

## Prevalence of smoking among adults residing in the Federal District of Brasília and in the state capitals of Brazil, 2008\*

Prevalência do tabagismo em adultos residentes nas capitais dos estados e no Distrito Federal, Brasil, 2008

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### Abstract

**Objective:** To determine the prevalence of smoking in the adult population of Brazil, in order to propose recommendations for the reduction of tobacco use. **Methods:** This was a population-based, cross-sectional study including a sample composed of residents ( $\geq 18$  years of age) of the capital cities of 26 Brazilian states and in the Federal District of Brasília, Brazil. For the determination of sample size, a 95% confidence interval and a 2% sample error were defined. The participants were selected and interviewed by means of the *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases). The proportion of smokers and the number of cigarettes smoked per day were estimated and stratified according to sociodemographic variables. In addition, the male/female ratio was estimated for the prevalence of smoking. **Results:** The prevalence of smoking was 16.1% (20.5% among males and 12.4% among females). The proportion of adults that reported smoking  $\geq 20$  cigarettes a day was 4.9%, being greater in males (6.5% vs. 3.6%). The prevalence of smoking was greater among individuals with a lower level of education ( $\leq 8$  years of schooling). The number of cigarettes smoked per day by males was approximately the double that smoked by females. **Conclusions:** The VIGITEL estimates indicate a reduction in the prevalence of smoking, which was, however, still greater among males than among females. The VIGITEL has been fundamental to monitoring smoking, as well as to informing decisions regarding public policies for health promotion and the prevention of chronic nontransmissible diseases.

**Keywords:** Smoking/epidemiology; Smoking/prevention & control; Cross-sectional studies.

### Resumo

**Objetivo:** Determinar a prevalência de tabagismo na população adulta do Brasil e propor recomendações para a redução do uso do tabaco. **Métodos:** Estudo transversal de base populacional, que incluiu uma amostra da população (18 anos ou mais) residente nas capitais dos 26 estados brasileiros e do Distrito Federal. Considerou-se para a determinação da amostra um intervalo de confiança de 95% e um erro amostral de 2%. Os participantes foram selecionados e entrevistados por meio do Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico (VIGITEL). Foram realizadas estimativas referentes à proporção de fumantes e o consumo de cigarros/dia conforme variáveis sociodemográficas. Adicionalmente, calculou-se a razão de prevalência de tabagismo entre homens e mulheres. **Resultados:** A prevalência de tabagismo foi de 16,1% (20,5% no sexo masculino e 12,4% no sexo feminino. A proporção de adultos que declararam fumar  $\geq 20$  cigarros ao dia foi de 4,9%, sendo maior no sexo masculino (6,5% vs. 3,6%). Houve maior prevalência de tabagismo entre indivíduos com menor escolaridade ( $\leq 8$  anos). O número de cigarros consumidos/dia no sexo masculino foi aproximadamente o dobro que o número entre as mulheres. **Conclusões:** As estimativas a partir do VIGITEL apontam uma redução na prevalência do tabagismo, com uma maior prevalência em homens do que em mulheres. O VIGITEL tem sido fundamental para o monitoramento do tabagismo, bem como para orientar políticas públicas de promoção à saúde e prevenção de doenças crônicas não transmissíveis.

**Descritores:** Tabagismo/epidemiologia; Tabagismo/prevenção & controle; Estudos transversais.

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## Introduction

The adverse effects of smoking on health have been demonstrated for many decades.<sup>(1,2)</sup> The first study that confirmed the association between smoking and cancer was the traditional prospective study conducted by Doll & Hill, who monitored the smoking habits and health of more than 30,000 English physicians, from 1951 until their deaths.<sup>(3)</sup>

In addition to being responsible for various types of cancer, exposure to tobacco smoke increases the risk of cardiovascular and respiratory diseases, even in passive smokers.<sup>(4,5)</sup> Of all types of cancer, the most common is lung cancer; the risk of lung cancer due to smoking is over 90% in males and 70% in females, which makes it of the utmost importance.<sup>(6,7)</sup>

The World Health Organization estimates that smoking is currently responsible for 5.4 million deaths annually.<sup>(6)</sup> In Brazil, smoking accounts for an estimated 200,000 deaths per year.<sup>(7)</sup> However, the reduction in daily smoking reduces the risk of cardiovascular and respiratory symptoms, as well as decreasing the incidence of cancer, especially lung cancer.<sup>(8)</sup>

Great efforts have been made by various countries, especially developed countries, to control smoking, which has led to a significant decrease in the prevalence of current smoking in recent decades. There has been an annual reduction of 0.6% in the prevalence of current smoking in Japan, of 0.7% in the prevalence of current smoking in the United States and of 0.8% in the prevalence of current smoking in the United Kingdom.<sup>(9)</sup> In Brazil, the prevalence of current smoking in adults aged  $\geq 18$  years was 34.8% in 1989 and decreased to 22.4% by 2003, which represents a relative annual decrease of 2.5% and an absolute annual decrease of 0.9%.<sup>(10)</sup>

This significant reduction in the prevalence of current smoking in Brazil was the result of interventions for the prevention and control of smoking. These interventions included educational, preventive and regulatory measures, such as the congressional approval of law 9294/96, which prohibited smoking in public places and, beginning in the year 2000, the advertising and promotion of tobacco products, which became restricted to the points of sale, as well as tobacco company sponsorships. The Brazilian National Program for Smoking Control was implemented in 1995 and has since been

coordinating such interventions through the Brazilian National Cancer Institute.<sup>(11)</sup> In 1999, the Brazilian National Health Products Oversight Agency began to regulate, control and monitor tobacco products by regulating their packaging, labeling and registration, as well as by enforcing the pertinent laws that were already in place.<sup>(12)</sup> It is of note that Brazil is legally linked to the Framework Convention on Tobacco Control (FCTC), and the monitoring and surveillance of smoking prevalence are among the measures adopted in Brazil.<sup>(13,14)</sup>

The *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases), implemented by the Brazilian National Ministry of Health in 2006, is aimed at gathering information on smoking and monitoring its prevalence in Brazil. The system monitors a series of risk factors in parallel with the monitoring of tobacco use by the population.<sup>(15)</sup> This informs decisions regarding public policies for health promotion and the prevention of smoking, aiming at reducing smoking-related morbidity and mortality.

The objective of the present study was to use VIGITEL data in order to describe the prevalence of current smoking in the adult population residing in the Federal District of Brasília and in the state capitals of Brazil.

## Methods

This was a population-based, cross-sectional study that evaluated a sample composed of adult residents ( $\geq 18$  years of age) of the capital cities of 26 Brazilian states and in the Federal District of Brasília. The participants were selected and interviewed by means of the VIGITEL. The sample selected in order to estimate the prevalence of any factor was determined by adopting a 95% confidence interval and a 2% sample error. A sample size of at least 2,000 interviews per city was obtained in two stages: random selection of households with a fixed telephone line; and random selection of an adult resident to be interviewed. Further details can be found in other studies describing the methodology used in the VIGITEL.<sup>(15)</sup>

As an instrument for monitoring risk factors or protective factors for chronic noncommunicable diseases (CNCDs), the VIGITEL investigates

various characteristics, among which is smoking. In the present study, only sociodemographic variables (city of residence, gender, age and level of education), tobacco use (current and past) and number of cigarettes smoked per day were used. In addition, an expansion factor was used in order to adjust the data evaluated to the total adult population of each city and of all the cities taken as a whole. This factor was calculated considering the probability of each individual to be selected, taking into account the number of telephone lines in the household, the number of adults in the household, the percentage of a given population category under study in relation to the percentage of the same category according to the 2000 census of

each city and the number of individuals evaluated by the system in relation to the number of adults residing in each city.<sup>(15)</sup>

In the present study, the proportion of smokers and the number of cigarettes smoked per day were estimated and stratified according to sociodemographic variables. In addition, we estimated the male/female ratio for the prevalence of current smoking. All individuals who reported smoking were classified as smokers, regardless of the frequency or intensity of smoking. All nonsmokers who reported having been smokers at any time in their lives were classified as former smokers. Individuals who smoked  $\geq 20$  cigarettes per day were classified as heavy smokers.

**Table 1** - Proportion of adult smokers ( $\geq 18$  years of age), according to gender, in state capitals and in the Federal District of Brasília, Brazil, 2008.<sup>a</sup>

| City/district  | Total, % (95% CI) | Gender           |                  | PR (M/F) |
|----------------|-------------------|------------------|------------------|----------|
|                |                   | M, % (95% CI)    | F, % (95% CI)    |          |
| Aracaju        | 12.0 (9.3-14.7)   | 16.7 (11.6-21.7) | 8.2 (5.6-10.8)   | 2.0      |
| Belém          | 13.5 (10.7-16.2)  | 19.4 (14.9-23.9) | 8.4 (5.1-11.6)   | 2.3      |
| Belo Horizonte | 19.2 (15.4-23.0)  | 22.4 (17.9-27.0) | 16.5 (10.5-22.4) | 1.4      |
| Boa Vista      | 17.3 (13.4-21.2)  | 23.3 (16.6-30.0) | 11.4 (7.7-15.0)  | 2.0      |
| Campo Grande   | 18.8 (15.6-21.9)  | 23.2 (18.2-28.2) | 14.8 (10.9-18.6) | 1.6      |
| Cuiabá         | 13.7 (11.1-16.3)  | 17.2 (12.5-21.8) | 10.5 (8.1-13.0)  | 1.6      |
| Curitiba       | 18.2 (15.7-20.7)  | 21.2 (17.3-25.1) | 15.5 (12.3-18.7) | 1.4      |
| Florianópolis  | 17.5 (15.0-20.1)  | 20.0 (16.1-23.9) | 15.3 (11.9-18.7) | 1.3      |
| Fortaleza      | 11.7 (9.3-14.0)   | 17.1 (12.5-21.7) | 7.2 (5.4-9.1)    | 2.4      |
| Goiânia        | 14.0 (11.5-16.6)  | 17.1 (13.4-20.7) | 11.4 (7.9-14.9)  | 1.5      |
| João Pessoa    | 11.5 (7.0-16.0)   | 17.8 (8.7-26.9)  | 6.3 (4.3-8.3)    | 2.8      |
| Macapá         | 16.0 (12.6-19.4)  | 24.8 (18.9-30.7) | 7.7 (4.9-10.3)   | 3.2      |
| Maceió         | 9.7 (7.4-12.0)    | 13.5 (9.1-17.9)  | 6.6 (4.6-8.5)    | 2.0      |
| Manaus         | 13.5 (10.7-16.3)  | 20.7 (15.7-25.8) | 6.9 (4.8-8.9)    | 3.0      |
| Natal          | 12.7 (10.2-15.2)  | 15.0 (10.9-19.0) | 10.8 (7.8-13.9)  | 1.4      |
| Palmas         | 13.1 (9.1-17.2)   | 19.7 (12.4-27.0) | 6.5 (4.1-9.0)    | 3.0      |
| Porto Alegre   | 19.4 (16.9-21.9)  | 21.8 (17.8-25.9) | 17.5 (14.4-20.5) | 1.2      |
| Porto Velho    | 17.9 (14.8-21.0)  | 22.0 (17.1-26.9) | 13.9 (10.3-17.5) | 1.6      |
| Recife         | 10.4 (8.4-12.4)   | 12.0 (8.4-15.5)  | 9.2 (7.0-11.4)   | 1.3      |
| Rio Branco     | 18.0 (13.6-22.4)  | 18.4 (12.3-24.5) | 17.7 (11.3-24.0) | 1.0      |
| Rio de Janeiro | 16.6 (13.9-19.4)  | 19.0 (14.2-23.9) | 14.6 (11.7-17.5) | 1.3      |
| Salvador       | 10.0 (8.0-12.1)   | 12.4 (8.9-15.9)  | 8.1 (5.7-10.4)   | 1.5      |
| São Luís       | 10.3 (8.0-12.5)   | 17.1 (12.7-21.5) | 4.6 (3.0-6.2)    | 3.7      |
| São Paulo      | 20.9 (17.0-24.9)  | 27.7 (20.3-35.1) | 15.1 (12.5-17.6) | 1.8      |
| Teresina       | 12.8 (9.9-15.7)   | 18.3 (13.3-23.3) | 8.3 (5.1-11.4)   | 2.2      |
| Vitória        | 13.0 (9.9-16.1)   | 13.9 (10.8-17.0) | 12.2 (7.2-17.3)  | 1.1      |
| FD             | 15.8 (12.7-18.8)  | 17.4 (12.7-22.1) | 14.4 (10.4-18.3) | 1.2      |

PR: prevalence ratio; and FD: Federal District (of Brasília). <sup>a</sup>Weighted percentage to adjust the sociodemographic distribution of the sample of the *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases) to the distribution of the adult population of each city according to the 2000 Census. Source: VIGITEL.

The variable “smoking experimentation” was based on an affirmative response to the question “Do you smoke?”, which characterized smokers, or to the question “Have you ever smoked?”, which characterized former smokers. The sum of the prevalence rates of current smoking and former smokers is presented according to birth cohort. The consumption of commercially available cigarettes is more common than is that of other tobacco products, such as cigars, pipes and hand-rolled cigarettes. Therefore, in the present study, we analyzed only the consumption of commercially available cigarettes.

The data were analyzed using the STATA software, version 9 (Stata Corp.; College Station, TX, USA), and a 95% confidence interval was defined.

The present study was approved by the Human Research Ethics Committee of the Brazilian National Ministry of Health. Participants were presented with all the necessary information regarding the research, as well as with the possibility of withdrawing from the study at any time, the confidentiality of the information provided being guaranteed. Because the present study was conducted by telephone, we obtained verbal, rather than written, informed consent.

## Results

The prevalence of current smoking among adults ranged from 9.7%, in the city of Maceió,

to 20.9%, in the city of São Paulo. Although smoking was more common among males than among females in all cities, the difference between genders varied considerably from city to city. In Macapá, for instance, smoking was approximately three times more common among males than among females (24.8% and 7.7%, respectively). In Porto Alegre, however, there was no significant difference between genders (21.8% among males and 17.5% among females). The prevalence of current smoking among males was highest in São Paulo (27.7%), Macapá (24.8%) and Boa Vista (23.3%), whereas that of current smoking among females was highest in Rio Branco (17.7%), Porto Alegre (17.5%) and Belo Horizonte (16.5%). The prevalence of current smoking among males was lowest in Recife (12.0%), Salvador (12.4%) and Maceió (13.5%), whereas that of current smoking among females was lowest in São Luís (4.6%), João Pessoa (6.3%) and Palmas (6.5%; Table 1).

In the entirety of the adult population of the 27 cities studied via the VIGITEL, the prevalence of current smoking was 16.1%, being higher among males (20.5%) than among females (12.4%). Among males, the prevalence of current smoking was relatively stable in those 64 years of age or younger (approximately 20%), decreasing to 13% in individuals aged 65 years or older. Among females, the prevalence of current smoking increased from 9% to 18% from age

**Table 2** – Proportion of smokers in the entirety of the adult population in state capitals and in the Federal District of Brasília, Brazil, according to gender, age and years of schooling, 2008.<sup>a</sup>

| Variable           | Total, % (95% CI) | Gender           |                  | PR (M/F) |
|--------------------|-------------------|------------------|------------------|----------|
|                    |                   | M, % (95% CI)    | F, % (95% CI)    |          |
| Age, years         |                   |                  |                  |          |
| 18-24              | 16.5 (12.0-20.9)  | 24.2 (16.1-32.3) | 9.3 (6.6-12.0)   | 2.6      |
| 25-34              | 15.6 (13.7-17.5)  | 20.3 (17.0-23.5) | 11.4 (9.5-13.3)  | 1.8      |
| 35-44              | 16.4 (15.0-17.8)  | 18.8 (16.5-21.0) | 14.3 (12.6-16.0) | 1.3      |
| 45-54              | 19.7 (18.0-21.4)  | 21.9 (19.1-24.8) | 17.8 (15.7-19.8) | 1.2      |
| 55-64              | 17.1 (15.1-19.2)  | 19.7 (16.3-23.2) | 15.1 (12.7-17.4) | 1.3      |
| ≥ 65               | 9.1 (7.6-10.6)    | 13.4 (10.2-16.6) | 6.4 (4.9-7.8)    | 2.1      |
| Years of schooling |                   |                  |                  |          |
| ≤ 8                | 20.1 (18.1-22.2)  | 26.6 (22.8-30.3) | 14.6 (13.0-16.1) | 1.8      |
| 9-11               | 11.6 (10.7-12.4)  | 14.1 (12.6-15.5) | 9.5 (8.5-10.6)   | 1.5      |
| ≥ 12               | 11.5 (10.4-12.6)  | 12.6 (10.9-14.4) | 10.5 (9.1-11.9)  | 1.2      |
| Total              | 16.1 (15.0-17.3)  | 20.5 (18.3-22.7) | 12.4 (11.5-13.3) | 1.7      |

PR: prevalence ratio. <sup>a</sup>Weighted percentage to adjust the sociodemographic distribution of the sample of the *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases) to the distribution of the adult population of each city according to the 2000 Census and to take into account the population weight of each city. Source: VIGITEL.

18 to age 54, decreasing to 15.1% and 6.4% in the two subsequent age brackets, respectively. The prevalence of current smoking was particularly high among males and females with up to 8 years of schooling (26.6% and 14.6%, respectively), being nearly twice as high as that observed among individuals with a higher level of education in the case of males (Table 2).

The proportion of individuals who reported smoking  $\geq 20$  cigarettes per day ranged from 2.1%, in Salvador, to 8.2%, in Porto Alegre. Heavy smoking tended to be more common among males than among females. As can be seen in Table 3, the cities with the highest proportions of heavy smokers were Porto Alegre (8.2%), Belo Horizonte (7.9%) and João Pessoa (6.1%).

In the entirety of the adult population of the 27 cities, the proportion of adults who reported smoking  $\geq 20$  cigarettes per day was 4.9%, being higher among males (6.5%) than among females (3.6%). Among males, the prevalence of heavy smoking tended to increase with age, being more than twice as high among individuals in the 18-24 year age bracket as among those in the 55-64 year age bracket. The relationship between heavy smoking and age was less clear in the case of females. However, beginning at the age of 65 years, a decrease was observed. The proportion of individuals who reported smoking  $\geq 20$  cigarettes per day was particularly high among males and females with 8 or fewer years of schooling (8.7% and 4.7%, respectively), being approximately twice as high as that

**Table 3** – Proportion of adults ( $\geq 18$  years of age) who smoke 20 or more cigarettes per day, according to gender, in state capitals and in the Federal District of Brasília, Brazil, 2008.<sup>a</sup>

| City/district  | Total, % (95% CI) | Gender          |                | PR (M/F) |
|----------------|-------------------|-----------------|----------------|----------|
|                |                   | M, % (95% CI)   | F, % (95% CI)  |          |
| Aracaju        | 4.3 (2.6-7.5)     | 8.2 (4.6-11.7)  | 1.1 (0.2-2.1)  | 7.5      |
| Belém          | 3.4 (1.5-2.5)     | 4.9 (2.2-7.7)   | 2.0 (0.4-4.4)  | 2.5      |
| Belo Horizonte | 7.9 (4.4-1.3)     | 9.2 (6.1-12.3)  | 6.9 (0.8-12.9) | 1.3      |
| Boa Vista      | 3.2 (1.9-2.4)     | 4.5 (2.2-6.7)   | 1.9 (0.8-3.0)  | 2.4      |
| Campo Grande   | 5.6 (3.8-4.8)     | 9.5 (6.1-12.9)  | 2.0 (0.9-3.1)  | 4.8      |
| Cuiabá         | 4.9 (2.9-3.6)     | 7.9 (3.9-11.8)  | 2.2 (1.2-3.3)  | 3.6      |
| Curitiba       | 6.1 (4.7-2.0)     | 8.3 (5.9-10.6)  | 4.2 (2.5-5.8)  | 2.0      |
| Florianópolis  | 5.6 (4.0-1.5)     | 6.8 (4.7-9.0)   | 4.4 (2.3-6.6)  | 1.5      |
| Fortaleza      | 3.2 (2.0-1.9)     | 4.3 (2.2-6.3)   | 2.3 (1.1-3.6)  | 1.9      |
| Goiânia        | 5.7 (3.7-1.5)     | 7.0 (4.6-9.4)   | 4.6 (1.4-7.8)  | 1.5      |
| João Pessoa    | 6.1 (1.6-4.7)     | 10.8 (1.3-20.2) | 2.3 (0.9-3.6)  | 4.7      |
| Macapá         | 4.2 (2.5-4.7)     | 7.1 (3.7-10.5)  | 1.5 (0.4-2.7)  | 4.7      |
| Maceió         | 2.8 (1.3-2.1)     | 3.8 (0.9-6.8)   | 1.8 (0.6-3.1)  | 2.1      |
| Manaus         | 3.0 (1.4-3.4)     | 4.8 (1.5-8.1)   | 1.4 (0.7-2.0)  | 3.4      |
| Natal          | 5.7 (3.8-1.9)     | 7.7 (4.5-11.0)  | 4.1 (1.8-6.3)  | 1.9      |
| Palmas         | 3.3 (1.2-2.0)     | 4.3 (0.4-8.3)   | 2.2 (0.9-3.6)  | 2.0      |
| Porto Alegre   | 8.2 (6.4-1.0)     | 8.2 (5.9-10.5)  | 8.1 (5.6-10.6) | 1.0      |
| Porto Velho    | 5.1 (3.2-1.4)     | 5.9 (2.9-9.0)   | 4.3 (2.1-6.5)  | 1.4      |
| Recife         | 3.6 (2.4-1.6)     | 4.6 (2.1-7.0)   | 2.9 (1.7-4.1)  | 1.6      |
| Rio Branco     | 4.6 (2.2-1.1)     | 4.8 (2.0-7.6)   | 4.4 (0.5-8.3)  | 1.1      |
| Rio de Janeiro | 6.0 (4.3-1.7)     | 7.7 (4.6-10.8)  | 4.5 (2.8-6.2)  | 1.7      |
| Salvador       | 2.1 (1.1-1.9)     | 2.8 (1.1-4.5)   | 1.5 (0.4-2.7)  | 1.9      |
| São Luís       | 2.7 (1.3-7.3)     | 5.1 (2.1-8.2)   | 0.7 (0.0-1.4)  | 7.3      |
| São Paulo      | 5.4 (4.2-1.8)     | 7.2 (4.9-9.5)   | 3.9 (2.7-5.1)  | 1.8      |
| Teresina       | 3.1 (1.6-1.6)     | 3.9 (1.9-6.0)   | 2.4 (0.3-4.5)  | 1.6      |
| Vitória        | 2.3 (1.5-1.6)     | 2.8 (1.6-4.0)   | 1.8 (0.9-2.7)  | 1.6      |
| FD             | 3.9 (2.6-1.7)     | 5.0 (3.1-6.8)   | 3.0 (1.0-5.0)  | 1.7      |

PR: prevalence ratio; and FD: Federal District (of Brasília). <sup>a</sup>Weighted percentage to adjust the sociodemographic distribution of the sample of the *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases) to the distribution of the adult population of each city according to the 2000 Census. Source: VIGITEL.

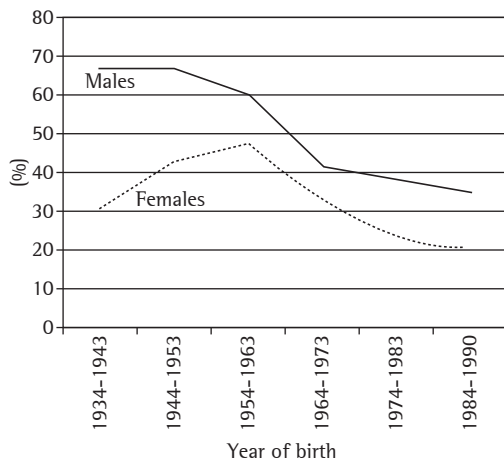
**Table 4** – Proportion of adults (≥ 18 years of age) who smoke 20 or more cigarettes per day in the entirety of the adult population in state capitals and in the Federal District of Brasília, Brazil, according to gender, age and years of schooling, 2008.<sup>a</sup>

| Variable                  | Total, % (95% CI) | Gender          |               | PR (M/F) |
|---------------------------|-------------------|-----------------|---------------|----------|
|                           |                   | M, % (95% CI)   | F, % (95% CI) |          |
| <b>Age, years</b>         |                   |                 |               |          |
| 18-24                     | 3.4 (2.0-4.8)     | 3.9 (1.9-5.8)   | 2.9 (0.8-4.9) | 1.3      |
| 25-34                     | 4.1 (3.1-5.1)     | 5.6 (3.8-7.4)   | 2.7 (1.8-3.6) | 2.1      |
| 35-44                     | 5.2 (4.3-6.0)     | 6.7 (5.3-8.1)   | 3.8 (2.8-4.8) | 1.8      |
| 45-54                     | 7.4 (6.2-8.5)     | 9.1 (7.1-11.0)  | 5.9 (4.6-7.2) | 1.5      |
| 55-64                     | 7.4 (5.9-8.9)     | 10.6 (7.9-13.3) | 4.9 (3.2-6.5) | 2.2      |
| ≥ 65                      | 3.9 (2.8-5.1)     | 7.3 (4.6-10.0)  | 1.8 (1.0-2.7) | 4.1      |
| <b>Years of schooling</b> |                   |                 |               |          |
| ≤ 8                       | 6.6 (5.7-7.4)     | 8.7 (7.3-10.2)  | 4.7 (3.6-5.7) | 1.9      |
| 9-11                      | 2.7 (2.3-3.1)     | 3.6 (2.9-4.3)   | 2.1 (1.6-2.5) | 1.7      |
| ≥ 12                      | 3.5 (2.9-4.1)     | 4.4 (3.4-5.4)   | 2.7 (2.1-3.4) | 1.6      |
| Total                     | 4.9 (4.4-5.4)     | 6.5 (5.7-7.3)   | 3.6 (3.0-4.1) | 1.8      |

PR: prevalence ratio. <sup>a</sup>Weighted percentage to adjust the sociodemographic distribution of the sample of the *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases) to the distribution of the adult population of each city according to the 2000 Census. Source: VIGITEL.

observed among individuals with a higher level of education (Table 4).

Figure 1 shows the proportions of adults who began smoking (current smokers + former



**Figure 1** – Percentage of adult smokers and former smokers (≥ 18 years of age) in the adult population of the Federal District of Brasília and of the state capitals of Brazil, according to gender and year of birth, as assessed by the *Sistema de Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL, Telephone-based System for the Surveillance of Risk and Protective Factors for Chronic Diseases), 2008. A weighted percentage was used in order to adjust the sociodemographic distribution of the VIGITEL sample to the distribution of the adult population of each city according to the 2000 Census and to take into account the population weight of each city.

smokers), according to birth cohort. There was a decrease in the prevalence of current smoking among males in the last decades in Brazil. The prevalence of current smoking among males between 65 and 74 years of age (born between 1934 and 1943) was 67.2%, decreasing to 60.3% among those born between 1954 and 1963, 41.5% among those born between 1964 and 1973 and 35% among those born between 1984 and 1990. For females, the prevalence of current smoking increased from 30.7% among those born between 1934 and 1943 to 47.7% among those born between 1954 and 1963, decreasing to 32.6% among those born between 1964 and 1973 and to 20.2% among those born between 1984 and 1990.

## Discussion

Smoking, which was once seen as a lifestyle choice, is currently recognized as a chemical dependency that exposes individuals to innumerable toxic substances. Smoking is a major public health problem and accounts for millions of deaths per year worldwide. In addition, smoking is responsible for enormous social, economic and environmental costs.<sup>(1,7)</sup>

Brazil is one of the principal producers and exporters of tobacco, which makes strategies for reducing or diversifying the cultivation of tobacco (or a combination of the two) more



complex due to the pressure exerted by the tobacco industry.<sup>(16)</sup> However, this theme has been promoted by the Brazilian National Ministry of Agrarian Development and has been the subject of national and international conferences aiming to create economic alternatives to the cultivation of tobacco. These initiatives are also supported by the National Commission for the Implementation of the FCTC and are the theme of the implementation of the convention in Brazil.<sup>(17)</sup>

A major theme in the implementation of the FCTC is to provide the country with an efficient and systematic mechanism of surveillance to monitor the trends in tobacco consumption. The VIGITEL surveillance mechanism presents a high cost-benefit ratio and provides estimates of various indicators of smoking among adults, taking into consideration various factors, such as the frequency and intensity of smoking, as well as the age at smoking onset. The VIGITEL can facilitate the evaluation of annual trends in tobacco consumption, as well as the estimation of nationwide changes in smoking, in order to guide the development of policies for smoking control. This information is compared and corrected at longer intervals in household surveys of broader scope in Brazil.<sup>(15)</sup>

The present study revealed that the prevalence of current smoking was higher among males, a finding that was also reported in other studies, such as the 1989 Brazilian National Health and Nutrition Survey, which showed that the prevalence of current smoking was 40% among males and 26% among women over 15 years of age in 2003,<sup>(18)</sup> and the Household Survey on Risk Behavior and Morbidity Referred to Diseases and Noncommunicable Risks, which was conducted in 16 capitals in Brazil and showed that the predominance of smoking among males is maintained in most capitals,<sup>(19)</sup> a finding that was confirmed in the World Health Survey.<sup>(20)</sup>

The 2003 household survey of risk factors for CNCs showed that the prevalence of current smoking among females was nearing that observed among males in the cities of the southern and southeastern regions of Brazil. This demonstrates that exposure to smoking has increased among females, which might be due to campaigns that promote smoking and are targeted at this population group, leading to an increase in the incidence of lung cancer,

tracheal cancer and bronchial cancer.<sup>(21)</sup> The present study showed the prevalence of current smoking in 2008, confirming the trend toward a decrease observed in recent years. Another piece of evidence, showing the trend in past years, is provided by the birth cohort analysis (Figure 1), which shows, in the cross-sectional study, the decrease in the number of smokers and the increase in the number of former smokers in recent cohorts. Therefore, the behavior of males shows that they began smoking earlier and reached the peak of consumption between 1940 and 1950, and that the prevalence of current smoking among males has subsequently decreased. The prevalence of current smoking among females, however, began to increase later and peaked in the 1960s, approximately. Lopez et al.<sup>(22)</sup> reported that the peak in the prevalence of current smoking occurs 15-20 years later among females than among males, as was confirmed in the present study. The explanation for the increase in smoking among females in Brazil includes, but is not limited to, the promotion of smoking as a desirable behavior by movies and the media, associated with the strong cultural appeal of affirmation of the independence and liberation of females, duly captured by the advertising campaigns launched by the tobacco industry even under the restrictions of federal law 9294/96, which prohibits the advertising and promotion of tobacco products, as well as tobacco company sponsorships.

Some authors have reported that, a peak in the prevalence of current smoking at any given time point is accompanied by a corresponding increase, approximately 30 years later, in the rates of mortality from smoking.<sup>(22,23)</sup>

Lopez et al.<sup>(22)</sup> described the four stages of the smoking epidemic in function of the evolution of the prevalence of consumption among males and females, as well as of smoking-related mortality. Stage 1 corresponds to the moment at which the prevalence of current smoking, as well as smoking-related mortality, is low among males and females. Stage 2 corresponds to an increase in the prevalence of current smoking among males, when the mortality rates in this group begin to increase. Stage 3 corresponds to a decrease in the prevalence of current smoking among males, a peak in the prevalence among females and an increase in smoking-related mortality in both genders. Stage 4 corresponds

to a reduction in the prevalence of current smoking in both genders and a reduction in smoking-related mortality among males.

The entirety of the data regarding Brazil, generated via the VIGITEL, indicates that the country is in transition between stages 3 and 4, whereas it was classified as being at stage 2 in the 1990s. The prevalence of current smoking among females did not decrease until the 1970s, later than among males, which explains the current trend toward decreased rates of lung cancer among males and the trend toward increased rates of lung cancer among females.<sup>(21)</sup>

The possibility that the epidemic is at different stages in distinct regions and states might explain the variations found in the prevalence of current smoking in the capital cities of Brazil, since the prevalence of current smoking was found to be lower in those located in the northeast, such as Maceió, Aracaju, Recife, Salvador and São Luís, than in those located in the south or southeast, including São Paulo, Porto Alegre and Belo Horizonte. In the capital cities of northeastern Brazil, the prevalence of current smoking among females was lower, which indicates earlier stages of the epidemic. This indicates that educational measures that are sensitive to the differences between genders, such as campaigns that take into consideration the differences between males and females in terms of the determinants of smoking, including measures to prevent smoking initiation and to prohibit smoking in public places, should be a priority. In the other regions, in addition to the measures reported previously, gender-sensitive smoking cessation measures also take on greater importance, since the epidemic has reached a higher level in males and females, which are, at that stage, both affected by death from lung cancer. It is also important to include measures to prevent the consumption of other forms of tobacco, such as hand-rolled cigarettes and snuff, especially in tobacco-growing regions and rural areas.

The national and state policies for smoking control can change the cycles of the epidemic,<sup>(22)</sup> accelerating the reduction in the prevalence of consumption among males and females in a different manner, as well as in a more homogeneous manner in all population strata. The analysis of the profile of mortality from lung cancer in states and cities—compared with the

evolution of tobacco consumption—as well as the evaluation of smoking control policies implemented in the same period, is central to a more precise evaluation of the differences found in the various states of the country and of the responses to smoking control policies.

In addition to the differences observed between genders and the evolution of the smoking epidemic in Brazil, the present study showed a higher prevalence of current smoking among individuals with a lower level of education, which is in accordance with the findings of the 2003 household survey.<sup>(19)</sup> This might be due to the fact that individuals with a higher level of education have greater access to information. Therefore, a higher level of education is a protective factor. This result also influences the smoking control policies, which can yield better results if the sociocultural differences that exist in the country are considered.

The VIGITEL has been fundamental to informing decisions regarding public policies for health promotion and the prevention of CNCDs. In 2008, the health administrators on the Tripartite Committee for Health Care Management agreed on a goal of an annual reduction of 0.5% in the prevalence of current smoking, to be achieved through monitoring by means of the VIGITEL. This goal shows that the themes of health promotion and smoking control are a priority in the agenda of the Unified Health Care System<sup>(24)</sup> and that the VIGITEL surveillance system should continue to be used in the years to come.

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