DOI: 10.1590/1980-5497201500060005

ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Smoking Trends among Brazilian population - National Household Survey, 2008 and the National Health Survey, 2013

Tendência de fumantes na população Brasileira segundo a Pesquisa Nacional de Amostra de Domicílios 2008 e a Pesquisa Nacional de Saúde 2013

Deborah Carvalho Malta[I,II], Maria Lucia Vieira[III], Celia Landman Szwarcwald[IV], Roberta Caixeta[V], Sonia Maria Feitosa Brito[VI], Ademar Arthur Chioro dos Reis[VII]

ABSTRACT: ***Objective:*** To compare current tobacco smoking prevalence in the Brazilian population and the federal states in adults (aged ≥ 18 years), using the National Household Survey 2008 and National Health Survey, 2013. ***Methods:*** Using data from two national surveys conducted in 2008 and 2013, the paper examines the current tobacco smoking prevalence in Brazil at the national level and at the federal state level. We calculated the percentage change for the period. ***Results:*** Overall, results show -19% reduction in current tobacco smoking prevalence from 18.5% (2008) to 14.7% (2013). Results also show a significant percentage decline in smoking prevalence across geographic regions and demographic characteristics including gender, race, age and education levels. The decline occurred in all regions, urban and rural areas, and in most states. The reduction was -17.5% for men and -20.7% for women, having occurred in all age groups, with the greatest reduction in the group from 25 to 39 years of age; in all categories of race/color, a higher prevalence was found among the blacks and browns. It also declined in all the levels of schooling, with a higher reduction in lower education levels. In 2013, the prevalence for people with less education was 19.7% and 8.7% for those with college degrees. ***Conclusion:*** There was an average reduction of about 19% in tobacco consumption in Brazil and the Brazilian states in both sexes, all ages, and race color. Tobacco consumption in the country is one of the lowest in the world and has declined significantly, which can be attributed to the control policies, regulation, and prevention.

Keywords: Smoking. Tobacco. Chronic disease. Health Surveys. Health Promotion. Government Regulation.

[I]Departamento de Vigilância de Doenças e Agravos Não Transmissíveis, Secretaria de Vigilância em Saúde, Ministério da Saúde – Brasília (DF), Brazil.

[II]Universidade Federal de Minas Gerais – Belo Horizonte (MG), Brazil.

[III]Instituto Brasileiro de Geografia e Estatística – Rio de Janeiro (RJ), Brazil.

[IV]Instituto de Comunicação e Informação Científica e Tecnológica em Saúde, Fundação Oswaldo Cruz – Rio de Janeiro (RJ), Brazil.

[V]*Pan American Health Organization/World Health Organization – PAHO/WHO – Washington (DC), USA.*

[VI]Secretaria de Vigilância em Saúde, Ministério da Saúde – Brasília (DF), Brazil.

[VII]Universidade Federal de São Paulo – São Paulo (SP), Brazil.

Corresponding author: Deborah Carvalho Malta. Departamento de Vigilância Doenças e Agravos Não Transmissíveis e Promoção da Saúde, Secretaria de Vigilância em Saúde, Ministério da Saúde. SAF Sul, Trecho 02, Lotes 05/06, Bloco "F", Torre 1, Edificio Premium, térreo, sala 15, CEP: 70070-600, Brasília, DF, Brasil. E-mail: dcmalta@uol.com.br

Conflict of interests: nothing to declare – **Financial support:** none.

RESUMO: ***Objetivo:*** Comparar a prevalência de fumantes atuais de tabaco na população brasileira e nas unidades federativas, em adultos (≥ 18 anos), considerando dois inquéritos populacionais realizados em 2008 e 2013. ***Métodos:*** São comparadas as prevalências de fumantes atuais de tabaco no Brasil e nas unidades federativas analisando dados da Pesquisa Nacional de Amostra de Domicílios, de 2008, e da Pesquisa Nacional de Saúde, de 2013. Foram calculados a variação percentual no período e o valor de p. ***Resultados:*** A prevalência de fumantes atual de tabaco reduziu -19% no período, saindo de 18,2% (2008) para 14,7% (2013). O declínio ocorreu em todas as regiões, área urbana e rural e na maioria dos estados. A redução foi de -17,5% para os homens e -20,7% para as mulheres, reduziu em todas as faixas de idade, sendo a maior redução entre 25 e 39 anos; também reduziu para todas as categorias de raça/cor, sendo as prevalências mais altas entre pretos e pardos. Declinou também em todas as faixas de escolaridade, sendo maior a redução nas faixas de menor escolaridade. Em 2013, as prevalências para população com menor escolaridade foram de 19,7% e de 8,7% para quem tem nível superior completo. ***Conclusão:*** Ocorreu uma redução média de cerca de 19% no consumo do tabaco no Brasil e nos estados brasileiros, em ambos o sexos, todas faixas de idade e raça/cor. O consumo do tabaco no país é um dos mais baixos do mundo e declinou de forma significativa, o que pode ser atribuído a políticas de controle, regulação e prevenção.

Palavras-chave: Hábito de fumar. Tabaco. Doença crônica. Inquéritos epidemiológicos. Promoção da saúde. Regulamentação governamental.

INTRODUCTION

Tobacco use is one of the major risk factors for noncommunicable diseases also called chronic diseases. It causes cardiovascular diseases (hypertension, stroke, and myocardial infarction), cancer (lung, oral cavity, esophagus, stomach, colon, bladder, kidneys, and cervix), and chronic respiratory diseases (chronic obstructive pulmonary diseases – COPD)[1]. Tobacco use has also been associated with delayed uterine growth and constitutes an important risk factor for communicable diseases such as tuberculosis[2,3]. It is estimated that smoking causes about 71% of lung cancer deaths, 42% of chronic respiratory diseases, and almost 10% of cardiovascular diseases[1].

World Health Organization (WHO) estimates that about one billion smokers worldwide and about 6 million deaths per years are caused by tobacco use[4]. Tobacco use may increase global mortality by about 20 to 30 times and a number of studies estimate that the harmful effects of secondhand smoke-related deaths would increase from 30 to 50%[1-5].

To help prevent premature avoidable mortality from NCDs, WHO set a target of 30% relative reduction in current tobacco use between 2015 and 2025. The target allows governments and society to commit to reducing tobacco use, exposure to secondhand smoke and to advance protective measures[6].

The first study on monitoring tobacco use in Brazil was conducted in 1989 and showed a 34.8% smoking prevalence nationally among adults[7]. Subsequent studies have shown a reduction in smoking prevalence including the 2003 World Health Survey which showed a prevalence rate of 22.4%[7,8].

In 2005, Brazil signed the Treaty of the Framework for Tobacco Control, to which the country commit to continuous monitoring of tobacco use through the country[9]. In 2006, the Ministry of Health implemented the Chronic Diseases Risk Factor Surveillance using Telephone Inquiry referred to as Vigitel. Vigitel has been implemented annually to monitor tobacco prevalence in the capital cities. The survey has shown a decline in tobacco use among adults in Brazilian State Capitals[10,11].

Monitoring of the chronic diseases risk factors national data is important for Brazil particularly given the country's global commitments with the WHO and the United Nations (UN) Organization, in the reduction of prevalence of smoking up to 2025[6].

This study examines the changes current smoking prevalence adults (≥ 18 years of age), in Brazilia nationally and by Federal States, using two waves of national surveys: the National Household Survey (*Pesquisa Nacional de Amostra de Domicílios* – PNAD)2008 and the National Health Survey 2013.

METHODS

The National Household Survey 2008 and National Health Survey were both carried out by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* – IBGE). PNAD 2008 included a health survey supplement with a specific module on tobacco use, the Global Tobacco Adult Survey (GATS)[12,13].

The GATS questionnaire included in PNAD 2008 contains several questions on tobacco use and other key tobacco indicators and allows for international comparison with other countries that have implemented the survey. The inclusion of GATS in PNAD 2008 involved extensive national and international partnership, including IBGE, the Ministry of Health (MoH), the WHO, the Pan-American Health Organization (PAHO), Institute for Global Tobacco Control, Johns Hopkins Bloomberg School of Public Health, Bloomberg Philanthropy, and Centers for Disease Control and Prevention (CDC)[14,15].

In 2013, this partnership was repeated in the implementation of the National Health Survey, allowing for the continuity of the monitoring of tobacco products across the country. A shorter version of the standardized set of tobacco questions called Tobacco Questions for Survey (TQS), was used for the National Health Survey. TQS allows country comparison of a set of key tobacco indicators internationally. TQS is simple which makes it easier to administer either as a stand-alone survey or incorporated in a national household health survey as an additional module.

GATS questionnaire and TQS comprise questions about use of smoking tobacco products (manufactured cigarettes, straw or hand-rolled cigarettes, Indian cigarettes or bidis, clove cigarettes or Bali, pipes, cigars or cigarillos, and narguille) and smokeless tobacco products (chewing tobacco or snuff). Other thematic blocks of the questionnaire include tobacco use cessation, exposure to secondhand smoke, exposure to pro and anti-tobacco media, and economics of tobacco use.

GATS Brazil was conducted in 2008 as a health supplement in the PNAD and was referred to as Special Tobacco Survey (*Pesquisa Especial do Tabagismo* – PETAB)[12] The survey used

a nationally representative sample of adults aged 15 years or older. A stratified multistage cluster sample design was used to select 51,011 households. The GATS sample comprised one-third of the sampled households included in the PNAD. One individual was randomly chosen from each selected household[12]. A total of 39,425 individual interviews were completed with an overall response rate of 94.0%. In Brazil, this research was called.

The National Health Survey 2013 is a part of Brazil Integrated System of Household Surveys. The survey produces nationally representative estimates of the health conditions and lifestyle among adult Brazilian population aged 18 years or older. The 2013 survey included Tobacco Questions for Survey[13].

The National Health Survey used a stratified three stage cluster sample design. The census sectors or set of sectors formed the primary sampling units (*unidades primárias de amostragem* – UPAs), the households were the units of the second stage, and residents aged 18 years or older defined the units of the third stage. The National Health Survey randomly selected a total of 81,187 households, and individuals aged 18 years or older were interviewed, with one individual in from each household being selected. At the end of the collection, 64,348 interviews were collected in households, resulting in a no-response rate of 8.1%[13].

DATA COLLECTION

Both PNAD 2008 and National Health Survey 2013 were conducted using the hand computers (personal digital assistance – PDA), programed for the processes. Initially, contact was made with the responsible person or any resident in the selected household. The survey field interviewer described the survey to the resident including its objectives, procedures, and the importance of the participation in the survey and secured their consent to participate; a list of all the adult residents in the household was prepared and one adult was randomly selected to participate in the interview. The interviews were scheduled in the most convenient dates and times for the respondents, allowing for two or more visits in each household[12,13].

We analyzed the GATS 2008 and TQS data from National Health Survey 2013. We used descriptive analysis to produce national and state estimates of current tobacco smokers and also by other demographic characteristics. To ensure comparability between PETAB 2008 and TQS 2013, we excluded from PETAB 2008 all respondents aged 15 to 17. This allowed for the comparability of the data as TQS 2013 was only administered to adults 18 years and older.

The statistical analysis was conducted using Stata software, version 11.0. We produced tobacco smoking prevalences with their respective confidence intervals of 95% (95%CI) by gender, regions, federal units (states), and residence (urban and rural). In addition, we calculated the differences between the tobacco smoking prevalence between 2008 and 2013 and the *p* value. Tobacco smoking prevalence was also calculated for sociodemographic characteristics including age, education, and race/color.

The National Health Survey was approved by the National Committee for Ethics in Human Research (CONEP), endorsement No. 328.159, June 26th, 2013.

RESULTS

Overall adult current smoking prevalence in 2008 was 18.2% (95%CI 17.7 – 18.7), among men 22.9% (95%CI 22.1 – 23.7), and among women 13.9% (95%CI 13.3 – 14.5) (Tables 1 to 3).

In 2013, current smoking prevalence overall was 14.7% (95%CI 14.2 – 15.2), 18.9% (95%CI 18.0 – 19.7) among men and 11% (95%CI 10.5 – 11.6) women.

The results show an overall -19.0% ($p < 0.001$) reduction in current smoking prevalence among adults in Brazil. By gender, there was a -17.5% decline among men ($p < 0.001$), and a -20.7% decline among women ($p < 0.001$) (Tables 1 to 3).

At residence level, there was a 17.8% decline in urban area and a 23.8% ($p < 0.001$) decline in rural area (Table 1). However, there were significant variations in reductions in current smoking prevalence across the regions, and among Federal Units, with the highest declined observed in Paraíba of -42.2%. Reduction in current smoking prevalence was observed in almost all Federal Units with exception of Minas Gerais, Paraná, Santa Catarina, Amazonas, Amapá, and Acre, in which the reduction was not statistically significant (Table 1).

In terms of other socio-demographic characteristics, there was a significant decline in current smoking prevalence across age groups, education levels and across race/color. The highest decline across age groups was among the 25 – 39 age group (-24.3%) and the 18 – 24 age group (-22.4%) while the highest decline across education levels was among the less-educated (-19.9%). However, the less-educated group had the highest smoking prevalence compared to other education levels.

DISCUSSION

Results from comparing the two waves of surveys show a 20.0% reduction in current smoking prevalence from 2008 and 2013. This decline is evident across all regions in the country, and in both the rural and the urban areas. Although there are some states that did show a significant decline, in most states there was a significant decline in current smoking prevalence. The decline in current smoking prevalence is also evidence across socio-demographic characteristics include gender, age, education, and race/color.

Previous surveys using (household interviews[7,8] and telephone based interviews[10] have shown a decline in current smoking prevalence among adults in Brazil. Results from Vigitel for the Brazilian state capital cities showed a decline in current smoking prevalence from 15.7% in 2006 and reduced to 11.3% in 2013[10,11]. Results from this study, demonstrate the progress in Brazil to reduced adult smoking prevalence among adults. Brazil has become to one of the few countries with lowest smoking prevalence in the world compared 16 other GATS countries[14] (China, Russia, Thailand, Bangladesh, Egypt, India, Mexico, Philippines, Poland, Turkey, Ukraine, Vietnam, among others), with a total of 3 billion inhabitants. The comparison between these countries was possible owing to the use of the standard GATS protocol which include same questionnaire, and sampling and survey methodology that allows for comparison of results among the countries implementing the survey[14].

Table 1. Comparison of the prevalence of current tobacco smokers in the adult population (≥ 18 years), according to the National Survey of Household Sample, 2008 and the National Health Survey, 2013 relative change and *p*-value. Brazil, regions, federal units, urban, and rural.

	PNAD 2008 % (95%CI)	NHR 2013 % (95%CI)	Relative change (%)	p-value
Brazil (total)	18.2 (17.7 – 18.7)	14.7 (14.2 – 15.2)	-19.0	< 0.001*
Urban	17.5 (17.0 – 18.0)	14.4 (13.9 – 14.9)	-17.8	< 0.001*
Rural	21.9 (20.5 – 23.3)	16.7 (15.4 – 18.1)	-23.8	< 0.001*
North	17.7 (15.9 – 19.7)	13.2 (11.9 – 14.7)	-25.3	< 0.001*
Rondônia	16.2 (12.9 – 20.1)	11.9 (10.0 – 14.0)	-26.8	0.007*
Acre	23.5 (17.1 – 31.3)	18.8 (16.7 – 21.1)	-20.0	0.063
Amazonas	14.5 (10.7 – 19.3)	13.1 (11.6 – 14.8)	-9.4	0.162
Roraima	19.0 (13.2 – 26.4)	14.1 (12.0 – 16.5)	-25.5	0.042*
Pará	18.8 (16.1 – 21.8)	12.9 (10.5 – 15.9)	-31.0	0.001*
Amapá	14.7 (10.4 – 20.4)	13.3 (11.1 – 16.0)	-9.1	0.175
Tocantins	20.2 (17.2 – 23.7)	13.9 (11.8 – 16.4)	-31.2	< 0.001*
Northeast	18.4 (17.6 – 19.3)	14.2 (13.4 – 15.1)	-22.8	< 0.001*
Maranhão	17.6 (14.6 – 21.1)	15.3 (12.2 – 19.0)	-13.2	0.117
Piauí	21.1 (17.1 – 25.9)	16.8 (14.5 – 19.3)	-20.7	0.025*
Ceará	20.7 (18.6 – 23.0)	16.3 (14.3 – 18.6)	-20.9	0.002*
Rio Grande do Norte	18.8 (15.9 – 22.1)	13.2 (11.2 – 15.4)	-30.0	< 0.001*
Paraíba	21.7 (18.5 – 25.3)	12.5 (10.6 – 14.8)	-42.2	< 0.001*
Pernambuco	18.5 (16.6 – 20.6)	15.0 (13.4 – 16.9)	-18.8	0.003*
Alagoas	17.0 (13.4 – 21.3)	13.1 (11.2 – 15.2)	-23.0	0.023*
Sergipe	14.1 (11.0 – 18.0)	12.0 (10.1 – 14.3)	-14.9	0.105
Bahia	16.8 (15.2 – 18.6)	12.8 (11.0 – 14.8)	-23.9	0.001*
Southeast	17.6 (16.7 – 18.4)	15.0 (14.2 – 15.9)	-14.6	< 0.001*
Minas Gerais	18.6 (17.0 – 20.2)	17.8 (15.8 – 19.9)	-4.3	0.166
Espírito Santo	18.9 (15.2 – 23.3)	13.1 (10.9 – 15.8)	-30.7	0.002*
Rio de Janeiro	16.0 (14.5 – 17.6)	12.7 (11.3 – 14.1)	-20.9	< 0.001*
São Paulo	17.6 (16.4 – 18.9)	14.8 (13.6 – 16.1)	-15.9	0.001*
South	20.0 (18.8 – 21.3)	16.1 (14.7 – 17.5)	-19.9	< 0.001*
Paraná	19.5 (17.5 – 21.7)	18.1 (15.6 – 20.8)	-7.5	0.134
Santa Catarina	17.8 (15.4 – 20.5)	16.0 (13.3 – 19.2)	-10.2	0.127
Rio Grande do Sul	21.8 (19.9 – 23.8)	14.2 (12.6 – 16.0)	-34.8	< 0.001*
Mid-West	17.3 (16.0 – 18.7)	13.4 (12.5 – 14.5)	-22.2	< 0.001*
Mato Grosso do Sul	19.6 (16.5 – 23.1)	17.8 (15.7 – 20.2)	-9.0	0.131
Mato Grosso	18.3 (14.9 – 22.3)	12.5 (10.3 – 15.1)	-31.8	0.001*
Goiás	17.5 (15.6 – 19.6)	13.4 (11.9 – 15.1)	-23.5	< 0.001*
Federal District	13.5 (11.3 – 16.0)	10.8 (9.2 – 12.6)	-20.2	0.022*

GATS: *Global Tobacco Adult Survey*; TQS: *Tobacco Questions for Surveys*; *statistically significant values.

Table 2. Comparison of the prevalence of current tobacco smoking prevalence among adult male (≥ 18 years), according to the National Survey of Household Sample and the National Health Survey. Relative change and *p* value. Brazil, regions, federal units, urban, and rural.

	PNAD 2008 % (95%CI)	NHR 2013 % (95%CI)	Relative change (%)	p-value
Brazil (totalmale)	22.9 (22.1 – 23.7)	18.9 (18.0 – 19.7)	-17.5	< 0.001*
Urban	21.8 (20.9 – 22.7)	18.3 (17.3 – 19.2)	-16.2	< 0.001*
Rural	28.4 (26.3 – 30.5)	22.4 (20.5 – 24.4)	-21.1	< 0.001*
North	23.1 (20.4 – 26.0)	19.0 (16.9 – 21.3)	-17.7	0.009*
Rondônia	19.3 (14.3 – 25.4)	17.0 (13.9 – 20.6)	-11.9	0.149
Acre	30.4 (20.3 – 42.8)	21.9 (18.9 – 25.3)	-27.8	0.034*
Amazonas	19.1 (14.3 – 25.1)	20.0 (17.5 – 22.8)	4.8	0.191
Roraima	26.3 (17.2 – 38.0)	19.5 (16.1 – 23.5)	-25.8	0.060
Pará	25.0 (20.8 – 29.8)	18.8 (14.9 – 23.5)	-24.7	0.017*
Amapá	17.4 (11.2 – 25.9)	19.3 (15.1 – 24.3)	10.9	0.184
Tocantins	24.8 (19.9 – 30.3)	18.1 (14.8 – 22.0)	-26.9	0.009*
Northeast	24.8 (23.3 – 26.2)	19.1 (17.8 – 20.6)	-22.8	< 0.001*
Maranhão	25.4 (21.1 – 30.2)	21.8 (16.6 – 28.0)	-14.3	0.117
Piauí	30.3 (23.3 – 38.3)	22.9 (19.3 – 26.8)	-24.6	0.020*
Ceará	25.2 (21.8 – 28.9)	20.2 (17.1 – 23.6)	-19.9	0.014*
Rio Grande do Norte	23.8 (18.7 – 29.8)	17.7 (14.4 – 21.6)	-25.6	0.018*
Paraíba	28.3 (23.1 – 34.3)	15.0 (12.3 – 18.2)	-46.9	< 0.001*
Pernambuco	24.9 (21.8 – 28.3)	18.8 (16.2 – 21.7)	-24.6	0.001*
Alagoas	21.2 (15.4 – 28.5)	15.7 (12.5 – 19.7)	-25.7	0.042*
Sergipe	20.1 (14.7 – 27.0)	16.9 (13.6 – 20.8)	-16.0	0.120
Bahia	23.6 (21.1 – 26.3)	19.2 (16.1 – 22.7)	-18.6	0.018*
Southeast	21.6 (20.2 – 23.0)	19.0 (17.5 – 20.5)	-12.0	0.007*
Minas Gerais	23.2 (20.7 – 25.9)	23.4 (19.9 – 27.3)	0.8	0.199
Espírito Santo	25.1 (18.8 – 32.7)	17.5 (14.0 – 21.7)	-30.4	0.011*
Rio de Janeiro	20.0 (17.5 – 22.8)	15.2 (13.1 – 17.7)	-23.8	0.002*
São Paulo	21.1 (19.1 – 23.2)	18.4 (16.4 – 20.7)	-12.5	0.037*
South	23.6 (21.8 – 25.5)	19.1 (17.0 – 21.4)	-19.1	0.001*
Paraná	23.0 (20.1 – 26.1)	21.6 (17.7 – 25.9)	-6.2	0.171
Santa Catarina	20.4 (16.8 – 24.5)	19.7 (15.3 – 25.0)	-3.2	0.195
Rio Grande do Sul	26.1 (23.2 – 29.1)	16.4 (13.7 – 19.4)	-37.2	< 0.001*
Mid-West	22.2 (20.2 – 24.4)	16.8 (15.1 – 18.6)	-24.4	< 0.001*
Mato Grosso do Sul	26.1 (20.8 – 32.3)	22.3 (18.8 – 26.3)	-14.5	0.097
Mato Grosso	25.0 (20.1 – 30.6)	16.1 (12.7 – 20.2)	-35.6	0.001*
Goiás	22.2 (19.2 – 25.6)	16.5 (13.7 – 19.6)	-25.8	0.002*
Federal District	15.3 (11.7 – 19.6)	13.4 (10.7 – 16.5)	-12.4	0.142

GATS: *Global Tobacco Adult Survey*; TQS: *Tobacco Questions for Survey*; *values statistically significant.

Table 3. Comparison of the prevalence of current tobacco smoking prevalence among adult females (≥ 18 years), according to the National Survey of Household Sample and the National Health Survey, relative change, and *p*-value. Brazil, regions, federal units, urban, and rural.

	PNAD 2008 % (95%CI)	NHR 2013 % (95%CI)	Relative change (%)	p-value
Brazil (total female)	13.9 (13.3 – 14.5)	11.0 (10.5 – 11.6)	-20.7	< 0.001*
Urban	13.8 (13.1 – 14.4)	11.0 (10.4 – 11.7)	-19.8	< 0.001*
Rural	14.5 (12.9 – 16.3)	10.7 (9.4 – 12.2)	-26.0	< 0.001*
North	12.4 (10.4 – 14.7)	7.8 (6.8 – 9.0)	-37.2	< 0.001*
Rondônia	13.3 (9.3 – 18.7)	6.9 (5.2 – 9.2)	-47.8	< 0.001*
Acre	16.7 (11.3 – 24.0)	15.9 (13.3 – 18.9)	-5.1	0.193
Amazonas	9.7 (5.4 – 16.9)	6.5 (4.9 – 8.5)	-33.2	0.062
Roraima	11.7 (6.5 – 20.2)	8.9 (6.8 – 11.5)	-24.1	0.123*
Pará	12.6 (9.7 – 16.1)	7.3 (5.5 – 9.7)	-41.6	< 0.001*
Amapá	12.1 (6.7 – 20.8)	7.9 (5.8 – 10.7)	-34.6	0.054
Tocantins	15.5 (11.3 – 20.9)	10.0 (7.7 – 12.8)	-35.7	0.005*
Northeast	12.7 (11.7 – 13.8)	9.9 (9.1 – 10.8)	-22.1	< 0.001*
Maranhão	10.0 (6.5 – 15.2)	9.3 (6.7 – 13.0)	-6.8	0.193
Piauí	12.7 (9.0 – 17.8)	11.1 (8.7 – 14.2)	-12.6	0.160
Ceará	16.7 (14.4 – 19.3)	12.9 (10.8 – 15.4)	-22.9	0.008*
Rio Grande do Norte	14.4 (10.7 – 19.0)	9.2 (7.3 – 11.6)	-35.7	0.003*
Paraíba	15.8 (12.2 – 20.1)	10.3 (8.0 – 13.3)	-34.5	0.003*
Pernambuco	12.7 (10.9 – 14.9)	11.8 (9.8 – 14.1)	-7.5	0.160
Alagoas	12.9 (8.9 – 18.3)	10.8 (9.0 – 12.9)	-16.5	0.126
Sergipe	8.9 (6.5 – 12.1)	7.5 (5.7 – 9.9)	-15.2	0.139
Bahia	10.6 (9.0 – 12.5)	7.2 (5.8 – 8.9)	-32.5	< 0.001*
Southeast	14.0 (13.1 – 15.0)	11.5 (10.6 – 12.5)	-17.8	< 0.001*
Minas Gerais	14.3 (12.7 – 16.2)	12.7 (10.6 – 15.1)	-11.4	0.101
Espírito Santo	13.2 (10.2 – 17.1)	9.2 (6.8 – 12.2)	-30.9	0.016*
Rio de Janeiro	12.7 (11.0 – 14.5)	10.6 (9.0 – 12.3)	-16.6	0.034*
São Paulo	14.5 (13.0 – 16.1)	11.5 (10.2 – 13.1)	-20.1	0.002*
South	16.7 (15.3 – 18.3)	13.3 (11.7 – 15.0)	-20.5	0.001*
Paraná	16.3 (13.9 – 19.0)	14.9 (12.1 – 18.3)	-8.6	0.154
Santa Catarina	15.4 (12.4 – 19.1)	12.5 (9.5 – 16.4)	-18.9	0.085
Rio Grande do Sul	17.9 (15.7 – 20.3)	12.3 (10.3 – 14.6)	-31.3	< 0.001*
Mid-West	12.7 (11.2 – 14.4)	10.4 (9.2 – 11.7)	-18.2	0.008*
Mato Grosso do Sul	13.6 (10.0 – 18.3)	13.8 (11.4 – 16.6)	1.0	0.199
Mato Grosso	11.9 (8.6 – 16.1)	9.0 (6.9 – 11.8)	-23.8	0.066
Goiás	13.1 (10.7 – 15.9)	10.6 (8.6 – 13.0)	-19.3	0.053
Federal District	11.9 (9.3 – 15.2)	8.6 (6.8 – 10.8)	-28.0	0.015*

GATS: *Global Tobacco Adult Survey*; TQS: *Tobacco Questions for Surveys*; *values statistically significant.

Globally, European countries have higher current smoking prevalences overall and among both men and women, followed by the Americas[2]. Among Asian countries, such as India and Bangladesh, and other Western Pacific and Southeastern Asian countries, the current smoking prevalence among women are very low, which may be explained by the religious and cultural influences[2]. Brazil follows the trend of the European countries, with high current smoking prevalence among women, which is about half the prevalence among men. However, this study found a significant decline in current smoking prevalence both among the men and women. In previous studies did not show any decline among women[10].

Several studies in Brazil and globally, have shown the higher smoking prevalence among men than women[2,8,10,14,15]. The gender differences smoking prevalence may be explained by cultural

Table 4. Comparison of the prevalence of current tobacco smoking in the Brazilian population of adults (≥ 18 years) by sex, age, race/ethnicity, education level, and place of residence, National Survey of Household Sample, 2008 and National Health Survey, 2013.

	PNAD 2008 % (95%CI)	NHR 2013 % (95%CI)	Relative change (%)	p-value
Gender				
Male	22.9 (22.1 – 23.7)	18.9 (18.0 – 19.7)	-17.5	< 0.001*
Female	13.9 (13.3 – 14.5)	11.0 (10.5 – 11.6)	-20.7	< 0.001*
Age (years)				
18 – 24	13.6 (12.5 – 14.8)	10.6 (9.4 – 11.9)	-22.4	< 0.001*
25 – 39	17.3 (16.5 – 18.1)	13.1 (12.3 – 13.9)	-24.3	< 0.001*
40 – 59	23.1 (22.1 – 24.0)	19.2 (18.3 – 20.2)	-16.6	< 0.001*
60+	14.5 (13.4 – 15.6)	12.6 (11.6 – 13.8)	-12.5	0.009*
Education				
No education/incomplete primary school	24.5 (23.5 – 25.6)	19.7 (18.8 – 20.6)	-19.9	< 0.001*
Complete primary school/ incomplete elementary school	20.5 (19.7 – 21.3)	16.5 (15.1 – 18.1)	-19.3	< 0.001*
Complete elementary school/ incomplete college degree	12.3 (11.5 – 13.1)	10.3 (9.5 – 11.1)	-16.4	< 0.001*
Complete college degree	10.6 (9.4 – 12.0)	8.7 (7.6 – 10.0)	-17.8	0.013*
Race/color				
Caucasian/white	16.0 (15.3 – 16.7)	13.0 (12.3 – 13.7)	-19.0	< 0.001*
Black	22.6 (20.8 – 24.4)	17.7 (15.8 – 19.7)	-21.8	< 0.001*
Brown	20.0 (19.2 – 20.8)	16.1 (15.3 – 16.9)	-19.5	< 0.001*
Others	18.0 (14.0 – 22.9)	14.0 (10.7 – 18.1)	-22.4	0.057
Residence				
Urban	17.5 (17.0 – 18.0)	14.4 (13.9 – 14.9)	-17.8	< 0.001*
Rural	21.9 (20.5 – 23.3)	16.7 (15.4 – 18.1)	-23.8	< 0.001*

GATS: *Global Tobacco Adult Survey*; TQS: *Tobacco Questions for Surveys*; *values statistically significant.

and religious factors. Tobacco was originally introduced among men and has been associated with a symbol of masculinity and power[16]. Later on, through tobacco industry strategies, tobacco was introduced to women. The introduction of tobacco to women occurred in Brazil in the mid-twentieth century. One strategy used by the tobacco industry to target use of tobacco among women was to associate the behavior with gender equality, independence, and glamour[16,17].

In Brazil, there are differences in the current smoking prevalence urban and rural populations. Rural areas have a higher smoking prevalence as compared to urban areascountry[12]. Cultural factors particularly in tobacco producing regions, as is the case of the South and Northeast regions of Brazil, may, in part, explain the higher prevalence among this rural community[15]. However, the decline occurred smoking prevalence in Brazil across urban and rural areas, may reflect the impact and effectiveness of the tobacco control policies across the country[9].

Although smoking prevalence among the more-educated population is lower in both surveys, the significant decline observed among all the levels of education, particularly among those with less years of school education shows progress made in reducing tobacco use in the country. Other studies have also shown that education is a protective factor against tobacco use both in Brazil[9,11-13] and in other countries[2,14]. It is therefore, important to ensure that tobacco control programs and policies could effectively target those with low education as well.

All the regions showed a downward trend in smoking prevalence. However, there are variations in smoking prevalence across the regions. Smoking prevalence was higher in the South region, followed by the Southeastern region. Higher smoking prevalence in the South may be explained by cultural factors such as influence from European migrant population and influence from neighboring countries such as Argentina and Uruguay, with prevalences around 30.0%[2]. Economic factors are also noteworthy when it comes to tobacco smoking in Brazil particularly given the country is a major tobacco producer in the region. Brazil is the second largest producer and the largest exporter of tobacco in the world, and a great part of the tobacco crops are grown in the South[18,19].

The states with the highest smoking prevalence in 2008 were: Acre, Rio Grande do Sul, Paraíba, and Piauí. In 2013, they were: Acre, Paraná, Minas Gerais, and Mato Grosso do Sul. The national tobacco control law was approved in 2011 and regulated by presidential decree in 2014[20]. Before that, only the states of São Paulo, Rio de Janeiro, Paraná, Mato Grosso, Rondônia, Amazonas, Roraima, and Paraíba had passed specific state tobacco control laws[21]. This fact may explain the important reduction observerd in Paraíba in the period under study. However, state laws were followed by mobilization and fiscalization measures, showing an uneven performance among states, such as in Paraná, where no changes in smoking prevalence during the period under study. Acre state displayed high smoking prevalence in both the waves of the survey. It is important to also consider the possibility of illegal tobacco products market in border regions such as Acre which shares borders with other countries such as Peru and Bolivia.

In relation to race/color, the results showed a decline across all groups. However, black and brown people had higher smoking prevalence as compared to other races/colors. The United States show different results, indicating that black people smoke less[22].

The progress in reducing smoking prevalence in Brazil could be attributed to several tobacco control policies and implemented actions, such as regulatory, educational, preventive actions, and expanding measures for the access to treatment among smokers[9,11]. The ban of partial advertisement of tobacco dates to 1996 and was followed by the implementation of several steps and measures, such as the ratification of the WHO Framework Convention on Tobacco Control (*Convenção-Quadro para o Controle do Tabaco)* in 2005, the federal Tobacco Control Law in 2011, and the presidential decree in 2014[20]. These legal milestones banned the use of tobacco in indoor public places, established rules for the protection of workers from secondhand smoke, increased tobacco products taxes to 85%, and defined the minimum price of cigarettes, in addition to prohibiting any advertisement of the products and expanding the space occupied by health warning on cigarette package.[20]

CONCLUSION

The 19% relative reduction in smoking prevalence in Brazil from 2008 to 2013 may be understood in the context of the country's adoption and implementation of a set of best practices disclosed by the WHO[1,2] as tobacco protective:

- prohibiting the sale of tobacco to minors;
- prohibiting the use of tobacco in indoor public places and in public transportation;
- use of warning labels in cigarette packs;
- raising taxes and prices on tobacco products; and
- ban tobacco advertising, promotion and sponsorship.

Another internationally recognized success for Brazil is the continuous monitoring of tobacco use. Brazil was the first country in the Americas to conduct GATS[14] and the second country in the world to complete a second tobacco survey, using the standardized questionnaire (TQS)[13], in addition to the annual monitoring Vigitel survey[10,11]. This effort was internationally recognized in March 2015 when and Brazil won the Bloomberg Foundation Award for the country's leadership in tobacco control monitoring.

Given the reduction in smoking prevalence achieved in the country, Brazil is project to achieve or exceed the target reduction goal of 30% in smoking prevalence, as stipulated in the Strategic Action Plan for the fight of Chronic Noncommunicable Diseases 2011–2022[23] and in the Global Action Plan for the Prevention and Control of Noncommunicable Diseases of the WHO[6,23].

ACKNOWLEDGMENTS

The authors thank the technicians from the Centers for Disease Control and Prevention, CDC Global Tobacco Control Branch (Atlanta, USA): Lazarous Mbulo, Krishna M. Palipudi, and Linda Andes, by the support in the analysis, especially in the GATS/2008.

REFERENCES

1. World Health Organization (WHO). Global status report on noncommunicable diseases 2010 [Internet]. Geneva: WHO; 2011.
2. World Health Organization (WHO). WHO report on the global tobacco epidemic, 2013. Enforcing bans on tobacco advertising, promotion and sponsorship. Geneva: WHO; 2013. Disponível em: http://apps.who.int/iris/bitstream/10665/85380/1/9789241505871_eng.pdf?ua=1. (Acessado em 15 de maio de 2015).
3. Zamboni M. Epidemiologia do câncer do pulmão. J Pneumol 2002; 28(1): 41-7.
4. Doll R, Hill AB. Smoking and carcinoma of the lung. Br Med J 1950; 2(4682): 739-58.
5. Malta DC, Moura L, Souza MFM, Curado MP, Alencar AP, Alencar GP. Tendência da mortalidade por câncer de pulmão, traquéia e brônquios no Brasil, 1980-2003. J Bras Pneumol 2007; 33(5): 536-43.
6. World Health Organization (WHO). Global Action Plan for the Prevention and Control of NCDs 2013-2020 [Internet]. Geneva: WHO; 2013. Disponível em: http://www.who.int/nmh/events/ncd_action_plan/en/. (Acessado em 27 de janeiro de 2014).
7. 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.
8. Szwarcwald CL, Malta DC, Pereira CA, Vieira MLFP, Conde WL, Souza Júnior PRB, et al. Pesquisa Nacional de Saúde no Brasil: concepção e metodologia de aplicação. Ciênc Saúde Coletiva 2014; 19(2): 333-42.
9. 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(7): 2520-36.
10. Malta DC, Iser BPM, Sá NNB de, Yokota RT de C, Moura L de, 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(4): 812-22.
11. Malta DC, Oliveira TP, Luz M, Stopa SR, Silva Junior JB, Reis AAC. Tendências de indicadores de tabagismo nas capitais brasileiras, 2006 a 2013. Ciênc Saúde Coletiva 2015; 20(3): 631-40.
12. Instituto nacional de Câncer. Oganização Pan-Americana de Saúde. Pesquisa Especial de Tabagismo – PETab: relatório Brasil. Rio de Janeiro: INCA; 2011.
13. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional de Saúde 2013: percepção do estado de saúde, estilos de vida e doenças crônicas. Rio de Janeiro: IBGE; 2014. Disponível em: ftp://ftp.ibge.gov.br/PNS/2013/pns2013.pdf. (Acessado em 15 de dezembro de 2014).
14. 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.
15. Levy D, Almeida LM, Szklo A. The Brazil SimSmoke 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.
16. 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: WHO; 2010. p. 29-50.
17. Amos A, Haglund M. From social taboo to "torch of freedom": the marketing of cigarettes to women. Tob Control 2000; 9(1): 3-8.
18. Vargas MA, Oliveira BF. Estratégias de diversificação em áreas de cultivo de tabaco no Vale do Rio Pardo: uma análise comparativa. Rev Econ Sociol Rural 2012; 50(1): 157-74.
19. Bartholomay P, Iser BP, de Oliveira PP, dos Santos TE, Malta DC, Sobel J, et al. Epidemiologic investigation of an occupational illness of tobacco harvesters in southern Brazil, a worldwide leader in tobacco production. Occup Environ Med 2012; 69(7): 514-518
20. 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. Brasília: Diário Oficial da República Federativa do Brasil; 2014.
21. Aguiar I. Lei Antifumo: em apenas 8 dos 26 Estados brasileiros e no DF os fumódromos já eram proibidos. Agora a proibição é nacional. Brasil Post. Publicado em 03/12/2014. Disponível em: http://www.brasilpost.com.br/2014/12/03/lei-antifumo-o-que-muda_n_6257904.html. (Acessado em 15 de maio de 2015).
22. Centers for Disease Control and Prevention (CDC). PCD Collection: Behavioral Risk Factor Surveillance System – BRFSS. About the BRFSS, 2008. Disponível em: http://www.cdc.gov/brfss/. (Acessado em 20 de fevereiro de 2013).
23. 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(1): 151-64.

Received on: 04/14/2015
Final version presented on: 08/06/2015
Accepted on: 08/10/2015