Epidemiological profile and trend in prostate cancer mortality in Brazil and its regions from 2012 to 2021

Perfil epidemiológico e tendência da mortalidade por câncer de próstata no Brasil e suas regiões de 2012 a 2021

Perfil epidemiológico y tendencia de la mortalidad por cáncer de próstata em Brasil y sus regiones de 2012 a 2021

RESUMO

Objetivo: analisar a tendência temporal da mortalidade por câncer de próstata no país e macrorregiões no período de 2012 a 2021. Métodos: O presente estudo consiste em um estudo ecológico, descritivo e exploratório do câncer de próstata no Brasil de 2012 a 2021. Foram calculadas as taxas padronizadas de mortalidade (TPM). A tendência temporal foi estipulada pela regressão de Prais-Winsten. Resultados: As maiores médias da TPM no Brasil foram para a região Centro-Oeste com 61,70 óbitos por 100 mil homens (desvio padrão - DP=4,25), seguida do Nordeste com 60,71 óbitos/100mil (DP=1,77). A região Centro-Oeste apresentou uma variação percentual anual (VPA) entre 55-59 anos de -5,07% (intervalo de confiança de 95% - IC95% = -8,44; -1,57), enquanto no Nordeste foi de -1,75% (IC95% = -2,43; -1,05). A raça indígena no Brasil obteve VPA de 5,58% (IC95% = 1,35; 10,03). Conclusão: A tendência temporal do Centro-Oeste e Nordeste entre 55-59 anos foi de diminuição no Brasil, enquanto a mortalidade na cor indígena no padrão Brasil houve crescimento.

DESCRITORES: Câncer de próstata; Mortalidade; Fatores de risco; Perfil de saúde; Perfil epidemiológico dos grupos étnicos.

ABSTRACT

Objective: To analyze the temporal trend of prostate cancer mortality in the country and macro-regions from 2012 to 2021. Methods: This is an ecological, descriptive and exploratory study of prostate cancer in Brazil from 2012 to 2021. Standardized mortality rates (SMR) were calculated. The time trend was stipulated by Prais-Winsten regression. Results: The highest PMR averages in Brazil were for the Midwest region with 61.70 deaths per 100,000 men (standard deviation - SD=4.25), followed by the Northeast with 60.71 deaths/100,000 (SD=1.77). The Midwest region had an annual percentage change (APC) between 55-59 years of -5.07% (95% confidence interval - 95%CI = -8.44; -1.57), while in the Northeast it was -1.75% (95%CI = -2.43; -1.05). The indigenous race in Brazil had a PAV of 5.58% (95%CI = 1.35; 10.03). Conclusion: The temporal trend in the Midwest and Northeast between 55-59 years of age was downward in Brazil, while mortality in the indigenous race in Brazil pattern was upward.

DESCRIPTORS: Prostate cancer; Mortality; Risk factors; Health profile; Epidemiological profile of ethnic groups.

RESUMEN

Objetivo: Analizar la tendencia temporal de la mortalidad por cáncer de próstata en el país y macrorregiones de 2012 a 2021. Métodos: Se trata de un estudio ecológico, descriptivo y exploratorio del cáncer de próstata en Brasil de 2012 a 2021. Se calcularon las tasas estandarizadas de mortalidad (TME). La tendencia temporal fue estipulada por regresión de Prais-Winsten. Resultados: Los promedios más altos de TMP en Brasil fueron para la región Centro-Oeste con 61,70 muertes por 100.000 hombres (desviación estándar - DE=4,25), seguida por el Nordeste con 60,71 muertes/100.000 (DE=1,77). La región Centro-Oeste presentó un cambio porcentual anual (CPA) entre 55-59 años de -5,07% (intervalo de confianza del 95% - IC 95% = -8,44; -1,57), mientras que en el Nordeste fue de -1,75% (IC 95% = -2,43; -1,05). La raza indígena en Brasil tuvo un PAV de 5,58% (IC 95% = 1,35; 10,03). Conclusión: La tendencia temporal en el Medio Oeste y Nordeste entre 55-59 años de edad fue descendente en Brasil, mientras que el patrón de mortalidad en la raza indígena en Brasil fue ascendente.

DESCRIPTORES: Cáncer de próstata; Mortalidad; Factores de riesgo; Perfil de salud; Perfil epidemiológico de grupos étnicos.

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INTRODUCTION

According to the National Cancer Institute (INCA - Instituto Nacional de Câncer), in 2020, it was found that the cancers with the highest incidence in men are lung and prostate cancer, with lung cancer being predominant in the world population. Both, unlike some other types, are independent of the country's Human Development Index. Prostate cancer in the period from 2020 to 2022 presented an average of 65 thousand new cases, with an incidence rate of 62.95 cases per 100 thousand men. This cancer ranks first in incidence in all Brazilian regions, excluding non-melanoma skin cancer.[1]

Prostate cancer has a higher incidence in men between the ages of 45 and 60 and early diagnosis can help with a better prognosis. Therefore, it is important to carry out periodic clinical examination, due to its low symptoms in the early stages, manifesting as difficulty urinating and increased nocturnal urinary frequency, symptoms similar to those of benign prostratic hyperplasia.[2] Performing a digital rectal examination, tests such as prostate specific antigen detected in the blood (PSA), imaging tests and, when suspected, a biopsy are tools to confirm the diagnosis of this cancer, allowing its treatment. It is a slowly evolving neoplasm, and the indolent factor is related to its relative low mortality when compared to its high incidence. [3]

Mortality caused by prostate cancer mostly affects people over 55 years of age, and is even more lethal in those over 75 years of age.[4] Reducing the mortality of prostate cancer patients depends on an early diagnosis that can optimize curative treatment. In order to identify areas with a higher mortality rate for directing public policies in Brazil, the objective was to analyze the temporal trend in prostate cancer mortality in the country and macro-regions in the period from 2012 to 2021.

METHODS

Quantitative, exploratory and descriptive ecological time series study. We used open and public data on deaths from malignant neoplasm of the prostate in Brazil from 2012 to 2021, in men aged 45 and over.

Data were extracted from the Mortality Information System regarding the underlying cause of death in code C61. The information is made available by the IT Department of the Unified Health System (Datasus) and was accessed in December 2023 via Tabnet. The results were presented until 2021, due to the unavailability of more recent data on the study survey date.

The selected variables were: Brazilian macro-region of residence (North, Northeast, South, Southeast and Central-West), age group every 5 years (45 to 80 years and over), year of death (2012-2021), race/ color (white, black, brown, yellow, indigenous). It is included from 45 years of age, justified by the orientation of the investigation of malignant prostate neoplasia being indicated in black people or risk groups from this age group. [5]

The descriptive analysis was carried out using absolute and relative frequency (%). Crude prostate cancer mortality rates were calculated according to year, location and group (age group and race/color). The formula used was:

$$\frac{o_i}{p_i} \times 100\,mil$$

Where: di – deaths from prostate cancer in males, in a specific age group or race/color in a given location and period; and pi male resident population in the same age group or race/color, location and period. Population estimates by age group, location and period were extracted from intercensal projections from the Brazilian Institute of Geography and Statistics (IBGE) 2018 edition 6, accessed through Tabnet.

Considering that the IBGE does not provide intercensal estimates of the resident population according to race/color, it was decided to estimate the populations in the years studied using the geometric interpolation technique. The 2000 and 2010 census populations were considered to interpolate the population for the years 2001 to 2009 and extrapolate to 2011 to 2021. The formula for interpolation followed:

$$\frac{Y - C}{X - A} = \frac{D - C}{B - A}$$

$$Y = \frac{(D - C)}{(B - A)} \times (X - A) + C$$

Where: Y – refers to the estimate of the population to be interpolated; X – refers to the year of the population to be interpolated; C – the population estimate in the year 2000; D – the population estimate in 2010; A – the year 2000; B – the year 2010.

In order to eliminate age differences when comparing crude mortality rates by Brazilian macro-regions, general rates were standardized. The methods described by Naing 7 were followed. The direct method was adopted, with the standard world population estimated by the WHO (2000-2025). [8]

The standardization of mortality rates follows the following steps:

1) Calculation of specific rates by age group every 5 years
2) Calculation of expected deaths, given by multiplying the specific rates by the specific standard population by age group
3) Sum of total expected deaths
4) Calculation of the general standardized rate given by dividing the total expected deaths by the total standard population

The standardized rates were compared only between macro-regions, while the coefficients by age group and race/color were used in their raw form.

The temporal trend was estimated using Prais-Winsten regression. Time (year of death) was considered an independent variable and crude and standardized mortality rates from prostate cancer were considered a dependent variable. All indicators were transformed into base 10 logarithms to: (1) reduce the heterogeneity of residual variance; (2) correct possible deviations from normality; (3) allow the calculation of the annual percentage variation (APV).[9]

Based on the regression results, the APV and its respective 95% confidence interval (95% CI) were estimated using the formulas.[9]

$$Percent\ variation = [-1 + 10^{b1}] \times 100\%$$
$$IC95\%_{lower} = [-1 + 10^{lower\ CI\ of\ b1}] \times 100\%$$
$$IC95\%_{upper} = [-1 + 10^{upper\ CI\ of\ b1}] \times 100\%$$

This parameter is used to describe and quantify the trend. Negative results indicate a decrease in indicators over the years analyzed, positive results indicate an increase, when there is no statistical significance (p>0.05), this is a stationary trend.[9]

The Prais-Winsten technique aims to correct the serial autocorrelation of regression models. Considering the nature of the data, the correction is not always satisfactory, therefore, this research chose to report and analyze the corrected Durbin-Watson indicator. Therefore, for this study values of 1.5 and 2.5 were considered reliable.[9]

Descriptive rate calculations were performed in Microsoft Excel 365. Stata 17 was used for temporal trend analysis. The significance level adopted was 5% (p<0.05).

Appraisal by the Research Ethics Committee was waived because it was a study with secondary data and publicly accessible.

RESULTS

In Brazil, 149,350 deaths from prostate cancer were identified in the period from 2012 to 2021. In this scenario, the macro-region with the highest mortality was the Southeast with 42% of total deaths. The southern region occupied third place with a percentage of deaths equal to 17%. The lowest proportions of deaths were observed in the North, with 5.6% of deaths (Table 1).

Regarding the standardized mortality rate, the highest averages observed in the period from 2012 to 2021 were in the Central-West, with 61.70 deaths per 100 thousand men (SD=4.25), followed by the Northeast with 60.71 deaths/ 100 thousand (SD=1.77), South with 59.68 deaths per 100 thousand (SD=4.83), North with 56.05 deaths/100 thousand

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Table 1 – Absolute and relative distribution of sociodemographic variables of prostate cancer deaths among men in Brazil, 2012-2021

CHARACTERISTICS	N	%
Age group		
45 to 49 years old	592	0,4
50 to 54 years old	1.693	1,1
55 to 59 years old	4.542	3,0
60 to 64 years old	9.633	6,4
65 to 69 years old	16.166	10,8
70 to 74 years old	22.969	15,4
75 to 79 years old	28.167	18,9
80 years old and older	65.588	43,9
Race/color		
White	76.232	51,0
Black	15.217	10,2
Yellow	955	0,6
Brown	51.473	34,5
Indigenous	243	0,2
Ignored	5.230	3,5
Macroregion		
North	8.385	5,6
Northeast	41.526	27,8
Southeast	63.333	42,4
South	25.422	17,0
Midwest	10.684	7,2

Source: Survey data, 2023

Table 2 – Distribution of crude and standardized mortality rates from prostate cancer per 100,000 men according to macro-region of the country, 2012-2021

RATE	MACROREGION					
	NORTH	NORTHEAST	SOUTHEAST	SOUTH	MIDWEST	BRAZIL
Gross						
2012	42,96	57,04	50,69	55,37	50,55	52,52
2013	43,60	58,50	49,07	57,54	52,76	52,69
2014	46,93	58,52	48,31	57,04	55,48	52,66
2015	48,38	60,21	48,42	54,07	51,30	52,43
2016	43,11	60,05	49,67	53,38	53,28	52,64
2017	47,59	61,29	49,14	53,89	51,74	52,96
2018	44,60	59,98	48,89	54,69	49,72	52,30
2019	43,37	60,25	49,15	54,09	50,18	52,33
2020	41,40	59,84	46,27	53,53	48,51	50,57
2021	41,60	57,17	47,30	55,79	48,30	50,74
Standardized						
2012	54,06	57,73	46,47	65,74	63,13	58,93
2013	55,18	59,65	44,37	67,13	65,71	58,72
2014	59,52	60,09	43,08	65,32	68,64	58,28
2015	61,38	62,06	42,58	60,64	63,16	57,51
2016	54,45	61,98	42,93	58,68	64,87	57,08
2017	60,50	63,15	41,77	57,90	62,10	56,70
2018	56,33	61,64	40,90	57,32	58,99	55,30
2019	54,61	61,66	40,37	55,58	58,65	54,56
2020	52,26	61,01	37,33	53,74	56,41	52,04
2021	52,24	58,15	37,60	54,80	55,41	51,60

Source: Survey data, 2023

(SD= 3.30), Southeast with 41.74 deaths /100 thousand (SD=2.83). The national average of 56.07 deaths/100 thousand (SD=2.63) between 2012 and 2021 was surpassed in every year only by the Northeast region and, in second place, the Central-West region during the years 2012 to 2020. The Southeast region had the lowest annual mortality rates when compared to the national average (Table 2).

Regarding the trend, the Northeast region had a reduction in mortality of 1.75% per year among the age group from 55 to 59 years old, behind only the South and Central-West regions with a reduction of 2.8% and 5% per year, respectively. In the Southeast, the age group from 45 to 49 years old had the biggest reduction in the region, with 3.39% per year, while the Central-West presented the biggest decrease in mortality of 5.07% per year among 55-59 years old. The temporal trend for the North region remained stationary in all age groups analyzed (Table 3).

Table 3 – Temporal trend of mortality rates per 100 thousand men by age group in Brazilian macro-regions, 2012-2021

VARIABLES	APV (%)	CI 95%		*P-VALUE*	CORRECTED D-W	INTERPRETATION
		LOWER	UPPER			
North						
45 to 49 y/o	-5,90	-15,12	4,35	0,212	2,047	Stationary
50 to 54 y/o	-3,46	-19,57	15,88	0,668	1,582	Stationary
55 to 59 y/o	-1,75	-3,75	0,30	0,084	2,071	Stationary
60 to 64 y/o	-2,21	-5,88	1,59	0,213	1,990	Stationary
65 to 69 y/o	0,80	-1,39	3,04	0,427	1,628	Stationary
70 to 74 y/o	-1,07	-2,15	0,03	0,054	2,600	Stationary
75 to 79 y/o	-0,51	-1,39	0,37	0,215	1,578	Stationary
80 y/o and older	-0,78	-2,95	1,44	0,437	1,743	Stationary
General (SMR)	-0,74	-2,27	0,81	0,299	1,772	Stationary
Northeast						
45 to 49 y/o	1,55	-6,29	10,05	0,670	1,896	Stationary
50 to 54 y/o	-1,79	-4,83	1,36	0,223	1,880	Stationary
55 to 59 y/o	-1,75	-2,43	-1,05	<0,001	1,869	Decrease
60 to 64 y/o	-0,20	-0,97	0,58	0,576	1,398	Stationary
65 to 69 y/o	-0,47	-2,64	1,75	0,637	1,467	Stationary
70 to 74 y/o	-0,28	-1,68	1,15	0,667	1,580	Stationary
75 to 79 y/o	0,16	-0,88	1,20	0,737	1,921	Stationary
80 y/o and older	0,71	-0,40	1,84	0,178	1,478	Stationary
General (SMR)	0,13	-1,08	1,35	0,813	1,412	Stationary
Southeast						
45 to 49 y/o	-3,39	-5,35	-1,40	0,005	2,047	Stationary
50 to 54 y/o	-2,14	-3,73	-0,53	0,016	1,819	Stationary

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55 to 59 y/o	-0,32	-0,98	0,34	0,297	2,254	Decrease
60 to 64 y/o	-1,14	-2,32	0,08	0,063	1,949	Stationary
65 to 69 y/o	-1,35	-3,17	0,50	0,130	1,900	Stationary
70 to 74 y/o	-2,48	-3,68	-1,24	0,002	1,896	Stationary
75 to 79 y/o	-2,32	-3,46	-1,17	0,002	1,968	Stationary
80 y/o and older	-2,41	-2,77	-2,06	<0,001	1,578	Stationary
General (SMR)	-2,16	-2,70	-1,62	<0,001	1,925	Stationary
South						
45 to 49 y/o	1,27	-6,78	10,03	0,734	1,785	Stationary
50 to 54 y/o	-3,35	-7,02	0,45	0,076	1,956	Stationary
55 to 59 y/o	-2,81	-3,68	-1,94	<0,001	1,866	Decrease
60 to 64 y/o	-0,77	-1,60	0,07	0,068	2,215	Stationary
65 to 69 y/o	-1,97	-3,37	-0,54	0,013	2,007	Decrease
70 to 74 y/o	-2,84	-3,53	-2,15	<0,001	2,479	Decrease
75 to 79 y/o	-2,88	-4,81	-0,94	0,009	1,876	Decrease
80 y/o and older	-2,57	-3,06	-2,06	<0,001	2,009	Decrease
General (SMR)	-2,46	-3,11	-1,79	<0,001	1,621	Decrease
Midwest						
45 to 49 y/o	2,12	-8,27	13,68	0,664	2,270	Stationary
50 to 54 y/o	-4,19	-9,80	1,77	0,141	1,554	Stationary
55 to 59 y/o	-5,07	-8,44	-1,57	0,011	2,108	Decrease
60 to 64 y/o	-1,56	-5,09	2,12	0,353	2,046	Stationary
65 to 69 y/o	-2,50	-4,54	-0,43	0,024	2,255	Decrease
70 to 74 y/o	-3,17	-5,68	-0,58	0,023	1,829	Decrease
75 to 79 y/o	-1,26	-1,88	-0,64	0,002	1,931	Decrease
80 y/o and older	-1,70	-3,04	-0,35	0,020	1,505	Decrease
General (SMR)	-1,95	-2,88	-1,02	0,001	1,582	Decrease
Brazil						
45 to 49 y/o	-1,05	-3,93	1,91	0,432	1,838	Stationary
50 to 54 y/o	-2,52	-3,77	-1,26	0,002	1,883	Decrease
55 to 59 y/o	-1,49	-1,88	-1,11	<0,001	2,217	Decrease
60 to 64 y/o	-1,07	-2,27	0,15	0,077	1,755	Stationary
65 to 69 y/o	-1,17	-2,39	0,07	0,061	1,728	Stationary
70 to 74 y/o	-1,86	-2,93	-0,78	0,004	1,763	Decrease
75 to 79 y/o	-1,62	-2,21	-1,03	<0,001	2,162	Decrease
80 y/o and older	-1,44	-1,79	-1,10	<0,001	1,443	Decrease
General (SMR)	-1,48	-1,98	-0,98	<0,001	1,778	Decrease

Source: Survey data, 2023
Note: APV = Annual Percentage Variation; 95%CI upper and lower = upper and lower 95% confidence interval; D-W = Durbin-Watson; SMR = Standardized Mortality Rate per 100 thousand men

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The color black was highlighted in crude mortality rates in the Central-West region compared to other races/color. It was observed that the South and Central-West regions exceeded the total mortality rate in Brazil in the black race/color, while in the Northeast and Southeast the white race stood out and the yellow race had the lowest rates. The south had the highest mortality rates in the indigenous population (Table 4).

Table 4 – Distribution of crude mortality rates per 100,000 men according to race/color, macro-region and year of death, Brazil, 2012-2021

CHARACTERISTICS	YEAR OF DEATH										
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	TOTAL
North											
White	7,82	8,06	8,10	8,20	8,38	8,53	8,75	8,94	8,71	9,05	8,45
Black	8,31	8,53	8,27	8,66	8,61	9,25	9,58	9,42	9,73	9,75	9,05
Yellow	4,00	3,51	3,22	2,99	3,23	3,58	2,96	3,14	2,70	3,07	3,21
Brown	4,80	4,88	5,28	5,34	5,55	5,83	5,62	5,82	5,67	5,69	5,46
Indigenous	2,15	2,48	2,45	2,54	2,06	2,49	2,69	2,89	4,95	2,83	2,77
Northeast											
White	4,86	5,56	5,12	5,32	4,51	5,25	5,43	4,86	4,71	5,37	5,10
Black	4,50	4,86	4,45	4,96	4,49	5,73	5,34	4,90	5,68	5,32	5,05
Yellow	3,88	0,45	0,85	0,80	0,38	0,71	1,02	1,29	1,54	1,48	1,21
Brown	3,86	3,93	4,64	4,82	4,58	5,02	4,74	4,75	4,48	4,63	4,56
Indigenous	2,16	1,20	2,34	1,71	1,67	1,62	1,59	2,58	4,54	1,72	2,14
Southeast											
White	6,52	6,66	6,73	7,22	7,02	7,67	7,62	7,77	7,68	7,61	7,25
Black	6,51	7,22	6,62	6,81	6,79	7,62	7,32	7,36	7,78	7,92	7,22
Yellow	2,28	1,87	1,63	1,42	1,55	1,17	1,39	0,97	1,34	1,76	1,50
Brown	5,96	6,20	6,70	6,86	7,22	7,27	7,24	7,55	7,56	7,27	7,00
Indigenous	1,38	2,71	3,11	3,93	3,01	4,65	3,74	2,04	5,63	2,77	3,32
South											
White	8,10	8,13	8,10	8,35	8,67	8,69	8,85	9,22	8,92	9,17	8,62
Black	9,73	9,48	9,28	10,32	10,58	10,85	11,93	11,40	11,29	11,82	10,72
Yellow	5,81	5,59	5,29	4,83	5,37	6,30	5,52	5,75	4,11	4,36	5,26
Brown	4,12	4,00	4,20	4,20	4,50	4,88	4,69	4,85	4,49	4,77	4,49
Indigenous	4,48	6,00	5,17	4,20	3,06	5,05	7,49	8,44	9,66	8,47	5,77
Midwest											
White	8,91	9,41	9,60	9,29	9,45	9,56	9,99	9,97	9,85	10,64	9,67
Black	11,72	12,26	12,53	12,03	9,93	12,38	11,57	12,97	14,17	11,94	12,16
Yellow	3,47	5,24	3,21	2,21	4,69	4,54	1,99	3,48	6,37	6,54	4,24
Brown	3,34	3,37	3,47	3,34	3,13	4,01	3,75	4,02	4,33	4,28	3,73
Indigenous	4,09	1,38	2,80	4,26	0,00	0,00	2,96	4,51	1,52	9,28	3,05
Brazil											

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White	7,08	7,79	7,97	7,52	8,23	7,83	8,47	8,67	8,22	8,35	8,01
Black	8,86	9,20	9,98	8,20	8,62	8,26	9,13	9,01	10,03	9,15	9,05
Yellow	2,49	1,55	2,19	3,45	1,96	3,10	1,18	2,25	0,54	1,81	2,00
Brown	4,89	5,18	5,88	5,68	5,98	6,24	5,38	5,53	5,60	5,75	5,62
Indigenous	0,74	3,62	0,00	0,70	2,05	1,35	1,98	2,60	5,11	1,89	2,04

Source: Survey data, 2023

The South region showed the highest growth in brown mortality of 3.3% per year, followed by a 1.33% increase in white deaths. In the Central-West, the yellow population showed a significant reduction of 8.44% per year. Among all macro-regions, the Northeast was the one with the lowest growth in black mortality at 1.88% per year, while regions such as the North grew 2.25% per year. With regard to indigenous race/color, the trend was Stationary in all macro-regions, however, when observing the Brazilian pattern there is a growth of 5.58% per year. Furthermore, the annual decrease in occurrences classified as ignored in the Northeast, Southeast and Brazil stands out. In the last two years analyzed, the Northeast region showed an increase in mortality rates in brown, white and black populations respectively (Table 5).

Table 5 – Temporal trend of mortality rates per 100 thousand men by race/color in Brazilian macro-regions, 2012-2021

VARIABLES	APV (%)	CI 95%		*P-VALUE*	CORRECTED D-W	INTERPRETATION
		LOWER	UPPER			
North						
White	-0,46	-1,72	0,80	0,421	2,265	Stationary
Black	2,25	1,14	3,37	0,002	2,369	Increase
Yellow	2,61	-13,36	21,56	0,734	1,412	Stationary
Brown	1,79	-0,65	4,30	0,130	1,713	Stationary
Indigenous	5,95	-1,09	13,50	0,089	1,960	Stationary
Ignored	-4,13	-12,08	4,52	0,293	2,118	Stationary
Northeast						
White	2,05	1,28	2,83	<0,001	1,732	Increase
Black	1,88	1,09	2,66	<0,001	2,147	Increase
Yellow	-4,46	-9,80	1,21	0,106	1,506	Stationary
Brown	2,32	0,79	3,85	0,008	1,220	Increase
Indigenous	5,61	-1,75	13,53	0,120	1,668	Stationary
Ignored	-8,10	-8,86	-7,34	<0,001	3,089	Decrease
Southeast						
White	1,59	1,20	1,99	<0,001	1,970	Increase
Black	2,71	1,56	3,85	<0,001	1,837	Increase
Yellow	-2,41	-5,85	1,16	0,156	1,908	Stationary
Brown	1,95	0,67	3,25	0,008	1,979	Increase
Indigenous	8,14	-1,68	18,96	0,095	1,417	Stationary
Ignored	-11,83	-15,47	-8,04	<0,001	1,801	Decrease
South						
White	1,33	0,84	1,82	<0,001	1,961	Increase
Black	0,92	-1,24	3,13	0,358	1,994	Stationary
Yellow	4,52	-6,14	16,39	0,371	1,862	Stationary
Brown	3,30	1,74	4,91	0,001	1,955	Increase
Indigenous	4,95	-1,37	11,69	0,106	2,671	Stationary
Ignored	-2,48	-5,07	0,17	0,063	1,811	Stationary
Midwest						
White	1,53	0,78	2,28	0,002	1,914	Increase
Black	0,40	-1,38	2,22	0,617	1,999	Stationary
Yellow	-8,44	-15,72	-0,55	0,039	1,731	Decrease
Brown	1,16	-0,98	3,35	0,248	1,712	Stationary
Indigenous	11,33	-0,05	23,99	0,051	1,316	Stationary
Ignored	-5,88	-11,45	0,03	0,051	1,784	Stationary
Brazil						
White	1,56	1,29	1,83	<0,001	2,043	Increase
Black	2,08	1,50	2,66	<0,001	1,943	Increase
Yellow	-2,52	-4,32	-0,69	0,013	1,811	Decrease
Brown	1,97	0,70	3,25	0,007	1,822	Increase
Indigenous	5,58	1,35	10,03	0,016	1,980	Increase
Ignored	-8,74	-10,77	-6,67	<0,001	1,825	Decrease

Source: Survey data, 2023

DISCUSSION

The mortality and prevalence of prostate cancer varies according to each region of the planet. 10 A slow and progressive increase in mortality from this condition was observed in South American countries,

where Brazil and Mexico had the lowest mortality, with 12-13 deaths per 100 thousand inhabitants during the year 2000, compared to the whole of South America where it had 50.2 deaths/100 thousand inhabitants in the year 2008 with an increase to 59.2 cases in 2020. [11]

In the present study, there was a decrease in the mortality rate by age group in Brazil, possibly justified by the increase in incentives and public policies aimed at prevention and diagnosis, as well as, for the beginning of early investigation through physical examination of the prostate from the age of 45 in the black population, and 55 years in the others.5 It is known that the incidence and prevalence of prostate cancer worldwide increases over the years in the male population. The presence of prostate cancer under the age of 40 is predominantly rare. 10 However, due to regional inequalities and heterogeneous socioeconomic profiles, rates by race/color still remain high despite showing a significant reduction in all regions of Brazil.

It was observed that, among the country's macro-regions, the Central-West led with the highest death rates in the black population, while in the age range of 55 to 59 years it was favorable, showing a significant decrease. This same reduction occurred in an age group of intense screening for populations that do not present risks.[11] The various barriers and difficulties in accessing diagnosis and treatment, with the main factor being the deficiency of the health care system in this location, contributed to the increase in the mortality rate in the last decade analyzed.[11] This can be justified by the territoriality and socioeconomic profile of the region.[12]

In the period analyzed, the color

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Lucas G. Dantas, Ana H.P.S. Campos, Yvnna S. Lima, Júlia S.A. Barretto, José M. S. Neto, Vitor A.L. Pionorio, Jefferson F.C. Batista, Sonia O. Lima
Epidemiological profile and trend in prostate cancer mortality in Brazil and its regions from 2012 to 2021

black stood out with higher mortality rates, mainly in the Central-West region of the country. The population of men of African descent has in their genetic code the most common variants of chromosomal area 8q24, which have been shown to be related to an increased probability of developing prostate cancer.[13,14] Furthermore, the black male population also has a tendency to develop the most serious and aggressive forms of the disease that can be associated with genetic issues.[10] Although the evidence relating to increasing physical activity and reducing prostate cancer is limited, being an active practitioner of exercises at any time of life that promotes some type of body movement has been shown to be beneficial among all ethnic groups. It was evidenced that, after bariatric surgery, due to weight reduction and changes in the patients' lifestyle, there was a reduction in the risk of various types of cancer, including prostate cancer.[15] The lack of screening, accurate diagnoses and efficient treatments involves not only the unpreparedness of professionals and the public health system, but also the approach to various factorial comorbidities that favor the development of this condition.

The increase in mortality in indigenous people due to prostate cancer in Brazil, as a whole, was greater when compared to the other races/color studied. It is important to understand that not only race should be considered as a preponderant risk factor or as the only one with clinical relevance.[16] In this sense, it is of fundamental importance that there is a more detailed and careful investigation regarding the use of the word race when trying to attribute it to a certain risk factor or genetic heritability. This increase in overall Brazilian mortality among indigenous people is possibly explained by the difficulty in accessing health care that certain populations have, which, due to the location where they live, the arrival of the public health system becomes deficient.

The Northeast region showed a significant increase in mortality rates in the years 2020 to 2021 in brown, white and black populations. These data agree with research where during the new coronavirus pandemic there was an increase in prostate cancer mortality in this region. What may have been related to the state of quarantine decreed and the installation of protocols aimed at the safety of the population, going to medical appointments became more difficult, and consequently neglecting the treatment of prostate cancer.[12] In this sense, as the disease progresses, the therapeutic prognosis becomes guarded and overall survival decreases, thus favoring an increase in high mortality rates. [17]

Cancers evolve slowly over the years, where in many cases, even if present histologically, the symptoms and clinical manifestations become non-specific or absent.[18] Due to the dynamic population evident in Brazil, the accuracy of the underlying cause of death is hampered by the set of previous comorbidities that may or may not be linked to prostate cancer.[11] Therefore, the need to prioritize public and collective human health actions in each region of the country, respecting their territorial and socioeconomic differences, especially in regions where access to the location is extremely difficult, becomes evident. It is of utmost importance to pay attention to early diagnostic and therapeutic measures, the more active search for men who have heritability risk factors, obesity, sedentary lifestyle, age group and race/color, the formulation and dissemination of more assertive information about prostate exams and the training of professionals who are in direct contact with this male population, aiming to reduce mortality rates in higher and lower risk groups and in regions that previously did not have significant increases in their rates.

This research has the limitation of the quality of the data used which, as they are secondary, can suffer from underreporting, especially due to inadequate or incorrect completion of the death certificate, which can lead to erroneous classifications that prevent the verification of the real scenario in the country. However, the study is relevant due to its national representation and because it considers aspects such as age group and race/color in the design, which, as demonstrated, can present different temporal patterns. Therefore, this research can contribute to better targeting of health policies. It is suggested that screening actions be intensified, especially in macro-regions and less favored groups.

CONCLUSION

In the present study, considerable mortality rates from prostate cancer were observed in Brazil during the period studied. The Center-West and Northeast regions of the country had higher standardized mortality rates than other macro-regions. The color black was highlighted in crude mortality rates in the Central-West region compared to other races/color. Furthermore, it was observed that the South and Central-West regions exceeded Brazil's total rate in black race/color. Regarding the temporal trend, in general, there is a reduction in rates, especially in the Southeast, Northeast and Central-West regions. There is an annual increase in mortality among black, brown and white people, while those of yellow race and ignored classifications show a reduction.

REFERENCES

1. Instituto Nacional do Câncer. Incidência de câncer no Brasil, https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/estimativa2020. pdf. (2024, accessed 1 April 2024).

2. Rawla P. Epidemiology of Prostate Cancer. World J Oncol 2019; 10: 63–89.

3. Sekhoacha M, Riet K, Motloung P, Gumenku L, Adegoke A, Mashele S. Prostate Cancer Review: Genetics, Diagnosis, Treatment Options, and Alternative Approaches. Mol Basel Switz 2022; 27: 5730.

4. World Health Organization. Prostate cancer, https://platform.who.int/mortality/themes/theme- details/topics/indicator-groups/indicator-group-details/MDB/prostate-cancer (2024, accessed 1 April 2024).

5. Brasil. Câncer de próstata, https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a- z/c/cancer-deprostata#:~:text=Hist%C3%B3rico%20de%20c%C3%A2ncer%20na%20fam%C3%ADlia (2024, accessed 1 April 2024).

6. Instituto Brasileiro de Geografia e Estatística. Projeção da população do Brasil e das Unidades da Federação. IBGE, https://www.ibge.gov.br/apps/populacao/projecao/index.html (2021, accessed 18 October 2021).

7. Naing NN. Easy Way to Learn Standardization : Direct and Indirect Methods. Malays J Med Sci MJMS 2000; 7: 10–15.

8. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJ, Lozano R, Inoue M. Age Standardization of Rates: A new WHO Standard.

9. Antunes JLF, Cardoso MRA. Uso da análise de séries temporais em estudos epidemiológicos. Epidemiol E Serviços Saúde 2015; 24: 565–576.

10. Ng KL. The Etiology of Prostate Cancer. In: Bott SR, Ng KL (eds) Prostate Cancer. Brisbane (AU): Exon Publications, http://www.ncbi.nlm.nih.gov/books/NBK571322/ (2021, accessed 1 April 2024).

11. Silva JFS da, Mattos IE, Aydos RD. Tendencies of mortality by prostate cancer in the states of the Central-West Region of Brazil, 1980 - 2011. Rev Bras Epidemiol 2014; 17: 395–406.

12. Costa YXA, Duarte TC, Silva-Barbosa CE da, Neto BHM da S, Sousa JBM de, Macedo G de S, Soares IM, Marchezini JL da C, Buna S dos SS, Martins KO, Andrade BC de M, Peixoto ELO, Leite LDF, Vieira SC, Oliveira MC de, Santos CCT. Diagnóstico de câncer de próstata em uma análise de incidência nos estados da Bahia e Rio Grande do Norte: houve influência do COVID-19? Res Soc Dev 2022; 11: e59711226285–e59711226285.

13. Okobia MN, Zmuda JM, Ferrell RE, Patrick AL, Bunker CH. Chromosome 8q24 variants are associated with prostate cancer risk in a high risk population of African ancestry. The Prostate 2011; 71: 1054–1063.

14. Freedman ML, Haiman CA, Patterson N, McDonald GJ, Tandon A, Waliszewska A, Penney K, Steen RG, Ardlie K, John EM, Oakley-Girvan I, Whittemore AS, Cooney KA, Ingles SA, Altshuler D, Henderson BE, Reich D. Admixture mapping identifies 8q24 as a prostate cancer risk locus in African-American men. Proc Natl Acad Sci U S A 2006; 103: 14068–14073.

15. Friedenreich CM, Ryder-Burbidge C, McNeil J. Physical activity, obesity and sedentary behavior in cancer etiology: epidemiologic evidence and biologic mechanisms. Mol Oncol 2021; 15: 790–800.

16. Chowdhury-Paulino IM, Ericsson C, Vince R, Spratt DE, George DJ, Mucci LA. Racial disparities in prostate cancer among black men: epidemiology and outcomes. Prostate Cancer Prostatic Dis 2022; 25: 397–402.

17. Braga SFM, Souza MC de, Oliveira RR de, Andrade EIG, Acurcio F de A, Cherchiglia ML. Patient survival and risk of death after prostate cancer treatment in the Brazilian Unified Health System. Rev Saúde Pública; 51. Epub ahead of print 15 May 2017. DOI: 10.1590/S1518-8787.2017051006766.

18. Silva GA e, Jardim BC, Ferreira V de M, Junger WL, Girianelli VR. Mortalidade por câncer nas capitais e no interior do Brasil: uma análise de quatro décadas. Rev Saúde Pública 2020; 54: 126–126

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