, with no direct inference at the individual level, under penalty of incurring ecological fallacy[(14).

Finally, the exclusive use of SIM data may involve underreporting, errors in classifying the underlying cause, and incomplete sociodemographic variables, limiting the accuracy of analyses and preventing causal inferences[21]. Nevertheless, the system is an essential source for monitoring mortality in Brazil. Thus, we sought to filter and organize the data ly for more robust and accurate analyses.

CONCLUSION

This study identified significant inequalities in mortality from malignant breast neoplasms in the state of Piauí between 2010 and 2023. A growing trend in mortality rates was observed throughout the period, with peaks in 2017 and 2021. The spatial distribution revealed a higher concentration of deaths in the main cities, especially Teresina, Parnaíba, and Picos, highlighting inequalities in access to diagnosis and treatment. The profile of women who died showed a predominance of those aged between 50 and 64, brown-skinned, with low levels of education, and mostly married.

These findings reinforce the importance of public policies for early screening and equitable access to health services, especially in more vulnerable regions. Knowledge of the epidemiological profile and spatial-temporal distribution of mortality from breast cancer is essential for planning more effective breast cancer control actions in the state.

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