

Evolution of tobacco use indicators according to telephone surveys, 2006-2014

Evolução de indicadores do tabagismo segundo inquéritos de telefone, 2006-2014

Evolución de indicadores del tabaquismo según encuestas por teléfono, de 2006-2014

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Abstract

The goal of this study was to describe the trend of tobacco-use indicators for adults in Brazilian state capitals. Simple linear regression was used to analyze tobacco-use trends according to data from telephone survey VIGITEL between 2006 and 2014. The prevalence of smokers in Brazil dropped 0.645p.p. per year this period, from 15.6% (2006) to 10.8% (2014). There was a decrease per sex, schooling, major regions, and in most age groups. The prevalence of former smokers dropped from 22.2% (2006) to 21.2% (2014); smoking 20 cigarettes or more per day went from 4.6% (2006) to 3% (2014). Passive smoking at home dropped 0.614p.p. per year since 2009, and was 9.4% in 2014. Passive smoking at the workplace decreased 0.54p.p. a year, reaching 8.9% in 2014. The prevalence trend of smokers is declining for sexes, schooling, and major regions in almost all age groups. This indicates that the global target of 30% reduction in tobacco use until 2025 is possible to be reached, reflecting the effectiveness of control actions for this risk factor in Brazil.

Smoking; Chronic Disease; Tobacco Smoke Pollution; Health Surveys; Epidemiological Surveillance

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Introduction

The hazards of tobacco use are broadly documented in global and national studies ^{1,2,3}. Tobacco is the main risk factor for chronic noncommunicable diseases (NCDs), which account for 63% of the deaths worldwide¹, and 72% in Brazil ^{4,5}.

Tobacco-related diseases include cancer (lung, oral, breast, others) chronic respiratory diseases, intrauterine growth restriction, predisposition to preterm delivery among others, in particular cardiovascular diseases ⁶. In general, health hazards are due to both direct tobacco use and passive exposure to smoking ^{1,2,6,7}.

The World Health Organization (WHO) states that if no significant measure is taken globally, the tobacco-related deaths estimated for 2030 will reach 8 million, or 10% of the total global deaths ^{1,6}.

Currently, the prevalence of tobacco use worldwide is high, with significant variations among the different regions ⁸. In Brazil, the prevalence of smoking in 1989 was 34.8% in adults, and subsequent surveys evidenced significant reduction ^{9,10}. In 2013, the Brazilian National Health Survey (PNS in portuguese) indicated a prevalence of 14.7% regarding tobacco smoking ¹¹.

The decrease of this indicator fulfills a commitment made by Brazil and WHO through their plans, launched respectively in 2011 and 2013, which are the Strategic Action Plan for Tackling Chronic Noncommunicable Diseases in Brazil, 2011 to 2022 ^{9,12}, and the *Global Action Plan for the Prevention and Control of NCDs* ¹³; the latter having established the target of 30% reduction in tobacco-use prevalence worldwide between 2015 and 2025 ¹². WHO has encouraged countries to monitor tobacco use as an essential measure to support control policies and reverse tobacco epidemic.

The monitoring of tobacco products is a commitment made by Brazil since 2005, when the WHO Framework Convention on Tobacco Control (WHO-FCTC) was approved, to progressively deploy a national epidemiological surveillance system for tobacco use and other social, economic and health indicators. Therefore, the continuous monitoring of tobacco indicators is essential to support public policies ³. A good surveillance system should follow tobacco-use indicators, allowing the development of proper policies, measurement of impact effectiveness and, when necessary, the adjustment of the measures ¹⁴.

Thus, the Ministry of Health has established as a priority the organization of NCDs surveillance and the implementation of surveys, such as the *Risk and Prospective Factors Surveillance System for Chronic Non-Communicable Diseases through Telephone Interview* (VIGITEL) ¹⁵, annually conducted since 2006 in the 26 Brazilian state capitals and the Federal District; and home-based surveys conducted every 5 years, such as the PNS ¹¹ and the *National Student Health* every 3 years, among others ⁹.

The current study aims to describe the trends of tobacco-related indicators in Brazilian state capital cities and the Federal District between 2006 and 2014, collected by the telephone survey VIGITEL.

Methods

Information about risk factors and protection were analyzed based on VIGITEL survey information collected annually between 2006 and 2014, by means of telephone interviewing of the adult population (≥ 18 years old), living in the capital cities of the 26 Brazilian states and the Federal District.

VIGITEL uses probabilistic samples of adult population (≥ 18 years old) based on telephone landline records made available annually by the main home phone service providers in Brazil. Five thousand telephone landlines of each city were drawn, which are divided in replicated subsamples of 200 lines each, for identification of the eligible lines, i.e., active residential lines. After line eligibility is confirmed, the resident to be interviewed is selected ¹⁵.

Post-stratification weights were attributed for one to obtain reliable estimates of the adult population with a landline in each city, considering the following variables: sex (female and male), age group (18-24, 25-34, 35-44, 45-54, 55-64 and 65 and older), and schooling (no schooling, incomplete basic education, complete basic education, incomplete high school education, complete high school education, incomplete higher education, complete higher education). Further methodological details are shown in other publications ^{15,16}.

Starting in 2012, the post-stratification weight of each subject of the VIGITEL sample was calculated with the rake method^{16,17}, using the SAS (SAS Inst., Cary, USA) application specific routine¹⁷. This method uses iterative procedures that take into account successive comparisons between the distribution estimates of each sociodemographic variable of the VIGITEL sample and the total city population. These comparisons culminate in finding the weights that, once applied to the VIGITEL sample, make the sociodemographic distribution of the variables equal to the estimated distribution for the total city population.

The VIGITEL questionnaire has some 90 questions on issues related to the demographic and socioeconomic characteristics of the subjects; their diet and physical activity standards; cigarette smoking and alcohol consumption, among others.

In the current study, temporal trend analyses were performed between 2006 and 2014 for tobacco-related indicators: (1) smokers: the person who gave a positive answer to the question “Do you smoke?” was considered a smoker, regardless of the number of cigarettes, frequency and duration of the smoking habit; (2) former smokers: the person who gave a positive answer to the question “Have you ever smoked?”, regardless of the number of cigarettes and duration of the smoking habit; (3) Proportion of smokers who smoke 20 or more cigarettes a day: number of people who smoke 20 or more cigarettes a day according to their answer to the question: “How many cigarettes do you smoke a day?”; starting in 2009 questions about passive smoking were included. This is why the trend presented here about these two indicators relates to the period of 2009 to 2014; (4) Proportion of passive smokers at home: number of non-smoking individuals who reported that at least one of the persons he/she lived with smoked at home, in response to the question: “Do any of the people with whom you live smoke at home?”; (5) Proportion of passive smokers at the workplace: number of non-smoking individuals who reported that at least one person smoked in the workplace, in response to the question: “Does any co-worker smoke in the same environment you work in?”. The denominator of all investigated indicators is the total of individuals interviewed.

The temporal trend analysis of tobacco-use indicators was stratified according to sex, age, schooling and region of the country. The method used to estimate the trend was the simple linear regression model, whose response variable (Y_i) is the proportion of the indicator, and the explanatory variable (X_i) is time (year of the assessment). A negative model-adjusted line angular coefficient (β) shows that the relationship between the indicator and the time is decreasing; otherwise, the relationship is increasing. The positive value of the angular coefficient represents the average annual increase in proportion of the indicator for each time unit; otherwise, it shows that the average annual proportion has dropped.

The proportions for the 2006 to 2014 period were presented, as well as the trend expressed by the angular coefficient of the line and the trend significance level. Model adequacy measures were used, analysis of residuals with 5% significance level. For data processing and statistical analysis, the software Stata version 11.1 (StataCorp LP, College Station, USA). The proportion estimation commands were employed taking into account the weighting factors of each subject interviewed by the VIGITEL survey¹⁵.

This study was approved by the National Ethics Research Committee with Humans (Conep), opinion n. 355.590. The signing of the free consent form was replaced by verbal consent at the time of the telephone contacts with the interviewees.

Results

In this study, differences were found in tobacco-use prevalence according to sex, age, schooling, and region. Over the period of time investigated, higher prevalences were presented by males, less schooled individuals, age group between 45 and 54 years of age, and residents in the Southern region of Brazil.

In the trend analysis, the prevalence of smokers in Brazil presented a relative reduction of 0.645p.p. per survey year, ranging from 15.6% in 2006 to 10.8% in 2014. For males, the decrease between 2006 and 2014, was at an average rate of 0.793p.p. a year, from 19.3% (2006) to 12.8% (2014); for females the reduction was 0.518p.p. a year, from 12.4% (2006) to 9% (2014) (Table 1). The proportion of smokers

Table 1

Trends in the proportion of smokers, per sex, age group, education, Brazil and regions. VIGITEL 2006-2014.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	Trend	p-value	Inclination	Intercept
Sex													
Male	19.3	19.6	18.0	17.5	16.8	16.5	15.5	14.4	12.8	(-)	< 0.001	-0.793	1,611.30
Female	12.4	12.3	12.0	11.5	11.7	10.7	9.2	8.6	9.0	(-)	< 0.001	-0.518	1,052.70
Both	15.6	15.7	14.8	14.3	14.1	13.4	12.1	11.3	10.8	(-)	< 0.001	-0.645	1,310.00
Regions													
North	15.1	14.9	13.5	12.3	12.2	11.7	9.3	8.1	7.9	(-)	< 0.001	-0.97	1,961.40
Northeast	13.1	12.8	10.6	11.5	10.3	9.3	8.9	7.4	7.6	(-)	< 0.001	-0.73	1,477.50
Central	14.8	14.2	13.9	13.7	13.4	10.9	10.6	10.9	10.1	(-)	< 0.001	-0.635	1,288.80
Southeast	16.7	17.1	17.1	15.4	16.2	15.8	14.4	13.6	12.7	(-)	< 0.001	-0.525	1,070.70
South	18.8	19.1	17.6	20.0	17.1	17.8	14.8	14.6	14.5	(-)	0.0038	-0.642	1,306.90
Age group (years)													
18-24	12.0	13.7	11.5	10.9	10.9	8.8	8.5	7.1	7.8	(-)	< 0.001	-0.745	1,507.60
25-34	14.1	14.6	13.8	14.5	14.2	13.2	11.7	12.1	11.9	(-)	0.0032	-0.363	743.60
35-44	18.5	17.5	16.5	14.8	15.1	13.9	12.9	11.2	9.9	(-)	< 0.001	-1.023	2,071.40
45-54	22.6	21.7	19.6	18.9	18.0	18.6	16.0	15.1	13.2	(-)	< 0.001	-1.082	2,192.30
55-64	15.0	15.8	17.2	16.7	16.7	15.9	15.0	13.6	12.5		0.0603	-0.363	745.70
65 and older	9.4	8.5	9.3	8.4	8.1	9.0	7.6	6.9	8.1	(-)	0.0281	-0.213	437.20
Education													
0-8	19.1	18.9	18.9	18.1	18.1	18.2	16.3	15.0	14.1	(-)	< 0.001	-0.613	1,250.20
9-11	13.8	13.5	12.0	11.9	12.2	10.7	10.0	10.3	10.3	(-)	< 0.001	-0.48	976.40
12 and more	10.9	12.1	10.8	10.8	10.0	9.8	9.1	7.4	6.8	(-)	< 0.001	-0.582	1,178.90

Note: trend (+) indicates a significantly increasing trend; trend (-) indicates a significantly decreasing trend. P-value is calculated using linear regression. Inclination represents the average annual variation, in percentage points.

also decreased significantly in some age groups, with the highest reduction in the 45-54 age group, having reached 1.082p.p. a year; the lowest reduction was among individuals 65 years and older (-0.213p.p. a year) (Table 1).

There was also reduction among all education levels. The rate of smokers with more schooling dropped from 10.9% in 2006 to 6.8% in 2014, and among adults with up to 8 years of schooling the smoking prevalence also decreased, even though the figures are higher, dropping from 19.1% (2006) to 14.1% (2014). Significant reductions were also seen in all regions of the country (Table 1).

The total population of former smokers dropped from 22.2% to 21.2%; in males, the proportion of former smokers went from 26.7% to 25.6%. In addition, there was an increase in the proportion of former smokers of the age group 55 to 64 years, and among individuals with 0 to 8 years of schooling, from 27.9% to 30.2%. A decrease in the population of former smokers was also seen in the Northeast Region (Table 2).

The prevalence of adults who state smoking 20 cigarettes or more a day decreased from 4.6% (2006) to 3% (2014), a reduction of 0.195p.p. a year. The decrease was observed in both sexes, but it was steeper among males. A decrease was also seen in the age groups 18 to 24 years and 35 to 54 years. Furthermore, significant reduction was observed in all regions of the country and among the population with 0 to 8 years of schooling, and 12 years of schooling or more (Table 3).

Regarding passive smoking at home, a significant reduction in all sex and schooling categories was seen. This reduction was higher in females, from 13.4% (2009) to 10% (2014), and for individuals with 0 to 8 years of schooling, dropping from 12.7% (2009) to 9% (2014). A significant decrease was also found in all investigated age groups, except in individuals 35 to 44 years. Passive smoking at home was also significantly reduced in regions North, Northeast and Southeast (Table 4).

Table 2

Trends in the proportion of former smoker, per sex, age group, education, Brazil and regions. VIGITEL 2006-2014.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	Trend	p-value	Inclination	Intercept
Sex													
Male	26.7	26.9	26.3	26.8	26.5	25.8	24.5	25.6	25.6	(-)	0.0181	-0.215	458.2
Female	18.4	19.5	18.9	18.7	19.3	18.9	18.1	18.9	17.5		0.1645	-0.113	246.5
Both	22.2	22.9	22.3	22.5	22.6	22.1	21.0	22.0	21.2	(-)	0.0328	-0.162	347.0
Regions													
North	25.2	24.4	24.7	25.8	25.3	24.0	22.1	24.4	23.4		0.1005	-0.237	500.1
Northeast	21.4	21.4	21.9	20.6	21.5	20.3	19.7	20.7	20.3	(-)	0.0319	-0.187	396.1
Central	20.8	21.7	22.1	23.4	20.9	21.2	21.2	20.1	20.8		0.2599	-0.147	316.2
Southeast	22.3	23.6	22.0	22.4	22.7	22.6	21.3	22.7	21.2		0.1604	-0.138	300.4
South	23.2	23.5	22.8	23.4	24.6	24.1	22.4	21.7	22.4		0.2367	-0.145	314.6
Age group (years)													
18-24	11.9	10.7	10.1	9.6	10.2	9.2	8.7	10.3	10.3		0.1349	-0.18	371.9
25-34	14.2	14.0	14.0	14.2	13.1	13.7	13.0	13.2	12.8	(-)	0.0026	-0.175	365.3
35-44	22.4	23.3	20.8	20.5	19.9	19.2	16.5	17.7	15.8	(-)	< 0.001	-0.885	1,798.4
45-54	34.0	33.5	33.7	33.9	33.9	33.0	30.4	30.1	30.2	(-)	0.0028	-0.548	1,134.7
55-64	31.8	36.1	36.4	36.4	37.3	37.3	39.1	39.1	37.5	(+)	0.0089	0.635	-1,239.6
65 and older	34.3	37.5	35.4	36.1	38.8	35.4	33.6	37.0	34.9		0.8089	-0.057	149.8
Education													
0-8	27.9	29.1	28.6	30.4	30.2	30.2	29.0	30.6	30.2	(+)	0.0408	0.238	-449.5
9-11	17.4	17.9	18.0	16.7	18.1	17.4	17.3	18.2	16.9		0.694	-0.03	77.8
12 and more	17.7	17.9	16.4	16.8	16.4	16.3	15.0	15.3	15.2	(-)	< 0.001	-0.352	723.2

Note: trend (+) indicates a significantly increasing trend; trend (-) indicates a significantly decreasing trend. P-value is calculated using linear regression. Inclination represents the average annual variation, in percentage points.

Passive smoke at the workplace dropped from 12.1% (2009) to 8.9% (2014), and remained higher among males throughout the period. In regards to age groups, a reduction was seen in individuals between the ages of 25 and 54 years. A decrease was also seen in all but the Central region. A reduction of passive smoking at the workplace was also seen among individuals with 0 to 11 years of schooling (Table 5).

Discussion

Brazil has made progress in regards to its commitment to national⁹ and global¹³ tobacco-use reduction goals. The results presented here indicate significant improvement in tobacco-use indicators in the country, and the advances are seen in practically all sexes, years of schooling, age, and region, reflecting the importance of the VIGITEL survey in the annual monitoring of tobacco indicators¹⁵.

In Brazil, population studies with adults on tobacco use begun in 1989 with the *Brazilian National Health and Nutrition Survey* (PNSN in portuguese), which showed a prevalence of 34.8%¹⁰. In 2003, *The World Health Survey* evidenced significant reduction of tobacco-use, with the prevalence dropping to 22.4%¹⁰; then, in 2008 the *National Tobacco Survey* (PETab)¹⁸ showed the rate of 17.2% and, in 2013, the *National Health Survey* found 14.7%¹¹.

There are important differences in regards to gender, with men typically smoking more than women. The highest prevalence of tobacco use among women is in Europe (20%)⁶, followed by the

Table 3

Trends in the proportion of smokers who smoke 20 cigarettes or more a day, per sex, age group, education, Brazil and regions. VIGITEL 2006-2014.

	2006	2007	2008	2009	2010	2011	2012	2013	2014	Trend	p-value	Inclination	Intercept
Sex													
Male	6.3	6.3	6.2	5.4	5.4	5.2	5.5	4.5	4.1	(-)	< 0.001	-0.263	534.7
Female	3.2	3.3	3.2	3.1	3.4	3.0	2.8	2.4	2.1	(-)	0.0049	-0.133	270.9
Both	4.6	4.7	4.6	4.2	4.3	4.0	4.0	3.4	3.0	(-)	< 0.001	-0.195	396.0
Regions													
North	3.2	3.1	3.3	2.9	2.7	2.8	2.5	1.7	1.4	(-)	< 0.001	-0.218	441.5
Northeast	3.7	3.2	3.0	2.9	2.7	2.5	2.9	2.2	2.1	(-)	< 0.001	-0.167	337.8
Central	3.8	4.0	4.3	3.7	4.2	2.8	3.4	2.4	3.1	(-)	0.0275	-0.172	348.6
Southeast	5.2	5.7	5.4	4.7	5.2	5.0	4.9	4.3	3.6	(-)	0.0069	-0.188	383.4
South	6.8	6.5	6.8	7.0	6.4	6.3	5.6	5.3	4.8	(-)	0.0016	-0.245	498.6
Age group (years)													
18-24	2.2	2.7	1.9	1.9	2.3	1.8	1.8	1.8	1.0	(-)	0.0157	-0.13	263.2
25-34	2.9	3.7	3.5	3.0	3.5	2.9	3.2	2.7	3.0		0.2317	-0.055	113.7
35-44	5.6	5.3	5.1	5.3	4.5	3.8	4.6	3.3	2.7	(-)	< 0.001	-0.335	677.8
45-54	9.5	7.9	7.3	6.8	6.9	7.0	5.7	5.5	5.0	(-)	< 0.001	-0.47	951.5
55-64	5.7	6.6	7.4	6.4	7.1	5.8	7.0	4.6	4.2		0.1263	-0.223	455.0
65 and older	2.5	2.6	3.9	1.9	2.3	3.8	2.9	2.6	2.4		0.9308	-0.008	19.5
Education													
0-8	5.9	6.2	6.8	6.0	5.8	6.1	6.2	4.9	4.1	(-)	0.0382	-0.203	414.5
9-11	3.9	3.7	2.9	3.0	3.6	2.7	3.0	3.1	2.9		0.0638	-0.098	200.8
12 and more	3.0	3.2	3.0	2.5	2.9	2.7	2.5	1.6	1.8	(-)	0.0029	-0.173	351.0

Note: trend (+) indicates a significantly increasing trend; trend (-) indicates a significantly decreasing trend. P-value is calculated using linear regression. Inclination represents the average annual variation, in percentage points.

Americas, where men smoke about 1.5 times more than women ⁶. In the Western Pacific Region, the prevalences among men are quite high, about 46%, and low among women ⁶. Similarly in Southeast Asia, men smoke up to 10 times more than women ⁸. Also in the countries of the *Global Adults Tobacco Survey* the frequencies tend to be lower among women. In countries such as Egypt, India and Bangladesh, with strong religious and cultural influences, the prevalences in women are quite low, under 2%, compared to about 30% among men ⁸.

The power of tobacco among men has historical, cultural and market explanations. Since the beginning of the 20th century the tobacco industry tried to associate the idea of strength, virility and power in its tobacco advertisements ^{19,20}. In most countries this was a protective factor for women, who started the habit later. In the Western world, this initiation was fostered by the tobacco industry in disseminating that it favored gender equality, and to strengthen female emancipation and self-affirmation ^{20,21,22}. In Brazil this movement was stronger in the 1960s and 1970s, and broadly stimulated by the movie industry ^{3,23}.

A reduction in prevalence of smoking and in the use of heavier tobacco products was seen in both sexes, in all regions. The literature indicates that low income and schooling are associated with higher tobacco-use prevalences in Brazil ^{3,23} and in other countries ⁸.

Another important trend was reduction of smoking and use of heavier tobacco products among all schooling levels, being steeper in less schooled populations. This is a very positive factor, as tobacco use is higher among low schooling and income populations, which worsens health inequalities and predisposes the most vulnerable population to higher NCDs prevalence ¹. Expenditures with smoking impose an economic burden on the low-income population ¹⁸ due to the costs of the addiction and health expenses; therefore it is important to advance further in reducing prevalence in this population.

Table 4

Trends in the proportion of passive smoking at home, per sex, age group, education, Brazil and regions. VIGITEL 2006-2014.

	2009	2010	2011	2012	2013	2014	Trend	p-value	Inclination	Intercept
Sex										
Male	11.9	9.9	9.9	9.3	9.6	8.7	(-)	0.0273	-0.5	1,015.6
Female	13.4	12.8	12.5	11.0	10.7	10.0	(-)	< 0.001	-0.709	1,437.0
Both	12.7	11.5	11.3	10.2	10.2	9.4	(-)	0.0012	-0.614	1,246.5
Regions										
North	13.9	13.0	12.3	10.9	10.6	10.7	(-)	0.0031	-0.703	1,425.7
Northeast	12.8	12.5	12.3	11.1	10.4	9.0	(-)	0.002	-0.757	1,534.3
Central	11.7	9.5	9.9	10.2	9.8	10.4		0.477	-0.151	314.8
Southeast	12.9	11.3	11.1	9.4	10.1	9.1	(-)	0.0092	-0.694	1,407.2
South	11.4	10.8	10.1	11.3	10.1	9.1		0.0801	-0.354	723.1
Age group (years)										
18-24	19.6	16.9	17.4	16.8	16.7	15.1	(-)	0.0247	-0.677	1,379.2
25-34	13.4	12.5	13.4	11.0	11.6	10.7	(-)	0.0352	-0.531	1,081.1
35-44	9.8	7.7	8.5	7.2	8.0	7.3		0.1113	-0.369	749.5
45-54	10.8	9.4	8.4	8.2	6.6	6.8	(-)	0.002	-0.817	1,652.0
55-64	10.9	11.5	9.2	8.3	9.1	8.1	(-)	0.0312	-0.631	1,279.6
65 and older	10.1	10.8	8.7	9.0	8.2	7.5	(-)	0.0146	-0.586	1,187.2
Education										
0-8	12.7	11.2	10.8	10.3	9.6	9.0	(-)	< 0.001	-0.68	1,378.4
9-11	13.9	12.8	12.8	10.7	11.4	9.9	(-)	0.0062	-0.751	1,523.4
12 and more	10.7	9.9	10.0	9.4	9.5	9.2	(-)	0.01	-0.266	544.3

Note: trend (+) indicates a significantly increasing trend; trend (-) indicates a significantly decreasing trend. P-value is calculated using linear regression. Inclination represents the average annual variation, in percentage points.

All regions showed a tendency of decrease in practically all indicators, with the highest reductions in the Northern and Northeastern regions. Higher prevalences of smoking and use of heavier tobacco products are seen in the Southern and Southeastern regions. The lower prevalences in the Northern and Northeastern regions are explained by cultural issues, weak presence of the tobacco industry, and lower prevalence among women, considering that historically their initiation in these regions has always been lower ²⁴. Concurrently, the Southern region presents the higher prevalences due to the agricultural production in the area, the presence of tobacco manufacturers ²⁵, and cultural characteristics such as the influence of migrant populations in the past, and frequent contact with populations that live in the border area of neighboring countries, where tobacco-use prevalence is high ^{18,26}.

VIGITEL showed a reduction of passive smoking at home and at the workplace for both sexes, for most age groups, schooling levels and regions. The Central Region did not present a reduction of these indicators, and the Southern region remained stable in regards to passive smoking at home. Passive smoking subjects non-smokers to the same risks and diseases caused by direct smoking, except for the magnitude; while smoking may increase the risk of death 20 to 30 times, passive smoking increases this risk 30 to 50% ^{25,27}.

Data from the PNS rated passive smoking at the workplace in 13.5%, and at home in 10.7%. With the decree that forbids smoking in collective environments, passive smoking at the workplace is expected to reduce even further ¹¹.

Compared with other countries, Brazil has the lowest prevalences, as ascertained in a comparative study conducted by the WHO and partners in 2012 ⁸. This study showed that among 16 countries (China, Russia, Thailand, Bangladesh, Egypt, India, Mexico, Philippines, Poland, Turkey, Ukraine, Vietnam, others) where a great part of the world population lived, over 3 billion people, Brazil had the lowest tobacco-use prevalence ⁸.

Table 5

Trends in the proportion of passive smoking at the workplace, per sex, age group, education, Brazil and regions. VIGITEL 2006-2014.

	2009	2010	2011	2012	2013	2014	Trend	p-value	Inclination	Intercept
Sex										
Male	17.0	15.3	16.1	15.5	14.1	13.1	(-)	0.0127	-677	1,377.3
Female	7.9	6.5	7.1	6.0	6.1	5.2	(-)	0.0148	-0.451	914.5
Both	12.1	10.5	11.2	10.4	9.8	8.9	(-)	0.0108	-0.54	1,096.7
Regions										
North	13.3	12.5	12.9	11.2	11.1	9.2	(-)	0.0071	-0.754	1,528.9
Northeast	11.9	11.3	11.3	10.4	9.7	9.1	(-)	< 0.001	-0.563	1,142.8
Central	13.0	10.5	11.0	11.5	10.2	9.9		0.0832	-0.454	924.8
Southeast	12.2	10.0	11.3	10.3	9.9	8.7	(-)	0.0417	-0.537	1,090.9
South	9.4	8.9	8.8	8.4	7.7	7.4	(-)	< 0.001	-0.4	813
Age group (years)										
18-24	12.5	11.0	12.6	9.6	9.2	10.3		0.1072	-0.554	1,125.8
25-34	14.0	12.4	12.5	12.4	11.8	9.7	(-)	0.0163	-0.669	1,357.0
35-44	15.8	13.5	14.7	12.5	13.1	10.6	(-)	0.0231	-0.84	1,703.0
45-54	12.9	11.0	11.1	11.3	9.8	9.6	(-)	0.0166	-0.569	1,154.6
55-64	7.4	7.4	8.2	9.4	7.4	6.9		0.8838	-0.037	82.5
65 and older	2.8	2.1	2.5	2.3	2.5	2.5		0.8298	-0.014	31.2
Education										
0-8	13.6	11.4	12.2	12.3	10.7	10.4	(-)	0.0483	-0.514	1,046.3
9-11	13.2	12.2	12.4	11.2	11.2	9.9	(-)	0.0031	-0.591	1,201.3
12 and more	7.5	6.5	7.8	6.4	6.5	5.2		0.0876	-0.369	748.0

Note: trend (+) indicates a significantly increasing trend; trend (-) indicates a significantly decreasing trend. P-value is calculated using linear regression. Inclination represents the average annual variation, in percentage points.

As in the current study, a drop in tobacco use has also been observed in other countries, such as the United States, Uruguay, Argentina, European countries and others, even though the figures are still high worldwide, which indicates there is much yet to be done. The highest prevalences are found in Europe, reaching around 30%, and the lowest, in Africa ⁶.

A limiting factor of the methodology used by the VIGITEL survey lies in the fact that the study is done with adults living in state capital cities and the Federal District who have a landline at home, which limits the representativeness of the sample. This problem is minimized by the use of weighting factors, which try to match the demographic characteristics of the Vigitel sample to those of the general adult population, according to the Brazilian Institute of Geography and Statistics (IBGE) census data. Starting in 2012, all prevalences found by the VIGITEL survey were revised according to the use of the post-stratification rake methodology and the updated annual population estimates from census projections. Therefore, the trend analyses presented in this study were recalculated, and may differ from previously published data ²³.

The monitoring of tobacco indicators in the countries is an actual need, in dealing with the reduction goals established by the WHO Global Action Plan for the Prevention and Control of NCDs ¹³. However, more than 100 countries worldwide do not have monitoring initiatives, making it hard to accurately compare and monitor tobacco-use trends ¹⁴. Brazil has been considered an example for the world in terms of tobacco monitoring, and in 2015 received an award from the Bloomberg Foundation for its initiatives in the organization of tobacco monitoring and surveillance in the country ²⁸.

Brazil has also been internationally acknowledged for its actions in the fields of regulation, education, prevention and governance ^{8,28}. The regulatory measures adopted comply with the cost-effective interventions published by the WHO for the prevention of NCDs ¹, such as: (a) raising taxes and prices on tobacco products; (b) prohibition to smoke in public places; (c) the inclusion of tobacco-use hazard warnings; (d) prohibition of tobacco advertisement, sponsorship and promotion¹. Among recent

regulatory measures, mention should be made of *Law 12,546/2011*, smoke-free environments, and its regulation by *Presidential Decree 8.262/2014*, which banned smoking in closed environments, regulated cigarette exhibition in the points of sale only and expanded the printing space for public health warnings¹⁵. Other measures increased cigarette taxation to 85%, and established minimum prices for tobacco in accordance with the best evidences for reduction of tobacco use. Another milestone that improved actions governance was Brazil signing the WHO-FCTC, in 2005^{6,29}.

Further advances in this field are necessary, like revisiting the issues on additives, which was regulated by the *Collegiate Board Resolution (RDC) 14/2012* of the Brazilian Health Regulatory Agency (Anvisa). This regulation banned the use of cigarette additives, which give cigarettes a sugary flavor or pleasant scents, making them a more palatable product, targeting younger people to initiate the habit of smoking³⁰. This measure, however, was questioned by the tobacco industry in 2013, and the Brazilian Supreme Court gave a temporary injunction suspending the effect of the regulation. Another global discussion, led by Australia, is for the adoption of generic cigarette packs, with no logos or promotional texts. It is important that Brazil adopt this type of packs to protect adolescents and younger people. These and other measures are necessary in the continuing process of fighting tobacco use.

Conclusion

This study shows an improvement of all tobacco-related indicators in Brazil over the investigated period. There was a reduction in the prevalence of smokers according to sex, age, schooling and in all regions of the country. There was also a decrease in the proportion of heavy smokers, who smoked 20 cigarettes or more daily, according to sex, age, schooling and regions. A decrease in passive smoking at home according to sex, age, schooling, and in the Northern, Northeastern and Southeastern regions. A decrease in passive smoking at the workplace according to sex, age, schooling and in all but the Central Region. An increase of former smokers was seen for the age groups 55 to 64 years, 65 years and older, and for less educated individuals.

A decrease in prevalences analyzed in this paper ascertain the ongoing decline of smoking in Brazil, and indicate that the reduction goals established by the national and global Plans for Tackling NCDs are likely to be met, or even surpassed.

Contributors

D. C. Malta participated in the project design, data analysis and interpretation, article writing, relevant critical review of the intellectual content, and approval of the final version of the manuscript. S. R. Stopa, M. A. S. Santos, S. S. C. A. Andrade, T. P. Oliveira and M. M. A. Silva participated in writing the article, critical review of content and data interpretation. E. B. Cristo participated in data analysis and approval of the final version of the manuscript.

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References

1. World Health Organization. Global status report on noncommunicable diseases 2010. Geneva: World Health Organization; 2011.
2. Doll R, Hill AB. Smoking and carcinoma of the lung. *Br Med J* 1950; 2:739-58.
3. Almeida L, Szklo A, Sampaio M, Souza M, Martins LF, Szklo M, et al. Global Adult Tobacco Survey Data as a tool to monitor the WHO Framework Convention on Tobacco Control (WHO FCTC) implementation: the Brazilian case. *Int J Environ Res Public Health* 2012; 9:2520-36.
4. Schmidt MI, Duncan BB, Silva GA, Menezes AM, Monteiro CA, Barreto SM, et al. Chronic non-communicable diseases in Brazil: burden and current challenges. *Lancet* 2011; 377:1949-61.
5. Malta DC, Moura L, Prado RR, Escalante JC, Schmidt MI, Duncan BB. Mortalidade por doenças crônicas não transmissíveis no Brasil e suas regiões, 2000 a 2011. *Epidemiol Serv Saúde* 2014; 23:599-608.
6. World Health Organization. WHO report on the Global Tobacco Epidemic 2013: enforcing bans on tobacco advertising, promotion and sponsorship. Geneva: World Health Organization; 2013.
7. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: World Health Organization; 2009.

8. Giovino GA, Mirza SA, Samet JM, Gupta PC, Jarvis MJ, Bhala N, et al. Tobacco use in 3 billion individuals from 16 countries: an analysis of nationally representative cross-sectional household surveys. *Lancet* 2012; 380:668-79.
9. Malta DC, Moraes Neto OL, Silva Junior JB. Apresentação do plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis no Brasil, 2011 a 2022. *Epidemiol Serv Saúde* 2011; 20:425-38.
10. Monteiro CA, Cavalcante TM, Moura EC, Claro RM, Szwarcwald CL. Population-based evidence of a strong decline in the prevalence of smokers in Brazil (1989-2003). *Bull World Health Organ* 2007; 85:527-34.
11. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde: 2013. Percepção do estado de saúde, estilos de vida e doenças crônicas. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2014.
12. Malta DC, Silva Júnior JB. O plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis no Brasil e a definição das metas globais para o enfrentamento dessas doenças até 2025: uma revisão. *Epidemiol Serv Saúde* 2013; 22:151-64.
13. World Health Organization. WHO global action plan for the prevention and control of NCDs 2013-2020. Geneva: World Health Organization; 2013.
14. World Health Organization. MPOWER: a policy package to reverse the tobacco epidemic. Geneva: World Health Organization; 2008.
15. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde, Secretaria de Vigilância em Saúde, Ministério da Saúde. *Vigilite Brasil 2015. Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico: estimativas sobre frequência e distribuição sociodemográfica de de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2015*. Brasília: Ministério da Saúde; 2016.
16. Bernal R. Inquéritos por telefone: inferências válidas em regiões com baixa taxa de cobertura de linhas residenciais [Doctoral Dissertation]. São Paulo: Faculdade de Saúde Pública da Universidade de São Paulo; 2011.
17. Izrael D, Hoaglin DC, Battaglia MP. A SAS macro for balancing a weighted sample. In: *Proceedings of the Twenty-Fifth Annual SAS Users Group International Conference*. Cary: SAS Institute; 2000. p. 207-29.
18. Instituto Nacional de Câncer; Organização Pan-Americana da Saúde. *Pesquisa Especial de Tabagismo (PETab): relatório Brasil*. Rio de Janeiro: Instituto Nacional de Câncer; 2011.
19. Amos A, Haglund M. From social taboo to "torch of freedom": the marketing of cigarettes to women. *Tob Control* 2000; 9:3-8.
20. Apelberg B, Aghi M, Asma S, Donaldson E, Yeong CC, Vaithinathan R. Prevalence of tobacco use and factors influencing initiation and maintenance among women. In: Samet JM, Soon-Young Y, editors. *Gender, women, and the tobacco epidemic*. Geneva: World Health Organization; 2010. p. 29-50.
21. Huxley R, Woodward M. Cigarette smoking as a risk factor for coronary heart disease in women compared with men: a systematic review and meta-analysis of prospective cohort studies. *Lancet* 2011; 378:1297-300.
22. Vollset SE, Tverdal A, Gjessing HK. Smoking and deaths between 40 and 70 years of age in women and men. *Ann Intern Med* 2006; 144:381-9.
23. Malta DC, Iser BPM, Sá NNB, Yokota RTC, Moura L, Claro RM, et al. Trends in tobacco consumption from 2006 to 2011 in Brazilian capitals according to the VIGITEL survey. *Cad Saúde Pública* 2013; 29:812-22.
24. Malta DC, Moura EC, Silva SA, Oliveira PPV, Costa e Silva VL. Prevalência do tabagismo em adultos residentes nas capitais dos estados e no Distrito Federal, Brasil, 2008. *J Bras Pneumol* 2010; 36:75-83.
25. World Health Organization; International Agency Research Cancer. *GLOBOCAN 2012: Estimated Incidence, Mortality and Prevalence Worldwide in 2012*. Geneva: World Health Organization/Lyon: International Agency Research Cancer; 2012.
26. Vargas MA, Oliveira BF. Estratégias de diversificação em áreas de cultivo de tabaco no Vale do Rio Pardo: uma análise comparativa. *Revista de Economia e Sociologia Rural* 2012; 50:157-74.
27. Zamboni M. Epidemiologia do câncer do pulmão. *J Pneumol* 2002; 28:41-7.
28. Bloomberg Philanthropies. *Bloomberg Philanthropies Awards for Global Tobacco Control: Meet the winning organizations*. <http://www.bloomberg.org/blog/2015-bloomberg-philanthropies-awards-global-tobacco-control-meet-winning-organizations/> (accessed on 10/Jun/2015).
29. Azevedo-Silva G, Valente JG, Malta DC. Tendências do tabagismo na população adulta das capitais brasileiras: uma análise dos dados de inquéritos telefônicos de 2006 a 2009. *Rev Bras Epidemiol* 2011; 14 Suppl 1:103-14.
30. Agência Nacional de Vigilância Sanitária. Resolução – RDC Nº 14, de 15 de março de 2012. Dispõe sobre os limites máximos de alcatrão, nicotina e monóxido de carbono nos cigarros e a restrição do uso de aditivos nos produtos fumígenos derivados do tabaco, e dá outras providências. http://portal.anvisa.gov.br/wps/wcm/connect/d50d8f804d44b146bcecfe4031a95fac/Resolucao_RDC_14_Teo_res_e_Aditivos_16Mar12.pdf?MOD=AJPERES (accessed on 10/Jun/2015).

Resumo

O objetivo do estudo foi descrever a tendência de indicadores de tabagismo em adultos nas capitais brasileiras. Utilizou-se regressão linear simples para analisar a tendência do tabagismo segundo dados do inquérito telefônico VIGITEL, entre 2006-2014. A prevalência de fumantes no Brasil caiu 0,645p.p. por ano no período, variando de 15,6% (2006) a 10,8% (2014). Houve redução por sexo, escolaridade, grandes regiões, e na maioria das faixas etárias. A prevalência de ex-fumantes passou de 22,2% (2006) para 21,2% (2014), fumo de 20 cigarros ou mais por dia de 4,6% (2006) para 3% (2014). Fumo passivo no domicílio reduziu 0,614p.p. ao ano, desde 2009, sendo de 9,4% em 2014. Fumo passivo no trabalho reduziu 0,54p.p. ao ano, chegando a 8,9% em 2014. A tendência da prevalência de fumantes é declinante, para ambos os sexos, níveis de escolaridade e grandes regiões, em quase todas as faixas etárias. Isso aponta que a meta global de redução de 30% do tabagismo até 2025 tem potencial para ser alcançada, refletindo importantes ações de controle desse fator de risco no país.

Hábito de Fumar; Doença Crônica; Poluição por Fumaça de Tabaco; Inquéritos Epidemiológicos; Vigilância Epidemiológica

Resumen

El objetivo del estudio fue describir la tendencia de indicadores de tabaquismo en adultos dentro de las capitales brasileñas. Se utilizó una regresión lineal simple para analizar la tendencia del tabaquismo, según datos de la encuesta telefónica VIGITEL, entre 2006-2014. La prevalencia de fumadores en Brasil cayó 0,645p.p. por año durante el período, variando de un 15,6% (2006) a un 10,8% (2014). Hubo una reducción por sexo, escolaridad, grandes regiones, y en la mayoría de las franjas de edad. La prevalencia de ex-fumadores pasó de 22,2% (2006) a 21,2% (2014), el consumo de 20 cigarrillos o más al día de un 4,6% (2006) a un 3% (2014). Los fumadores pasivos en el domicilio se redujeron 0,614p.p. al año, desde 2009, siendo de un 9,4% en 2014. Los fumadores pasivos en el trabajo se redujeron un 0,54p.p. al año, llegando a un 8,9% en 2014. La tendencia de la prevalencia de fumadores esa la baja, para ambos sexos, los niveles de escolaridad y grandes regiones, en casi todas las franjas de edad. Esto apunta a que la meta global de reducción de un 30% del tabaquismo hasta 2025 tiene potencial para ser alcanzada, reflejando importantes acciones de control de ese factor de riesgo en el país.

Hábito de Fumar; Enfermedad Crónica; Contaminación por Humo de Tabaco; Encuestas Epidemiológicas; Vigilancia Epidemiológica

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