

Temporal Trend of Mortality from Oral and Pharyngeal Cancer in Brazil, 2004 a 2023

Tendência Temporal da Mortalidade por Câncer de Boca e Faringe no Brasil, 2004 a 2023

Tendencia Temporal de la Mortalidad por Câncer de Boca y Faringe em Brasil, 2004 a 2023

RESUMO

Objetivo: A analisar a tendência temporal de mortalidade por câncer de boca e de faringe no Brasil, de 2004 a 2023. **Método:** Estudo ecológico, de série temporal, a partir de dados do Sistema de Informação sobre Mortalidade; as taxas de mortalidade foram calculadas segundo região, estado, sítios anatômicos, sexo e faixa etária e a tendência, avaliada por regressão de Prais-Winsten. **Resultados:** Foram registrados 74.820 óbitos por câncer de boca e 69.786 por câncer de faringe. Ambas as neoplasias apresentaram tendência temporal crescente na maioria das regiões, especialmente no Norte (VPA = 5,6%; IC95%: 0,78–0,97) e Nordeste (VPA = 5,51%; IC95%: 1,50–1,76), com predomínio de óbitos em homens e maior mortalidade em pessoas acima de 60 anos. **Conclusão:** Houve tendência temporal crescente e heterogênea da mortalidade por câncer de boca e faringe no Brasil, marcada por disparidades regionais profundas e um perfil demográfico em evolução.

DESCRIPTORIOS: Neoplasias Bucais; Neoplasias Faríngeas; Mortalidade.

ABSTRACT

Objective: To analyze the temporal trend of mortality from oral and pharyngeal cancer in Brazil, from 2004 to 2023. **Method:** Ecological, time-series study, based on data from the Mortality Information System; mortality rates were calculated according to region, state, anatomical sites, sex, and age group, and the trend was assessed by Prais-Winsten regression. **Results:** A total of 74,820 deaths from oral cancer and 69,786 from pharyngeal cancer were recorded. Both neoplasms showed an increasing temporal trend in most regions, especially in the North (APC = 5.6%; 95% CI: 0.78–0.97) and Northeast (APC = 5.51%; 95% CI: 1.50–1.76), with a predominance of deaths in men and higher mortality in people over 60 years of age. **Conclusion:** There was an increasing and heterogeneous temporal trend in mortality from oral and pharyngeal cancer in Brazil, marked by profound regional disparities and an evolving demographic profile.

DESCRIPTORS: Oral Neoplasms; Pharyngeal Neoplasms; Mortality.

RESUMEN

Objetivo: Analizar la tendencia temporal de la mortalidad por cáncer oral y faríngeo en Brasil, de 2004 a 2023. **Método:** Estudio ecológico, de series de tiempo, basado en datos del Sistema de Información de Mortalidad; las tasas de mortalidad se calcularon según región, estado, sitios anatómicos, sexo y grupo de edad, y la tendencia se evaluó mediante regresión de Prais-Winsten. **Resultados:** Se registraron 74.820 muertes por cáncer oral y 69.786 por cáncer faríngeo. Ambas neoplasias mostraron una tendencia temporal creciente en la mayoría de las regiones, especialmente en el Norte (APC = 5,6%; IC del 95%: 0,78-0,97) y el Nordeste (APC = 5,51%; IC del 95%: 1,50-1,76), con predominio de muertes en hombres y mayor mortalidad en personas mayores de 60 años. **Conclusión:** Se observó una tendencia temporal creciente y heterogénea en la mortalidad por cáncer oral y faríngeo en Brasil, marcada por profundas disparidades regionales y un perfil demográfico en evolución.

DESCRIPTORIOS: Neoplasias Orales; Neoplasias Faríngeas; Mortalidad.

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INTRODUCTION

The global increase in the burden of chronic noncommunicable diseases (NCDs), with cancer among the leading causes of morbidity and mortality, is one of the greatest contemporary challenges for public health¹. In the Brazilian and Latin American context, oral and pharyngeal cancers are a significant public health problem, associated with high morbidity, disfigurement, and death. The most recent estimates from the National Cancer Institute (INCA) for the 2023-2025 triennium rank oral cavity tumors as the 5th most frequent among Brazilian men, with approximately 11,200 new cases annually. When considering the head and neck region as a whole, these figures exceed 21,000 cases/year, also including laryngeal cancers (6,190 cases), which highlights the weight of these neoplasms in the national oncological profile².

Mortality trends for mouth and pharynx cancer in Brazil over the last few decades have revealed diverse temporal behavior, marked by significant regional and demographic differences. While some states, especially in the South and Southeast regions, have historically high rates, but with

a more modest growth trend or even stabilization, others, particularly in the North and Northeast regions, are experiencing a sharp annual percentage increase. This pattern suggests an ongoing epidemiological transition, with the internalization and geographical expansion of the burden of these diseases³.

Mortality rates for these cancers are strongly influenced by a multifactorial set of factors. In addition to classic determinants, such as smoking and alcoholism, whose association is well established, HPV infection, especially for oropharyngeal tumors, has emerged as a risk factor of growing importance. Furthermore, the lethality of these neoplasms is intrinsically linked to diagnosis in advanced stages, which, in turn, reflects barriers to access to health services, including limitations in primary care for early recognition of lesions and timely referral to specialized centers^{4,5}.

Data published by the National Cancer Institute (INCA) reiterate the magnitude of the problem. Estimates point to a significant number of new cases of oral cancer each year in Brazil, making it one of the most common cancers in men. The average five-year survival rate, when diagnosis is delayed, remains unfavorable, gen-

erally below 50%, highlighting the prognostic impact of staging at diagnosis. These statistics underscore the continuing need for epidemiological surveillance and targeted strategies for disease control^{6,7}.

Given this scenario, the present study aims to analyze the temporal trend of mortality from oral and pharyngeal cancer in Brazil over a period of two decades (2004-2023).

METHODS

This is an ecological study with time series analysis of mortality from oral and pharyngeal cancer in Brazil from 2004 to 2023.

Death data were extracted from the Mortality Information System (SIM/DATASUS), and population data from the Brazilian Institute of Geography and Statistics (IBGE). All deaths from oral cancer (C00-C09) and pharyngeal cancer (C09-C14) were included in the study, according to the 10th International Classification of Diseases (ICD-10), by region of residence (North, Northeast, Southeast, South, and Midwest), state, sex, and anatomical site.

The variables of interest in the study were: sex (male; female); age group (0 to 19 years; 20 to 39 years;

40 to 59 years; 60 to 79 years; 80 years or older); year of occurrence (2004 to 2023); place of residence (Brazil; Brazilian regions; state); anatomical site (C00-C14).

Mortality rates per 100,000 inhabitants were analyzed for Brazil, regions, and states, using absolute data on annual deaths from 2004 to 2023. The rates were obtained by dividing the number of deaths by the population in each year and multiplying the result by 100,000.

The average mortality rate for the period was calculated by the arithmetic mean of the annual rates for each region, state, and anatomical site. To evaluate the temporal trend, we used Prains-Winsten regression, which allows for the correction of first-degree serial autocorrelation in time series. The model estimates the regression coefficient, 95% confidence intervals, and the annual percentage change (APC) of the rates, classified into three patterns: increasing (APC > 0.5), stationary (APC between -0.5 and 0.5), and decreasing (APC < -0.5). The confidence interval was 95% for the average mortality rate.

All analyses were performed using R software. This study was conducted using publicly available data, which does not allow for individual identification and therefore does not require approval from an ethics and research committee.

RESULTS

Between 2004 and 2023, 74,820 deaths from oral cancer and 69,786 deaths from pharyngeal cancer were recorded in Brazil, representing average rates of 1.87 and 1.75 per 100,000 inhabitants, respectively. Analysis of the temporal trend showed that both types of cancer presented a predominantly increasing behavior, although with marked regional differences. In the case of oral cancer, all Brazilian regions showed an increase in rates,

with the Northeast (VPA = 5.51%; 95% CI: 1.50–1.76) and North (VPA = 5.6%; 95% CI: 0.78–0.97), regions that historically have more unfavorable socioeconomic indicators. For pharyngeal cancer, the upward trend

was present in almost all regions except the South (APR = 0.28%; 95% CI: 2.17–2.27), where it remained stationary, suggesting stabilization of mortality patterns in this territory (Table 1).

Table 1 - Number and percentage of deaths, average coefficient per 100,000 inhabitants, and trend in mortality rates for oral and pharyngeal cancer by region. Brazil, 2004-2023.

Region	Deaths		Coeficiente médio	VPA*	IC95%*	Interpretação
	n	%				
Mouth						
North	2983	4,0	0,88	5,6	0,78-0,97	Growing
Northeast	17852	23,9	1,63	5,51	1,50-1,76	Growing
Southeast	36649	49,0	2,17	2,19	2,06-2,28	Growing
South	12805	17,1	2,22	1,28	2,11-2,32	Growing
Midwest	4531	6,0	1,49	2,81	1,38-1,60	Growing
Brazil	74820	100	1,87	2,77	1,76-1,98	Growing
Pharynx						
North	2462	3,5	0,72	4,1	0,65-0,79	Crescente
Northeast	14989	21,5	1,37	5,13	1,27-1,47	Crescente
Southeast	34503	49,5	2,05	0,53	2,00-2,09	Crescente
South	12792	18,3	2,22	0,28	2,17-2,27	Estacionária
Midwest	5040	7,2	1,66	1,61	1,57-1,75	Crescente
Brazil	69786	100	1,75	1,32	1,69-1,80	Crescente

APV: Annual percentage change; 95% CI: Confidence interval of the mean coefficient.

During the period analyzed, mortality from oral cancer was predominantly male in all regions, with men accounting for approximately 81% of deaths, corresponding to a male/female ratio of approximately 4:1. The highest average rates were recorded in the South (2.22/100,000 inhabitants) and Southeast (2.17/100,000 inhabitants), both showing an upward trend, although with more modest annual percentage changes (APC = 1.28% and 2.19%, respectively). In contrast, the North and Northeast regions, despite

having lower average coefficients (0.88 and 1.63/100,000 inhabitants, respectively), showed the highest relative increases, with APV of 5.6% and 5.51%. Among women, rates were consistently lower in all regions, but also showed an upward trend, reinforcing the expansion of the disease burden on this historically less affected group (Figure 1A).

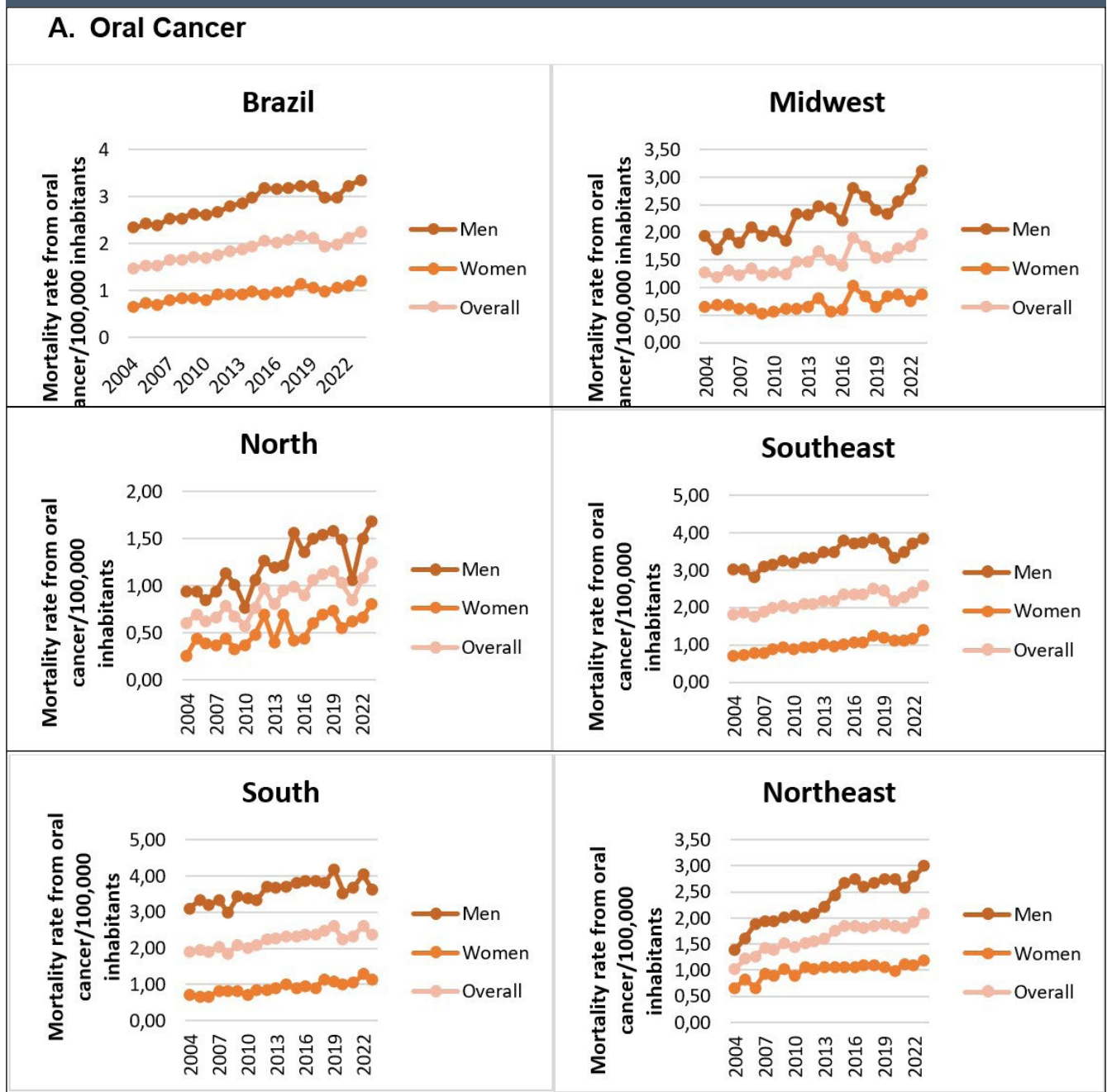
For pharyngeal cancer, the difference between the sexes was even more pronounced: men accounted for 85% of deaths, resulting in a male/female ratio of approximately 6:1. The Southeast stood out for the highest absolute num-

ber of deaths and a high average rate (2.05/100,000 inhabitants), although with more modest growth (APR = 0.53%). The South had the highest national average rate (2.22/100,000 inhabitants), but remained stable (APR

= 0.28%). The Northeast and North regions stood out for their growth rates, with APAs of 5.13% and 4.1%, respectively, even though they maintained lower average coefficients (1.37 and 0.72/100,000 inhabitants). Among

women, although mortality remained at much lower levels, there was an upward trend in all regions, particularly in the Northeast and North, which showed the greatest relative increase over the historical series (Figure 1B).

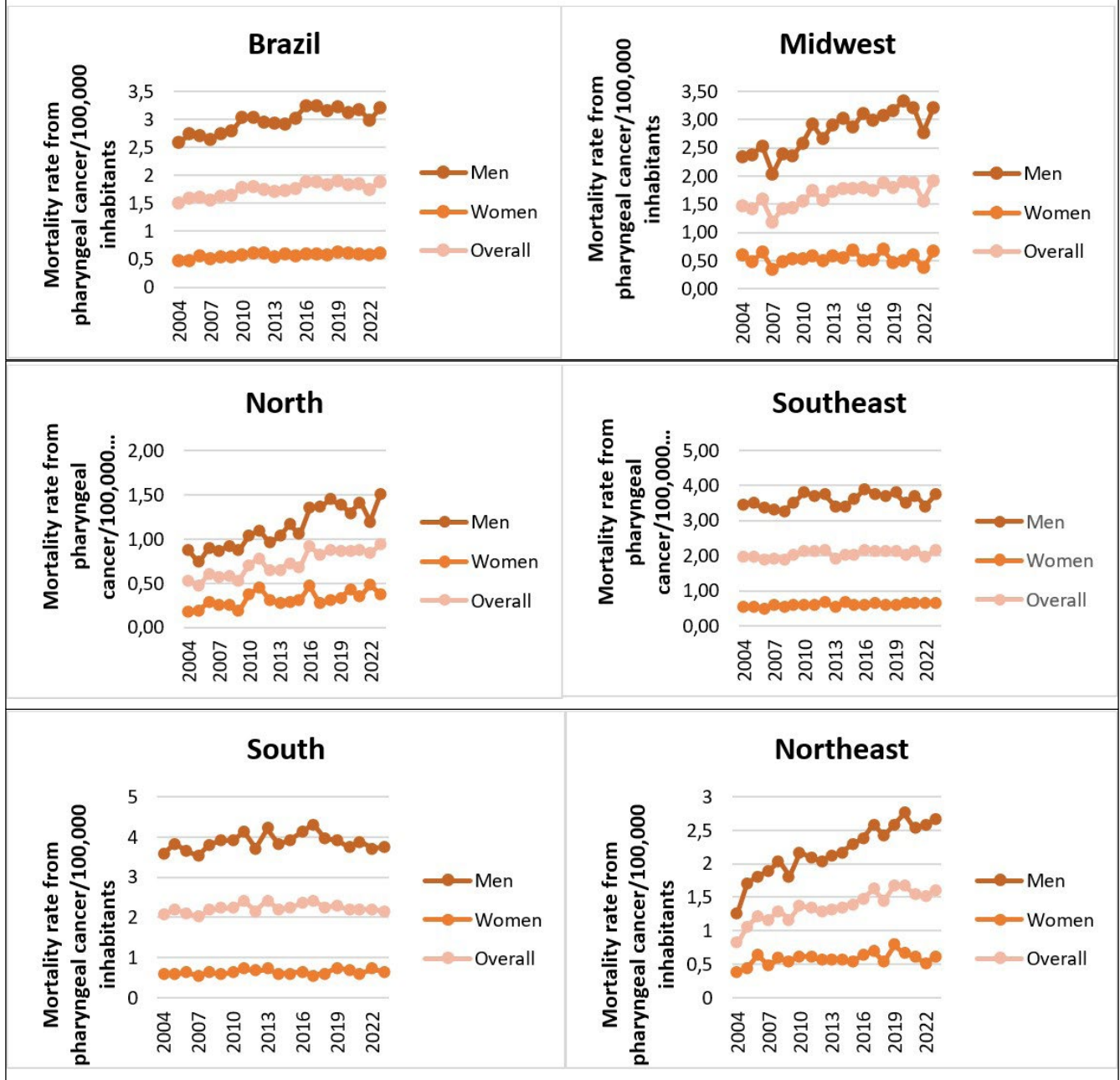
Figure 1 - Mortality rate from oral cancer (A) and pharyngeal cancer (B), by sex and region. Brazil, 2004-2023.



Original Article

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B. Pharyngeal Cancer



When broken down by anatomical site, the oropharynx (0.89/100,000) stood out as the main site of occurrence, accounting for 24.6% of recorded deaths, followed by other parts of the tongue (0.55/100,000) with 15.4%, and other parts of the mouth (0.54/100,000), with 14.9%. These three sites together accounted

for almost half of all deaths analyzed. The growth trend was consistent for most anatomical locations, including the base of the tongue, floor of the mouth, and major salivary glands. Some anatomical regions showed a reduction or stabilization in rates, such as the piriform sinus (APR = -0.7%) and other poorly defined lo-

cations (APR = -1.46), which showed a downward trend. The hypopharynx category (APR = -0.27) remained stationary (Table 2).

Stratification by age group showed progressive growth in mortality from the fifth decade of life onwards, with a substantial increase in older ages. This behavior was observed for both

oral and pharyngeal cancer, being more pronounced after the age of 60, which reinforces the strong asso-

ciation of these neoplasms with the aging process of the population and with exposure to risk factors, such as

smoking and alcoholism, throughout life (Figure 2).

Table 2. Number and percentage of deaths, average coefficient per 100,000 inhabitants, and trend in mortality rates for oral and pharyngeal cancer according to anatomical site. Brazil, 2004-2023.

CID-10	Deaths		Coeficiente médio	VPA*	IC95%*	Interpretação
	n	%				
Anatomical site						
C00 - Lip	1210	0,8	0,03	2,75	0,03-0,03	Crescent
C01 - Base of the tongue	9286	6,4	0,23	4,63	0,21-0,26	Growing
C02 - Other parts of the tongue	22204	15,4	0,55	3,59	0,50-0,60	Growing
C03 - Gums	883	0,6	0,02	2,56	0,02-0,02	Growing
C04 - Floor of the mouth	4394	3,0	0,11	5,06	0,10-0,12	Growing
C05 - Palate	5324	3,7	0,13	2,56	0,12-0,14	Growing
C06 - Other parts of the mouth	21537	14,9	0,54	0,82	0,53-0,55	Growing
C07 - Parotid gland	5172	3,6	0,13	3,84	0,12-0,14	Growing
C08 - Other glands	1751	1,2	0,04	7,44	0,04-0,05	Growing
C09 - Tonsils	3059	2,1	0,08	0,7	0,07-0,08	Growing
C10 - Oropharynx	35518	24,6	0,89	3,48	0,83-0,95	Growing
C11 - Nasopharynx	6243	4,3	0,16	2,78	0,15-0,16	Growing
C12 - Piriform sinus	1345	0,9	0,03	-0,7	0,03-0,04	Decreasing
C13 - Hypopharynx	8411	5,8	0,21	-0,27	0,20-0,22	Stationary
C14 - Other locations	18269	12,7	0,46	-1,46	0,44-0,48	Decreasing

Notas: Variação percentual anual; Intervalo de confiança do coeficiente médio.

Figure 2 - Mortality rate from oral (A) and pharyngeal (B) cancer, by age group. Brazil, 2004-2023.

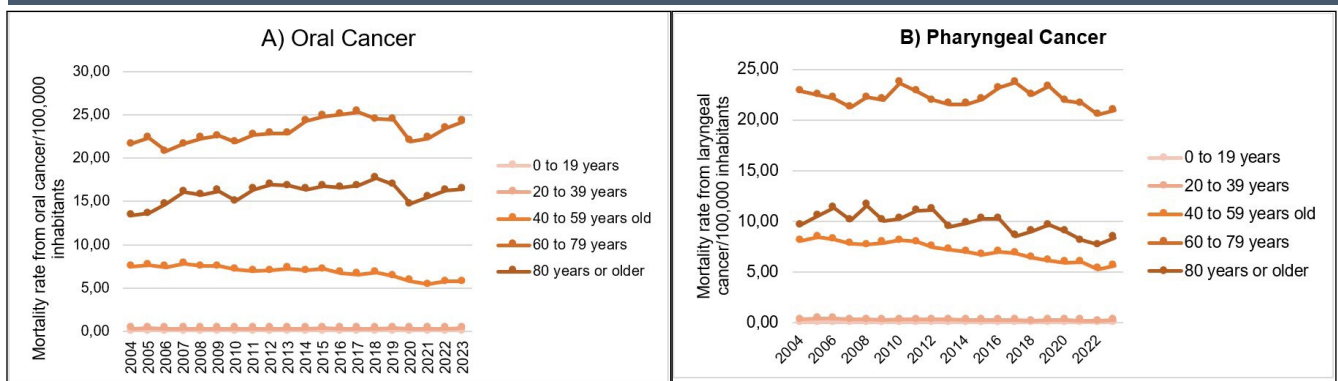


Figure 3 shows the distribution of average mortality rates for oral and pharyngeal cancer, according to Federal Units (UF) in the period from 2004 to 2023. States in the

Southeast and South regions had the highest average mortality coefficients, consolidating the historically higher pattern in these territories. With regard to oral cancer, the state

of Rio de Janeiro had the highest mortality rate (2.28/100,000), and with regard to pharyngeal cancer, Paraná had the highest mortality rate (2.39/100,000).

Figure 3 - Average mortality rate for oral and pharyngeal cancer (per 100,000 inhabitants) by state. Brazil, 2004-2023.



DISCUSSION

The results of this study reveal a worrying scenario of mortality from oral and pharyngeal cancer in Brazil over two decades. The upward trend observed for most regions and anatomical sites corroborates the growing global burden of head and neck neoplasms, driven by established and emerging risk factors⁸. The national upward trend, with an Annual Percentage Change (APC) of 2.77% for oral cancer and 1.32% for pharyngeal cancer, is in line with international trends, which point to a significant increase in the incidence and mortality from these cancers in middle- and low-income countries, in contrast to the stabilization or decline observed in many developed countries⁹. This phenomenon largely reflects difficulties in accessing health services, prevention programs, and early diagnosis¹⁰.

The regional heterogeneity observed is one of the most significant findings of this study. While the South and Southeast regions have the highest average mortality rates, the North and Northeast regions stand out for the most significant annual increases (VPA >5% for oral cancer). A similar study conducted by Parea et al. (2020) already pointed to a "delayed epidemic" in the less developed regions of Brazil, where classic risk factors, such as smoking and alcoholism, remain highly prevalent, and the incorporation of effective public policies is slower¹¹.

The male predominance of deaths is consistent with the global literature and is closely linked to greater historical and cultural exposure to the main risk factors^{12,13}. However, the growing trend identified in females, albeit starting from lower levels, is concerning. This phenomenon can be attributed to the higher prevalence of smoking and alcohol consumption among women in recent decades, in

addition to the potential role of HPV infection, which has a less asymmetrical distribution between genders. Data from INCA and national cohort studies already signaled this change in the epidemiological profile, requiring public health strategies that consider this new reality¹⁴.

Analysis by anatomical site showed the oropharynx as the site with the highest mortality, a finding that resonates with the ongoing etiological transition for head and neck cancers. The significant participation of Human Papillomavirus (HPV) infection, particularly for tonsil and base of tongue tumors, has altered the natural history of the disease. While tobacco- and alcohol-related cancers are slowly declining in some areas, HPV-related tumors, which often affect younger individuals with fewer comorbidities, are on the rise^{15,16}. This trend is well documented in North America and Europe, and data suggest that Brazil is following a similar path, although the traditional cofactor of smoking still exerts a strong influence¹⁷.

The stabilization of mortality from pharyngeal cancer in the South Region, contrasting with the increase in other regions, warrants reflection. This region has one of the highest Human Development Index (HDI) scores in the country and a relatively more consolidated health infrastructure. It is plausible that successful tobacco control interventions, awareness campaigns, and more timely access to diagnosis and treatment may be influencing this stabilization. This situation mirrors what is observed in high-income countries, where public policies have succeeded in curbing mortality from these cancers¹⁸.

The age gradient of mortality, with an increase from the age of 60 onwards, reinforces the strong association of these neoplasms with aging and the cumulative effect of exposure to carcinogens throughout life.

Interstate disparities in mortality,

particularly in Rio de Janeiro and Paraná, reinforce the pattern that the burden of these diseases is not uniform even within the same macro-region. These differences can be explained by a complex interaction between the distribution of risk factors, the availability of specialized services (such as head and neck surgery and radiotherapy), and the effectiveness of the cancer care network. The acceleration of rates in northern and northeastern states, such as Pará and Maranhão, highlights the urgency of regionalized health policies that take into account local specificities.

From a prevention standpoint, the results reinforce the need to strengthen tobacco and alcohol control policies, which remain central pillars¹⁹. At the same time, HPV vaccination, available in the National Immunization Program (PNI) for girls and boys, emerges as a promising tool to change the long-term trend of oropharyngeal cancers²⁰. Low vaccination coverage in some regions, however, poses a threat to its potential impact²¹.

Finally, the lethality of these neoplasms, reflected in mortality rates, is intrinsically linked to diagnosis in advanced stages^{4,8}. Despite advances in the SUS, barriers to access to primary care, investigation of suspicious lesions, and referral to specialized centers persist²². Strategies to train Primary Health Care (PHC) professionals in the recognition of precursor lesions, associated with public awareness campaigns, are essential to reverse this situation²³.

CONCLUSION

In conclusion, the analysis of two decades shows a growing and heterogeneous temporal trend in mortality from oral and pharyngeal cancer in Brazil, marked by profound regional disparities and an evolving demographic profile. While the South and Southeast regions have the highest

rates, the most rapid growth in the North and Northeast regions signals a geographical expansion of the disease burden, closely linked to socioeconomic inequalities and access to healthcare. The male predominance persists, but the upward trend among women and the centrality of the oro-

pharynx highlight the influence of emerging risk factors, such as HPV, coexisting with traditional ones, such as tobacco and alcohol.

This scenario therefore requires an urgent and multifaceted public health response that integrates the strengthening of tobacco and alcohol control

policies, the expansion of HPV vaccination coverage, the training of primary care providers for early diagnosis, and the guarantee of timely access to specialized treatments in order to reverse this upward trajectory and reduce health inequalities.

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