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Food marketing in supermarket circulars in Brazil: An obstacle to healthy eating

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ABSTRACT

The study aims to characterize the foods advertised in supermarket circulars in Belo Horizonte, Brazil, as well as to analyze the price and discounts applied to the products. Supermarket circulars were obtained from five supermarket chains during 2018. Foods were classified according to the NOVA classification system and the Pan-American Health Organization (PAHO) nutritional profile model. Advertised prices, with and without discount, were recorded. Ultra-processed foods responded for 66.9% of ads, followed by fresh or minimally processed foods with 19.9%, processed foods with 9.5%, and processed culinary ingredients with 3.7%. Only 3.5% of the products did not exceed any critical nutrients of the PAHO model. Processed foods had a higher cost (R$3.27/100 g) in relation to other food categories. Products excessive in trans-fat and sodium were statistically significant cheaper when compared to those that did not present inadequacy of these nutrients. The reverse was verified for foods excessive in saturated fat, in total fat and in added sugars. Processed culinary ingredients were more frequent on sale (27.7%), while processed foods were the least advertised with discount (15.9%). Products that were adequate in saturated fat, trans fat, total fat and added sugar were statistically significant more announced with discount. Processed culinary ingredients presented the lowest percentage of discount (13.5%). The study confirms the position of supermarket circulars in Brazil as an obstacle to healthy eating, due to the higher incidence of processed and ultra-processed food advertisements, although no greater financial stimulus was noted for these products.

1. Introduction

In the last decades, the prevalence of obesity and other non-communicable diseases (NCD) has increased in Brazil and all over the world, becoming a major public health issue (Ng et al., 2014; GBD, 2017). It is estimated that 20.3% of the Brazilian adult population living in the country's state capitals are obese (Ministério da Saúde, 2020) and the proportional mortality from NCDs was 75.9% in 2017 in the country (Malta et al., 2020).

The increasing substitution of fresh and minimally processed foods for processed foods and ultra-processed foods in the Brazilian diet has favored this scenario (Martins et al., 2013; Canella et al., 2014). Fresh foods are foods that are obtained directly from plants or animals, without having undergone any changes or processing, while minimally processed foods are fresh foods that have undergone minimal changes. Processed culinary ingredients are products extracted from unprocessed foods and are used during food preparation to enhance flavor, such as oils, fats, sugar, and salt. Processed foods are unprocessed or minimally processed foods added with salt, sugar, oil or another processed culinary ingredient and ultra-processed foods are industrial formulations which include, for example, antioxidants, stabilizers, and preservatives (Chart 1) (Monteiro et al., 2010, 2016).

The problem of increasing the consumption of processed foods and ultra-processed foods is explained by the nutritional composition of these foods: they have high energy density, high content of critical nutrients (such as free sugars, sodium, total and saturated fat), and low content of vitamins and minerals (Monteiro et al., 2010, 2016). A large body of evidence associates the higher proportion of processed foods and ultra-processed foods in the diet and obesity and NCD occurrence (Elizabeth et al., 2020).

Therefore, the Brazilian Dietary Guidelines recommend moderation in the consumption of processed foods and avoiding the consumption of ultra-processed foods. On the other hand, these guidelines advice that the diet should be based on a wide variety of fresh or minimally processed foods and that the processed culinary ingredients should be used in small quantities (Ministério da Saúde, 2014). Currently, about 9.8% of the total calories available for consumption in Brazilian households come from processed foods and 18.4% from ultra-processed foods (IBGE, 2017).

The marketing of unhealthy foods, especially ultra-processed ones is pointed out as an important obstacle to healthy eating (Monteiro et al., 2016; Horta et al., 2018). In the consumer's food environment,

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supermarket circulars are a crucial marketing strategy for stimulating consumers to acquire specific foods (Cameron et al., 2017). Commercial establishments choose the food items that are of interest to be sold and announce them in these circulars with special prices and discounts (Dawson, 2013; Hawkes, 2009).

The price of foods and beverages is a critical driver of food choice, particularly among families and households with limited food budgets (Darmon and Drewnowski, 2015). Previous evidence shows that price promotions on unhealthy foods are ubiquitous in many settings and appear to be more common than price promotions for healthy food (Backholer et al., 2019). Price promotions can influence shopping behavior in several ways which include choosing one brand over another to take advantage of the promotion, trialing of a brand or flavor that has not been previously purchased, and/or "stockpiling" an item by buying in greater quantity than would normally be purchased, which has been show to also increase consumption (Bennett et al., 2020).

Describing food marketing and price promotions in the consumer's food environment and comparing it to what is indicated by the current nutritional guidelines allows knowing how much this environment is in line with messages promoting healthy eating in the country and how much it can be an obstacle to the adherence to these recommendations (Cameron et al., 2017).

Some studies monitored supermarket circulars in Australia, Canada, Denmark, the United States, the Netherlands, New Zealand, the United Kingdom and Sweden, and pointed out the frequent advertisement of foods considered unhealthy by the dietary guidelines proposed by these countries (Ethan et al., 2013; Martin-Biggers et al., 2013; Thornton et al., 2013; Jahns et al., 2014; Ravensbergen et al., 2015). In Brazil, a recent study portrays a similar scenario, in which advertisements for processed foods and ultra-processed foods are more frequent than

Food group	Definition	Food sub-groups
Fresh foods and minimally processed foods	Fresh foods are foods obtained directly from plants or animals, without having undergone any changes or processing, such as fruits, vegetables and fresh meat. Minimally processed foods include fresh foods that have undergone minimal changes. Examples include dried, polished and packaged grains, among others.	• Meats • Coffee and tea • 100% fruit juice and coconut water • Rice, corn and other cereals • Fish and seafood • Milk • Pasta • Water • Fruits • Nuts • Flour (manioc, wheat, corn) • Beans • Vegetables • Yogurt (natural) • Eggs • Other unprocessed and minimally processed foods
Processed culinary ingredients	Products extracted from fresh foods and are used during food preparation to enhance flavor, such as oils, fats, sugar and salt	• Oils • Animal fat • Sugar • Starch • Other processed culinary ingredients
Processed foods	Fresh or minimally processed foods added with salt, sugar, oil or another processed culinary ingredient	• Cheese • Canned vegetables • Salted and canned fish • Fruit candy, jam and jelly • Salted meat • Other processed foods
Ultra-processed foods	Industrial formulations with five or more ingredients, which include, for example, antioxidants, stabilizers and preservative es	• Ice cream, chocolate and candies • Cookies and candies • Dairy beverages • Sausages • Ready to eat frozen meals • Artificial juices, isotonic and other beverages • Soda • Packaged bread • Sauces • Curd cheese • Chips • Powdered chocolate and other coffees • Instantaneous noodles and soup • Breakfast cereals • Seasoning • Margarine and vegetable cream • Other ultra-processed foods

Chart 1. Food groups according to NOVA classification.

advertisements for fresh and minimally processed foods in four supermarket chains circulars during nine weeks of study (Camargo et al., 2020). However, the authors have not investigated other elements presented in the circulars such as discounts and prices.

Thus, the present study aims to characterize the foods advertised in supermarket circulars, according to the food classification system adopted in the Brazilian Dietary Guidelines, i.e. the NOVA classification (Ministério da Saúde, 2014), and the Pan-American Health Organization (PAHO) nutritional profile (Organização Pan-Americana de Saúde, 2016) as well as to analyze the price and discounts applied to the products.

2. Methodology

Supermarket circulars were obtained from five supermarket chains in the city of Belo Horizonte, Minas Gerais, during 2018 (from January 02 to December 31). Belo Horizonte is one of the main urban centers in Brazil, being the sixth largest city in the country and the eighth in Latin America, with an estimated population in its metropolitan region of 5 million inhabitants (IBGE, 2019).

In 2018, according to the Superintendence of Collection and Tax Information from the Finance Department of the State of Minas Gerais (*Superintendência de Arrecadação e Informações Fiscais da Secretaria da Fazenda do Estado de Minas Gerais*) database, there were 415 hypermarkets, supermarkets, and grocery stores from 167 chains in the city and the ones that composed our sample represented 36% of all of these establishments. The supermarket chains studied were among the 20 most profitable supermarket chains in Brazil in 2018 according to the Brazilian Association of Supermarkets (*Associação Brasileira de Supermercados - ABRAS*) (https://www.abras.com.br/convencao/convencao-abras-2019/).

The supermarket circulars were extracted from supermarket websites or directly from stores depending on the way each supermarket have chosen to release their circulars. The ones that were valid for all stores in the supermarket chain were included in the sample; those specific to certain regions or neighborhoods have not been analyzed. The circulars presented different periods of disclosure, varying between weekly, biweekly, and monthly. For all products, the start and end dates of the circulars were recorded, and they were classified according to the season of the year (summer, autumn, winter, or spring).

Advertised prices, with and without discount, were recorded and are presented in R$/100 g in order to decrease bias since prices per unit of energy tend to be highly influenced by the energy density of foods. In some cases, the resulting data are difficult to interpret (such as for low-calorie foods and beverages) (Maia et al., 2020).

Food and beverages were classified according to the NOVA classification system in fresh or minimally processed, processed culinary ingredients, processed and ultra-processed foods and in food subgroups (Chart 1) (Monteiro et al., 2010, 2016). Nutritionists conducted the codification of the food items in each subgroup in accordance with the type of food that have appeared in the circulars. The least common food items were classified as 'other'.

Owing to the differences between Brazil's dietary guidelines food classification to that of many other countries, we also investigated food advertisement in supermarket circulars in accordance with the nutritional profile model proposed by PAHO. PAHO nutritional profile is applicable only to processed and ultra-processed foods and classifies food items with excessive content of critical nutrients. It is based on the recommendations of the World Health Organization (WHO) for the prevention of NCD and provides evidence-based information for the formulation of public policies and fiscal regulations designed to prevent the consumption of unhealthy foods (Organização Pan-Americana de Saúde, 2016).

Nutritional profile analysis was carried out using the nutritional information present on the Brazilian Nutritional Composition Table (IBGE, 2011). The content of calories, sodium, total fat, saturated fat, trans fat and added sugars in 100 g of foods were considered. Adaptations to the PAHO profile were necessary considering the information available in the food composition table used. The original model identifies the excessive content of sodium, free sugars, saturated fat and total fat and the presence of other sweeteners and trans-fat in foods (Organização Pan-Americana de Saúde, 2016). In the present study, the analysis of products that contained other sweeteners was not performed, since the nutritional composition table used did not indicate the presence of these substances in foods (IBGE, 2011). In addition, the added sugars referred to in the food composition table was considered equal to the content of free sugars. Finally, calorie-free products, such as zero-calorie drinks, were adjusted to 0.5 kcal for every 100 g of product so that the application of the nutritional profile model was possible.

Food items announced with price discount or in the conditions 'pay 2 take 3 or other' or '20% extra or other' were identified and the percentage of the discount applied were calculated using the formula: price discount (%) = (1 − (final price/initial price)) *100.

Descriptive analysis was performed to describe absolute and relative frequency of food groups according to the NOVA system and the PAHO nutritional profile during the whole year and stratified by seasons (summer, autumn, winter, and spring). In addition, percentages of price discounts were described in mean ± standard-error.

Student *t*-test, one-way analysis of variance (ANOVA one-way) and Pearson's chi-square test were applied to compare prices, presence of discounts and percentages of discounts, according to food category and nutritional profile. Bonferroni correction test for multiple comparisons was performed, which adjusts the level of significance (α) for all possible comparisons. Thus, in the present study, α was adjusted to 0.8% ($p < 0.008$), given the possibility of 6 comparisons in the tests.

Excel software was used to organize the data. For analysis purposes, the statistical software Stata, version 12.0, was used.

3. Results

A total of 17,012 food and beverage advertisements were initially identified. Advertisements concerning culinary preparations (which referred to supermarkets own-made recipes, for example cakes and pies) (n = 566), nutrient/food supplements (n = 108), and artificial sweeteners (n = 58) were excluded given their particularities of use and nutritional composition, resulting in a final sample of 16,280 items. Ultra-processed foods responded for 66.9% of the advertisements, followed by fresh or minimally processed foods with 19.9%, processed foods with 9.5%, and processed culinary ingredients with 3.7% (Table 1). The participation of food advertisements did not vary during the four seasons of the year: differences were limited to 2% among the seasons (Fig. 1).

Among fresh or minimally processed foods, meats (6.8%) were the most advertised, while in the category of processed culinary ingredients oils prevailed (1.7%). Processed cheeses (3.4%) and canned vegetables (2.7%) corresponded to the highest percentage of foods advertised in the category of processed foods. Ice cream, chocolates, and candies (10.6%), cookies and cakes (10.5%), dairy beverages (7.9%) and sausages (7.2%) prevailed in the ultra-processed food category. Regarding the nutritional profile of processed foods and ultra-processed foods, only 3.5% of them did not exceed any of the critical nutrients and 59.4% was excessive in total fat; 50.3% in added sugars; 49.4% in saturated fat, 46.9% in sodium and 45.7% in *trans*-fat (Table 1).

With regard to prices, processed foods had a statistically significant higher cost (R$ 3.27/100 g) in relation to the other groups of the NOVA classification - fresh or minimally processed foods: R$ 2.71/100 g; processed culinary ingredients: R$ 2.41/100 g and ultra-processed foods: R$ 2.75/100 g. Products excessive in trans-fat (R$ 2.30/100 g) and sodium (R$ 2.73/100 g) were statistically significant cheaper when compared to those that did not present inadequacy of these nutrients (R$ 3.24/100 g and R$ 2.88/100 g). The reverse was verified for foods excessive in saturated fat (R$ 3.11/100 g vs R$ 2.52/100 g), in total fat

Table 1
Participation of foods advertised on supermarket circulars in Brazil in accordance with the NOVA classification system and the PAHO nutritional profile. 2018.

Food categories	Absolute frequency	Relative frequency (%)	95% CI
Fresh or minimally processed food	*3241*	*19.91*	*19.29–20.52*
Meats	1112	6.83	6.44–7.22
Coffee and tea	318	1.95	1.74–2.14
100% fruit juice and coconut water	287	1.76	1.56–1.97
Rice, corn and other cereals	249	1.53	1.34–1.71
Fish and seafood	249	1.53	1.34–1.72
Milk	192	1.18	1.01–1.35
Pasta	189	1.16	0.99–1.33
Water	127	0.78	0.64–0.92
Fruits	103	0.63	0.51–0.75
Nuts	91	0.56	0.44–067
Flour (manioc, wheat, corn)	82	0.50	0.39–0.61
Beans	72	0.44	0.34–0.54
Vegetables	68	0.42	0.32–0.52
Yogurt (natural)	58	0.36	0.26–0.45
Eggs	4	0.02	0.00–0.05
Other fresh and minimally processed foods	40	0.25	0.17–0.32
Processed culinary ingredients	*596*	*3.66*	*3.37–3.94*
Oils	282	1.73	1.53–1.93
Animal fat	175	1.07	0.92–1.23
Sugar	71	0.44	0.33–0.54
Starch	63	0.39	0.29–0.48
Other processed culinary ingredients	5	0.03	0.00–0.06
Processed foods	*1553*	*9.54*	*9.08–9.99*
Cheese	556	3.41	3.14–3.69
Canned vegetables	439	2.70	2.45–2.95
Salted and canned fish	177	1.09	0.93–1.25
Fruit candy, jam and jelly	134	0.82	0.68–0.96
Salted meat	75	0.46	0.36–0.56
Other processed foods	172	1.06	0.89–1.21
Ultra-processed foods	*10,890*	*66.89*	*66.16–67.61*
Ice cream, chocolate and candies	1724	10.59	10.12–11.06
Cookies and candies	1716	10.54	10.07–11.01
Dairy beverages	1296	7.96	7.54–8.38
Sausages	1177	7.22	6.83–7.63
Ready to eat frozen meals	694	4.26	3.95–4.57
Artificial juices, isotonic and other beverages	650	3.99	3.69–4.29
Soda	557	3.42	3.14–3.70
Bread	528	3.24	2.97–3.51
Sauces	500	3.07	2.81–3.33
Curd cheese	453	2.78	2.53–3.03
Chips	438	2.69	2.44–2.94
Powdered chocolate and other coffees	259	1.59	1.39–1.78
Instantaneous noodles and soup	238	1.46	1.28–1.64
Cereals	213	1.30	1.13–1.48
Seasoning	150	0.92	0.77–1.07
Margarine and vegetable cream	141	0.86	0.72–1.01
Other ultra-processed foods	156	0.96	0.81–1.11
Excessive in sodium*	5847	46.99	46.11–47.86
Excessive in total fat*	7391	59.40	58.53–60.26
Excessive in saturated fat*	6140	49.35	48.46–50.22
Excessive in trans-fat*	5682	45.66	44.78–46.53
Excessive in added sugar*	6257	50.29	49.40–51.16

CI: confidence interval
*Applies only to processed and ultra-processed foods

(R$ 3.06/100 g vs. R$ 2.45/100 g) and in added sugars (R$ 2.91/100 g vs. R$ 2.71/100 g) (Table 2).

About discounts, processed culinary ingredients were statistically significant more frequent on sale (27.7%) in relation to the other food categories, while processed foods were the least advertised with discount (15.9%). Processed foods and ultra-processed foods adequate in saturated fat (20.1%), trans fat (20.0%), total fat (19.9%) and added sugar (19.4%) were statistically significant more announced with discount when compared to those excessive in these nutrients: 16.8%; 16.6%; 17.5%; 17.6%, respectively (Table 2).

Finally, the processed culinary ingredients were those that presented the lowest percentage of discount (13.5%) in relation to the other categories. Fresh or minimally processed foods (15.6%), processed foods (16.5%) and ultra-processed foods (16.47%) did not statistically differ as to the percentage of discount applied (Table 2).

4. Discussion

The present study revealed the high prevalence of unhealthy food items in supermarket circulars: three out of every four products advertised in the supermarkets circulars belong to the group of processed and ultra-processed foods with undesirable nutritional profile (Organização Pan-Americana de Saúde, 2016), encouraging consumers to purchase these products, in disagreement with what the Brazilian Dietary Guidelines recommend (Ministério da Saúde, 2014).

The present study advances the knowledge on the subject, especially considering the lack of evidence in Brazil and similar developing countries. The first investigation on the content of supermarket circulars in Brazil was conducted in 2016 (between June and July), relying on circulars collected for nine consecutive weeks. Overall, 73% of advertisements belonged to processed and ultra-processed foods (Camargo et al., 2020). Our results relying on a bigger set of circulars, collected during an entire year, found similar proportion (76.4%) suggesting that the high presence of processed and ultra-processed foods is a constant during the year and not a seasonal phenomenon. Besides that, as both studies involved local and national supermarkets (from two different geographical regions of the country), it also suggests that this scenario is likely to be seen in most regions instead of being a regional phenomenon.

Similarly, a research in the United States also found that food advertisements in a sample of supermarket circulars issued between mid-September to early October 2011 from each of the 50 states and Washington, D.C. did not reflect the recommendations of MyPlate, the American food guide (Martin-Biggers et al., 2013). Other investigations also found a wide presence of discretionary foods, such as desserts and ice creams, unhealthy ready to eat meals and confectionary and chocolate, in supermarket circulars in different countries, ranging from 31.6% to 70% (Charlton et al., 2015).

In addition to the simple exposure of products in the supermarket circulars, the price factor is also an important determinant in consumer choice (Backholer et al., 2019; Bennett et al., 2020). The present study indicated that the cost of processed foods was significantly higher than the other categories and, that there are no differences between the price of fresh or minimally processed foods and the ultra-processed foods advertised. Regarding food cost according to the nutritional profile, the results are distinct, depending on the critical nutrient. Products excessive in trans-fat and sodium were cheaper than the products with adequate content of these nutrients, while the reverse was noted for foods excessive in total and saturated fat and in added sugars.

Possibly, we did not find a clear pattern in the prices of food products announced in supermarket circulars, especially regarding nutritional profile, because such circulars are just a piece in the promotion puzzle in the supermarkets. One possible explanation resides on the hypothesis that circular's contents are chosen in a way to promote products from different food groups that are either complementary in distinct shopping patterns or substitutes inside the same food group but not between

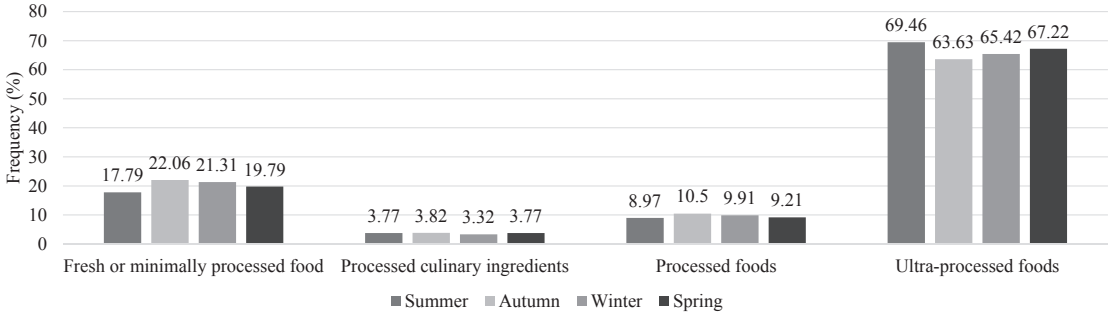

Fig. 1. Participation of foods advertised on supermarket circulars in Brazil in accordance with the NOVA classification system and the seasons of the year. 2018.

Table 2
Price and discount of foods advertised on supermarket circulars in Brazil in accordance with the NOVA classification system and the PAHO nutritional profile. 2018.

Nutrient	Price (R$/100 g)			Discount			Percentage of discount		
	Mean	SD	p-value	Frequency (%)	95% CI	p-value	Mean	SD	p-value
NOVA classification									
Fresh food and minimally processed food	2.71 [a]	7.11	<0.001 *	19.12 [ab]	17.77–20.48	<0.001 #	15.60 [a]	0.09	<0.001 *
Processed culinary ingredient	2.41[b]	3.09		27.68 [acd]	24.08–31.28		13.45 [abc]	0.06	
Processed food	3.27 [abc]	3.27		15.96 [bce]	14.14–17.79		16.52[b]	0.09	
Ultra-processed food	2.75[c]	3.81		18.83 [de]	18.09–19.57		16.47[c]	0.08	
Excessive in sodium									
Yes	2.73	2.68	0.0247 £	18.84	17.84–19.84	0.3150 #	16.56	8.04	0.6338 £
No	2.88	4.38		18.14	17.21–19.07		16.39	8.61	
Excessive in total fat									
Yes	3.06	3.73	<0.0001 £	17.49	16.62–18.36	0.0010 #	16.56	8.72	0.5763 £
No	2.45	3.58		19.91	18.81–21.01		16.36	7.82	
Excessive in saturated fat									
Yes	3.11	3.95	<0.0001 £	16.82	15.88–17.75	<0.0001 #	16.54	9.11	0.7093 £
No	2.52	3.36		20.08	19.09–21.07		16.41	7.66	
Excessive in trans fat									
Yes	2.30	2.01	<0.0001 £	16.64	15.68–17.61	<0.0001 #	16.64	8.66	0.4259 £
No	3.24	4.60		20.01	19.05–20.96		16.36	8.11	
Excessive in added sugar									
Yes	2.91	4.45	0.0019 £	17.58	16.63–18.53	0.001 #	16.61	8.58	0.3945 £
No	2.71	2.69		19.35	18.37–20.33		16.32	8.06	

CI: confidence interval; SD: standard deviation
Note: Same letters in a column indicate statistically significant differences
* One-way ANOVA with Bonferroni correction
# Pearson Chi-square with Bonferroni correction
£ Student *t*-test

groups. Thus, the role of the circulars would become more to induce (or reinforce) instant demand inside each group, than to shift demand between groups. In this sense, customers could maximize the number of suggested items acquired and optimize their satisfaction with the circular and the store.

Regarding products on sale on supermarket circulars, processed culinary ingredients showed prominence, albeit with the lowest percentage of discount applied. In the case of fresh and minimally processed foods and ultra-processed foods, once again, there were no differences regarding the discount and the percentage of discount applied. In other words, supermarkets circulars did not confer a financial benefit for the consumer by selecting fresh or minimally processed foods in relation to ultra-processed foods. However, processed and ultra-processed foods with excess of critical nutrients were less advertised with discount suggesting the reasons for promoting such products with unbalanced nutrient content possibly falls more on the expansion of their exposure to consumers than on the economic stimulus to their consumption..

Two studies found a higher proportion of unhealthy foods on sale than healthy foods on supermarkets on the Netherlands (Ravensbergen et al., 2015) and in the United States (Phipps et al., 2014). In Dutch supermarket, consumers achieved higher discounts when buying high amount of unhealthy foods (Ravensbergen et al., 2015). In the United States, shoppers were more likely to purchase sweet snacks and sugar-sweetened beverages on sale compared with when sold at full price. However, the likelihood of buying low-calorie foods on sale versus at full price was not significant for fruits or vegetables (Phipps et al., 2014).

In Brazil, is still more expensive to consume ultra-processed foods than the combination of fresh and minimally processed foods (Claro et al., 2016), although an analysis of the evolution of food prices in the country indicates that, over the past decades, the cost of healthy items has increased more than less healthy options (Maia et al., 2020). This can possibly explain why processed and ultra-processed foods are not advertised with great financial attractiveness in supermarket circulars in the Brazilian context.

Some limitations must be considered in the interpretation of the results. First, only circulars valid for the entire supermarket chains were analyzed. Second, only stores located on Belo Horizonte metropolitan area were included. However, in both cases the bias introduced seems to be minor. In the first case, single store specific promotions tend to be restricted to special cases (such as ready to expire products) and not necessarily represent the chain marketing behavior. In the second, although the advantages of a national data collection are undeniable,

such approach is almost unfeasible in a country with continental dimensions such as Brazil. Besides, most of the major national chains are present in Belo Horizonte (the sixth biggest city of the country, with 5 million habitants) (IBGE, 2019) and no evidence up to know suggests that regional marketing approaches impact the share of ultra-processed products in the circulars.

In addition, the PAHO nutrient profile was applied under adaptations, given the limitations on available nutritional information. No other study applied the PAHO (Organização Pan-Americana de Saúde, 2016) nutritional profile model to characterize the products advertised in supermarket circulars and this approach confers more comparability of our results. Finally, we only estimated the frequency and the financial stimulus of food items advertised on supermarket circulars but the effect of a circular also depends on the way in which the different products are promoted in relation to each other. Other strategies that can be studied in supermarket circulars arere the proportion of space occupied by each product on the circular (Martin-Biggers et al., 2013) and differentiating all products that are on the first page of the circular, which are probably more noted by consumers. Future investigations can access these points in the Brazilian supermarket circulars.

Finally, the present investigation confirms the position of supermarket circulars in Brazil as an obstacle to healthy eating. Food marketing carried out in this media can encourage unhealthy diets, due to the higher incidence of advertising processed and ultra-processed foods with critical nutrients in excess, although no greater financial stimulus was noted for these products. These findings are relevant, because although eating habits are understood as an individual choice, they are influenced by characteristics of the food environment, including advertising information.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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