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Factors associated with fruit and vegetable consumption in Brazil, 2006

ABSTRACT

OBJECTIVE: To estimate the frequency of fruit and vegetable consumption and associated factors.

METHODS: A total of 54,369 individuals aged ≥ 18 years living in Brazilian state capitals and the federal district in 2006 were interviewed through the system *Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico* (VIGITEL – telephone-based surveillance of risk and protective factors for chronic diseases). The food consumption indicators used were regular intake of fruits and vegetables (≥ 5 days/week) and adequate intake (≥ 5 times/day). The prevalence of the indicators and their confidence intervals, stratified according to sex, were calculated. To analyze associations between sociodemographic variables, crude odds ratios were calculated and then adjusted for sex, age, schooling level and marital status.

RESULTS: Less than half of the individuals said that they regularly consumed fruits (44.1%) or vegetables (43.8%), while 23.9% said they regularly consumed both fruits and vegetables. Adequate intake was reported by 7.3% of the interviewees. Fruit and vegetable consumption varied between the cities studied, was greater among women and increased with increasing age and schooling level.

CONCLUSIONS: Initiatives for promoting fruit and vegetable consumption need to address both the whole population and, especially, cities in the Northern and Northeastern regions of Brazil, young people, men and the population strata of low schooling level.

DESCRIPTORS: Food Consumption. Fruit. Greens. Chronic Disease, prevention & control. Health Surveys. Brazil. Telephone interview.

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INTRODUCTION

Fruits and vegetables are important components of a healthy diet and their consumption in adequate quantities may reduce the risk of cardiovascular diseases and some types of cancer.[8] Estimates from the World Health Organization (WHO) indicate that insufficient consumption of fruits and vegetables is among the ten most important risk factors for the total overall disease burden worldwide.[18] A minimum intake of 400 g of fruits and vegetables per day is considered sufficient, and this is equivalent to five portions of these foods.[17]

Fruits and vegetables are important foods because they are sources of micronutrients, fibers and other components with functional properties.[15] Furthermore, they are foods with low energy density, i.e. with few calories in relation to the volume of the food consumed, which favors maintenance of healthy body weight.[11]

Promotion of fruit and vegetable consumption is indicated by WHO as a priority within nutritional, food and agricultural policies.[19] To this end, at the start of the 2000s, the Brazilian government included this subject in its political and technical agenda. It became a signatory of the Global Strategy for promotion of healthy eating, physical activity and health[20] and instituted incentives for fruit and vegetable consumption, legitimated through the National Council for Food and Nutritional Security. This incentive had the aim of increasing the consumption, production and commercialization of these foods, within the perspective of health promotion and food and nutritional security as human rights.[16]

Knowledge of the frequency and distribution of fruit and vegetable consumption among the population, along with their determinants, is needed in order to direct national and local strategies for stimulating the consumption of these foods. The aim of the present study was to estimate the frequency of fruit and vegetable consumption and the factors associated with this.

METHODS

This was a cross-sectional study that presented estimates for indicators of fruit and vegetable consumption, derived from data from the system of telephone-based surveillance of risk and protective factors for chronic diseases (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico*, VIGITEL).

VIGITEL is a monitoring system that was implemented by the Ministry of Health in 2006, with the main objective of continuously monitoring the frequency and distribution of risk factors and protective factors relating to chronic non-transmittable diseases among the Brazilian population. Probabilistic samples of the population aged 18 years or over living in homes in Brazilian state capitals and the Federal District with at least one fixed telephone line were studied. Sampling of at least 2,000 individuals per city was carried out using the complete electronic registration of fixed residential telephone lines in each city. It involved drawing the lines (households) and one resident per line to be interviewed. Greater details regarding the sampling procedure are presented in another paper.[10]

The fruit and vegetable intake of 54,369 individuals was investigated by means of the following questions: “How many days a week do you usually eat fruit?”; “On an ordinary day, how many times do you eat fruit?”; “How many days a week do you usually eat raw salad vegetables, such as lettuce, tomato or cucumber?”; “On an ordinary day, do you each raw salad vegetables with your lunch, dinner or both lunch and dinner?”; “How many days a week do you usually eat cooked greens and vegetables, such as kale, carrot, christophine (chayote), aubergine (eggplant) or courgette (zucchini), without counting potato or manioc (cassava)?”; and, “On an ordinary day, do you eat cooked greens and vegetables with your lunch, dinner or both lunch and dinner?”.

From the responses given, four food indicators were created: regular fruit intake, with consumption on five or more days a week; regular vegetable intake, with consumption on five or more days a week; regular fruit and vegetable intake, i.e. the combination of the first two indicators; and adequate fruit and vegetable intake, when the consumption of these foods was five or more times a day.

The sociodemographic variables studied were: sex, age group (18-24, 25-34, 35-44, 45-54, 55-64 and ≥ 65 years), schooling level (0-8, 9-11 and ≥ 12 years of study) and marital status (single, married or in a partnership, widowed, separated or divorced).

For the estimates of frequency of fruit and vegetable intake in the population aged 18 years and over in each city, weighting factors were used to equalize the sociodemographic composition of the sample with the composition observed in the demographic census of 2000 in the state capitals and Federal District.[10]

The fruit and vegetable intake was described in terms of relative frequencies (%) and confidence intervals, stratified by sex. In analyzing associations between sex and indicators of fruit and vegetable intake, the chi-square association test was used. Logistic regression models were developed to estimate the crude and adjusted odds ratios for regular fruit and vegetable intake according to sex, age, schooling level and

marital status. The SPSS software (version 13) was used, taking a significance level of 5% and a confidence interval of 95%.

Because this survey consisted of telephone interviews, the free and informed consent form was replaced by verbal consent that was obtained at the time of the telephone contact with the interviewees. The project for implementation of VIGITEL was approved by the Ministry of Health's National Ethics Committee for Research on Human Beings.

RESULTS

The indicators for fruit and vegetable intake were evaluated among 54,369 individuals aged ≥ 18 years living in Brazilian state capitals and the Federal District, of whom 60.8% were women and 39.2% were men. Less than half of these individuals consumed fruits (44.1%) or vegetables (43.8%) on five or more days a week, and less than a quarter (23.9%) declared that they regularly consumed both fruits and vegetables. Adequate consumption, i.e. five or more times a day, was reported by 7.3% of the interviewees. Although the frequency of consumption of these groups of foods was significantly greater among the women than among the men, the indicators showed that neither sex had sufficient fruit and vegetable intake (Table 1).

The rate of regular fruit and vegetable intake varied greatly between different regions of the country. It was highest in the state capitals in the southern region (36.5%) and lowest in the state capitals of the northern region (11.9%). The city with the lowest frequency of consumption was Macapá (Amapá) (7.8%), while Porto Alegre (Rio Grande do Sul) presented the highest frequency (38.6%) (Table 2).

Despite the regional differences, only a small proportion of the population living in the Brazilian state capitals reported adequate fruit and vegetable intake, ranging from 2.4% in Rio Branco (Acre) to 10.5% in Porto Alegre (Rio Grande do Sul). The pattern of higher consumption among women was observed in most of the state capitals, especially in relation to regular consumption of both fruits and vegetables (Table 2)

Table 3 shows the association observed between sociodemographic variables and the indicator of regular consumption of both fruits and vegetables. The frequency of regular consumption was higher among the women (29.2% versus 17.8% among the men). It increased with age, and was significantly higher among individuals aged ≥ 65 years, in relation to young adults aged 18 to 24 years (adjusted odds ratio = 3.11). Higher frequency of consumption was shown to be directly associated with schooling level. From analysis of the adjusted associations, the frequency of regular consumption of fruits and vegetables increased with individuals' age and schooling level. In addition, married status was a factor independently associated with consumption of these foods.

The associations between the sociodemographic variables and adequate fruit and vegetable intake (five or more times a day) did not differ from the pattern observed for the indicator of regular consumption (Table 4).

DISCUSSION

A minority of the individuals surveyed were following the nutritional recommendations established by WHO for fruit and vegetable consumption. This places Brazil

Table 1. Fruit and vegetable consumption according to sex.[a] Brazil, 2006. (N = 54,369)

Consumption indicator	Sex		p*	Total
	Male (n = 21,294) % (95% CI)	Female (n = 33,075) % (95% CI)		(n = 54,369) % (95% CI)
Regular fruit consumption[b]	35.5 (34.9;36.1)	51.4 (50.8;51.9)	<0.001	44.1 (43.6;44.5)
Regular vegetable consumption[c]	39.5 (38.9;40.1)	47.4(46.8;48.0)	<0.001	43.8 (43.4;44.2)
Regular fruit and vegetable consumption[d]	17.8 (17.3;18.2)	29.2 (28.6;29.6)	<0.001	23.9 (23.5;24.2)
Adequate fruit and vegetable consumption[e]	5.0 (4.7;5.2)	9.4 (9.0;9.7)	<0.001	7.3 (7.1;7.6)

[a] Weighted percentage, to adjust the sociodemographic distribution of the VIGITEL sample to that of the population aged ≥18 years in each city, according to the 2000 demographic census.

[b] Fruit consumption on five or more days a week.

[c] Vegetable consumption on five or more days a week.

[d] Combined consumption of fruits and vegetables on five or more days a week

[e] Combined consumption of fruits and vegetables five or more times a day.

* Chi-square test (p<0.05)

Table 2. Percentage of individuals with regular and adequate consumption of fruits and vegetables, according to sex, in the different regions and state capitals, and in the Federal District.[a] Brazil, 2006. (N = 54,369)

Region/City	Regular consumption[b]			Adequate consumption[c]		
	Male	Female	Total	Male	Female	Total
	%	%	%	%	%	%
Northern region	9.0	14.6*	11.9	2.6	3.6	3.2
Belém	6.4	14.2*	10.6	2.5	3.4	3.0
Boa Vista	9.7	14.0	11.9	1.8	3.5	2.6
Macapá	5.3	9.3	7.4	2.7	3.8	3.2
Manaus	10.5	12.0	11.3	2.8	3.6	3.2
Palmas	12.2	32.9*	22.6	3.6	4.9	4.3
Porto Velho	13.5	21.4**	17.5	3.1	5.1	4.1
Rio Branco	10.0	19.0**	14.4	2.2	2.6	2.4
Northeastern region	15.6	22.7*	19.5	3.4	4.8*	4.2
Aracaju	18.8	28.6*	24.2	2.2	5.5**	4.0
Fortaleza	16.8	21.6*	19.4	3.0	4.6**	3.9
João Pessoa	21.1	29.8*	25.9	3.1	5.1	4.1
Maceió	14.0	23.3*	19.0	2.6	4.0	3.4
Natal	15.6	27.4*	22.1	3.1	6.4**	4.9
Recife	17.1	23.3*	20.5	4.2	3.9	4.1
Salvador	13.3	21.1*	17.6	3.1	5.0**	4.2
São Luís	13.2	18.6**	16.2	4.6	4.8	4.7
Teresina	15.3	20.0	17.9	5.0	4.6	4.8
Southern region	28.6	43.3*	36.5	5.6	12.6*	9.4
Curitiba	28.1	40.6*	34.8	5.4	11.3*	8.5
Florianópolis	26.6	43.8*	35.6	5.3	11.6**	8.6
Porto Alegre	29.6	45.9*	38.6	6.0	14.2*	10.5
Southeastern region	17.8	31.1*	25.0	6.0	12.0*	9.2
Belo Horizonte	21.6	31.0*	26.7	8.0	9.1	8.6
Rio de Janeiro	16.0	25.0*	20.9	6.8	11.2*	9.2
São Paulo	17.9	34.7*	26.8	5.1	13.1*	9.4
Vitória	23.9	31.5	28.2	7.0	9.1	8.2
Central-western region	21.2	35.4*	28.7	5.1	10.2*	7.8
Brasília	24.8	36.1*	30.8	5.6	10.7*	8.3
Campo Grande	20.8	36.4*	29.0	2.9	7.5**	5.4
Cuiabá	15.3	27.4*	21.6	2.4	7.2**	4.9
Goiânia	17.3	36.8*	27.8	6.5	12.2*	9.6
Total	17.8	29.1*	23.9	5.0	9.4*	7.3

[a]Weighted percentage, to adjust the sociodemographic distribution of the VIGITEL sample to that of the population aged ≥18 years in each city, according to the 2000 demographic census.

[b] Combined consumption of fruits and vegetables on five or more days a week.

[c] Combined consumption of fruits and vegetables five or more times a day.

*$p < 0.001$; **$p < 0.05$ (chi-square test for differences between sexes).

in a very unfavorable situation regarding comparisons with developed countries.[2,4,12] Data from the Behavior Risk Factor Surveillance System showed that in the United States, adequate fruit and vegetable intake was achieved by around 25% of the population aged ≥18 years in 2007, ranging from 16.3% in Oklahoma to 32.5% in the District of Columbia.[3] Thus, if stimulation of consumption is one of the priority actions on the health promotion agenda, its implementation is a great challenge, given the low frequency of fruit and vegetable intake among the Brazilian population.

Table 3. Odds ratios for regular consumption of fruits and vegetables, according to sociodemographic variables. Brazil, 2006.[a] (N = 54,369)

Variable	Regular consumption[b]	Odds ratios for regular consumption of fruits and vegetables[c]			
	%	Crude	95% CI	Adjusted	95% CI
Sex					
Male	17.8	1		1	
Female	29.2	1.90	1.82;1.98	1.97	1.89;2.06
Age (years)					
18 – 24	14.5	1		1	
25 – 34	21.6	1.63	1.53;1.74	1.50	1.40;1.61
35 – 44	24.1	1.88	1.76;2.01	1.66	1.54;1.79
45 – 54	30.6	2.60	2.43;2.79	2.38	2.20;2.58
55 – 64	32.6	2.86	2.64;3.10	2.84	2.59;3.10
≥ 65	32.8	2.89	2.67;3.13	3.11	2.83;3.41
Schooling level (years)					
0 – 8	20.9	1		1	
9 – 11	22.2	1.08	1.03;1.13	1.33	1.26;1.39
≥ 12	36.2	2.14	2.04;2.26	2.44	2.31;2.57
Marital status					
Single	18.9	1		1	
Married	26.5	1.54	1.48;1.61	1.22	1.16;1.29
Separated or divorced	25.9	1.50	1.37;1.63	0.95	0.87;1.05
Widowed	30.0	1.84	1.68;2.01	0.89	0.80;0.99

[a] Weighted percentage, to adjust the sociodemographic distribution of the VIGITEL sample to that of the population aged ≥18 years in each city, according to the 2000 demographic census.
[b] Combined consumption of fruits and vegetables on five or more days a week.
[c] Odds ratio adjusted according to sex, age, schooling level and marital status.

The estimates from the present study are consistent with those from previous studies that showed insufficient fruit and vegetable intake among the Brazilian population. The results from the Family Budget Survey of 2002-03, which provided information on average availability of foods in the household, rather than individual food consumption, indicated that the average availability of fruits and vegetables in Brazilian households was around one third of the recommendations for consumption of these foods.[7] A study based on the Brazilian data from the World Health Survey found that 41% of the adult individuals reported daily consumption of fruits and 30%, vegetables.[5]

The pattern of fruit and vegetable consumption differed between Brazilian cities and population subgroups according to sex, age and other sociodemographic variables. Regional inequalities were also identified in relation to household availability of fruits and vegetables in the Family Budget Survey,[7] such that the availability was lower in the northern and northeastern regions of the country.

It was also observed that men and younger individuals consumed lower quantities of fruits and vegetables, thus confirming the data from the World Health Survey.[5] Another Brazilian household survey, on risky behavior and reported morbidity due to non-transmittable diseases and pathological conditions, carried out in 15 state capitals and the Federal District, showed a tendency towards increasing consumption of fruits and vegetables with age.[a] An association between consumption of these foods and sex was also observed in studies in other countries.[1,4,13,14] This was also observed in relation to age: the estimated fruit and vegetable intake was greater among older individuals in 14 regions in Africa, America, Europe and Asia.[8]

The positive association between age and fruit and vegetable consumption can be interpreted as a reflection of differences in the formation of dietary habits between generations. Older individuals formed their dietary habits during a period of the country's history that was less marked by consumption of processed foods containing high levels of fat, sugar and salt,

[a] Instituto Nacional de Câncer. Inquérito domiciliar sobre comportamento de risco e morbidade referida de doenças e agravos não transmissíveis: Brasil, 15 capitais e Distrito Federal, 2002-2003. Rio de Janeiro; 2004.

Table 4. Odds ratios for adequate consumption of fruits and vegetables, according to sociodemographic variables. Brazil, 2006.[a] (N = 54,369)

Variable	Adequate consumption[b]	Odds ratios for adequate consumption of fruits and vegetables[c]			
	%	Crude	95% CI	Adjusted	95% CI
Sex					
Male	5.0	1		1	
Female	9.4	1.98	1.84;2.12	2.05	1.91;2.20
Age (years)					
18 – 24	3.1	1		1	
25 – 34	6.3	2.10	1.85;2.38	1.95	1.71;2.22
35 – 44	7.0	2.34	2.06;2.66	2.12	1.85;2.44
45 – 54	10.9	3.80	3.35;4.31	3.57	3.10;4.10
55 – 64	10.8	3.78	3.29;4.34	3.82	3.28;4.45
≥ 65	11.9	4.21	3.67;4.83	4.64	3.98;5.43
Schooling level (years)					
0 – 8	6.5	1		1	
9 – 11	6.5	1.00	0.92;1.08	1.28	1.18;1.38
≥ 12	11.5	1.88	1.74;2.03	2.13	1.96; 2.31
Marital status					
Single	5.3	1		1	
Married	8.4	1.65	1.53;1.78	1.17	1.07;1.27
Separated or divorced	7.7	1.50	1.30;1.74	0.84	0.72;0.98
Widowed	10.0	1.99	1.73;2.28	0.80	0.68;0.94

[a] Weighted percentage, to adjust the sociodemographic distribution of the VIGITEL sample to that of the population aged ≥18 years in each city, according to the 2000 demographic census.
[b] Combined consumption of fruits and vegetables five or more times a day.
[c] Odds ratio adjusted according to sex, age, schooling level and marital status.

and by scarcity of complex carbohydrates, fibers and micronutrients. The higher consumption of fruits and vegetables among individuals of more advanced age may also be related to the care taken regarding their health, in following the guidance received at health-care services. Such guidance is sought more often because of the increasing prevalence of chronic non-transmittable diseases with increasing age.

The sociodemographic indicator used to estimate social differences was individuals' schooling level. This was associated positively and independently with fruit and vegetable consumption. Data on individuals' income and purchasing power are not available within the VIGITEL system. Jaime & Monteiro[5] found that schooling level had an independent effect on fruit and vegetable consumption, in an analysis controlled using possession of household goods (as an indicator for income level). Thus, actions that expand the population's knowledge regarding the importance that consumption of these foods has for health may increase their consumption. This was shown in a community-based trial evaluating the immediate impact of an educational nutritional intervention for increasing the participation of fruits and vegetables in the diet of families living in a poor district of the municipality of São Paulo.[6]

One of the limitations of the present study was the possibility of measurement bias, given that VIGITEL did not include individuals living in households without a fixed telephone. With the aim of attenuating such bias, weightings were introduced to equalize the sociodemographic composition of the VIGITEL sample studied with the composition found through the 2000 demographic census in the 27 cities studied.

Another limitation relates to the differences in the methods for evaluating diet and defining and categorizing fruits and vegetables, which impaired comparisons between studies on population-based intake of these foods. Finally, the indicator for adequacy of fruit and vegetable intake was defined as daily consumption of these foods at least five times, starting from questions on how many meals the individual had on an ordinary day and, in the case of vegetables, with direct reference to the main meals (lunch and dinner).

The fruit and vegetable intake recommendations from WHO,[17] which are reproduced in the Dietary Guide for the Brazilian Population[a] are expressed in grams and portions. In the VIGITEL system, the questions relate to the number of times a day and not to the quantity (grams or portions) of fruits and vegetables consumed per day. This difference in the consumption measurement may have led to over or underestimation of the individuals' classification for this indicator. This would have resulted from ignoring the consumption of more than one portion of fruit or vegetable at the same meal and consumption of vegetables outside of the main meals. Although this does not form part of Brazilian dietary habits, it could occur among individuals with other dietary influences or with different dietary habits.

A previous study on the validity of indicators for food and drink intake derived from VIGITEL data found moderate reproducibility (kappa coefficient = 0.57), sensitivity of 46.4% and specificity of 71.6% for fruit and vegetable consumption, taking the reference point of the individuals' classification from three 24-hour dietary recalls.[9] These data confirm that there is a need to deepen the investigations on these questions, to take into account regional differences and seasonality. Nonetheless, despite the limitations identified, the results from the present study are generally consistent with findings in the literature.

Continuous and comparable collection of information on fruit and vegetable consumption, as provided through the VIGITEL system, enables assessment of the impact of programs and initiatives for promoting the consumption of these foods among the Brazilian population. In this respect, programs for promoting fruit and vegetable consumption have been evaluated based on information provided through the telephone-based risk factor monitoring system (Behavioral Risk Factor Surveillance System) in the United States. These assessments have indicated that initiatives developed since the start of the 1990s with the aim of increasing the fruit and vegetable intake, have failed.[2,13]

It is concluded that initiatives for promoting fruit and vegetable consumption in Brazil, aimed at the general population, need to be implemented, given that the consumption is below the current recommendations. However, special attention needs to be given to the cities of the northern and northeastern regions, to young adults, to men and to population strata presenting low schooling levels.

[a] Ministério da Saúde. Secretaria de Políticas de Saúde. Coordenação Geral da Política Nacional de Alimentação e Nutrição. Guia Alimentar para a população brasileira: promovendo a alimentação saudável. Brasília; 2006[cited 2007 Dec 21]. (Série A. Normas e Manuais Técnicos). Available in: http://dtr2004.saude.gov.br/nutricao/documentos/guia_alimentar_conteudo.pdf

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