ORIGINAL ARTICLE

Trends in smoking prevalence in all Brazilian capitals between 2006 and 2017

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ABSTRACT

Objective: To evaluate the trends in smoking prevalence in all Brazilian capitals between 2006 and 2017. **Methods:** This was a study of temporal trends in smoking, based on information from the Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases. The trends in smoking prevalence were stratified by gender, age, level of education, and capital of residence. We used linear regression analysis with a significance level of 5%. **Results:** From 2006 to 2017, the overall prevalence of smoking in the Brazilian capitals declined from 19.3% to 13.2% among men and from 12.4% to 7.5% among women ($p < 0.05$ for both). Despite the overall decline in the prevalence of smoking in all of the capitals, the rate of decline was lower in the more recent years. There was also a reduction in the prevalence of former smoking (22.2% in 2006 to 20.3% in 2017). In contrast, there was an upward trend in the prevalence of former smoking among individuals with a lower level of education (from 27.9% in 2006 to 30.0% in 2017). In 2017, the prevalence of smoking among men was highest in the cities of Curitiba, São Paulo, and Porto Alegre, whereas it was highest among women in the cities of Curitiba, São Paulo, and Florianópolis. **Conclusions:** There have been improvements in smoking prevalence in Brazil. Annual monitoring of smoking prevalence can assist in the battle against chronic noncommunicable diseases.

Keywords: Smoking; Tobacco use disorder; Health surveys.

INTRODUCTION

Smoking is a major risk factor for chronic respiratory disease, cardiovascular disease, and various cancers.[1] Approximately 1.1 billion smokers (i.e., 80% of all smokers) live in low- or middle-income countries, where the burden of smoking-related diseases is highest.[2]

Tobacco use represents a major health care system problem because of increased socioeconomic and health care costs.[3] The total cost of smoking has been estimated at US$ 1,436 billion, which is equivalent to 1.8% of the world's annual gross domestic product.[4] Approximately 40% of this cost occurs in low- and middle-income countries, reflecting substantial losses caused by smoking.[4] In addition, the indirect cost of smoking-attributable diseases is estimated at US$ 1,014 billion.[4]

More than 7 million deaths per year are due to smoking, and approximately 890,000 are due to exposure to secondhand smoke.[5] In 2015, smoking accounted for the loss of 150 million disability-adjusted life years.[6] Smoking is associated with high morbidity and mortality; although the prevalence of smoking has steadily declined worldwide, it remains high in some regions and vulnerable groups.[3]

The reduction in smoking prevalence was primarily due to a substantial expansion and strengthening of tobacco control initiatives worldwide.[6] In Brazil, studies using data from the 1989 Brazilian National Survey on Health and Nutrition, the 2003 *Pesquisa Especial de Tabagismo* (PETab, Global Adult Tobacco Survey), the 2008 Brazilian National Household Sample Survey, and the 2013 *Pesquisa Nacional de Saúde* (PNS, Brazilian National Health Survey) have shown a reduction in tobacco use in the country.[7,8]

Regulatory measures to reduce smoking in Brazil include the implementation of the Framework Convention on Tobacco Control in 2006 and the enactment of the Smoke-Free Law in 2014.[9] The 2011-2022 Strategic Action Plan to Combat Chronic Noncommunicable Diseases (NCDs) set a goal of reducing tobacco use and implementing surveillance of smoking.[9,10] The *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases) is an essential tool for monitoring the frequency and distribution of major determinants of chronic NCDs and their risk factors, including smoking.[11]

The objective of the present study was to evaluate the trends in smoking prevalence in all Brazilian capitals between 2006 and 2017.

METHODS

This was a study of temporal trends in smoking between 2006 and 2017, based on data from the VIGITEL. The

VIGITEL is a cross-sectional population-based study that annually assesses adults (≥ 18 years of age) residing in any of the 26 Brazilian state capitals or in the Federal District of Brasília. Between 2006 and 2017, 12 telephone-based surveys were conducted, a total of 54,000 interviews being conducted each year (i.e., approximately 2,000 interviews in each capital city). Details regarding the sampling and data collection process are provided elsewhere.[11]

In the present study, smoking prevalence was analyzed as follows:

a. Prevalence of current smoking: number of smokers/number of individuals interviewed. Those who answered "yes" to the question "Do you smoke?" were considered to be smokers regardless of the number of cigarettes smoked per day, frequency of smoking, or duration of smoking.

b. Prevalence of former smoking: number of former smokers/number of individuals interviewed. Nonsmokers who answered "yes" to the question "Have you ever smoked?" were considered to be former smokers regardless of the number of cigarettes smoked or the duration of smoking.

c. Prevalence of smoking ≥ 20 cigarettes per day: number of individuals smoking ≥ 20 cigarettes per day/number of individuals interviewed, the number of individuals smoking ≥ 20 cigarettes per day being assessed by the question "How many cigarettes do you smoke per day?".

As of 2009, smoking prevalence analysis included the following:

d. Prevalence of passive smoking at home: number of nonsmokers who reported living with at least one smoker who smoked inside the household/number of individuals interviewed, the number of nonsmokers who reported living with at least one smoker who smoked inside the household being assessed by the question "Do any of the people who live with you usually smoke inside the household?".

e. Prevalence of passive smoking at work: number of nonsmokers who reported having at least one coworker who smoked indoors at work/number of individuals interviewed, the number of nonsmokers who reported having at least one coworker who smoked indoors at work being assessed by the question "Do any of your coworkers usually smoke indoors at work?".

The temporal trends in smoking prevalence were stratified by gender, age group (18-24, 25-34, 35-44, 45-54, 55-64, and ≥ 65 years), level of education (0-8, 9-11, and ≥ 12 years of schooling), and capital of residence.

A linear regression model was used for trend analysis, the response variable (Y_i) being the prevalence of smoking and the explanatory variable (X_i) being the year of study. A negative slope coefficient (β) indicated a reduction in smoking prevalence over the years, whereas a positive slope coefficient indicated an annual increase in prevalence. Analysis of residuals

was performed in order to assess the goodness of fit of the model. The level of significance was set at 5%. The Stata statistical software package, version 14 (StataCorp LP, College Station, TX, USA) was used for data processing and statistical analysis.

The VIGITEL was approved by the Brazilian National Research Ethics Committee (Ruling no. 355,590/2013). All participants gave verbal informed consent during the telephone interview.

RESULTS

Figure 1 shows the trends in smoking prevalence in Brazil, by gender. There was a trend toward a reduction in smoking prevalence (p < 0.001). The prevalence of current smoking was found to be higher in males than in females (19.3% in 2006 and 13.2% in 2017 vs. 12.4% in 2006 and 7.5% in 2017). This was also true for the prevalence of former smoking, smoking ≥ 20 cigarettes per day, and passive smoking at work. In the 2015-2017 period, there was a reduction in the rate of decline in the prevalence of smoking in the general population and in males. There were reductions in the prevalence of former smoking (from 22.2% in 2006 to 20.3% in 2017; p < 0.001), smoking ≥ 20 cigarettes per day (from 4.6% in 2006 to 2.6% in 2017; p < 0.001), passive smoking at home (from 12.7% in 2006 to 7.9% in 2017; p < 0.001), and passive smoking at work (from 12.1% in 2006 to 6.7% in 2017; p < 0.001) among males and females.

The trends in smoking prevalence in Brazil were also stratified by level of education. There was a trend toward an increase in the prevalence of former smoking among individuals who had had 0-8 years of schooling (from 27.9% in 2006 to 30.0% in 2017; p = 0.0435; slope = 0.159); among those who had had 9-11 years of schooling, there was no significant variation (p = 0.527; β = −0.035); and there was a decrease in the number of former smokers among individuals who had had ≥ 12 years of schooling (p < 0.001; β = −0.270). There was a trend toward a reduction in the prevalence of current smoking, smoking ≥ 20 cigarettes per day, passive smoking at home, and passive smoking at work for all levels of education. The decrease in the prevalence of current smoking and smoking ≥ 20 cigarettes per day was most pronounced among individuals who had had 0-8 years of schooling (p < 0.001; β = −0.591 and p < 0.001; β = −0.232, respectively). The decrease in the prevalence of passive smoking at home and passive smoking at work was most pronounced among individuals who had had 9-11 years of schooling (p < 0.001; β = −0.725), followed by those who had had 0-8 years of schooling (p < 0.001; β = −0.675) and those who had had ≥ 12 years of schooling (p < 0.001; β = −0.373; Figure 2).

Table 1 shows the trends in smoking prevalence in Brazil, by age group. There was a trend toward a reduction in the prevalence of current smoking, smoking ≥ 20 cigarettes per day, passive smoking at
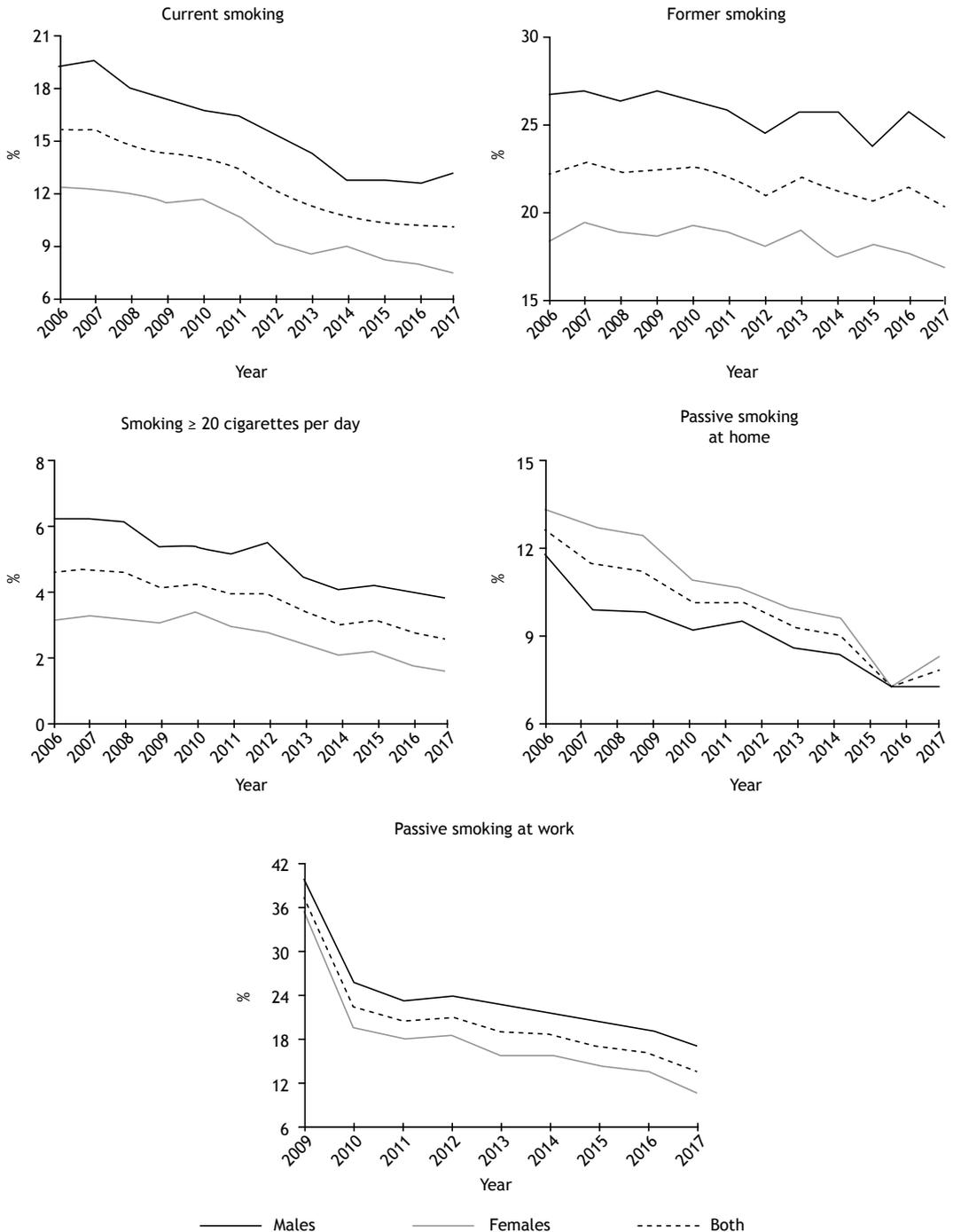
Figure 1. Trends in smoking prevalence in all Brazilian capitals, by gender. VIGITEL, 2006-2017. VIGITEL: *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases).

home, and passive smoking at work in all age groups. The prevalence of smoking was highest in individuals in the 45- to 54-year age bracket between 2006 and 2014, and, as of 2015, in those in the 55- to 64-year age bracket. In all years studied, smoking prevalence was lowest in those ≥ 65 years of age. There was a trend toward an increase in the prevalence of former smoking in individuals in the 55- to 64-year age bracket

(p = 0.013; β = 0.390). The prevalence of smoking ≥ 20 cigarettes per day was highest in those in the 45- to 54-year age bracket (p < 0.001; β = −0.507), the rate of increase in the prevalence of smoking ≥ 20 cigarettes per day being highest in individuals in the 55- to 64-year bracket (p = 0.003; β = −0.271). Although the prevalence of passive smoking at home was found to have decreased over the years, it was
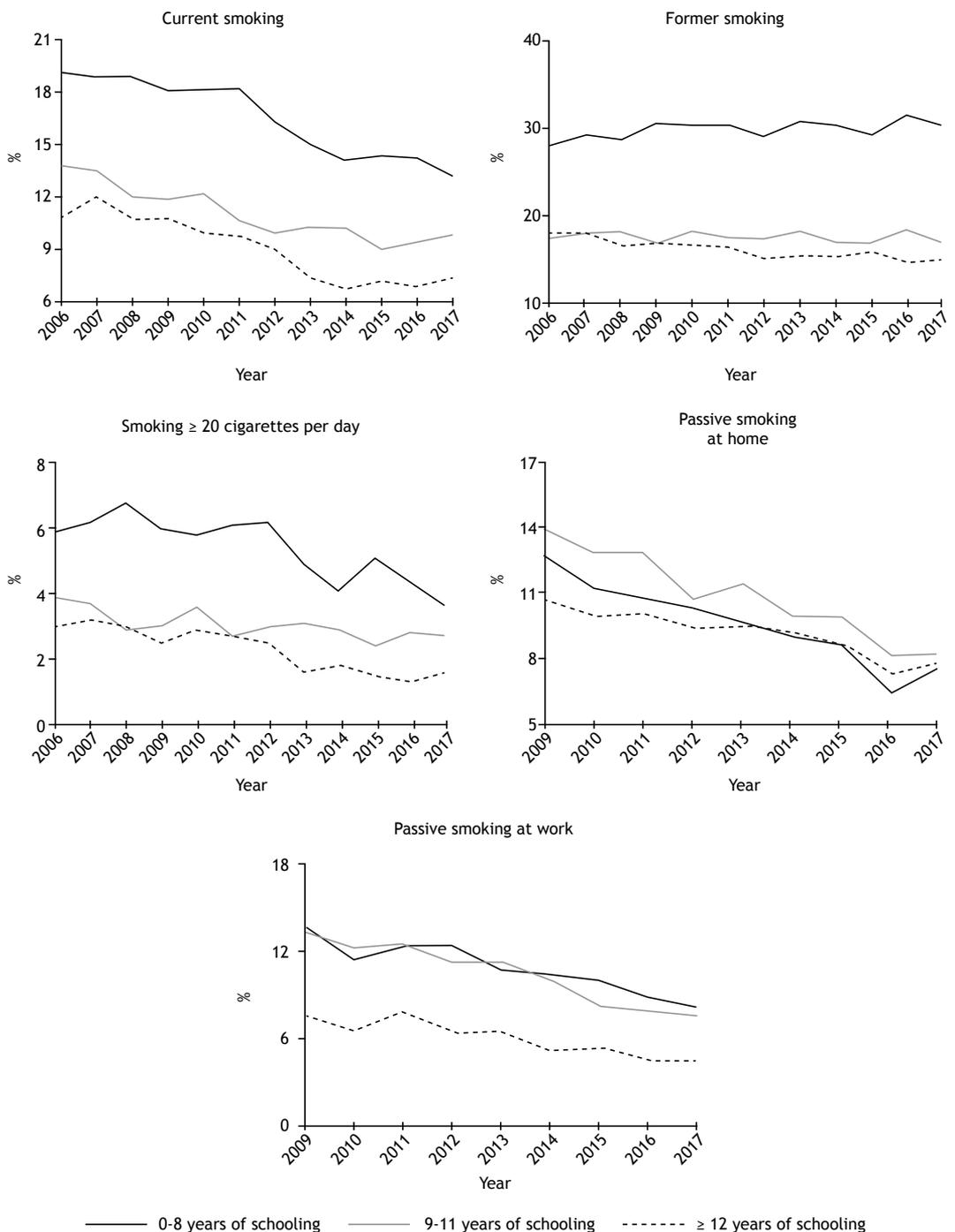
Figure 2. Trends in smoking prevalence in all Brazilian capitals, by level of education (number of years of schooling). VIGITEL, 2006-2017. VIGITEL: *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases).

highest in individuals in the 18- to 24-year age bracket (p < 0.001; β = −0.972). The prevalence of passive smoking at work was highest in individuals in the 35- to 44-year age bracket (p < 0.001; β = −0.975) and in those in the 25- 34-year age bracket (p < 0.001; β = −0.803). Although the prevalence of passive smoking at work was lowest in individuals in the 18-24 year age bracket, the β coefficient was −0.828 in that

age group, and there was no significant variation in individuals > 55 years of age.

The prevalence of smoking in males was found to have decreased in all Brazilian capitals. In 2017, smoking prevalence in males was highest in the cities of Curitiba, São Paulo, and Porto Alegre (Table 2). The prevalence of smoking in females was also found

Table 1. Trends in smoking prevalence, by age group. VIGITEL, 2006-2017.

Prevalence	Age	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	p	Slope
Current smoking	18-24	12.0	13.7	11.5	10.9	10.9	8.8	8.5	7.1	7.8	7.2	7.4	8.5	< 0.001	−0.533
	25-34	14.1	14.6	13.8	14.5	14.2	13.2	11.7	12.1	11.9	10.5	9.7	9.6	< 0.001	−0.481
	35-44	18.5	17.5	16.5	14.8	15.1	13.9	12.9	11.2	9.9	10.4	10.0	11.7	< 0.001	−0.777
	45-54	22.6	21.7	19.6	18.9	18	18.6	16.0	15.1	13.2	12.7	12.6	11.2	< 0.001	−1.033
	55-64	15.0	15.8	17.2	16.7	16.7	15.9	15.0	13.6	12.5	12.8	13.5	11.6	0.001	−0.420
	≥ 65	9.4	8.5	9.3	8.4	8.1	9.0	7.6	6.9	8.1	8.2	7.7	7.3	0.007	−0.156
Former smoking	18-24	11.9	10.7	10.1	9.6	10.2	9.2	8.7	10.3	10.3	8.7	9.3	10.4	0.103	−0.124
	25-34	14.2	14.0	14.0	14.2	13.1	13.7	13.0	13.2	12.8	12.2	12.9	12.1	< 0.001	−0.185
	35-44	22.4	23.3	20.8	20.5	19.9	19.2	16.5	17.7	15.8	16.8	16.8	14.9	< 0.001	−0.706
	45-54	34.0	33.5	33.7	33.9	33.9	33.0	30.4	30.1	30.2	27.9	26.2	24.6	< 0.001	−0.847
	55-64	31.8	36.1	36.4	36.4	37.3	37.3	39.1	39.1	37.5	36.6	39.7	37.7	0.013	0.390
	≥ 65	34.3	37.5	35.4	36.1	38.8	35.4	33.6	37.0	34.9	35.8	37.0	34.2	0.682	−0.056
Smoking ≥ 20 cigarettes per day	18-24	2.2	2.7	1.9	1.9	2.3	1.8	1.8	1.8	1.0	1.6	1.6	1.4	0.003	−0.094
	25-34	2.9	3.7	3.5	3.0	3.5	2.9	3.2	2.7	3.0	2.9	2.2	1.9	0.005	−0.108
	35-44	5.6	5.3	5.1	5.3	4.5	3.8	4.6	3.3	2.7	3.6	3.1	3.0	< 0.001	−0.261
	45-54	9.5	7.9	7.3	6.8	6.9	7.0	5.7	5.5	5.0	3.6	3.6	3.5	< 0.001	−0.507
	55-64	5.7	6.6	7.4	6.4	7.1	5.8	7.0	4.6	4.2	4.3	4.4	4.0	0.003	−0.271
	≥ 65	2.5	2.6	3.9	1.9	2.3	3.8	2.9	2.6	2.4	2.7	2.3	2.3	0.478	−0.038
Passive smoking at home	18-24	-	-	-	19.6	16.9	17.4	16.8	16.7	15.1	15.2	10.7	11.2	< 0.001	−0.972
	25-34	-	-	-	13.4	12.5	13.4	11.0	11.6	10.7	10.6	9.0	10.6	0.002	−0.460
	35-44	-	-	-	9.8	7.7	8.5	7.2	8.0	7.3	7.4	6.0	6.5	0.004	−0.340
	45-54	-	-	-	10.8	9.4	8.4	8.2	6.6	6.8	6.1	6.3	5.7	< 0.001	−0.595
	55-64	-	-	-	10.9	11.5	9.2	8.3	9.1	8.1	7.5	5.4	6.0	< 0.001	−0.692
	≥ 65	-	-	-	10.1	10.8	8.7	9.0	8.2	7.5	6.7	4.9	5.6	< 0.001	−0.687
Passive smoking at work	18-24	-	-	-	12.5	11.0	12.6	9.6	9.2	10.3	5.9	6.4	6.7	0.001	−0.828
	25-34	-	-	-	14.0	12.4	12.5	12.4	11.8	9.7	10.8	7.7	7.0	< 0.001	−0.803
	35-44	-	-	-	15.8	13.5	14.7	12.5	13.1	10.6	8.7	8.9	8.1	< 0.001	−0.975
	45-54	-	-	-	12.9	11.0	11.1	11.3	9.8	9.6	9.0	8.7	8.3	< 0.001	−0.520
	55-64	-	-	-	7.4	7.4	8.2	9.4	7.4	6.9	7.5	5.3	6.0	0.080	−0.263
	≥ 65	-	-	-	2.8	2.1	2.5	2.3	2.5	2.5	2.1	2.5	2.3	0.456	−0.023

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to have decreased in all Brazilian capitals. In 2017, smoking prevalence in females was highest in the cities of Curitiba, São Paulo, and Florianópolis (Table 3).

DISCUSSION

The present study showed a reduction in the prevalence of smoking between 2006 and 2017, as well as improvements in the prevalence of former smoking, smoking ≥ 20 cigarettes per day, passive smoking at home, and passive smoking at work. In the 2015-2017 period, there was a reduction in the rate of decline in smoking prevalence in Brazil as a whole and in some of the Brazilian capitals. The prevalence of smoking was highest in males, individuals with a lower level of education, and individuals in the 35- to 64-year age bracket. The prevalence of smoking in 2017 was highest in the capital cities of Curitiba, São Paulo, Porto Alegre, and Florianópolis.

The 2011-2022 Strategic Action Plan to Combat Chronic NCDs set a goal of reducing the prevalence of smoking by 30%.[9,10] The World Health Organization

Global Action Plan for the Prevention and Control of NCDs and the United Nations 2030 Agenda for Sustainable Development have also set goals of reducing the prevalence of smoking.[12,13]

Data from the 1989 Brazilian National Survey on Health and Nutrition showed that the prevalence of tobacco use among adults was 34.8%.[14] Data from the 2003 World Health Survey showed a reduction in smoking prevalence (to 22.4%).[14] The 2008 PETab showed a smoking prevalence of 17.2%,[15] and the 2013 PNS showed a smoking prevalence of 14.7%. [8,16] These results show that Brazil has made progress in reducing the prevalence of smoking.

Brazil has set a global example on reducing smoking prevalence, and these advances have been attributed to the regulatory measures put forth by the World Health Organization Framework Convention on Tobacco Control, which came into force in 2005. Several measures have been implemented in the country, such as monitoring tobacco use and raising taxes on tobacco products.[17,18] Other measures include Decree no. 5,658, which was

Table 2. Trends in smoking prevalence among males in all Brazilian capitals. VIGITEL, 2006-2017.

Capital	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	p	Slope
Aracaju	17.2	15.4	16.3	9.9	14.2	13.6	10.6	12.7	9.9	10.4	8.2	8.7	< 0.001	−0.724
Belém	19.8	20.7	17.4	16.0	19.6	17.3	10.9	11.4	10.1	11.6	9.7	13.0	< 0.001	−0.961
Belo Horizonte	21.3	19.8	20.3	17.7	17.6	19.1	15.5	15.8	16.2	12.4	13.5	10.6	< 0.001	−0.861
Boa Vista	22.1	17.9	21.1	17.1	16.1	15.4	14.2	13.8	13.1	11.2	8.2	9.8	< 0.001	−1.119
Campo Grande	19.3	21.2	21.4	16.6	17.5	17.6	13.4	14.4	15.5	14.1	15.0	15.8	0.003	−0.575
Cuiabá	19.3	17.8	17.4	12.4	15.9	16.5	14.1	15.4	15.6	14.9	12.7	12.6	0.008	−0.437
Curitiba	21.1	19.8	20.4	23.8	17.9	20.5	15.6	15.9	14.9	14.5	17.8	18.3	0.023	−0.509
Florianópolis	20.1	23.5	18.1	19.1	17.3	1.06	16.6	14.5	14.0	10.3	11.8	13.6	< 0.001	−0.926
Fortaleza	18.7	18.0	15.8	19.4	13.9	12.6	13.0	10.0	8.6	9.0	9.8	8.8	< 0.001	−1.034
Goiânia	16.7	15.2	16.6	15.8	16.6	14.0	13.3	15.4	14.1	8.7	14.0	13.5	0.021	−0.399
João Pessoa	19.1	18.4	14.4	15.6	14.8	13.6	14.0	10.7	12.9	13.2	11.4	8.0	< 0.001	−0.765
Macapá	26.8	23.2	24.0	25.6	15.2	15.1	16.1	13.8	10.3	10.7	12.8	11.2	< 0.001	−1.531
Maceió	18.0	15.5	13.4	16.6	13.2	10.1	11.2	13.5	10.3	9.4	9.1	10.1	< 0.001	−0.706
Manaus	18.3	20.6	18.7	15.0	15.2	15.4	10.9	10.7	10.3	13.1	7.9	11.0	< 0.001	−0.963
Natal	17.4	16.5	13.9	15.1	16.5	14.4	11.4	7.9	11.6	10.6	11.5	10.4	0.001	−0.669
Palmas	17.8	17.7	14.4	14.2	13.9	15.6	11.0	7.2	10.6	9.7	10.4	12.6	0.003	−0.694
Porto Alegre	23.3	22.1	21.4	21.9	20.0	22.2	16.8	18.7	17.9	16.7	17.4	16.7	< 0.001	−0.619
Porto Velho	24.0	19.4	21.3	21.3	18.2	19.8	13.3	14.2	9.7	12.8	13.8	12.8	< 0.001	−1.083
Recife	18.7	19.2	12.3	15.2	16.9	13.0	13.4	13.4	13.3	11.1	11.4	12.2	0.002	−0.593
Rio Branco	24.1	21.2	16.5	16.5	20.1	18.9	19.0	11.7	14.8	10.9	12.6	15.0	0.002	−0.875
Rio de Janeiro	16.5	17.1	17.2	15.2	13.0	13.5	17.1	15.1	10.8	14.6	13.5	12.7	0.024	−0.365
Salvador	11.8	14.9	10.9	12.3	10.3	9.8	7.3	6.6	9.0	5.6	6.8	5.9	< 0.001	−0.717
São Luís	16.5	18.0	16.4	16.9	13.4	16.4	12.4	14.3	9.3	8.5	9.2	9.1	< 0.001	−0.892
São Paulo	22.3	22.9	21.7	19.9	21.3	21.8	20.7	17.6	15.4	15.6	14.6	17.2	< 0.001	−0.728
Teresina	21.7	20.9	17.5	19.5	15.9	17.1	16.7	11.6	11.0	10.3	9.5	7.7	< 0.001	−1.269
Vitória	17.2	17.9	15.1	14.8	15.4	14.2	11.7	10.2	11.0	10.5	10.8	12.7	< 0.001	−0.639
Brasília	18.1	20.0	15.4	17.7	15.9	10.6	13.0	16.3	12.4	13.9	14.5	14.9	0.054	−0.413
Brasil	19.3	19.6	18.0	17.5	16.8	16.5	15.5	14.4	12.8	12.8	12.7	13.2	< 0.001	−0.690

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issued in 2006 and enacted the Framework Convention on Tobacco Control, banning the advertising of tobacco products[19]; Law no. 12,546, which was issued in 2011 and established smoke-free environments[20]; and Decree no. 8,262/2014, which regulated smoke-free environments, increased the size of text and graphic warnings on the packages of tobacco products and other smoking products, prohibited the sale of tobacco products and other smoking products to minors (individuals under 18 years of age), established a minimum price for tobacco products and other smoking products, and banned smoking advertisements in the media, among other measures.[21]

In recent years, there has been a reduction in the rate of decline in smoking prevalence, a longer observation period being required in order to determine whether this trend will change. This draws attention to the need for new regulatory measures, including the use of plain packaging, enforcement of the law regulating smoke-free environments and point-of-sale advertising, control of illicit tobacco trade, and provision of support to small-scale tobacco farmers for crop diversification.[22] Other relevant issues include the impact of the current economic crisis in Brazil, the implementation of fiscal austerity measures, cuts in public spending on social welfare and health care, and the diminishing regulatory role of the Brazilian government.[23-25]

Because of historical, economic, cultural, and social issues, being male is still a determinant of smoking.[26] In addition, tobacco companies created a brand image that promoted the ideals of prestige, wealth, glamour, masculinity, athleticism, and health.[27] Data from the Global Burden of Disease 2015 study showed that, worldwide, the prevalence of smoking in 2015 was 25.0% among males and 5.4% among females.[6] Data from two Brazilian national surveys also showed a higher prevalence of smoking in males (18.9% and 21.6%) than in females (11.0% and 13.1%).[8,15]

The present study showed an upward trend in smoking cessation among individuals with a lower level of education and an increase in the rate of decline in the prevalence of smoking ≥ 20 cigarettes per day, both of which can be attributed to increased tobacco taxation and pricing. Price increases constitute the most cost-effective strategy to reduce the number of smokers and daily tobacco use, especially among younger and lower-income individuals.[28] A tax increase resulting in a 10% increase in tobacco prices can reduce

Table 3. Trends in smoking prevalence among females in all Brazilian capitals. VIGITEL, 2006-2017.

Capital	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	p	Slope
Aracaju	7.7	6.1	8.7	6.2	6.9	4.4	6.1	4.0	3.8	3.6	3.2	1.6	< 0.001	−0.517
Belém	10.8	8.3	7.8	7.6	6.9	6.3	5.6	4.6	4.3	3.2	3.0	3.1	< 0.001	−0.660
Belo Horizonte	11.0	10.9	13.2	11.5	12.9	10.8	9.9	10.3	9.2	6.0	8.7	7.1	0.002	−0.466
Boa Vista	10.7	11.6	10.5	10	8.7	7.3	3.6	4.9	5.7	3.7	4.8	3.8	< 0.001	−0.774
Campo Grande	9.8	10.4	12.4	11.3	9.0	8.1	10.3	11.1	6.3	5.4	8.6	6.6	0.016	−0.409
Cuiabá	10.7	10.4	11.0	9.7	9.4	9.6	8.7	6.5	5.5	7.2	5.8	4.4	< 0.001	−0.587
Curitiba	16.0	16.4	13.9	15.5	14.6	13.6	9.7	11.9	12.4	9.8	10.7	13.2	0.004	−0.484
Florianópolis	14.7	13.8	13.8	17.4	14.8	10.9	10.8	10.6	10.3	10.3	8.6	9.6	< 0.001	−0.614
Fortaleza	13.1	11.2	8.1	11.2	6.6	6.9	5.4	4.8	6.7	4.2	5.1	3.0	< 0.001	−0.779
Goiânia	10.2	10.6	10.0	9.0	9.4	6.9	7.0	6.0	7.1	6.7	7.0	5.5	< 0.001	−0.443
João Pessoa	10.6	9.6	6.5	6.9	8.4	6.3	7.2	4.5	4.8	4.9	3.5	5.8	< 0.001	−0.490
Macapá	8.7	10.0	9.1	8.4	7.6	8.2	4.9	6.6	4.8	5.3	5.2	3.4	< 0.001	−0.533
Maceió	10.4	10.2	7.2	7.2	8.6	6.1	8.1	5.0	4.7	5.1	5.6	3.6	< 0.001	−0.532
Manaus	8.2	9.7	7.6	6.4	6.6	6.8	6.3	3.6	6.3	4.8	3.4	4.4	< 0.001	−0.448
Natal	9.9	11.0	10.5	9.6	8.6	6.1	8.2	4.8	4.1	5.8	3.5	5.2	< 0.001	−0.660
Palmas	8.9	8.0	7.2	8.2	9.1	7.1	6.8	4.3	3.0	3.8	3.5	4.1	< 0.001	−0.552
Porto Alegre	16.9	19.4	17.1	20.9	17.7	19.0	19.3	14.7	15.1	13.4	10.5	9.0	0.002	−0.806
Porto Velho	12.9	10	13.7	12.4	9.5	9.9	10.3	9.0	6.1	7.3	4.9	3.4	< 0.001	−0.797
Recife	11.5	9.2	9.3	9.4	9.0	9.1	10.5	8.5	7.9	4.9	7.2	6.8	0.002	−0.378
Rio Branco	16.3	16.0	13.0	13.0	15.2	9.6	10.9	7.7	5.2	7.7	7.2	6.8	< 0.001	−0.983
Rio de Janeiro	13.4	14.5	14	11.4	12.1	11.8	10.5	9.0	10.2	10.8	9.2	7.9	< 0.001	−0.515
Salvador	7.2	7.3	7.6	6.0	7.3	5.5	5.4	4.0	5.4	3.8	3.7	2.6	< 0.001	−0.429
São Luís	7.7	8.1	5.0	6.6	4.7	5.8	4.2	2.9	2.5	1.5	2.3	2.2	< 0.001	−0.576
São Paulo	14.3	14.9	15.4	14.6	16.3	14.8	11.1	12.6	13.0	12.2	12.1	11.7	0.005	−0.346
Teresina	10.4	8.8	7.2	7.0	7.2	8.3	7.0	4.3	3.1	5.4	3.9	3.3	< 0.001	−0.574
Vitória	12.6	8.8	9.7	9.3	9.2	6.1	6.2	6.5	7.6	5.7	5.2	5.0	< 0.001	−0.561
Brasília	13.7	9.9	11.7	12.5	12.5	10.0	8.1	5.9	7.4	9.2	7.4	8.9	0.007	−0.490
Brasil	12.4	12.3	12.0	11.5	11.7	10.7	9.2	8.6	9.0	8.3	8.0	7.5	< 0.001	−0.496

VIGITEL: *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases).

tobacco use by approximately 4% in high-income countries and approximately 8% in low- and middle-income countries. [28] Another strategy is the Protocol to Eliminate Illicit Trade in Tobacco Products,[29] the objective of which is to recoup lost taxes and reduce access to low-priced tobacco products available on the black market. Yet another strategy is the provision of universal access to smoking cessation treatment in the Brazilian Unified Health Care System, primarily at primary care clinics.[30]

With regard to the prevalence of smoking among different age groups, our results are similar to those of a study in which the prevalence of smoking was lowest in individuals in the 18- to 24-year age bracket (10.7%) and highest in those in the 40- to 59-year age bracket (19.4%).[14] In a study using data from the 2008 Brazilian National Household Sample Survey, the prevalence of smoking was found to increase with age up to the age of 59 years, decreasing among the elderly.[31]

Brazil is characterized by great cultural diversity, and there are large socioeconomic differences across individuals in the country, all of which can have an impact on tobacco use patterns.[32] The fact that the southern region of Brazil is the largest tobacco producer in the country can have a social, political, economic, and cultural impact on tobacco acceptance and use there, and might explain why smoking prevalence was highest in that region.[33] Data from the PETab and the PNS also show that smoking prevalence is highest in southern Brazil and in the state of São Paulo.[15]

In order to advance in the fight against chronic NCDs and their risk factors (particularly smoking), policy decisions and new regulatory measures conflicting with the interests of the tobacco industry are needed so that the goals of reducing the prevalence of smoking set by the Strategic Action Plan to Combat Chronic NCDs, the World Health Organization Global Action Plan for the Prevention and Control of NCDs, and the United Nations 2030 Agenda for Sustainable Development can be achieved.

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