# Original Article

# Random sample survey on the prevalence of smoking in the major cities of Brazil*

Levantamento randomizado sobre a prevalência de
tabagismo nos maiores municípios do Brasil

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## Abstract

**Objective:** To provide access to the results of a randomized cross-sectional study conducted by the Brazilian Center for Information on Psychotropic Drugs in 2001. **Methods:** This survey involved a random sample of individuals ranging from 12 to 65 years of age and residing in the 107 largest cities (over 200,000 inhabitants) in Brazil, which represented 27.7% of the Brazilian population, estimated to be 169,799,170 inhabitants at the time. A total of 8,589 interviews were conducted. The Substance Abuse and Mental Health Services Administration questionnaire, translated and adapted for use in Brazil, was used in the interviews. **Results:** Of the sample as a whole, 41.1% of the interviewees reported having experimented with tobacco products. The prevalence of daily smokers was 17.4% (20.3% among males and 14.8% among females). We found that 9% of the sample (10.1% of the men and 7.9% of the women) were nicotine-dependent, according to the criteria of the National Household Survey on Drug Abuse. **Conclusions:** The prevalence of current smoking in the 107 largest cities of Brazil is significantly lower in this decade than was the national prevalence at the end of last century.
**Keywords:** Smoking/epidemiology; Tobacco use disorder; Smoking cessation.

## Resumo

**Objetivo:** Divulgar os dados de um estudo transversal randomizado, realizado em 2001, pelo Centro Brasileiro de Informações sobre Drogas Psicotrópicas. **Métodos:** A população pesquisada neste levantamento incluiu indivíduos com 12-65 anos de idade, residentes nos 107 maiores municípios do Brasil (com mais de 200 mil habitantes), o que representou 27,7% da população brasileira na época, estimada em 169.799.170 habitantes. Foram realizadas no total 8.589 entrevistas. Utilizou-se o questionário *Substance Abuse and Mental Health Services Administration*, que foi traduzido e adaptado para o uso no Brasil. **Resultados:** Do total, 41,1% dos entrevistados disseram já ter utilizado produtos derivados de tabaco alguma vez na vida. A prevalência de uso diário de tabaco foi de 17,4% da amostra (20,3% entre os homens e 14,8% entre as mulheres). Observou-se que 9% da população (10,1% entre os homens e 7,9% entre as mulheres) são dependentes da nicotina, segundo os critérios do *National Household Surveys on Drug Abuse*. **Conclusões:** A prevalência do uso diário de tabaco, nos maiores municípios brasileiros, é significativamente menor na presente década do que a prevalência nacional ao final do século passado.
**Descritores:** Tabagismo/epidemiologia; Transtorno por uso de tabaco; Abandono do hábito de fumar.

## Introduction

According to the World Health Organization, smoking is the principal preventable cause of death and disease worldwide, affecting more than one billion people. Smoking accounts for more than 5 million deaths per year worldwide, and it is estimated that smoking will account for more than 10 million deaths per year in 2030. It is believed that, in Brazil, approximately 200,000 deaths per year occur as a result of smoking.[1,2]

The Brazilian National Survey on Health and Nutrition, conducted in 1989, provided important data regarding the epidemiology of tobacco consumption in the Brazilian population.

According to that study, the total prevalence of smoking in Brazil reached the impressive rate of 34.8%, corresponding to approximately 30.6 million current smokers over 15 years of age, of whom 18.2 million (43.3%) were male and 12.4 million (27.0%) were female.[3,4]

The First House-to-House Survey on Psychotropic Drug Use provided important and recent information regarding the prevalence of smoking in the Brazilian population, the percentage of nicotine-dependent individuals and the components of nicotine dependence. That was a randomized nationwide study that involved different age brackets and was conducted by the Brazilian Center for Information on Psychotropic Drugs in 2001.[5] The present article refers to the data regarding tobacco consumption in Brazil collected during that survey.

## Methods

The present survey was conducted between September and December of 2001, and the target population comprised individuals in the 12-65 age bracket who resided in the largest cities of Brazil. The sample included all cities with over 200,000 inhabitants according to data from the census conducted in 1995 by the *Instituto Brasileiro de Geografia e Estatística* (IBGE, Brazilian Institute of Geography and Statistics).[6] A total of 107 cities, which represented 27.7% of the Brazilian population (estimated to be 169,799,170 at the time), were studied. Tocantins was the only state that was not included in the study, because none of its cities has more than 200,000 inhabitants.

Each city under study was divided into census sectors (comprising 200-300 households) because, according to the IBGE, a census sector is the smallest unit that provides socioeconomic information. Subsequently, groups of homogeneous sectors, designated "strata", were created using multivariate statistical techniques. The number of households to be surveyed in each census sector was set at 24, which was considered ideal for the purpose of the study and, at the same time, within the budget.

In each census sector, the households were selected systematically, the first household being chosen randomly. In order to ensure the randomness of the sample, an interval of selection was created for each sector, corresponding to the total number of households in the sector under study divided by 24. For instance, there were 260 houses in sector 25 of the city of São Paulo (Capão Redondo neighborhood). Therefore, the interval of selection for that sector would be 10.83 (260 ÷ 24), which was rounded up to 11. Still using the Capão Redondo neighborhood as an example, the interviewer in charge chose any of the households in the sector as the first household and then, based on the interval of selection, counted 11 households in order to identify the second household, and so on. The interviewers were instructed not to consider commercial establishments, hospitals, factories, boarding houses or hotels. In the case of residential buildings, each apartment was considered a household. Therefore, more than one interview might take place in the same building.

For each household selected, all residents were identified and registered in decreasing order by age, first the men and then the women. Subsequently, tables were used for random drawing, as defined by Kish.[7] The tables had a fixed sequence of numbers on the upper line, in order to register the number of residents in the household, and a random number on the lower line, which was used to determine who would be interviewed, according to the order in which the residents were registered. In certain situations (after three unsuccessful attempts at obtaining an interview; if any given person refused, partially or completely, to be interviewed; impediment on the part of the family—physical or mental impairment; and impossibility of carrying out the interview due to travel or hospitalization), the interviewers were instructed to select a substitute, provided that the substitute lived in the same census sector and was of the same gender, belonged to the same age bracket and had the same socioeconomic profile of the person that had been initially chosen through random drawing.

We employed the Substance Abuse and Mental Health Services Administration (SAMHSA) questionnaire, developed by the U.S. Department of Health and Human Services,[8] which has been translated and adapted for use in Brazil. The first part of the questionnaire contains explanations regarding the survey; the second part is used in order to register the demographic data of the interviewee (gender, age, skin color and socioeconomic level); the third and fourth parts

address the use of psychotropic drugs, including nicotine, and aim to gather detailed information regarding lifetime use and frequency of use; the fifth part, which does not apply to the present article, is used in order to evaluate injection drug use; the sixth part includes the criteria for drug dependence, in accordance with the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R)[9]; the seventh part is used in order to determine whether interviewees have sought treatment for dependence; and the eighth part is used in order to determine whether interviewees have experienced complications related to drug use.

The socioeconomic status of the interviewee (second part of the SAHMSA questionnaire) was determined in accordance with the classification proposed by the Brazilian Association of the Market Research Institutes,[10] which takes into consideration the level of education and items owned by the interviewee, such as the number of automobiles, radios, refrigerators, etc. According to this classification, the interviewee is categorized using a system of letters, from A to E, in which A indicates the highest socioeconomic level and E indicates the lowest.

Psychoactive drug dependence was diagnosed in accordance with the criteria of the National Household Surveys on Drug Abuse (NHSDA), which uses six of the nine criteria found in the DSM-III-R.[9] Patients were identified as being dependent on any given drug, including nicotine, if they met at least two of the following criteria:

- Spending a considerable amount of time obtaining, using or recovering from the effects of the drug in question
- Using the drug in question in greater quantities or frequency than intended

- Having developed a tolerance to the drug in question (greater quantity required in order to produce the same effects)
- Engaging in physically risky behavior (e.g., driving, piloting, operating machinery, swimming, etc.) while under the influence of the drug in question or soon after its effects have waned
- Having personal problems (e.g., problems with family, friends or the police; problems at work; or emotional problems) due to the use of the drug in question
- Wishing to reduce or eliminate the use of due to the use of the drug in question

The NHSDA criteria (found in the SAMHSA questionnaire) and their reliability were previously validated in a study conducted in the state of São Paulo in 1999, thus allowing their use in the present study.[11]

## Results

The population investigated in the present survey included individuals in the 12- to 65-year age bracket residing in the 107 largest cities of Brazil (cities with more than 200,000 inhabitants), which corresponded to 47,045,907 inhabitants (27.7% of the Brazilian population at the time; Table 1). A total of 9,480 households were randomly selected, and a total of 8,589 interviews were conducted, the rate of failure being 9.3%. Regarding the distribution according to gender, the Brazilian population at the time was composed of 49% men and 51% women, whereas the study sample was composed of 43% men and 57% women.

Of the sample as a whole, 49.0% were ≥ 35 years of age; 18.0% were in the 25-34 age bracket; 21.0% were in the 18-24 age bracket; and 12.0% were in the 12-17 age bracket.

**Table 1 –** Population represented in the sample, percentage evaluated per region, number of census sectors surveyed and lifetime tobacco use, in Brazil and in each of the five regions of Brazil, in 2001.

| Region of Brazil | Cities with over 200,000 inhabitants, n | Population represented, n | % of the total | Sectors investigated, n | Lifetime tobacco use % (95% CI) |
|---|---|---|---|---|---|
| North | 8 | 2,948,749 | 22.8 | 26 | 33.8 (21.0-46.7) |
| Northeast | 22 | 9,108,348 | 19.1 | 78 | 37.4 (29.5-45.3) |
| Central-West | 7 | 3,634,977 | 31.2 | 29 | 34.0 (22.2-45.8) |
| South | 18 | 4,425,486 | 17.6 | 43 | 44.1 (32.4-55.7) |
| Southeast | 52 | 26,928,350 | 37.1 | 219 | 43.6 (38.6-48.6) |
| Total | 107 | 47,045,907 | 27.7 | 395 | 41.1 (37.5-44.7) |

The proportion of women and of individuals ≥ 35 years of age was higher in the sample than in the Brazilian population at large (57.0% and 49.0% *vs.* 51.0% and 41.0%). In contrast, only 12.0% of the interviewees were in the 12-17 age bracket, compared with 18.0% of the Brazilian population as a whole.

Regarding the socioeconomic status, the distribution of the interviewees into the classes was as follows: class A, 6%; class B, 19%; class C, 36%; class D, 29%; and class E, 10%. This demonstrates that the majority of the sample was composed of individuals in the low-income brackets, classes C and D predominating.

Of all the interviewees, 41.1% (95% CI: 37.5-44.7) had experimented with tobacco at least once, the percentage being higher among men than among women (46.2%; 95% CI: 42.3-50.0 *vs.* 36.3%; 95% CI: 33.2-39.4, respectively). Table 1 shows the percentages of lifetime tobacco use in each of the five regions of Brazil, and Table 2 shows the percentages of lifetime tobacco use according to the gender of the interviewees in the country and the age bracket to which they belonged. The rates for tobacco use in the previous year and for tobacco use in the previous month were quite similar—19.5% (95% CI: 18.0-21.1) and 19.2% (95% CI: 18.4-21.0), respectively.

The prevalence of daily smoking in the sample was 17.4% (20.3% among the men and 14.8% among the women; 95% CI: 15.1-19.8). Among those ≥ 35 years of age, the prevalence was higher, reaching 24.0% (28.3% among the men and 20.3% among the women; 95% CI: 22.0-26.0).

Another important finding refers to the number of nicotine-dependent smokers, which was evaluated in accordance with the NHSDA dependence criteria. We found that 9.0% of the interviewees (95% CI: 7.2-10.7) met the criteria for nicotine dependence (10.1% of the men and 7.9% of the women). These data translate to 51.7% of the daily smokers (49.8% of the men and 53.4% of the women) being nicotine-dependent. From the age of 18 onward, women presented prevalence rates of nicotine dependence that were closer to those observed for men; however, the prevalence of nicotine dependence among women was never greater than was that among men, in any age bracket.

**Table 2 –** Daily tobacco use and lifetime tobacco use, distributed according to the gender of the interviewees and the age bracket to which they belonged, in the 107 largest Brazilian cities (with over 200,000 inhabitants) in 2001.

| Age bracket, years | Total and by gender | Daily use | | | Lifetime use | | |
|---|---|---|---|---|---|---|---|
| | | Observed, % | Estimated population,[a] n × 1,000 | 95% CI | Observed, % | Estimated population,[a] n × 1,000 | 95% CI |
| 12-17 | Total | 3.7 | 280 | (2.1-5.4) | 15.7 | 1,177 | (12.4-19.0) |
| | M | 4.5 | 165 | (2.7-6.3) | 15.2 | 560 | (12.1-18.3) |
| | F | 3.0 | 116 | (1.5-4.5) | 16.2 | 618 | (12.9-19.4) |
| 18 to 24 | Total | 16.0 | 1,475 | (13.2-18.7) | 37.7 | 3,482 | (33.8-41.6) |
| | M | 19.2 | 885 | (16.3-22.2) | 42.8 | 1,974 | (39.1-46.5) |
| | F | 12.7 | 590 | (10.5-15.0) | 32.6 | 1,508 | (29.5-35.7) |
| 25 to 34 | Total | 16.3 | 1,735 | (13.7-18.8) | 40.0 | 4,261 | (36.3-43.7) |
| | M | 18.3 | 972 | (15.7-21.0) | 43.9 | 2,329 | (40.5-47.3) |
| | F | 14.3 | 763 | (12.1-16.4) | 36.1 | 1,932 | (33.2-39.1) |
| > 35 | Total | 24.0 | 4,718 | (22.0-26.0) | 53.0 | 10,408 | (50.5-55.7) |
| | M | 28.3 | 2,610 | (26.1-30.4) | 61.4 | 5,674 | (59.1-63.7) |
| | F | 20.2 | 2,109 | (18.7-21.8) | 45.4 | 4,734 | (43.5-47.4) |
| All age brackets | Total | 17.4 | 8,208 | (15.1-19.8) | 41.1 | 19,328 | (37.5-44.7) |
| | M | 20.3 | 4,632 | (17.7-22.9) | 46.2 | 10,537 | (42.3-50.0) |
| | F | 14.8 | 3,577 | (12.8-16.7) | 36.3 | 8,791 | (33.2-39.4) |

[a]In some cases, the sum of the thousands between men and women does not add up because the data are the results of formulas applied separately. The estimates were obtained through weighting by age and by gender.

**Table 3 –** Answers to questions on the Substance Abuse and Mental Health Services Administration questionnaire regarding the different components of nicotine dependence (signs/symptoms) in the previous year in the 107 Brazilian cities with over 200,000 inhabitants in 2001.

| Attributes of smoking in the previous year | Age bracket, years | | | | |
|---|---|---|---|---|---|
| | 12-17 | 18-25 | 26-34 | ≥ 35 | Total |
| | % | % | % | % | % |
| Significant amounts of time lost[a] | 0.2 | 2.3 | 2.7 | 3.9 | 2.7 |
| Greater frequency[b] | 1.5 | 7.3 | 9.2 | 10.7 | 8.2 |
| Tolerance[c] | 0.1 | 1.3 | 1.6 | 1.3 | 1.2 |
| Physical risks[d] | * | * | * | * | * |
| Personal problems[e] | 2.1 | 4.2 | 3.6 | 4.6 | 3.9 |
| Wanted to quit or reduce smoking | 5.3 | 15.7 | 16.8 | 20.8 | 16.4 |

[a]In obtaining, using or recovering from the effects of nicotine. [b]Smoked more or more often than intended. [c]Greater quantity required in order to produce the same effects. [d]Engaged in physically risky behavior (driving, piloting, using machines, etc.) while under the influence of nicotine or soon after its effects have waned. [e]Smoking-related problems: with family or friends; at work; emotional disorders; or psychological difficulties. *Low precision.

Table 3 provides further information regarding the signs and symptoms that constitute nicotine dependence, specifically in the previous year of use. The highest proportion of affirmative answers was observed among individuals ≥ 35 years of age. In contrast, the lowest proportion of affirmative answers on the questionnaire was observed among interviewees in the 12-17 age bracket. Another interesting finding was related to the question regarding the desire to reduce or quit smoking, which only 16.4% of the interviewees (95% CI: 14.1-18.7)—19% of the men (95% CI: 22.3-26.4) and 14% of the women (95% CI: 16.1-19.1)—answered affirmatively. Nevertheless, that was the question for which the proportion of affirmative responses was the highest, ranging from 20.8% among the interviewees ≥ 35 years of age (95% CI: 18.9-22.7) to 5.3% among those in the 12-17 age bracket (95% CI: 3.3-7.3). The question for which the proportion of affirmative responses was the second highest was that regarding loss of control, which is characterized by the consumption of a higher than intended number of cigarettes and was reported by 8.2% of the interviewees.

## Discussion

The present study was carried out 12 years after the Brazilian National Survey on Health and Nutrition (1989) and aided in revealing the behavior of the Brazilian population regarding tobacco consumption. According to the data obtained for 2001, 17.4% of the Brazilian population residing in the 107 largest cities of the country were current smokers (20.3% of the men and 14.8% of the women); the prevalence increased to 24.0% when only those ≥ 35 years or age were considered (28.3% of the men and 20.2% of the women). Although the study did not include all of the cities in Brazil, which would have been practically impossible, it has the merit of having evaluated all Brazilian cities with over 200,000 inhabitants, in all regions of the country and in a randomized manner, which should reflect the general attitude of the Brazilian population toward smoking.

The prevalence of smoking found in the present study is corroborated by findings of recent studies, which have also found a lower prevalence of smoking than that found in studies conducted in previous decades.[3,12,13] It is possible that the overall consumption of tobacco among the Brazilian population stabilized between 2001 and 2004, since a randomized study conducted in 2003 and involving the population over 40 years of age in the metropolitan area of São Paulo reported the prevalence of smoking to be 24.0%, exactly the same at that observed for individuals ≥ 35 years of age in the present study.[12] The World Health Survey, developed by the World Health Organization, was a worldwide investigation into the health conditions in various countries. The data from the implementation of the World Health Survey in Brazil (in 2003) also seem to indicate stabilization, since the application of questionnaires to 5,000 individuals ≥ 18 years of age revealed the prevalence of current smoking in the Brazilian population to be 22.4%.[13] Finally, in 2008, the prevalence

of smoking among the 2,488 residents over 19 years of age of a small city in Rio Grande do Norte was reported to be 23.5%, and there were no differences between the urban and rural areas.[14]

According to the stages of the model proposed by Lopez et al.[15] to describe the evolution of the behavior of the smoking epidemic (and based on the data from the present study and on those from other studies), Brazil is probably in transition between stages III and IV.[12,13] At stage III, the prevalence of smoking among men stabilizes and begins to drop rapidly, especially among those who are younger and have a higher level of education; women reach the peak of prevalence at stage III and, at the end of the stage, that prevalence begins to drop. At stage IV, the prevalence continues to drop among men and women, and smoking increasingly becomes a behavior of less privileged socioeconomic groups. It is interesting to observe the difference in the behavior of the prevalence of smoking among both genders by comparing the data from the Brazilian National Survey on Health and Nutrition, conducted in 1989 (Brazilian population sample: prevalence of 43.3% among men and of 27.0% among women), with those from the present study, conducted in 2001 (population sample of the 107 largest Brazilian cities: prevalence of 20.3% among men and of 14.8% among women).[3,5] The evaluation of these data shows that, among both genders, the prevalence of current smoking is decreasing; however, men are quitting smoking more rapidly, which is in accordance with the model proposed by Lopez et al.[15]

Our data show that, within the study sample, 15.7% of the interviewees in the 12-17 age bracket had experimented with smoking. In a recent study involving young college students from Brasília (mean age: 21.6 ± 3.6 years), the prevalence of smoking was 17.4% (quite close to the prevalence found in the present study).[16] Among the various factors favoring smoking experimentation by young Brazilians are the low price of cigarettes in Brazil—one of the lowest in the world—and the ease of access to cigarettes in the country.[17,18] Despite this, cigarette use in this age bracket has decreased considerably in recent years, as was well documented in a nationwide survey on psychotropic drug consumption,[19] in which 1,558 students (predominantly in the

13-15 age bracket) were interviewed. Lifetime tobacco use among students decreased from 33.7% in 1997 to 21.8% in 2004.

In addition to the reduction in the prevalence of smoking in Brazil between the end of the 20th century and the beginning of the current century, according to recent studies (including the present one), there was a decrease in the annual per capita consumption of cigarettes in the same period: a decrease of approximately 30% between 1989 and 2002, even computing the estimates of consumption of contraband and counterfeit cigarettes,[3] mean cigarette consumption having decreased from 14.9/day in 1989 to 12.6/day in 2003.[13]

Approximately 30.0% of Brazilian smokers smoke 20 or more cigarettes per day, which suggests a high level of dependence.[20] This is in accordance with the results of a recently published study, in which the mean Fagerström test score[21] was high (6.2 ± 2.0) among 203 smokers who sought a smoking cessation program.[22] This finding shows the importance of determining not only the number of smokers but also the prevalence of nicotine dependence in the population. This is justified by the fact that the treatment of nicotine-dependent smokers should have a broader approach and include pharmacological intervention.[23] In this context, the present study is, to date, the only study that has provided data regarding the prevalence of nicotine dependence in a large population sample, as well as the prevalence of the principal signs and symptoms of nicotine dependence. Our survey showed that, according the NHSDA criteria, 9.0% of the sample (10.1% of the men and 7.9% of the women), and probably of the Brazilian population, are nicotine-dependent. The questions receiving the greatest numbers of affirmative responses were those regarding excessive consumption and the desire to reduce or quit smoking. The highest prevalence of nicotine dependence was observed among individuals ≥ 35 years of age (11.3%), which is explained by the longer smoking history, which increases smoking exposure and, consequently, the probability of becoming dependent. The lowest prevalence of nicotine dependence was found among the youngest individuals (12-17 age bracket), many of whom were probably still in the experimentation phase. It should

be borne in mind that the NHSDA criteria allow us to define whether there is psychoactive drug dependence (in the case of the present study, nicotine was the drug of interest) but do not allow us to evaluate the intensity of dependence, specific complementary instruments such as the Fagerström Test for Nicotine Dependence being required for that purpose.[21,23]

The tendency toward a decrease in the prevalence of smoking in Brazil can be attributed to measures developed by the National Cancer Institute and to the implementation of numerous anti-smoking laws in the country.[3,24] Directive no. 1,575, issued in 2002, was important because it regulated and created the Referral Centers for the Approach to and Treatment of Smokers within the scope of the Unified Health Care System. At these centers, smokers can receive, in addition to instructions, the required drugs to aid in smoking cessation. However, despite that directive, smoking cessation drugs are still not readily available in the public health care system. The following are also noteworthy: Federal Law no. 9,782, issued on January 26, 1999, which regulates the control and inspection of tobacco products by the Brazilian National Health Products Oversight Agency; Federal Law no. 10,167, issued in December of 2000, which banned all tobacco-company advertisements on and sponsorship of television programs, radio shows, magazines, newspapers and billboards; and Resolution no. 104 of the Brazilian National Health Products Oversight Agency, which makes it mandatory for tobacco companies to place pictorial warnings on the back of cigarette packs.

We conclude that the prevalence of daily smoking in the largest cities of Brazil is lower in the present decade than in the final decade of the preceding century. In addition, a significant proportion of smokers are nicotine-dependent. It is possible that this decrease is due to effective anti-smoking laws, as well as to a greater awareness of the population regarding the hazardous effects of smoking. The next step in the fight against smoking will require that the Brazilian National Smoking Control Program be expanded, aiming to increase the availability of free smoking cessation drugs at health care facilities across the country.

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