

Health perception, health conditions, and smoking cessation in Brazil

Percepção e condições de saúde e cessação de tabagismo no Brasil

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Abstract

Background: Smoking cessation is strongly associated with motivational factors. It is possible that individuals who have successfully stopped smoking have different conditions and judgments about their own health. **Objective:** To evaluate the relationship between tobacco-related diseases, health perception, and successful smoking cessation in Brazil. **Method:** Cross-sectional observational study using data from the 2013 National Health Survey (PNS - 2013). Sociodemographic and health-related variables were considered in this study. Logistic regression modeling was carried out considering smoking cessation as outcome. **Results:** Successful smoking cessation attempt was associated with age (OR=2.9, $p=0.004$), marital status (OR=1.69, $p<0.001$), level of education (OR=1.34, $p<0.001$), socioeconomic status (OR=1.58, $p<0.001$), census status (OR=1.07; $p<0.001$), access to pro-tobacco advertising (OR=1.74, $p<0.001$), anti-tobacco campaigns (OR=3.30; $p<0.001$) and, in particular, living with other smokers (OR=9.65; $p<0.001$). **Conclusion:** Knowledge about sociodemographic and census status variables is relevant to the assessment of future specific health promotion policies. **Keywords:** smoking; smoking cessation; surveys; epidemiology; noncommunicable diseases; urban health.

Resumo

Introdução: A cessação do tabagismo tem forte relação com fatores motivacionais. É possível que indivíduos que obtiveram sucesso na cessação do tabagismo possam ter diferentes condições e julgamentos sobre sua própria saúde. **Objetivo:** avaliar a relação entre as doenças tabaco-relacionadas, percepção de saúde e o sucesso na cessação de tabagismo no Brasil. **Método:** estudo transversal que utilizou dados da Pesquisa Nacional de Saúde (PNS) de 2013. Foram considerados para o estudo dois grupos de variáveis: sociodemográficas e variáveis relacionadas à saúde. Foi realizada modelagem por regressão logística, cujo desfecho foi ter conseguido parar de fumar. **Resultados:** Houve associação entre sucesso na tentativa de parar de fumar com a idade (OR=2,9, $p=0,004$), estado civil (OR=1,69, $p<0,001$), escolaridade (OR=1,34, $p<0,001$), classe socioeconômica (OR=1,58, $p<0,001$), situação censitária (OR=1,07; $p<0,001$), acesso à publicidade pró-tabaco (OR=1,74, $p<0,001$), campanhas antitabaco (OR=3,30; $p<0,001$) e, principalmente, para convívio domiciliar com outro fumante (OR=9,65; $p<0,001$). **Conclusão:** O conhecimento de variáveis sociodemográficas e de situação de domicílio é relevante para avaliação de políticas de promoção da saúde específicas.

Palavras-chave: tabagismo; cessação do tabagismo; inquéritos; epidemiologia; doenças crônicas não transmissíveis; saúde urbana.



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INTRODUCTION

Brazil has been suffering with the burden of noncommunicable diseases (NCDs), which are expected to increase, particularly due to population aging¹. As a result, several public policies have been implemented to contain the advance in mortality from NCDs². The fight against smoking is an example of a successful health promotion action that has created legislation such as the smoking ban in closed spaces and the increase in taxes on tobacco products, with positive repercussions on smoking prevalence and cessation rates³.

The benefits of smoking cessation are well established. Former smokers have a reduced risk of death and a subsequent increase in life expectancy, as well as a reduced risk of cancer, particularly lung cancer, cardiovascular diseases, such as heart attacks and strokes, and chronic lung diseases^{4,5}.

A significant number of studies have evaluated the determining and conditional factors of smoking cessation, such as demographic characteristics (age, race, level of education, income, occupation)⁶⁻⁸, intensity of exposure to nicotine⁹⁻¹¹ or to passive smoking^{7,11,12}, and previous smoking cessation attempts among current smokers^{6,8}; however, there is no consensus on the magnitude of these associations¹³.

Smoking cessation has a strong relationship with motivational factors. Although smokers are motivated to quit, nicotine addiction leads to relapses among those who were able to suspend smoking for a short or long period. It is plausible that individuals who have successfully stopped smoking may have different conditions and judgments about their own health, as well as social, economic, and demographic characteristics different from those of individuals who have failed to do so¹⁴. In this context, this study aims to evaluate the relationship between tobacco-related diseases, health perception, and successful smoking cessation in Brazil.

METHOD

This is a cross-sectional observational study that used data from the 2013 National Health Survey (PNS - 2013)¹⁵.

The PNS is part of the Integrated System of Household Surveys (SIPD) of the Brazilian Institute of Geography and Statistics (IBGE) and uses the same sample design. This design consisted of a complex probability sample in three selection stages, with the last stage randomly selecting a resident aged ≥ 18 years from the household at the time of the interview to answer a specific questionnaire. Further methodological details can be found in the IBGE reference publication^{15,17}.

Study sample

The study sample was composed of 14,239 individuals aged ≥ 18 years who reported having attempted to quit smoking. Of these, 10,258 succeeded and are currently former smokers, whereas 3,981 failed and are currently smokers with a history of attempted cessation. It is worth noting that individuals who have never smoked (41,215) and those who smoke but have never tried to quit (4,748) were not included in the analyses.

Smoking status was defined based on responses to a sequence of three questions in the questionnaire, as follows: "Currently, do you smoke any tobacco products?" Individuals who replied they smoked daily or less than daily were considered smokers. Those who responded negatively to first question at the time of the survey were then asked: "How about in the past, did you smoke any tobacco products?" Individuals who reported having smoked daily or less than daily were considered former smokers.

Instruments and data collection

To characterize smoking behavior, questions on the following topics were included in the questionnaire: age at taking up smoking, smoking frequency (occasional or daily), type of tobacco product consumed, time since taking up smoking, number of manufactured cigarettes smoked, and smoking cessation attempts over the past 12 months¹⁶.

Study variables

Sociodemographic and health-related variables were considered in this study

The following sociodemographic variables were analyzed: sex (male and female), age group (≤ 24 years, 25-39 years, 40-59 years, and ≥ 60 years), race (white and non-white), level of education (illiterate and incomplete primary school, complete primary school and incomplete secondary school, complete secondary school and more); marital status (single, married, and separated/widowed); socioeconomic status (A/B: very high and high, C: medium, D/E: low and very low), and census status (urban or rural). Regarding socioeconomic status, it is worth noting that the classification used was adapted from the Brazilian Economic Classification Criteria of the Brazilian Association of Research Companies, considering scores assigned according to presence of high-cost items in the household and level of education of the head of the family. It should also be noted that this adjustment was carried out for the analyses of the PNS¹⁶.

Some chronic tobacco-related diseases, such as acute myocardial infarction, cerebrovascular accident, chronic obstructive pulmonary disease and lung cancer, were evaluated. As for the smoking-related variables, presence of other smokers at home was categorized into "inexistent", "daily", and "occasionally", which comprised the subcategories: "weekly", "monthly", and "less than monthly".

Individuals who reported having seen any anti-tobacco information in newspapers/magazines, television, and radio, or health warnings on packs of cigarettes were considered as exposed to anti-tobacco campaigns. Individuals exposed to pro-tobacco advertisement were those who reported having seen information about the availability of tobacco products for sale or consumption.

Finally, the health-related variable refers to health self-assessment, initially with five categories in the PNS questionnaire (very good, good, regular, poor, and very poor), and later reorganized into three categories (very good/good, regular, poor/very poor).

From the questions related to smoking cessation, individuals were categorized into two groups (Figure 1): Group A: individuals who have quit smoking ($n=10,258$); Group B: current smokers who have tried but failed to quit smoking ($n=3,981$). This was considered the dependent variable in the study.

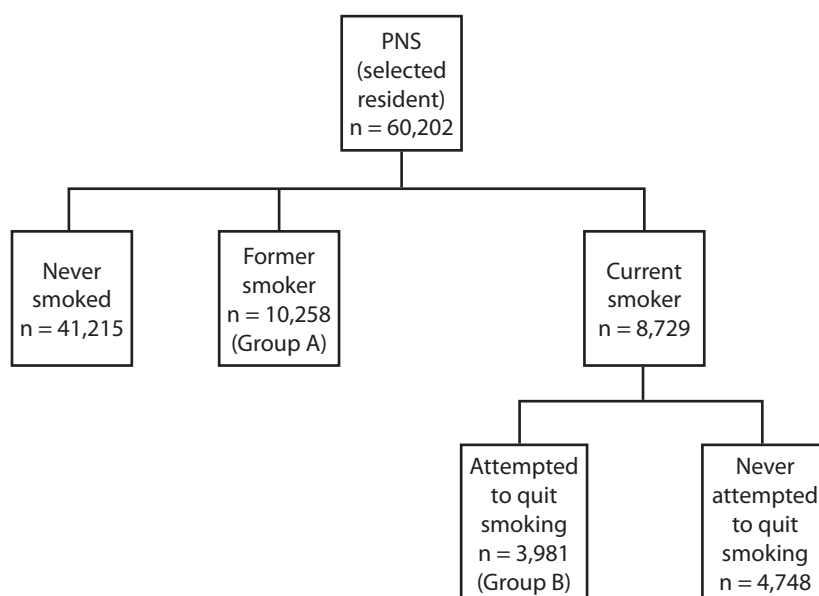


Figure 1. Representation of the study groups of success and failure in smoking cessation attempts

Statistical analysis

From the frequency of current smoking status, absolute and relative frequencies were created for each independent variable and tested one at a time for their association with the outcomes using the Pearson's chi-squared test. The level of statistical significance adopted was 95%. From the bivariate analysis, binary logistic regression modeling was carried out considering smoking cessation as outcome, providing there was an attempt to quit at some point.

To evaluate the adjustment of the alternative model tested, statistical analysis of maximum likelihood was conducted comparing the null model and the alternative model (which included the independent variables one by one by using Forward Stepwise regression). Raw and adjusted odds ratios were obtained with 95% confidence intervals for the significant variables and, finally, the quality of adjustment of the models was evaluated.

It should be noted that, as the study used public data without participant identification, approval from the Research Ethics Committee was not required.

RESULTS

The group that successfully stopped smoking was composed predominantly of male, single, non-white adults aged 40-59 years, with low level of education, belonging to socioeconomic status C, residing in urban areas. Prevalence rates for diseases were as follows: cerebrovascular accidents (CVA), 2.7%; chronic obstructive pulmonary disease (COPD), 3.0%; lung cancer, 0.1%; acute myocardial infarction (AMI), 2%. In the health self-assessment, 54.2% of the individuals in this group reported having very good/good health (Table 1). In general, there were more people who did not live with other smokers and who had had previous access to anti-tobacco campaigns. However, the vast majority reported not living with other smokers.

Comparison between the group with successful and unsuccessful smoking cessation attempts showed statistically significant differences regarding age, marital status, level of education, race, socioeconomic and census status, diagnosis of CVA and AMI, access to information (for and against tobacco use), and living with other smokers (all with $p < 0.001$) (Table 2).

Results of the logistic regression models for success and/or failure in smoking cessation attempts showed a direct association with age, with a gradual increase across the categories (p trend=0.001): individuals at more advanced ages presented a 3.7-fold higher chance of success compared with that of younger individuals. In other words, the older the individuals, the greater their chances of being able to quit smoking. This association persisted even after adjustment to other variables, considering the potential confounding with the incidence of chronic diseases (p trend = 0.005), which was approximately 1.9 times higher in the older group. Direct association was also found for marital status, in which married individuals had an approximately 135% higher chance of success in attempts to quit smoking compared with single individuals ($p < 0.001$), which was reduced to 60% after adjustment. Regarding schooling, after adjustment, the chance of being able to quit smoking was 34% higher among those with a higher level of education compared with that of individuals who are illiterate and did not complete primary school ($p < 0.001$). Race lost its statistical significance ($p = 0.659$) after adjustment to other variables. Belonging to a higher socioeconomic status (A or B) increased the chance of successful smoking cessation by 84% - 49% after adjustment, maintaining statistical significance ($p < 0.001$). As for census status, it was observed that residing in an urban environment increases the chance of successful smoking cessation (OR=1.07; $p < 0.001$).

Prior history of chronic diseases did not show statistically significant difference for successful smoking cessation attempts (CVA and AMI, with $p = 0.593$ and 0.066, respectively) (Table 3). It is important to note that there was particularly consistent association between successful smoking cessation attempts and exposure to pro-tobacco advertisement (OR=1.74, $p < 0.001$), and especially anti-tobacco campaigns (OR=3.30, $p < 0.001$). A result that particularly stood out was the association between successful smoking cessation attempts and living with other smokers, which was significantly higher than the other factors, with a nearly 9-fold higher chance of success for individuals not living with other smokers, even after adjusting to other variables.

Table 1. Profile of the study sample according to demographic and health-related variables. National Health Survey (PNS), Brazil, 2013

Group	Variables	Categories	n	%
Demographic	Age group	<24 years	876	6.1
		25-39 years	3515	24.7
		40-59 years	5896	41.4
		≥60 years and Above	3952	27.8
	Sex	Male	7496	52.6
		Female	6743	47.4
	Marital status	Married	5660	39.7
		Separated/widowed	2791	19.6
		Single	5788	40.7
	Education	1	8036	56.4
		2	1855	13.0
		3	3090	21.7
		4	1258	8.9
	Race	White	5463	38.4
		Non-White	8776	61.6
	Socioeconomic status	A/B	3143	22.1
		C	5828	40.9
		D/E	5268	37.0
	Census status	Urban	11281	79.2
Rural		2958	20.8	
Tobacco-dependent conditions	CVA	Yes	384	2.7
		No	13855	97.3
	COPD	Yes	423	3.0
		No	13816	97.0
	Lung cancer	Yes	13	0.1
		No	14226	99.9
	AMI	Yes	284	2.0
		No	13955	98.0
	Living with other smokers	No	10361	72.8
		Occasionally	819	5.8
Access to information	Pro-tobacco	Daily	3059	21.5
		Yes	4439	31.2
	No	9800	68.8	
	Anti-tobacco	Yes	10979	77.1
No		3260	22.9	
Health self-assessment	Very good/Good	7713	54.2	
	Good	5068	35.6	
	Regular/Poor	1458	10.2	
Total			14239	100.00

Table 2. Distribution of the study sample by demographic and health-related characteristics according to smoking cessation. National Health Survey (PNS), Brazil, 2013

Group	Variables	Categories	Smoking cessation				p-value
			No		Yes		
			n	%	n	%	
Demographic	Age group	<24 years	387	9.7	489	4.8	<0.001
		25-39 years	1306	32.8	2209	21.5	
		40-59 years	1721	43.2	4175	40.7	
		≥60 years	567	14.3	3385	33.0	
	Sex	Male	2096	52.7	5400	52.6	0.999
		Female	1885	47.3	4858	47.4	
	Marital Status	Married	1144	28.7	4516	44.0	<0.001
		Separated/ widowed	674	16.9	2117	20.6	
	Education	1	2295	57.6	5741	56.0	<0.001
		2	592	14.9	1263	12.3	
		3	856	21.5	2234	21.7	
		4	238	6.0	1020	10.0	
	Socioeconomic status	A/B	646	16.2	2497	24.3	<0.001
		C	1634	41.0	4194	40.9	
		D/E	1701	42.8	3567	34.8	
Race	White	1373	34.5	4090	39.9	<0.001	
	Non-White	2608	65.5	6168	60.1		
Census status	Urban	3070	77.1	8211	80.0	<0.001	
	Rural	911	22.9	2047	20.0		
Tobacco-dependent conditions	CVA	Yes	78	2.0	306	3.0	<0.001
		No	3903	98.0	9952	97.0	
	COPD	Yes	133	3.3	290	2.8	0.109
		No	3848	96.7	9968	97.2	
	Lung cancer	Yes	1	0.1	12	0.2	0.129
		No	3980	99.7	10246	99.8	
	AMI	Yes	50	1.3	234	2.3	<0.001
		No	3931	98.7	10024	97.7	
	Living with other smokers	No	1583	39.8	878	85.6	<0.001
		Occasionally	319	8.0	500	4.9	
Daily		2079	52.2	980	9.6		
Access to information	Pro-tobacco	Yes	1857	46.6	2582	25.2	<0.001
		No	2124	53.4	7676	74.8	
	Anti-tobacco	Yes	3700	92.9	7279	71.0	<0.001
		No	281	7.1	2979	29.0	
Health self-assessment	Very Good/ Good	2194	55.1	5519	53.8	0.370	
	Regular	1389	34.9	3579	35.9		
	Poor/ Very Poor	398	10.0	1060	10.3		
Total			3981	27.95	10258	82.05	

Table 3. Measurements of association of the logistic regression model for successful smoking cessation attempts according to demographic and health-related variables. National Health Survey (PNS), Brazil, 2013

Group	Variables	Categories	OR _c (95% CI)	p-value	OR _a (95% CI)	p-value
Demographic	Age Group	<24 years	1		1	
		25-39 years	1.34 (1.15 – 1.56)	<0.001	1.02 (0.85)	0.005
		40-59 years	1.92 (1.66 – 2.22)		1.30 (1.08 – 1.56)	
		≥60 years	4.72 (4.02 – 5.54)		2.75 (2.24 – 3.38)	
	Married	2.35 (2.17 – 2.56)	1.60 (1.43 – 1.77)			
	Marital Status	Separated/ widowed	1.87 (1.69 – 2.07)	<0.001	1.04 (0.91 – 1.19)	0.112
		Single	1		1	
		1	1		1	
	Education	2	0.86 (0.76 – 0.95)	<0.001	0.98 (0.85 – 1.12)	0.426
		3	1.04 (0.95 – 1.14)		1.05 (0.92 – 1.20)	
		4	1.71 (1.48 – 1.99)		1.19 (0.96 – 1.47)	
		Race	White		1.26 (1.17 – 1.36)	
	Non-White		1	1		
	Socioeconomic status	A/B	1.84 (1.66 – 2.04)	<0.001	1.49 (1.26 – 1.77)	<0.001
		C	1.22 (1.13 – 1.33)		1.22 (1.10 – 1.36)	
		D/E	1		1	
Census status	Urban	1.19 (1.09 – 1.30)	<0.001	1.07 (1.01 – 1.18)	0.024	
	Rural	1		1		
Tobacco-dependent conditions	CVA	Yes	1.54 (1.20 – 1.98)	<0.001	1.09 (0.80 – 1.47)	0.593
		No	1		1	
	AMI	Yes	1.83 (1.35 – 2.50)	<0.001	1.40 (0.98 – 2.01)	0.066
		No	1		1	
	Living with other smokers	No	11.76 (10.87 – 12.91)	<0.001	9.65 (8.74 – 10.65)	<0.001
		Occasionally	3.32 (2.83 – 3.90)		3.09 (2.61 – 3.66)	
Daily	1	1				
Access to information	Pro-tobacco	Yes	2.60 (2.41 – 2.81)	<0.001	1.74 (1.58 – 3.82)	<0.001
		No	1		1	
	Anti-tobacco	Yes	5.93 (4.74 – 6.13)	<0.001	3.30 (2.86 – 3.82)	<0.001
		No	1		1	

DISCUSSION

Smoking rates have been declining over recent decades. According to the National Health and Nutrition Survey of 1989 and the World Health Survey of 2003, the prevalence of smoking in the adult Brazilian population has decreased by 35%, at an average rate of 2.5% per year, going from 34.8% in 1989 to 22.4% in 2003¹⁷. The 2008 Special Smoking Survey (PETab-2008), which was adapted from the Global Adult Tobacco Survey (GATS), is a supplementary module to the National Household Sample Survey (PNAD). The PETab-2008 suggests that this reduction has been sustained, as the prevalence of smoking estimated by this survey was 17.2%: 21.6% men and 13.1% women, aged ≥15 years¹⁸⁻²⁰. Data from Vigitel, a telephone survey representative of residents of the Brazilian state capitals, in an equivalent period (2006-2009), suggest a decrease in the prevalence of smoking among men (from 19.3% to 18.4%) and a slight increase among women (from 11.7% to 12.4%), considering Brazil as a whole²¹.

This decline is largely a result of cessation, though there is still scarcity of nationwide or large-scale studies in Brazil with estimates of former smokers. Data to enable the calculation of smoking cessation in Brazil are only available for the past two decades. The household survey on risk behaviors and morbidity of diseases and non-communicable diseases, conducted between 2002 and 2003 by the Ministry of Health (MS), estimated smoking cessation by means of an index that considered current and former smokers in 16 Brazilian state capitals, and found a significant variation between the cities studied, from 44.0% in João Pessoa to 58.3% in Campo Grande, without, however, presenting a specific pattern between the regions of the country²². Data from the PETab-2008 showed that the proportion of former daily smokers was 14.1%. Among those who do not smoke currently, 46.9% reported having smoked in the past, either regularly or occasionally²³.

It is important to note that the PETab-2008 was the first representative national survey that sought to analyze the factors associated with smoking cessation²⁴. Comparison between data from the PNAD and more recent analyses from the PNS^{24,25} shows that, between 2008 and 2013, Brazil maintained a decline in the prevalence of smoking, and that this trend is associated with smoking cessation incentive policies, especially with the increase in taxes and prices of tobacco products, health warnings on cigarette packs, the smoking ban in closed public spaces, and the ban on advertising and sponsorship. In addition, there is a higher incidence of current smokers who have tried to quit smoking in the recent past, and cessation has increased even in the categories in which this was less prevalent, such as men, individuals with lower levels of education, and young people²⁴.

This study found that the association between successful smoking cessation and tobacco-related illnesses loses its statistical significance after adjustment to sociodemographic variables. Furthermore, no significant association with health self-assessment was found after bivariate analysis. This finding does not agree with studies in the literature, which showed that smoking cessation is closely associated with presence of illnesses, particularly among individuals aged >40 years. The most plausible explanation for this may be the occurrence of selective survival bias, i.e., the loss of sick people through death or because people did not answer the questionnaire, causing an underestimation of the relationship between illness and smoking cessation. It is also possible that people quit smoking due to the incidence of symptoms that precede chronic diseases – such as coughing, tiredness, etc. — without yet having a diagnosis of the clinical disease. Another explanation supported in the literature is that smoking cessation has a larger relationship with contextual life factors (expressed by the demographic variables) than the influence of a diagnosis of a disease or self-perception of health. Furthermore, it is likely that there is a selective survival bias, a potential limitation of surveys in general.

As contextual effects appear to be important in determining smoking cessation, it is worth noting the difference in cessation between urban and rural environments. International studies have tried to measure possible differences in the prevalence of smoking between urban and rural environments to then draw up specific strategies to promote cessation in each of them. In China, statistics from 2009-2010 showed that 51% of its population of approximately 1.3 billion people live in rural environments, and the prevalence of smoking at that time among the rural population was 29.8% vs. 26.1% among the urban population. It is believed that, as there is predominance of agricultural work in rural environments, the prevalence of smoking would reach up to 60% in these locations, and a few studies have shown how smoking behaviors and cessation are developed in this population group^{26,27}.

In the urban context, the best time trends of falling smoking prevalence and rising smoking cessation are found for white, older (≥ 60 years) individuals with higher income. This may be due to greater ease of access to smoking cessation assistance, such as counseling from health professionals, pharmacological treatment, and therapies against nicotine addiction²⁸.

Relapse is a natural phenomenon that commonly occurs in any addiction cycle, with individuals often making three to 10 cessation attempts before definitively quitting smoking. A temporary change to an undesirable behavior occurs more easily than a definite change that is adopted in the long term as a lifestyle²⁹. Social support (whose relationship can be observed, for example, in the association between smoking cessation and marital status), the

use of medication, cognitive-behavioral therapy, and in person or telephone follow-up after an intensive approach are key strategies for relapse prevention³⁰.

Educational policies aimed at raising awareness of the harm associated with smoking may help to promote cessation or discourage individuals from taking up smoking, thus reinforcing social norms against smoking. In the same way that advertisement that associated positive social images with smoking contributed to increased prevalence around 30-40 years ago, disclosure of the negative effects of smoking tends to increase its decline³¹⁻³³. The importance of educational measures and information about the harm caused by cigarettes were evaluated by Levy et al., who showed that 6 and 8% of the decline in smoking in Brazil from 1989 to 2008 may be attributed to educational measures and health warnings on cigarette packs, respectively²⁰.

A recent study showed that smokers exposed to sanitary warnings 30 days before the survey were 58% more likely to use the services available for smoking cessation compared with controls. It is worth noting that this study used a directly observed primary outcome (participating in a smoking cessation group) and did not rely on the self-reports of the participants³⁴.

Living with other smokers is a significant barrier to smoking cessation³⁵. In fact, the most recent systematic review that examined a set of evidence related to the involuntary exposure to tobacco smoke found a positive association between living with other smokers and being a smoker, susceptibility to smoking, and smoking initiation and addiction, and a negative association with cessation³⁶. It is considered that secondary smoking exposure may favor the social pressures and suggestions encouraging collective behavior, in a way that cessation will be more successful where this pressure is diminished, that is, where there are other smokers³⁷.

It is believed that smoking cessation among people who do not live with other smokers is related to stigmatization. Stigmatization creates an unfavorable public sentiment in relation to smoking and establishes an anti-smoking social norm. In addition, the negative sentiment of the public against smokers is positively associated with the intention of quitting³⁸. It is important to note that this relationship is so strong that, compared to it, other variables recognized in the literature such as sex, age, and level of education lose their strength of association or even their statistical significance, as observed in this study.

Finally, it is worth remembering that Brazil, by signing the Framework Convention on Tobacco Control (FCTC) of the World Health Organization (WHO), has pledged to protect the health of its population through control of the smoking epidemic³⁹. Examples of the consequences of this policy are the enactment of Law no. 12.546/2011⁴⁰, which regards smoke-free environments and taxes on tobacco-related products; and the Presidential Decree no. 8.262/2014⁴¹, which regulates these measures. Thus, the WHO drew up a plan of policies in 2008, reflecting the interests of the FCTC and of the Action Plan for the Prevention and Control of Noncommunicable Diseases, called MPOWER. This consists of six interventions that must continue in the country in order to achieve even smaller rates of smoking prevalence and which seek to monitor key indicators of tobacco consumption (Monitor), protect the public against tobacco smoke (Protect), offer help for smoking cessation (Offer), warn about the harms of smoking (Warn), enforce prohibitions on promotion and marketing (Enforce), and raise taxes on tobacco-related products (Raise)²⁰. All of these actions go along with the attempts to reduce smoking provided for in the National Health Promotion Policy (PNPS)⁴².

The main limitations to this study are as follows. In addition to the fact that it is a survey – and therefore subject to survival bias of the interviewees – it is important to note that there was no defined period for former smokers. Thus, the group that quit smoking may have made one or several attempts, and they may have occurred over the last 12 months or at a time prior to the reference period of the survey. However, the analysis has important evidence that qualifies the study. It is worth mentioning the relationship between living with other smokers and smoking cessation, the magnitude of which makes this association undeniable.

The study shows evidence that tobacco control policies supported by the FCTC have produced positive results in the sense of stimulating smoking cessation by means of measures that inform society about the harm caused by the consumption of tobacco products and that reduce the social acceptance of smoking. They also show the importance of approaches to

smokers involving all the family, as living with smokers can have a strong influence on smoking cessation.

REFERENCES

1. Lima-Costa MF, Veras RP. Saúde pública e envelhecimento. *Cad Saude Publica*. 2003;19(3):700-1. <http://dx.doi.org/10.1590/S0102-311X2003000300001>.
2. Malta DC, Morais OL No, Silva JB Jr. Presentation of the strategic action plan for coping with chronic diseases in Brazil from 2011 to 2022. *Epidemiol Serv Saúde*. 2011;20(4):425-38.
3. Malta DC, Silva JB Jr. 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 Saude*. 2013;22(1):151-64. <http://dx.doi.org/10.5123/S1679-49742013000100016>.
4. Karnath B. Smoking cessation. *Am J Med*. 2002;112(5):399-405. [http://dx.doi.org/10.1016/S0002-9343\(01\)01126-3](http://dx.doi.org/10.1016/S0002-9343(01)01126-3). PMID:11904115.
5. US Department of Health and Human Services. National Institutes of Health, National Cancer Institute, Department of Health and Human Services. The health consequences of smoking: a report of the surgeon general. Atlanta: U.S. Department of Health and Human Services; 2004. 792p.
6. Velters MH, Kottke TE, Solberg LI, Brekke ML, Rooney B. Dependency, social factors, and the smoking cessation process: the doctors helping smokers study. *Am J Prev Med*. 1990;6(4):185-93. [http://dx.doi.org/10.1016/S0749-3797\(18\)31004-3](http://dx.doi.org/10.1016/S0749-3797(18)31004-3). PMID:2223165.
7. Centers for Disease Control and Prevention. Quitting smoking among adults—United States, 2001–2010. *MMWR Morb Mortal Wkly Rep*. 2011;60(44):1513-9. PMID:22071589.
8. Rafful C, García-Rodríguez O, Wang S, Secades-Villa R, Martínez-Ortega JM, Blanco C. Predictors of quit attempts and successful quit attempts in a nationally representative sample of smokers. *Addict Behav*. 2013;38(4):1920-3. <http://dx.doi.org/10.1016/j.addbeh.2012.12.019>. PMID:23380497.
9. Corrigan WA. Understanding brain mechanisms in nicotine reinforcement. *Br J Addict*. 1991;86(5):507-10. <http://dx.doi.org/10.1111/j.1360-0443.1991.tb01798.x>. PMID:1859913.
10. Sofuoglu M, Lesage M. The reinforcement threshold for nicotine as a target for tobacco control. *Drug Alcohol Depend*. 2012;125(1-2):1-7. <http://dx.doi.org/10.1016/j.drugalcdep.2012.04.023>. PMID:22622242.
11. Yang JJ, Song M, Yoon H, Lee H, Lee Y, Lee S, et al. What are the major determinants in the success of smoking cessation: results from the health examinees study. *PLoS One*. 2015;10(12):e0143303. <http://dx.doi.org/10.1371/journal.pone.0143303>. PMID:26633704.
12. Richmond RL, Kehoe LA, Webster IW. Multivariate models for predicting abstinence following intervention to stop smoking by general practitioners. *Addiction*. 1993;88(8):1127-35. <http://dx.doi.org/10.1111/j.1360-0443.1993.tb02132.x>. PMID:8401167.
13. Li C, Balluz LS, Ford ES, Okoro CA, Zhao G, Pierannunzi C. A comparison of prevalence estimates for selected health indicators and chronic diseases or conditions from the behavioral risk factor surveillance system, the National Health Interview Survey, and the National Health and Nutrition Examination Survey, 2007–2008. *Prev Med*. 2012;54(6):381-7. <http://dx.doi.org/10.1016/j.ypmed.2012.04.003>. PMID:22521996.
14. Malta DC, Oliveira TP, Vieira ML, Almeida L, Szwarcwald CL. Uso e exposição à fumaça do tabaco no Brasil: resultados da Pesquisa Nacional de Saúde 2013. *Epidemiol Serv Saude*. 2015;24(2):239-48. <http://dx.doi.org/10.5123/S1679-49742015000200006>.
15. Damacena GN, Szwarcwald CL, Malta DC, Souza PRB Jr, Vieira MLFP, Pereira CA, et al. O processo de desenvolvimento da Pesquisa Nacional de Saúde no Brasil, 2013. *Epidemiol Serv Saude*. 2015;24(2):197-206. <http://dx.doi.org/10.5123/S1679-49742015000200002>.
16. Szwarcwald CL, Souza PR Jr, Marques AP, Almeida WD, Montilla DE. Inequalities in healthy life expectancy by Brazilian geographic regions: findings from the National Health Survey, 2013. *Int J Equity Health*. 2016;15(1):141. <http://dx.doi.org/10.1186/s12939-016-0432-7>. PMID:27852270.
17. 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(7):527-34. <http://dx.doi.org/10.2471/BLT.06.039073>. PMID:17768501.
18. Instituto Nacional de Câncer. Global adult tobacco survey Brazil report [Internet]. Rio de Janeiro: INCA; 2010 [cited 2016 Nov 28 Available from: <https://www.paho.org/hq/dmdocuments/2010/GATS%202010%20Brazil%20Report%20en.pdf>].

19. 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(9842):668-79. [http://dx.doi.org/10.1016/S0140-6736\(12\)61085-X](http://dx.doi.org/10.1016/S0140-6736(12)61085-X). PMID:22901888.
20. Levy D, Almeida LM, Szklo A. The Brazil Sim Smoke policy simulation model: the effect of strong tobacco control policies on smoking prevalence and smoking-attributable deaths in a middle-income nation. *PLoS Med*. 2012;9(11):e1001336. <http://dx.doi.org/10.1371/journal.pmed.1001336>. PMID:23139643.
21. Silva GAE, 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. <http://dx.doi.org/10.1590/S1415-790X2011000500011>.
22. Instituto Nacional do Câncer. Prevalência de tabagismo no Brasil - Dados dos inquéritos epidemiológicos em capitais brasileiras. Rio de Janeiro: INCa; 2004. [cited 2017 Jov 23]. Available from: http://bvsmms.saude.gov.br/bvsm/publicacoes/tabaco_inquerito_nacional_070504.pdf.
23. Barros AJD, Cascaes AM, Wehrmeister FC, Martínez-Mesa J, Menezes AMB. Tabagismo no Brasil: desigualdades regionais e prevalência segundo características ocupacionais. *Cien Saude Colet*. 2011;16(9):3707-16. <http://dx.doi.org/10.1590/S1413-81232011001000008>. PMID:21987315.
24. Szklo AS, Souza MC, Szklo M, de Almeida LM. Smokers in Brazil: who are they? *Tob Control*. 2016;25(5):564-70. <http://dx.doi.org/10.1136/tobaccocontrol-2015-052324>. PMID:26292700.
25. Szklo AS, Volchan E, Thrasher JF, Perez C, Szklo M, Almeida LM. Do more graphic and aversive cigarette health warning labels affect Brazilian smokers' likelihood of quitting? *Addict Behav*. 2016;60:209-12. <http://dx.doi.org/10.1016/j.addbeh.2016.04.021>. PMID:27161535.
26. Wang J, Li C, Jia C, Liu Y, Liu J, Yan X, et al. Smoking, smoking cessation and tobacco control in rural China: a qualitative study in Shandong Province. *BMC Public Health*. 2014;14(1):916. <http://dx.doi.org/10.1186/1471-2458-14-916>. PMID:25190269.
27. Ho MG, Ma S, Chai W, Xia W, Yang G, Novotny TE. Smoking among rural and urban young women in China. *Tob Control*. 2010;19(1):13-8. <http://dx.doi.org/10.1136/tc.2009.030981>. PMID:19822528.
28. Stead LF, Lancaster T. Combined pharmacotherapy and behavioural interventions for smoking cessation. *Cochrane Database Syst Rev*. 2012;10:CD008286. PMID:23076944.
29. Reichert J, Araújo AJ, Gonçalves CMC, Godoy I, Chatkin JM, Sales MPU, et al. Smoking cessation guidelines--2008. *J Bras Pneumol*. 2008;34(10):845-80. <http://dx.doi.org/10.1590/S1806-37132008001000014>. PMID:19009219.
30. Soto S, Arredondo EM, Villodas MT, Elder JP, Quintanar E, Madanat H. Depression and chronic health conditions among latinos: the role of social networks. *J Immigr Minor Health*. 2016;18(6):1292-300. <http://dx.doi.org/10.1007/s10903-016-0378-2>. PMID:26976003.
31. Bayer R, Stuber J. Tobacco control, stigma, and public health: rethinking the relations. *Am J Public Health*. 2006;96(1):47-50. <http://dx.doi.org/10.2105/AJPH.2005.071886>. PMID:16317199.
32. Hammond D, Fong GT, McNeill A, Borland R, Cummings KM. Effectiveness of cigarette warning labels in informing smokers about the risks of smoking: findings from the International Tobacco Control (ITC) Four Country Survey. *Tob Control*. 2006;15(Suppl 3):iii19-25. <http://dx.doi.org/10.1136/tc.2005.012294>. PMID:16754942.
33. Starr MA, Drake K. Graphic warning labels and the demand for cigarettes. *Tob Control*. 2017;26(2):169-74. <http://dx.doi.org/10.1136/tobaccocontrol-2015-052775>. PMID:27015879.
34. Guydish J, Tajima B, Le T, Henderson C, Yip D, Gruber V, et al. Do cigarette graphic warnings encourage smokers to attend a smoking cessation programme: a quasi-experimental study. *Tob Control*. 2018;27(1):43-9. <http://dx.doi.org/10.1136/tobaccocontrol-2016-053207>. PMID:27913790.
35. Eng L, Qiu X, Su J, Pringle D, Niu C, Mahler M, et al. The role of second-hand smoke exposure on smoking cessation in non-tobacco-related cancers. *Cancer*. 2015;121(15):2655-63. <http://dx.doi.org/10.1002/cncr.29340>. PMID:25877384.
36. Okoli CT, Kodet J. A systematic review of secondhand tobacco smoke exposure and smoking behaviors: Smoking status, susceptibility, initiation, dependence, and cessation. *Addict Behav*. 2015;47:22-32. <http://dx.doi.org/10.1016/j.addbeh.2015.03.018>. PMID:25863004.
37. Kashigar A, Habbous S, Eng L, Irish B, Bissada E, Irish J, et al. Social environment, secondary smoking exposure, and smoking cessation among head and neck cancer patients. *Cancer*. 2013;119(15):2701-9. <http://dx.doi.org/10.1002/cncr.28088>. PMID:23765604.
38. Kim J, Cao X, Meczkowski E. Does stigmatization motivate people to quit smoking? Examining the effect of stigmatizing anti-smoking campaigns on cessation intention. *Health Commun*. 2017 33(6):681-9. PMID:28398092.

39. 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 Jul;9(7):2520-36. <http://dx.doi.org/10.3390/ijerph9072520>. PMID:22851957.
40. Brasil. Lei nº 12.546, de 14 de dezembro de 2011. Institui o Regime Especial de Reintegração de Valores Tributários para as Empresas Exportadoras (Reintegra); dispõe sobre a redução do Imposto sobre Produtos Industrializados (IPI) à indústria automotiva; altera a incidência das contribuições previdenciárias devidas pelas empresas que menciona; altera as Leis nº 11.774, de 17 de setembro de 2008, nº 11.033, de 21 de dezembro de 2004, nº 11.196, de 21 de novembro de 2005, nº 10.865, de 30 de abril de 2004, nº 11.508, de 20 de julho de 2007, nº 7.291, de 19 de dezembro de 1984, nº 11.491, de 20 de junho de 2007, nº 9.782, de 26 de janeiro de 1999, e nº 9.294, de 15 de julho de 1996, e a Medida Provisória nº 2.199-14, de 24 de agosto de 2001; revoga o art. 1º da Lei nº 11.529, de 22 de outubro de 2007, e o art. 6º do Decreto-Lei nº 1.593, de 21 de dezembro de 1977, nos termos que especifica; e dá outras providências. *Diário Oficial da República Federativa do Brasil, Brasília*, 15 de dezembro de 2011; Seção 1. p. 3.
41. Brasil. Decreto nº 8.262, de 31 de maio de 2014. Altera o Decreto nº 2.018, de 1º de outubro de 1996, que regulamenta a Lei nº 9.294, de 15 de julho de 1996. *Diário Oficial da República Federativa do Brasil, Brasília*, 2 de junho de 2014; Seção 1. p. 1.
42. Malta DC, Morais OL No, Silva MMA, Rocha D, Castro AM, Reis AAC, et al. Política Nacional de Promoção da Saúde (PNPS): capítulos de uma caminhada ainda em construção. *Cien Saude Colet*. 2016;21(6):1683-94. <http://dx.doi.org/10.1590/1413-81232015216.07572016>. PMID:27281656.