Original article

Trends in social security benefits for oral and oropharyngeal cancer from 2006 to 2013 in Brazil

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Abstract

Objective: to analyze the trends in the concession of social security sick pay for oral and oropharyngeal cancer, from 2006 to 2013, in Brazil. **Methods**: time series study using data of workers insured by the Brazilian National Institute of Social Security (INSS); Prais-Winsten generalized linear regressions were used to calculate the annual percentage change (APC). **Results**: social security benefits for oral and oropharyngeal cancer presented significant increase (APC=9.0%; 95%CI 1.4; 17.4); benefits for other parts of the mouth, nasopharynx, oropharynx, floor of mouth and palate have also shown significant increase; the areas of trade (5.5%) and manufacturing (5.2%) were the most prevalent activities; there was a high proportion of fields in blank in the information systems (average of 72.9%). **Conclusion**: trends in occupational benefits for oral and oropharyngeal cancer showed significant increase.

Keywords: Mouth Neoplasms; Oropharyngeal Neoplasms; Social Security; Trends; Times Series Studies.

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Introduction

Social security sick pay is a benefit paid by the Brazilian National Institute of Social Security (INSS) to all insured workers who are temporarily incapacitated to carry out their work activities due to a general health disease and/or condition, not associated with work accidents, nor with occupational diseases or work-related diseases.[1] This benefit is a good indicator of the main causes of illness in the Brazilian working adult population, particularly of health status that result from more severe clinical conditions,[1] such as oral and oropharyngeal cancers.

Oral and oropharyngeal cancers are important public health problems in several parts of the world,[2,3] with a mortality rate of 3.90/100 thousand inhabitants and an incidence rate of 7.10/100 thousand in the world (data based on 2012).[4] In Brazil, the Brazilian National Cancer Institute José Alencar Gomes da Silva (Inca) estimated a total of 15,490 new cases of oral cancer in the population for the year 2016.[5]

Oral and oropharyngeal cancers are important public health problems.

The increase in social benefits and expenses related to work incapacity is not a reality exclusive from Brazil. In Great Britain, from 1985 to 1995, there was a steady increase in social security benefits, especially those of longer duration,[6] such as cases of cancer.

Studying trends in social benefits for oral cancer may help in the planning of public policies for the health sector. Such analyses may reflect the economic impact that these diseases and conditions cause for Social Security, the state institution responsible for funding these benefits. Analyzing the trend of each affected anatomical region can indicate which one(s) deserve special attention, in order to subsidize preventive measures. The analysis presented below, based on the Brazilian National Classification of Economic Activities (CNAE) and its 21 large groups,[7] may assist in the planning of interventions among workers of any priority groups.

The objective of this study was to analyze the trends in the concession of social benefits for oral and oropharyngeal cancer from 2006 to 2013 in Brazil, according to specific anatomical regions, as well as to describe the distribution of these benefits according to the CNAE of the affected workers.

Methods

Ecological time series study with secondary data obtained from the database of the Ministry of Social Security (MPS).

Data were extracted from the Social Security database, statistics on occupational health and safety. This database, has information regarding the anatomical region of oral cancer, according to the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10) and the CNAE that generates the benefit. The data have operational limitations: it is not possible to access the sociodemographic information of the workers who received the benefit, nor their geographic region of residence. In order to analyze the relation between social benefits according to ICD-10 codes and the generating CNAE, we requested data directly from the Ministry of Social Security via information portal of the federal government (http://www.acessoainformacao.gov.br/). These data correspond to a population of approximately 49 million workers, referring to December 2013.

All records of social security sick pay (information on health and occupational safety) for oral and oropharyngeal cancer conceded in Brazil from 2006 to 2013 were included.[8] The studied diseases follow ICD-10 codes comprehended between C00 to C14, where C00 to C09 are oral cancers and C10 to C14 are oropharyngeal cancers.

The rate of benefits per worker was calculated by dividing the number of benefits conceded each year by the number of insured workers (in December of each corresponding year). The rate was calculated for the total of oral and oropharyngeal cancers, according to specific anatomical regions, according to ICD-10 codes: C00 (Lip); C01 (Base of tongue); C02 (Other and unspecified parts of tongue); C03 (Gum); C04 (Floor of mouth); C05 (Palate); C06 (other and unspecified parts of mouth); C07 (Parotid gland); C08 (Other and unspecified major salivary glands); C09 (Tonsil); C10 (Oropharynx); C11 (Nasopharynx); C12 (Pyriform sinus); C13 (Hypopharynx); and C14 (Other and ill-defined sites in the lip, oral cavity and pharynx).

All information was compiled in a Microsoft Excel spreadsheet and exported to the statistical software STATA version 14. Prais-Winsten generalized linear regressions were used to calculate the benefit rate

for each anatomical region, considering the serial autocorrelation inherent to time series analyses. Annual percentage change (APC) was then calculated, with a 95% confidence interval (95%CI). The following formulas were used:[9, 10]

$$APC = 100x(-1 + 10^b)$$

$$95\%CI = 100x(-1 + 10^{(b \pm t*EP)})$$

Trends in social benefits for oral and oropharyngeal cancer were classified as increasing, stable, or decreasing. They were increasing when regression coefficients were positive, decreasing when negative, and stable when they were not significantly different from zero ($p > 0.05$).[10]

We calculated the distribution (%) of social security benefits conceded according to the 21 large CNAE groups: 1) Agriculture, 2) Extractive industries, 3) Manufacturing, 4) Electricity and gas, 5) Water, sewage and waste, 6) Construction, 7) Trade, 8) Transport and mail, 9) Accommodation and food, 10) Information and communication, 11) Financial, 12) Real estate, 13) Professional and scientific, 14) Administrative, 15) Public administration, 16) Education, 17) Human health and services 18) Arts, culture, sports and recreation, 19) Other services, 20) Domestic services and 21) International organizations, in addition to the category 'Ignored' (when there was no CNAE information). Data from 2009 to 2013 were considered, because 2006, 2007 and 2008 data were unavailable.

The Ethics Research Committee of the Federal University of Mato Grosso do Sul approved the present study on April 24th, 2016: Presentation Certificate for Ethical Appreciation No. 52944916.4.0000.0021.

Results

In the period from 2006 to 2013, the rate of social benefits conceded for oral and oropharyngeal cancer (C00-C14) was of 6.28/100 thousand workers insured by the INSS (Table 1). There was a 9% (95%CI 1.41; 17.45) annual growth rate for both cancers, with an increase of 7.90% (95%CI 1.60;14.59) for oral cancer (C00-C09) and of 10.86% (95%CI 0.33;22.51) for oropharyngeal cancer (C10-C14) (Figure 1).

There were differences in trends according to the anatomical regions of oral and oropharyngeal cancer. Lip (C00), base of tongue (C01), gum (C03), other and unspecified parts of mouth (C06), parotid gland (C07), other and unspecified major salivary glands (C08), tonsil (C09), and hypopharynx (C13) presented stable trends. Pyriform sinus (C12) presented a decline, whereas other and unspecified parts of tongue (C02), floor of mouth (C04), palate (C05), oropharynx (C10) and nasopharynx (C11) presented increasing trends (Table 2).

The distribution of social benefits according to large groups of CNAE revealed that 72.9% of the fields were left in blank in the period from 2009 to 2013. The lack of such information compromised the interpretation of the results presented herein (Table 3).

Discussion

The results showed growth trends in the concession of social security sick pay for oral and oropharyngeal

Table 1 – Rate of social benefits for oral and oropharyngeal cancer (per 100 thousand insured workers), Brazil, 2006-201

Year	Benefits	Workers	Rates (per 100 thousand)
2006	1,740	35,000,000	4.97
2007	2,104	37,610,000	5.59
2008	2,677	39,640,000	6.75
2009	2,623	41,210,000	6.36
2010	2,879	44,070,000	6.53
2011	3,038	46,310,000	6.56
2012	3,146	47,460,000	6.63
2013	3,330	49,000,000	6.80
Average	2,692	42,537,500	6.28

cancer in the period from 2006 to 2013 in Brazil of around 9% per year. This raise occurred mainly for social benefits related to oral cancers located in anatomical regions difficult to visualize by oral clinical inspection, such as the palate (C05), floor of mouth (C04) and other and unspecified parts of tongue (C02), and in regions of the oropharynx, such as oropharynx (C10) and nasopharynx (C11). Moreover, in approximately three quarters of the conceded social benefits, the information referring to the worker's classification of the economic activity – CNAE – was not registered by Social Security. This shows fragility

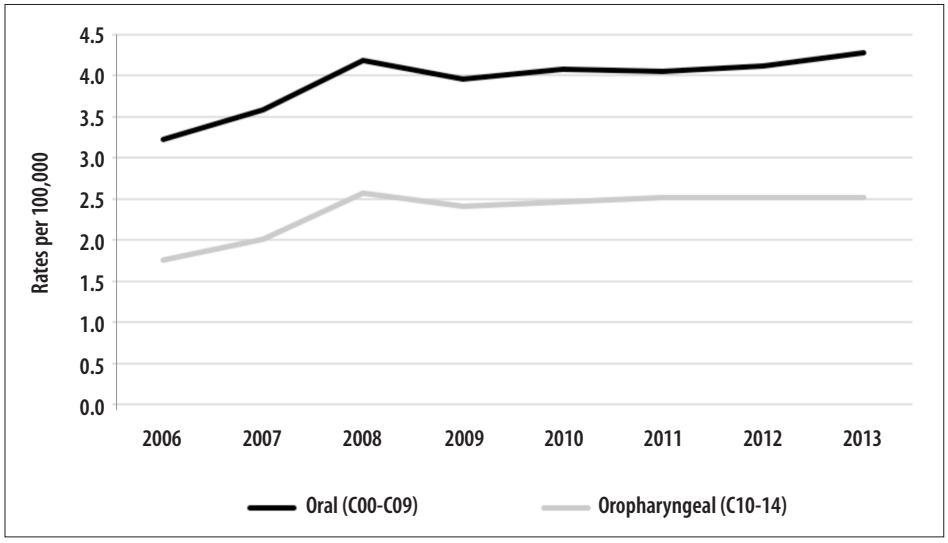

Figure 1 – Rates of concession of social security benefits for oral (C00-C09) and oropharyngeal cancer (C10-C14) (per 100 thousand insured workers), Brazil, 2006-2013

Table 2 – Analysis of trends in oral and oropharyngeal cancer social security benefits among insured workers Brazil, 2006-2013

ICD-10[a]	Anatomic Region	APC[b]	95%CI[c]	p-value	Interpretation
C00	Lip	2.43	-12.24;19.56	0.72	Stable
C01	Base of tongue	4.94	-3.84;14.52	0.23	Stable
C02	Other and unspecified parts of tongue	15.48	5.46;26.18	0.01	Increase
C03	Gum	-10.72	-23.00;3.52	0.11	Stable
C04	Floor of mouth	9.08	2.49;16.09	0.01	Increase
C05	Palate	9.83	0.39;20.23	0.05	Increase
C06	Other and unspecified parts of mouth	14.82	-5.16;39.32	0.13	Stable
C07	Parotid gland	-2.00	-10.45;7.25	0.60	Stable
C08	Other and unspecified salivary glands	-1.86	-13.32;11.11	0.72	Stable
C09	Tonsil	8.89	-3.75;23.59	0.14	Stable
C10	Oropharynx	19.25	8.05;31.61	0.01	Increase
C11	Nasopharynx	10.10	3.62;16.98	0.01	Increase
C12	Pyriform sinus	-3.11	-5.77;-0.37	0.03	Decrease
C13	Hypopharynx	11.24	-8.77;35.65	0.23	Stable
C14	Other and ill-defined sites in the lip, oral cavity and pharynx	-3.56	-15.01;9.44	0.51	Stable

a) ICD-10: International Statistical Classification of Diseases and Related Health Problems 10th Revision.
b) APC: annual percentage change.
c) 95%CI: 95% confidence interval.

Table 3 – Percentage distribution of oral and oropharyngeal cancer social benefits conceded to insured workers according to the Brazilian National Classification of Economic Activities (CNAE) large groups, Brazil, 2009-2013

CNAE large groups	2009	2010	2011	2012	2013	Total
Agriculture	0.2	0.5	0.1	0.2	0.1	0.2
Extractive industries	0.2	0.2	0.3	0.3	0.2	0.2
Manufacturing	5.5	5.1	5.8	4.8	5.0	5.2
Eletricity and gas	0.2	0.1	0.1	0.1	0.0	0.1
Water, sewage and waste	0.6	0.5	0.4	0.4	0.4	0.4
Construction	1.6	1.9	2.4	2.6	2.3	2.2
Trade	5.5	5.7	4.7	6.1	5.5	5.5
Transport and mail	1.7	2.5	1.8	2.2	2.5	2.1
Accommodation and food	0.9	0.7	0.8	1.0	0.8	0.8
Information and communication	0.4	0.2	0.5	0.3	0.2	0.3
Financial	0.1	0.3	0.6	0.8	0.7	0.5
Real state	0.1	0.0	0.1	0.1	0.1	0.1
Profissional and scientific	0.5	0.4	0.4	0.4	0.4	0.4
Administrative	2.8	2.6	2.6	2.9	2.8	2.7
Public administration	3.1	3.9	3.8	3.6	3.2	3.5
Education	0.8	1.0	0.7	0.8	0.5	0.7
Human health and social services	0.8	0.8	0.9	0.8	1.0	0.8
Arts, culture, sports and recreation	0.1	0.2	0.2	0.1	0.1	0.2
Other services	1.1	0.9	1.1	0.8	0.8	0.9
Domestic services	0.0	0.0	0.0	0.0	0.0	0.0
International organizations	0.0	0.0	0.0	0.0	0.0	0.0
Ignored	73.8	72.5	72.9	71.7	73.4	72.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

Observation: values correspond to the percentage distribution (%) per year, for each CNAE large group responsible for oral and oropharyngeal cancer social benefits.

in the qualification of data concerning occupational health and safety of workers.

Some studies on oral cancer mortality trends indicated stability in Brazil during the 1980s and 1990s.[11] In a time series analysis from 1979 to 2002, the mortality rate for oral cancer showed stability, and increasing trends for oropharyngeal cancer.[9] In another study, conducted in the city of São Paulo,[12] the authors reported stability in oral cancer mortality rates between 1980 and 1998, with declining trends for gum and lip cancers, visualization and diagnosis, and increased cancer mortality rates in nonspecific parts of the mouth, regions difficult to visualize in clinical inspections. In the present study, there have been growing trends, both for some types of oral cancer, particularly those difficult to visualize clinically, and for oropharyngeal cancers. We corroborate findings that the more difficult the clinical visualization, the lower the probability of early detection of the lesions.

Regarding oral cancers, those of other and unspecified parts of tongue (C02), floor of mouth

(C04) and palate (C05) showed increasing trends. With the exception of the palate, a region of easy visualization in clinical inspection, other and unspecified parts of tongue and floor of mouth are regions in which screening actions – by visual inspection, to perceive lesions suspected of malignancy – would not be as effective. However, other regions of easy visualization, such as lips, gums and tongue, showed stable trends.

As for oropharyngeal cancers, a region of difficult visualization by clinical inspection, the oropharynx and nasopharynx showed increasing tendencies, and the others, stability, resulting in proportional growth of the group of oropharyngeal cancers as a whole. The explanation for the growing trend of oropharyngeal cancers is the difficulty in diagnosing respective lesions, which probably, when diagnosed, are already in a more advanced stage of development, with a direct impact on the mortality rates for this group. This growth is also reported by another time series study,[9] referring to Brazil from 1979 to 2002, with data from the Mortality Information System (SIM).

In health services, a first plausible measure for the attempt to perform an early diagnosis of these cancers would be a clinical inspection of the oral cavity, performed by a professional dentist. Studies on the effectiveness of oral cancer screening actions[13-15] have shown that there are no statistically significant differences between the screened group and the control group. However, an intervention study carried out in India demonstrates the effectiveness of screening for the diagnosis of oral cancer at an early clinical stage,[16] besides reducing its mortality by 81% in the long term.[17] These results reinforce the importance of preventive actions in oral health, stipulated in the Program for Medical Control in Occupational Health, as for example, occupational, admission and periodic dental examinations for workers insured by the INSS.

Regarding tobacco consumption, the 2013 National Health Survey (PNS) indicated a prevalence of smoking in 15% of the Brazilian adult population, which is higher among men (19.2%) than women (11.2%).[18] A Brazilian study, based on data from the National Household Sample Survey (PNAD) and conducted by the Brazilian Institute of Geography and Statistics (IBGE) in 2008, showed a higher prevalence of smoking among workers to whom is required less education level and more physical effort, even after adjusting for age, sex and income, which is based on the fact that the occupational activity can be associated with tobacco consumption. PNAD/IBGE findings may also explain the increase in the trends in social benefits for oral and oropharyngeal cancer, as observed in our study, despite the population's trend to reduce tobacco use; some occupational groups remain with higher prevalence of smoking when compared to those with higher level of schooling and non-manual labor.[19]

Antunes et al.,[20] in a case control study conducted in the city of São Paulo and that took into account the interaction between alcohol and smoking, showed that (i) the independent effects of alcohol consumption are smaller or are not associated with oral and oropharyngeal cancer, and that (ii) the independent effects of smoking are also reduced, although they are still associated with the disease. Likewise, possible stressors in the workplace tend to contribute to these problems, whether because stress increases the risk of alcohol and tobacco consumption, or because it contributes to an aggression to the body that ends up reducing man's potential of adaptation to work.[20]

The consumption of fruits and vegetables, in turn, has been an important protective factor for oral cancer.[21] Toporcov et al.,[22] also based on a case control study, found that consumption of pork, soup, cheese, bacon and fried foods was a risk factor for oral cancer in the Brazilian population, and consumption of butter and margarine (more than seven times a week), a protective factor. In a study carried out in Australia,[23] their data on fruit, vegetable and alcohol consumption need to be interpreted with caution when analyzing protection factors in relation to oral and oropharyngeal cancer, considering that these neoplasms may present the same trends for sex and age, with possible blinding of the effects of a healthy diet.[23] In this case, adequate dietary intervention of these workers should be considered, in the form of dietary (re)education, with probable promising results.

Some limitations of this study should be considered. Although secondary data analyses provide support for public policy planning, management and implementation, the results should be interpreted with caution, since they may be affected by the quality of the information.[24] The occupational health and safety database registration systems, provided by the Ministry of Social Security, have some operational limitations. It was not possible to have access to the ethnic group, income, sex and Brazilian geographical regions, regarding the incidence of social

benefits, which limited some analyses and time inferences.

The ignored/blank group of workers of CNAE accounted for 73% of social security benefits. This finding highlights the need to improve information systems on sick pay. If the qualification of epidemiological data is not precise, strategies to minimize the effects of the disease among the working population may be compromised. However, among the social benefits correctly notified, Trade, Manufacturing, Administrative, and Public Administration groups were the most frequent among the conceded benefits.

Therefore, primary prevention, with intervention in lifestyle and environment, including the working environment, is the best option for the prevention and reduction of cancer mortality.[25]

In conclusion, this study highlighted both an increasing trend in social benefits for oral and oropharyngeal cancer from 2006 to 2013 in Brazil, and an important failure in quantifying epidemiological data from the CNAE records that generates such social benefits, which impairs the monitoring of the health situation of Brazilian workers. Since April 2007, with the implementation of the Technical Epidemiological Nexus (NTEP)[26] from cross-referencing social benefits data in accordance with ICD-10 codes and with CNAE codes, it was possible to establish the causal link between occupational activity and concession of social benefit ratio, overcoming the underreporting limitation of the communications of occupational injury (CAT) by companies. This strategy can help workers prove the relation between the disease – in this case oral and oropharyngeal cancer – and work. Against an approximately 72% lack of CNAE registration, the NTEP definition is compromised. In addition, for the companies that generate social benefits, the payment of the contributions to the Work-related Injury Insurance (SAT) is linked to NTEP and to accident prevention factor (FAP).[27] Thus, the fewer the records of occupational accidents and social benefits, the lower the contribution rates. In order to improve public policies in this sector, investments are recommended in order to improve data filling referring to CNAE that generates the social security benefit, so as to bring benefits both to workers and to companies that invest in primary prevention.

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Authors' contribution

Bomfim RA contributed to the initial conception and design of the study, analysis and interpretation of data, preparation of preliminary versions of the manuscript, final scientific writing, critical analysis and final approval of the published version. Cascaes AM contributed to the interpretation of data, preparation of preliminary versions of the manuscript, final scientific writing, critical analysis of important intellectual content and final approval of the version to be published. The final version of the manuscript was approved by all authors, who are responsible accuracy and integrity.

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