ORIGINAL ARTICLE

https://doi.org/10.1590/1806-9282.20221230

Ultra-processed foods and the nutritional quality of the diet of Brazilian pregnant women

Karina da Rocha Mariano[1], Giovanna Calixto Andrade[2], Maria Laura Costa Louzada[2,3], Mary Uchiyama Nakamura[1], Edward Araujo Júnior[1], Eduardo Souza[1]

SUMMARY

OBJECTIVE: The aim of this study was to evaluate the consumption of ultra-processed foods by Brazilian pregnant women and its association with the nutritional quality of the diet.

METHODS: This is a prospective and cross-sectional study with food consumption data of Brazilian pregnant women from the 2017 to 2018 Family Budgets Survey (*Pesquisa de Orçamentos Familiares*). Food consumption was measured using two 24-h food recalls, and the foods were categorized according to the NOVA classification. The averages of absolute and relative energy consumption for each of the NOVA groups and subgroups were estimated. The sociodemographic characteristics described the diet's caloric contribution of ultra-processed and non-ultra-processed food fractions. Linear regression models were used to describe the association between quintiles of the caloric contribution of ultra-processed foods and the average content of nutrients in the diet.

RESULTS: Consumption of ultra-processed foods represented 20.9% of the total calories in the diet of Brazilian pregnant women. There was a higher energy contribution of ultra-processed foods in the diet of pregnant women living in urban areas (22%), with higher per capita income (23.7%), and in the south region of the country (26.9%). In addition, the data showed an association between higher consumption of ultra-processed foods with reduced intake of protein, carbohydrate, fiber, potassium, iron, zinc, and folate and increased intake of total fat, saturated fat, trans fat, and free sugar.

CONCLUSION: Results show that higher consumption of ultra-processed foods is associated with a reduction in the nutritional quality of the diet of Brazilian pregnant women.

KEYWORDS: Food-processing industry. Nutritional quality. Pregnant women.

INTRODUCTION

In recent years, the diet pattern of the Brazilian population has changed, with a decrease in the consumption of vegetables, cereals, and tubers and an increase in the consumption of foods rich in fats and sugars such as ultra-processed foods (UPFs)[1,2]. The NOVA classification categorizes foods based on the extent and purpose of industrial processing. UPFs are formulations of food substances modified by chemical processes and assembled into ready-to-eat foods and beverages, using numerous cosmetic additives such as colorings, flavors, emulsifiers, sweeteners, and thickeners[3].

Several studies have shown that a diet based on UPFs increases the risk of developing overweight, obesity, and chronic noncommunicable diseases (NCDs)[4-6] and contributes to inadequate intake of micronutrients due to the low nutritional quality of these foods, which have a high energy density; high content of free sugar, sodium, and saturated and trans fats; and low content of fiber, vitamins, and minerals[7-9].

The increase in the consumption of UPFs is especially worrying in the population of pregnant women, a group vulnerable to nutritional inadequacies[10], as micronutrient deficiency in the gestational period is considered a global public health problem[10,11]. According to the World Health Organization (WHO) (2017)[11], inadequate nutrient intake during pregnancy can increase the prevalence of NCDs, which, in turn, increases the risk of adverse outcomes during pregnancy[12]. Thus, the nutritional quality of the diet is critical to ensuring a healthy pregnancy for both the mother and the fetus[10-12].

Although the importance of an adequate diet in the gestational period is well established in the literature[10-12] and the negative impact of the consumption of UPFs on the nutritional quality of the diet for the general population[4-9], this relationship

[1]Universidade Federal de São Paulo, Paulista School of Medicine, Department of Obstetrics – São Paulo (SP), Brazil.
[2]Universidade de São Paulo, Nucleus of Epidemiological Research in Nutrition and Health – São Paulo (SP), Brazil.
[3]Universidade de São Paulo, Faculty of Public Health, Department of Nutrition – São Paulo (SP), Brazil.
*Corresponding author: araujojred@terra.com.br

Conflicts of interest: the authors declare there is no conflicts of interest. Funding: none.
Received on September 13, 2022. Accepted on October 12, 2022.

has been less investigated in the population of pregnant women. This fact motivated us to evaluate the consumption of UPFs by Brazilian pregnant women and the association with the nutritional quality of the diet.

METHODS

The data analyzed come from the individual food consumption module of the Brazilian Family Budgets Survey (POF – *Pesquisa de Orçamentos Familiares*), carried out by the Brazilian Institute of Geography and Statistics (IBGE) between 2017 and 2018[13].

The POF uses a complex two-stage cluster sampling plan. In the first stage, geographic and socioeconomic stratification are selected by systematic sampling, with probability proportional to the number of households in each sector. In the second stage, families are selected by simple random sampling.

Standardized questionnaires were applied to obtain data such as age, sex, pregnancy, ethnicity or race, educational level, household income, geographic region, and urban or rural area. The POF sample, referring to 2017–2018, was 57,920 households. The individual food consumption module was applied to a probabilistic subsample of 20,112 households. All residents over 10 years of age residing in these households were selected, totaling a subsample of 46,164 individuals.

Women between 10 and 50 years old who answered "yes" to the question "Are you pregnant?" regarding the POF questionnaire 7 (Personal Food Consumption Block)[13] were included in the study, totaling a sample of 379 pregnant women. In addition, data from the individual food consumption module were obtained from two 24-h food recalls, applied on nonconsecutive days. The recalls contained all meals and beverages (except water) consumed within 24 h, including the preparation, homemade measure, daily servings, meal times, and place of consumption.

We used data from the Brazilian Food Composition Table (TBCA)[14] to estimate the nutrients for each food and drink reported in the survey. Additionally, the "Model of Nutritional Profile" method of the Pan American Health Organization (PAHO)[15] was used to evaluate free sugar. Analyses were performed using the 2-day 24-h recall, when available. The Multiple Source Method® (MSM) program (version 1.0.1)[16] was used to adjust the estimate of habitual food and nutrient intake.

The consumption items (n=1,593) reported in the survey were categorized according to the NOVA food classification, which divides foods into four groups[3]:

- *Natural or minimally processed foods* (group 1) are obtained directly from animals or plants with no modifications/alterations after separation from nature such as cleaning, milling, freezing, pasteurization, fermentation, and other processes that do not include the addition of substances to the original foods.
- *Processed culinary ingredients* (group 2) are condiments extracted directly from foods of the first group or nature such as sugar, salt, oils, and fats.
- *Processed foods* (group 3) are produced by the industry with the addition of salt or sugar (or another substance commonly used in cooking) to natural or minimally processed food.
- *Ultra-processed foods* (group 4) are formulations of food substances modified by chemical processes and assembled into ready-to-eat foods and beverages, using numerous cosmetic additives such as dyes, flavors, emulsifiers, sweeteners, and thickeners.

The nutritional quality of the diet was evaluated by dietary indicators, for which WHO established consumption goals for the prevention of NCDs[16,17]. The parameters used were protein, carbohydrate, free sugar, fiber, total fat, saturated fat, trans fat, sodium, and potassium. In addition to the micronutrients that WHO points out, there is a need for greater nutritional surveillance during the gestational period: iron, folate, zinc, calcium, and vitamin A[18,19].

The total and relative energy consumption averages of the NOVA groups and subgroups were estimated to describe food consumption. The diet was divided into two fractions, one composed only of UPFs and the other of non-UPFs. In addition, the caloric contribution of each fraction was described for the total sample of pregnant women and by sociodemographic characteristics, using a 95% confidence interval to analyze the statistical difference.

The sample of pregnant women was first stratified according to the quintiles of energy contribution of UPFs to the total caloric value of the diet to evaluate the association between the consumption of UPFs and the nutritional quality of the diet. The first quintile had the lowest caloric contribution of UPFs, and the last quintile had the highest. Then, the average intake of energy and nutrients by consumption quintiles of UPFs was estimated. Linear regression was used to identify the association's direction and statistical significance. Models were adjusted for confounding variables such as age group, per capita income, educational level, urban or rural residence, and country macro-regions, considering $p<0.05$ as the level of statistical significance. All analyses were performed using the Stata/MP software, version 14.0, considering the complex design of the 2017–2018 POF sample and its weighing factors.

The Research Ethics Committee approved this project of the Federal University of São Paulo (protocol 5682270619).

RESULTS

A total of 379 (11.9%) pregnant women were adolescents (10–18 years old), and 88.1% were adult women (19–50 years old). Most lived in urban areas (76.3%), had a per capita income of up to R$ 1,667.8 (78.9%), and were from the north (21.9%) and northeast (37.2%) regions. There was a more significant energy contribution from UPFs in the diet of pregnant women living in urban areas (22%), with higher per capita income (23.7%), and in the south of the country (26.9%) (Table 1).

The average daily energy consumption was 1791.2 kcal, of which 52.6% came from natural or minimally processed foods, 15.7% from processed culinary ingredients, 10.8% from processed foods, and 20.9% from UPFs. In the group of natural or minimally processed foods, the three items that had the most significant contribution to total energy consumption were rice (9.6%), beef (7.0%), and beans (5.6%). Among products of animal origin, after meat, poultry had the highest energy contribution (5.3%). Fruits and vegetables contributed 3.8 and 1.7% to the total daily energy, respectively.

In the group of processed culinary ingredients, vegetable oil and sugar presented the highest energy contribution of 8.0 and 5.7%, respectively. Processed breads alone accounted for more than 70% of the calories consumed in the processed food group. As for UPFs, ready-to-eat or semi-ready meals were the items with the highest consumption in terms of total energy intake (3.2%), followed by margarine (2.8%) and salted biscuits and chip-type salty snacks (2.6%) (Table 2).

Table 3 shows that the energy contribution in the last quintile was 165% (925 kcal) more significant than the energy contribution in the first quintile. The relative content of free sugar, total fat, saturated fat, and trans fat increases significantly with the increase in the contribution of UPFs to the diet. In contrast, the opposite occurs for protein content, carbohydrate, fiber, potassium, iron, folate, and zinc. For sodium, calcium, and vitamin A, no significant association was found between the quintiles of consumption of UPFs and the content of these micronutrients in the diet.

Table 1. Mean percentage of total energy intake from two fractions of the diet according to sociodemographic characteristics – pregnant women aged 10–50 years (Brazil, Family Budget Survey, 2017–2018) (N=379).

	N	%	Non-ultra-processed food diet fraction[a]	Ultra-processed food diet fraction
			% (95%CI)	% (95%CI)
Age group (years)				
10–18	45	11.9	77.2 (71.76–82.64)	22.8 (17.36–28.24)
19–50	334	88.1	79.4 (77.66–81.07)	20.6 (18.93–22.34)
Educational level (years)				
≤5	35	9.2	79.0 (72.14–85.87)	21.0 (14.13–27.86)
6–11	150	40.6	79.9 (77.95–81.83)	20.1 (18.17–22.05)
12–16	194	51.2	78.6 (75.974–81.16)	21.4 (18.84–24.03)
Area				
Urban	289	76.3	78.0 (76.11–79.85)	22.0 (20.14–23.88)
Rural	90	23.8	84.7 (82.48–86.84)	15.3 (13.16–17.52)
Per capita income				
Up to R$ 440.6	106	28.0	83.8 (81.36–86.30)	16.2 (13.70–18.64)
R$ 442.3–913.8	116	30.6	79.0 (76.04–82.00)	21.0 (18.00–23.96)
R$ 915.2–1,667.8	77	20.3	77.4 (75.07–79.71)	22.6 (20.29–24.93)
> R$ 1,667.8	80	21.1	76.3 (71.73–80.84)	23.7 (19.16–28.27)
Region				
North	83	21.9	84.8 (81.91–87.67)	15.2 (12.33 -18.09)
Northeast	141	37.2	82.2 (80.12–84.28)	17.8 (15.72–19.88)
Southeast	72	19.0	77.3 (73.75–80.88)	22.7 (19.12–26.25)
South	43	11.4	73.1 (68.85–77.44)	26.9 (22.56–31.15)
Midwest	40	10.6	76.7 (73.14–80.27)	23.3 (19.73–26.86)

[a]Dietary fraction composed of natural or minimally processed foods, processed culinary ingredients, and processed foods.

Table 2. Mean absolute and relative daily energy intake according to NOVA food groups and subgroups – pregnant women aged 10–50 years (Brazil, Family Budget Survey, 2017–2018) (N=379).

NOVA Food Groups	kcal/day	% Total energy intake
Natural or minimally processed foods	**924.0**	**52.6**
Rice	167.9	9.6
Beef	120.2	7.0
Beans	95.8	5.6
Poultry	91.3	5.3
Fruits	67.1	3.8
Pasta	58.8	3.2
Milk	56.0	3.1
Beans	40.0	2.3
Vegetables and legumes	29.0	1.7
Pork	33.5	1.9
Cassava flour	28.8	1.5
Natural fruits juices	27.3	1.5
Fish	18.9	1.2
Corn, oats, wheat, and other cereals	19.0	1.1
Eggs	20.9	1.2
Wheat flour	12.2	0.7
Coffee and tea	9.9	0.6
Other[a]	27.4	1.3
Processed culinary ingredients	**280.4**	**15.7**
Plant oils	140.1	8.0
Sugar	103.5	5.7
Butter	17.2	1.0
Animal fats	5.9	0.3
Other[b]	13.6	0.7
Processed foods	**194.2**	**10.8**
Processed breads	147.6	8.4
Cheese	25.9	1.4
Salted, smoked, or canned meat or fish	9.4	0.5
Other[c]	11.3	0.5
Ultra-processed foods	**392.6**	**20.9**
Ready-to-eat or semi-ready-to-eat meals[d]	77.5	3.8
Margarine	49.8	2.8
Salted biscuits and chip-type salty snacks	46.6	2.6
Cold cuts	34.3	1.9
Cookies, cakes, and sweet pies	41.7	2.2
Bread, hamburger, hot dog, and similar	33.7	2.0
Chocolates, ice cream, candies, or other industrialized desserts	33.7	1.6
Milk-based drinks	22.2	1.1
Carbonated soft drinks	20.3	1.1
Fruit drinks industrialized	14.4	0.8
Other[e]	18.4	1.0
Total	**1,791.2**	**100.0**

[a]Natural yogurt, lentils, chickpeas and other legumes, nuts and seeds, other flours, seafood, and other meats. [b]Coconut milk, starch, vinegar, and salt. [c]Legumes/vegetables/fish preserves, fruit jam, tomato sauce, beer, and wine. [d]Pizzas, sandwiches, fast food, snacks, frozen pasta dishes and noodles, soup, and other "instant" foods. [e]Breakfast cereals, ultra-processed cheeses, industrialized sauces, cream, spirits, other nonalcoholic beverages, and caloric supplements.

Table 3. Mean dietary nutritional indicators according to quintiles of consumption of ultra-processed foods – pregnant women aged 10–50 years (Brazil, Family Budget Survey, 2017–2018) (N=379).

Nutritional indicators	Quintile of consumption of ultra-processed foods (% total energy)					β	p-value*
	Q1	Q2	Q3	Q4	Q5		
Total energy (kcal/day)	1,412.5	1,654.4	1,655.3	1,910.2	2,337.7	209.95	0.000
Percentage of total energy from							
Protein	15.3	14.9	14.4	13.7	14.1	-0.38	0.003
Carbohydrates	60.4	59.1	58.7	58.6	57.2	-0.67	0.028
Free sugars	11.0	15.1	16.5	16.2	19.2	1.73	0.000
Total fats	24.3	26.0	26.9	27.7	28.7	1.04	0.000
Saturated fat	7.3	8.3	8.3	8.7	8.8	0.34	0.000
Trans fat	0.5	0.6	0.6	0.7	0.9	0.10	0.000
Nutrients density							
Fiber (g/1,000 kcal)	14.6	12.1	11.5	11.4	10.1	-0.94	0.002
Sodium (g/1,000 kcal)	1.4	1.4	1.4	1.4	1.3	-27.29	0.093
Potassium (mg/1,000 kcal)	1363.6	1164.3	1160.6	1088.7	993.8	-80.55	0.000
Iron (mg/1,000 kcal)	6.0	5.9	5.6	5.7	5.2	-0.18	0.025
Folate (µg/1,000 kcal)	254.2	221.7	215.9	219.3	190.6	-12.73	0.002
Zinc (mg/1,000 kcal)	5.7	6.1	5.3	4.4	4.3	-0.48	0.000
Calcium (mg/1,000 kcal)	244.2	218.4	224.9	241.5	219.5	-2.36	0.601
Vitamin A (µg/1,000 kcal)	143.0	253.1	232.7	267.4	178.2	7.99	0.476

*p<0.05 for linear trend in the variation of the nutritional indicator according to quintiles of consumption of ultra-processed foods (with adjustment for confounding variables).

DISCUSSION

In this study, we showed that the higher consumption of UPFs contributes to a reduction in the intake of protein, carbohydrates, fiber, potassium, iron, zinc, and folate and an increase in the intake of total fat, saturated fat, trans fat, and free sugar. Thus, in proportion to the increased consumption of UPFs, it reduced the nutritional quality of the diet. These findings corroborate with other studies in Brazil, which also showed that the higher consumption of UPFs favors a decrease in the intake of essential micronutrients for the human body (iron, zinc, and folate) and those that prevent NCDs (fiber and potassium)[7-9,20].

Different types of UPFs such as ready-to-eat and semi-ready-to-eat meals, sweet and savory cookies, cold cuts, and cold cuts, which are rich in free sugar, trans fat, and sodium, had a significant quota in the diet of pregnant women. This is worrying since the intake of these nutrients above the recommended level is associated with overweight, obesity, and NCD[5,6]. Studies have reported that women with a high pre-pregnancy body mass index, who present excessive gestational weight gain, and a higher risk of obstetric complications, may contribute to the intergenerational expansion of the obesity and NCD epidemic[12,21].

The percentage of caloric diet in the NOVA groups among pregnant women was similar to that of Brazilian nonpregnant women[13], showing that during the period of pregnancy, there was no reduction in the consumption of UPFs. The consumption of UPFs also presented sociodemographic characteristics like the patterns observed in the general population[1], being higher in the urban region, in the higher income bracket, and in the south part of the country. One factor that explains the greater consumption of UPFs is the greater availability and ease of acquisition of UPFs[22]. This scenario confirms the importance of public policies to strengthen nutritional assistance in prenatal care and reduce exposure to UPFs.

The NOVA classification is fundamental for policies to promote healthy eating, encouraging reflection on food composition and its impacts on health such as its use in the "Food Guide for the Brazilian Population"[23]. In 2020, the Ministry of Health launched the "Protocol for the Use of the Food Guide for the Brazilian Population in the Dietary Guidelines for Pregnant Women"[24] as a support material for clinical practice in primary health care, whose central recommendation is to encourage the consumption of natural or minimally processed foods to the detriment of ultra-processed.

This study has limitations such as the lack of information on the women's gestational age and those from the 24-h recall, the underreporting of food consumption, the differences between real and standardized cooking recipes, and the differences between the real nutritional composition and that of the TBCA[14].

Among the strengths of this study are the use of two 24-h food recalls, which provided detailed information on the foods consumed, and the use of the NOVA classification to assess the nutritional quality of the diet since studies with the population are still scarce for pregnant women.

CONCLUSION

The negative impact of the consumption of UPFs on the nutritional quality of the diet of Brazilian pregnant women was evidenced. In this way, encouraging the reduction of consumption of UPFs has the potential to improve the nutritional profile of the diet of pregnant women.

AUTHORS' CONTRIBUTIONS

GCA: Conceptualization, Visualization, Writing – original draft. **KRM:** Data curation, Validation, Visualization. **MLCL:** Formal Analysis, Visualization. **MUN:** Investigation, Methodology, Visualization. **ES:** Project administration, Supervision, Visualization. **EAJ:** Visualization, Writing – review & editing.

REFERENCES

1. Levy RB, Andrade GC, Cruz GLD, Rauber F, Louzada MLDC, Claro RM, Monteiro CA. Three decades of household food availability according to NOVA - Brazil, 1987-2018. Rev Saude Publica. 2022;56:75. https://doi.org/10.11606/s1518-8787.2022056004570
2. Souza AM, Pereira RA, Yokoo EM, Levy RB, Sichieri R. Most consumed foods in Brazil: National Dietary Survey 2008-2009. Rev Saude Publica. 2013;47(suppl 1):190s-9s. https://doi.org/10.1590/S0034-89102013000700005
3. Monteiro CA, Cannon G, Levy RB, Moubarac JC, Louzada ML, Rauber F, et al. Ultra-processed foods: what they are and how to identify them. Public Health Nutr. 2019;22(5):936-41. https://doi.org/10.1017/S1368980018003762
4. Pagliai G, Dinu M, Madarena MP, Bonaccio M, Iacoviello L, Sofi F. Consumption of ultra-processed foods and health status: a systematic review and meta-analysis. Br J Nutr. 2021;125(3):308-18. https://doi.org/10.1017/S0007114520002688
5. Rauber F, Da Costa Louzada ML, Steele EM Millett C, Monteiro CA, Levy RB. Ultra-processed food consumption and chronic non-communicable diseases-related dietary nutrient profile in the UK (2008–2014). Nutrients. 2018;10(5):587. https://doi.org/10.3390/nu10050587
6. Chen X, Zhang Z, Yang H, Qiu P, Wang H, Wang F, et al. Consumption of ultra-processed foods and health outcomes: a systematic review of epidemiological studies. Nutr J. 2020;19(1):86. https://doi.org/10.1186/s12937-020-00604-1
7. Louzada MLC, Martins APB, Canella DS, Baraldi LG, Levy RB, Claro RM, et al. Ultra-processed foods and the nutritional dietary profile in Brazil. Rev Saude Publica. 2015;49:38. https://doi.org/10.1590/S0034-8910.2015049006132
8. Louzada MLC, Martins APB, Canella DS, Baraldi LG, Levy RB, Claro RM, et al. Impact of ultra-processed foods on micronutrient content in the Brazilian diet. Rev Saude Publica. 2015;49:45. https://doi.org/10.1590/S0034-8910.2015049006211
9. Martini D, Godos J, Bonaccio M, Vitaglione P, Grosso G. Ultra-processed foods and nutritional dietary profile: a meta-analysis of nationally representative samples. Nutrients. 2021;13(10):3390. https://doi.org/10.3390/nu13103390
10. Vitolo MR. Nutrição: da gestação ao envelhecimento. 2nd ed. Rio de Janeiro (RJ): Rubio; 2015. p. 79-82.
11. World Health Organization. Proper maternal nutrition during pregnancy planning and pregnancy: a healthy start in life recommendations for health care referências 48 professionals – the experience from Latvia. København: WHO Regional Office for Europe; 2017.
12. Miele MJ, Souza RT, Calderon IM, Feitosa FE, Leite DF, Rocha Filho EA, et al. Maternal nutrition status associated with pregnancy-related adverse outcomes. Nutrients. 2021;13(7):2398. https://doi.org/10.3390/nu13072398
13. Instituto Brasileiro de Geografia e Estatística, Diretoria de Pesquisas, Coordenação de Trabalho e Rendimento. Pesquisa de Orçamentos Familiares 2017-2018: Análise do Consumo Alimentar Pessoal no Brasil. Rio de Janeiro (RJ): IBGE; 2020.
14. Rede Brasileira de Dados de Composição de Alimentos, Universidade de São Paulo, Food Research Center. Tabela Brasileira de Composição de Alimentos (TBCA). Versão 7.1. 2020. [cited on November 11, 2022]. Available from: http://www.fcf.usp.br/tbca
15. Pan American Health Organization. Nutrient Profile Model; PAHO HQ Library Cataloguing-in-Publication Data: Washington (DC): Pan American Health Organization; 2016.
16. German Institute of Human Nutrition Potsdam-Rehbrücke. The Multiple Source Method (MSM) [Internet]. Versão 1.0.1. Potsdam: DIfE; 2012. [cited on May 10, 2022]. Available from: https://dife.de/msm
17. World Health Organization. Diet, nutrition and the prevention of chronic diseases: report of a joint WHO/FAO expert consultation. Geneva: WHO Technical Report Series; 2003. p. 17.
18. World Health Organization. Issues new guidance on dietary salt and potassium. Geneva: World Health Organization; 2013.
19. World Health Organization. WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: World Health Organization; 2016.
20. Graciliano NG, Silveira JACD, Oliveira ACMD. The consumption of ultra-processed foods reduces overall quality of diet in pregnant women. Cad Saude Publica. 2021;37(2):e00030120. https://doi.org/10.1590/0102-311X00030120
21. Kc K, Shakya S, Zhang H. Gestational diabetes mellitus and macrosomia: a literature review. Ann Nutr Metab. 2015;66(suppl 2):14-20. https://doi.org/10.1159/000371628
22. Costa DVP, Lopes MS, Mendonça RD, Malta DC, Freitas PP, Lopes ACS. Food consumption differences in Brazilian urban and rural areas: the National Health Survey. Cien Saude Colet. 2021;26(suppl 2):3805-13. https://doi.org/10.1590/1413-81232021269.2.26752019
23. Ministério da Saúde. Guia Alimentar Para a População Brasileira. 2 Edn. Brasília (BR): Ministério da Saúde; 2014.
24. Ministério da Saúde. Fascículo 3 Protocolos de Uso do Guia Alimentar Para a População Brasileira na Orientação Alimentar de Gestantes. Brasília (BR): Ministério da Saúde, Universidade de São Paulo; 2021.