O Mundo da Saúde

The Impact of Public Policies on Morbimortality from Bronchial and Lung Neoplasms
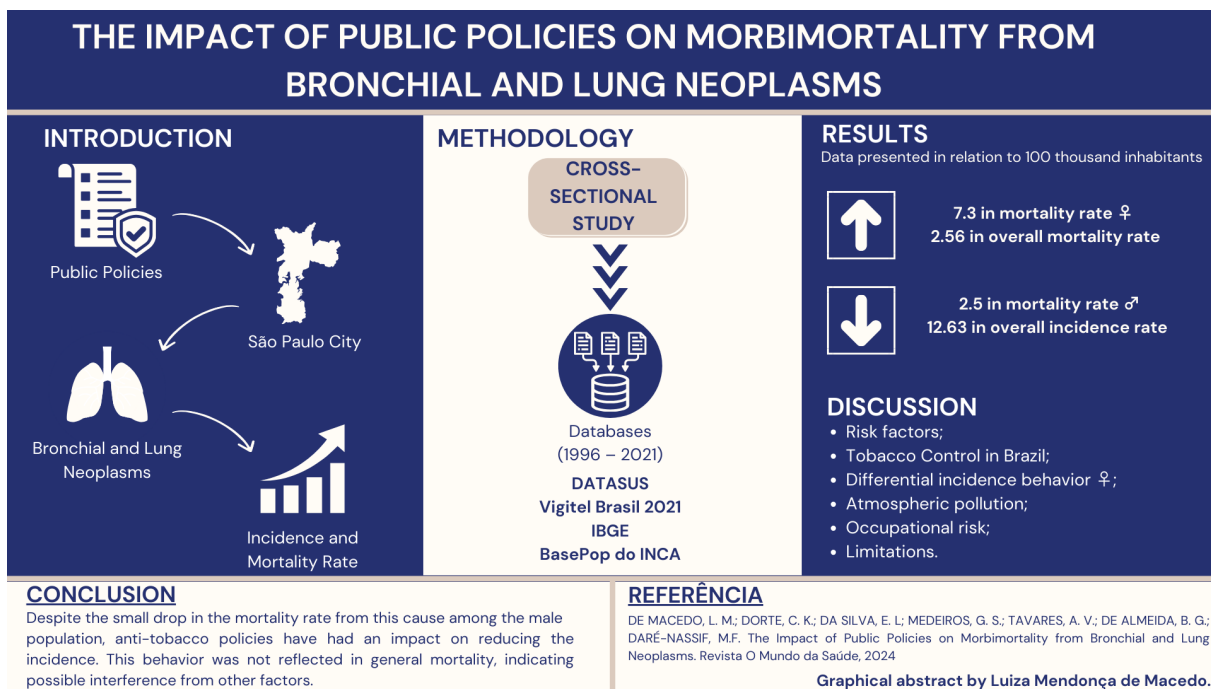
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Graphical Abstract

THE IMPACT OF PUBLIC POLICIES ON MORBIMORTALITY FROM BRONCHIAL AND LUNG NEOPLASMS

INTRODUCTION
Public Policies
São Paulo City
Bronchial and Lung Neoplasms
Incidence and Mortality Rate

METHODOLOGY
CROSS-SECTIONAL STUDY
Databases (1996 – 2021)
DATASUS
Vigitel Brasil 2021
IBGE
BasePop do INCA

RESULTS
Data presented in relation to 100 thousand inhabitants
↑ 7.3 in mortality rate ♀
2.56 in overall mortality rate
↓ 2.5 in mortality rate ♂
12.63 in overall incidence rate

DISCUSSION
- Risk factors;
- Tobacco Control in Brazil;
- Differential incidence behavior ♀;
- Atmospheric pollution;
- Occupational risk;
- Limitations.

CONCLUSION
Despite the small drop in the mortality rate from this cause among the male population, anti-tobacco policies have had an impact on reducing the incidence. This behavior was not reflected in general mortality, indicating possible interference from other factors.

REFERÊNCIA
DE MACEDO, L. M.; DORTE, C. K.; DA SILVA, E. L; MEDEIROS, G. S.; TAVARES, A. V.; DE ALMEIDA, B. G.; DARÉ-NASSIF, M.F. The Impact of Public Policies on Morbimortality from Bronchial and Lung Neoplasms. Revista O Mundo da Saúde, 2024

Graphical abstract by Luiza Mendonça de Macedo.

Abstract

The article seeks to analyze temporal variations in the incidence of malignant neoplasms of the bronchi and lungs in the city of São Paulo, considering interventions and public policies to combat pollution and smoking. The quantitative, descriptive and cross-sectional study used data from DATASUS, Vigitel Brasil 2021, IBGE and BasePop from INCA. Between 1996 and 2021, there was an increase in the female mortality rate of 7.3 per 100 thousand inhabitants, while the male mortality rate suffered a drop of 2.5 per 100 thousand inhabitants. Despite anti-smoking policies, overall mortality increased by 2.56 per 100,000 inhabitants, while the incidence rate fell by 12.63 per 100,000 inhabitants. Despite public policies related to tobacco control since 1950 and other risk factors such as occupational exposure and air pollution, lung cancer continues to be a significant threat, suggesting the need to review implemented strategies. Furthermore, historically, female smoking shows how social and cultural changes have influenced the increase in consumption among women, pointing to the need for stricter public policies and awareness-raising actions. It is also recognized that the lack of detailed data on risk factors and the effectiveness of implemented measures highlights the complexity of the challenge of reducing the incidence of lung and bronchial cancer.

Keywords: Risk Factors. Public Policy. Smoking. Lung Neoplasms.

INTRODUCTION

Malignant neoplasms of the bronchi and lungs have been the most common type of cancer in the world for several decades, being responsible for the highest cancer-related mortality among both sexes[1] and, therefore, should be the target of studies aimed at minimizing this scenario. In 2020, there were approximately 2,206,771 new cases of lung cancer, 1,435,943 in men and 770,828 in women worldwide[2]. While in Brazil, in 2020, 30,200 cases were registered, 17,760 men and 12,440 women[3]. Furthermore, it is worth highlighting that the emergence of such neoplasia can be associated with different lifestyle patterns and styles, involving modifiable external factors, such as tobacco consumption, occupational exposure to toxic substances, atmospheric pollution, and non-modifiable ones, such as longevity and the sex[4].

The estimated number of new cases of tracheal, bronchial and lung cancer for Brazil, for each year from 2023 to 2025, is 32,560 cases, corresponding to the estimated risk of 15.06 cases per 100 thousand inhabitants, with 18,020 cases among men and 14,540 cases among women.

These values correspond to an estimated risk of 17.06 new cases per 100,000 men and 13.15 per 100,000 women[5].

Given this panorama, the study aims to elucidate possible temporal variations in the incidence and mortality rates of bronchial and lung neoplasms, between the years 1995 and 2015 and 1996 and 2021, respectively, in the population of the city of São Paulo. The analysis focuses on presenting quantitative data relating them to interventions and strategies adopted through public policies to combat pollution and tobacco, which have been applied in Brazil for more than five decades. In this way, observing the behavior of these data makes it possible to evaluate which measures were effective or not in changing indicators specific to the 10th revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) C34, since only in the year 2023 7,260 new cases were reported in Brazil. Through such reflection, it is possible to identify which type of anti-smoking and pollution control campaign/strategy should be the focus of improvements and priority in relation to other less effective ones.

METHODOLOGY

This is a quantitative, descriptive and cross-sectional study, whose data search was carried out in October 2023. From the Department of Information and IT of the Unified Health System (DATASUS), via TABNET, in the Vital Statistics category, data was sought using the Mortality section – since 1996 by ICD-10, general mortality in São Paulo. The filters used were: ICD-10 Category, with C34, relating to Malignant Neoplasia of the Bronchi and Lungs; Municipality, the one used being 355030 - São Paulo; Available periods, between 1996-2021. Furthermore, Vigitel Brasil 2021 (Surveillance of risk and protective factors for chronic diseases by telephone survey) and the Brazilian Institute of Geography and Statistics (IBGE) were used with the consumer price index[6]. Another Health Information System was the BasePop Incidences of the National Cancer Institute (INCA), through the in-

cidence tabulator, using the absolute value of the Population-Based Cancer Registry (RCBP) in São Paulo[7]. In this case, the filters used were: ICD-10, with C34 – Bronchi and Lungs; with data available from 1997 to 2015. The choice of these databases is justified by the easy access through the virtual offering of the platforms, free availability, frequency of periodic updates and transparency of information. To analyze the results, the data were tabulated and interpreted using simple descriptive statistics such as frequency. To this end, the Excel® software, 2010 version, was used to create the graphs.

Furthermore, to calculate the crude mortality and specific incidence rates for the neoplasm in question, according to the respective sexes, the formulas indicated in the figure below were applied, repeatedly, to evaluate each year of the studied interval:

$$\text{Mortality rate} = \frac{number\ of\ deaths\ by\ ICD-10\ C34\ in\ S\tilde{a}o\ Paulo\ from\ 1996\ to\ 2021}{population\ at\ risk\ in\ S\tilde{a}o\ Paulo\ from\ 1996\ to\ 2021} * 10^n$$

$$\text{Incidence rate} = \frac{number\ of\ new\ ICD-10\ C34\ cases\ in\ S\tilde{a}o\ Paulo\ from\ 1997\ to\ 2015}{population\ at\ risk\ in\ S\tilde{a}o\ Paulo\ from\ 1996\ to\ 2021} * 10^n$$

In addition, data on public policies related to combating risk factors for malignant neoplasms of the bronchi and lungs were collected from 1950 to the current period from INCA[8]. Another way to identify relevant public policies was by surveying the literature in the PubMed database using the keywords: "public policies" and "tobacco", finding a total of five documents. From reading the titles, abstracts and documents in full, two articles related to the theme were selected[9,10].

RESULTS

In the public policy scenario, it is noted that some of those that were implemented influenced the variation in the data evalua-ted. Through the survey carried out in both selected articles, as indicated in Figure 01, the following stand out:

PUBLIC POLICIES	YEAR OF CREATION	OBJECTIVE
NATIONAL COORDINATION FOR TOBACCO CONTROL AND PRIMARY CANCER PREVENTION (CONTAPP)	1996	TOBACCO CONTROL AND PRIMARY CANCER PREVENTION
BRAZILIAN FEDERAL LAW N. 9,294/96	1996	RESTRICTION ON ADVERTISING. PROHIBITION OF SMOKING IN COLLECTIVE TRANSPORT AND CAR ROTATION IN SP
ANVISA CREATION	1999	TOBACCO CONTROL AND REGULATION
FRAMEWORK CONVENTION FOR TOBACCO CONTROL (FCTC)	2003	INTERNATIONAL TOBACCO REDUCTION
UNIFIED HEALTH SYSTEM (SUS) REFORMS	2004 AND 2006	TREATMENT OF SMOKERS AND PROMOTION/PREVENTION ACTIONS
LEGISLATION IMPROVEMENT	2011	PROHIBITION OF THE USE OF CIGARETTES IN COLLECTIVE USE ENVIRONMENTS AND INCREASE IN TAXES
BRAZILIAN FEDERAL LAW N. 8.625/14	2014	RESTRICTION ON ADVERTISING OF TOBACCO DERIVATIVES AND PROHIBITION OF SMOKING IN CLOSED COLLECTIVE ENVIRONMENTS

Figure 1 - Public policies related to tobacco and smoking consumption, according to year of creation and objective

When observing the number of new cases and the number of deaths, in Figure 02, a great proximity between the number of new cases and the number of deaths in the period from 2005 to 2013 can be noticed. This approximation is due to the number of new cases , which suffered a drop, from 1997 with 2,252 cases to 1,211 cases in 2015, in contrast to the number of deaths, which increased, between 1996 and 2021, from 1,263 cases to 1,909 cases, indicating an increase in morbimortality from malignant neoplasia of the bronchi and lungs in the period analyzed.

FIGURE 02 - NUMBER OF NEW CASES AND DEATHS PER YEAR
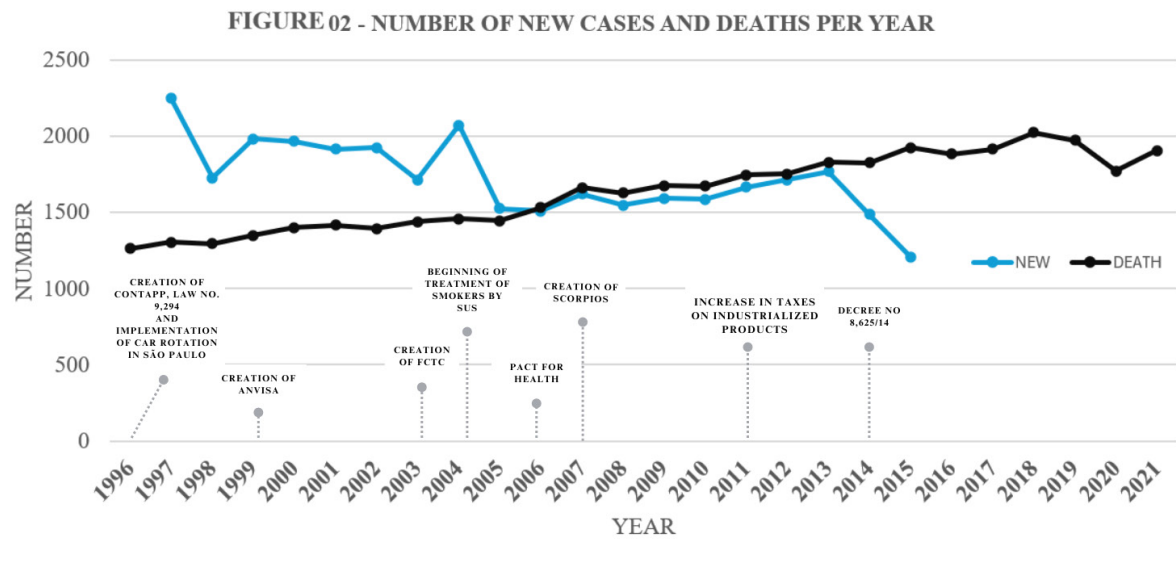
Source: Registro de Base Populacional, Ministério da Saúde (MS)/ Instituto Nacional de Câncer (INCA)/ Divisão de Vigilância e Análise de Situação; Ministério da Saúde (MS)/ Secretaria de Vigilância à Saúde (SVS)/ Coordenação-Geral de Informações e Análises Epidemiológicas (CGIAE) - Sistema de Informações sobre Mortalidade - SIM.

Figure 2 - Number of new cases between 1997 and 2015 and deaths between 1996 and 2021 from malignant neoplasms of the bronchi and lungs in the city of São Paulo.

When analyzing the incidence rates of new cases and the mortality rate of malignant neoplasms of the bronchi and lungs, from Figure 03, it is observed that the rate curve behaves in a similar way to the curves of absolute numbers (presented in Graph 2), showing that despite the presence of public policies aimed at reducing pollutants and reducing smoking, the general mortality rate increased by 2.56% in the period between 1996 and 2021. However, the incidence rate showed a drop of 12.63% between 1997 and 2015. It is notable that from 2007 onwards there was an inversion of the curves of both the rates and the absolute numbers between incidence and mortality, with mortality being higher.

From the analysis of the data obtained in the comparison of mortality according to sex, it is noted, in Figure 04, that with a total of 42,519 carriers of malignant neoplasia of the

bronchi and lungs during the historical series of 1996 and 2021, being male 25,670 and female 16,849. Between the period, the female mortality rate increased by 7.3 per 100,000 inhabitants and the male mortality rate fell by 2.50 per 100,000 inhabitants.

Another piece of data found that deserves to be highlighted is the relationship between the prevalence of smokers and the price of a pack of cigarettes. It can be seen in figure 05 that, despite the increase in the price of a pack of cigarettes by R$2.20 over a period of 16 years, there was a drop in the prevalence of smokers by 6.6% within that same period. These variations were mainly due to the implementation of the Strategic Action Plan for Combating Chronic Non-Communicable Diseases in Brazil in 2011, which imposed a minimum price for cigarettes and increased taxes on industrialized products.

FIGURE 03 - INCIDENCE RATE AND MORTALITY RATE PER YEAR
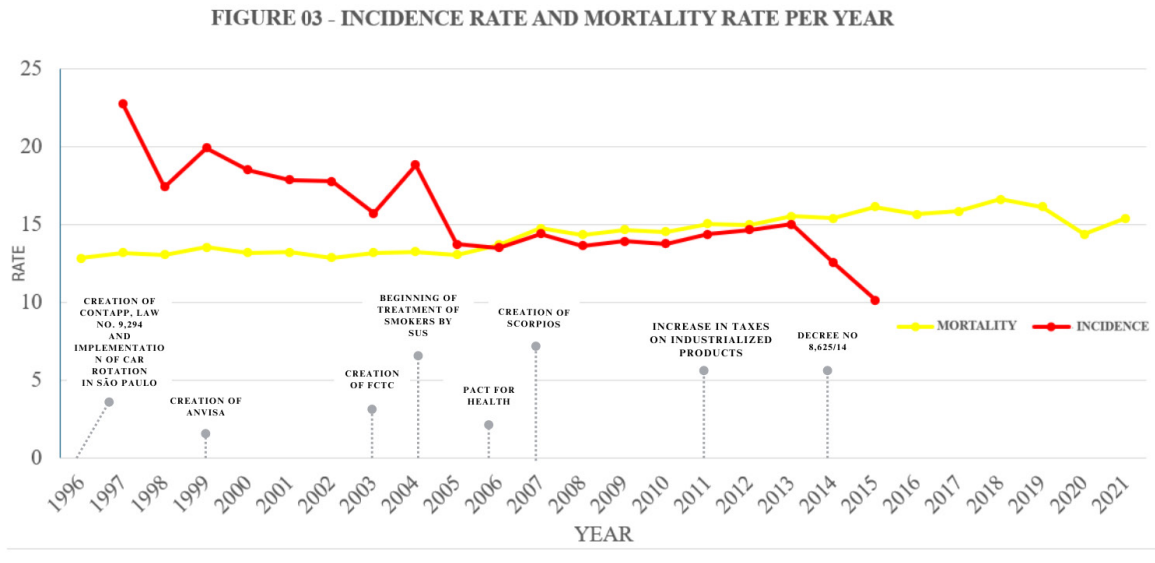
Source: 1980, 1991, 2000 e 2010: IBGE - Censos Demográficos; 1996: IBGE - Contagem Populacional; 1981-1990, 1992-1999, 2001-2006: IBGE - Estimativas preliminares para os anos intercensitários dos totais populacionais, estratificada por idade e sexo pelo MS/ SGEP/ DATASUS; 2007-2009: IBGE - Estimativas elaborada no âmbito do projeto UNFPA/ IBGE (BRA/4/P31A) - População e Desenvolvimento. Coordenação de População e Indicadores Sociais; 2011-2012: IBGE - Estimativas populacionais enviadas para o TCU, estratificadas por idade e sexo pelo MS/ SGEP/ DATASUS.

Figure 3 - Incidence rate and mortality rate by malignant neoplasms of the bronchi and lungs (1996-2021) in the city of São Paulo.

FIGURE. 04 - MORTALITY RATE PER YEAR AND SEX
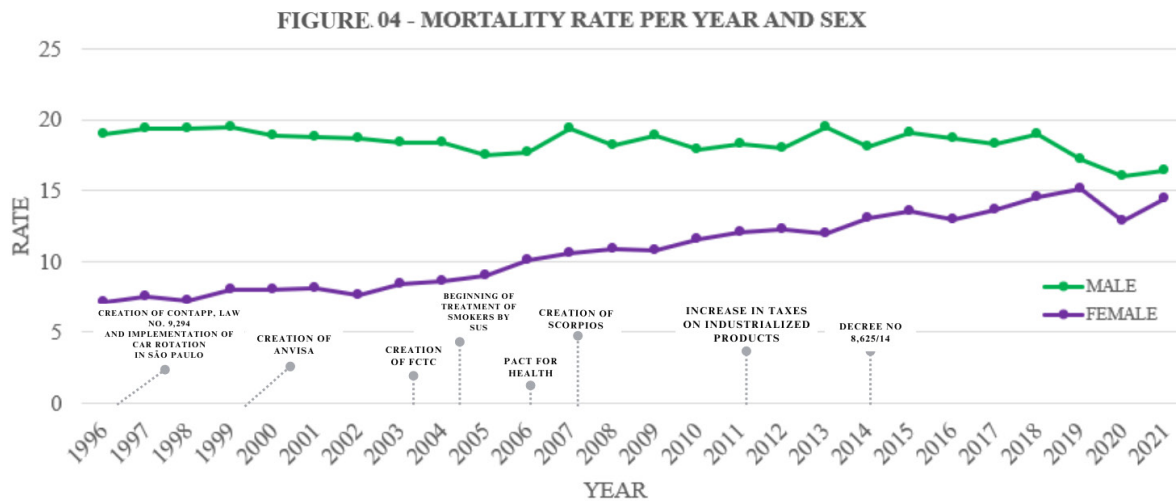
Source: Ministério da Saúde (MS)/ Secretaria de Vigilância à Saúde (SVS)/ Coordenação-Geral de Informações e Análises Epidemiológicas (CGIAE) - Sistema de Informações sobre Mortalidade - SIM.

Figure 4 - Mortality rate by malignant neoplasms of the bronchi and lungs (1996-2021) in the city of São Paulo.

FIGURE 5 - PREVALECE OF SMOKERS IN CAPITAL CITIES AND PRICE OF A PACK OF CIGARETTES (2006-2021)
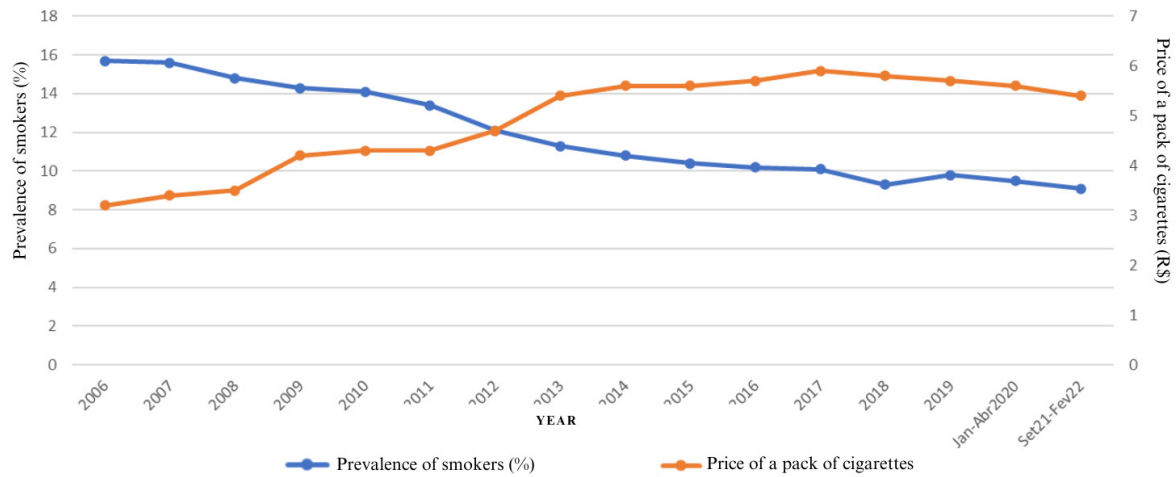
Source: *Vigitel Brasil 2021: Vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2021/ Ministério da Saúde 2021, **Instituto Brasilero de Geografia e Estatística (IBGE). Índice de Preço ao Consumidor.

Figure 5 - Prevalence of smokers in the capitals and price of a pack of cigarettes between 2006 and February 2022 in the city of São Paulo.

DISCUSSION

Despite the slight drop in the incidence and mortality of malignant neoplasms of the bronchi and lungs among men, which may be a reflection of investment in public policies to control smoking, the difficulty in reducing these rates in the general population persists. This scenario highlights the need for discussion about the effectiveness of the measures incorporated so that they can actively contribute to changing and controlling this habit within the scope of Public Health.

Risk factors

In order to analyze variations in mortality and incidence rates related to C34, it is necessary to analyze the risk factors related to this neoplasm. In this case, smoking is the main aggravating factor for the occurrence of malignant neoplasia of the bronchi and lungs, directly influencing the drop in the incidence rate and the continuous increase in

the mortality rate of this ICD in the city of São Paulo. The decrease in incidence may be related to the increase in the number of ex-smokers and efforts to quit smoking[11]. In addition to the smoking habit, smoking status and the age at which the practice began are important factors to be considered regarding the lethality of lung cancer[12]. It is important to mention that family history is associated with a 1.5 to 4-fold increase in the chances of developing lung cancer[13]. Passive smoking also poses a threat to the development of bronchial and lung cancer, however, at a lower intensity than that of active smokers. In addition to the genetic factor in those who have never smoked, there are also risk factors, but in smaller proportions: human papillomavirus infection, nutrition, occupational exposure to asbestos, radioactive minerals and radiation in medical examinations and environmental exposure to

cigarette smoke[14]. Pre-existing diseases such as pulmonary fibrosis, chronic obstructive pulmonary disease (COPD) and pulmonary tuberculosis also provide the microenvironment for the emergence of the disease[12].

Smoking control in Brazil

Smoking has been the subject of discussion among health professionals for decades. In 1950, 120 years after the mass production of cigarettes began, it began to be recognized as a risk factor for multiple diseases. In the 1970s, movements began to emerge to control tobacco consumption in Brazil. However, the main milestones to be considered occurred in the 1980s, when the National Tobacco Control Program was created in 1986, the main policy to combat smoking in Brazil and which remains in force to this day, under the coordination of the Unified Health System (SUS), created in 1988, and INCA the following year. The creation of the National Health Surveillance Agency in 1999 is also relevant for anti-tobacco policy actions[8]. Finally, Brazil ratified the commitment through the World Health Organization (WHO) Framework Convention on Tobacco Control (FCTC/WHO), the first international public health treaty that aims to combat smoking, in 2005. Since then, the National Tobacco Control Policy (PNCT) has been oriented towards compliance with the measures proposed by this convention.

The PNCT's premise is to reduce the prevalence of smokers in Brazil and the consequences caused by this habit on public health. The laws involved in tobacco control are broad and cover different scenarios, such as: regulation of the products themselves, education, regulation of advertising and packaging, financial issues and control of environments where consumption of tobacco takes place. Control and inspection related to tobacco products began to occur after the creation of Anvisa in 1999, which has a specialized sector for this function, the General Management of Tobacco Derivative Products. The measures adopted include the imposition of maximum limits on the levels of tar, nicotine and carbon monoxide in the smoke of cigarettes sold in Brazil and the ban on the use of additives that add flavor and increase chemical dependence. These measures were made official in 2012 to the detriment of the guidelines for implementing article 9 of the FCTC/WHO. Educational actions are divided into: information and awareness among the population regarding the harm caused by tobacco; training of professionals to manage the formulation of tobacco control actions. Such activities are guided by article 12 of the FCTC. Packaging labeling is also an important topic to be considered, with its first legislation being created in 1988, when the Ministry of Health introduced text, still without images, on cigarette packs warning about the harm to health caused by the product[15]. The addition of illustrations began in 2001, through Anvisa, which imposed health warnings containing photos and the Hotline number, which together occupy at least 100% of one side of the product packaging. From 2004 onwards, the images underwent changes after evaluating the progressive loss of effectiveness, a phenomenon that also occurred in 2008, when the third group of images was launched, covering more extreme themes. It was only in 2008 that lung cancer was introduced. The SimSmoke Political Simulation estimated that 8% of the 46% reduction in smoking prevalence that occurred between 1989 and 2010 in the country was due to the inclusion of these warnings on cigarette packs. Furthermore, research indicates an increase in the number of smokers concerned about their own health due to the information contained on the packaging. In 2000, cigarette advertisements in the main media (newspapers and television) were banned, as was the association of tobacco with sporting activities and the distribution of samples and gifts. In 2011 there was an important improvement to this law, prohibiting the advertising of tobacco products in places of sale without the association of health warnings. Statistics show that advertising is the main reason why smoking has become a pediatric

disease. Tobacco consumption in collective environments has been the target of public policies since 1996, when the law was launched that allowed the existence of areas reserved for smoking within public places, the famous "smoking areas". In 2011 and 2014, decrees were issued regulating this law and prohibiting the use of cigarettes, cigars, pipes and other tobacco products in places of collective use, both public and private. Some of the exceptions are outdoor areas, establishments suitable for smoking, audiovisual production sites and religious services. It is also estimated that passive smoking is responsible for at least seven deaths a day in Brazil.

Thus, it is reaffirmed that investment in public policies to control smoking has proven effective in reducing the prevalence of smokers, requiring continued actions so that this risk factor in the development of malignant neoplasms of the bronchi and lungs is controlled. However, it is clear that in addition to smoking control, there is investment in public policies to reduce and control other risk factors, as well as the implementation of public policies that provide opportunities to reduce mortality.

Differential behavior of incidence in women

During the First World War, the interwar period and the Second World War, functional changes were promoted and had a direct impact on the panorama of women in society. With the emergence of more modern lifestyles in metropolitan centers, the strengthening of mass communication vehicles and the growth and growth of women's struggle for equal rights intensified. During this period, American culture influenced the entire world and capitalism gained notoriety, leading to the reproduction of mass cultural products, which conveyed a feeling of modernity. Given this scenario, a series of habits and behaviors were introduced in an unprecedented way for women at that time, such as cigarette consumption, a custom, until then, mostly restricted and practiced by men[16].

The act of smoking carried with it the image of an elegant woman, sexually uninhibited, defiant of moral codes and with access to work, escaping the standard of the current patriarchal and sexist ultrastructure. Cinema played an important role in the consumption of cigarettes by women, through the representation of empowerment by female characters who smoke[17].

Gradually, the tobacco industry began to see the female audience as a potential expanding market, encouraging their consumption through advertisements that placed them as protagonists, appealing to a more seductive and ostentatious profile[16].

Nowadays, it is clear that tobacco consumption patterns have changed, extending to other segments of the population, making it a common practice. Factors such as the stress and loneliness of modern life, added to the other social roles that women have occupied (being mother, wife, professional, head of the family and model of beauty standards) can justify the use of cigarettes as an escape valve and escape from reality[17].

Studies indicate that the majority of female smokers perceive the harm caused by the practice6, and those who are in a situation of greater social vulnerability and less education tend to have a superficial knowledge of the individual and collective harm[18]. The beginning of the practice is encouraged by close groups of friends and family, the respective sense of belonging produced, and expression of rights in relation to men[19].

Furthermore, tobacco consumption is encouraged by the beneficial view of relaxation, stress reduction and anxiety relief[19,20]. Therapeutic resources that assist in smoking cessation are extremely expensive and scarce, making it an inaccessible reality for individuals with lower purchasing power who wish to quit smoking[20].

There are two main types of lung neoplasms: Small Cell Carcinoma and Non-Small Cell Lung Carcinoma (Adenocarcinoma, Squamous Cell Carcinoma and Large Cell Carcinoma). Adenocarcinomas are the most common (38%), less associated with smoking and

affect more women. Squamous Cell Carcinomas (20%) and Small Cell Carcinomas (14%) have a strong link with smoking, especially in men[21], but the increase in smoking among women in contemporary times can change this dynamic. Changes in cigarette consumption, such as the use of filters since 1960, as they do not eliminate smaller particles that are deposited in the periphery of the lungs, the region most affected by adenocarcinomas[22,23]. The persistence of anti-tobacco policies and attention to early diagnosis and treatment are essential in the face of these changes in the incidence and histological pattern of lung neoplasms, especially considering the potential increase in women.

Finally, the increase in the incidence of female smokers and the mortality of this group due to the neoplasia in question may be related to the manipulations of the tobacco industry, still present in the current century. Furthermore, factors such as stress, loneliness, anxiety and the female public's late approach to cigarette consumption are factors that may be associated with this late increase, in relation to the male population.

Atmospheric pollution

Air pollution is recognized by the International Agency for Research on Cancer as a risk factor for the development of cancer, especially due to the increased risk of developing lung and bronchial cancer. It is estimated that around 14% of deaths from C34 may be related to air pollution. Atmospheric pollution is regulated in Brazil by the Conama resolution. Among the pollutants, fine inhalable particles (PM2.5) are closely related to the development of this neoplasm. According to the WHO, 92% of the world's population lives in places where air quality levels exceed safe values for preserving health, which is paradoxical when observing the minimum number of public actions aimed at controlling air quality in Brazil[24]. One of the policies that influenced the reduction of damage caused by air pollution, especially in large metropolises, was the industrial zoning policy launched in 1980.

Car rotation is a measure that has been in force for 26 years in São Paulo and aims to reduce the number of vehicles in circulation on public roads during the same time, improving traffic and also air quality. Places with a high density of vehicular traffic coincide with areas that demonstrate the highest relative risk values for hospitalization due to C34[25]. The importance of controlling pollutant emissions from motor vehicles is due to the diffusion of nitrogen dioxide, nitrogen oxide, sulfur dioxide and fine particulate matter into the atmosphere, which increase the risk of lung and bronchial cancer. The rotation contributes to a reduction of up to 14.3% in pollution, according to Cetesb calculations, a number that is lower than expected (23%) due to the lack of full adherence to the rotation, the use of a second car and the increase in the number of taxis in streets.

In this sense, it is clear that there is still a lack of public policies that seek to effectively mitigate air pollution as a risk factor control strategy for malignant neoplasms of the bronchi and lungs.

Occupational Risk

Occupational exposure is associated with up to 29% of C34 cases, according to the International Labor Organization[26]. However, the attribution of lung and bronchial neoplasms to occupational risk is often discarded due to the appreciation of other factors more detailed in the literature, such as smoking. The WHO recognizes that 10% of deaths caused by this neoplasia are directly related to occupational risks[27]. Asbestos is a substance considered carcinogenic and its use has already been banned in 48 countries. In Brazil, since 1995, a law has regulated the extraction and use of a specific class of asbestos, but this law left a gap in relation to white asbestos, which corresponds to more than 95% of the types of asbestos present in nature[27]. It is also worth highlighting that in 2015 Brazil was the second largest producer and third largest consumer of asbestos in the

world. Only in 2017 did the Federal Superior Court decide to ban the use of all types of asbestos in the country. A limitation of the present study concerns the impossibility of evaluating solely the effect of occupational risk, or other risk factors mentioned, on the incidence and mortality from malignant neoplasms of the bronchi and lungs.

Limitations

Among the limitations of the study, we can mention: the availability of information offered by databases about the incidence of ICD-10 C34, which may have been influenced by registration biases; the absence of information on the prevalence of smokers, the price of a pack of cigarettes in years prior to 2006, and data on deaths using ICD-10 C34 in years prior to 1996, and in the period from 2016 to 2021; the presence of estimates of the total population of the municipality of São Paulo provided only in the intervals from 1997 to 1999, from 2001 to 2009 and from 2011 to 2021; the occurrence of the pandemic caused by the coronavirus from 2019 to 2023 may have changed the estimated data for the total population of the municipality in question.

CONCLUSION

In view of the above, it is clear that the measures aimed at reducing the incidence of lung and bronchial cancer are varied and cover a wide spectrum. Anti-tobacco policies had an impact on reducing the prevalence of smokers and the incidence of ICD-10 C34, however, this behavior was not reflected in general mortality from this cause, indicating possible interference from other factors (population growth and aging, atmospheric pollution and occupational exposure toxic). It is also worth highlighting the small drop in the mortality rate from this cause among the male population, which may indicate the effects of policies implemented over the years studied.

Furthermore, many of the constitutional measures adopted prove to be inefficient because they are not very rigid and minimally supervised, in addition to having loopholes and being applied late, taking into account the beginning of recognition of the etiologies of this cancer. Other issues to be considered are: the disease has a chronic nature and a long latency period, which can take years to develop, making it necessary to evaluate the effectiveness of measures applied over a long period of time.

Therefore, there is an urgent need for public policies to control smoking with a focus on the female gender, which has shown an increase in the incidence of malignant neoplasms of the bronchi and lungs and may have an impact on general mortality rates in the future. It is also important to encourage studies that, like this one, seek to analyze the impact of government measures and their impact on morbimortality indicators.

CREdiT author statement

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REFERENCES

1. Câncer - OPAS/OMS | Organização Pan-Americana da Saúde [Internet]. www.paho.org. 2020. Available from: https://www.paho.org/pt/topicos/cancer

2. Zhang Y, Vaccarella S, Morgan E, Li M, Jaione Etxeberria, Chokunonga E, et al. Global variations in lung cancer incidence by histological subtype in 2020: a population-based study. Lancet Oncology. 2023; 24(11):1206–18. Available from: https://doi.org/10.1016/S1470-2045(23)00444-8

3. INCA - Instituto Nacional de Câncer. Estimativa 2020: incidência de câncer no Brasil [Internet]. 2020. Acesso em 25 de abril de 2024. Disponível em: https://www.inca.gov.br/publicacoes/livros/estimativa-2023-incidencia-de-cancer-no-brasil

4. Novo CPD, Zanin L, Perin V, Fonseca MRCC da. Mortalidade por câncer de pulmão: perfil e tendências após a vigência da Lei Antifumo. Rev. Fam., Ciclos Vida Saúde Contexto Soc. [Internet]. 9º de março de 2021 [citado 21º de janeiro de 2024];9:252-63. Disponível em: https://doi.org/10.18554/refacs.v9i0.4326

5. INCA - Instituto Nacional de Câncer. Estimativa 2023: incidência de câncer no Brasil [Internet]. 2023. Acesso em 19 de janeiro de 2024. Disponível em: https://www.inca.gov.br/publicacoes/livros/estimativa-2023-incidencia-de-cancer-no-brasil

6. Szklo A. VIGITEL nos tempos da pandemia! [Internet]. [cited 2023 Oct 29]. Available from: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//parceiros_13042022_vigitel_new1.pdf

7. Incidências do BasePop [Internet]. www.inca.gov.br. Available from: https://www.inca.gov.br/BasePopIncidencias/Home.action

8. Política Nacional [Internet]. Instituto Nacional de Câncer - INCA. Available from: https://www.gov.br/inca/pt-br/assuntos/gestor-e-profissional-de-saude/observatorio-da-politica-nacional-de-controle-do-tabaco/politica-nacional

9. Teixeira LA, Jaques TA. Legislação e Controle do Tabaco no Brasil entre o Final do Século XX e Início do XXI. Rev. Bras. Cancerol. [Internet]. 30º de setembro de 2011 [citado 21º de janeiro de 2024];57(3):295-304. Disponível em: https://doi.org/10.32635/2176-9745.RBC.2011v57n3.658

10. Portes LH, Machado CV, Turci SRB, Figueiredo VC, Cavalcante TM, Silva VL da C e. A Política de Controle do Tabaco no Brasil: um balanço de 30 anos. Ciência coletiva [Internet). 2018Jun;23(6): 1837-48. Available from: https://doi.org/10.1590/1413-81232018236.05202018

11. Malta DC, Gomes CS, Andrade FMD de, Prates EJS, Alves FTA, Oliveira PPV de, et al. Tobacco use, cessation, secondhand smoke and exposure to media about tobacco in Brazil: results of the National Health Survey 2013 and 2019. Revista Brasileira de Epidemiologia. 2021;24(suppl 2). Available from: https://doi.org/10.1590/1980-549720210006.supl.2

12. Nogueira JF, Mota AL, Araújo APF, Figueiredo BQ de, Santos GM, Silva LCS e, Miquelanti TG, Nascimento Júnior VP do, Araújo BC de. Epidemiological profile of lung cancer in Brazil between 2013 and 2020. RSD [Internet]. 2021Dec.11 [cited 2024Jan.21];10(16):e203101623566. Available from: https://doi.org/10.33448/rsd-v10i16.23566

13. Câncer de Pulmão em Indivíduos não Fumantes: Padrões Epidemiológicos, Clínicos e de Sobrevida baseados no Gênero [Internet]. Inca.gov.br. 2023 [cited 2023 Oct 29]. Available from: https://rbc.inca.gov.br/index.php/revista/article/view/81/41

14. PASCHOAL, M. Epidemiologia do Câncer de Pulmão, Rev Sociedade de Pneumologia e Tisiologia do Estado do Rio de Janeiro [Internet], 2023; 31(1): 6-10. Disponível em: https://www.sopterj.com.br/wp-content/uploads/2023/03/3-pulmao_ri_vol31_n1_2023-art-1.pdf

15. Nacional De Câncer I, Gomes Da Silva J. MINISTÉRIO DA SAÚDE [Internet]. [cited 2023 Oct 30]. Available from: https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//cartilha_amianto_2020.pdf

16. Gorberg M. A mulher e o cigarro: representações de feminilidade nos anos 1920. dObra[s] – revista da Associação Brasileira de Estudos de Pesquisas em Moda. 2020 Aug 3;14(29):222–48. Available from: https://doi.org/10.26563/dobras.v14i29.1145

17. CUNHA I, SILVA M. TABAGISMO ENTRE MULHERES - PROBLEMA DE SAÚDE PUBLICA QUE CRESCE NO SILENCIO E NA SOLIDAO [Internet]. Grupo Educacional Filadélfia. [cited 2023 Oct 30]. Available from: https://www.filadelfia.com.br/artigo-academico/tabagismo-entre-mulheres-problema-de-saude-publica-que-cresce-no-silencio-e-na-solidao/#:-text=A%20fragilidade%20emocional%20provocada%20pela.no%20mundo%20provocado%20pelas%20mulheres.&text=seu%20poder%20aquisitivo%E2%80%A6,das%20mulheres%20um%20importante%20alvo%E2%80%A6%E2%80%9D

18. Sánchez Martínez JA, Ribeiro CR de O. The search for equality: representations of the smoking act among adolescent women. Rev Latino-Am Enfermagem [Internet]. 2008Jul;16(spe):640–5. Available from: https://doi.org/10.1590/S0104-11692008000700022

19. Scarinci I, Silveira A, Santos D, Beech B. Sociocultural factors associated with cigarette smoking among women in Brazilian worksites: a qualitative study. Health Promotion International. 2007 May 9;22(2):146-54. Available from: https://doi.org/10.1093/heapro/dam012

20. Bhanji S, Andrades M, Taj F, Khuwaja AK. Factors related to knowledge and perception of women about smoking: a cross sectional study from a developing country. BMC Women's Health. 2011;11(16). Available from: https://doi.org/10.1186/1472-6874-11-16

21. Filho GB. Bogliolo - Patologia (9th edição). Rio de Janeiro: Guanabara Koogan, 2016.

22. Alberg AJ, Brock MV, Samet JM. Epidemiology of Lung Cancer: Looking to the Future. Journal of Clinical Oncology. 2005 May 10;23(14):3175–85. Available from: https://doi.org/10.1200/JCO.2005.10.462

23. Janssen-Heijnen M. The changing epidemiology of lung cancer in Europe. Lung Cancer. 2003 Sep;41(3):245–58. Available from: https://doi.org/10.1016/S0169-5002(03)00230-7

24. Vigilância em Saúde ambiental e Qualidade do ar Poluição atmosférica na ótica do sistema Único de Saúde [Internet]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/poluicao_atmosferica_SUS_saude_ambiental.pdf

25. Ribeiro, Adeylson Guimarães. Câncer e poluição do ar relacionada ao tráfego veicular no município de São Paulo: análise espacial em pequenas áreas [tese]. São Paulo: , Faculdade de Saúde Pública; 2018 [citado 2024-04-25]. https://doi:10.11606/T.6.2018.tde-14062018-123942.

26. Câncer de pulmão [Internet]. Instituto Nacional de Câncer - INCA. 2022. Available from: https://www.gov.br/inca/pt-br/

assuntos/cancer/tipos/pulmao

27. Vigilância do Câncer Relacionado ao Trabalho e ao Ambiente 2ª edição revista e atualizada Ministério da Saúde Instituto Nacional de Câncer (INCA) [Internet]. Available from: https://bvsms.saude.gov.br/bvs/publicacoes/vigilancia_cancer_relacionado_trabalho_2ed.pdf