

# Prevalence and social distribution of risk factors for chronic noncommunicable diseases in Brazil

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## ABSTRACT

**Objective.** To assess risk factors for chronic noncommunicable disease (CND) and to identify social inequalities in their distribution among the adult Brazilian population.

**Methods.** Study of CND risk factors (including tobacco use, overweight and obesity, low fruit and vegetable intake (LFVI), insufficient leisure-time physical activity (LTPA), sedentary lifestyle, and alcohol abuse, among other risks) in a probabilistic sample of 54 369 individuals from Brazil's 26 state capitals and Federal District, in 2006, using the Surveillance System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (VIGITEL), a computer-assisted telephone interviewing (CATI) survey system, and calculated age-adjusted prevalence ratios for trends in education levels using Poisson regression with linear models.

**Results.** Men reported higher tobacco use, overweight, LFVI, sedentary lifestyle, and alcohol abuse versus women, but lower insufficient LTPA. In men, education was associated with increased overweight and sedentary lifestyle, but decreased tobacco use, LFVI, and insufficient LTPA. Among women, education was associated with decreased tobacco use, overweight, obesity, LFVI, and insufficient LTPA, but increased sedentary lifestyle.

**Conclusion.** In Brazil, prevalence of CND risk factors (except insufficient LTPA) is higher in men. For both sexes, the CND risk factor prevalence ratio is influenced by level of education.

## Key words

Risk factors, tobacco use disorder, overweight, obesity, fruit, exercise, alcoholism, health care surveys, epidemiology, Brazil.

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In Brazil, chronic noncommunicable diseases (CNDs) are leading causes of morbidity and mortality, following the trend seen in developed countries. Approximately 63% of all deaths have CNDs as a primary cause, varying from 47.3% in northern Brazil to 72.5% in southern Brazil (1). Also, CNDs account for 59% of the total years of life lost (YLLs) by premature death and for 75% of disability-adjusted life years (DALYs) (2). According to the World Health Organization (WHO), the 10 major factors associated with YLLs by disease or prema-

ture death in the Americas include five that are also risk factors for CND, namely (in order of importance): alcohol abuse, overweight, tobacco use, low fruit and vegetable intake (LFVI), and physical inactivity (insufficient leisure-time physical activity (LTPA) or sedentary lifestyle).

To help determine the prevalence of these and other CND risk factors, in 2006, the Brazilian government launched the Surveillance System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (*Vigilância de Fatores de*

*Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, VIGITEL), a surveillance system for CND risk factors based on computer-assisted telephone interviewing (CATI). Intended for use as a continuous system for monitoring adult residents of Brazil's 26 state capitals and Federal District, which collectively comprise 25% of the national adult population, VIGITEL will help identify CND risk factors. In addition to providing baseline information, this system will help Brazil's public health authorities develop risk reduction strategies to improve the quality of life (2).

In 2006, the current study examined self-reported tobacco use, overweight and obesity, LFVI, insufficient LTPA, sedentary lifestyle, and alcohol abuse, among other risks (3). The purpose of the study was to assess risk factors for CNDs and identify social inequalities in their distribution among the adult Brazilian population.

## METHODS

Probabilistic sampling of the adult population ( $\geq 18$  years old) living in Brazil's 26 state capitals and Federal District was carried out in 2006 using the VIGITEL system. In each city, sampling was performed in two steps: random selection of households with landline telephones, and random selection of prospective interviewees. A minimum of 2 000 interviews was conducted in each city to ensure risk-factor frequency estimates with a maximum error of 2% and a 95% confidence interval (CI). Due to the similarity between men and women in the survey sample in terms of proportion, maximum errors of 3% were expected for certain risk-factor frequency estimates reported by sex.

Interviews were conducted in a centralized manner from August to December 2006 to collect information about demographic and socioeconomic characteristics, food consumption and physical activity patterns, smoking, alcohol abuse, self-reported weight and height, and self-reported medical diagnosis of hypertension and diabetes, among other risks. The dependent variables were CND risk factors (tobacco use, overweight and obesity, LFVI, insufficient LTPA, sedentary lifestyle, alcohol abuse, high blood pressure, diabetes, and dyslipidemia), and the independent variables were education, as an explanatory variable, and age, as a con-

founder. Overall, 2 283 (4.2%) of the cases were missing information on education level. For these cases, mean years of education for same sex and age was used, a procedure similar to that used in the Behavioral Risk Factor Surveillance System (BRFSS), a periodic telephone-based health survey used to track health conditions and risk behaviors in the United States since 1984 (4), and the main method recommended for determining appropriate weighting factors.

The dependent variables were divided into dichotomous ("yes" or "no") categories. Education was divided into four categories (0 to 4, 5 to 8, 9 to 11, and  $\geq 12$  years), and age was divided into six categories (18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and  $\geq 65$  years old). Tobacco use was considered positive for daily or occasional smoking. Overweight was defined as body mass index (BMI)  $\geq 25$  kg/m<sup>2</sup>, and obesity as BMI  $\geq 30$  kg/m<sup>2</sup>, as per WHO recommendations (5). LFVI was defined as ingestion of fruit or vegetables less than five times per day; insufficient LTPA was defined as individuals not engaging in light or moderate physical activities for 30 min per day during five or more days a week, or intense activity for 20 min at least three times a week, during leisure time; and sedentary lifestyle was defined as no type of physical activity during leisure time in the last three months, no intense exercise at work, no walking or biking to work, and no responsibility for heavy household cleaning. Alcohol abuse was defined as more than five doses for men and more than four doses for women on at least one occasion in the last 30 days, a consumption level defined as high risk for acute problems according to WHO criteria (6).

To estimate frequency of CND risk factors within each city studied, two weighting factors were applied: the first was designed to reflect the ratio between the number of adults living in each household and the number of land telephone lines; the second took into account the ratio between the percentage of people in a given census category (by sex, age, and education level) and the percentage of the same category in VIGITEL. To estimate overall frequency of CND risk factors (across all cities studied), the same two weighting factors were used, plus a third factor that considered the proportion of 1) adults living in each city and 2) adults studied through VIGITEL.

Data analysis was carried out with STATA version 9.2 (StataCorp, College Station, TX, USA), using survey commands to generate frequency distribution (proportions) with CIs, and weighting factors. Age-adjusted prevalence ratios (APRs) for trends in education levels were calculated by sex using Poisson regression (log-linear) models, based on a 5% significance level ( $p < 0.05$ ) and 95% CIs.

The study was approved by the National Human Research Ethics Committee of the Brazilian Ministry of Health.

## RESULTS

Using VIGITEL, 54 369 interviews were conducted—40.7% with males and 59.3% with females (19.7, 21.5, 20.1, 17.5, 10.9, and 10.4% of those aged 18 to 24, 25 to 34, 35 to 44, 45 to 54, 55 to 64, and  $\geq 65$  years of age, respectively, and 31.2, 40.3, and 28.5 of those with 0 to 8, 9 to 11, and  $\geq 12$  years of education, respectively) (data not shown). Table 1 shows age and education characteristics of the study population after weighting to represent the distribution of the population aged  $\geq 18$  years according to Brazil's national census for the year 2000.

Men were more likely to report tobacco use, overweight, LFVI, sedentary lifestyle, and alcohol abuse compared to women, whereas women were more likely to report insufficient LTPA (Table 2). There was no difference for obesity between men and women.

Among men, prevalence of tobacco use, LFVI, and insufficient LTPA decreased with education level; the APR was 0.55 for tobacco use, 0.95 for LFVI, and 0.90 for insufficient LTPA in those with the highest education level ( $\geq 12$  years). Overweight and sedentary lifestyle increased with education, reaching an APR of 1.18 for overweight and 1.60 for sedentary lifestyle in those with the highest education level ( $\geq 12$  years). Obesity and alcohol abuse were not strongly affected by education (Table 3).

Among women, tobacco use, overweight, obesity, LFVI, and insufficient LTPA decreased with education (Table 4). The APR was 0.61 for tobacco use, 0.64 for overweight, 0.49 for obesity, 0.92 for LFVI, and 0.92 for insufficient LTPA among women with the highest education level ( $\geq 12$  years). Sedentary lifestyle increased with education and was seen in more than 40% of women with the highest education level ( $\geq 12$  years), with

**TABLE 1. Percent distribution<sup>a</sup> by sex of probabilistic sample of residents from Brazil's 26 state capitals and Federal District with landline telephone service, according to age and education, 2006**

Characteristics	Total (n = 54 369)	Men (n = 25 064)	Women (n = 29 305)
Age (years)			
18 to 24	21.3	22.2	20.5
25 to 34	25.2	26.0	24.5
35 to 44	21.3	21.5	21.1
45 to 54	14.7	14.6	14.8
55 to 65	8.8	8.4	9.1
≥65	8.7	7.3	9.9
Education (years)			
0 to 4	18.5	17.3	19.4
5 to 8	34.7	36.1	33.5
9 to 11	29.9	29.1	30.7
≥12	16.9	17.5	16.4

**Source:** Survey data from the Surveillance System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, VIGITEL), a surveillance system for CND risk factors based on computer-assisted telephone interviewing (CATI).

<sup>a</sup> Weighted to represent distribution of population aged ≥18 years according to Brazil's national census for the year 2000.

in a sedentary lifestyle than women but less likely to have insufficient LTPA, corroborating other Brazilian studies (9, 11). In the United States, lower levels of education were found to be associated with lower LTPA; women with lower levels of education were less active during leisure time but more active at work and in household activities compared to more highly educated women (12).

The current study results also showed that women were more careful about their diet, consuming more fruits and vegetables than men, corroborating the research of Jaime and Monteiro, which found that, in 2003, younger men in Brazil tended to consume less fruit and vegetables compared to women (13). This association between fruit and vegetable intake and gender has also been found in studies conducted elsewhere (14).

In addition, overweight was less prevalent among women, especially among those more educated. This difference between the sexes could be attributed to cultural issues: compared to men, women (especially those with more education) tend to be more concerned about beauty and weight and are thus more careful about their diet, whereas men spend more time than women resting, drinking, and eating fatty snacks. Other studies have indicated an association between overweight and socioeconomic status. For example, a study conducted in Canada showed that higher-income men had a higher BMI than poor men, whereas the inverse was found in women (15).

an APR of 3.55. Alcohol abuse was not strongly affected by education.

## DISCUSSION

Along with smoke exposure, tobacco use is one of the main potentially preventable causes of CND, according to WHO (7). According to the Brazilian National Survey on Health and Nutrition (*Pesquisa Nacional sobre Saúde e Nutrição*, PNSN), in 1989, approximately 40% of men and 26% of women aged 15 years and older were smokers (8). In 2003, the Household Survey on CND Risk Factors and Self-Reported Morbidity (*Inquérito*

*domiciliar sobre comportamentos de risco e morbidade referida de doenças e agravos não transmissíveis*), which is conducted in 15 state capitals and the Federal District, showed that this difference between sexes remains unchanged (9).

High consumption of alcohol is associated with hypertension, cirrhosis, and stroke, as well as cancer of the mouth, pharynx, larynx, esophagus, and liver. The higher alcohol intake reported among men in this study is consistent with other studies carried out in Brazil and elsewhere (9, 10).

The results of the current study indicate that men were more likely to engage

**TABLE 2. Prevalence<sup>a</sup> and 95% confidence interval (CI) of risk factors for chronic noncommunicable diseases (CNDs) in probabilistic sample of adults (≥18 years old) from Brazil's 26 state capitals and Federal District with landline telephone service, by sex, 2006**

CND risk factors	Total		Men		Women	
	%	95% CI	%	95% CI	%	95% CI
Tobacco use	16.2	15.9–16.5	20.3	19.7–20.8	12.8	12.4–13.1
Overweight <sup>b</sup>	43.0	42.6–43.4	47.3	46.6–48.0	38.8	38.2–39.4
Obesity <sup>c</sup>	11.4	11.1–11.7	11.3	10.8–11.7	11.5	11.1–11.9
Low fruit and vegetable intake LFVI <sup>d</sup>	92.7	92.4–92.9	95.0	94.8–95.3	90.6	90.3–91.0
Insufficient leisure-time physical activity LTPA <sup>e</sup>	85.1	84.5–85.8	81.7	80.5–82.9	88.1	87.4–88.8
Sedentary lifestyle <sup>f</sup>	29.2	28.8–29.6	39.8	39.1–40.4	20.1	19.7–20.5
Alcohol abuse <sup>g</sup>	16.1	15.7–16.4	25.3	24.8–25.9	8.1	7.8–8.4

**Source:** Survey data from the Surveillance System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, VIGITEL), a surveillance system for CND risk factors based on computer-assisted telephone interviewing (CATI).

<sup>a</sup> Weighted to represent distribution of population aged ≥18 years according to Brazil's national census for the year 2000.

<sup>b</sup> Body mass index (BMI) ≥25 kg/m<sup>2</sup>.

<sup>c</sup> BMI ≥30 kg/m<sup>2</sup>.

<sup>d</sup> Less than five times per day.

<sup>e</sup> Not engaging in light or moderate physical activities for 30 min per day during five or more days per week, or intense activity for 20 min at least three times per week, during leisure time.

<sup>f</sup> No physical activity during leisure time in last three months, no intense exercise at work, no walking or biking to work, and no responsibility for heavy household cleaning.

<sup>g</sup> More than five doses for men and more than four doses for women during one or more days in last 30 days.

**TABLE 3. Prevalence<sup>a</sup> and age-adjusted prevalence ratio of risk factors for chronic noncommunicable diseases (CNDs) in men, by education level, in probabilistic sample of adults (≥18 years old) from Brazil's 26 state capitals and Federal District with landline telephone service, 2006**

CND risk factors	Education (years)				P-value <sup>b</sup>
	0 to 4	5 to 8	9 to 11	≥12	
	% prevalence (age-adjusted prevalence ratio)				
Tobacco use	25.1 (1.00) <sup>c</sup>	23.8 (0.94)	16.5 (0.65)	14.4 (0.55)	<0.001
Overweight <sup>d</sup>	46.6 (1.00) <sup>c</sup>	46.2 (1.08)	45.4 (1.13)	53.5 (1.18)	0.001
Obesity <sup>e</sup>	12.5 (1.00) <sup>c</sup>	11.6 (1.03)	9.8 (0.94)	11.8 (0.96)	0.518
Low fruit and vegetable intake (LFVI) <sup>f</sup>	95.7 (1.00) <sup>c</sup>	96.1 (0.99)	95.5 (0.98)	91.5 (0.95)	<0.001
Insufficient leisure-time physical activity (LTPA) <sup>g</sup>	85.7 (1.00) <sup>c</sup>	85.4 (1.01)	77.5 (0.93)	77.1 (0.90)	<0.001
Sedentary lifestyle <sup>h</sup>	34.9 (1.00) <sup>c</sup>	36.8 (1.15)	39.9 (1.28)	50.7 (1.60)	<0.001
Alcohol abuse <sup>i</sup>	21.0 (1.00) <sup>c</sup>	26.3 (1.06)	25.8 (0.98)	26.9 (1.10)	0.579

**Source:** Survey data from the Surveillance System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, VIGITEL), a surveillance system for CND risk factors based on computer-assisted telephone interviewing (CATI).

<sup>a</sup> Weighted to represent distribution of population aged ≥18 years according to Brazil's national census for the year 2000.

<sup>b</sup> Based on Poisson regression, with significance at  $P < 0.05$ .

<sup>c</sup> Reference value.

<sup>d</sup> Body mass index (BMI) ≥25 kg/m<sup>2</sup>.

<sup>e</sup> BMI ≥30 kg/m<sup>2</sup>.

<sup>f</sup> Less than five times per day.

<sup>g</sup> Not engaging in light or moderate physical activities for 30 min per day during five or more days per week, or intense activity for 20 min at least three times per week, during leisure time.

<sup>h</sup> No physical activity in leisure time during last three months, no intense exercise at work, no walking or biking to work, and no responsibility for heavy household cleaning.

<sup>i</sup> More than five doses for men and more than four doses for women during one or more days in last 30 days.

**TABLE 4. Prevalence<sup>a</sup> and age-adjusted prevalence ratio of risk factors for chronic noncommunicable diseases (CNDs) in women, by education level, in probabilistic sample of adults (≥18 years old) from Brazil's 26 state capitals and Federal District with landline telephone service, 2006**

CND risk factors	Education (years)				P-value <sup>b</sup>
	0 to 4	5 to 8	9 to 11	≥12	
	% prevalence (age-adjusted prevalence ratio)				
Tobacco use	13.4 (1.00) <sup>c</sup>	15.4 (1.12)	11.5 (0.83)	9.1 (0.61)	<0.001
Overweight <sup>d</sup>	52.7 (1.00) <sup>c</sup>	44.7 (0.98)	31.3 (0.79)	28.5 (0.64)	<0.001
Obesity <sup>e</sup>	19.1 (1.00) <sup>c</sup>	12.8 (0.80)	8.2 (0.60)	7.5 (0.49)	<0.001
Low fruit and vegetable intake (LFVI) <sup>f</sup>	91.1 (1.00) <sup>c</sup>	91.5 (0.98)	92.0 (0.97)	85.7 (0.92)	<0.001
Insufficient leisure-time physical activity (LTPA) <sup>g</sup>	91.6 (1.00) <sup>c</sup>	88.9 (0.97)	86.7 (0.94)	84.8 (0.92)	<0.001
Sedentary lifestyle <sup>h</sup>	18.5 (1.00) <sup>c</sup>	12.8 (0.89)	17.7 (1.48)	41.4 (3.55)	<0.001
Alcohol abuse <sup>i</sup>	5.2 (1.00) <sup>c</sup>	8.7 (1.25)	9.0 (1.12)	8.6 (1.13)	0.933

**Source:** Survey data from the Surveillance System of Risk and Protective Factors for Chronic Non-Communicable Diseases through Telephone Interviews (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, VIGITEL), a surveillance system for CND risk factors based on computer-assisted telephone interviewing (CATI).

<sup>a</sup> Weighted to represent distribution of population aged ≥18 years according to the Brazilian national census for the year 2000.

<sup>b</sup> Based on Poisson regression, with significance at  $P < 0.05$ .

<sup>c</sup> Reference value.

<sup>d</sup> Body mass index (BMI) ≥25 kg/m<sup>2</sup>.

<sup>e</sup> BMI ≥30 kg/m<sup>2</sup>.

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<sup>h</sup> No physical activity during leisure time during last three months, no intense exercise at work, no walking or biking to work, and no responsibility for heavy household cleaning.

<sup>i</sup> More than five doses for men and more than four doses for women during one or more days in last 30 days.

## Limitations

The main limitation of the current, population-based study is that the survey sample only included residents from Brazil's state capitals and Federal District with landline telephone service and thus comprised fewer males, youths, and lower-educated people compared to the general population of the 27 cities studied. The results are therefore not generalizable nationwide, even after applying weighted factors to expand them to the entire population of these cities.

Because the sample surveyed by VIGITEL in each city was drawn only from the residential landline telephone listing, no assumptions can be made about those without a land telephone line based on the current study results. VIGITEL (i.e., residential landline telephone) coverage in the cities studied was approximately 70%, varying from 34% in Macapá, the capital of Amapá State in northern Brazil (one of the poorest and least-developed regions), to 82% in Curitiba, the capital of Paraná State and the largest city in Brazil's prosperous Southern Region. Compared to the general Brazilian population, the VIGITEL study population had more female and older subjects with higher levels of education.

To reduce the differences between the VIGITEL study population and the general population, weighting factors were used to partially correct bias resulting from the low landline telephone coverage. As described above, based on the method used in the BRFSS (4), the distribution of age and education, by sex, was weighted to represent the adult population ( $\geq 18$  years old) of the Brazilian national census for the year 2000. Nevertheless, due to the bias resulting from the landline (phone service) requirement, the data from this study can only be compared with a few Brazilian national household surveys. In addition, because of the differences in classification of some of the indicators, these comparisons may

only be made for some risk factors. In addition, although the current study results are similar to data from face-to-face Brazilian surveys (6), they must be interpreted carefully, as many Brazilian cities have a lower level of landline telephone coverage (10 lower than 50%, 11 between 50 and 70%, and only 6 higher than 70%) than those covered in this study. It should be noted, however, that VIGITEL's estimated prevalence of CND risk factors was consistent with that determined in a 2002–2003 study (9).

The use of self-reported height and weight can also be seen as a limitation, as some studies have found incorrect self-reporting (higher and lower, respectively, than the actual measurements) (16–18), which can skew the BMI and consequently the reported percentage of overweight and obesity (when calculated by height and weight). However, the good agreement between self-reported and measured height and weight in the current results supported the use of the BMI recommended for this type of study (16–18).

Despite these limitations, it should be noted that 1) in the current study, VIGITEL reached about 25% of the Brazilian population aged  $\geq 18$  years, covering a large sample at low cost, with good response rates and rapid reporting, and thus providing a good estimate of prevalence, and 2) the Ministry of Health intends to use VIGITEL on an ongoing basis to track the evolution of CND risk factors over time. Therefore, in addition to providing baseline data, this system will help evaluate the impact of public interventions.

## Recommendations

Validation studies are recommended to confirm the estimated risk of selection bias resulting from VIGITEL's land telephone line requirement and corrected through weighting. In addition, it should be noted that the methodology used by

VIGITEL is best indicated for places where landline telephone coverage is reasonably high (although it is still necessary to use weighting factors). Face-to-face and cell-phone pilot studies designed to improve the weighting factors, such as those being conducted in Brazil, are also recommended.

## Conclusion

The CND risk factors that occurred most frequently in men in Brazil were tobacco use, overweight, LFVI, sedentary lifestyle, and alcohol abuse. In women, insufficient LTPA was the most frequently reported risk factor. The differences between the sexes for these variables were significant. There was no difference between men and women for obesity. Overall, LFVI and overweight were the most prevalent risk factors in the study population. While education plays a protective role against tobacco use, LFVI, and insufficient LTPA (for both men and women), and against overweight (for women), higher levels of education tend to be associated with a more sedentary lifestyle (in both men and women), and overweight (in men).

Despite the limitation posed by its survey coverage, which only included individuals with residential landline telephone coverage, VIGITEL proved an efficient system for identifying the prevalence and distribution of CND risk factors in Brazil, showing good performance (response rates between 64.4% and 81.0% and refusal rates between 5.4% and 15.0%) at a low cost (about 5 times less than that for household surveys), and a capacity for rapid reporting (producing a report within two months). It is therefore a valuable tool for estimating prevalence of modifiable risk factors and can also be used to guide the development of public policy and health surveillance as well as the identification of social inequities, an important consideration when targeting public policies.

## REFERENCES

1. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde, Departamento de Análise de Situação em Saúde. Saúde Brasil 2006: uma análise da situação de saúde no Brasil. Brasília: MS; 2006. (Série G Estatística informação em Saúde).
2. Malta DC, Cezário AC, Moura L, Morais Neto OL, Silva Júnior JB. A construção da vigilância e prevenção das doenças crônicas não transmissíveis no contexto do Sistema Único de Saúde. *Epidemiol Serv Saúde*. 2006;15(3):47–65.
3. Ministério da Saúde (BR). VIGITEL Brasil 2006: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico. Brasília: MS; 2007.
4. U.S. Centers for Disease Control and Prevention. Behavioral Risk Factor Surveil-

- lance System Survey Data [database on the Internet]. Atlanta (GA): U.S. Department of Health and Human Services, CDC; 2007. Available from: [http://www.cdc.gov/brfss/technical\\_infodata/survey\\_data/2007.htm](http://www.cdc.gov/brfss/technical_infodata/survey_data/2007.htm).
5. World Health Organization. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. World Health Organ Tech Rep Ser. 1995;854:1–452.
  6. World Health Organization. International guide for monitoring alcohol consumption and related harm. Geneva: WHO, Department of Mental Health and Substance Dependence; 2000. (WHO/MSD/MSB/00.4).
  7. World Health Organization. The world health report 2002: reducing risks, promoting healthy life. Geneva: WHO; 2002.
  8. Ministério da Saúde (BR), Instituto Nacional de Alimentação e Nutrição. Perfil de crescimento da população brasileira de 0 a 25 anos: Pesquisa Nacional sobre Saúde e Nutrição. Brasília: INAN; 1990.
  9. Ministério da Saúde (BR), Secretaria de Vigilância em Saúde/Secretaria de Atenção à Saúde/Instituto Nacional de Câncer, Coordenação de Prevenção e Vigilância. Inquérito domiciliar sobre comportamentos de risco e morbidade referida de doenças e agravos não transmissíveis: Brasil, 15 capitais e Distrito Federal 2002–2003. Rio de Janeiro: INCA; 2004.
  10. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. Alcohol use among adolescents and adults—New Hampshire, 1991–2003. MMWR Morb Mortal Wkly Rep. 2004;53(8):174–5.
  11. Cercato C, Mancini MC, Arguello AMC, Passos VQ, Villares SMF, Halpern A. Hipertensão arterial, diabetes melito e dislipidemia de acordo com o índice de massa corpórea: estudo em uma população brasileira. Rev Hosp Clin Fac Med Sao Paulo. 2004;59(3):113–8. Epub 2004 Jul 28.
  12. Crespo CJ, Smit E, Andersen RE, Carter-Pokras O, Ainsworth BE. Race/ethnicity, social class and their relation to physical inactivity during leisure time: results from the Third National Health and Nutrition Examination Survey, 1988–1994. Am J Prev Med. 2000;18(1):46–53.
  13. Jaime PC, Monteiro CA. Consumo de frutas e hortaliças na população adulta brasileira, 2003. Cad. Saude Publica. 2005;21 Supl:S19–24. Epub 2006 Jan 31.
  14. Serdula MK, Gillespie C, Kettel-Khan L, Farris R, Seymour J, Denny C. Trends in fruit and vegetable consumption among adults in the United States: Behavioral Risk Factor Surveillance System, 1994–2000. Am J Public Health. 2004;94(6):1014–8.
  15. Matheson FI, Moineddin R, Glazier RH. The weight of place: a multilevel analysis of gender, neighborhood material deprivation, and body mass index among Canadian adults. Soc Sci Med. 2008;66(3):675–90.
  16. Fonseca MJM, Faerstein E, Chor D, Lopes CS. Validade de peso e estatura informados e índice de massa corporal: estudo pró-saúde. Rev Saude Publica. 2004;38(3):392–8.
  17. Silveira EA, Araújo CL, Gigante DP, Barros AJD, Lima MS. Validação do peso e altura referidos para o diagnóstico do estado nutricional em uma população de adultos no Sul do Brasil. Cad Saude Publica. 2005;21(1):235–45.
  18. Peixoto Mdo R, Benício MH, Jardim PC. Validade do peso e altura referidos: o estudo de Goiânia. Rev Saude Publica. 2006;40(6):1065–72.

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## RESUMEN

### Prevalencia y distribución social de los factores de riesgo de enfermedades crónicas no transmisibles en Brasil

**Objetivos.** Evaluar los factores de riesgo de enfermedades crónicas no transmisibles (ECNT) e identificar las desigualdades sociales relacionadas con su distribución en la población adulta brasileña.

**Métodos.** Se estudiaron los factores de riesgo de ECNT (entre ellos el consumo de tabaco, el sobrepeso y la obesidad, el bajo consumo de frutas y vegetales [BCFV], la insuficiente actividad física en el tiempo de ocio [IAFTO], el estilo de vida sedentario y el consumo excesivo de alcohol) en una muestra probabilística de 54 369 adultos de 26 capitales estatales de Brasil y el Distrito Federal en 2006. Se utilizó el Sistema de Vigilancia de los Factores Protectores y de Riesgo para Enfermedades Crónicas No Transmisibles por Entrevistas Telefónicas (VIGITEL), un sistema de encuestas telefónicas asistido por computadora, y se calcularon las prevalencias ajustadas por la edad para las tendencias en cuanto al nivel educacional mediante la regresión de Poisson con modelos lineales.

**Resultados.** Los hombres informaron mayor consumo de tabaco, sobrepeso, BCFV, estilo de vida sedentario y consumo excesivo de alcohol que las mujeres, pero menos IAFTO. En los hombres, la educación se asoció con un mayor sobrepeso y un estilo de vida sedentario, pero con un menor consumo de tabaco, BCFV e IAFTO. En las mujeres, la educación se asoció con un menor consumo de tabaco, sobrepeso, obesidad, BCFV e IAFTO, pero aumentó el estilo de vida sedentario.

**Conclusiones.** En Brasil, la prevalencia de factores de riesgo para ECNT (excepto IAFTO) es mayor en los hombres que en las mujeres. En ambos sexos, el nivel de educación influye en la prevalencia de los factores de riesgo para ECNT.

## Palabras clave

Factores de riesgo, trastorno por uso del tabaco, sobrepeso, obesidad, frutas, ejercicio, alcoholismo, encuestas de atención de la salud, epidemiología, Brasil.