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DIETARY BEHAVIORS AMONG YOUNG AND OLDER ADULTS IN BRAZIL

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Abstract: *Objectives:* To describe healthy and unhealthy dietary behaviors among young and older Brazilian adults. *Design:* Cross-sectional study based on secondary data from the Brazilian National Health Survey 2013/2014, conducted by the Brazilian Institute of Geography and Statistics (IBGE). *Settings:* Brazil. *Participants:* 59,402 Brazilian adults (18 years or over), representative of the whole community-dwelling Brazilian adult population. *Measurements:* Frequency of regular (5 days/week or more) consumption of food considered of a healthy diet (fruit, vegetables, greens, cooked vegetables, beans, milk, chicken, fish) and unhealthy diet (red meat, soda and sweets, meal replacement for fast food and high salt consumption) was investigated. Differences among young adults (18-39 years), middle-aged adults (40-59 years) and older adults (60+ years) were assessed through 95% confidence intervals and logistic regression models with contrast function, considering the complexity of the sample and the sample weight of the research. *Results:* Less than half of the population reported consuming fruit regularly (41.3%, 95% CI = 40.5 - 42.2) and only one quarter reported consuming vegetables regularly (25.4%, 95% CI = 24.7 – 26.1). Regular consumption of soft drinks was cited by 26.6% (95% CI = 25.5 - 27.6) for men and 20.6% (95% CI = 19.8 - 21.4) for women. Young adults presented, in general, lower frequency of regular consumption of healthy food and higher frequency of unhealthy food when compared to middle-aged and the older adults. *Conclusion:* Current dietary behaviors adopted by the Brazilian population is characterized by a high prevalence of inadequate food intake, mainly among young adults calling the attention to the necessity for age-specific public health interventions.

Key words: Diet, health, aging.

Introduction

Healthy dietary behaviors are important factors in promoting and maintaining healthy aging (1, 2). Its association with the development of non-communicable chronic diseases (NCCD) has been widely discussed worldwide (3, 4). The insufficient consumption of fruit and vegetables and the high consumption of red meats and sugar-rich foods are positively related to the development of NCCD, such as obesity, diabetes and hypertension (4, 5).

It is well known that non-communicable chronic diseases (NCCD) are associated with unhealthy aging, increased disabilities, loss of work productivity and reduced family income and have a significant financial impact on the countries' health systems (4, 6). Due to these consequences, Brazil has established goals to prevent the progress of NCCD with actions aimed to prevent their major risk factors and ensure adequate care for patients' health in the period from 2011 to 2022. The Brazilian plan corroborates with the global goals aimed to fight these diseases until 2025 by the WHO and draws attention to the need for monitoring the risk factors related to these diseases (6).

Different from other factors, such as genetic and socioeconomic status, dietary behaviors are prone to changes during the life course and should be monitored over time to identify groups vulnerable to the development of NCCD (7). However, research on dietary behaviors comparing different age groups is still little explored in the country, drawing attention to the need for more detailed food consumption studies, identifying risk groups and contributing to the development of health prevention strategies to favor healthy aging and curb the increase in NCCD.

The Brazilian National Health Survey that took place in 2013-2014 in a representative sample of the Brazilian population was the first national population-based survey to investigate health and lifestyle conditions in the Brazilian population, making it possible to study the dietary behaviors of adults of different ages (8).

The objective of this study is to describe healthy and unhealthy dietary behaviors among young and older Brazilian adults.

Methods

Study Design

This is a cross-sectional study based on data from the Brazilian National Health Survey (NHS), conducted in 2013/2014 by the Brazilian Institute of Geography and Statistics (IBGE).

Population

The studied population consisted of residents of private households in Brazil, except those located in the special census sectors (barracks, military bases, lodges, encampments, boats, penitentiaries, prisons, asylums, orphanages, convents and hospitals). Details about the sample can be seen in the official

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publication of the NHS 2013/2014 (9).

In summary, the research sample is a subset of the Integrated System of Household Surveys (SIPD, in Portuguese) Master Sample of IBGE, of which geographic coverage comprises the census sectors of the Geographical Operational Base of the Demographic Census of 2010. The NHS is a domiciliary survey and the sampling method used a three-stage conglomerate sampling. The census sectors comprise the Primary Sampling Units (PSUs); the households are the second stage units; and residents aged 18 years or older define the third stage units.

As an integral part of the SIPD, the PSUs of the survey were obtained from the Master Sample, which is the system's sampling structure. Therefore, the PSU stratification in this research was the same as that adopted for the Master Sample. The PSU subset selection was attained by simple random sampling. In the second stage, a fixed number of permanent private households was selected by simple random sampling in each PSU selected in the first stage. The selection was carried out in the National Registry of Addresses for Statistical Purposes (CNEFE, in Portuguese) in its most recent update. In each researched home, a resident aged 18 years or older was selected to answer a specific questionnaire, also by simple random sampling, from the list of residents built at the time of the interview. A total of 6,069 PSUs was included in the NHS sample, and 81,767 households were selected. Due to refusals and closed homes, which were empty or non-existent, interviews were conducted in 64,308 households, in which 4,106 adults refused to participate or were not found. Pregnant women were excluded from the analyses, resulting in a final sample of 59,402 individuals.

Data collection

Field research took place from August 2013 to February 2014. In summary, contact was made with the person responsible for the household or with one of the residents of the selected household. The interviewer described the study to the resident, its objectives, procedures and the importance of participating in the research. A list of all the adults residing in the household was prepared and the respondent who would answer the household questionnaire was identified, as well as the adult who would answer the individual interview.

The interviews were carried out using a Personal Digital Assistant (PDA) device. The interviewers were adequately trained to carry out the interviews and to perform all necessary measures. The questionnaire was divided into 20 modules involving questions about the general characteristics of the household and its inhabitants and about the health conditions of the selected resident, in addition to the weight, height, waist circumference, and blood pressure measurements, as well as biochemical tests.

This study used information from the module on socioeconomic conditions and the module on lifestyle, focusing on questions about dietary habits. The survey on dietary habits included questions on the daily and/or weekly frequency of healthy food consumption (fruit, fruit juices, green vegetables and greens, cooked vegetables, legumes, milk, chicken and fish) and unhealthy foods (red meats, soft drinks and sweets).

The survey on milk consumption also included a question about the type of milk consumed (whole, skimmed or semi-skimmed, or both types) for individuals who reported consuming milk at least once a week. The type of soft drink was also evaluated (regular, light or diet) for individuals who reported drinking it more than once a week.

The weekly frequency of replacing meals (lunch and/or dinner) with fast food was also inquired, as well as questions about the use of salt, considering what individuals thought of their own consumption, taking into account homemade and processed foods: very high, high, suitable, low or very low.

Study variables

Age was categorized into three groups: young adults (18 to 39 years), middle-aged adults (40 to 59 years) and older adults (60 years or over).

Consumption of fruit, vegetables, greens, legumes, chicken and fish was considered as regular when individuals reported consuming these foods on at least 5 days of the week. For the estimation of the regular consumption of fruit, two approaches were considered: including the consumption of 100% fruit juice and not including it.

Milk consumption was considered regular when the weekly frequency of consumption was higher than the median milk consumption (4 days a week).

For foods considered part of an unhealthy diet (red meats, soft drinks and sweets), respondents were considered regular consumers when they reported consuming these foods at least 5 times a week.

As for fast food consumption, individuals were considered consumers when they reported replacing lunch or dinner with sandwiches, snacks or pizzas at least seven times a week. This amount was adopted because, considering all meals in one week, seven is half the number of the possible main meals (lunch/dinner).

Regarding salt consumption, individuals who reported having a very high and high consumption were classified in the category of high salt consumption and the others in the category of low salt consumption.

Data analysis

All variables were presented for the total population and according to gender. The percentage of individuals with regular consumption of fruit, vegetables or cooked vegetables, greens, beans, milk (regardless of type), chicken, fish, red meats, soft drinks and sweets was estimated.

We also estimated the percentage of consumers of skimmed or semi-skimmed milk and soft drinks at least once a week and the prevalence of individuals replacing meals (lunch and/or dinner) with fast food and the percentage of individuals reporting a high consumption of salt.

Table 1
Frequency and 95% confident interval (95%CI) of the regular consumption of fruit, vegetables, and greens, according to gender and age. Brazil, 2013

Frequency of consuption (%)	MEN			
	Total (n=25,920)	18 – 39 years old (n= 12,295)	40 – 59 years old (n= 9,070)	≥ 60 years old (n= 4,555)
Regular* consumption of fruit	35.0 (33.8-36.1)	28.9 (27.5-30.4)	37.7 (35.8-39.5) [a]	47.1 (44.5-49.8) [a,b]
Regular* consumption of fruit and/or 100% fruit juice	47.4 (46.2-48.6)	43.2 (41.6-44.9)	49.2 (47.3-51.1) [a]	55.9 (53.2-58.5) [a,b]
Regular* consumption of vegetables	42.3 (41.1-43.4)	38.8 (37.3-40.4)	45.5 (43.6-47.3) [a]	45.9 (43.1-48.7) [a]
Regular* consumption of vegetables and greens	27.8 (26.7-28.0)	24.7 (23.4-25.0)	30.6 (28.8-32.3) [a]	31.3 (28.6-34.0) [a]
Frequency of consuption (%)	**WOMEN**			
	Total (n=33,482)	**18 - 39 years old (n= 15,530)**	**40 - 59 years old (n= 11,330)**	**≥ 60 years old (n= 6,622)**
Regular* consumption of fruit	47.1 (46.1 - 48.1)	39.2 (37.8 - 40.6)	49.5 (47.9 - 51.1) [a]	61.2 (59.1 - 63.2) [a,b]
Regular* consumption of fruit and/or 100% fruit juice	56.8 (55.8 - 57.8)	50.2 (48.8 - 51.6)	58.8 (57.2 - 60.4) [a]	68.2 (66.3 - 70.2) [a,b]
Regular* consumption of vegetables	50.5 (49.5 - 51.1)	45.0 (43.5 - 46.5)	55.2 (53.4 - 56.7) [a]	54.8 (52.7 - 56.9) [a]
Regular* consumption of vegetables and greens	35.9 (34.9-36.9)	30.7 (29.2-32.2)	38.5 (36.9-40.1) [a]	43.2 (41.1-45.2) [a,b]

* Consumption on at least 5 days of the week; a. $p < 0,05$ comparing to individuals with 18 - 39 years old; b. $p < 0,05$ comparing to individuals with 40 - 59 years old.

Differences between young adults, middle-aged adults and older adults were assessed by observing the 95% confidence intervals and through logistic regression models, of which independent variable was a variable indicating the three age group categories and using the contrast function to evaluate the difference between each age group. Values of $p < 0.05$ were considered statistically significant.

All analyses were performed using the SAS software, version 9.1.3 (2003, SAS Institute, Cary, NC) considering the sample complexity and weight of the research.

The Brazilian National Health Survey (NHS) was approved by the National Committee for Ethics in Research (CONEP), of the Brazilian National Health Council (CNS), in June 2013 (n. 328.159). All participants signed the free and informed consent form before answering the survey and the dataset is publicly available at: http://www.ibge.gov.br/home/estatistica/populacao/pns/2013.

Results

Most of the individuals interviewed were women (51.9%). The mean age of the population was 43.1 years (95% CI = 42.8 - 43.4), being 42.3 years (95% CI = 41.9 - 42.7) in men and 43.8 (95% CI = 43.4 - 44.2) in women.

Almost half of the population reported consuming fruit regularly (41.3%, 95% CI = 40.5 - 42.2). Considering the consumption of fruit and 100% fruit juices, this percentage changed to 52.3% (95% CI = 51.5 - 53.1). Only a quarter of the population reported consuming vegetables regularly (25.4%, 95% CI = 24.7 - 26.1).

The differences between the age ranges are observed in both genders. The frequency of regular consumption of both fruit and vegetables increased according to the increase in the age group. Only the frequency of vegetable consumption among men and of vegetables among men and women did not differ between older and middle-aged adults. Comparing the genders, women showed a higher frequency of consumption of fruit and vegetables when compared to men (Table 1).

Regarding the regular consumption of beans, there was no difference in the frequency of consumption among men from the different age groups. Regular chicken consumption was higher among older adults when compared to younger adults, with no difference in the frequency of consumption of middle-aged adults, while the percentage of fish consumption was higher among middle-aged adults compared to younger ones (Table 2). Men showed a reduction in fish consumption as age increased. Among women, the consumption of fish did not differ between the age groups, while the consumption of chicken was reported to be more frequent among older women, when compared to the other age groups (Table 2).

The frequency of regular milk consumption and the weekly consumption of skimmed or semi-skimmed milk was higher among older adults compared to young and middle-aged adults, both among men and women. In women, the consumption of milk increased with age, whereas in men, the increase in consumption was only observed for skimmed or semi-skimmed milk (Table 2).

Table 3 shows the frequency of unhealthy eating habits in men and women. In both genders, young adults reported consumption of unhealthy items more frequently when compared to older adults, except for fast food.

The percentage of individuals not consuming exclusively light/diet soft drinks was 93.6% (95% CI = 93.1 - 94.1), being higher among men (94.7%, 95% CI = 94.1 - 95.3) than among

Table 2
Frequency and 95% confident interval (95%CI) of the healthy dietary habits, according to gender and age. Brazil, 2013

Healthy dietary habits			**MEN**	
	Total (n=25,920)	**18 – 39 years old (n= 12,295)**	**40 – 59 years old (n= 9,070)**	**≥ 60 years old (n= 4,555)**
Regular* consumption of beans	76.8 (75.8-77.7)	77.3 (76.0-78.2)	76.7 (75.1-78.4)	75.3 (73.2-77.3)
Regular* consumption of milk	50.2 (49.1-51.3)	48.5 (46.9-50.1)	47.7 (45.8-49.7)	60.2 (57.7-62.8)[a,b]
Consumption of skimmed or semi-skimmed milk	13.4 (12.5-14.3)	9.7 (8.7-10.7)	15.1 (13.4-16.7)[a]	20.8 (18.4-23.2)[a,b]
Regular* consumption of chicken	12.7 (12.0-13.5)	12.3 (11.4-13.3)	12.4 (11.2-13.7)	14.5 (12.6-16.5) [a]
Regular* consumption of fish	2.9 (2.6-3.6)	2.6 (2.2-3.1)	3.4 (2.9-4.0)[a]	2.9(2.2-3.6)
Healthy dietary habits			**WOMEN**	
	Total (n=33,482)	**18 - 39 years old (n= 15,530)**	**40 - 59 years old (n= 11,330)**	**≥ 60 years old (n= 6,622)**
Regular* consumption of beans	67.5 (66.5-68.5)	65.3 (64.2-67.0)	69.5 (68.0-71.0) [a]	68.2 (66.3-70.2) [a]
Regular* consumption of milk	57.6 (56.6-58.6)	52.2 (50.7-53.7)	58.1 (56.4-59.7)[a]	69.0 (67.3-70.8)[a,b]
Consumption of skimmed or semi-skimmed milk	20.1 (19.2-21.1)	14.4 (13.1-15.7)	21.2 (19.5-22.8) [a]	30.1 (28.0-32.1) [a,b]
Regular* consumption of chicken	14.6 (13.9-15.3)	13.8 (12.8-14.9)	14.2 (13.1-15.2)	17.2 (15.7-18.6) [a,b]
Regular* consumption of fish	2.8 (2.5-3.1)	2.5 (2.1-2.9)	3.0 (2.5-3.5)	3.1 (2.6-3.7)

* Consumption on at least 5 days of the week; [a] $p < 0,05$ comparing to individuals with 18 - 39 years old; b. $p < 0,05$ comparing to individuals with 40 - 59 years old.

women (92.4%, 95% CI, 91.7 - 93.1) and among younger adults (97.2%, 95% CI = 96.7 – 97.7 among men and 95.3%, 95% CI = 94.6 - 96.1 among women) compared to middle-aged adults (93.4%, 95% CI = 92.2 - 94.5 among men and 90.7%, 95% CI = 89.3 - 92.0 among women) and older adults (87.4%, 95% CI = 84.5 - 90.3 among men and 86.0%, 95% CI = 83.7 - 88.3 among women).

Discussion

This study shows the prevalence of healthy and unhealthy dietary behaviors observed in young and older Brazilian adults. Young adults generally had a lower frequency of regular consumption of foods constituting a healthy diet (fruit, vegetables and greens) and a higher frequency of unhealthy eating habits, when compared to middle-aged adults and older adults.

Young adults are known to have a lower-quality diet when compared to middle-aged adults (10, 11). Overall, older and middle-aged adults are more likely to make positive changes in their diet because of increased awareness of the association between diet and health or due to the presence of chronic diseases that require changes and implementation of a healthier diet, such as diabetes and hypertension (12).

Nicklett and colleagues (2013), in a review on fruit and vegetable consumption among older adults, also found that they eat more fruit and vegetables when compared to younger adults. It is believed that older individuals can better recognize the importance of diet for health when compared to younger ones (13, 14). On the other hand, Vaccaro and Huffman (2017) found that more than 70% of older old adults (≥75 years old) failed to consume the recommended amount of fruit and vegetables, whereas the younger old (55 – 64.9 years) consumed significantly more total fruit and vegetables than the oldest old (≥ 80 years) ($p = .028$). Corroborating their findings, in our study, less than half of older adults ((≥ 60 years) followed the daily recommendations related to fruit and vegetable consumption (15).

This finding is of concern due to the importance of these foods in the prevention of chronic diseases and in quality of life promotion. Adequate consumption of fruit and vegetables may contribute to the reduction of cardiometabolic risk, the development of other chronic diseases, such as cancer, and general mortality (16, 17).

The consumption of red meats was cited by Barros and collaborators (2012) as a negative influence on food habits, as it may interfere with digestion and bring health risks (18). A longitudinal study of 74,645 Swedish adults found that individuals reporting a higher consumption of red meats (highest quintile of consumption) had a 21% higher risk of mortality from all causes when compared to individuals in the lowest quintile of consumption (Risk Ratio - RR = 1.21, 95% CI: 1.13 - 1.29) (15). In Brazil, Carvalho and collaborators (2015) drew attention to the consequences of excessive consumption of red and processed meats, not only for health, but also for the environment, such as the emission of carbon dioxide, indicating the urgent need for interventions aimed to reduce the consumption of these food items (19). In our study, there was a lower frequency of red meat consumption among the elderly when compared to young and middle-aged adults,

Table 3
Frequency and 95% confident interval (95%CI) of the unhealthy dietary habits, according to gender and age. Brazil, 2013

Unhealthy dietary habits	MEN			
	Total (n=25,920)	**18 – 39 years old (n= 12,295)**	**40 – 59 years old (n= 9,070)**	**≥ 60 years old (n= 4,555)**
Regular* consumption of soft drinks	26.6 (25.5-27.6)	34.1 (32.5-35.7)	22.0 (20.4-23.6) [a]	13.8 (12.1-15.4) [a,b]
Regular* consumption of sweets	20.9 (20.0-21.7)	23.5 (22.2-24.8)	17.7 (16.4-19.1) [a]	19.4 (17.4-21.5) [a]
Consumption of fast food	3.4 (3.0-3.8)	3.0 (2.6-3.5)	3.3 (2.6-4.0)	4.5 (3.3-5.7) [a]
High consumption of salt	16.1 (15.3-16.9)	18.8 (17.6-20.0)	15.4 (14.1-16.8) [a]	9.4 (7.9-10.9)[a,b]
Regular* consumption of red meats	42.6 (41.5-43.7)	44.6 (43.0-46.1)	41.6 (39.7-43.5) [a]	38.9 (36.3-41.6) [a]
Unhealthy dietary habits	**WOMEN**			
	Total (n=33,482)	**18 - 39 years old (n= 15,530)**	**40 - 59 years old (n= 11,330)**	**≥ 60 years old (n= 6,622)**
Regular* consumption of soft drinks	20.6 (19.8-21.4)	27.9 (26.5-29.2)	16.7 (15.5-17.9)[a]	10.6 (9.3-11.9) [a,b]
Regular* consumption of sweets	22.4 (21.5-23.2)	27.8 (26.4-29.2)	19.2 (17.8-20.6) [a]	15.5 (14.0-17.0) [a,b]
Consumption of fast food	4.6 (4.1-5.1)	4.2 (3.5-4.9)	4.5 (3.8-5.3)	5.5 (4.4-6.6) [a]
High consumption of salt	12.4 (11.7-13.1)	16.1 (15.1-17.2)	10.7 (9.7-11.8) [a]	6.8 (5.6-7.9) [a,b]
Regular* consumption of red meats	31.5 (30.5-32.5)	34.4 (33.0-35.9)	29.5 (28.0-31.1) [a]	28.2 (26.1-30.1) [a]

* Consumption on at least 5 days of the week; a. $p < 0,05$ comparing to individuals with 18 - 39 years old; b. $p < 0,05$ comparing to individuals with 40 - 59 years old.

indicating a possible attention towards the consumption of leaner meats among older adults.

One important finding of our study was the increasing consumption of milk with age. Although older adults consume less meat, they can attain their protein requirement through milk intake (20).

As for markers of an unhealthy diet, a worse behavior was observed among younger adults compared to middle-aged and older adults, with a higher frequency of regular consumption of soft drinks and sweets among the younger ones. The consumption of soft drinks and other beverages with added sugar has been associated with the development of several chronic diseases, in addition to obesity, both in children and in adults (21). Thus, the high consumption of soft drinks can affect the nutritional status and the maintenance of a healthy life.

In Brazil, data on household food availability from the Brazilian Household Budget Surveys (HBS) had already shown a 400% increase in the consumption of this type of beverage between the 1970s and 2002-2003. The latest HBS, carried out in 2008-2009, also showed an increase of 39.3% in the availability of soft drinks at the household level since 2002-2003 (22).

Diet stands out as an important behavioral factor of healthy aging. Akbaraly et al. (2013) found a positive association between low adherence to healthy diet recommendations and increased premature death, and also described that a Westernized dietary pattern significantly reduced the probability of achieving optimal health at more advanced ages, regardless of other health behaviors, such as physical activity and smoking (23).

Considering the changes that have been occurring in the eating habits of the Brazilian population, the present study reinforces the need to develop strategies focusing on diet-related behaviors. Lafortune et al (2016) showed that an unhealthy diet is associated with unsuccessful aging, which favors the development of non-communicable chronic diseases (1).

The present study is characterized by an analysis of dietary habits across different stages of life (young adults, middle-aged adults and older adults), using a representative sample of the Brazilian population. Thus, the results shown here contribute to understand and enable interventions against the occurrence of diseases in the Brazilian population in the present and coming decades.

On the other hand, the results should be analyzed with caution since, with aging, it becomes more difficult to accurately report some lifestyle behaviors, such as food consumption. Also, several factors may influence certain behaviors, including the pre-existence of some chronic condition, being necessary to compare adults and the elderly considering the presence of these conditions.

Another limitation that should be considered when interpreting these results is the cross-sectional design of the study, which does not allow following changes on consumption over the years. On the other hand, since this is the first Brazilian National Health Survey, this study contributes to the understanding of diet-related behaviors that can be used to monitor food intake in the future and to develop strategies to change risk factors for NCCD in specific population groups.

Another important fact is the method used to evaluate food

markers, since specific questions on food frequency may not reflect the usual food intake, such as the 24-hour recall or a food frequency questionnaire. The questions about the consumption of some foods used in the NHS have already been used in the National Health Survey and the Surveillance System for Protective and Risk Factors for Chronic Diseases by Telephone Survey (VIGITEL) since 2006 and were previously validated by Monteiro et al. (2008) (24).

This study contributes to previous studies on lifestyle behaviors by bringing a description of risk factors for non-communicable chronic diseases across three age groups (18-39 years old; 41-59 years old; 60 years or over). Since dietary behaviors have been associated with healthy aging and quality of life, this study highlights the high prevalence of inadequate food intake, mainly by young adults, and call attention to the need for age-specific public health interventions. It also helps to identify behavioral factors that not only decrease morbidity and mortality but also influence healthy aging and, therefore, must be incorporated since adulthood.

Author Contributions: INB contributed to the data analysis plan, undertook the data analysis and interpretation. AOCG was involved in the data analysis and interpretation. RGBB and GBSJ collaborated in formulating the aims and interpretation of the data. AOCG was involved in the interpretation of the data and writing the manuscript. All authors read the final draft of the manuscript and approve its submission for publication.

Ethical standard: This paper used data from the Brazilian National Health Survey. The Brazilian National Health Survey (NHS) was approved by the National Committee for Ethics in Research (CONEP), of the Brazilian National Health Council (CNS), in June 2013 (n. 328.159). All participants signed the free and informed consent form before answering the survey and the dataset is publicly available at: http://www.ibge.gov.br/home/estatistica/ populacao/pns/2013.

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