Temporal trend of Mortality by Oral Cancer and Coverage of Primary Attention in the State of Rio de Janeiro

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Tendência Temporal da Mortalidade por Câncer de Boca e da Cobertura de Atenção Primária no Estado do Rio de Janeiro

Tendencia Temporal de la Mortalidad por Cáncer Bucal y la Cobertura de Atención Primaria de Salud en el Estado de Río de Janeiro

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ABSTRACT

Introduction: Oral cancer is usually diagnosed late, compromising the individuals' quality of life or causing death. **Objective:** Check the time trend of mortality by oral cancer in the State of Rio de Janeiro and the coverage of the Family Health Strategy (FHS) and oral health teams (OHT). **Method:** Ecological study with analysis of the time trend of mortality by oral cancer, from 1999 to 2018 and the coverage of the FHS and OHT, in the period from 2002 to 2018 in the State and Health Regions. Generalized linear regression of Prais-Winsten to calculate trends for the state, each Health Region, sex, age group and tumor location was utilized. **Results:** Declining trends in mortality by oral cancer in the State and in the Regions *Metropolitana I* and *II*. In the other Health Regions, it was stationary. The trends of deaths in men, aged 40 to 59 years and 80 years or more were decreasing. In the location of the tumor, there was a decreasing trend among deaths in other and unspecified parts (C06) and a raising trend in mortality by cancer of the Tongue Base (C01). In the coverage of FHS and OHT in most Health Regions and in the State, the trend was rising. **Conclusion:** Declining trend in oral cancer mortality and the rising trend of FHS and OHT in the State of Rio de Janeiro was not observed for all Health Regions.

Key words: mouth neoplasms/mortality; time series studies.

RESUMO

Introdução: O câncer de boca é comumente diagnosticado de forma tardia, comprometendo a qualidade de vida dos indivíduos ou os levando a óbito. **Objetivo:** Verificar a tendência temporal da mortalidade por câncer de boca no Estado do Rio de Janeiro e da cobertura da Estratégia Saúde da Família (ESF) e de equipes de saúde bucal (ESB). **Método:** Estudo ecológico com análise da tendência temporal da mortalidade por câncer de boca, entre 1999 e 2018, e da cobertura da ESF e ESB, no período de 2002 a 2018, no Estado e Regiões de Saúde. Utilizou-se a regressão linear generalizada de Prais-Winsten no cálculo das tendências para o Estado, cada Região de Saúde, sexo, faixa etária e localização do tumor. **Resultados:** Houve tendência de mortalidade por câncer de boca decrescente no Estado e nas Regiões Metropolitana I e II; nas demais Regiões de Saúde, foi estacionária. As tendências dos óbitos em homens, das faixas etárias 40 a 59 anos e 80 anos ou mais, foram decrescentes. Na localização do tumor, houve tendência decrescente entre óbitos por outras partes e partes não especificadas (C06) e uma tendência crescente na mortalidade por câncer de base de língua (C01). Na cobertura de ESF e ESB, na maioria das Regiões de Saúde e no Estado, a tendência foi crescente. **Conclusão:** A tendência decrescente na mortalidade por câncer de boca e a tendência crescente de ESF e ESB, no Estado do Rio de Janeiro, não foram observadas em todas as Regiões de Saúde.

Palavras-chave: neoplasias bucais/mortalidade; estudos de séries temporais.

RESUMEN

Introducción: El cáncer de boca suele diagnosticarse de forma tardía, comprometiendo la calidad de vida de los individuos o llevándolos a la muerte. **Objetivo:** Verificar la tendencia temporal de mortalidad por cáncer bucal en el Estado de Río de Janeiro y la cobertura de la Estrategia de Salud de la Familia (ESF) y los equipos de salud bucal (ESB). **Método:** Estudio ecológico con análisis de la tendencia temporal de mortalidad por cáncer bucal, entre 1999 y 2018 y la cobertura de ESF y ESB, en el período de 2002 a 2018, en el Estado y Regiones de Salud. Regresión lineal generalizada de Prais-Winsten en el cálculo de tendencias para el Estado, cada región sanitaria, sexo, grupo de edad y ubicación del tumor. **Resultados:** Tendencia decreciente de la mortalidad por cáncer bucal en el Estado y Metropolitano I y II. En las demás Regiones Sanitarias, fue estacionario. Las tendencias de muertes en hombres, de 40 a 59 años y 80 años o más, estaban disminuyendo. En la localización del tumor, hubo una tendencia decreciente entre las muertes por otras partes y partes no especificadas (C06) y una tendencia creciente en la mortalidad por cáncer de Base de la Lengua (C01). En la cobertura de la ESF y ESB en la mayoría de Regiones Sanitarias y en el Estado, la tendencia fue en aumento. **Conclusión:** Tendencia decreciente de mortalidad por cáncer bucal y tendencia creciente de ESF y ESB en Estado de Río de Janeiro no se observó en todas Regiones Sanitarias.

Palabras clave: neoplasias de la boca/mortalidad; estudios de series temporales.

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INTRODUCTION

Oral cancer is challenging to health services. Even if the anatomic area is easily accessible and visualized, the reduction of incidence and mortality has been a tough task for health managers, professionals and the general population. Of silent onset, without painful symptomatology, oral neoplastic lesions go unnoticed for a while[1], leading to late diagnosis which compromises the quality-of-life of the individuals or death[2].

Oral malignant neoplasms are more common in older than 40 years male smokers, occasionally alcoholics, low income and low education[3-5]. Traditionally, this population profile does not use health services and a good portion of risks factors are the target of initiatives of Family Health Strategy[6] (FHS).

The national proposal to reorganize primary attention in Brazil through FHS started in 1990[7], but only in 2000 oral health was included in family health by a ministerial ordinance as long as each oral health team (OHT) worked in association with two family health teams[8]. In 2003[9] the restricted access to public health was exposed systematically in a great national epidemiological investigation, revealing a chaotic scenario, mainly in the adult population.

Although the reduction of the mortality rate by oral cancer cannot be explained exclusively by the access to health services – even because the actual use of these services is impacted by aspects related to the individual as sex, age, education and income[10] – it is unquestionable the importance of a health attention network able to coordinate what type of care is provided[11].

The state of Rio de Janeiro has 92 municipalities and nine Health Regions with important differences regarding FHS coverage and oral health. Although the State has increased the number of OHT in primary attention, oral health coverage in FHS was low, 26% in 2018[12].

The continuous investigation of the variation of oral cancer mortality rate is a required monitoring strategy of health planning which allows to put into perspective the event in each period analyzed, further to the possibility of anticipating the behavior of the variable of interest, whereas the current scenario is kept[13]. Likewise, monitor the coverage of FHS and OHT to evaluate the actual growth of the primary attention of the State allows to design the organization of primary attention to control oral cancer.

The objective of the present study was to investigate the temporal trend of mortality by oral cancer in the State of Rio de Janeiro and the trend of the coverage of FHS and OHT.

METHOD

Ecological study about oral cancer mortality in the State of Rio de Janeiro and Health Regions from 1999 to 2018 was carried out and the coverage of FHS and OHT in the State from 2002 to 2018.

The first year of the investigation about mortality was one year before the Ministerial Ordinance[8] which determined the inclusion of FHS and OHT and the last year when the information about the beginning of the study became unavailable. In addition, the beginning of the coverage of FHS considered the first year with data available for all the months and the last year with mortality rates was the ending year.

According to ICD-10, the basic cause of death selected were: lip (C00), base of the tongue (C01), tongue (C02), gum (C03), floor of the mouth (C04), palate (C05), other parts and unspecified parts (C06). Although tumors of the base of the tongue are located in the oropharynx, it was followed the grouping utilized by the International Agency for Research on Cancer (IARC) whose mortality statistics and incidence is called GLOBOCAN 2020[15] and include this topography as malignant tumor of the oral cavity to allow comparison with future studies that come to use the same reference.

The rates of mortality adjusted by the Brazilian population of 2010 were obtained from the Mortality Online Atlas[16] available at the website of the National Cancer Institute (INCA) for the State of Rio de Janeiro and for each Health Regions and also by sex, age-range and basic cause of death.

The deaths by oral cancer of the residing population were categorized in age-ranges from 20 to 39 years, 40 to 59 years, 60 to 79 years and 80 years or older. Deaths below 20 years are rare harms and were not included in the study.

The FHS and OHT of the State of Rio de Janeiro were collected from the website of "*Sala de Apoio à Gestão Estratégica do Ministério da Saúde* (Sage)"[12].

The Prais-Winsten generalized linear regression model was the method of choice to analyze the temporal trend of death by oral cancer and coverage of FHS and OHT proposed by Antunes and Waldman[17]. The simple linear regression should not be utilized in time series analyzes because of the serial autocorrelation explained as a correlation between the results of an observation of one time period and the same observation one time before[13].

The Durbin-Watson statistics was used to detect the presence of autocorrelation obtained from the Prais-Winsten regression. Results close to two indicate absence of autocorrelation[13].

The mortality rate adjusted for the period 1999 to 2018 for the State of Rio de Janeiro and Health Regions and the coverage of family health and of FHS and OHT from 2002 to 2018 were the dependent variable. The independent variables were the years of the time series.

According to Antunes[18], the mortality rates and the coverages should be subject to log transformation to reduce the heterogeneity of the variance of the results of the regression analysis.

The annual growth rates and of the coverages and respective confidence intervals were obtained from the formulas:

$$\text{Annual growth rate} = -1 + 10^{b}$$
$$\text{CI 95\%} = -1+10^{(b \pm t(0.05;n-1)x\ EP)}$$

The regression coefficient of beta and the standard error of the estimate beta were obtained from Prais-Winsten regression and the value of *t* through the bicaudal Student's t distribution with level of significance of 5%, considering the number of years of the series-1[18].

The time series is interpreted by the observation of the confidence interval, when the interval contains zero, the trend will be stable; otherwise, it will be increasing when the growth rate is positive or decreasing when negative[19].

The software R Project for Statistical Computing[20] version 3.5.3 with calculation in Excel was adopted to analyze the data.

In compliance with Ordinances 466/2012[21] and 510/2016[22] the approval by the Institutional Review Board was waived since no human subjects were identified and only public data were utilized.

RESULTS

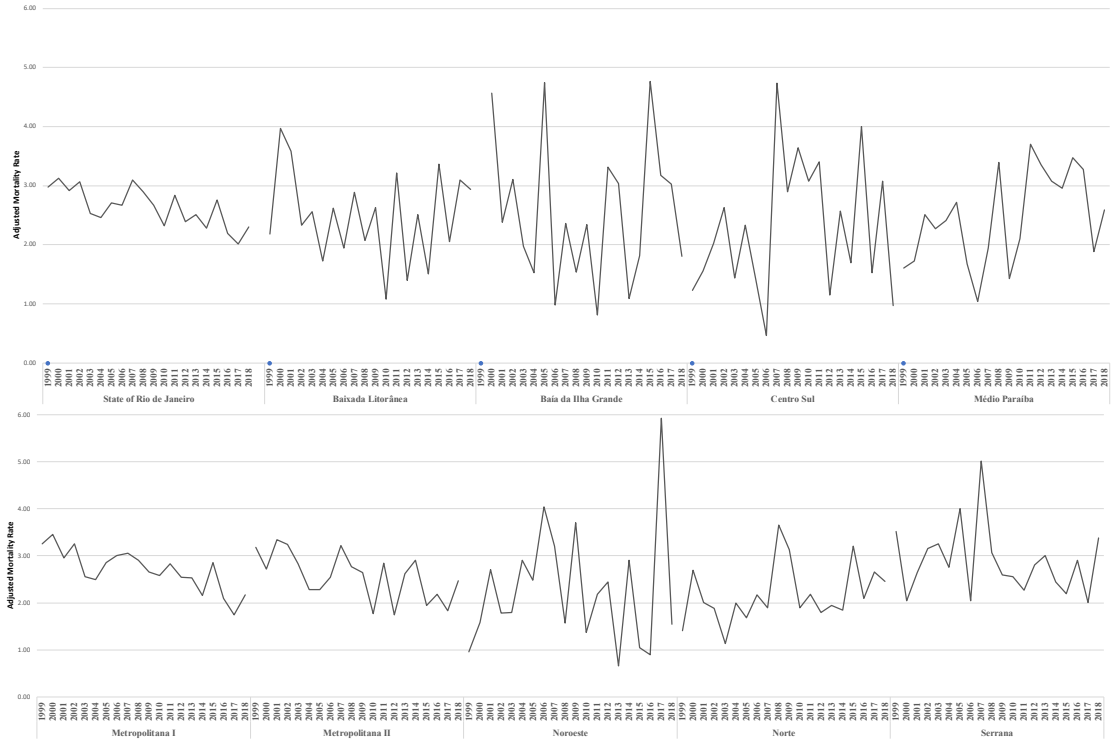
During 20 years for all Health Regions the distribution of mortality rates by oral cancer from 1999 to 2018 presented variation (Graph 1).

OHT coverage was below the coverage of FHT (Graph 2) in all Health Regions (Graph 3) during the period analyzed. Regions *Metropolitana I*, where the difference between the coverages increased since 2010 and *Metropolitana II* where the difference was kept high during the 17 years of the series stand out.

A declining trend of 1.54%/year of the mortality rate by oral cancer from 1999 to 2018 was found in the State of Rio de Janeiro, but this trend was not detected for all the State's Health Regions (Table 1).

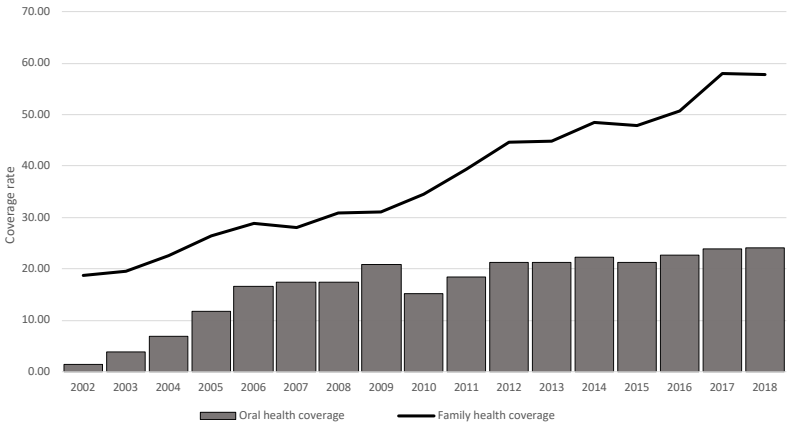
Of the nine Health Regions of the State of Rio de Janeiro, only two presented significant decline of the mortality rate: *Metropolitanas I* and *II*, with annual reduction of 2.20% and 1.98% respectively. For the other regions, there was no change in the trend of the mortality rates by oral cancer which kept stable (Table 1).

The mortality rate declined 1.65% from 1999 to 2018 in males but in women, no change of the trend of



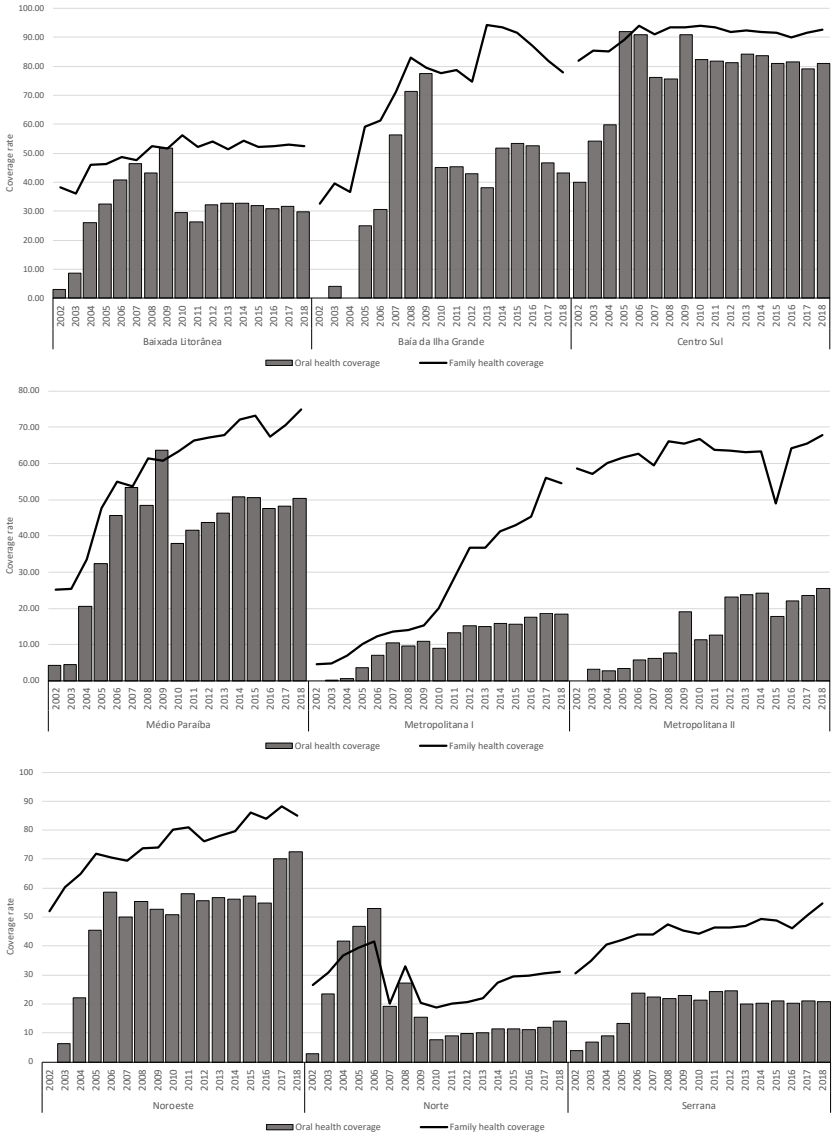
Graph 1. Distribution of mortality rate by oral cancer. State of Rio de Janeiro and Health Regions, 1999-2018

Source: Mortality Online Atlas[16].



Graph 2. Coverage of family health and oral health. State of Rio de Janeiro, 2002-2018

Source: Sage[12].



Graph 3. Coverage of family health and oral health. Health Regions of the State of Rio de Janeiro, 2002-2018

Source: Sage[12].

mortality was encountered. Increasing trend of 3%/year was found in the mortality rate for the age range from 40 to 59 years and of 1.09%/year for 80 years or more. The trend was stable for other age-ranges (Table 1).

For tumors of the base of the tongue, increasing trend of mortality rate of 2.32%/year was detected in the period. Deaths by tumors of unspecified parts of the mouth presented declining trend of 5.27%/year. For other causes of death, the mortality rates remained stable (Table 1).

In the State of Rio de Janeiro, increasing trend of 7.33%/year was found for family health coverage and for oral health coverage, 18.21%/year from 2002 to 2018. For most of the Health Regions, increasing trend was encountered both for family health coverage and oral health coverage, standing out the *Metropolitana I* Region with growth of 17.09% and 36.64%, respectively (Table 2).

Region *Norte* presented stable trend for both coverages. The Regions *Baixada Litorânea* and *Metropolitana II* presented different trends for both coverages. At *Baixada Litorânea*, the trend of family health coverage was increasing and stable for oral health; at *Metropolitana II*, the trend for family health was stable and increasing for oral health coverage (Table 2).

DISCUSSION

The analysis of the trend of mortality rate in a 20-years period showed that the reduction of the rate was not

Table 1. Trend of mortality rate by oral cancer and annual percent change rate, according to place of residence, sex, age and location of the tumor. Rio de Janeiro, 1999-2018

Variables Local of residence (State and Health Regions)	Annual Percent Change – CI (95%)	p-value	Trend
State of Rio de Janeiro	**-1.54 (-2.21; -0.86)**	**0.000**	**Decreasing**
Baía de Ilha Grande	-0.13 (-3.82; 3.70)	0.944	Stable
Baixada Litorânea	-0.89 (-2.76; 1.01)	0.336	Stable
Centro-Sul	1.55 (-2.27; 5.52)	0.413	Stable
Médio Paraíba	2.53 (-0.49; 5.65)	0.098	Stable
Metropolitana I	-2.20 (-3.06; -1.34)	0.000	Decreasing
Metropolitana II	-1.98 (-3.04; -0.82)	0.001	Decreasing
Noroeste	-0.53 (-4.17; 3.25)	0.768	Stable
Norte	1.78 (-0.36; 3.97)	0.100	Stable
Serrana	-0.87 (-2.16; 0.44)	0.180	Stable
Sex			
Female	-1.18 (-2.46; 0.13)	0.075	Stable
Male	-1.65 (-2.34; -0.96)	0.000	Decreasing
Age range			
20 to 39 years	0.58 (-1.27; 2.45)	0.524	Stable
40 to 59 years	-2.96 (-4.24; -1.66)	0.000	Decreasing
60 to 79 years	-0.53 (-1.45; 0.41)	0.253	Stable
80 years or more	-1.09 (-2.04; -0.13)	0.028	Decreasing
Location of the tumor			
Lip	-1.90 (-5.68; 2.03)	0.320	Stable
Base of the tongue	2.32 (0.43; 4.24)	0.019	Increasing
Tongue	1.03 (-0.89; 2.99)	0.278	Stable
Gingiva	5.37 (-0.79; 11.91)	0.087	Stable
Floor of the tongue	3.34 (-4.54; 11.87)	0.398	Stable
Palate	0.90 (-1.54; 3.39)	0.454	Stable
Other unspecified parts	-5.27 (-6.17; -4.36)	0.000	Decreasing

Source: Mortality On-line Atlas[16].
Caption: CI = Confidence Interval.

Table 2. Trend of family health coverage, oral health coverage and annual percent change according to residence. Rio de Janeiro, 2002-2018

Coverage of family health			
Local of residence	**Annual percent change CI 95%**	**p-value**	**Trend**
State of Rio de Janeiro	**7.33 (6.41; 8.26)**	**<0.001**	**Increasing**
Baía de Ilha Grande	5.53 (1.54; 9.68)	0.010	Increasing
Baixada Litorânea	1.86 (0.57; 3.17)	0.008	Increasing
Centro-Sul	0.63 (0.01; 1.25)	0.047	Increasing
Médio Paraíba	6.88 (2.79; 11.13)	0.003	Increasing
Metropolitana I	17.09 (13.37; 20.93)	<0.001	Increasing
Metropolitana II	0.38 (-0.49; 1.25)	0.375	Stable
Noroeste	2.61 (1.73; 3.49)	<0.001	Increasing
Norte	-0.52 (-4.20; 3.31)	0.775	Stable
Serrana	2.98 (1.61; 4.37)	<0.001	Increasing
Coverage of oral health			
Local of residence	**Annual growth rate CI 95%**	**p-value**	**Trend**
State of Rio de Janeiro	**18.21 (4.80; 33.34)**	**0.010**	**Increasing**
Baía de Ilha Grande	22.10 (0.45; 48.42)	0.049	Increasing
Baixada Litorânea	13.72 (-1.91; 31.84)	0.085	Stable
Centro-Sul	3.18 (0.07; 6.38)	0.047	Increasing
Médio Paraíba	14.87 (1.54; 29.96)	0.031	Increasing
Metropolitana I	36.64 (8.30; 72.41)	0.013	Increasing
Metropolitana II	16.40 (10.24; 22.91)	<0.001	Increasing
Noroeste	11.83 (2.94; 21.48)	0.013	Increasing
Norte	-1.34 (-11.03; 9.41)	0.786	Stable
Serrana	10.51 (0.85; 21.09)	0.035	Increasing

Source: Sage[12].
Caption: CI = Confidence Interval.

significant in the State of Rio de Janeiro: 1.54%/year. Although most of the Health Regions presented stable trend, in the Regions *Metropolitana I* and *II* the trend was declining where more than 70% of the State population live[23].

The decreasing trend of 2% of deaths by oral cancer in males although low is an important outcome, because, in average, males present mortality rates higher than women[2] and tend to use less health services[24], which makes early diagnosis of suspicious lesions, difficult. And even if the trend of deaths in women was not relevant, the growth rate was negative, a potential decrease.

The variation of mortality rate along the years is typically analyzed in studies of head and neck cancer[25-29] to discuss hypotheses about population group differences, gaps in care offered to the patients or monitoring of control actions of the disease[28].

Antunes et al.[25], in a 2003-2009 time series of deaths by oral cancer in the capital of São Paulo with separate analysis of deaths in tongue (C02) and unspecified parts of the mouth (C06) of the group of malignant tumors of the mouth found an increasing trend of the mortality rate in women and stable for males, similar to the time variation of deaths by tongue cancer. However, trends of deaths by malignant neoplasms of unspecified parts of the mouth was stable for women and decreasing for males.

Perea et al.[27] included salivary glands in the group of oral cancer in their analysis between 2002 and 2013 and found a decrease by these neoplasms in the Region *Sudeste*; for the whole country, nevertheless, these rates were stable. On the other hand, Cunha et al.[29] while analyzing the mortality by oral and oropharynx cancer from 2000 to 2013 in Brazil concluded that there was an increase of 1.5%/year of the rate by cancer of the base of the tongue, in concurrence with the trend the present study found in the State of Rio de Janeiro with an increase of 2.60%/year

of the deaths by malignant neoplasms of the base of the tongue from 1999 to 2018.

Bonfante et al.[30], while investigating the survival of oral cancer in Brazil from 2000 to 2006 concluded that the tumors of the tongue, base and floor of the mouth were associated with lower survival. Bezerra et al.[31] found that tumors of the base of the tongue were associated with advanced stage and, in fact this is one of the least favorable locations for early diagnosis as compared with other oral locations as the authors discussed. This specificity should be weighed by always asking the patients if they noticed changes or have difficulties of deglutition.

The reduction of oral cancer mortality requires a health network capable of offering early diagnosis, immediate beginning of oncologic treatment and that the population is aware about the main signs and symptoms of the disease and the importance of not delaying the search for health services. Rath et al.[32] ratified this hypothesis when they concluded that in patients with oral cancer the main reason to seek treatment was the escalation of the symptom and the main barrier was poor awareness of the severity, in addition to the expectation that the lesion would cure by itself.

FHS capillarity and the specific activity the teams develop[33] favor the spread of information about risk factors and main signs and symptoms of oral cancer, strengthening the reach of prevention and early diagnosis initiatives[34]. The expansion of the family health teams is quite important and should be encouraged permanently.

Likewise, the increase of OHT allows professionals to join the routine of family health teams, bringing questions of interest of oral cavity care and harms and pursuing to share with other health professionals and the population making them agents of prevention and early diagnosis of oral cancer. Oral cancer control depends on the access to quality oral health[6,34].

Rocha et al.[34] found association among the rates of mortality and oral health care in primary attention, with better coverage of FHS and low mortality rates by oral cancer.

The Guidelines of the National Policy of Oral Health ensured an important advance for that question in Brazil. For the first time, the country counted with norms for the organization of the public oral health policy[36-38]. However, in 2018 there was low coverage by OHT (26%)[12].

Scarparo et al.[39] analyzed the evolution of public oral health in the State of Rio de Janeiro post PNSB until 2010 and concluded that in this period there was an important increase in the number of municipalities with OHT in FHS reaching nearly 80% of the State's municipalities. However, despite this 6-years rise, the state coverage was low in 2010.

Although the analysis about the actual increase of the access to oral health cannot be done by the direct interpretation of populational coverage as clearly pointed out by Frazão and Narvai[40] − the calculation of the oral health coverage is based in the potential demand anticipated for each team and not in the actual demand for the service −, the coverage of oral health is an important indicator to evaluate and monitor the commitment of the municipal manager with the oral health of its constituents, allowing to follow up fluctuations and contextualize against political and economic settings[38,41].

The analysis of the times series on family and oral health coverage of the present study revealed that the annual growth rate of the Health Regions with increasing trend of family health coverage was lower than 10%/year, except *Metropolitana I* from 2002 to 2018. The annual percent change of the Regions with increasing trend of oral health coverage ranged between 11% and 37%. However, even if the increase of oral health coverage has been higher than family health coverage, the first is still behind the whole State.

Analyzing the annual oral health coverage of the Health Regions, the growth percent rates of the Regions *Centro-Sul* (318%) and *Metropolitana I* (36.64%) stand out. However, these two Regions in 2018 had the highest (81%) and the second lowest oral health coverage (18%), respectively[12]. In addition, considering that *Metropolitana I* concentrates nearly 60% of the State population, it is evident the long-term gap of oral health coverage, despite the annual growth between 2002 and 2018.

In Brazil, oral cancer is similar to other diseases whose diagnosis and treatment are compromised by the difficulty of access to public oral health services[37]. Primary prevention actions which are aimed to tackle with the main risk factors and secondary prevention to early detection of the lesions are able to impact the incidence and mortality by malignant neoplasms of the lip and oral cavity. It is essential to ensure access, mainly to primary attention because the action of the teams in the region favors an improved approach to the population and is independent from seeking the health clinic.

Analyzes of the trend of mortality by oral cancer should be encouraged to follow up the impact of the organization of the network because it is a cancer that is receptive for prevention and early detection. Stable or increasing trend indicates difficulty in ensuring that tumors are treated from the onset and the construction of a line of care for oral cancer control requires public health attention capable of identifying timely the suspicious lesions, diagnostic confirmation and oncologic treatment.

There are few studies about oral cancer investigating the same anatomic sites the current study has analyzed,

mainly in the State of Rio de Janeiro and despite being an important methodologic approach, it narrows comparability.

The current study has limitations inherent to secondary data-based studies which is the quality of the data available although solid databases of the National Health System (SUS) have been utilized. In addition, results can be influenced due to deaths sub-notification and errors of updating the number of family health and oral health teams.

CONCLUSION

The trend of oral cancer mortality increased from 1999 to 2018 in the State of Rio de Janeiro which was not found in all health regions. The coverage of family health and oral health also increased between 2002 and 2018 but not for all health regions.

CONTRIBUTIONS

All the authors contributed substantially to the study design, acquisition, analysis and interpretation of the data, wording and critical review. They approved the final version published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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