DOI: 10.1590/1413-81232018247.19992017

Perceived barriers for the consumption of fruits and vegetables in Brazilian adults

Graziela Maria Gorla Campiolo dos Santos (https://orcid.org/0000-0002-6416-8107) [1]
Ana Maria Rigo Silva (https://orcid.org/0000-0002-9527-4914) [1]
Wladithe Organ de Carvalho (http://orcid.org/0000-0003-1950-2505) [1]
Cassiano Ricardo Rech (https://orcid.org/0000-0002-9647-3448) [2]
Mathias Roberto Loch (https://orcid.org/0000-0002-2680-4686) [1]

Abstract *This study aimed to verify the association between perceived barriers to consumption of fruits (CF) and vegetables (CV) with demographic characteristics. A cross-sectional study was performed (n = 877 people with ≤44 years from Cambé (PR), a medium-sized Brazilian city). We investigated five barriers to CF and CV. We used binary logistic regression analysis adjusted for demographic variables. "Cost burdens family budget" was the most prevalent barrier (CF 57.7%, CV 49.9%), with a greater probability of barrier to CF in women and people with lower schooling (0-4 years/study) and to CV in women, people with lower schooling and economic level B/C. "Family doesn't have the habit" was mentioned for 16.4% for CF and 10.9% for CV, with a greater probability for people aged 50-59 years in CF. "Does not have the time to buy fresh food" was quoted by 8.0% (CF) and 7.6% (CV), with a greater probability of the CF barrier in women and single individuals. "Need to prepare" had a prevalence of 7.6% for CF, with greater probability for those aged 44-59 years and 9.7% for CV, and was higher in women. The prevalence for "Not liking the taste" was 6.2% for CF and 6.6% for CV, with a greater probability in black/brown/indigenous people.*

Key words *Food habits, Feeding behavior, Fruit, Vegetables, Cross-sectional studies*

[1] Programa de Pós-Graduação em Saúde Coletiva, Centro de Ciências da Saúde, Universidade Estadual de Londrina. Av. Robert Koch 60, Vila Operária. 86038-350 Londrina PR Brasil. grazielacampiolo@yahoo.com.br
[2] Programa de Pós-Graduação em Educação Física, Universidade Federal de Santa Catarina. Florianópolis SC Brasil.

Introduction

The first principle shown by the second edition of the Food Guide for the Brazilian Population is that food is more than the mere intake of nutrients, since it is influenced by cultural and social realms and should therefore be treated beyond merely functional aspects. In addition, food patterns have changed rapidly, especially since the last decades, both in higher income countries and in middle and lower income countries. In the Brazilian case, it seems that the main changes involve the replacement of fresh or processed foods of vegetable origin (rice, beans, cassava, potatoes and vegetables) and culinary preparations based on these foods by ready-to-eat industrialized products. These changes have contributed to the imbalanced supply of nutrients and the excessive intake of calories[1].

Insufficient fruit and vegetable intake is among the top ten risk factors for all-cause death. Among middle-income populations, it is estimated that 0.9 million deaths/year are attributed to this risk factor (3.9% of all deaths) and approximately 0.2 million deaths/year (2.5% of total deaths)[2] occur among high-income populations. In addition, results from meta-analyses with prospective studies have shown that greater fruit or vegetable consumption is associated with a significantly reduced risk of diabetes type 2[3-5] and cardiovascular diseases[6].

Given this context, it is of great importance to seek greater knowledge about the factors that hinder or facilitate the adoption of healthy eating habits so that interventions that are more effective are elaborated to promote them. To that effect, we must be consider that the adoption or not of any behavior is complex, not a mere matter of individual choice.

Some studies on barriers to the consumption of fruits and vegetables have been identified. Among those using a qualitative methodology, Figueira et al.[7] interviewed 62 users of the Belo Horizonte Health Academy Program. Lucan et al.[8] interviewed 20 low-income black Americans in Philadelphia. Yeh et al.[9] carried out a study from 12 focus groups, involving 147 participants of African-American, Hispanic and Caucasian origin in North Carolina and Connecticut (USA).

Among cross-sectional quantitative studies, the Eikenberry and Smith[10] studies involved 796 low-income individuals recruited in food programs, grocery stores and other public places in four communities of the U.S. A study conducted in Santiago, Chile, included 449 university students[11], and another study in the same country included 463 mothers of schoolchildren of different socioeconomic levels and 412 elementary school teachers[12]. A study in Brasilia investigated 98 adults[13]. Among the barriers mentioned in these studies are high cost, lack of time, unpleasant taste, lack of habit, high perishability of these foods, "laziness", forgetfulness, lack of satiation, difficulty in transporting to work, little availability in the market, preparation, among others.

The mentioned studies referred mostly to specific populations and only two were conducted in Brazil. Considering the importance of knowing the distribution of these barriers in the adult population, providing information to assist in the elaboration of strategies and public policies, this study aimed to estimate the prevalence of perceived barriers to the consumption of fruits and vegetables and to analyze its association with sociodemographic characteristics in adults of a medium-sized municipality in the southern region of Brazil.

Methodology

This is a cross-sectional study with individuals aged 44 years or older living in the urban area of the city of Cambé (PR), metropolitan region of Londrina, Brazil. The research is part of the project VIGICARDIO: "Cardiovascular Diseases in the State of Paraná: mortality, risk profile, drug therapy and complications", approved by the Human Research Ethics Committee of the State University of Londrina, Londrina (PR). The project began in 2011, with population-based sampling in which 1,180 subjects aged 40 years or older were interviewed. At the time, the study population consisted of all residents in the urban area of the municipality and aged 40 years or over. We chose this age group intentionally, considering the greater occurrence of cardiovascular complications in individuals aged 40 years and over, which was the central focus of the larger project. The municipality is located in the northern region of Paraná, in the metropolitan region of Londrina. In 2010, according to the Demographic Census[14], Cambé had 93,733 inhabitants with a population density of 195.54 inhabitants per km^2. The municipality's Human Development Index in 2000 was 0.793 (mean human development) and Gini Index for household income of 0.40. Further details on the sampling process of the study conducted in 2011, as well as characteristics of the investigated subjects are available in Souza et al.[15].

In 2015, the same subjects were sought again. This new data collection occurred between March and October 2015 through home interviews. The physical form (of which data were double entered and inconsistencies corrected later) was used for approximately 2/3 of the data, and tablets were used for the remainder. Interviews were scheduled by telephone, and for the cases not located in this way, a direct home visit was carried out. Subjects not found in three visits, performed on different days and periods, including one day at the end of the week were considered losses.

Dependent variables

Since, in 2011, no information on perceived barriers to fruit and vegetable consumption was found and that, at the time of planning the study, a specific tool was not found in the literature for its evaluation, we decided to elaborate questions, whose process construction took place in different stages:

1) Users in waiting rooms of some PHC facilities of Londrina (PR) answered the following question: a) In your opinion, what are the main barriers / difficulties to a healthy diet?

2) Due to people's difficulty in understanding the question asked in the previous stage, a more specific question was asked about the intake of fruits or vegetables, also applied to PHC facilities' users: What are the main barriers/difficulties to eating fruits or vegetables?

3) From the answers obtained in the second stage, questions were elaborated based on the most frequent ones, with alternatives of dichotomous answers, as follows:

a) In general, do you like the taste of fruit? b) Does your family have a habit/custom of eating fruits?; c) Is the cost of fruits a burden to the household's budget? (or would be, if purchased); d) The need to prepare fruits (washing and peeling, for example) is a difficulty to eat (eat more) fruits?; e) Do you have time to go to the market frequently to buy fresh fruits?

For questions "d" and "e", in addition to the "yes" and "no" alternatives the following response options were set: "other people perform this activity/task" and "I have some limitations that prevent me from performing this activity/task". For these cases, the barrier was considered only if the subject answered "yes" to question "d" and "no" to question "e".

In addition to these five questions, the following question was asked: "Is there any other factor that makes it difficult for you to eat (or eat more) fruits?" The same questions were asked in relation to the consumption of vegetables.

Independent and control variables

The independent variables (also used as control) were collected from subjects' self-reported information at the time of the interview. The variables used in this study and the respective categories were: gender (male and female); age range, in years (44-49, 50-59, 60 and over); self-reported ethnicity/skin color (white/yellow and brown/black/indigenous); years of schooling (0-4, 5-8, 9 and over); economic class, grouped as A and B; C; D and E (ABEP, 2015)[16] and marital status (with companion, without companion).

Data review

Information obtained from the physical form was double entered into a Microsoft Office Excel® 2010 program database. Only this information was transcribed and compared to verify inconsistencies using the Spreadsheet Compare program. The information collected using ODK Collect did not require transcription or validation since they were concomitantly collected and cloud stored in Excel format (Ona Server). Analyses were performed in the Statistical Package for Social Science (SPSS), version 19.0. Descriptive statistics were used to characterize the sample, and a binary logistic regression, gross and adjusted analysis (for all sociodemographic variables), with calculation of OR, were used to verify the association between the demographic variables and barriers.

Results

Of the 1,180 subjects who participated in the VIGICARDIO study in 2011, 295 were losses (108 for change of address and no new location, 87 for refusals, 51 for deaths, 49 were not found after three visits, and 8 had to be excluded for failing to respond to questions related to this study's objectives). Thus, we considered data from 877 subjects aged 44 years or older.

Respondents were mostly women (55.9%), aged 44-59 years old (60.6%) and self-declared as white (60.2%), had up to eight years schooling (71.3%), were classified at economic level C or lower (64.4%) and had a companion (68.9% married or with common-law marriage status) (Table 1).

Table 1. Distribution of the sample according to demographic characteristics, Cambé - PR, 2015.

Characteristics	n	%
Gender		
Female	490	55,9
Male	387	44,1
Age range (years)		
44-49	197	22,5
50-59	334	38,1
60-69	225	25,7
70-79	100	11,4
80 and over	21	2,4
Ethnicity/skin color		
White	528	60,2
Yellow	26	3,0
Indigenous	6	0,7
Brown	258	29,4
Black	59	6,7
Years of schooling		
0-4	392	44,7
5-8	233	26,6
9 and over	252	28,7
Economic class		
A	50	5,7
B	262	29,9
C	464	52,9
D – E (lower)	101	11,5
Marital status*		
Single	70	8,0
Married or stable union	604	68,9
Divorced	78	8,9
Widow	123	14,0

* Difference in n value due to non-responses of two respondents.

Regarding the barriers to fruit consumption, the most mentioned was "cost burdens the household's budget" (57.7%). The probability of showing this barrier was significantly higher among women (OR = 1.93; 95% CI-1.45-2.57) and those with 0-4 years of schooling (OR = 1.57; 95% CI = 1.07-2.31). The "family has no habit/ custom of consuming fruits" was mentioned by 16.4% of the sample and the probability of showing this barrier was higher among individuals aged 50-59 years (OR = 2.01; 95% CI = 1.30-3.10). The "lack of time to go to market/fair often to buy fresh fruits" was mentioned by 8.0% of the sample and the probability of showing this barrier was higher among women (OR = 1.79; 95% CI = 1.03-3.12) and among those who had no companion (OR = 1.92; 95% CI = 1.14-3.24). The "need to prepare" barrier was mentioned by 7.6% of the sample and the probability of showing this barrier was higher among individuals aged 44-49 years (OR = 2.37; 95% CI = 1.10-5.12) and 50-59 years (OR = 2.35; 95% CI = 1.22-4.51). The "not liking fruits" barrier was mentioned by 6.2% of the sample and was not associated with any demographic variables (Table 2).

Regarding barriers to the consumption of vegetables, the most mentioned was the "cost burdens the household's budget", with a prevalence of 49.9%. The probability of showing this barrier was higher among women (OR = 1.63; 95% CI = 1.23-2.16), individuals with up to 4 years of schooling (OR = 1.79; 95% CI = 1.22-2.63) and economic level B and C (OR = 2.01; 95% CI = 1.01-3.99). The "family has no habit/ custom of consuming vegetables" was mentioned by 10.9% of the sample and no association was observed with the demographic variables. The "need to prepare" barrier was mentioned by 9.7% of the sample and the probability of showing this barrier was higher among women (OR = 1.69, 95% CI = 1.03-2.76). The barrier "lack of time to go to the market/fair frequently to buy fresh vegetables" was mentioned by 7.6% of the sample and no association was observed with the demographic variables. The "not liking the taste of vegetables" barrier was mentioned by 6.6% of the sample and the probability of showing this barrier was higher among brown / black / indigenous individuals (OR = 2.43; 95% CI = 1.38-4.26) (Table 3).

As for the other barriers mentioned by respondents, we observed that 16 and 17 other barriers were mentioned for the consumption of fruits and vegetables, respectively. Among these, the most mentioned regarding fruit consumption was "lack of personal habit" (4.3%), followed by "health-related problems" (2.1%) and "lack of time to consume at work" (1.9%). In the consumption of vegetables, the most mentioned "other barriers" were "lack of personal habit" (2.1%) and "no variety of quality vegetables in the market" (1%) (Data not shown in the tables).

Discussion

Study results indicate that the main perceived barrier to fruit and vegetable consumption is related to their cost, with a most likely perception among women and individuals with lower levels of schooling. Other barriers investigated had a frequency much lower than the cost-related.

Features of identified barriers reinforce the urgency of addressing the issue intersectorally,

Table 2. Association between perceived barriers to fruit consumption and demographic variables. Data adjusted for all demographic variables. Cambé, PR, 2015.

	Not liking the taste OR (IC 95%)	Family has no habit/custom OR (IC 95%)	Cost burdens the household's budget OR (IC 95%)	Need to prepare OR (IC 95%)	Lack of time to go to Market/fair frequently OR (IC 95%)
Total prevalence (%	6,2	16,4	57,7	7,6	8,0
Gender					
Male	1,0	1,0	1,0	1,0	1,0
Female	0,98 (0,55-1,74)	1,15 (0,79 – 1,67)	1,93 (1,45 – 2,57)	1,00 (0,59 – 1,69)	1,79 (1,03 – 3,12)
AGE RAGE (years)					
60 and over	1,0	1,0	1,0	1,0	1,0
50-59	1,66 (0,83- 3,30)	2,01 (1,30 – 3,10)	1,02 (0,73 – 1,41)	2,35 (1,22 – 4,51)	1,37 (0,75 – 2,53)
44-49	2,00 (0,89-4,50)	1,12 (0,64 – 1,95)	1,08 (0,73 – 1,61)	2,37 (1,10 – 5,12)	1,56 (0,76 – 3,20)
Ethnicity/skin color					
White/yellow	1,0	1,0	1,0	1,0	1,0
Brown/black/indigenous	1,12 (0,63- 1,99)	1,02 (0,69 – 1,50)	1,08 (0,81 – 1,46)	0,67 (0,38 – 1,19)	0,94 (0,55 – 1,62)
Years of schooling					
9 and over	1,0	1,0	1,0	1,0	1,0
5-8	1,68 (0,72- 3,91)	0,98 (0,59 – 1,62)	1,19 (0,81 – 1,76)	0,74 (0,35 – 1,57)	1,01 (0,49 – 2,07)
0-4	1,95 (0,84- 4,53)	0,92 (0,56 – 1,52)	1,57 (1,07 – 2,31)	1,16 (0,57 – 2,34)	1,07 (0,53 – 2,17)
Economic class					
A (higher)	1,0	1,0	1,0	1,0	1,0
B e C	1,09 (0,23- 5,25)	1,04 (0,46 – 2,35)	1,72 (0,90 – 3,28)	0,50 (0,20 – 1,26)	0,89 (0,28 – 2,83)
D e E (lower)	0,81 (0,13- 5,15)	0,65 (0,23 – 1,89)	2,18 (0,98 – 4,85)	0,48 (0,13 – 1,77)	0,81 (0,19 – 3,34)
Marital status					
With companion	1,0	1,0	1,0	1,0	1,0
Without companion	1,09 (0,58- 2,01)	1,24 (0,83 – 1,85)	0,93 (0,68 – 1,27)	1,07 (0,60 – 1,89)	1,92 (1,14 – 3,24)

Table 3. Association between perceived barriers to consumption of vegetables and demographic variables. Data adjusted for all demographic variables. Cambé, PR, 2015.

	Not liking the taste OR (IC 95%)	Family has no habit/ custom OR (IC 95%)	Cost burdens the household's budget OR (IC 95%)	Need to prepare OR (IC 95%)	Lack of time to go to Market/fair frequently OR (IC 95%)
Total prevalence (%)	6,6	10,9	49,9	9,7	7,6
Gender					
Male	1,0	1,0	1,0	1,69	1,0
Female	0,94 (0,54-1,64)	1,23 (0,79 – 1,93)	1,63 (1,23 – 2,16)	1,00 (1,03 – 2,76)	1,46 (0,85 – 2,52)
AGE RAGE (years)					
60 and over	1,0	1,0	1,0	1,0	1,0
50-59	0,73 (0,39- 1,35)	1,43 (0,86 – 2,38)	1,07 (0,78 – 1,48)	1,34 (0,78 – 2,31)	1,61 (0,85 – 3,04)
44-49	0,52 (0,22-1,25)	1,24 (0,66 – 2,35)	1,23 (0,83 – 1,82)	1,31 (0,68 – 2,54)	1,85 (0,89 – 3,86)
Ethnicity/skin color					
White/yellow	1,0	1,0	1,0	1,0	1,0
Brown/black/indigenous	2,43 (1,38- 4,26)	0,89 (0,56 – 1,41)	0,97 (0,72 – 1,29)	0,92 (0,57 – 1,50)	1,08 (0,63 – 1,86)
Years of schooling					
9 and over	1,0	1,0	1,0	1,0	1,0
5-8	0,83 (0,34- 204)	0,71 (0,38 – 1,33)	1,20 (0,82 – 1,76)	0,81 (0,43 – 1,56)	1,28 (0,62 – 2,64)
0-4	1,65 (0,76- 3,59)	0,97 (0,54 – 1,73)	1,79 (1,22 – 2,63)	1,05 (0,57 – 1,94)	1,12 (0,53 – 2,35)
Economic class					
A (higher)	*	1,0	1,0	1,0	1,0
B e C	1,0	1,29 (0,46 – 3,57)	2,01 (1,01 – 3,99)	2,89 (0,65 – 12,8)	0,50 (0,18 – 1,40)
D e E (lower)	0,38 (0,13- 1,11)	1,44 (0,42 – 4,92)	2,05 (0,91 – 4,66)	2,15 (0,40 – 11,7)	0,40 (0,10 – 1,58)
Marital status					
With companion	1,0	1,0	1,0	1,0	1,0
Without companion	0,75 (0,40- 1,42)	1,20 (0,75 – 1,92)	0,88 (0,64 – 1,19)	1,15 (0,70 – 1,90)	1,57 (0,91 – 2,69)

* there were no cases between economic level A.

since it involves structural, economic, cultural, educational and social elements that cannot be ignored in the study of human-related food issues. While, to some extent, the food type definition of each person or household depends on individual choices, which depend on larger circumstances and often subjects have less choosing power than they actually believe they do.

The price of products involves more than individual or household budget organization. It is determined by economic and political choices that do not always favor healthy eating. This context reflects the influence of the food industry, including lobbying, with the legislative and executive branches of government[17] and agricultural public policies in Brazil that often privilege agribusiness to the detriment of family agriculture[18].

Another important point concerns advertising. Personal preferences in various fields are, at least partially, determined by the media, which sometimes are subtle and go unnoticed. Even news features of an apparently merely journalistic nature are not exempt and often appear to serve the interests of advertisers more than public interest[19,20]. The food guide for the Brazilian population emphasizes that one of the 10 steps to adequate and healthy food is "to be critical about the information, guidance and messages about food linked in commercial programs", also because there also seems to be a lot of information available about healthy eating, but few are safe and evidence-based sources[1].

Although this study did not analyze the feminization of poverty, understood as "changing levels of poverty from an unfavorable bias to women or to female-headed households"[21], the coincidence of barriers associated with women and low schooling or to the condition of being without a companion can point to the occurrence of this phenomenon in the studied population, unfavorable to the adequate consumption of fruits and vegetables.

In Brazil, one of the most unequal countries in the world and that has an important part of the Brazilian population with low income[22-24], the perception of cost as a barrier is very relevant. Two Brazilian studies that used data from the Household Budgets Survey to address the issue of food costs and their acquisition. Claro and Monteiro[25] analyzed in 48,470 households between 2002 and 2003 the influence of household income and the price of food on the participation of fruits and vegetables among the foods purchased by households and observed, for all the strata of households analyzed, that fruits and vegetables accounted for 2.5% of calories, priced four times higher than other foods. A 1% reduction in the price of fruits and vegetables would increase by 0.79% total calories and a 1% increase in household income would add 0.27% to the total caloric intake. Authors concluded that increased income and lower prices of fruits and vegetables might improve their participation in the diet of Brazilians. Borges et al.[26] analyzed the seven-day food acquisition of 55,970 families in 2008. Calories, expenses and average price were calculated and current and ideal expenditures were compared for the eight food groups proposed by the 2006 Brazilian food guide. Acquisitions did not reach the recommended amounts for fruits, vegetables, dairy products and cereals and exceeded those of beans, oils/fats, sweets, meats and eggs. If individuals with lower income (R$ 71.40 per capita/month) were to achieve recommendations, food expenses would have to increase by 58% and for those with income ≤ R$ 415.00 per capita/month, food expenses would have to increase 39%. Authors point out that for this group of Brazilians, this increased food expenditure would compromise almost all the household's income.

The second most prevalent barrier, both for fruit and vegetable consumption, was "the family does not have the habit/custom", possibly related to the important changes in the eating habits of Brazilians in the last decades[27]. The National Food and Nutrition Policy[28], among other objectives, seeks to value food culture. Thus, health education strategies become important, and seeking a family-oriented approach, consistent with the Family Health Strategy, can be an interesting path. It is worth mentioning that knowledge, in general, is not enough to change behaviors and to make people adopt healthier behaviors. Often strategies overestimate the potential of information in changing habits and ignore complex health-related behaviors.

The third most mentioned to fruit consumption was the "lack of time to go to the market/fair frequently to buy fresh fruits" and this was the fourth most prevalent barrier to the consumption of vegetables. A study carried out with adults from 11 municipalities in the central region of Rio Grande do Sul found that most of the respondents purchased their fruits and vegetables once a week and only 10% acquired this food daily[29].

Regarding vegetable consumption, the third most mentioned barrier was the "need for preparation" and this was the fourth most prevalent

barrier in the case of fruits. According to the Food Guide for the Brazilian Population, the weakened transmission of culinary skills between generations favors the consumption of ultra-processed foods. In contrast to these foods, in natura or minimally processed foods usually need to be selected, pre-prepared, seasoned, cooked, combined with other foods and shown in the form of dishes so that they can be consumed. This obviously requires time from the person himself or from the person in the household who is responsible for the preparation of meals[1]. Fresh, nutritious foods often require culinary skills, are more expensive and require more preparation time.

Not liking the taste for the consumption of fruits and vegetables was, of the five barriers investigated in the closed questions, the one with the lowest prevalence. Generally, foods with low energy density are less palatable and many vegetables are considered to have a bitter taste, which leads many people to replace these foods with foods that are more appealing to consume and hinders compliance with nutritional recommendations[30]. A study by Pollard et al.[31] observed that sensorial features were reported as an important reason for the lower consumption of these foods in individuals who did not consume adequate amounts of fruits and vegetables. We wish to highlight that "taste" is not merely a biological issue, but also a social and historical construction, since culture not only indicates what is and is not food, establishing prescriptions and prohibitions, but also makes distinctions about what is "good" and "bad"[32]. Thus, any healthy eating promotion strategy should consider this aspect.

In this study, we observed that women were more likely to show barriers "the cost of fruits and vegetables or vegetables burdens the household's budget", the "need for preparation" of vegetables, as well as "lack of time to go to the market/fair frequently to buy fresh fruits". Women's entry into the labor market, especially since the 1970s, and dependence on women's income in the household's livelihood did not distract them from the centrality of domestic chores, often generating a second day's work[33]. Even women who work outside their homes are still the main, if not the only responsible for selecting and acquiring food and preparing meals, which makes them probably more aware of the food cost's burden in households' budgets. The fact that they have, on average, less leisure time than men, including the time to prepare meals, can lead to choices that privilege practicality to the detriment of the nutritional quality of food.

Subjects with up to four years of schooling were more likely to refer to the barrier "the cost burdens the household's budget" to buy fruits and vegetables, which can be related to lower wages due to the lower level of schooling, which can also have a direct effect on the employability rate. Individuals without a companion were more likely to refer to the "lack of time to go to market/fair frequently to buy fresh fruits", which may have occurred because they had a greater accumulation of functions and, thus, less time for this type of activity.

As for ethnicity/skin color, subjects self-declared as brown/black/indigenous were more likely to show the "not liking the taste of vegetables" barrier, which may be related to the lower access of this group to fruits and vegetables at other stages of the life cycle. However, this finding must be confirmed by other investigations and for the construction of more robust hypotheses that explain the relationship found in this work.

Some characteristics of this study should be highlighted. Firstly, the fact that it was carried out from a population-based study, which is an important point in view of the scarce studies on the perceived barriers to the consumption of fruits and vegetables involving large populations. The population-based study that took place in 2011 did not reveal any information on perceived barriers to consumption of fruits and vegetables. They were inserted in the 2015 research, which looked for all the subjects who had participated in 2011. Thus, caution is needed when generalizing, because it cannot be said that the sample surveyed in 2015 is representative of the current population of Cambé, PR.

A positive point was the process of constructing the tool at different stages, as described in the methodology, and that we observed, at the time of data collection, that it was easily applied and understood by the population studied. However, we suggest, in investigations with specific populations, to consider the possibility of investigating other, context-specific barriers. For example, in the elderly population, dental limitations that hinder or prevent the consumption of certain foods; in a population of workers, issues related to the work process such as time available for eating, number of intervals, access to food in the workplace, etc.

It should also be noted that the investigation of self-reported barriers to the consumption of fruits and vegetables requires the use of different methods and approaches. Research form questions may reveal part of the phenomenon, but

Ciência & Saúde Coletiva, 24(7):2461-2470, 2019

they do not fully explain such a complex and subjective phenomena. Thus, studies that use other methods, including qualitative analysis, can be very relevant and may involve not only the study of subjects but also elements such as advertising, investment, etc.

Results can help guide public policies aimed at increasing consumption of fruits and vegetables. Strategies for promoting healthy eating need to take into account the population's eating habits, food accessibility, convenience, local food variety and food prices, as they are important barriers to keeping a healthy diet and changing eating behaviors.

It is imperative that the various sectors be involved, in addition to the health sector. Actions should be integrated and complementary and include not only changes in individuals and households, but also public policies for changes in sectors such as food advertising, economy and agriculture, seeking to curb costs and increase the supply of these foods, even addressing the issue of inadequate food consumption for health by the Unified Health System and by the Education sector.

In addition, we need to consider, as emphasized by Burlandy et al.[34], that intersectoriality cannot be separated from a political process that questions the criteria of participation of various stakeholders, since disregarding this aspect can favor commercial interests to the detriment of public interest. Thus, the promotion of healthy eating should be carried out by seeking an extended view of the phenomenon, avoiding simplistic counseling or prescription practices that are decontextualized from subjects' and households' realities.

Collaborations

GMGC Santos, AMR Silva and MR Loch participated in all stages of the work execution. WO Carvalho and CR Rech participated in the critical review of the manuscript and worked on the final design and writing of it.

Acknowledgments

Work carried out with the support of the National Council of Scientific and Technological Development - CNPq - Brazil from the Universal Edict.

References

1. Brasil. Ministério da Saúde (MS). *Guia alimentar para a população brasileira*. 2ª ed. Brasília: MS; 2014.
2. World Health Organization (WHO). *Global health risks: mortality and burden of disease attributable to selected major risks*. Geneva: WHO; 2009.
3. Wang PY, Fang JC, Gao ZH, Zhang C, Xie SY. Higher intake of fruits, vegetables or their fiber reduces the risk of type 2 diabetes: A meta-analysis. *J Diabetes Investig* 2016; 7(1):56-69.
4. Wu Y, Zhang D, Jiang X, Jiang W. Fruit and vegetable consumption and risk of type 2 diabetes mellitus: a dose-response meta-analysis of prospective cohort studies. *Nutr Metab Cardiovasc Dis* 2015; 25(2):140-147.
5. Li M, Fan Y, Zhang X, Hou W, Tang Z. Fruit and Vegetable Intake and Risk of Type 2 Diabetes Mellitus: Meta-Analysis of Prospective Cohort Studies. *BMJ Open* 2014; 4(11):e005497.
6. Zhan J, Liu YJ, Cai LB, Xu FR, Xie T, He QQ. Fruit and Vegetable Consumption and Risk of Cardiovascular Disease: a Meta-analysis of Prospective Cohort Studies. *Crit Rev Food Sci Nutr* 2017; 57(8):1650-1663.
7. Figueira TR, Lopes ACS, Modena CM. Barreiras e fatores promotores do consumo de frutas e hortaliças entre usuários do Programa Academia da Saúde. *Rev. Nutr* 2016; 29(1):85-95.
8. Lucan SC, Barg FK, Long JA. Promoters and barriers to fruit, vegetable, and fast-food consumption among urban, low-income African Americans: A qualitative approach. *Am J Public Health* 2010; 100(4):631-635.
9. Yeh MC, Ickes SB, Lowenstein LM, Shuval K, Ammerman AS, Farris R, Katz DL. Understanding barriers and facilitators of fruit and vegetable consumption among a diverse multi-ethnic population in the USA. *Health Promot Int* 2008; 23(1):42-50.
10. Eikenberry N, Smith C. Healthful eating: perceptions, moti-vations, barriers, and promoters in low-income Minnesota communities. *J Am Diet* Assoc 2004; 104(107):1158-1161.
11. Olivares CS, Lera ML, Bustos ZN. Stages of change, benefits and barriers on physical activity and fruit and vegetables intake in chilean university students. *Rev. chil. Nutr* 2008; 35(1):25-35.
12. Olivares SC, Lera LM, Mardones Mah, Araneda JF, Olivares MAC, Colque MEM. Motivaciones y barreras para consumir 5 porciones de frutas y verduras al día en madres de escolares y professores de enseñanza básica. *Archivos Latinoam Nutr* 2009; 59(2):166-173.
13. Silva CL, Costa THM. Barreiras e facilitadores do consumo de frutas e hortaliças em adultos de Brasília. *Sci Med* 2013; 23(2):68-74.
14. Instituto Brasileiro de Geografia e Estatística (IBGE). *Censo Demográfico 2010*. Rio de Janeiro: IBGE; 2010.
15. Souza RKT, Bortolletto MSS, Loch MR, Gonzáles AD, Matsuo T, Cabrera MAS, Remondi FA, Yonamine CY. Prevalência de fatores de risco cardiovascular em pessoas com 40 anos ou mais de idade, em Cambé, Paraná (2011): estudo de base populacional. *Epidemiologia e Serviços de Saúde* 2013; 22(3):435-444.
16. Associação Brasileira de Empresas de Pesquisa (ABEP). *Critério de Classificação Econômica Brasil (CCEB): em vigor a partir de 01/01/2015*. [acessado 2017 Abr 20]. Disponível em: http://www.abep.org/
17. Baird MF. O lobby na regulação da publicidade de alimentos da Agência Nacional de Vigilância Sanitária. *Rev. Sociol. Polit* 2016; 24(1):67-91.
18. Locatel CD, Lima FLS. Agronegócio e poder político: políticas agrícolas e o exercício do poder no Brasil. *Sociedade e Território* 2016; 28(2):42-65.
19. Oliveira-Costa MS, Amorim, ACCLA, Cadaxa, AG, Mendonça, AVM. Promoção da saúde da mulher brasileira e a alimentação saudável: vozes e discursos evidenciados pela Folha de SP. *Cien Saude Colet* 2016; 21(6):1957-1964.
20. Oliveira VC. Os sentidos da saúde nas mídias jornalísticas impressas. *Revista Eletrônica de Comunicação, Informação & Inovação em Saúde* 2013; 6(4):Suplemento.
21. Medeiros M, Costa J. Is There a Feminization of Poverty in Latin América? *World Development* 2008; 36(1):115-127.
22. Buss PM, Pellegrini Filho A. Iniqüidades em saúde no Brasil, nossa mais grave doença: comentários sobre o documento de referência e os trabalhos da Comissão Nacional sobre Determinantes Sociais da Saúde. *Cad Saude Publica* 2006; 22(9):2005-2008.
23. Barros RP, Foguel MN, Ulyssea G. *Desigualdade de renda no Brasil: uma análise da queda recente*. Brasília: Ipea; 2006. v. 2
24. Costa MA, Marguti, BO. *Atlas da vulnerabilidade social nos municípios brasileiros.* Brasília: Ipea, 2015.
25. Claro RM, Monteiro CA. Renda familiar, preço de alimentos e aquisição domiciliar de frutas e hortaliças no Brasil. *Rev Saude Publica* 2010; 44(6):1014-1020.
26. Borges CA, Claro, RM, Martins APB, Villar, BS. Quanto custa para as famílias de baixa renda obterem uma dieta saudável no Brasil? *Cad Saude Publica* 2015; 31(1):137-148.
27. Mendonça CP, Anjos LA. Aspectos das práticas alimentares e da atividade física como determinantes do crescimento do sobrepeso/obesidade no Brasil. *Cad Saude Publica* 2004; 20(3):698-709.
28. Brasil. Ministério da Saúde (MS). *Política Nacional de Alimentação e Nutrição*. Brasília: MS; 2013.
29. Souza RS. Comportamento de compra dos consumidores de frutas, legumes e verduras na região central do Rio Grande do Sul. *Ciência Rural* 2008; 38(2):511-517.
30. Brug J, Tak NI, Te Velde SJ, Bere E, Bourdeaudhuij I. Taste preferences, liking and other factors related to fruit and vegetable intakes among schoolchildren: results from observational studies. *Br J Nutrition* 2008; 99(1):s7-s14.
31. Pollard J, Greenwood D, Kirk S, Cade J. Motivations for fruit and vegetable consumption in UK women's cohort study. *Public Health Nutr* 2002; 5(3):479-486.
32. Maciel ME. Cultura e alimentação ou o que têm a ver os macaquinhos de Koshima com Brillat-Savarin? *Horizontes antropológicos* 2001; 16(7):145-156.
33. Soares C, Saboia AL. *Tempo, trabalho e afazeres domésticos: um estudo com base na Pesquisa Nacional por Amostra de Domicílios de 2001 e 2005*. Rio de Janeiro: IBGE; 2007. Texto para Discussão nº 21.
34. Burlandy L, Gomes FS, Carvalho CMP, Dias PC, Henriques P. Intersetorialidade e potenciais conflitos de interesse entre governo e setor privado comercial no âmbito das ações de alimentação e nutrição para o enfrentamento de doenças crônicas não transmissíveis. *Vig Sanit Debate* 2014; 2(4):124-129.

Article submitted 07/08/2017
Approved 04/10/2017
Final version submitted 06/10/2017