

Food consumption differences in Brazilian urban and rural areas: the National Health Survey

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Abstract *This paper aimed to identify food consumption differences as per healthy and unhealthy diet markers among adults living in Brazilian urban and rural areas. A cross-sectional study was performed with data from the National Health Survey (2013). Diet was assessed by using healthy and unhealthy diet markers. Prevalence (%) was estimated, and sequential logistic regression models were adjusted to estimate odds ratios (OR) and confidence intervals (95%CI). Urban areas evidenced a higher consumption of fruits and vegetables, fish, soft drinks, and meal replacement by snacks, while rural areas showed higher consumption of meat with excess fat and beans. Adjusted analyses showed higher regular consumption of beans and meat with excess fat; and lower consumption of soft drinks, fruits and vegetables and meal replacement by snacks in rural areas compared to urban areas. Similar trends were observed in the macro-regions of the country. Food consumption differences among Brazilians living in rural and urban areas denote the importance of fostering food policies that respect and value food traditions and culture.*

Key words *Food Consumption, Nutrition Surveys, Rural Area, Urban Area, Health status disparities*

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Introduction

Chronic non-communicable diseases (NCDs) are a growing global health problem. One of the factors that most contribute to this progressive increase is unhealthy lifestyles, especially inadequate diet¹.

Despite the World Health Organization's (WHO) warning for more than fifteen years about the need to promote improvements in people's diet², the world food pattern is progressively deteriorating, especially in urban areas³. Food consumption changes seem to stem from the fast pace of life and intense changes in the food system, which promote increased consumption of ultra-processed foods⁴ to the detriment of fresh and minimally processed foods⁵⁻⁸.

More than half of the world's population live in urban areas⁹. In Brazil, this figure reaches 80%¹⁰. Brazil is a country of continental dimensions, with significant regional variations and a culinary heritage expressed in traditional habits and recipes¹¹. However, unequal urbanization and industrialization processes seem to affect population groups differently^{11,12} and, probably, the country's macroregions, in such a way that assessing the differences in food consumption of Brazilians living in urban and rural areas is essential, mainly because the country has a continuous and systematic effort to ensure the Human Right to Adequate and Healthy Food and food sovereignty by valuing and respecting food culture.

However, evidence on food distinctions by Brazilian macroregions in urban and rural areas is scarce. In this sense, this paper aimed to identify differences in food consumption, according to markers of healthy and unhealthy food, among adults living in Brazilian urban and rural areas.

Methods

Design and study population

A cross-sectional study was performed with data from the National Health Survey¹³ (PNS) conducted by the Brazilian Institute of Geography and Statistics (IBGE) in partnership with the Ministry of Health and nested in the Integrated Household Survey System (SIPD). The PNS stands out for being conducted face-to-face in a representative sample of the Brazilian population and its macroregions, in urban and rural areas, and is the largest national health survey. It was approved by the National Human Research Eth-

ics Committee of the Ministry of Health, and all respondents signed the Informed Consent Form.

The PNS uses a simple, three-stage cluster random sampling: (1) primary sampling units (PSU) consisting of one or more census tracts; (2) households present in each PSU selected in the first stage; (3) adult resident (≥ 18 years) selected in each household⁵.

Data collection took place between August 2013 and February 2014 on Personal Digital Assistance (PDA). In total, 64,348 home interviews and 60,202 individual interviews were conducted with the selected adult resident¹³. Further methodological details can be obtained in Souza-Júnior *et al.*⁵.

Outcome variables: healthy and unhealthy diet markers

Food consumption was analyzed by three and four healthy and unhealthy diet markers, respectively. The healthy diet markers were recommended consumption of fruits and vegetables (five or more times a day on five or more days of the week); regular consumption of beans (five days or more a week) and fish (at least once a week). The unhealthy diet markers were eating meat with fat or chicken with skin (yes); regular consumption (five days or more per week) of soft drinks or processed juice, regular consumption of sweet foods; replacing meals with snacks (replacement of lunch or dinner with sandwiches, snacks or pizzas, seven days a week).

The classification of consumption as recommended and regular was based on the Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey (VIGITEL) system, and the validity of these indicators was analyzed¹⁴.

Primary explanatory variable: household situation

The household situation in the PNS is defined by its location in urban or rural areas as per the municipal law in force at the time of the Demographic Census. The urban condition covers areas corresponding to cities (municipal headquarters), towns (district headquarters), or isolated urban areas, whereas the rural situation covers the entire area outside these limits¹⁰.

Covariates

The following sociodemographic data were used as adjustment variables: gender (male and

female), age group (18-29, 30-39, 40-49, 50-59 and 60 and over), schooling (illiterate and with little education: no education and incomplete elementary school, complete basic education: complete elementary school and incomplete secondary school, incomplete higher education: complete high school and incomplete higher education, complete higher education: full higher education), skin color (black, brown and white) and macroregions of the country (North, Northeast, South, Southeast, and Midwest).

Data analysis

The analyses were performed using the Stata software (Stata Corporation, College Station, Texas) version 14.0 using the *svy* command, which considers the intricate design of the sample. Initially, a descriptive analysis of the variables was performed by calculating the prevalence and 95% confidence interval.

Adjusted sequential logistic regression models were built to verify the association between place of residence and healthy and unhealthy diet markers. Model 1 was adjusted for the gender and age variables; Model 2 was adjusted for variables of Model 1 plus schooling and skin color; and Model 3 was adjusted for the variables of Model 2 plus the country's macroregions. The results were shown by the odds ratio and 95% confidence interval.

Results

The Brazilian population resides mostly in urban areas (81.0%; 95%CI: 80.8-81.2). The proportion of individuals residing in rural areas of the country was higher only in the North and Northeast macroregions (Table 1).

The rural areas showed a predominance of male individuals (51.4%, 95%CI: 49.7-53.0 vs. 46.5%, 95%CI: 45.6-47.3), brown (54.6%, 95%CI: 52.6-56.5 vs. 40.6%, 95%CI: 39.8-41.5), illiterate or with little instruction (66.0% 95%CI: 64.1-67.7 vs. 34.7%, 95%CI: 33.8-35.6) when compared to urban areas (Table 1).

When analyzing the prevalence of the markers of healthy and unhealthy food consumption in Brazil, when comparing rural areas with urban areas, we observed a lower consumption of fruits and vegetables, fish, soft drinks and meal replacement with snacks; and higher consumption of beans, and meat or chicken with excess fat, and no differences for the consumption of

sweet foods (Table 2). Differences were also observed between the macroregions, with higher consumption of fish in the North and Northeast regions, and of beans in the Southeast and Midwest regions. However, lower consumption of fruits and vegetables was found in the Northeast.

When analyzing these markers by country's macroregions, we observed prevalence variations and differences in magnitude. For example, in the North of the country, the prevalence of regular fish consumption was higher in rural areas (78.9%, 95%CI: 77.3-80.3 vs. 73.8%, 95%CI: 72.9-74.7), as well as the consumption of sweets in the urban areas of the Northern macroregions (12.2%, 95%CI: 11.6-12.9 vs. 9.0%, 95%CI: 8.0-10.1) and the northeast (18.3%, 95%CI: 17.7-19.0 vs. 15.0%, 95%CI: 14.0-16.1) when compared to rural areas (Table 2).

In the adjusted analysis of the markers of healthy and unhealthy food consumption, we observed a higher consumption of beans (OR=1.20; 95%CI: 1.14-1.26) and meat or chicken with excess fat (OR=1.48; 95%CI: 1.42-1.55); and lower consumption of fruits and vegetables (OR=0.89; 95%CI: 0.85-0.96); fish (OR=0.88; 95%CI: 0.84-0.92); soft drinks (OR=0.55; 95%CI: 0.52-0.59) and replacement of meals with snacks (OR=0.59; 95% CI: 0.51-0.66) (Table 3).

Discussion

Differences are observed in food consumption, as per healthy and unhealthy diet markers, between adults living in Brazilian urban and rural areas, and macroregions. Brazilians living in rural areas are more likely to have a traditional dietary pattern, with the consumption of minimally processed foods, especially beans, and lower consumption of ultra-processed foods, despite the lower consumption of fruits and vegetables, and fish.

These food consumption pattern differences observed between urban and rural areas were also seen in the country's macroregions. Noteworthy, only in the North macroregion, is the highest consumption of fish in rural and non-urban areas, as observed in the rest of the country and other macroregions.

Brazil has excellent territorial extension and differences in climate, culture, and economic activities in its macroregions, producing national and regional marks, which probably reflect the diversity of the eating habits of the Brazilian population. A national mark identified in this study

Table 1. Description of the sample by sociodemographic characteristics and region. National Health Survey, Brazil, 2013 (N=60,202).

Variable	Brazil		Urban		Rural	
	%	95%CI	%	95%CI	%	95%CI
Gender						
Male	47.2	46.4-47.9	46.5	45.6-47.3	51.4	49.7-53.0
Female	52.8	52.1-53.6	53.5	52.6-53.3	48.6	48.6-50.3
Age group (years)						
18-29	26.1	25.4-26.7	26.2	25.6-26.9	25.2	23.7-26.7
30-39	21.6	21.0-22.2	21.6	20.9-22.2	21.8	20.6-23.0
40-49	18.1	17.5-18.6	18.0	17.4-18.3	18.4	17.3-19.5
50-59	16.2	15.6-16.7	16.4	15.7-17.0	15.2	14.2-16.4
≥60	18.0	17.4-18.6	17.8	17.1-18.5	19.4	19.3-20.5
Skin color						
White	48.1	47.3-48.9	50.1	49.2-50.9	36.1	34.2-38.0
Brown	42.6	41.8-43.3	40.6	39.8-41.5	54.6	52.6-56.5
Black	9.3	8.9-9.8	9.3	8.8-9.8	9.3	8.0-10.7
Schooling						
Illiterate or with little education ¹	39.0	38.2-39.9	34.7	33.8-35.6	66.0	64.1-67.7
Complete Basic Education ²	15.6	15.0-16.1	15.7	15.1-16.3	14.8	13.5-16.2
Incomplete Higher Education ³	32.7	32.0-33.5	35.4	34.5-36.2	16.3	15.0-17.7
Complete Higher Education ⁴	12.7	12.0-13.4	14.2	13.4-15.1	2.9	2.3-3.4
Region						
North	7.4	7.2-8.6	6.7	6.5-6.9	11.7	10.9-12.5
Northeast	26.6	26.1-27.1	23.5	23.0-24.0	45.8	44.0-17.6
Southeast	43.8	43.1-44.4	47.3	46.6-48.0	21.8	50.1-23.6
South	14.9	14.3-15.2	14.7	14.2-15.1	16.0	14.8-17.2
Midwest	7.3	7.1-7.5	7.8	7.5-8.0	4.7	4.3-5.1

¹Illiterate or with little education (Illiterate and incomplete Elementary School); ²Complete Basic Education (Complete Elementary School and Incomplete Secondary School); ³Incomplete Higher Education (Complete Secondary School and incomplete Higher Education); ⁴Complete Higher Education (Full Higher Education).

Source: Elaborated by the authors, 2019.

is the consumption of beans, while the consumption of fish is a regional mark.

Another study conducted with PNS data, but aiming at analyzing the prevalence of the consumption of foods considered healthy markers in the Brazilian population as a whole, revealed that healthy eating habits are still in force in the country. We found that approximately three-quarters of the population consumed beans regularly, just over a third had recommended fruit and vegetable consumption, and just over half of the population¹⁵ reported the regular consumption of fish.

In this study, higher consumption of beans was observed in rural areas of all macroregions of the country, except in the North, in which consumption did not differ between areas. Beans are an important marker of the food culture of the entire Brazilian population and healthy eating¹⁶⁻¹⁸, a symbol of basic and daily food for Brazilians.

These results may suggest that the urbanization process and changes in the contemporary food pattern may, somehow, contribute to reducing the consumption of this minimally-processed food, the preparation of which requires more time and culinary skills, resulting in significant loss to the traditional national food culture¹⁹.

Traditional food in the food culture of Brazilians living in rural areas – meat with excess fat – was also more prevalent in these locations. These results are similar to those obtained in a study conducted with a sample of adults living in rural areas of a state in the Southeastern Brazilian macro-region, which identified a prevalence of over 70% of animal fat consumption²⁰. However, despite being a traditional food, fatty meats are considered an unhealthy diet marker because their excessive consumption is associated with the risk of developing cardiovascular diseases²¹.

Table 2. Prevalence of healthy and unhealthy diet markers by region of the country and household situation. National Health Survey, Brazil, 2013.

Diet Markers	Prevalence % (95% CI)					
	Brazil		North		Northeast	
	Urban	Rural	Urban	Rural	Urban	Rural
Healthy						
Recommended consumption of FV	38.2 (37.3-39.2)	31.2 (29.4-33.0)	37.1 (36.1-38.0)	30.4 (28.8-32.1)	29.1 (28.4-30.0)	22.6 (21.4-23.9)
Regular consumption of beans	71.2 (70.4-72.0)	76.3 (74.6-77.9)	50.0 (49.0-51.0)	48.3 (46.5-50.1)	69.2 (69.4-70.0)	79.5 (78.2-80.7)
Regular consumption of fish	55.2 (54.2-56.2)	50.8 (48.3-53.2)	73.8 (72.9-74.7)	78.9 (77.3-80.3)	68.1 (67.3-39.9)	60.4 (59.0-61.9)
Unhealthy						
Consumption of meat or chicken with excess fat	35.8 (34.9-36.7)	45.8 (43.9-47.8)	31.7 (30.7-32.6)	42.3 (40.5-44.1)	26.2 (25.5-26.9)	33.1 (31.7-37.5)
Regular consumption of soft drinks	24.9 (24.2-25.7)	13.5 (12.4-14.8)	26.2 (25.3-27.1)	11.6 (10.5-12.8)	16.8 (16.2-17.5)	12.4 (11.4-13.4)
Regular consumption of sweet foods	22.0 (21.3-22.7)	19.5 (17.9-21.3)	12.2 (11.6-12.9)	9.0 (8.0-10.1)	18.3 (17.7-19.0)	15.0 (14.0-16.1)
Replacing meals with snacks	4.3 (3.9-4.7)	2.1 (1.6-2.9)	4.1 (3.7-4.5)	1.2 (0.9-1.7)	3.5 (3.2-3.9)	1.8 (1.4-2.2)
Diet Markers	Prevalence % (95% CI)					
	Southeast		South		Midwest	
	Urban	Rural	Urban	Rural	Urban	Rural
Healthy						
Recommended consumption of FV	44.1 (43.2-45.0)	40.3 (37.9-42.7)	36.2 (35.1-37.4)	36.2 (33.3-39.1)	46.9 (45.7-48.1)	44.0 (41.0-47.1)
Regular consumption of beans	75.7 (74.9-76.4)	88.4 (87.0-90.0)	55.8 (54.6-57.6)	65.5 (62.6-68.3)	77.4 (76.3-78.4)	85.2 (82.9-87.2)
Regular consumption of fish	54.5 (53.7-55.4)	42.3 (40.0-44.8)	48.8 (47.6-50.0)	35.9 (33.0-38.8)	45.5 (44.3-46.8)	43.5 (40.6-46.6)
Unhealthy						
Consumption of meat or chicken with excess fat	34.1 (33.3-34.9)	55.3 (52.9-57.8)	35.6 (34.4-36.8)	54.2 (51.2-57.2)	42.7 (41.5-43.9)	57.2 (54.2-60.2)
Regular consumption of soft drinks	24.5 (23.8-25.3)	22.4 (20.5-24.6)	27.2 (26.1-28.3)	16.2 (14.1-18.6)	27.0 (25.9-28.1)	18.8 (16.6-21.3)
Regular consumption of sweet foods	21.9 (21.1-22.6)	24.4 (22.4-26.6)	25.2 (24.2-26.3)	22.5 (20.0-25.1)	21.5 (19.6-21.5)	21.8 (19.4-24.4)
Replacing meals with snacks	8.5 (8.0-9.0)	5.4 (4.4-6.7)	10.5 (9.8-11.3)	6.3 (5.0-8.0)	7.9 (7.3-8.6)	3.2 (2.2-4.4)

Note: FV=Fruits and vegetables

Source: Elaborated by the authors, 2019.

The greater consumption of these foods in the Midwest and South may be related to cultural and economic aspects, since these macroregions stand out for their agricultural activity²², favoring access (price and availability), besides their strong symbolic value represented by barbecue culture in these regions²³.

Concerning the consumption of ultra-processed foods, the lower consumption of soft drinks in rural areas may reveal a “protection” of traditional eating habits in these areas, which

must be maintained. However, efforts must be made to contain the increased consumption of sugary drinks, given the vital association between the consumption of these drinks, and overweight and NCDs²⁴. Thus, the adoption of macropolicies, such as taxation and changes in food labeling as experienced in other countries, is essential²⁵⁻²⁷.

However, despite this traditional dietary pattern based mainly on minimally-processed foods, rural areas also had a lower prevalence of consumption of fresh and minimally processed

Table 3. Odds ratio values for markers of healthy and unhealthy diet by residence in urban or rural areas of the Brazilian adult population. National Health Survey, Brazil, 2013.

Diet markers	Crude OR	Adjusted OR ^a	Adjusted OR ^b	Adjusted OR ^c
Healthy				
Recommended consumption of FV	0.73 (0.70-0.76)	0.73 (0.70-0.77)	0.83 (0.80-0.88)	0.89 (0.85-0.96)
Regular consumption of beans	1.26 (1.21-1.33)	1.23 (1.18-1.29)	1.07 (1.02-1.13)	1.20 (1.14-1.26)
Regular consumption of fish	0.94 (0.90-0.98)	0.93 (0.89-0.97)	1.00 (0.96-1.05)	0.88 (0.84-0.92)
Unhealthy				
Consumption of meat or chicken with excess fat	1.57 (1.50-1.64)	1.51 (1.45-1.59)	1.37 (1.30-1.43)	1.48 (1.42-1.55)
Regular consumption of soft drinks	0.56 (0.53-0.60)	0.55 (0.52-0.59)	0.52 (0.49-0.55)	0.55 (0.52-0.59)
Regular consumption of sweet foods	0.80 (0.76-0.85)	0.81 (0.77-0.86)	0.93 (0.88-0.99)	1.00 (0.93-1.05)
Replacing meals with snacks	0.41 (0.36-0.46)	0.41 (0.37-0.47)	0.52 (0.46-0.59)	0.59 (0.51-0.66)

Note: in bold: statistically significant associations. ^aUrban reference category. ^aAdjusted for gender and age; ^bAdjusted for gender, age, skin color and schooling; ^cAdjusted for gender, age, skin color, schooling and macro-region of the country.

Source: Elaborated by the authors, 2019.

foods, such as fruits and vegetables, and fish, respectively.

Differences in fish consumption between rural and urban areas may derive from the high cost and lower availability of this food in rural areas²⁸, especially those where fishing is not a traditional subsistence activity. Furthermore, it is necessary to recognize territorial differences, such as, for example, in the Northern macro-region, which had a prevalence of consumption above 70% in both urban and rural areas, possibly showing differences in food culture. In any case, these results reveal the need to stimulate the consumption of this food in the country, given its nutritional value and easy access in coastal areas, and the potential for expanding fishing in the country as a way to guarantee food and nutritional security²⁹.

The consumption of fruits and vegetables is still insufficient across the country. However, almost twice as many individuals living in urban areas reported recommended consumption, compared to those in rural areas³⁰. Such differences may indicate distinctions concerning the availability of these foods and prices charged³¹. A study carried out in Canada, for example, found lower access to FV in rural areas, with negative impacts on consumption^{32,33}. Another study conducted in 18 countries, including Brazil, showed that more significant financial expenditure is

required in rural areas compared to urban areas to consume the recommended amount of these foods³³.

The incentive to family farming, as well as the practice of affordable prices, solidary economy, and rural cooperativism are strategies that can increase the consumption of FV and benefit the health of this population, since much of the Brazilian production is destined for export, and the producer does not consume them. Qualitative study that investigated the subjective issues related to the consumption of FV among farmers in the rural area of São Paulo showed that, for fruit growers, fruit is not food, but work, therefore, they do not have a feeding function, their consumption is not essential, and its production has to ensure family subsistence. Thus, despite being cultivated and consumed routinely, fruits are considered food only when purchased. Vegetables, in turn, were classified as foods of secondary importance³⁴. Moreover, given the PNS sectional design, it was not possible to measure the influence of seasonality on FV consumption, both in rural and urban areas. Thus, we suggest conducting a study that considers possible seasonal consumption patterns by different periods of PNS data collection.

Food consumption unifies the country from the viewpoint of nutrition and, at the same time,

reveals its history, culture, traditions, and how it experiences the process of urbanization and globalization²³. Urbanization carries a series of changes in food consumption resulting from the lack of time to prepare and buy food, which can affect the choice for a more practical diet and with greater participation of ultra-processed foods^{20,35,36}. This can reveal, somehow, a probable penalty for living in the urban environment¹¹ since the search for practicality can lead to greater participation of ready-to-eat foods in the diet, meals prepared outside the home, and replacement of meals with snacks^{35,36}. As an example of this issue, this study mentions the differences identified in the prevalence of replacing lunch and dinner with sandwiches, snacks, or pizzas among Brazilians living in urban and rural areas. Between 1974 and 2003, there was an up to three times lower prevalence of consumption of ready-made and processed meals in rural areas compared to urban areas³⁷. Likewise, data from the Household Budget Survey (2008-2009) showed a lower prevalence of eating outside the home in rural areas³⁸.

Alongside urbanization, globalization generates a tendency to reduce regional differences due to the higher likelihood of integration, exchange of information, and food outreach. Thus, it is believed that the trend is that more and more residents of rural areas will adhere to the dietary standards of urban areas. As a result, the strong performance of public policies to promote adequate and healthy food that value the traditional food culture of Brazilians, as well as regulatory measures that contribute to building healthy eating environments is of paramount importance. Promoting healthy eating environments and valuing existing ones are crucial measures to favor and strengthen individual changes and enhance people's initiatives. Furthermore, in rural

areas, it requires the recognition of its potential as health-promoting environments, valuing local traditions, and cultural roots.

This study has limitations that should be considered. Food surveys are subject to information bias, impairing the measurement of the usual diet. Moreover, it is worth mentioning that because we are in a country of continental dimension and great diversity, rural and urban areas may not be homogeneous, and the multiple structure and geography may affect the results. However, this study has a sample power to be representative of these areas, considering the entire Brazilian territory.

On the other hand, a definite highlight of the study is the analysis of data adjusted by possible confounding variables, a statistical strategy that had not been explored in previous studies that used the same database. Finally, the importance of this study is evident when working with the National Health Survey, which is representative of the adult Brazilian population of all macroregions, especially with a better understanding of the food dynamics of urban and rural areas of a country with recognized diversity like Brazil, which opens horizons for nutritional interventions in these regions as per their peculiarities.

It is concluded that there are differences in the food consumption of Brazilians living in urban and rural areas. We consider, however, that differences tend to decrease with the advance of urbanization and industrialization. This study reveals that the food and nutrition policies, as well as the guidelines for the practice of adequate and healthy food diet provided to Brazilians, must be consonant not only with the economic and social context experienced but that also respect and value the cultural food dimensions aiming at its feasibility, sustainability, and promotion of well-being to the population.

Collaborations

DVP Costa, MS Lopes, RD Mendonça, PP Freitas and ACS Lopes participated in the project design, analysis and interpretation of data. DC Malta designed and coordinated the National Health Survey, coordinated the methodology and questionnaires used, and the analysis plan. DVP Costa, MS Lopes and PP Freitas were responsible for writing the article. And all authors were responsible for the final review of the article and its approval.

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