Original article

Food consumption markers in women from the rural area of Rio Grande, Rio Grande do Sul, Brazil, 2017*

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Abstract

Objective: to analyze markers of healthy and unhealthy food consumption and associated socio-economic, demographic and behavioral factors in women in the rural area of Rio Grande, RS, Brazil. **Methods**: this was a cross-sectional population-based study conducted in 2017; outcomes were collected using a Ministry of Health food consumption marker instrument; Poisson regression was used. **Results**: 963 women (15-49 years old) were included in the study; previous day consumption frequencies were beans 71.2%; sweetened beverages, 66.1%; fresh fruit, 52.9%; vegetables, 55.1%; filled sweet biscuits/desserts/candies, 35.5%; hamburger/charcuterie 22.5%, and instant noodles/savory biscuits 19.9%; fruit and vegetable consumption was higher in the A/B economic classes; prevalence of unhealthy food consumption was higher among women aged 15-19; women who ate 5/6 meals a day consumed more fresh fruit, vegetables and filled sweet biscuits/desserts/candies. **Conclusion**: appropriate prevalence of healthy consumption markers and moderate prevalence of unhealthy food consumption markers were found.

Keywords: Food Consumption; Women; Rural Population; Cross-Sectional Studies.

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Introduction

Food consumption practices range from breastfeeding to everyday family meals and originate from knowledge acquired and passed down from generation to generation and each individual's experiences in life. They are shaped by socio-economic, cultural, social and psychological conditions, interactions with the milieu, in addition to scientific knowledge at each moment in history.[1]

Evidence demonstrates that in just 30 years in Brazil many social and cultural changes have resulted in changes in the population's health and food consumption patterns.[2] Increased prevalence of overweight, found in all socio-economic levels, is frequently attributed to problems related to food intake, inadequate nutrition and changes in physical activity patterns.[2]

> *Due to industrialization and the intense process of urbanization, food composition has included higher energy values, more preservatives, fats and sugars, with few fibers and nutrients.*

Data taken from the 2013 National Health Survey (PNS)[3] and from the 2016 Chronic Diseases Risk and Protection Factor Telephone Survey Surveillance System (VIGITEL)[4] have pointed to insufficient consumption of healthy food and consumption of unhealthy food above recommended levels. The PNS[3] revealed that greens/vegetable and fruit/fruit juice consumption was 31.9% (95%CI 29.5;34.3) and that dessert consumption was 19.6% (95%CI 17.4;21.8), with noticeably less consumption of these kinds of food by the rural population when compared to the urban population.

So far the Ministry of Health has published two editions of its 'Food guide for the Brazilian population', with the aim of guiding the population in relation to food consumption, prioritizing adequate and healthy food intake.[5,6] The most recent edition, published in 2014, contains recommendations on the importance of consuming, preferentially, natural or minimally processed food, avoiding processed and ultra-processed food and reducing the use of oil, fat, salt and sugar.[6]

Due to industrialization and the intense process of urbanization, food composition has included higher energy values, more preservatives, fats and sugars, with few fibers and nutrients.[2] With effect from the 1990s, there has been a progressive increase in the proportion of food not consumed at home, replacing traditional homemade food with highly processed and ready-to--eat fast food.[7]

Although the benefits of healthy food are considerably emphasized in the literature,[4,8] few studies have evaluated the quality of food consumption by women living in rural areas. The Ministry of Health considers health conditions to be unfavorable in rural areas and aims to reduce health iniquities faced by the rural population by reducing risk factors associated with its morbidity and mortality.[9]

Food consumption in rural areas stands out among the implications of increased consumption of food that is industrially produced with varying degrees of processing.[2] It is essential to investigate whether habits of consuming these kinds of food can also be found among people living in rural areas, where natural food is more available and there is less access to some types of food, such as processed and ultra-processed food.[2]

Considering, furthermore, increased obesity in the reproductive stage of life, i.e. between 15 and 49 years of age, when consumption habits can represent risk of chronic noncommunicable diseases (CNCDs) or the worsening thereof,[8] and the potential fact of women being agents of change in these behaviors, given their important role in choosing food for their families, studying food consumption by the female segment of the population is fully justified.[10]

Having knowledge of local reality and reflecting on information generated is also important for informing the production of strategies capable of contributing to the quality of the community's food intake, as well as for the National Food and Nutrition Policy.[11] The objective of this study was to analyze markers of healthy and unhealthy food consumption and their associated socio--economic, demographic and behavioral factors among women living in the rural area of the municipality of Rio Grande, Rio Grande do Sul, Brazil.

Methods

This is a cross-sectional population-based study forming part of a larger study called 'Health of the rural Rio Grande population'. The study took place in 2017 with the aim of obtaining knowledge of basic health indicators, morbidity patterns, and patterns of health service use and access. The larger study was carried out

with different population groups, including women of childbearing age living in the rural area of the municipality of Rio Grande, Rio Grande do Sul state, Brazil.

The municipality of Rio Grande is located in the Southern region of Brazil, approximately 350km to the south of the state capital Porto Alegre, and covers an area of 2,709km². According to the most recent demographic census carried out by the Brazilian Institute of Geography and Statistics (IBGE),[12] the municipality had 197,228 inhabitants in 2010, 4% of whom lived in its rural area, and its human development index (HDI) was 0.744. The rural area of the municipality is comprised of 24 census tracts with around 8,500 inhabitants distributed between approximately 2,700 permanently inhabited households, with 1,820 women of childbearing age.[12]

The study population was comprised of women aged between 15 and 49 years old who lived in the rural area of the municipality of Rio Grande. Pregnant women, breastfeeding women and women with cognitive disabilities were not included in the study. The sampling process was systematic, so as to select 80% of permanently inhabited households in the rural area. In each census tract, 4 out of 5 households were visited, according to the 2010 IBGE Census list of households.[12]

In order to calculate the sample size, we used 30% frequency of unhealthy food consumption based on the 2016 Vigitel Survey,[4] a 3 percent margin of error and a 95% confidence interval %; we added 10% for losses and refusals, totaling 644 women. With the aim of providing greater statistical power to the analyses comparing outcomes and exposures studied, we added a further 15%, resulting in a minimum sample of 741. We opted to interview all women found in the selected households and this resulted in 963 eligible people. Based on the *a posteriori* sample calculation, considering all the women evaluated, 50% prevalence and keeping the 95% confidence interval, the margin of error reduced to one percentage point. With regard to measurements of association, the sample had 80% power ($\beta = 20\%$) and a 95% confidence interval ($\alpha = 5\%$) for detecting prevalence ratios (PR) equal to or greater than 1.2 as being significant. The estimates were calculated used OpenEpi.

Data collection took place between April and October 2017 in the households of the interviewed women. The questionnaires were administered by female interviewers trained beforehand and interviews took 30 minutes on average. The data were collected using an electronic version of the questionnaire and were saved on tablets, using RedCap®,[13] a web platform for building and managing surveys and databases.

Concomitantly to data collection, quality control was carried out on 10% of the sample, by means of a second interview by telephone, using a shortened version of the questionnaire to check consistency in administration of the instrument. In this stage, 113 questionnaires were administered (10.5%); the Kappa statistic varied between 0.51 and 0.97 and its consistency was equally variable, ranging from moderate in relation to the question about eating meals while watching television or using a computer or cellphone, to excellent for questions about age, marital status, tobacco smoking, history of pregnancy and depression.

The study's outcomes were seven variables for healthy and unhealthy food consumption used by the Ministry of Health's Food and Nutrition Surveillance System (Sisvan) questionnaire within the Brazilian National Health System (SUS) for monitoring the Brazilian population as part of the Primary Health Care routine.[14]

We studied food intake on the previous day, namely:

a) Healthy indicators
   - beans;
   - fresh fruit (fruit juice was not considered); and
   - greens and/or vegetables (potato, manioc, cassava, yuka and yam were not considered).

b) Unhealthy markers
   - hamburger and/or charcuterie (ham, mortadella, salami, sausage, hotdog sausage);
   - sweetened drinks (soda pop, carton juice, powdered juice, carton coconut milk, guarana/redcurrant syrup, fruit juice with added sugar);
   - instant noodles, salted packet snacks or savory biscuits; and
   - filled sweet biscuits, desserts or candies (sweets, lollipops, chewing gum, caramel, gelatin).

The answer options were 'yes', 'no' and 'don't know'. Food intake prevalence for each healthy or unhealthy marker was calculated by divided the number of 'yes' answers by the number of respondents.

The independent demographic variables were categorized into: self-reported race/skin color (white; black; brown, yellow or other), age range (in years: 15-19, 20-34, 35-49) and marital status (single; married; separated, divorced or widowed). With regard to the socio-economic variables, we used the 2015 Brazilian

Survey Company Association (ABEP)[15] economic classification (divided into socio-economic strata related to consumption: A/B, C, D/E) and having a paid job on the day of the interview (yes; no).

The behavioral variables we studied were: alcohol intake in the last week (yes; no); tobacco smoking in the last 30 days (nonsmoker, former smoker, smoker); physical activity during leisure time, taken to be walking for at least 30 minutes a day (yes; no); number of meals a day (12, 3-4, 5-6); eating watching television or using a computer or cellphone (yes; no) and number of children living at home (don't live at home; 1-2; 3 or more; have no children) and having had at least one medical appointment in the last year (yes; no).

We used absolute frequencies (n) and relative frequencies (%) for the descriptive statistical analysis of the categorical quantitative variables. We also presented the food marker prevalence rates according to the independent variable categories. The crude and adjusted multivariable analyses were performed using Poisson regression, with robust adjustment of variance; the prevalence ratios (PR), 95% confidence intervals (95%CI) and significance values were estimated using Wald's heterogeneity and linear trend tests. A model was built for each food indicator, three healthy indicators – beans; fresh fruit; and greens and/or vegetables – four unhealthy markers –filled sweet biscuits, candies or desserts; instant noodles, salted packet snacks or savory biscuits; sweetened drinks; and hamburger and/or charcuterie. Full adjust analysis was performed on all exposure variables, organized on the same hierarchical level, regardless of the crude analysis p value; factors associated with the outcome were considered to be those with $p<0.05$. Analysis was performed using Stata version 14.2®.

The research project was approved by the Federal University of Rio Grande (FURG) Health Research Ethics Committee (CEPAS): Process No. 51/2017. Adolescents aged 15 to 17 years old signed an assent form, while those responsible for the under 18 year-olds and women aged 18 to 49 years old signed a Free and Informed Consent form.

Results

In the 2,669 households with permanent inhabitants in the rural area of the municipality of Rio Grande, we identified 1,391 women of childbearing age, between 15 and 49 years old, 1,083 of whom (77.8%) were eligible for the study; 103 women (8.6%) were not found after three attempts (losses) and 17 (1.4%) did not want to take part in the study (refusals), resulting in 963 valid observations, the characteristics of which are described in Table 1. The majority of these women were of White race/skin color (86.0%), married (76.6%), had not drunk alcoholic beverages in the last week (89.6%), did not smoke (71.2%) and did not do physical activities in their leisure time (72.4%).

With regard to health food markers on the previous day, bean consumption prevalence was 71.2% (95%CI 68.3;74.1) (Figure 1). A linear trend was found in economic classification, whereby the prevalence of this food marker (beans) reduced as socio-economic stratum became higher (Table 2). Fresh fruit consumption prevalence was 52.9% (95%CI 49.7;56.0) (Figure 1). In the adjusted analysis, we found positive association between fresh fruit consumption and economic class (PR=1.47 – 95%CI 1.19;1.81) and number of meals per day (PR=1.46 – 95%CI 1.08;1.98) (Table 2). Consumption of greens and/or vegetables on the day before the interview was 55.1% (95%CI 51.9;58.2) (Figure 1). In the adjusted analysis, the highest consumption of greens and/or vegetables was associated with the highest socio-economic stratum (PR=1.39 – 95%CI 1.13;1.70), the 35-49 year age range (PR=1.07 – 95%CI 0.84;1.38) and having 5-6 meals a day (PR=1.15 – 95%CI 0.90;1.48) (Table 2).

In relation to unhealthy food markers, prevalence of hamburger and/or charcuterie consumption was 22.5% (95%CI 19.9;25.2) (Figure 1). In the adjusted analysis, lower consumption of these foods was found among women aged 35-49 years (PR=0.55 – 95%CI 0.34;0.91), while it was higher among those who worked (PR=1.32 – 95%CI 1.02;1.71) and those who consumed alcohol in the last week (PR=1.40 – 95%CI 1.01;1.94) (Table 3). Prevalence of sweetened drink consumption was 66.1% (95%CI 63.1;69.1) (Figure 1). In the adjusted analysis consumption was lower in the 35-49 age range (PR=0.80 – 95%CI 0.66;0.96), and higher among former smokers (PR=1.18 – 95%CI 1.05;1.33) and women who ate while watching television, using a computer or cellphone (PR=1.12 – 95%CI 1.02;1.23) (Table 3).

Prevalence of instant noodle, salted packet snack or savory biscuit consumption was 19.9% (95%CI 17.4;22.4) (Figure 1). Consumption of these foods was higher among women who did physical activities

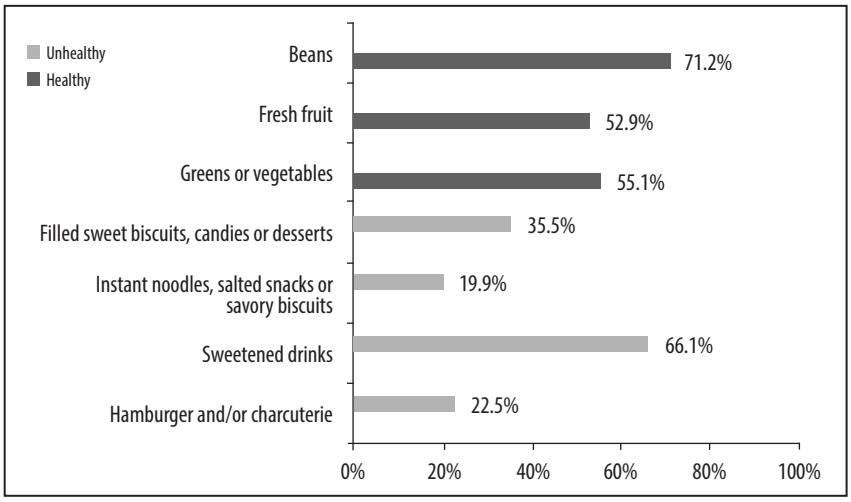

Figure 1 – Prevalence (%) of marker of healthy and unhealthy food consumption on the previous day, by women of childbearing age (15-49 years) in the rural of Rio Grande, Rio Grande do Sul, 2017

during leisure time (PR=1.62 – 95%CI 1.25;2.10), in the adjusted analysis (Table 4). Prevalence of filled sweet biscuit, candy or dessert consumption was 35.5% (95%CI 32.4;38.5) (Figure 1). In the adjusted analysis, consumption of these foods was higher among women who had 5-6 meals a day (PR=1.19 – 95%CI 0.86;1.65) and who ate watching television, using a computer or cellphone (PR=1.28 – 95%CI 1.07;1.53) (Table 4).

Further analysis, not shown in tables, enabled us to identify that depending on the day the questionnaire was administered differences were found between the groups' answers with regard to the healthy food marker 'beans' and the unhealthy food marker 'sweetened drinks', when the instrument was administered the day after Sundays and public holidays. Bean consumption was 19% lower (PR=0.81 – 95%CI 0.72;0.91) while sweetened drink consumption was 18% higher (PR=1.18 – 95%CI 1.07;1.30) on atypical days (Sundays and public holidays) than on other days.

Discussion

The results presented enabled identification of healthy and unhealthy food markers among women of childbearing age living in the rural area of a municipality in Southern Brazil. Prevalence of markers of healthy food consumption on the previous day was adequate, while prevalence of unhealthy food markers was moderate. The most prevalent marker was 'beans', while the least prevalent marker was 'instant noodles, salted packet snacks or savory biscuits'. We also found that risk factors for unhealthy markers differed according to the type of food and that unhealthy food consumption was higher among adolescents.

On the level of the population as a whole, marker evaluation enables recognition of food related to healthy or unhealthy nutrition, as well as enabling food and nutrition monitoring and surveillance.[14] The 'Food guides for the Brazilian population' recommend intake of at least one daily portion of beans or other leguminous vegetable (dried peas, chickpeas, lentils, soybeans) and adopting natural or minimally processed food items as the basis of one's diet.[5,6]

Bean consumption prevalence in our study was 71.2% lower than that found in studies conducted with rural populations.[3,16] In the rural area of the municipality of Ibatiba, ES, prevalence was 94%,[16] while among the rural population of Brazil as a whole, according to the PNS,[3] it was 74.8% – this being significantly higher than the rate found by the Vigitel survey[4] in Porto Alegre, capital of Rio Grande do Sul state, among women: 43.0%. It can be seen that basic and traditional food items of the Brazilian diet, such as beans, have lost importance in the face of the increasing share of processed and ready-to-eat foods, ready meals, also found among lower income strata.[17]

With regard to fresh fruit, this study found consumption prevalence of 52.9%. This is higher than the 31.9%

Table 1 – Characteristics of women of childbearing age (15-49 years) (n=963) of the rural area of Rio Grande, Rio Grande do Sul, 2017

Characteristics	n	%
Race/skin color (n=963)		
White	828	86.0
Black	59	6.1
Brown/yellow/other	76	7.9
Age range (in years) (n=962)		
15-19	117	12.2
20-34	405	42.1
35-49	440	45.7
Marital status (n=963)		
Single	181	18.8
Married	738	76.6
Separated/divorced/widowed	44	4.6
Economic classification (ABEPa) (n=958)		
A/B	144	15.0
C	648	67.7
D/E	166	17.3
Paid job (n=963)		
Yes	353	36.7
No	610	63.3
Alcohol (consumption in last week) (n=963)		
Yes	100	10.4
No	863	89.6
Tobacco smoking (n=954)		
Nonsmoker	679	71.2
Former smoker	140	14.7
Smoker	135	14.1
Physical activity in leisure time (walking for at least 30 min/day) (n=963)		
Yes	266	27.6
No	697	72.4
Number of meals per day (n=954)		
1-2	73	7.6
3-4	655	68.7
5-6	226	23.7
Eating watching TV, using computer or cellphone (n=956)		
Yes	476	49.8
No	480	50.2
Children living at home (n=953)		
Don't live at home	77	8.1
1-2 children	561	58.9
3 or more	86	9.0
Have no children	229	24.0
Medical appointment(s) in the last year (n=961)		
Yes	671	69.8
No	290	30.2

a) ABEP: Brazilian Survey Company Association.

Table 2 – Crude and adjusted analysis of healthy food markers, according to exposure variables, by women of childbearing age (15-49 years) in the rural area of Rio Grande, Rio Grande do Sul, 2017

Variables	Beans			Fresh fruit			Greens and/or vegetables		
	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])
Race/skin color		**p=0.720[e]**	**p=0.847[e]**		**p=0.645[e]**	**p=0.312[e]**		**p=0.990[e]**	**p=0.981[e]**
White	70.7	1.00	1.00	52.3	1.00	1.00	55.1	1.00	1.00
Black	72.9	1.03(0.88;1.21)	0.99(0.85;1.17)	57.6	1.10(0.88;1.38)	1.19(0.95;1.49)	54.2	0.98(0.77;1.25)	1.02(0.80;1.31)
Brown/yellow/ other	74.7	1.06(0.92;1.21)	1.04(0.90;1.20)	55.3	1.06(0.85;1.31)	1.03(0.83;1.27)	55.3	1.00(0.81;1.24)	1.01(0.83;1.23)
Age range (in years)		**p=0.573[f]**	**p=0.299[f]**		**p=0.15[f]**	**p=0.153[f]**		**p=0.04[f]**	**p=0.045[f]**
15-19	71.9	1.00	1.00	47.4	1.00	1.00	56.6	1.00	1.00
20-34	69.6	0.97(0.85;1.10)	0.96(0.82;1.13)	51.2	1.08(0.87;1.34)	1.10(0.85;1.41)	48.8	0.86(0.71;1.04)	0.88(0.70;1.11)
35-49	72.7	1.01(0.89;1.15)	1.03(0.87;1.22)	55.7	1.18(0.95;1.45)	1.18(0.90;1.54)	60.4	1.07(0.89;1.27)	1.07(0.84;1.38)
Marital status		**p=0.960[e]**	**p=0.975[e]**		**p=0.433[e]**	**p=0.866[e]**		**p=0.410[e]**	**p=0.236[e]**
Single	70.6	1.00	1.00	48.6	1.00	1.00	58.9	1.00	1.00
Married	71.3	1.01(0.91;1.12)	1.01(0.88;1.17)	53.7	1.10(0.94;1.30)	1.05(0.85;1.29)	53.9	0.92(0.80;1.06)	0.86(0.72;1.03)
Separated/ divorced/widowed	72.7	1.03(0.84;1.26)	1.02(0.81;1.28)	56.8	1.17(0.87;1.58)	1.09(0.79;1.50)	59.1	1.00(0.76;1.32)	0.93(0.69;1.24)
Economic classification (ABEP[g])		**p=0.009[f]**	**p=0.028[f]**		**p<0.001[f]**	**p<0.001[f]**		**p=0.002[f]**	**p<0.001[f]**
A/B	64.6	0.83(0.72;0.96)	0.86(0.73;1.00)	68.8	1.57(1.28;1.92)	1.47(1.19;1.81)	66.7	1.37(1.12;1.66)	1.39(1.13;1.70)
C	71.0	0.91(0.83;1.00)	0.93(0.84;1.02)	52.0	1.17(0.98;1.43)	1.17(0.97;1.41)	54.1	1.11(0.93;1.32)	1.15(0.97;1.37)
D/E	78.1	1.00	1.00	43.9	1.00	1.00	48.8	1.00	1.00
Paid job		**p=0.069**	**p=0.093**		**p=0.510**	**p=0.564**		**p=0.364**	**p=0.996**
Yes	67.6	0.92(0.85;1.01)	0.92(0.84;1.01)	54.3	1.04(0.92;1.18)	0.96(0.85;1.09)	57.0	1.06(0.94;1.19)	1.00(0.88;1.13)
No	73.3	1.00	1.00	52.1	1.00	1.00	54.0	1.00	1.00
Alcohol (intake in last week)		**p=0.295**	**p=0.266**		**p=0.083**	**p=0.192**		**p=0.536**	**p=0.397**
Yes	66.3	0.92(0.80;1.07)	0.92(0.79;1.07)	43.9	0.81(0.65;1.03)	0.86(0.69;1.08)	52.0	0.94(0.77;1.15)	0.91(0.74;1.12)
No	71.8	1.00	1.00	53.9	1.00	1.00	55.4	1.00	1.00
Tobacco smoking		**p=0.353[a]**	**p=0.401[a]**		**p=0.017[a]**	**p=0.085[a]**		**p=0.146[a]**	**p=0.132[a]**
Nonsmoker	69.8	1.08(0.97;1.20)	1.08(0.96;1.20)	55.3	0.97(0.82;1.15)	1.00(0.85;1.18)	54.4	1.14(0.99;1.32)	1.17(1.00;1.36)
Former smoker	75.2	1.05(0.94;1.17)	1.01(0.89;1.14)	53.9	0.73(0.59;0.91)	0.78(0.63;0.97)	62.1	0.96(0.81;1.14)	1.04(0.86;1.24)
Smoker	73.2	1.00	1.00	40.6	1.00	1.00	52.2	1.00	1.00
Physical activity in leisure time (walking for at least 30 min/ day)		**p=0.754**	**p=0.865**		**p=0.345**	**p=0.639**		**p=0.019**	**p=0.052**
Yes	70.5	0.99(0.90;1.08)	0.99(0.91;1.09)	55.3	1.06(0.93;1.21)	1.03(0.91;1.17)	61.0	1.15(1.02;1.30)	1.13(1.00;1.27)
No	71.5	1.00	1.00	52.9	1.00	1.00	52.8	1.00	1.00

to be continue

a) CA: crude analysis.
b) AA: adjusted analysis.
c) PR: prevalence ratio.
d) 95%CI: 95% confidence interval.
e) P value calculated using heterogeneity test.
f) P value calculated using Wald's linear trend test.
g) ABEP: Brazilian Survey Company Association.

continuation

Table 2 – Crude and adjusted analysis of healthy food markers, according to exposure variables, by women of childbearing age (15-49 years) in the rural area of Rio Grande, Rio Grande do Sul, 2017

Variables	Beans			Fresh fruit			Greens and/or vegetables		
	%	CA[a]	AA[b]	%	CA[a]	AA[b]	%	CA[a]	AA[b]
		PR[c] (95%CI[d])	PR[c] (95%CI[d])		PR[c] (95%CI[d])	PR[c] (95%CI[d])		PR[c] (95%CI[d])	PR[c] (95%CI[d])
Number of meals per day		**p=0.901[f]**	**p=0.459[f]**		**p<0.001[f]**	**p<0.001[f]**		**p=0.011[f]**	**p=0.016[f]**
1-2	74.0	1.00	1.00	39.8	1.00	1.00	52.1	1.00	1.00
3-4	70.6	0.95(0.83;1.10)	0.99(0.85;1.16)	50.5	1.27(0.95;1.70)	1.16(0.87;1.56)	52.6	1.01(0.80;1.27)	0.96(0.76;1.22)
5-6	72.6	0.98(0.84;1.15)	1.03(0.87;1.22)	64.6	1.46(1.21;2.19)	1.46(1.08;1.98)	63.3	1.15(0.95;1.55)	1.15(0.90;1.48)
Eating watching TV, using computer or cellphone		**p=0.258**	**p=0.234**		**p=0.054**	**p=0.145**		**p=0.081**	**p=0.231**
Yes	72.8	1.05(0.97;1.14)	1.05(0.97;1.14)	49.8	0.89(0.79;1.00)	0.91(0.81;1.03)	52.3	0.90(0.80;1.01)	0.93(0.83;1.05)
No	69.5	1.00	1.00	56.0	1.00	1.00	58.0	1.00	1.00
Children living at home		**p=0.383[e]**	**p=0.746[e]**		**p=0.380[e]**	**p=0.258[e]**		**p=0.575[e]**	**p=0.567[e]**
Don't live at home	72.7	0.98(0.84;1.13)	1.00(0.86;1.16)	59.7	0.87(0.72;1.07)	0.91(0.74;1.11)	55.8	0.99(0.80;1.22)	1.07(0.86;1.32)
1-2	71.0	1.07(0.89;1.28)	1.06(0.89;1.27)	52.2	0.79(0.59;1.05)	0.84(0.63;1.12)	55.2	0.86(0.64;1.16)	0.92(0.69;1.24)
3 or more	77.7	0.94(0.80;1.11)	0.96(0.79;1.17)	47.1	0.92(0.74;1.14)	1.04(0.81;1.33)	48.2	1.03(0.82;1.30)	1.11(0.85;1.45)
Have no children	68.4	1.00	1.00	54.7	1.00	1.00	57.6	1.00	1.00
Medical appointment(s) in the last year		**p=0.163**	**p=0.133**		**p=0.201**	**p=0.299**		**p=0.473**	**p=0.294**
Yes	70.0	0.94(0.87;1.02)	0.94(0.86;1.02)	54.3	1.09(0.95;1.25)	1.07(0.94;1.23)	54.3	0.96(0.85;1.08)	0.94(0.83;1.06)
No	74.3	1.00	1.00	49.7	1.00	1.00	56.8	1.00	1.00

a) CA: crude analysis.
b) AA: adjusted analysis.
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e) P value calculated using heterogeneity test.
f) P value calculated using Wald's linear trend test.
g) ABEP: Brazilian Survey Company Association.

found by the PNS studies[3] among rural area women. It is also higher than that found by the 2008-2009 Family Budgets Study (POF),[18] which assessed food items most frequently reported by the urban and rural Brazilian population (16%), and that found by the study conducted in Rio de Janeiro state with family farmers[19] (49.4%) who reported consuming fruit with at least one daily meal. The result of our study was also higher than the proportional score identified by the Vigitel survey,[4] which found 47.7% prevalence among the urban female population of Porto Alegre.

However, different ways of evaluating fruit consumption were used by these studies. The PNS[3] considered recommended consumption of fruit and vegetables based on weekly frequency of greens and/or vegetables with meals, and consumption of fruit or fruit juice. The 2008-2009 POF[17] used the notes made by participants recording all food they consumed over a 24-hour period. The Rio de Janeiro study[19] interviewed farming families including about the habit of consuming fruit as part of at least one daily meal. The Vigitel survey[4] considered regular consumption of fruit and vegetables on 5 days or more a week. Our study considered fresh fruit consumption on the previous day.

Fruit is rich in fibers, vitamins and minerals, as well as several compounds that contribute to preventing many diseases, so that their daily consumption is recommended.[5,6] With regard to income, the 2008-2009 POF,[18] conducted with rural and urban populations, found higher fruit consumption in the highest economic class. This corroborates the findings of our study which identified a gradient of higher consumption

Table 3 – Crude and adjusted analysis of unhealthy food markers, according to exposure variables, by women of childbearing age (15-49 years) in the rural area of Rio Grande, Rio Grande do Sul, 2017

Variables	Hamburger and/or charcuterie			Sweetened drinks		
	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])
Race/skin color		**p=0.677[e]**	**p=0.329[e]**		**p=0.095[e]**	**p=0.177[e]**
White	22.8	1.00	1.00	66.0	1.00	1.00
Black	23.7	1.04(0.65;1.67)	1.17(0.73;1.87)	76.0	1.16(0.99;1.34)	1.11(0.95;1.29)
Brown/yellow/other	18.4	0.81(0.49;1.32)	0.69(0.40;1.21)	61.0	0.92(0.76;1.11)	0.89(0.73;1.08)
Age range (in years)		**p<0.001[f]**	**p<0.001[f]**		**p<0.001[f]**	**p<0.001[f]**
15-19	31.6	1.00	1.00	77.2	1.00	1.00
20-34	24.4	0.77(0.56;1.07)	0.76(0.49;1.17)	69.4	0.90(0.80;1.01)	0.89(0.76;1.05)
35-49	18.2	0.58(0.41;0.81)	0.55(0.34;0.91)	60.2	0.78(0.69;0.88)	0.80(0.66;0.96)
Marital status		**p=0.079[e]**	**p=0.507[e]**		**p=0.030[e]**	**p=0.627[e]**
Single	27.3	1.00	1.00	74.0	1.00	1.00
Married	22.0	0.81(0.61;1.07)	1.04(0.70;1.53)	65.0	0.88(0.80;0.98)	0.97(0.84;1.11)
Separated/divorced/widowed	11.4	0.42(0.18;0.98)	0.64(0.26;1.57)	57.0	0.77(0.59;1.02)	0.86(0.64;1.16)
Economic classification (ABEP[g])		**p=0.061[f]**	**p=0.078[f]**		**p=0.571[f]**	**p=0.905[f]**
A/B	26.4	1.49(0.97;2.29)	1.34(0.93;1.94)	62.0	0.95(0.80;1.12)	1.01(0.85;1.19)
C	22.7	1.29(0.90;1.84)	1.51(0.97;2.35)	67.0	1.03(0.91;1.17)	1.04(0.92;1.17)
D/E	17.7	1.00	1.00	65.0	1.00	1.00
Paid job		**p=0.158**	**p=0.035**		**p=0.172**	**p=0.936**
Yes	25.0	1.19(0.94;1.51)	1.32(1.02;1.71)	63.0	0.93(0.85;1.03)	0.99(0.90;1.10)
No	21.1	1.00	1.00	68.0	1.00	1.00
Alcohol (intake in last week)		**p=0.035**	**p=0.040**		**p=0.613**	**p=0.994**
Yes	30.6	1.42(1.03;1.96)	1.40(1.01;1.94)	68.0	1.04(0.90;1.20)	1.00(0.87;1.15)
No	21.6	1.00	1.00	66.0	1.00	1.00
Tobacco smoking		**p=0.535[e]**	**p=0.561[e]**		**p=0.082[e]**	**p=0.010[e]**
Nonsmoker	23.0	1.06(0.77;1.46)	1.15(0.82;1.61)	64.0	1.09(0.96;1.23)	1.14(1.01;1.30)
Former smoker	24.3	0.83(0.57;1.20)	0.90(0.60;1.34)	70.0	1.13(1.01;1.27)	1.18(1.05;1.33)
Smoker	19.0	1.00	1.00	73.0	1.00	1.00
Physical activity in leisure time (walking for at least 30 min/day)		**p=0.786**	**p=0.830**		**p=0.118**	**p=0.165**
Yes	23.1	1.04(0.80;1.35)	1.03(0.79;1.34)	62.0	0.92(0.82;1.02)	0.93(0.83;1.03)
No	22.3	1.00	1.00	68.0	1.00	1.00
Number of meals per day		**p=0.236[f]**	**p=0.645[f]**		**p=0.497[f]**	**p=0.884[f]**
1-2	24.7	1.00	1.00	70.0	1.00	1.00
3-4	20.7	0.84(0.55;1.29)	0.76(0.49;1.17)	66.0	0.95(0.81;1.11)	0.96(0.82;1.12)
5-6	27.0	1.09(0.69;1.73)	0.92(0.58;1.47)	65.0	0.93(0.78;1.11)	0.97(0.81;1.15)
Eating watching TV, using computer or cellphone		**p=0.077**	**p=0.108**		**p=0.002**	**p=0.018**
Yes	24.8	1.24(0.98;1.57)	1.22(0.96;1.57)	71.0	1.16(1.06;1.27)	1.12(1.02;1.23)
No	20.0	1.00	1.00	61.0	1.00	1.00

to be continue

a) CA: crude analysis.
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d) 95%CI: 95% confidence interval.
e) P value calculated using heterogeneity test.
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continuation

Table 3 – Crude and adjusted analysis of unhealthy food markers, according to exposure variables, by women of childbearing age (15-49 years) in the rural area of Rio Grande, Rio Grande do Sul, 2017

Variables	Hamburger and/or charcuterie			Sweetened drinks		
	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])	%	CA[a] PR[c] (95%CI[d])	AA[b] PR[c] (95%CI[d])
Children living at home		**p=0.213[e]**	**p=0.544[e]**		**p=0.131[e]**	**p=0.148[e]**
Don't live at home	15.6	1.37(0.79;2.35)	1.07(0.62;1.85)	60.0	1.09(0.90;1.32)	1.00(0.82;1.21)
1-2	21.3	1.59(0.84;3.00)	1.36(0.72;2.58)	65.0	1.24(0.99;1.55)	1.16(0.93;1.45)
3 or more	24.7	1.68(0.96;2.96)	0.93(0.49;1.78)	74.0	1.16(0.95;1.42)	0.93(0.74;1.18)
Have no children	26.2	1.00	1.00	69.0	1.00	1.00
Medical appointment(s) in the last year		**p=0.136**	**p=0.108**		**p=0.816**	**p=0.545**
Yes	23.7	1.23(0.94;1.62)	1.26(0.95;1.66)	67.0	1.01(0.92;1.12)	1.03(0.93;1.14)
No	19.2	1.00	1.00	66.0	1.00	1.00

a) CA: crude analysis.
b) AA: adjusted analysis.
c) PR: prevalence ratio.
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of this marker among women with higher economic classification. A study in Lithuania,[20] with rural and urban populations, also revealed that people belonging to higher social classes had more likelihood of being aware of socially desirable dietary habits, which may have affected their reports of nutritional habits.

With regard to greens and vegetables, this study with rural females found higher consumption than that found by the 2008-2009 POF (16%)[17] among urban and rural populations, although it is in keeping with the same POF with regard to higher consumption of greens and vegetables by higher-income women.

As for unhealthy food consumption markers, the habit of consuming hamburgers and charcuterie on the day before was associated with the lowest age range interviewed, namely 15-19 years. This finding is relevant because the habit of consuming unhealthy food may be associated with increasingly early consumption of ultra-processed foods, providing a stimulus to inadequate food intake. In Pelotas, RS,[8] a study conducted with people living in the urban area assessed 2,732 adults and reached similar conclusions regarding the relationship between unhealthy food intake and the youngest age range (20-29 years) defined by the study. The conclusions allow the assumption that this habit could and should be discouraged at the start of adolescence.

It is noteworthy that this study found high consumption of soda pop and artificial fruit juice, this being the most prevalent unhealthy food marker we identified. The diet of women living in the rural area of Rio Grande was characterized by high consumption of calorie-dense foods. These results are consistent with other studies.[3,21-24] The high consumption of soda pop and artificial fruit juice we found is harmful owing to its proven association with the occurrence of CNCDs, particularly obesity and diabetes *mellitus*.[6] Furthermore, sweetened drink consumption was associated with the lowest age range, highlighting the need to encourage nutrition education strategies that discourage consumption of sweetened drinks and sweet food with high calorie levels, common to the majority of ultra-processed foods and responsible for increased risk of obesity.[6]

The instrument used in our study is recommended by the Ministry of Health in the context of the SISVAN, for checking previous day food consumption, and may reduce possible memory bias. In addition, its questions are clear and objective and easy to administer. Another positive point of the study was its having evaluated food consumption markers of women living in the rural area, since the majority of studies assess the urban population. We highlight the high proportion of participation (90%) and the rigorous methodology employed in all stages of the study, thus contributing to its internal validity.

The study's limitations include its cross-sectional design, which is not the most appropriate design for es-

Table 4 – Crude and adjusted analysis of unhealthy food markers, according to exposure variables, by women of childbearing age (15-49 years) in the rural area of Rio Grande, Rio Grande do Sul, 2017

Variables	Instant noodles, salted packet snacks or savory biscuits			Filled sweet biscuits, candies or desserts		
	%	CA[a]	AA[b]	%	CA[a]	AA[b]
		PR[c] (95%CI[d])	PR[c] (95%CI[d])		PR[c] (95%CI[d])	PR[c] (95%CI[d])
Race/skin color		**p=0.063[e]**	**p=0.0058[e]**		**p=0.334[e]**	**p=0.172[e]**
White	21.1	1.00	1.00	35.4	1.00	1.00
Black	17.0	0.80(0.45;1.44)	0.78(0.45;1.37)	42.4	1.20(0.88;1.63)	1.30(0.96;1.75)
Brown/Yellow/Other	9.2	0.44(0.21;0.90)	0.45(0.22;0.90)	30.3	0.85(0.60;1.22)	0.89(0.63;1.26)
Age range (in years)		**p=0.041[f]**	**p=0.762[f]**		**p<0.001[f]**	**p=0.169[f]**
15-19	27.2	1.00	1.00	51.8	1.00	1.00
20-34	19.9	0.73(0.51;1.05)	0.92(0.59;1.43)	35.3	0.68(0.55;0.85)	0.81(0.61;1.08)
35-49	17.8	0.65 (0.46;0.94)	0.90(0.55;1.50)	31.2	0.60(0.48;0.76)	0.76(0.55;1.06)
Marital status		**p=0.002[e]**	**p=0.111[e]**		**p<0.001[e]**	**p=0.408[e]**
Single	29.0	1.00	1.00	47.2	1.00	1.00
Married	18.2	0.63(0.48;0.83)	0.69(0.47;1.03)	33.2	0.70(0.58;0.85)	0.85(0.65;1.11)
Separated/divorced/widowed	11.4	0.39(0.17;0.92)	0.46(0.18;1.17)	27.3	0.58(0.35;0.96)	0.74(0.43;1.26)
Economic classification (ABEP[g])		**p=0.795[f]**	**p=0.840[f]**		**p=0.038[f]**	**p=0.125[f]**
A/B	19.6	0.94(0.60;1.48)	0.97(0.62;1.52)	39.6	1.38(1.01;1.89)	1.33(0.97;1.83)
C	19.8	0.95(0.68;1.34)	0.98(0.70;1.38)	36.4	1.27(0.98;1.65)	1.28(0.98;1.66)
D/E	20.7	1.00	1.00	28.7	1.00	1.00
Paid job		**p=0.521**	**p=0.691**		**p=0.869**	**p=0.539**
Yes	18.8	0.92(0.70;1.20)	0.94(0.71;1.26)	35.8	1.02(0.85;1.21)	1.06(0.88;1.28)
No	20.5	1.00	1.00	35.3	1.00	1.00
Alcohol (intake in last week)		**p=0.895**	**p=0.965**		**p=0.459**	**p=0.448**
Yes	19.4	0.97(0.63;1.49)	1.01(0.66;1.53)	38.8	1.11(0.85;1.44)	1.10(0.85;1.42)
No	20.0	1.00	1.00	35.1	1.00	1.00
Tobacco smoking		**p=0.743[e]**	**p=0.769[e]**		**p=0.061[e]**	**p=0.423[e]**
Nonsmoker	20.3	0.99(0.68;1.42)	1.13(0.77;1.64)	37.7	0.81(0.62;1.06)	0.92(0.70;1.21)
Former smoker	20.0	0.86(0.58;1.27)	0.96(0.63;1.45)	30.7	0.75(0.56;0.99)	0.83(0.62;1.11)
Smoker	17.4	1.00	1.00	28.3	1.00	1.00
Physical activity in leisure time (walking for at least 30 min/day)		**p<0.001**	**p<0.001**		**p=0.954**	**p=0.750**
Yes	26.9	1.56(1.21;2.02)	1.62(1.25;2.10)	35.6	1.01(0.83;1.22)	0.97(0.80;1.17)
No	17.2	1.00	1.00	35.4	1.00	1.00
Number of meals per day		**p=0.718[f]**	**p=0.698[f]**		**p=0.009[f]**	**p<0.001[f]**
1 a 2	20.6	1.00	1.00	38.4	1.00	1.00
3 a 4	19.5	0.95(0.59;1.53)	0.91(0.56;1.48)	31.7	0.83(0.60;1.13)	0.80(0.58;1.09)
5 a 6	21.2	1.03(0.62;1.73)	1.01(0.60;1.70)	46.0	1.20(0.87;1.66)	1.19(0.86;1.65)
Eating watching TV, using computer or cellphone		**p = 0.049**	**p = 0.107**		**p = 0.001**	**p < 0.001**
Yes	22.5	1.29(1.00;1.67)	1.24(0.95;1.61)	40.6	1.33(1.12;1.58)	1.28(1.07;1.53)
No	17.4	1.00	1.00	30.5	1.00	1.00

to be continue

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continuation

Table 4 – Crude and adjusted analysis of unhealthy food markers, according to exposure variables, by women of childbearing age (15-49 years) in the rural area of Rio Grande, Rio Grande do Sul, 2017

Variables	Instant noodles, salted packet snacks or savory biscuits			Filled sweet biscuits, candies or desserts		
	%	CA[a]	AA[b]	%	CA[a]	AA[b]
		PR[c] (95%CI[d])	PR[c] (95%CI[d])		PR[c] (95%CI[d])	PR[c] (95%CI[d])
Children living at home		**p=0.203[e]**	**p=0.622[e]**		**p=0.090[e]**	**p=0.365[e]**
Don't live at home	13.0	1.50(0.82;2.74)	1.38(0.76;2.48)	23.4	1.45(0.95;2.21)	1.32(0.87;2.01)
1-2	19.5	1.45(0.70;3.00)	1.47(0.72;3.01)	33.9	1.51(0.92;2.48)	1.49(0.92;2.41)
3 or more	18.8	1.85(0.99;3.45)	1.19(0.59;2.37)	35.3	1.86(1.21;2.87)	1.21(0.74;1.97)
Have no children	24.0	1.00	1.00	43.6	1.00	1.00
Medical appointment(s) in the last year		**p=0.480**	**p=0.479**		**p=0.811**	**p=0.813**
Yes	19.3	0.91(0.69;1.19)	0.90(0.69;1.19)	35.8	1.02(0.85;1.23)	1.02(0.85;1.23)
No	21.3	1.00	1.00	35.0	1.00	1.00

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b) AA: adjusted analysis.
c) PR: prevalence ratio.
d) 95%CI: 95% confidence interval.
e) P value calculated using heterogeneity test.
f) P value calculated using Wald's linear trend test.
g) ABEP: Brazilian Survey Company Association.

tablishing relationships of causality and, consequently, excludes the possibility of examining the temporality relationship between exposures and outcomes. Another important limitation relates to seasonality: the study was conducted between April and October, covering three seasons of the year: autumn, winter and spring, with different food items being available and consumed. A third limitation of the study lies in the representative character of dietary habits, especially when the day before is atypical, following public holidays and weekends, when dietary routine is usually left to one side.

The results presented can be useful for health services, for proposing dietary and nutritional education actions. After having been taken into consideration and duly analyzed by health service managers and professionals, its conclusions can serve as a baseline for interventions aimed at encouraging healthy dietary habits among women in rural areas, as well as for intervening in certain diseases and health conditions more directly susceptible to dietary habits.

Authors' contributions

Silveira FC, Susin LRO and Meucci RD took part in all stages of preparing this manuscript, including the study conception and design, data analysis and interpretation and writing the manuscript. All the authors have approved the final version and are responsible for all aspects of this work, ensuring the reliability of the data and the integrity and accuracy of the information.

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