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TRENDS IN INCIDENCE AND MORTALITY OF CERVICAL CANCER FROM 2000 TO 2018

Tendência da incidência e mortalidade do câncer de colo uterino de 2000 a 2018

Tendencias de incidencia y mortalidad por cáncer de cuello uterino de 2000 a 2018

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RESUMO

Objetivo: analisar a tendência da incidência e da mortalidade do câncer de colo uterino no período de 2000 a 2018 no estado de Mato Grosso. **Método:** estudo quantitativo, descritivo, com análise de dados dos Registros de Câncer de Base Populacional e do Sistema de Informação sobre Mortalidade de Mato Grosso. As tendências foram estimadas pelo método de regressão *joinpoint* e avaliadas por meio da variação percentual anual e da variação percentual média anual. **Resultados:** os dados mostraram uma diminuição nas taxas ajustadas de incidência do câncer de colo do útero de 5,0% e uma redução na mortalidade de 99,0%. A tendência de incidência apresentou variações temporais, com alguns períodos de aumento e outros de queda. **Conclusão:** o estudo destaca a eficácia das ações de saúde pública e a necessidade de continuar monitorando o câncer de colo do útero para direcionar políticas eficazes de controle e prevenção.

DESCRITORES: Neoplasias do colo do útero; Sistemas de informação em saúde; Vigilância em saúde pública.

ABSTRACT

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Objective: to analyze the trend in the incidence and mortality of cervical cancer from 2000 to 2018 in the state of Mato Grosso. **Method:** this was a quantitative, descriptive study that analyzed data from population-based cancer registries and the mortality information system of Mato Grosso. Trends were estimated using the Joinpoint Regression Method and evaluated using the annual and average annual percentage changes. **Results:** data showed a 5.0% decrease in adjusted cervical cancer incidence rates and a 99.0% reduction in mortality. The incidence trend exhibited temporal variations, with periods of both increase and decrease. **Conclusion:** the study highlights the effectiveness of public health initiatives and underscores the importance of ongoing cervical cancer surveillance to inform effective control and prevention policies.

DESCRIPTORS: Uterine cervical neoplasms; Health information systems; Public health surveillance.

RESUMEN

Objetivo: analizar la tendencia de la incidencia y mortalidad del cáncer de cuello uterino de 2000 a 2018 en el estado de Mato Grosso. **Método:** estudio cuantitativo, descriptivo, con análisis de datos de los Registros Poblacionales de Cáncer y del Sistema de Información de Mortalidad Mato Grosso. Las tendencias se estimaron utilizando el método de regresión de puntos de unión y se evaluaron utilizando el cambio porcentual anual y el cambio porcentual anual promedio. **Resultados:** los datos mostraron una disminución en las tasas de incidencia ajustadas de cáncer de cuello uterino del 5,0% y una reducción de la mortalidad del 99,0%. La tendencia de la incidencia mostró variaciones temporales, con algunos períodos de aumento y otros de disminución. **Conclusión:** el estudio destaca la efectividad de las acciones de salud pública y la necesidad de continuar monitoreando el para orientar políticas efectivas de control y prevención.

DESCRIPTORES: Neoplasias del cuello uterino; Sistemas de información en salud; Vigilancia en salud pública.

INTRODUCTION

Cancer is considered a global public health problem responsible for countless deaths and reduced life expectancy before the age of 70. In Brazil, it is estimated that there will be 704 thousand new cancer cases between 2023 and 2025. For the year 2045, an estimated 41.0% increase in cervical cancer (CC) incidence is expected, with 26,394 new cases. Additionally, a 49.0% increase in cervical cancer mortality is expected, with approximately 14,834 deaths. Despite advances in controlling CC in the country, it is the second most prevalent in the North and Northeast regions, the third most prevalent in the Midwest, the fourth most prevalent in the South, and the fifth most prevalent in the Southeast.[1-2]

CC is mainly caused by persistent human papillomavirus (HPV) infection, which is transmitted through unprotected sex. However, other factors can influence the disease, such as having multiple sexual partners, using oral contraceptives, smoking, having multiple pregnancies, and having a weakened immune system.[3-4] The most common type of cervical cancer is squamous cell carcinoma, and the rarest type is adenocarcinoma. Lesions can be classified as low-grade intraepithelial lesions (LGIL) or high-grade intraepithelial lesions (HGIL).[5-6]

Primary prevention of cervical cancer includes using condoms and receiving the HPV vaccine. Secondary prevention, on the other hand, involves early detection through cytopathological examination for women aged 25 to 64. For women with abnormal results, tertiary health care includes conization, chemotherapy, radiotherapy, and oncological surgery.[7]

In this context, this study aims to analyze the trend in CC incidence and mortality rates from 2000 to 2018 in the state of Mato Grosso (MT). Analyzing the current scenario of the disease is necessary due to existing gaps in its evolution in the state because specific regional data is scarce. Additionally, the significant impact of this neoplasm on Brazilian public health underscores the importance of directing health interventions toward CC control and developing public policies to reduce its morbidity and mortality.

METHOD

This quantitative, descriptive, and time-series research was carried out in the coverage area of the Population-Based Cancer Registries (RCBP) of Mato Grosso (Cuiabá and the interior). The state of Mato Grosso (MT) is located in the Midwest region of Brazil. It currently has 141 municipalities and a total population of 3,658,813, with a demographic density of 4.05 inhabitants per square kilometer. In 2021, its Human Development Index (HDI) was 0.736, compared to other states.

The research sample consisted of females aged 20 years or older residing in MT who were registered with the RCBP (Interior and Cuiabá) and the Mortality Information System (SIM) with a diagnosis of ICD C53 (Malignant Neoplasm of the Cervix) according to the International Classification of Diseases for Oncology. The study period was from 2000 to 2018. Cases with incomplete or inconsistent information in the records or missing data in the RCBP or SIM were excluded. The study period was defined by the RCBP database's availability until the present study. Population information was obtained through estimates from the Department of Informatics of the Unified Health System (DATASUS) and the Brazilian Institute of Geography and Statistics (IBGE).

Crude and adjusted incidence rates were calculated by age for each year by dividing the number of new cervical cancer cases by the population of the study period and multiplying by 100,000 women, as calculated below.

$$\frac{\text{Rate}}{\text{Pop. Est.}} \times 100.000$$

Crude rates were calculated using 10-year intervals (20–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80+). Incidence rates were standardized using the direct method, considering the world standard population proposed by Segi and modified by Doll, Payne, and Waterhouse.[10-11]

The data obtained were tabulated in Excel spreadsheets and imported into the Joinpoint Regression Program (version 5.2.0.0) for regression analysis. The annual percent change (APC) was calculated to describe the temporal trend and evaluate statistical significance (p<0.05). APC=0 was considered stable or null, increasing APC was considered positive, and decreasing APC was considered negative.[12-13]

During the study period, the average annual percent change (AAPC) was obtained. If there was more than one inflection point, the AAPC was considered for the calculation; otherwise, the AAPC equaled the APC. To test the null hypothesis that the APC and AAPC of the series are equal to zero, a 5% significance level was established.[14-15] To perform the calculation, the year of occurrence was considered the independent variable, and the incidence and mortality rates were considered the dependent variables.

This study is part of the Matrix Research Project entitled "Cancer and Its Associated Factors: Analysis of Population-Based and Hospital Registries in Mato Grosso," which was approved on July 20, 2021, by the Research Ethics Committee of the Federal University of Mato Grosso/Health. This study complies with Resolution No. 466/2012 and Opinion No. 4,858,521 (CAAE: 48121421.0.0000.8124).

RESULTS

From 2000 to 2018, 3,998 new cases of CC and 1,352 deaths from this pathology were registered in the state of MT in the RCBP Cuiabá and Interior. The highest number of cases occurred in 2004, with 7.3% (288) of cases, followed by 2015, with 6.9% (94) of cases. New cases and deaths were more prevalent among women aged 40 to 49 years, at 25.6% (1,024) and 25.4% (344), respectively.

The analysis of the temporal trend of crude incidence rates by age group revealed a downward trend during the study period, though only the 20-29 and 40-79 age groups showed statistical significance. For the 80+ age group, there was an increasing trend in AAPC with no statistical significance. Four statistically significant temporal trends were identified for the 20-29 age group: a decrease in the periods of 2003-2012 and 2016-2018, and an increase in the periods of 2000-2003 and 2012-2016 (Table 1, Figure 1).

Regarding the trend in crude mortality rates, a decreasing series was observed in the 40-80 age group, with statistical significance. Four statistically significant temporal trends were verified in the 70-79 age group, showing an increase in the periods of 2000-2008 and 2011-2016, and a decrease in the periods of 2008-2011 and 2016-2018 (Table 1, Figure 1).

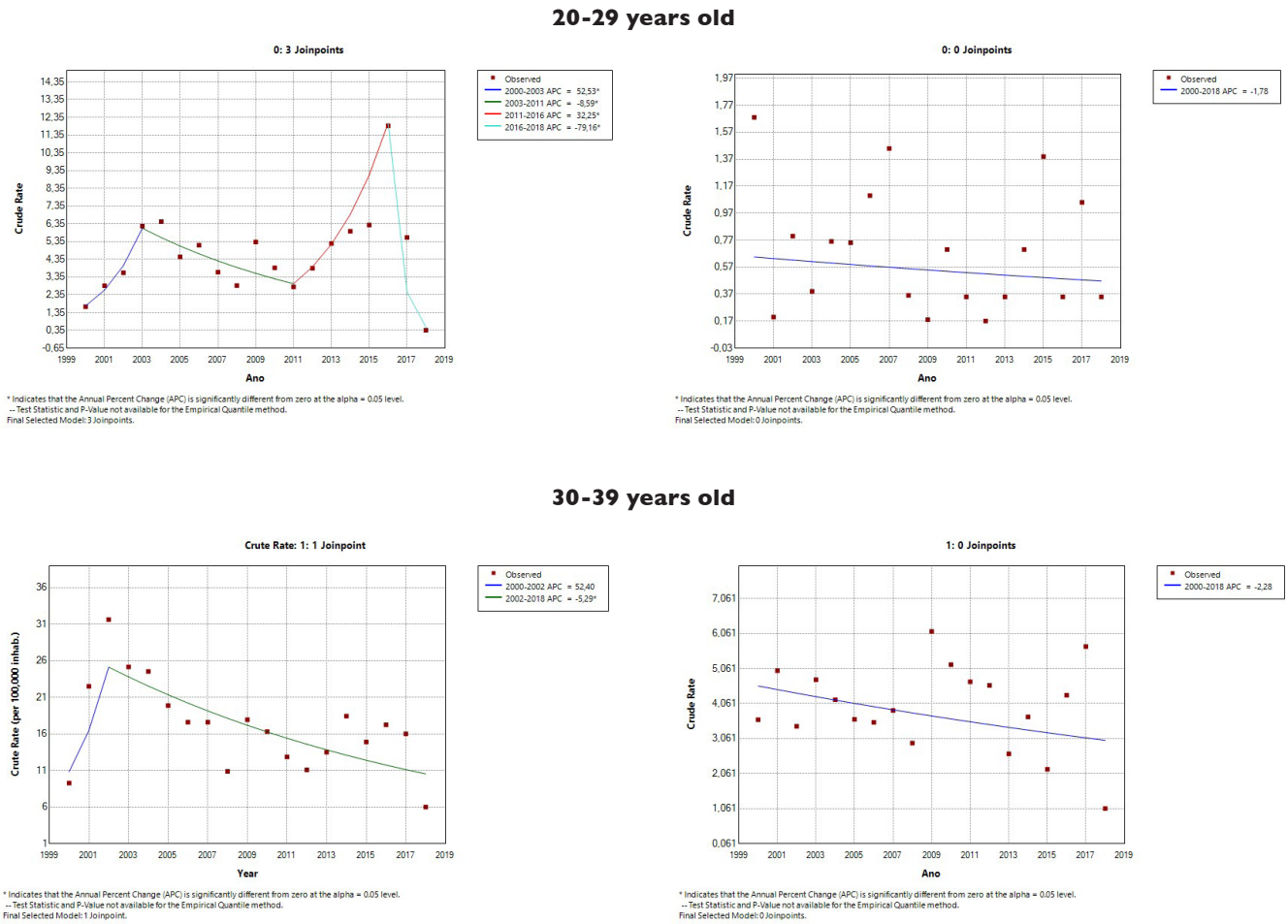
Table 1 - Trends in the incidence and mortality rates of cervical cancer, per 100,000 women, by age group. Mato Grosso, Brazil, 2000-2018

Incidence					
Age group	**Period**	**APC**	**95%CI**	**AAPC**	**Tendency**
20-29	2000-2018	-	-	-6,0*	Descending
	2000-2003	48,0*	(15,0 – 129,0)	-	Crescent
	2003-2012	-6,0*	(-21,0 - -2,0)	-	Descending
	2012-2016	41,0*	(20,0- 78,0)	-	Crescent
	2016-2018	-79,0*	(-85,0 - -64,0)	-	Descending
30-39	2000-2018	-	-	-2,0	Descending
	2000-2002	75,0*	(22,0 – 161,0)	-	Crescent
	2002-2018	-14,0*	(-31,0 - -8,0)	-	Descending
	2008-2016	3,0	(-0,7 – 29,0)		Crescent
	2016-2018	-33,0*	(-54,0 - -9,0)		Descending
40-49	2000-2018	-	-	-7,0*	Descending
	2000-2002	29,0*	(9,0- 47,0)	-	Crescent
	2002-2009	-10,0*	(-17,0 – 8,0)	-	Descending
	2009-2016	-4,0	(-6,0 – 4,0)	-	Descending
	2016-2018	-34,0*	(-42,0- -21,0)		Descending
50-59	2000-2018	-	-	-6,0*	Descending
	2000-2002	29,0	(-7,0 – 76,0)	-	Crescent
	2002-2016	-7,0	(-17,0 – 0,8)	-	Descending
	2016-2018	-30,0*	(-49,0 - -5,0)		Descending
60-69	2000-2018	-	-	-10,0*	Descending
	2000-2016	-6,0*	(-8,0 – 1,0)	-	Descending
	2016-2018	-35,0*	(-49,0 - -10,0)	-	Descending
70-79	2000-2018	-	-	-5,0*	Descending
	2000-2002	37,0	(-0,5 – 69,0)	-	Crescent
	2002-2018	-10,0*	(-12,0 - -8,0)	-	Descending
80+	2000-2018	-	-	4,0	Crescent
	2000-2002	117,0	(-1,0 – 383,0)		Crescent
	2002-2018	-5,0*	(-50,0– 0,7)		Descending
Mortality					
Age group	**Period**	**APC**	**95%CI**	**AAPC**	**Tendency**
20-29	2000-2018	-1,0	(-7,0 – 5,0)	-1,0	Stationary
30-39	2000-2018	-2,0	(-5,0 – 1,0)	-2,0	Stationary
40-49	2000-2018	-	-	-10,0*	Descending
	2000-2016	0,6	(-1,0 – 3,0)	-	Stationary
	2016-2018	-62,0*	(-71,0 – -40,0)	-	Descending
50-59	2000-2018	-	-	-11,0*	Descending
	2000-2016	0,3	(-3,0 – 4,0)	-	Stationary
	2016-2018	-67,0*	(-80,0 - -37,0)	-	Descending
60-69	2000-2018	-	-	-10,0*	Descending
	2000-2016	0,9	(-2,0 – 7,0)	-	Stationary
	2016-2018	-63,0*	(-81,0 - -21,0)	-	Descending

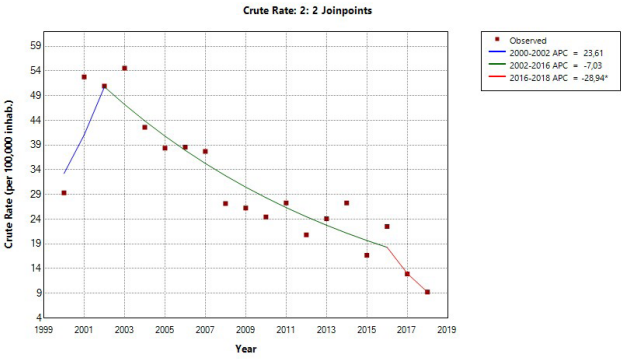
Incidence					
70-79	2000-2018	-	-	-14,0*	Descending
	2000-2008	7,0*	(0,3 -23,0)	-	Crescent
	2008-2011	-35,0*	(-45,0 - -13,0)	-	Descending
	2011-2016	23,0*	(10,0 – 73,0)	-	Crescent
	2016-2018	-78,0*	(-87,0 – 57,0)	-	Descending
80+	2000-2018	-	-	-8,0*	Descending
	2000-2016	4,0*	(0,8 – 10,0)	-	Crescent
	2016-2018	-68,0*	(-81,0 – 25,0)	-	Descending

Source: RCBP and SIM/ Elaborated, 2024
Subtitles: APC: annual percent change. CI: Confidence Interval. AAPC: average annual percentage change.
(*) Significantly different from 0 ($p < 0.05$). Joinpoint regression.

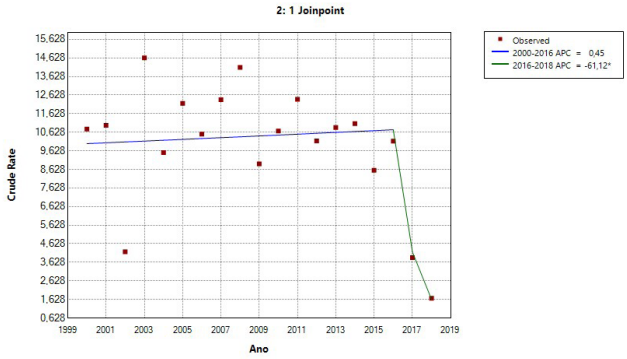
Figure 1 - Temporal trends in crude cervical cancer incidence and mortality rates per 100,000 women, by age group. Mato Grosso, Brazil, 2000-2018



40-49 years old

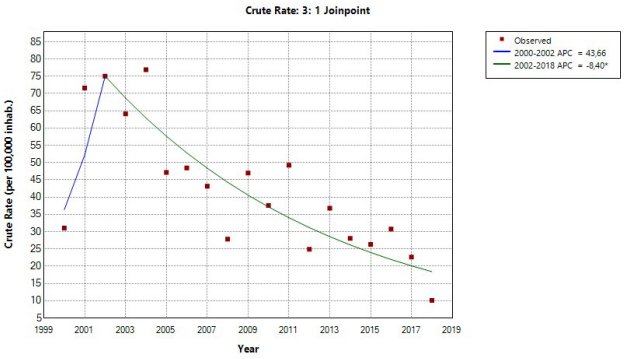


* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
-- Test Statistic and P-Value not available for the Empirical Quantile method.
Final Selected Model: 2 Joinpoints.

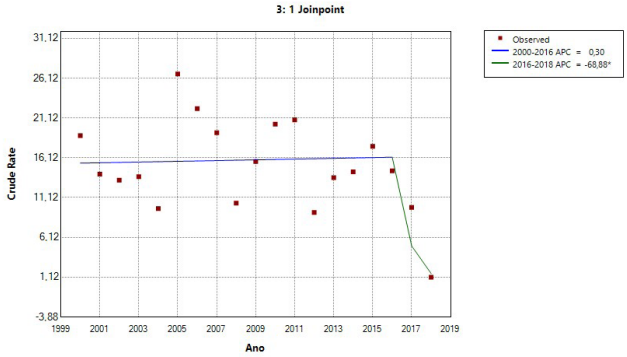


* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
-- Test Statistic and P-Value not available for the Empirical Quantile method.
Final Selected Model: 1 Joinpoint.

50-59 years old

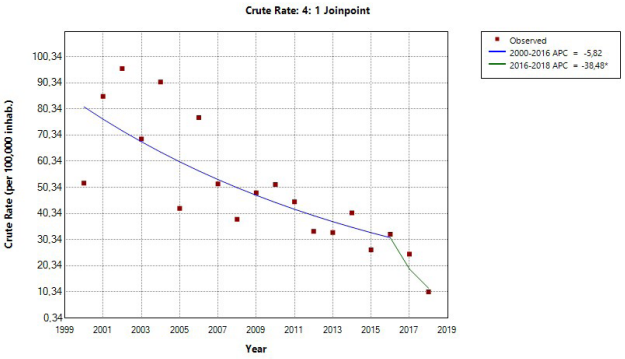


* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
-- Test Statistic and P-Value not available for the Empirical Quantile method.
Final Selected Model: 1 Joinpoint.

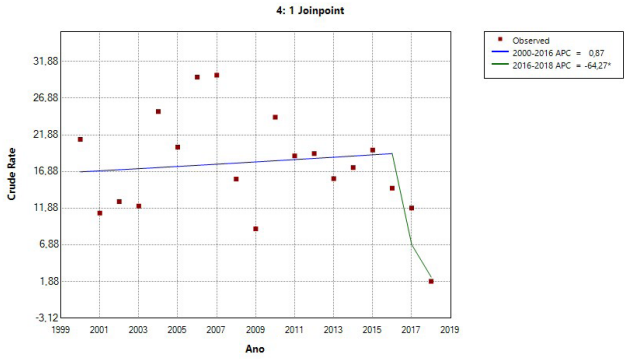


* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
-- Test Statistic and P-Value not available for the Empirical Quantile method.
Final Selected Model: 1 Joinpoint.

60-69 years old

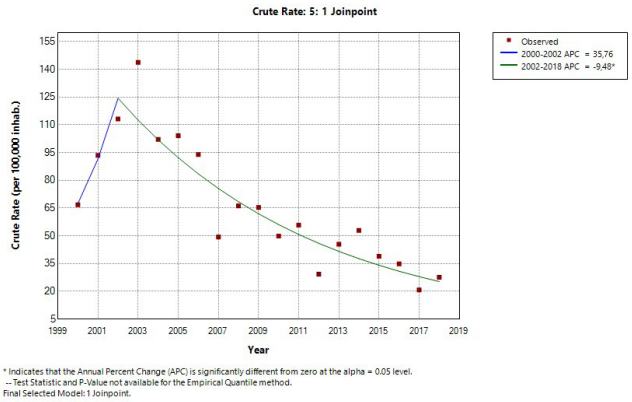


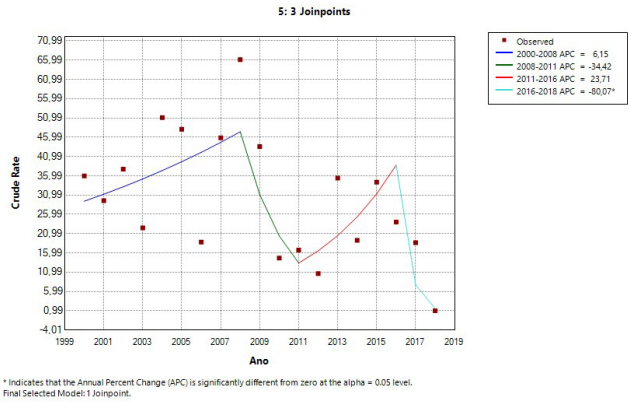
* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
-- Test Statistic and P-Value not available for the Empirical Quantile method.
Final Selected Model: 1 Joinpoint.



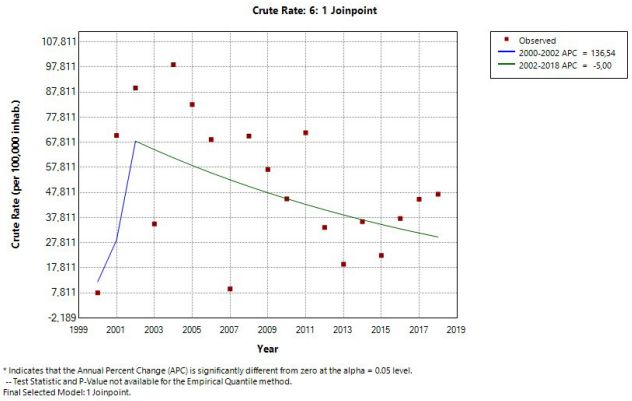
* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level.
-- Test Statistic and P-Value not available for the Empirical Quantile method.
Final Selected Model: 1 Joinpoint.

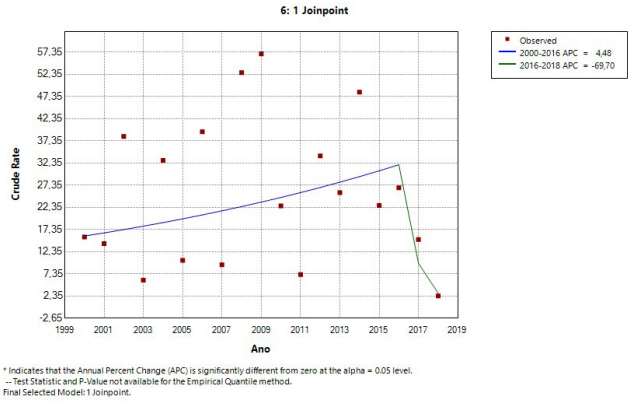
70-79 years old





80+





Source: RCBP and SIM, elaborated in 2024.

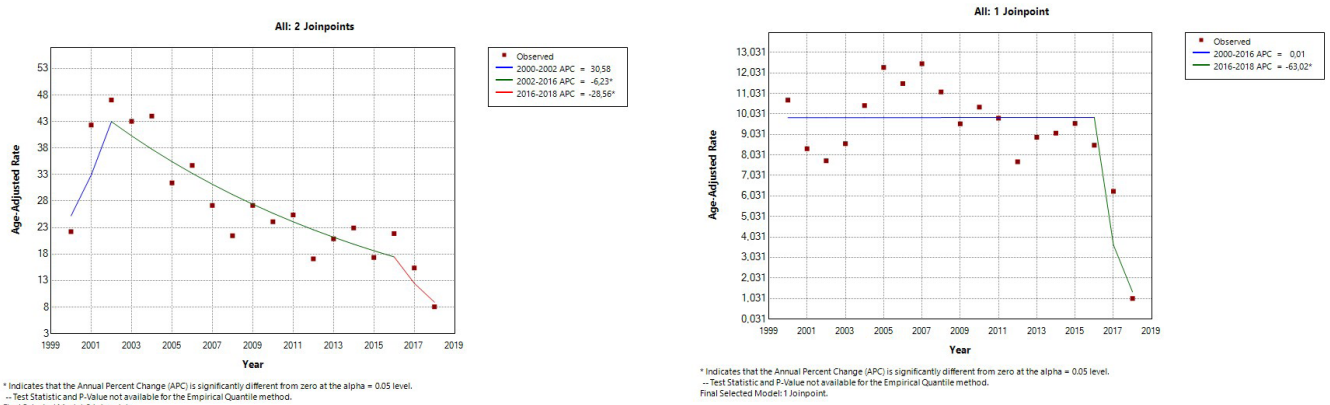
Regarding the trend in adjusted incidence and mortality rates, the AAPC decreased. However, the time series was divided into four incidence trends: 2000–2002, 2002–2008, 2008–2016, and 2016–2018. There was no significant trend in the period from 2008 to 2016 (APC = -3.0, 95% CI: -5.0 to 8.0). The historical mortality series was divided into two trends: 2000–2016 and 2016–2018. The decrease was statistically significant (APC = -609.0, 95% CI: -699.0, -406.0) from 2016 to 2018 (Table 2, Figure 2).

Table 2 - Trends in the adjusted incidence and mortality rates of cervical cancer per 100,000 women by age group*. Mato Grosso, Brazil, 2000-2018

Period	APC	95%CI	AAPC	95%CI	Tendency
Incidence					
2000-2018	-	-	-5,0**	(-7,0 - -4,0)	Descending
2000-2002	42,0**	(14,0-71,0)	-	-	Crescent
2002-2008	-12,0**	(-21,0 - -8,0)	-	-	Descending
2008-2016	-3,0	(-5,0 – 8,0)	-	-	Descending
2016-2018	-32,0*	(-43,0 - -16,0)	-	-	Descending
Mortality					
2000-2018	-	-	-99,0**	(-123,0 - -77,0)	Descending
2000-2016	0,0	(-26,0 – 20,0)	-	-	Stationary
2016-2018	-609,0**	(-699,0 - -406,0)	-	-	Decreasing

Source: RCBP and SIM/ Elaborated, 2024.
Subtitle: APC: annual percent change. CI: Confidence Interval. AAPC: average annual percentage change.
(*) Joinpoint did not differentiate the range from the age group in the data analysis.
(**) Significantly different from 0 ($p < 0.05$). Joinpoint regression.

Figure 2- Temporal trend of adjusted cervical cancer incidence and mortality rates per 100,000 women. Mato Grosso, Brazil, from 2000 to 2018.



Source: RCBP and SIM/ Elaborated, 2024

DISCUSSION

This study's analysis allowed us to evaluate the crude and adjusted incidence and mortality rates of cervical cancer (CC) in women in the state of Mato Grosso (MT) between 2000 and 2018. The results showed a 5.0% annual decrease in the adjusted incidence rates during the study period. Regarding the trend of deaths, we observed a 99.0% decrease in the period analyzed. Additionally, joinpoint analysis identified inflection points in the studied trends.

These results align with data from an international health research agency that observed a decrease in incidence and mortality rates in all analyzed countries, though the magnitude of the decrease varied due to socioeconomic development and health initiatives for preventing and treating the disease in countries with a high HDI.[16]

A similar study on the incidence and mortality of breast cancer and cervical cancer (CC) in Campinas, using RCBP data, observed a decline in invasive CC incidence between the

analyzed periods.[17] This finding aligns with a study on the magnitude of cancer in Brazil that used RCBP data, showing a significant decline in all Midwest states, with an annual average percentage change (AAPC) of 8.4% in Cuiabá, 5.0% in Goiânia, and 9.3% in the Federal District.[18]

A reduction in the crude incidence rates of cervical cancer (CC) was observed in most age groups, especially in populations aged 40 to 49 and 60 to 69 years. This indicates the effectiveness of actions aimed at improving the health of Brazilian women, particularly about the prevention of gynecological cancers, including CC. Since 2002, there has been a decline in incidence rates in all age groups studied. This phenomenon may be related to the implementation of the National Cervical Cancer Control Program, *Viva Mulher*, which required new strategies to reduce mortality and incidence of the disease in the country.[19]

The historical series of this study coincides with the expansion of access to gynecological care in the Unified Health System (SUS) and the implementation of national policies aimed at controlling CC and breast cancer. Specific plans and strategies were created to reduce CC incidence and mortality due to its epidemiological relevance.[3] In addition, screening was reaffirmed as a central control strategy, which may have influenced the decrease in incidence among women aged 20 to 49 years between 2012 and 2016. Other initiatives, such as cytopathology training, establishing reference services for diagnosing and treating precursor lesions, and HPV vaccination, also played an important role in reducing incidence, demonstrating the effectiveness of public policies.

The general trend in crude cervical cancer mortality rates by age group showed a statistically significant decreasing trend, particularly in the 60-79 age group. This pattern is similar to that found in a study conducted in southern Brazil, which identified a declining trend in mortality in the 50-69 age group and a stable trend in the other age groups.[20] Additionally, a study conducted in Cuiabá using SIM data over several decades observed stable mortality and incidence rates of cervical cancer (CC).[21] These results differ from those of studies analyzing the temporal trend of cervical cancer mortality in southern Santa Catarina, which identified an upward trend in the 50-59 age group, especially among women who self-identify as brown, single, and uneducated.[22]

Literature points to a direct relationship between education level and mortality rates, highlighting that education is a determining factor in accessing information and consequently adhering to early cervical cancer screening. This link underscores the importance of public health education, particularly within the context of primary health care, where health promotion, prevention, and recovery strategies can significantly impact the population's quality of life and result in lower cervical cancer mortality rates.

The observed decline in mortality from this neoplasm in recent years may be associated with increased cytopathological examination coverage and early diagnosis, resulting from women's health initiatives in the state of Mato Grosso. According to a national surveillance system that monitors risk and protective factors for chronic diseases, Brazil has increased the number of cytopathological examination among women aged 25 to 64 who have undergone an oncotic cytology test for cervical cancer at some point in their lives or within the last three years. This percentage was 76.8% in the capitals of the Brazilian states and the Federal District, though it varies among the different evaluated regions.[24]

One limitation of the study was the scarcity of research on cancer incidence in Brazil, especially studies using RCBP data. Additionally, hospital cancer registries (HCRs), one of the sources responsible for providing information to the RCBP, often present incomplete or inconsistent data. This gap in hospital data reflects the fragility of the RCBP itself.[25] However, this study has the potential to use RCBP data to recognize the magnitude of the disease, serve as a basis for epidemiological research, identify populations at risk, and improve the effectiveness of programs and the planning of control actions.[26]

CONCLUSION

This study's results offer important contributions to public health research by identifying significant epidemiological trends in cervical cancer control in Mato Grosso. Based on the presented data, a positive trend in CC control was observed in the region, with reductions in both incidence and mortality rates from 2000 to 2018. This decrease is partly due to the implementation and expansion of prevention programs, such as cytopathological screening. These findings underscore the importance of public policies focused on women's health and highlight the effectiveness of prevention and early diagnosis strategies in controlling cervical cancer.

However, when interpreting the results, limitations in the data, such as the RCBP's incompleteness, should be considered. Despite the advances, continuity and expansion of health initiatives are essential to further reducing morbidity and mortality due to this pathology. This will help achieve a more uniform decrease in all age groups, especially younger ones, which present variations in mortality rates.

Future research should include continuous monitoring of trends in CC incidence and mortality, with an emphasis

on identifying factors contributing to variations in different age groups.

ACKNOWLEDGEMENTS

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