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Relationship between Socioeconomic Factors and Consumption of Ultra-Processed Foods among Students from Public and Private Schools throughout Brazil in 2019

André Luiz Cavalcante Fontenele[1,*], Luiz Carlos de Abreu[1], Francisco Naildo Cardoso Leitão[2], Tamires dos Santos Vieira[3] and Janaína Paula Costa da Silva[4]

[1]University of São Paulo – USP, Brazil

[2]Federal University of Acre – UFAC, Brazil

[3]Federal University of Espírito Santo – UFES, Brazil

[4]Federal University of Uberlândia – UFU, Brazil

[*]**Corresponding Author:** André Luiz Cavalcante Fontenele, University of São Paulo – USP, Brazil, Tel.: +55 68 9 92029229, E--mail: nutriandrecfontenele@gmail.com

Abstract

Introduction: in childhood and adolescence, behaviors are acquired that can influence the rest of to human being's life. At this age, eating habits can well shaped, with to view you reducing childhood obesity, which has increased every year in Brazil and around the world. During the school period, students consume foods that directly influence their weight and depending on their socioeconomic level, choices can well significant in the quality of consumption.

Objective : to analyze the relationship between socioeconomic factors and ultra-processed food consumption among students from public and private schools in 2019.

Methods: the sample consisted of 124,720 adolescents, with the outcome being the consumption of ultra-processed foods. Categorical variables were presented in absolute and relative frequencies. Notes/scores were assigned evaluating the frequency of weekly consumption of each food, where 0 did not consume and consumed up to 7 times. The foods were subsequently ranked based on the highest daily consumption scores and recategorized into consumption quartiles, being presented graphically through medians, using boxplot graphs. Statistical tests were Mann-Whitney U or Kruskal Wallis, with a significance level of 5%. Results: the results indicate that adolescents from private schools consume more ultra-processed foods than those from public schools. The socioeconomically disadvantaged groups have lower consumption of healthy markers and higher consumption of ultra-processed products.

Conclusion: consumption of ultra-processed foods is higher in private schools.

Keywords: food; ultraprocessed; students; teenagers

Introduction

Obesity in childhood is the most debilitating problem of public health in the 21st century. It has emerged as a pandemic health problem throughout the world. Children who are obese tend to remain obese into adulthood and are prone to increased risk of diabetes and heart problems in their early lives. Childhood obesity is associated with increased morbidity and premature death. Preventing obesity in children is a high priority in the current situation. [1]

Recognize that weight gain is partly caused by high energy intake, which often includes a disproportionate amount of refined carbohydrates and/or processed foods (increased insulin release and increased enjoyment) and decreased physical activity [2]. The prevalence of obesity increased dramatically among children in school age (6-11 years) and adolescents (age, 12-19 years) between 1976 and 1980 and between 2009 and 2010 (from 6.5% to 18.0% in children and from 5.0% to 18.4% in adolescents).

Natural or minimally processed foods are substituted for processed and ultraprocessed foods (AUPs), which are most often introduced early into infant nutrition. This scenario contributes to the imbalance in the supply of nutrients and the high consumption of high-calorie foods, favoring or desensitization from obesity, which, in the childhood population, is related to early ageing and the introduction of food that is not saturated with complementary foods [3].

In recent years, the high consumption of ultraprocessed foods (AUP) has been observed among Brazilian schools. Nuts from Fishing National Saúde do School (PeNSE) of 2015 shows that 41.6, 26.7 and 31.3% of some consumers, five or more days a week, lanches, refrigerants and AUP rose, respectively. In contrast, just 32.7% of students present adequate consumption of fruit, 37.7% of vegetables and 60.7% of holidays. This consumption limit starts from the change in food management observed among the entire population, which includes the increase in consumption of highly processed products and drinks and the substitution of traditional refeições for quick or ready meals, as required by the AUPs [4].

Hugues [5] that policies intended to influence the food environment are well suited to changes in food behavior and are fundamental to improve it. Long [6] Aponta que embora as melhorias na nutricional qualidade da snack escolar e as regras que regem a qualidade nutricional des competitos foods tenham ganhado grande parte por esquisa e atenção das políticas, mudaças os mecanismos financiamento da snack escolar têm the potential to substantially increase the access and sustainability of the programs.

Pineda [7] as part of its research, shows that changes in the food environment and school can improve the eating behavior and BMI of children, but political actions are necessary to improve the food environments surrounding schools and schools to support food intake and BMI saudáveis. (Garden) say that schools provide a physical, social and educational environment for children and prevent the ability to mold physical activity (AF) and nutritional behaviours. Delfino [8] observed that teenagers are likely to consume energy-dense foods while watching television, mainly fried foods, desserts, refrigerators and salts; and Avery [9] reported in a systematic review that is now analyzing the consumption of fruits and vegetables, identifying a negative association such as watching TV.

Locatelli [10] finds in its research the positive influence of a snack offered in schools over food consumption in Brazil, and which requires having a wide application of the PNAE in the country, so as to avoid those who are examining the effects of nutrition school via PNAE and school cellars over the consumption of ultra-processed foods by teenagers.

Silva [8] notes that the prevalence of excessive consumption of ultra-processed foods in Brazil in 2015 was less in the northern region, and this may be due to behavioral, socio-economic, cultural and environmental characteristics, but it is not clear whether the presence of PNAE in schools will impact the consumption of teenagers. At the same time, it can be assumed that the factors mentioned may suffer from changes that over a long period of time will have direct impacts on consumption that

are not in the North, like many other regions in the country.

Objectives

The objective of this study is to analyze the relationship of socio-economic factors with the consumption of ultra-processed foods among students in public and private schools throughout Brazil in 2019.

Materials and Methods

The data analyzed in this cross-sectional study come from the fourth edition of the National School-based Health Survey (PeNSE), conducted in 2019. It had a complex sample design that covered the entire national territory and included students aged 13 to 17 years from public schools and private schools that are in the public eye, considering schools with fewer than 20 students enrolled, located in urban and rural areas of the country from 09 April to 30 September 2019 .We selected 124,888 participants to exclude 168 who did not respond or abandon the questionnaire, making the total number 124,720.

Study Design

The data analyzed in this transversal study are from the fourth edition of the National Educational Health Survey (PeNSE), carried out in 2019.

Place of Study and Period

At PeNSE 2019 you will see a complex demonstration that encompasses all of the national territory from 09 April to 30 September 2019.

Study Population and Inclusion Criteria

We selected 124,888 participants, excluding 168 who did not respond or abandon the questionnaire, totaling a final show of 124, 720 people. This includes students from 13 to 17 years of age in public and private schools that are in the popular population, taking into account schools with fewer than 20 students enrolled, located in urban and rural areas of the country .

Collection of Dice

TO Think 2019 teve um drawing amostral complex what abrague everything or territory national and including students from 13 to 17 years of age from public and private schools which are in the population-alve of the population, disregarding schools with fewer than 20 students enrolled, located in urban and rural areas of the country in any period of April 9th 30 of September 2019. TO Collect the data from our own schools and we will answer our students directly to an electronic questionnaire availability am device person digital assistant as help do finder.

Data Analysis

Foram attributed notes/scores to verify the frequency of weekly consumption of each food, waves 0 no consumes, And 7 consumes until 7 sometimes for week. Later on as notes foram divided by days from week.

Assim, foram estabelecidos the following scores: 0 (no consome), 0.14 (consome 1 day), 0.29 (consome 2 days), 0.43 (consome 3 days), 0.57 (consome 4 days), 0.72 (consome 5 dias), 0.86 (consome 6 dias) and 1 (consome todos os dias), compliant (Sichieri and Gigante, 2007). On average give scores I was made para fall food no groups of food ultraprocessed (AUP) And food *in nature* , compliant questionnaire from Search National of Health do School

- He thinks.

Oh food forum later ranqueados how base no majors scores of daily consumption and recategorized in consumption quarters (Q1-Q4). After this, quarters 2, 3 and 4 (Q2, Q3 and Q4) are conveniently located, originating only in two categories for ultra-processed foods. They are dice forum tables using or Microsoft Excel® And analyzed through SPSS® software, version 25.0.00.

To characterize the population being studied, a descriptive statistical analysis of the variables was carried out. As varied as presented in absolute frequencies and relative. For check the normality of the distribution, the consumption scores below the Shapiro-Wilk test ($p<0.05$), so that the p-value is less than 5%, decreasing the normality two dice. Oh results forum presented graphically for meio of medians, using boxplot graphics. Furthermore, for example, statistical tests such as Mann-Whitney U (Mann; Whitney, 1947) for two demonstrations, or Kruskal Wallis (Kruskal; Wallis, 1952) for three or more groups of independent demonstrations, both at a level of significance 5%.

TO analysis univariada I was carried out to to leave of models of regression of Fish how robust variation, I tend as a variable dependent on the consumption of ultra-processed foods and as a variable explicative of the socio-economic aspects and related to the food environment and education.

As varied independent what I will obtain value p lower to 20% ($p<0.20$) forum Entered by the Backward method the multivariable Poisson Regression model with robust variation, since those with less significance (greater p-value) were withdrawn from one to another of the models. OR procedure I was repeat until what all as varied presents No model could have significant statistical significance ($p<0.05$).

Useful, para verification do adjust do model final, or heads of Homer & Lemeshow. The prevalence rate (RP) with a 95% confidence interval (95% CI) should be used as recommended of effect. Oh dice obtidos forum analyzed how help do software was verse 14.2. For all analyses, a significant value of 5% was adopted.

Ethical and Legal Aspects of Research

For if to treat of uma base of dice of public domain, it was not necessary to Submission of the project to the Fisheries Ethics Committee. This is conducted in accordance with the Declaration of Helsinque and approved by the Ethics Committee of the National Ethics Committee in Fish (CONEP) do I advise National of Health (CNS) — Seem n. 3.249.268 (8 of April of 2019).

Results

Oh aspects presented no Table 1 show me what practically um third two alunos there's more of 15 years And what to majoria was studying am areas urban (94.7%) And school from public administration. TO big part two alunos (65.96%) I know of age enter 13 until 15 years. Um outro What is also interesting is that in relation to the heart/raça, a majority of public school students declare themselves less, whereas in private schools more than half of the students (50.7%) declare classes.

Table 1: Socioeconomic characteristics of children aged 13 to 17 in relation to the administrative dependency, Pense 2019

Varied	Public	Private	p- value
Sex - n (%)			
Home	31856 (49.0)	29599 (49.6)	0.036
woman	33107 (51.0)	30038 (50.4)	
Age n (%)			
13 – 15 years old	40168 (61.7)	42215 (70.6)	<0.001
16 – 17 years old	24902 (38.3)	17603 (29.4)	
Heart / Race - n (%)			
Pack	17888 (28.0)	29610 (50.7)	<0.001
Preto	9575 (15.0)	3967 (6.8)	
Parda	31588 (49.4)	21825 (37.4)	
Ethnic	4904 (7.7)	3009 (5.2)	
Blackberry how to Mother - n (%)			
Yes	56151 (86.3)	54799 (91.6)	<0.001
No	8892 (13.7)	4993 (8.4)	
Blackberry how or Pai - n (%)			
Yes	36744 (56.5)	41857 (70.0)	<0.001
No	28270 (43.5)	17920 (30.0)	
I can Cellular - n (%)			
Yes	52749 (81.1)	56657 (94.7)	<0.001
No	12295 (18.9)	3146 (5.3)	
Theme PC or notebook am house n (%)			
Yes	31800 (48.9)	52692 (88.1)	<0.001
No	33239 (51.1)	7111 (11.9)	
Theme access to Internet am house n (%)			
Yes	54957 (84.5)	58676 (98.1)	<0.001
No	10085 (15.5)	1128 (1.9)	
Somebody how wagon am house n (%)			
Yes	31589 (48.6)	51076 (85.4)	<0.001
No	33443 (51.4)	8729 (14.6)	
Level of ensino from mother n (%)			
My mother no I studied	3018 (4.7)	267 (0.4)	<0.001
No I'm finishing or ensino fundamental	12605 (19.4)	2231 (3.7)	
Terminate or ensino fundamental	4421 (6.8)	1412 (2,4)	
No six	13644 (21.0)	5970 (10.0)	

Type of Town Hall n (%)			
Capital	32670 (50.2)	31708 (53.0)	<0.001

Table 2: Single analysis of factors associated with the consumption of ultra-processed foods by adolescents in PeNSE 2019 in Brazil

Varied	Consumption infrequent	Frequent consumption	p- value	RP (95%CI)
Sex n (%)				
Home	12286 (55.6)	48874 (47.9)	<0.001	1.06 (1.05 - 1.06)
woman	9826 (44.4)	53190 (52.1)		
Age n (%)				
13 to 15 years	14753 (66.5)	67328 (65.8)	<0.001	1.00 (1.00 - 1.01)
16 to 17 years	7416 (33.5)	34967 (34.2)		
Heart/Race n (%)				
Branch	7300 (33.7)	40076 (40.0)	<0.001	0.97 (0.9 - 0.98)
Preta	2581 (11.9)	10895 (10.9)		
Parda	10034 (46.3)	43196 (43.1)		
Ethnic	1741 (8.0)	6137 (6.1)		
Blackberry how mother n (%)				
Yes	19533 (88.1)	91067 (89.0)	<0.001	0.98 (0.97 - 0.99)
No	2631 (11.9)	11200 (11.0)		
Schooling mother n (%)				
No I studied	1063 (4.8)	2190 (2,1)	<0.001	1.06 (1.05 - 1.06)
No know	4517 (20.4)	14982 (14.7)		
< 8 years old	5768 (26.1)	22467 (22.0)		
> 8 years old	10769 (48.7)	62523 (61.2)		
Blackberry how pai n (%)				
Yes	13770 (62.2)	64593 (63.2)	<0.001	0.99 (0.9 - 0.99)
No	8383 (37.8)	37644 (36.8)		
People no moradia n (%)				
< 5 people	13818 (63.4)	68830 (67.9)	<0.001	0.96 (0.95 - 0.96)
>5 people	7994 (36.6)	32494 (32.1)		
I can cell phone n (%)				
Yes	17708 (79.9)	91385 (89.4)	<0.001	0.83 (0.83 - 0.85)
No	4457 (20.1)	10892 (10.6)		
You have PCs or Notebooks at home n (%)				
Yes	12538 (56.6)	71754 (70.2)	<0.001	0.89 (0.88 - 0.89)
No	9625 (43.4)	30522 (29.8)		

Access to Internet am house n (%)				
Yes	18230 (82.3)	95073 (93.0)	<0.001	0.77 (0.76 - 0.78)
No	3932 (17.7)	7205 (7.0)		
Alguém em casa possui cart n (%)				
Yes	12025 (54.3)	70425 (68.9)	<0.001	0.88 (0.88 - 0.89)
No	10136 (45.7)	31845 (31.1)		
Type of Town Hall n (%)				
Capital	10548 (47.6)	53593 (52.4)	<0.001	0.96 (0.96 - 0.97)
No Capital	11621 (52.4)	48702 (47.6)		
Situation n (%)				
Urban	20094 (90.6)	98150 (95.9)	<0.001	0.80 (0.78 - 0.81)
Rural	2075 (9.4)	4145 (4.1)		

Oh results that analyses multivariable I know exhibited no Table 3. When compared, female sex [RP=1.06, CI=1.05 – 1.07], more education from mother [RP=1.14, CI=1.10 – 1.17], morar com a mãe [RP=1.02, CI=1.01 – 1.03] and not to be able to drink coffee from man [RP=1.05, CI=1.04 – 5] summers are associated with a greater probability of consuming ultra-processed foods. In comparison that you vary depending public administration [RP=0.97, IC=0.95 – 0.98], and the variables that compõem a socio-economic analysis: cell phone [RP=0.83, IC=0.83 – 0.85], PC or notebook at home [RP=0.97, IC=0.96 – 0.98], internet access at home [RP=0.86, IC =0.84 – 0.87], buy a cart at home [RP=0.93, IC=0.92 – 0.94], at the same time as various: customs as a snack at school [RP=0.98, IC=0.97 – 0.99], buy drinks/food in the cellar [RP=0.88, IC=0.87 – 0.89] and buy drinks/food on the street [RP=0.88, CI=0.87 – 0.89] for which they are associated with a lower probability of consuming ultra-processed foods.

Table 3: Multivariable analysis of factors associated with the consumption of ultraprocessed foods by adolescents in PeNSE 2019 in Brazil

Varied	p- value	RP (95%CI)
Sex		
Home	<0.001	1
woman		1.06 (1.05 - 1.07)
Dependence Administrative		
Private	<0.001	1
Public		0.97 (0.95 - 0.98)
Schooling mother		
No I studied	<0.001	1
No know		1.08 (1.05 - 1,11)
< 8 years old		1.12 (1.09 - 1,16)
> 8 years old		1.14 (1.10 - 1.17)
Blackberry how pai		
Yes	<0.001	1

No			1.02 (1.01 - 1.03)
I can cell phone			
Yes		<0.001	1
No			0.83 (0.83 - 0.85)
I can PC or Notebook am house			
Yes		<0.001	1
No			0.97 (0.96 - 0.98)
Access to Internet am house			
Yes		<0.001	1
No			0.86 (0.84 - 0.87)
Somebody am house I can wagon			
Yes		<0.001	1
No			0.93 (0.92 - 0.94)
Costume eat snack from school			
Yes		<0.001	1
No			0.98 (0.97- 0.99)
Buy drinks/food no cellar			
Yes		<0.001	1
No			0.88 (0.87 - 0.89)
No I'm a cellar			0.91 (0.90 - 0.92)
Buy drinks/food no street			
Yes		<0.001	1
No			0.88 (0.87 - 0.89)
Sem sellers open from school			0.88 (0.87 - 0.89
Toma coffee from manha			
Yes		<0.001	1
No			1.05 (1.04 - 1.05)
Dependence Administrative n (%)			
Public	13832 (62.4)	50893 (49.8)	<0.001	1.09 (1.08 - 1.10)
Private	8337 (37.6)	51402 (50.2)		
School offers snack n (%)			
Yes	12496 (56.4)	48271 (47.2)	<0.001	1.03 (1.02 - 1.03)
No	7627 (34.4)	47387 (46.4)		
No know responder	2018 (9.1)	6571 (6.4)		
Buy drinks/food in the cellar n (%)			
Yes	3545 (16.0)	34036 (33.3)	<0.001	0.92 (0.91 - 0.92)

No	14808 (66.9)	53144 (52.0)		
No I'm cellar	3775 (17.1)	14961 (14.6)		
Buy drinks/food on the street n (%)				
Yes	1778 (8.0)	16871 (16.5)	<0.001	0.94 (0.94 - 0.95)
No	16283 (73.6)	67464 (66.0)		
Sem sellers open from school	4072 (18.4)	17853 (17.5)		
Comer swimsuit with school snack n (%)				
Pulou	9673 (43.7)	54024 (52.8)	<0.001	0.98 (0.97- 0.99)
Yes, all os days	4526 (20.4)	14774 (14.4)		
Yes, 3 to 4 days no week	1265 (5.7)	6463 (6.3)		
Yes, 1 to 2 days no week	886 (4.0)	4167 (4.1)		
Rarely	3216 (14.5)	12974 (12.7)		
No	2594 (11.7)	9866 (9.6)		
Toma coffee from manha n (%)				
All os days	14098 (63.6)	54120 (52.9)	<0.001	1.01 (1.01 - 1.01)
Yes, 5 to 6 days by week	731 (3.3)	4860 (4.8)		
Yes, 3 to 4 days by week	678 (3.1)	4972 (4.9)		
Yes of 1 to 2 days in a week	597 (2.7)	3950 (3.9)		
Rarely	3952 (17.8)	24119 (23.6)		
No	2111 (9.5)	10254 (10.0)		
Frequency eat doing other activity n (%)				
All os days	9078 (41.0)	49873 (48.8)	<0.001	0.97 (0.97 - 0.97)
5 to 6 days for week	1221 (5.5)	8392 (8.2)		
3 to 4 days for week	1410 (6.4)	9745 (9.5)		
1 to 2 days no week	1977 (8.9)	9508 (9.3)		
No costume eat And to do something else	8456 (38.2	24722 (24.2)		

N: frequencies absolute; %: frequencies relatives; values P (<0.05) denotes meaning.

Discussion

This is supported by socio-economic data and its association with the consumption of ultra-processed foods in public and private schools in the country. The indicated results what exists um consumption lesser of food ultra-processed in school public in private relationships. Um fator what it seems to be associated negatively oh consumption of AUP And to schooling at home, this association is inversely proportional to the level of students who can, the greater the schooling, the greater the risk of the student ingesting ultra-processed drugs [11].

As a result of the particular divergence of [12] which indicates that maternal schooling can be considered an indirect indicator of the socio-economic level and with the increase in yield and possibility of better nutritional education, adolescents tend to

more balance our principles that Let's go to healthy food: a food offer of quality, to availability of make nose hands that people And os prices practiced on the market.

I'm sorry uma hypothetical para such divergence may if must as well oh fate of oh to be able higher level of schooling, more time spent outside the home, deciding to participate more actively no education nutritional do teenager, allowing what or memo hold book Find out what type of food you can consume.

Oh factors socioeconomics as well exercise impact No consumption of AUP And food *in nature*,[13] os groups socioeconomically disfavored I present less consumption of saudáveis markers and more consumption of ultraprocessed products, corroborating as [14 -17].

Teenagers Brazilians of level socioeconomic corn down I consume less *naturally occurring /minimally processed* foods , but also fewer ultra-processed foods in comparison how water of level socioeconomic corn high. TO availability of food *in nature* / minimally processed, pode ser limited in the least favorite places. This may be due to the less power acquired by students who experience greater difficulty in accessing foods considered healthy. It is interesting to note that these accesses can be done justly through that politics And programs what objectively to offer of food corn nature in schools.

Conclusion

In relation to the socio-economic factors of students who are less favorable and, consequently, how conditions social And finances corn limiting, I am sob major I risk nutritional ao third how options corn you face, os food ultra-processed what am theory I know products corn baratos. At the same time, when at public school healthy food is offered, students are students I am following third access to ist food And as well they consumption them to tendency of to be the greatest enter they group. Studies corn complete I know necessary para to confirm tais evidence.

References

1. Balasundaram P, Krishna S (2022) Obesity Effects On Child Health. In StatPearls. StatPearls Publishing.

2. Di Cesare M, Sorić M, Bovet P, Miranda JJ, Bhutta Z (2019) The epidemiological burden of obesity in childhood: a world-wide epidemic requiring urgent action. BMC medicine, 17: 212.

3. Pereira AM, Buffarini R, Domingues MR, Barros F, Silveira M (2022) Ultra-processed food consumption by children from a Pelotas Birth Cohort. Revista de saude publica, 56: 79.

4. Lacerda AT, Carmo A, Sousa TM, Santos L (2020) Participation Of Ultra-Processed Foods In Brazilian School Children's Diet And Associated Factors. Revista paulista de pediatria: official organ of the Sociedade de Pediatria de Sao Paulo, 38: e2019034.

5. Hugues Y, Díaz-Zavala RG, Quizán-Plata T, Corvalán C, Haby MM (2021) Poor compliance with school food environment guidelines in elementary schools in Northwest Mexico: A cross-sectional study. PloS one, 16: e0259720.

6. Long MW, Marple K, Andreyeva T (2021) Universal Free Meals Associated with Lower Meal Costs While Maintaining Nutritional Quality. Nutrients, 13: 670.

7. Pineda E, Bascunan J, Sassi F (2021) Improving the school food environment for the prevention of childhood obesity: What works and what doesn't. Obesity reviews: an official journal of the International Association for the Study of Obesity, 22: e13176.

8. Delfino LD, Tebar WR, Silva DAS, Gil FCS, Mota J et al. (2020) Food advertisements on television and eating habits in adolescents: a school-based study. Revista De Saúde Pública, 54: 55.

9. Avery A, Anderson C, McCullough F (2017) Associations between children's dietary quality and watching television during meal or snack consumption: TO systematic review. Maternal & child nutrition, 13: e12428.

10. Locatelli NT, Canella DS, Bandoni DH (2018) Positive influence of school meals on food consumption in Brazil. Nutrition, 53: 140-4.

11. Carroll JE, Sturgeon SR, Bertone-Johnson E, Van Kim N, Longacre MR, Dalton MA et al. (2024) Factors Correlated With Ultra-Processed Food (UPF) Intake in Preschool-Aged Children and Association With Weight. Journal of nutrition education and behavior, S1499-4046(23)00583-3.

12. Gonçalves HVB, Batista LS, de Amorim ALB, Bandoni DH (2023) Association between Consumption of Ultra-Processed Foods and Sociodemographic Characteristics in Brazilian Adolescents. Nutrients, 2027.

13. Costa C, Steele EM, Faria FR, Monteiro CA (2022) Scores of ultra-processed food consumption and its association with sociodemographic factors in the Brazilian National Health Survey, 2019. Cadernos de saude publica, 38: 1.

14. Fahlman MM, McCaughtry N, Martin J, Shen B (2010) Racial and socioeconomic disparities in nutritional behaviors: targeted interventions needed. J Nutr Educ Behav, 42: 10-6.

15. Novakovic R, Cavelaars A, Geelen A, Nikolic M, Altaba II, Viñas BR, Ngo J et al. (2014) Socio-economic determinants of micronutrient intake and status in Europe: a systematic review. Public Health Nutr, 17: 1031-45.

16. Giskes K, Avendano M, Brug J, Kunst AE (2010) A systematic review of studies on socioeconomic inequalities in dietary intakes associated with weight gain and overweight/obesity conducted among European adults. Obes Rev, 11: 413-42.

17. Darmon N, Drewnowski A (2008) Does social class predict dietary quality? Am J Clin Nutr, 87: 1107-17.