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Incidence trend of five main causes of cancer, in greater Cuiabá, Mato Grosso, Brazil, 2000 to 2016

Tendência da incidência dos cinco principais tipos de câncer na Grande Cuiabá, 2000 a 2016

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ABSTRACT: ***Objective***: To analyze the incidence trend of the five main causes of cancer, according to sex and age, in Greater Cuiabá, in the state of Mato Grosso, from 2000 to 2016. ***Methods***: Incidence information was obtained from the Population-Based Cancer Registry, referring to the municipalities Cuiabá and Várzea Grande (RCBP — Cuiabá). Crude incidence rates were calculated and the five main types of cancer were selected: for males, prostate (C61), lung (C33–34), colorectal (C18–21), stomach (C16) and oral cavity cancer (C00–10); and for females, breast (C50), cervix (C53), colorectal (C18–21), lung (C33–34) and thyroid gland cancer (C73). Age-adjusted rates were calculated by the direct method, using the world population as reference. Trends were estimated using the Joinpoint method and evaluated by Annual Percent Change (APC) and Average Annual Percent Change (AAPC). The Joinpoint Regression Program software, version 8.3.6.1, was used. ***Results***: During the period, there was a decreasing trend of lung (AAPC=-2.2; 95%CI -4.0—0.3) and stomach cancer (AAPC=-5.2; 95%CI -7.7—2.6) in men, and of cervix cancer (AAPC=-7.2; 95%CI -9.0—5.3) in women, and increasing for breast (AAPC=2.8; 95%CI 0.2–5.5) and thyroid cancer (AAPC=8.3; 95%CI 4.6–12.2). ***Conclusion***: In Greater Cuiabá, we found a downward incidence trend among elderly men for prostate, lung and stomach cancer. Women are affected at younger age groups, with an upward trend for breast cancer and downward trend for cervix cancer.

Keywords: Cancer. Incidence. Ecological studies. Time series studies.

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RESUMO: ***Objetivo***: Analisar a tendência da incidência das cinco principais causas de câncer, segundo sexo e faixa etária, na Grande Cuiabá, no estado de Mato Grosso, no período 2000 a 2016. ***Métodos***: As informações da incidência foram obtidas no Registro de Câncer de Base Populacional referente aos municípios Cuiabá e Várzea Grande. Foram calculadas as taxas de incidência brutas e selecionados os cinco principais tipos de câncer: para o sexo masculino foram próstata (C61), pulmão (C33–34), colorretal (C18–21), estômago (C16) e cavidade oral (C00–10) e para o sexo feminino foram mama (C50), colo do útero (C53), colorretal (C18–21), pulmão (C33–34) e glândula tireoide (C73). As taxas foram padronizadas pelo método direto, utilizando-se população mundial como referência. As tendências foram estimadas pelo método de regressão *joinpoint*, segundo sexo e faixa etária, e avaliadas por meio da variação percentual anual (*annual percent change* — APC) e da variação percentual média anual (*average annual percent change* — AAPC). Utilizou-se o *software* Joinpoint Regression Program, versão 8.3.6.1. ***Resultados***: No período, verificou-se tendência decrescente do câncer de pulmão (AAPC=-2,2; intervalo de confiança 95% [IC95%] -4,0–-0,3) e estômago (AAPC=-5,2; IC95% -7,7–-2,6), nos homens, e colo do útero (AAPC=-7,2; IC95% -9,0–-5,3), nas mulheres, e crescente para mama (AAPC=2,8; IC95% 0,2–5,5) e tireoide (AAPC=8,3; IC95% 4,6–12,2). ***Conclusão***: Na Grande Cuiabá, verificou-se tendência decrescente da incidência entre homens idosos para próstata, pulmão e estômago. Mulheres são acometidas em idades mais jovens, com tendência crescente para mama e decrescente para colo do útero.

Palavras-chave: Neoplasias. Incidência. Estudos ecológicos. Estudos de séries temporais.

INTRODUCTION

In 2020, more than 19 million new cases of cancer were estimated worldwide, excluding non-melanoma skin cancer. Of these, more than half of cases were among men (10.2 million versus 9.2 million in women). The most common types in males were lung (14.3%), prostate (14.1%), colorectal (10.6%), stomach (7.1%) and liver cancer (6.3%), and, in females, breast (24.5%), colorectal (9.4%), lung (8.4%), cervix (6.5%) and thyroid gland cancer (4.9%)[1].

In Brazil, the National Cancer Institute (INCA) estimated around 630,000 new cases of cancer for the 2020-2022 period, 49.4% in men and 50.6% in women. The most common cancers, with the exception of non-melanoma skin cancer, in 2020, were: prostate (29.2%), colorectal (9.1%), lung (7.9%), stomach (5.9%) and oral cavity cancer (5%) among men, and breast (29.7%), colorectal (9.2%), cervix (7.4%), lung (5.6%) and thyroid gland cancer (5.4%) among women[2].

The increase in incidence can be mostly attributed to environmental and behavioral factors, the reduction of infectious and parasitic diseases, the reduction in the younger population, and the growth of the elderly population. Physical inactivity, sedentary lifestyle, unhealthy eating habits and consequent increase in obesity, Human Papillomavirus and *Helicobacter pylori* infections are other important risk factors[3-5].

Knowing the extent of cancer is important for the planning and research for disease control programs. Cancer surveillance is an important strategic factor for understanding the proportion and impact of this affection on society. In Brazil, it is done through the Population-Based Cancer Registry (RCBP, in Portuguese). With at least one in each Brazilian region, there are currently 32 RCBPs with information available in the country, safely delineating the incidence of the main types of cancer[6,7]. Furthermore, trend analyses are an important tool and have been widely used to investigate the evolution of the disease[8,9].

Thus, the objective of this study was to analyze the incidence trend of the five main causes of cancer, according to sex and age group, in Greater Cuiabá, from 2000 to 2016.

METHODS

This is an ecological time series study composed of data about individuals diagnosed with cancer residing in Greater Cuiabá, which covers the most populous municipalities of Mato Grosso, Cuiabá (capital) and Várzea Grande (adjacent to the capital), from 2000 to 2016. In 2010, Cuiabá had 551,098 inhabitants (48.8% male), a population density of 157.66 inhab./km^2 and a Human Development Index (HDI) of 0.785. Várzea Grande had 252,596 inhabitants (52.5% male), a population density of 240.98 inhab./km^2 and an HDI of 0.734[10].

Information on new cases came from the RCBP of Cuiabá, which covers the municipalities of Cuiabá and Várzea Grande and is available on the website of the Population-Based Cancer Registry System (BasePopWeb), developed by INCA[11]. The study period was chosen based on the availability of updated information in partnership with the Mato Grosso State Health Department (SES-MT).

Census (2000 and 2010) and intercensus population estimates, used as denominators to calculate incidence rates, were extracted using the TABNET tabulator, available on the website of the Department of Informatics of the Unified Health System (SUS)[12,13].

Crude and age-adjusted incidence rates per 100,000 inhabitants were calculated for each year between 2000 and 2016, dividing the number of new cancer cases by the population over the period and multiplying by 100,000 inhabitants. Specific crude rates were calculated for each age group using 10-year intervals (20–29 years, 30–39 years, 40–49 years, 50–59 years, 60–69 years, 70–79 years, 80 years and older). And the standardized incidence rates were calculated by the direct method, considering the world standard population proposed by Segi[14] and modified by Doll et al.[15].

To select the five most frequent types of cancer, according to sex, the highest crude rates in the study period (2000–2016) were considered. Thus, the types of cancer selected for males were prostate (C61), lung (C33–34), colorectal (C18–21), stomach (C16) and oral cavity cancer (C00–10); for females, they were breast (C50), cervix (C53), colorectal (C18–21), lung (C33–34), and thyroid gland cancer (C73), according to the tenth revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10).

Joinpoint regression was used to analyze the incidence trend, which assesses whether there are changes at some points in the observed trend pattern. Then, we calculated the annual percentage change (APC), which is the direction and magnitude of the trend results, and the average annual percentage change (AAPC), which is the variation estimated by the calculation of the weighted geometric mean of different APCs with weight equal to the size of the segment for each time interval[16,17]. The year of occurrence was considered an independent variable and incidence rates were adjusted as dependent variables. The trend was considered upward when the APC and/or AAPC had a positive result, and the minimum value of the confidence interval was greater than 0, and downward when the APC and/or AAPC had a negative result and the maximum value of the confidence interval was below 0. Stability was defined when the confidence interval included 0.

The analysis by age groups was performed from 40 years of age in males and from 20 years of age in females. Some age groups were omitted from the tables for both sexes, because the series cannot have null values in the joinpoint regression. Statistical analyzes were performed using the Joinpoint Regression Program software version 8.3.6.1[18]. A significance level of 5% was adopted.

The present study is part of the research project entitled "Cancer and associated factors: analysis of population-based and hospital records" and was approved by the Research Ethics Committees of Júlio Muller University Hospital under opinion no. 3.048.183, dating from 11/20/2018, and SES-MT, under opinion no. 3,263,744 dating from 12/04/2019.

RESULTS

From 2000 to 2016, 22,345 new cases of cancer were identified, except for in situ and non-melanoma skin cancer. Of these, 11,141 (49.9%) new cases occurred in males and 11,204 (50.1%) in females. The five most common types of cancer, excluding non-melanoma skin cancers, were: prostate (33.6%), lung (8.2%), colorectal (7.4%), stomach (6.3%) and oral cavity cancer (5.5%) in men; and breast (29.7%), cervix (13.2%), colorectal (8.2%), lung (4.7%) and thyroid gland cancer (4.4%), in women (Table 1).

Among men, the adjusted incidence rate of prostate cancer ranged from approximately 80 to 60 new cases/100,000 men. Among women, the adjusted incidence rate for breast cancer stood out, ranging from approximately 50 to 60 new cases/100,000 women, and cervical cancer, which ranged from approximately 40 to 20 new cases/100,000 women.

The results indicate a downward trend for lung and stomach types in men, with a decline of 2.2% (95% confidence interval [95%CI]-4.0–-0.3) and 5.2% (95%CI -7.7–-2.6) per year, respectively, for the entire period. On the other hand, prostate cancer (APC=-3.2; 95%CI -6.1–-0.3) and oral cavity cancer (APC=-4.3; 95%CI -8.1–-0.4) had a decline only from 2006 to 2016. Among women, there was an increase of 2.8% per year (95%CI 0.2–5.5) in breast

Table 1. Proportional distribution and incidence rates of the ten most frequent primary cancer locations, crude and adjusted for age*, per 100,000 inhabitants. Greater Cuiabá, 2000-2016.

Primary location	Number of new cases	%	Crude rate	Adjusted rate
Males				
Prostate	3,739	33.6	56.55	87.54
Lung	914	8.2	13.82	20.16
Colon and rectum	825	7.4	12.48	16.66
Stomach	700	6.3	10.59	14.75
Oral cavity	614	5.5	9.29	11.74
Other locations	4,349	38.9	-	-
All except in-situ and non-melanoma skin cancer	11,141	100.0	-	-
All neoplasms	14,788	-	-	-
Females				
Mama	3,323	29.7	49.15	53.87
Cervix	1,479	13.2	21.88	23.26
Colon and rectum	918	8.2	13.58	16.09
Lung	528	4.7	7.81	9.80
Thyroid gland	494	4.4	7.31	7.12
Other locations	4,462	39.8	-	-
All except in-situ and non-melanoma skin cancer	11,204	100.0	-	-
All neoplasms	16,677	-	-	-

*standard world population.

cancer and 8.3% per year (95%CI 4, 6–12.2) in thyroid gland cancer. For cervical cancer, there was a reduction of 7.2% per year (95%CI -9.0–-5.3) (Table 2).

When analyzing the incidence trends by age group in men throughout the historical series, prostate cancer had a downward trend among men aged 80 years and over (AAPC=-3.0; 95%CI -5.7 –-0.3). For lung cancer, there was a decrease in the age groups of 40 to 49 years (AAPC=-4.2; 95%CI -7.7–-0.6) and 60 to 69 years (AAPC=-2.0; 95%CI -3.7–-0.2). For colorectal cancer, only the age group 70 to 79 years had an upward trend (AAPC=4.0; 95%CI 0.4–7.6). For stomach cancer, there was a decreasing trend in the groups from 60 to 69 years (AAPC=-6.2; 95%CI -10.0–-2.3) and 70 to 79 years (AAPC=-4.7; 95%CI -8.2–-1.1). Finally,

Table 2. Trend of adjusted incidence rates of the five most frequent cancer primary locations by sex. Greater Cuiabá, 2000-2016.

Males			
Primary location	Time frame	APC (95%CI)	AAPC (95%CI)
Prostate			-0.1 (-3.1–-3.0)
Trend 1	2000–2006	5.4 (-2.2–13.5)	
Trend 2	2006–2016	-3.2* (-6.1–-0.3)	
Lung	2000–2016	-2.2* (-4.0–-0.3)	-2.2* (-4.0–-0.3)
Colorectal	2000–2016	0.5 (-1.5–2.5)	0.5 (-1.5–2.5)
Stomach	2000–2016	-5.2* (-7.7–-2.6)	-5.2* (-7.7–-2.6)
Oral cavity			-2.2 (-5.8–1.6)
Trend 1	2000–2006	1.5 (-7.3–11.2)	
Trend 2	2006–2016	-4.3* (-8.1–-0.4)	
Females			
Primary location	Time frame	APC (95%CI)	AAPC (95%CI)
Breast			2.8* (0.2–5.5)
Trend 1	2000–2009	-1.6 (-5.1–2.0)	
Trend 2	2009–2016	8.7* (3.9–13.8)	
Cervix	2000–2016	-7.2* (-9.0–-5.3)	-7.2* (-9.0–-5.3)
Colorectal	2000–2016	1.0 (-1.4–3.5)	1.0 (-1.4–3.5)
Lung	2000–2016	1.5 (-0.6–3.6)	1.5 (-0.6–3.6)
Thyroid gland	2000–2016	8.3* (4.6–12.2)	8.3* (4.6–12.2)

APC: annual percent change; 95%CI: 95% confidence interval; AAPC: average annual percent change; *p<0.05; joinpoint regression.

oral cavity cancer had a decreasing trend in the age group from 40 to 49 years (AAPC=-4.7; 95%CI -8.1–-1.2) (Table 3).

For women aged 20 to 29 years, there was a reduction in cases of breast cancer in 2000–2005 (APC=-21.4; 95%CI -38.2–0.0), followed by an increase in 2005–2016 (APC=13.1; 95%CI 5.4–21.4). In the age groups 50 to 59 years and 60 to 69 years, an upward trend was observed, with increases of 2.5% (95%CI 0.2–4.8) and 4.8% per year (95%CI 2, 0–7.7), respectively. For cervical cancer, there was a significant increase of 51.3% per year (95%CI 15.9–97.5) in 2013–2016 for the age group 20 to 29 years, which contributed to an average increase in 8.2% per year (95%CI 0.8–16.2) throughout the period. In the 30-to-39 age group, a reduction was observed in 2003–2008 (APC=-16.4; 95%CI -25.1–-6.7). From 40 to 79 years old, a downward trend was seen, ranging from 6.9% (95%CI -9.5–-4.3) in the 40-to-49 age group to 9.1% (95%CI -11.3 –-2.8)

Table 3. Trend of adjusted incidence rates for the five most frequent primary cancer locations in males according to age group. Greater Cuiabá, 2000-2016.

	Age	Time frame	APC (95%CI)	AAPC (95%CI)
Prostate	50 to 59 years	2000–2016	2.2(-1.6–6.2)	2.2(-1.6–6.2)
	60 to 69 years	2000–2016	-0.5(-2.5–1.5)	-0.5(-2.5–1.5)
	70 to 79 years	2000–2016	-2.1(-4.1–0.0)	-2.1(-4.1–0.0)
	80 years and older	2000–2016	-3.0*(-5.7–-0.3)	-3.0*(-5.7–-0.3)
Lung	40 to 49 years	2000–2016	-4.2*(-7.7–-0.6)	-4.2*(-7.7–-0.6)
	50 to 59 years	2000–2016	-1.5(-5.0–2.1)	-1.5(-5.0–2.1)
	60 to 69 years	2000–2016	-2.0*(-3.7–-0.2)	-2.0*(-3.7–-0.2)
	70 to 79 years			-0.5(-8.2–7.8)
	Trend 1	2000–2009	-9.4*(16.6–-1.7)	
	Trend 2	2009–2016	12.2(-5.9–33.7)	
	80 years and older	2000–2016	-1.8(-6.2–2.8)	-1.8(-6.2–2.8)
Colorectal	40 to 49 years	2000–2016	-2.7(-9.0–4.2)	-2.7(-9.0–4.2)
	50 to 59 years	2000–2016	-1.0(-3.7–1.8)	-1.0(-3.7–1.8)
	60 to 69 years	2000–2016	1.0(-3.3–5.4)	1.0(-3.3–5.4)
	70 to 79 years	2000–2016	4.0*(0.4–7.6)	4.0*(0.4–7.6)
	80 years and older	2000–2016	-1.8(-7.2–3.8)	-1.8(-7.2–3.8)
Stomach	40 to 49 years	2000–2016	-3.3(-6.8–0.3)	-3.3(-6.8–0.3)
	50 to 59 years			-4.3(-10.5–2.3)
	Trend 1	2000–2002	-34.2(-61.1–11.3)	
	Trend 2	2002–2016	0.9(-2.9–4.9)	
	60 to 69 years	2000–2016	-6.2*(-10.0–-2.3)	-6.2*(-10.0–-2.3)
	70 to 79 years	2000–2016	-4.7*(-8.2–-1.1)	-4.7*(-8.2–-1.1)
Oral cavity	40 to 49 years	2000–2016	-4.7*(-8.1–-1.2)	-4.7*(-8.1–-1.2)
	50 to 59 years	2000–2016	-3.1(-8.7–2.8)	-3.1(-8.7–2.8)
	60 to 69 years	2000–2016	-1.5(-4.5–1.6)	-1.5(-4.5–1.6)

APC: annual percent change; 95%CI: 95% confidence interval; AAPC: average annual percent change; *p<0.05; joinpoint regression.

among women aged 60 to 69 years. Meanwhile, for thyroid gland cancer, an increasing trend was seen among women aged 30 to 59 years, ranging from 11.9 to 8.5% per year from 2000 to 2016. Colorectal and lung cancer trends were stable throughout the period (Table 4).

Table 4. Trend of adjusted incidence rates for the five most frequent primary cancer locations, according to age group, in females. Greater Cuiabá, 2000-2016.

Age	Time frame	APC (95%CI)	AAPC (95%CI)
Breast			
20 to 29 years			0.9(-6.9–9.4)
Trend 1	2000–2005	-21.4*(-38.2–0.0)	
Trend 2	2005–2016	13.1*(5.4–21.4)	
30 to 39 years			1.3(-4.4–7.3)
Trend 1	2000–2006	-11.0(-23.6–3.6)	
Trend 2	2006–2016	9.5*(4.6–14.7)	
40 to 49 years			2.0(-1.6–5.8)
Trend 1	2000–2008	-4.2(-9.8–1.7)	
Trend 2	2008–2016	8.7*(2.9–14.8)	
50 to 59 years	2000–2016	2.5*(0.2–4.8)	2.5*(0.2–4.8)
60 to 69 years	2000–2016	4.8*(2.0–7.7)	4.8*(2.0–7.7)
70 to 79 years	2000–2016	1.7(-1.5–5.0)	1.7(-1.5–5.0)
80 years and older	2000–2016	2.4(-1.0–5.9)	2.4(-1.0–5.9)
Colorectal			
40 to 49 years	2000–2016	2.5(-1.0–6.0)	2.5(-1.0–6.0)
50 to 59 years	2000–2016	1.8(-1.5–5.2)	1.8(-1.5–5.2)
60 to 69 years	2000–2016	-0.7(-4.4–3.1)	-0.7(-4.4–3.1)
70 to 79 years	2000–2016	-1.9(-5.1–1.5)	-1.9(-5.1–1.5)
80 years and older	2000–2016	0.7(-3.4–4.8)	0.7(-3.4–4.8)
Cervix			
20 to 29 years			8.2*(0.8–16.2)
Trend 1	2000–2013	0.2(-7.1–- 8.1)	
Trend 2	2013–2016	51.3*(15.9–97.5)	
30 to 39 years			-1.4(-7.2–4.8)
Trend 1	2000–2003	19.2(-7.9–54.1)	
Trend 2	2003–2008	-16.4*(-25.1–-6.7)	
Trend 3	2008–2016	1.8(-5.6–9.8)	
40 to 49 years	2000–2016	-6.9*(-9.5–-4.3)	-6.9*(-9.5–-4.3)
50 to 59 years	2000–2016	-7.5*(-10.0–-5.0)	-7.5*(-10.0–-5.0)
60 to 69 years	2000–2016	-9.1*(-11.3–-6.8)	-9.1*(-11.3–-6.8)
70 to 79 years	2000–2016	-7.2*(-11.3–-2.8)	-7.2*(-11.3–-2.8)

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Table 4. Continuation.

Age	Time frame	APC (95%CI)	AAPC (95%CI)
Lung			
40 to 49 years	2000–2016	3.5(-0.9–8.0)	3.5(-0.9–8.0)
50 to 59 years	2000–2016	2.0(-1.5–5.7)	2.0(-1.5–5.7)
60 to 69 years	2000–2016	0.5(-2.7–3.8)	0.5(-2.7–3.8)
70 to 79 years	2000–2016	0.6(-2.4–3.6)	0.6(-2.4–3.6)
80 years and older	2000–2016	-1.9(-6.0–2.4)	-1.9(-6.0–2.4)
Thyroid gland			
30 to 39 years	2000–2016	11.9*(6.5–17.7)	11.9*(6.5–17.7)
40 to 49 years	2000–2016	7.9*(2.6–13.6)	7.9*(2.6–13.6)
50 to 59 years	2000–2016	8.5*(2.3–15.1)	8.5*(2.3–15.1)

APC: annual percent change; 95%CI: 95% confidence interval; AAPC: average annual percent change; *p<0.05; joinpoint regression.

DISCUSSION

In Greater Cuiabá, from 2000 to 2016, considering the five most frequent primary locations of cancer, the incidence of colorectal and lung cancers stood out for both sexes, in addition to specific types in the female population (breast and cervix). and in the male population (prostate). While lung and stomach cancer, in men, and cervical cancer, in women, showed a decreasing trend, breast and thyroid increased in women throughout the period. In younger women, there was an increasing trend for breast, cervical and thyroid cancer. At older ages, a decreasing trend was observed for cervix cancer in women, and prostate and stomach cancer in men.

The World Health Organization emphasizes the importance of cancer prevention, promotion and control through RCBPs, which are structures that allow the collection, consolidation, analysis and dissemination of cancer incidence data in an organized and continuous way[19]. Studies on incidence trends are carried out with this purpose, allowing to assess the relationship between risk factors and prognosis and to establish strategies for planning, management and evaluation of prevention and health promotion services, in addition to allowing comparisons of different populations[20].

With a global estimate of 2.2 million new cases and 1.8 million deaths, in 2020 lung cancer was the second most diagnosed cancer and the leading cause of death. In men, it was the leading cancer type in 36 countries (with an adjusted rate of 39/100,000 inhabitants in high-income countries and 10.3/100,000 inhabitants in low- and middle-income countries) and the main cause of mortality in 93 countries. In women, there was an adjusted rate of 18.2 cases/100,000 inhabitants in high-income countries and 4.2/100,000 inhabitants in low- and

middle-income countries, and this cause of death stood out in 25 countries[1]. In Brazil, an adjusted rate of 16.19/100,000 men and 9.24/100,000 women was estimated in 2020. In the triennium 2020–2022, 7.9% of new cases are expected per year in men and 5.6% in women[5].

The present study points out a reduction in the age-standardized incidence rate for lung cancer in men, but a slight, nonsignificant increase in women. Regarding age, there was a reduction in all age groups, with emphasis on the range from 40 to 49 years. Other studies have also shown a reduction in the incidence of lung cancer. Garau et al., in Uruguay (2002–2015), showed a downward trend in men (-1.7% per year, 95%CI -2.3–-1.1)[21]. Zhang et al., in the period from 1985 to 2005, found variations from -1.3 to -3.4% per year in Denmark and Finland, respectively[22]. In Salvador (1997–2004) and São Paulo (1997–2008), Brazil, reductions of -5.7% per year (95%CI -10.7–-0.4) and -4.7% per year were observed (95%CI -9.0–-5.4), respectively[20].

About 90% of diagnosed lung cancer cases are associated with the use of tobacco derivatives, and different patterns of adherence to smoking and smoking cessation between the sexes have contributed to a different evolution between men and women[23]. However, in addition to environmental pollution, occupational exposure to other substances, such as silica and asbestos, makes lung cancer the most common type related to work[5]. Educational actions and other measures developed in Brazil have contributed to a decrease in the social acceptance of smoking. It is worth mentioning that, since 2002, the Ministry of Health has been publishing and updating ordinances that include smoking treatment in the SUS network[24].

In 2020, colorectal cancer accounted for more than 1.9 million new cases and 935 thousand deaths worldwide, ranking third for incidence and second for mortality. This type had an adjusted incidence rate of 29/100,000 men in high-income countries, with the largest contribution from the United States and some regions of Europe[1].

In the present study, despite the fact that colorectal cancer shows a stability trend in both sexes, there was an increasing trend among men aged between 70 and 79 years. Other studies have reported similar results. In Quito, Ecuador, there was an APC of 2.5% per year (95%CI 1.7–3.3)[25], and in Iran (2004–2010), 11.3% per year (95%CI 5.6–17.2)[26]. In Brazil, men over 60 years old living in in Fortaleza (CE) had an increase of 10.4% per year[27]. The high trend in the incidence of colorectal cancer in some countries may be due to technological improvements and screening programs adopted that contribute to early diagnosis[28]. Although Brazil has not adopted this program, public and private health systems have incorporated diagnostic tests that are more accessible than in the past[27]. In addition, the increased incidence, especially among men, may reflect changes in eating habits, physical inactivity, sedentary behaviors, and increased obesity[27].

Breast cancer surpassed lung cancer in incidence worldwide in 2020, ranking first, with an estimated 2.3 million new cases (11.7%), accounting for one in two cases of cancer and one in every six deaths[1]. In Brazil, a crude rate of 61.61/100,000 inhabitants was estimated for 2020. Per year of the triennium 2020-2022, 29.7% of cases are expected in women[5].

An upward trend in the incidence of breast cancer was observed in Granada, Spain (2008–2012) (APC 2.5% per year, 95%CI 2.1–2.9)[29]. Another study conducted in Quito, Ecuador

(1985–2013), showed an increase of 1.9% per year (95%CI 1.4–2.3)[25]. In Brazil, according to data from the RCBP of the Barretos Regional Health Department (2000–2015), the incidence rates of invasive breast cancer have increased (AAPC=4.3% per year, 95%CI 2.4–6.3)[30]. In Goiânia (1988–2003), the AAPC was 5.2% per year for the age group up to 39 years, 5.5% per year for the 40-to-59 age group and 4.5% per year for the age range of 60 years[31].

The present study shows a significant increase in the incidence rates of breast cancer for the analyzed period and by age group, especially between 50 and 69 years, which puts screening in an important role. According to Brazilian guidelines, routine mammography is recommended for women in this age group once every two years. As adopted in different countries, these recommendations are based on scientific evidence that supports the benefit of this strategy in reducing mortality in this group[32,33]. However, there was also an increase in younger age groups, which were not included in the screening. These findings can be explained by exposure to environmental, behavioral, and lifestyle factors, including alcohol consumption, obesity, and physical inactivity[29].

While breast cancer is increasing among women, cervical cancer has been decreasing worldwide in recent decades[34-36]. This decrease occurred among Latin American, Oceanian and European women with an APC that varies between -2.7 and -8.6% per year[36]. The same was observed in Quito, Ecuador (1985–2013)[25], and in Colombia (2003–2012)[37]. This corroborates the present study, with a decreasing trend in the period. However, a decrease in the trend was observed only in women over 40 years of age. Better access to health services, better education and prevention campaigns are changes that must have contributed to this result[38,39]. An increasing trend, on the other hand, was seen among younger women, as observed in Finland and the Netherlands[40,41]. Pap smear is the current gold-standard screening method and should be offered to women aged 25 to 64 who have already started sexual activity. This method makes it possible to identify precursor lesions that can be adequately treated, preventing their progression to cancer[42,43]. In Brazil, comparing the prevalence of the test between 2007 and 2013, with data from the Surveillance of Risk Factors and Protection for Chronic Diseases by Telephone Survey (VIGITEL), there was an increase in screening coverage, with emphasis on the high rates of approximately 86% in the Midwest Region[44].

Prostate cancer was the leading type of cancer in 112 countries[1], and it is considered a cancer of the elderly, as approximately 75% of cases worldwide occur after 65 years of age[5]. In Brazil, an adjusted incidence rate of 62.95 / 100,000 men was estimated in 2020[5].

The present study pointed out a reduction in the adjusted incidence rates of prostate cancer throughout the period only among the elderly with more advanced age. The RCBPs of Navarra, Spain (2000–2010), showed a similar result. APC of 2.4% per year was observed in the age group from 45 to 74 years and APC of -4.0% per year in the age group of 80 years and older[45]. A trend to diagnose prostate cancer in early stages has been observed worldwide[46]. In Brazil, the increase in incidence rates can be partially explained by the evolution of diagnostic methods, the improvement in the quality of information systems and the increase in life expectancy[5].

Stomach cancer appeared in our research as one of the five most frequent primary locations for cancer only in males. Despite the stability in the period, a downward trend was observed in elderly men. A similar result was seen in Colombia (APC close to -4.6% per year[37]), Costa Rica (-3.0% per year)[47] and Uruguay (-1.8% per year)[21]. This decline may be related to improvements in eating habits, healthier lifestyle, decrease in *Helicobacter pylori* infection rates, especially due to early detection and health promotion actions[48,49]. In Brazil, results from the National Health Survey indicate an increase in the prevalence of elderly people who practiced the recommended level of physical activity from 13.6% in 2013 to 19.8% in 2019[50,51]. With regard to food, according to data from the National Food Survey 2008–2009 and 2017–2018, traditional foods, such as rice and beans, and ultra-processed foods are still included in the Brazilian diet. However, there was a reduction in the consumption of processed meats and soft drinks[52].

On the other hand, thyroid cancer was more frequent only in women from Greater Cuiabá. Global estimates point to an adjusted incidence rate of 14.3/100,000 women in high-income countries and 2.6/100,000 women in low- and middle-income countries[1]. In Brazil, an adjusted incidence rate of 11.15/100,000 women was estimated in 2020[5].

In Quito, Ecuador, thyroid cancer incidence rates increased significantly (8.5% per year, 95%CI 5.6–11.5)[25], as well as in Portugal, between 1989 and 2009 (8 .7% per year)[53]. According to Garau et al., the trend of thyroid cancer incidence in Uruguay (2002–2015) increased among women (APC=8.7%; 95%CI 6.7–10.8)[21]. Similarly, an increasing trend was reported in women from Greater Cuiabá, especially among those in adult age groups. This increase can be explained by the diagnosis established through different surveys in several countries around the world. According to the authors, there is no evidence of increased exposure to risk factors such as radiation, overweight or diabetes, but there was an improvement in access to health services[54]. The increase in medical surveillance and the introduction of new diagnostic techniques such as neck ultrasound, computed tomography scan and magnetic resonance imaging, have made it possible to detect the disease in a large number of patients[55,56].

The use of information about incidence, especially the trend behavior of the main types of cancer with the highest occurrence, demonstrates the importance of RCBPs for cancer surveillance, as well as the planning, monitoring and evaluation of prevention and health promotion actions to control the disease. The information presented here is expected to contribute to a best management of public policies, leading to an improvement in the health conditions of the population.

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