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Gender and racial inequalities in trends of oral cancer mortality in Sao Paulo, Brazil

Desigualdades de gênero e raça na tendência de mortalidade por câncer de boca em São Paulo, Brasil

ABSTRACT

OBJECTIVE: To analyse recent trends in oral cancer mortality, focusing specifically on differences concerning gender and race.

METHODS: Official information on deaths and population in the city of Sao Paulo, 2003 to 2009, were used to estimate mortality rates from oral cancer (C00 to C10, International Classification of Diseases, 10th Revision), adjusted for age and stratified by gender (females and males) and race (blacks and whites). The Prais-Winsten auto-regression procedure was used to analyse the time series.

RESULTS: During the study period, 8,505 individuals living in the city of Sao Paulo died of oral cancer. Rates increased for females (rate of yearly increase = 4.4%, 95%CI 1.4;7.5), and levelled off for men, which represents an inversion of previous trends among genders in the city. Increases were identified for blacks, with a high rate of yearly increase of 9.1% (95%CI 5.5;12.9), and levelled off for whites. Oral cancer mortality in blacks almost doubled during the study period, and surpassed mortality in whites for almost all categories.

CONCLUSIONS: Mortality presented a higher increase among women than in men, and it doubled among backs. The surveillance of trends of oral cancer mortality across gender and racial groups may contribute to implementing socially appropriate health policies, which concurrently reduce the burden of disease and the attenuation of unfair, avoidable and unnecessary inequalities in health.

DESCRIPTORS: Mouth Neoplasms, mortality. Gender and Health. Ethnicity and Health. Health Inequalities.

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RESUMO

OBJETIVO: Analisar tendências recentes da mortalidade por câncer de boca, focalizando diferenças quanto a sexo e raça.

MÉTODOS: Foram utilizados dados oficiais de população e mortalidade na cidade de São Paulo entre 2003 e 2009 para estimar coeficientes de mortalidade por câncer de boca (C00-C10, Classificação Internacional de Doenças, 10ª Revisão), com ajuste por idade e estratificação por sexo (feminino e masculino) e cor (negros e brancos). Para cálculo de tendências foi utilizado o procedimento de Prais-Winsten de autorregressão para análise de séries temporais.

RESULTADOS: No período de estudo, 8.505 indivíduos residentes na cidade morreram de câncer de boca. Os coeficientes apresentaram tendência crescente para mulheres (taxa de crescimento anual = 4,4%, IC95% 1,4;7,5) e estacionária para homens, representando inversão das tendências anteriores entre os sexos, na cidade. Identificou-se tendência crescente para negros, com elevada taxa de aumento anual (9,1%, IC95% 5,5;12,9), e tendência estacionária para brancos. A mortalidade por câncer de boca em negros quase dobrou durante o período e ultrapassou a mortalidade em brancos para quase todas as categorias.

CONCLUSÕES: A mortalidade entre mulheres aumentou mais do que entre homens e duplicou entre negros. A vigilância de tendências da mortalidade por câncer de boca entre os estratos de sexo e cor pode contribuir para programas de saúde que reduzam a carga de doença e atenuem diferenças em saúde que são injustas, evitáveis e desnecessárias.

DESCRITORES: Neoplasias Bucais, mortalidade. Gênero e Saúde. Origem Étnica e Saúde. Desigualdades em Saúde.

INTRODUCTION

Oral cancer is a generic term that encompasses epithelial malignancies originating from any part of the mouth or the oropharynx. Almost all of these tumours are squamous cell carcinoma. Despite the important role played by genetic factors in carcinogenesis, oral cancer is overwhelmingly influenced by environmental and behavioural risk factors,[6] tobacco and alcohol consumption being the most relevant in order to explain its occurrence.[13] Existing evidence allows it to be estimated that more than 70% of cases might have been avoided by lifestyle changes, including diet, smoking and drinking habits.[26] These behaviours, in conjunction with viral infection and occupational and environmental exposures, account for a major proportion of these tumours.[13] Examples include long term exposure to sunshine, which has been acknowledged as being associated with a higher risk of lower lip cancer as well as HPV infection, which has been attributed as a factor for oropharyngeal cancer, especially among young adults.[6,13]

A large variation in incidence has been reported for oral cancer worldwide, particularly in developing countries. The incidence of oral cancer among males in Brazil (nearly 11 per 100,000) was estimated to be the third highest worldwide, after France and India.[30] The burden of this disease is higher in the Southeast of Brazil, with the State of Sao Paulo accounting for an estimated 31.26% of new cases.[a] Furthermore, the city of Sao Paulo has the highest mortality rates from oral cancer in the country.[9,11] During the last decade, the average mortality rate in the city was 3.2 per 100,000; this number was ten times higher when only males aged 60 or over were considered.[9]

Variation in oral cancer incidence mostly reflects differences in cumulative exposure to the abovementioned risk factors. Variation in oral cancer mortality reflects the influence of some additional factors, such as heterogeneous unequal access to health care and early diagnosis,[4,27] patients' comorbidities and the risk of competitive causes of death.

The highest prevalence of smoking in Brazil was detected in the South and Southeast regions, the most populous and developed portion of the country, where the city of Sao Paulo is located. Cancer register data

[a] Ministério da Saúde, Secretaria de Atenção à Saúde, Instituto Nacional de Câncer, Coordenação de Prevenção e Vigilância. Estimativa 2012: incidência de câncer no Brasil. Rio de Janeiro: INCA; 2011.

shows that in Porto Alegre, Southern Brazil, between 2000 and 2004, 670 new cases occurred (ICD C00 to C10); and in Sao Paulo, between 2000 and 2005, for the same anatomic regions, 6,839 new cases were registered.[b] Unsurprisingly, these two regions present the highest incidence of tumours that are closely related to tobacco consumption (oral, oesophagus and lung). In Sao Paulo, the prevalence of smoking among women increased until the late 1980s, and decreased thereafter, but at a lower rate than that observed among men.[32] However, the previous increase of smoking prevalence among women may have continued to contribute to unfavourable cancer statistics in the long run. Indeed, an increasing mortality trend from lung cancer, another tobacco-related disease, was reported for women living in the city, from 1995 to 2003, whereas the trend was stationary for men.[5]

To our knowledge, no previous study assessed racial differences for oral cancer mortality at the population level in the city of Sao Paulo. The black population is mostly concentrated in the poorer peripheral areas of the city, whereas the more affluent central portion of the city is mainly populated by whites.[c] The proportion of black inhabitants was inversely correlated with the human development index[c] (-0.813) in the city's districts. The association between oral cancer statistics and socioeconomic inequalities had already been reported in Sao Paulo, taking into consideration the area level distribution of both characteristics.[2]

This study aimed to assess recent trends in oral cancer mortality in Sao Paulo, Southeastern Brazil, focusing on gender and racial differences.

METHODS

With more than 10 million inhabitants, Sao Paulo is the largest city in South America, and one of the largest metropolises worldwide. The city population was historically composed of y immigration by settlers from European countries, mainly Portugal, Spain and Italy, and by the forced immigration of slaves from African countries. According to official demographic information, whites account for more than two thirds (67%) of the city population, and blacks account for 30%. The remaining population comprises individuals from Asian (mostly Japanese) descent and a few indigenous descendants. Racial miscegenation is a prominent characteristic of the Brazilian population, and light-skinned blacks (nearly 85% of blacks in the city) markedly prevail in the black population.

Data on deaths occurring in the city were obtained from death certificates, which are systematically gathered by the official system of information on mortality. This information allowed the stratification of deaths by gender, age, race, year, place of residence and underlying cause. The study period is from 2003 to 2009, and all deaths of individuals living in the city were considered eligible for the study, irrespective of the place in which death occurred.

Inclusion criteria refer to deaths by oral cancer, as defined by the codes C00 to C10 of the International Classification of Diseases, 10th revision. Deaths were classified into five categories, according to the anatomic localization of the tumour: tongue, oropharynx (including the tonsils), salivary glands, oral cavity (lips, gum, palate, floor of the mouth, retromolar area, vestibule of the mouth and cheek mucosa), and unspecified parts of the mouth. The assessment of mortality considered each category separately and the overall assessment of oral (mouth and oropharynx) cancer.

The census performed in 2000 and the population count performed in 2007 allowed intercensal data, stratified by gender (females, males) and by racial groups (blacks, whites), could be assessed. These intercensal estimates were used to calculate yearly death rates according to gender and race. Gender-specific death rates were adjusted for age, and race-specific death rates were adjusted for gender and age. The adjustment of rates used the direct method, with the age distribution of the world standard population.[d] The resulting figures were expressed in terms of 100,000 inhabitants.

Information on race or skin colour was generated by two different methodologies. In death certificates, the physician that declares the cause of death is responsible for informing the race of the deceased (hetero-classification) as white, brown, black, yellow or indigenous. In the censuses, individuals are asked to report their own race (self-reported classification), from the same pre-selected five options.

The magnitudes and trends of death rates were assessed and compared between genders and between racial groups. Race was classified in two categories, blacks and whites. For operational reasons (sparse strata would not produce a sufficiently large number of deaths to allow disaggregated analyses), one single category included brown and black individuals, and yellows and indigenous were not considered in the assessment of race.

Trend estimation used the Prais-Winsten procedure of auto-regression in the analysis of time series,[3] which

[b] Ministério da Saúde, Secretaria de Atenção à Saúde, Instituto Nacional de Câncer, Coordenação de Prevenção e Vigilância. Câncer no Brasil: dados dos registros de base populacional. Rio de Janeiro: INCA; 2010. v.4.
[c] Prefeitura do Município de São Paulo, Secretaria do Desenvolvimento, Trabalho e Solidariedade. Desigualdade em São Paulo: o IDH. São Paulo; 2004.
[d] Ahmad OE, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. Age standardization of rates: a new WHO standard. Geneva: World Health Organization; 2001. (Global Program on Evidence Discussion Paper Series, 31).

corrects first-order temporal autocorrelation of residues. The outcome of this analysis is the rate of yearly increase, which is equivalent to the annual percent change that may be obtained by a Joinpoint analysis assessing only one trend for the period. The relatively short study period (eight years: from 2003 to 2009) meant that it was not possible to assess more than one trend for each category.

Statistical analysis used the Stata 11.0 software, 2009.

RESULTS

From 2003 to 2009, 8,505 individuals living in the city of Sao Paulo died of oral cancer. This figure includes 1,483 women and 7,022 men; three indigenous, 66 yellow, 1,127 brown, 524 black, 6,477 white, and 308 (corresponding to 3.6% of deaths) individuals without information on race in their death certificate. Figures 1 and 2 illustrate the overall and site-specific assessment of oral cancer mortality rates according to gender and racial groups. Mortality ranked higher in magnitude for men than for women in all comparisons throughout the study period. Mortality also ranked higher for whites than for blacks in all comparisons during the earlier years of the current assessment. However, blacks surpassed whites in mortality in almost all comparisons for the final years of the assessment.

Oral cancer mortality is on the increase for women and for blacks in the city, whereas stationary trends were observed for their counterparts (men and whites). Among women, the overall mortality from oral cancer increased at a yearly rate of 4.4% (95%CI 1.4;7.5). The overall mortality from oral cancer increased at a yearly rate of 9.1% (95%CI 5.5;12.9) for blacks. At this ratio, mortality almost doubled during the 2003-2009 study period among blacks, whereas rates remained almost the same among whites.

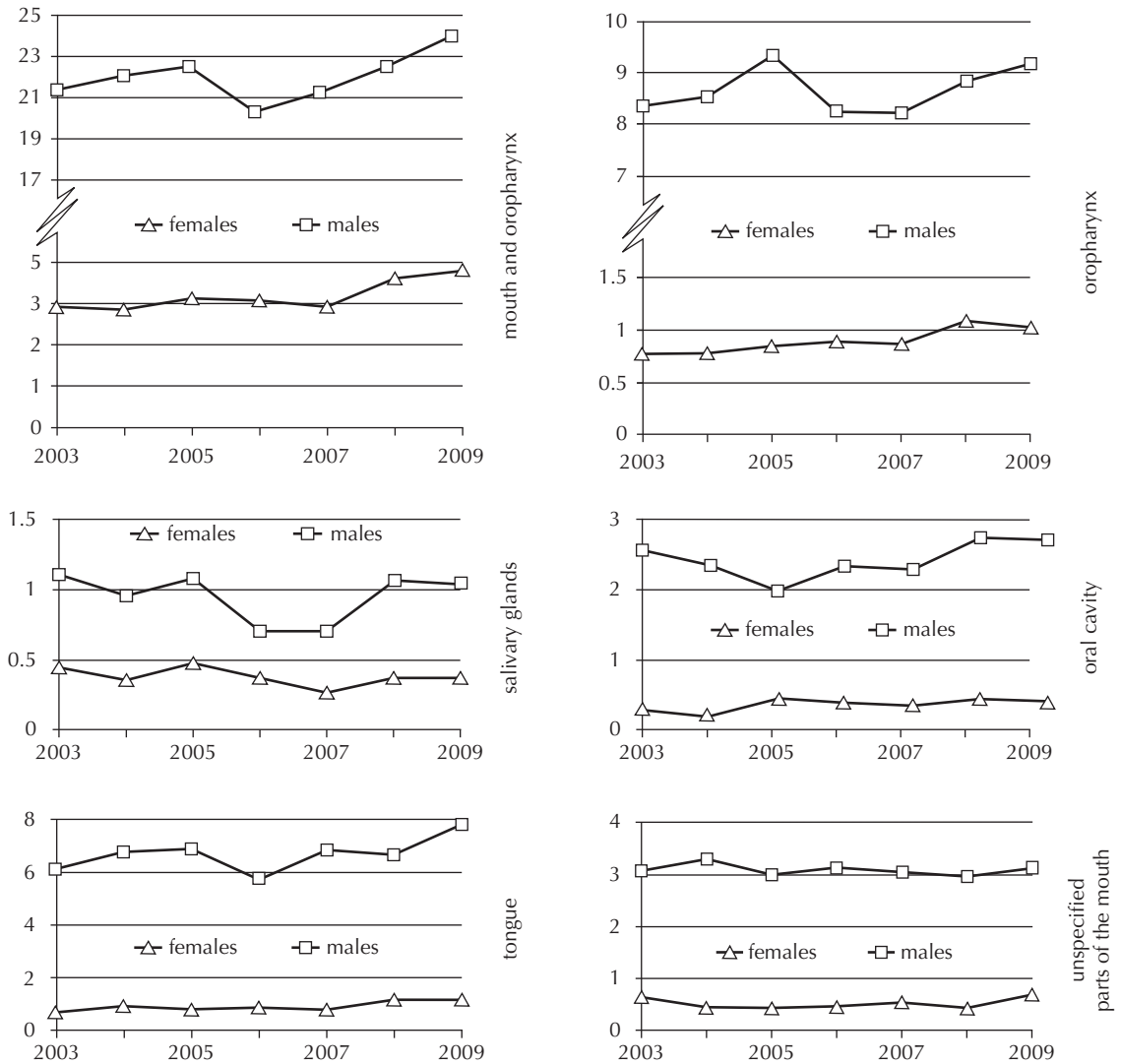

Figure 1. Oral cancer mortality by gender. Sao Paulo, Southeastern Brazil, 2003-2009.

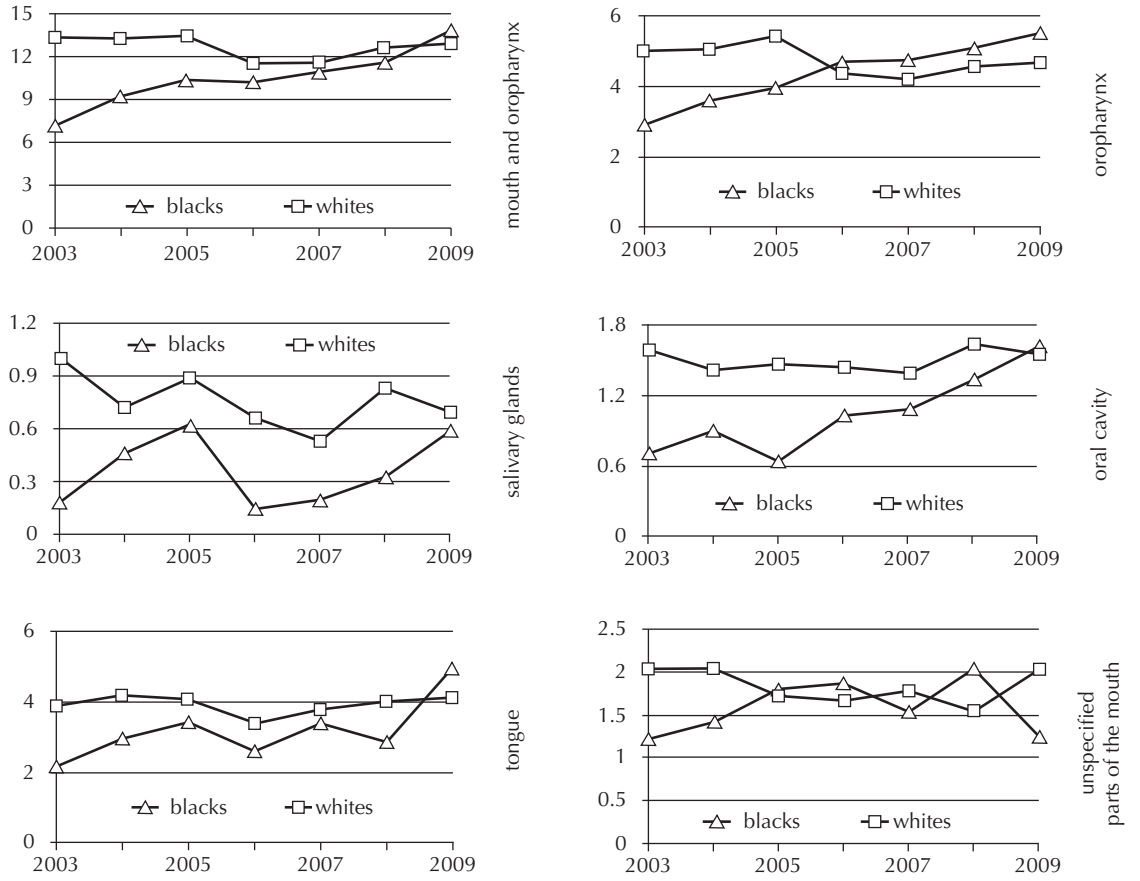

Figure 2. Oral cancer mortality by race. Sao Paulo, Southeastern Brazil, 2003-2009.

With regards to the specific assessment by type of cancer and gender, increasing trends of mortality were acknowledged for women in the categories of oropharynx, tongue and oral cavity. The overall and site-specific assessment of mortality among men resulted in stationary trends, except for the category of unspecified parts of the mouth, which presented a slightly decreasing trend, at a yearly rate of -0.9% (95%CI -1.5;-0.4) (Table 1).

With regards to the specific assessment by type of cancer and race, increasing trends of mortality were acknowledged for blacks in the categories of oropharynx, tongue and oral cavity. In 2003, oral cancer mortality was 88% higher in whites; however, in 2009, mortality was nearly 6% higher in blacks. The overall and site-specific assessment of mortality among whites resulted in stationary trends (Table 2).

DISCUSSION

From 2003 to 2009, oral cancer mortality was on the increase for women and for blacks in Sao Paulo, although rates were stationary for men and whites. These results are the most relevant findings of the current study.

The gender difference in trends reported here represents an inversion of the previous assessment of mortality in the same city, which reported that mortality was on the increase for men and levelled-off for women from 1980 to 2002.[9] From 1995 to 1999, oral cancer mortality in men living in Brazil ranked, on average, 3.47 times the rates assessed for women.[11,e] In Sao Paulo, during the study period, this proportion was even higher: 6.92. However, the report of an increasing trend for women raises concerns on the eventual suppression of their advantageous position in the long term.

Men had higher prevalence of smoking and of heavy smoking (more than 20 cigarettes a day) than females in all age groups.[18,19] The prevalence of excessive consumption of alcoholic beverages has also been reported to be higher among men than among women in studies assessing specific cities and the overall Brazilian

[e] Ministério da Saúde, Secretaria Nacional de Assistência à Saúde, Instituto Nacional de Câncer, Coordenação de Prevenção e Vigilância. Atlas de mortalidade por câncer no Brasil 1979-1999. Rio de Janeiro: INCA; 2002.

Table 1. Oral cancer mortality (per 100,000 inhabitants), rate of yearly increase (95%CI) and trends by gender. Sao Paulo, Southeastern Brazil, 2003-2009.

Type of cancer (per anatomic localization)	Mortality in 2003	Mortality in 2009	Rate of yearly increase (%)	95%CI	Trend
			Female		
Salivary glands	0.44	0.38	-4.05	-11.04;3.49	Stationary
Tongue	0.73	1.23	7.19	1.77;12.89	Increase
Oral cavity	0.30	0.43	8.57	1.41;16.23	Increase
Unspecified parts of the mouth	0.66	0.72	1.28	-4.50;7.40	Stationary
Oropharynx	0.77	1.03	5.98	4.59;7.38	Increase
Mouth and oropharynx	2.90	3.79	4.38	1.38;7.47	Increase
			Male		
Salivary glands	1.11	1.05	-1.31	-11.09;9.55	Stationary
Tongue	6.22	7.82	1.87	-1.25;5.08	Stationary
Oral cavity	2.59	2.75	2.20	-3.06;7.74	Stationary
Unspecified parts of the mouth	3.08	3.13	-0.93	-1.49;-0.37	Decrease
Oropharynx	8.33	9.16	0.75	-1.46;3.02	Stationary
Mouth and oropharynx	21.33	23.90	1.31	-1.24;3.91	Stationary

Table 2. Oral cancer mortality (per 100,000 inhabitants), rate of yearly increase (95%CI) and trends by race. Sao Paulo, Southeastern Brazil, 2003-2009.

Type of cancer (per anatomic localization)	Mortality in 2003	Mortality in 2009	Rate of yearly increase (%)	95%CI	Trend
			Black[a]		
Salivary glands	0.19	0.59	5.93	-19.99;40.25	Stationary
Tongue	2.12	4.87	6.40	1.26;11.81	Increase
Oral cavity	0.70	1.59	14.40	8.53;20.59	Increase
Unspecified parts of the mouth	1.22	1.26	3.12	-3.61;10.32	Stationary
Oropharynx	2.90	5.48	10.56	7.26;13.95	Increase
Mouth and oropharynx	7.14	13.79	9.14	5.49;12.93	Increase
			White		
Salivary glands	0.99	0.70	-4.13	-10.69;2.91	Stationary
Tongue	3.85	4.11	0.36	-3.36;4.23	Stationary
Oral cavity	1.57	1.59	0.67	-1.89;3.29	Stationary
Unspecified parts of the mouth	2.03	2.04	-2.44	-5.62;0.84	Stationary
Oropharynx	4.95	4.64	-2.26	-5.63;1.23	Stationary
Mouth and oropharynx	13.39	13.02	-1.05	-4.40;2.41	Stationary

[a] The category "Black" includes brown and black individuals

context.[20,f] Additionally, women have been reported to present with a higher and more frequent intake of fruit and vegetables, considered protective against oral cancer,[24] than men in the Brazilian context.[20]

These reports converged to conclude that well-known risk factors for oral cancer are more prevalent in men than in women. This observation is consistent with the current observation that oral cancer mortality remained higher among men than among women throughout the study period. However, gender stratified information on previous patterns of exposure to tobacco smoking, alcohol drinking and dietary habits is absent; which prevents the appraisal of factors that may have contributed to the observation of discrepant trends of mortality among genders.

The current report of increasing oral cancer mortality in women reinforces the hypothesis that the reduction in smoking prevalence, which was appraised as strong

[f] Ministério da Saúde, Secretaria de Vigilância em Saúde, Secretaria de Atenção a Saúde, Instituto Nacional do Câncer, Coordenação de Prevenção e Vigilância. Inquérito domiciliar sobre comportamentos de risco e morbidade referida de doenças e agravos não transmissíveis: Brasil, 15 capitais e Distrito Federal, 2002-2003. Rio de Janeiro: INCA; 2004.

in Brazil after 1989,[23] may have been less intense for women than for men.[32] We also observe that the assessment of the effect of smoking on cancer mortality should also consider aspects other than prevalence, such as the intensity and duration of the habit, which have not been measured at the population level in Brazil.

The Brazilian health authority estimated the prevalence of smoking as one-third of adults, with an increasing trend for women, mainly young adults, during the last decades of the 20th century.[f] The *per capita* consumption of cigarettes was considered to be relatively reduced,[14] although this appraisal is considered to be underestimated owing to the smuggling of cigarettes.[25] This consideration highlights how much remains to be done in Brazil with regard to the control of the tobacco epidemic and the reduction of its deleterious effects.

The discrepancy among trends for blacks and whites was so large, that blacks almost doubled mortality from oral cancer in the short term (2003-2009), while rates remained at almost the same magnitude for whites. We insist that the trend of oral cancer mortality among blacks, at such a high rate of yearly increase is indeed a public health problem, and poses challenges to the health system. Nationwide representative surveys conducted in Brazil recently reported differences in exposure to the main risk factors for oral cancer among women and men; unfortunately, these surveys have not considered assessing race as an analytical category.

Blacks and poorer socioeconomic strata have been reported to have a higher prevalence of heavy alcohol consumption in Brazil.[15] Surveys on smoking prevalence in Brazil have not assessed racial differences to exposure. However, these surveys reported a higher prevalence of tobacco smoking among individuals with fewer years of schooling.[19,22] This observation has to be considered as a possible explanation for the poorer profile of oral cancer mortality among blacks, because this population stratum is mostly concentrated in deprived peripheral areas of the city of Sao Paulo. Differences in the risk of oral cancer between blacks and whites were hypothesized to have no biologic basis, and rather reflect different exposure to risk factors across racial strata.[12,16,33]

Additionally, differential access to and utilization of health services may contribute to explaining the poorer profile of oral cancer mortality among blacks. Studies specifically addressing cancer prophylaxis[1] or healthcare in general[28] concluded that blacks use health services less frequently for preventive purposes and demand proportionally less treatments than whites in the Brazilian context. A poorer profile of oral cancer mortality has also been reported for blacks in the North American context, in studies that highlighted the need of targeted, race-specific health interventions for the prevention, treatment, and follow-up of cancer patients.[21,29,31]

The assessment of mortality from underlying causes may be biased by differences in case definition, incomplete ascertainment of death certificates, and differential access to care and diagnosis. Having exclusively assessed one single city for a relatively short period, this study may have not been affected by these sources of error. The main limitations of this study are the absence of information on race in 3.6% of deaths from oral cancer during the study period, and the use of two different frameworks to assess race; i.e., classification by health professionals in death certificates, and self-reported classification at the population level.[7] We also observe that studies in the Brazilian context concluded that self-reported race depends on racial features of the interviewer.[8] Sao Paulo has been reported to have a system of information on mortality as accurate as any other country with a long tradition in the area of health statistics,[17] and we are unaware of variations in the quality of death certificates by race in the short term. Nonetheless, we contend that racial classification is indeed a complex issue, and that this study used the best information on this issue that is available for health surveillance.

Statistically significant differences in mortality trends reflect differential patterns of exposure to risk factors and inequalities in access to health services. The most prominent risk factors of the disease (tobacco smoking and alcohol intake) are also considered to have prognostic relevance for the evolution of the disease, because patients that continue to smoke and/or to drink after the diagnosis of oral cancer reveal a lower commitment to treatment.[10] The need for health interventions targeting inequalities in the outcome of oral health is made more urgent by the perception of how much and how rapidly these trends may impact on the mortality profile.

The main risk factors of oral cancer are shared by several other types of cancer and by other non-communicable diseases. There is an obvious need for more research on the differential exposure to tobacco smoking, alcohol drinking and poor dietary habits among gender and race strata in Brazil. The surveillance of disease and the monitoring of the main exposures may contribute to implementing socially appropriate health policies, which concurrently aim to reduce the overall burden of disease and the attenuation of unfair, avoidable and unnecessary inequalities in health.

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