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PEDIATRIC ORIGINAL ARTICLE

Nutritional quality and child-oriented marketing of breakfast cereals in Guatemala

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OBJECTIVES: Food marketing has been implicated as an important driver of obesity. However, few studies have examined food marketing in low- and middle-income countries (LMICs). This study documents the prevalence of advertising on cereal boxes in Guatemala and examines associations between various marketing strategies and nutritional quality.
METHODS: One box from all available cereals was purchased from a supermarket located in an urban area in Guatemala City, Guatemala. A content analysis was performed to document child-oriented marketing practices, product claims and health-evoking images. The Nutrient Profile Model (NPM) was used to calculate an overall nutrition score for each cereal (the higher the score, the lower the nutritional quality).
RESULTS: In all, 106 cereals were purchased, and half of the cereals featured child-oriented marketing (54, 50.9%). Cereals had a mean (± s.d.) of 5.10 ±2.83 product claims per cereal, and most cereals (102, 96.2%) contained health-evoking images. Child-oriented cereals had, on average, higher NPM scores (13.0 ± 0.55 versus 7.90 ± 0.74, $P < 0.001$) and sugar content (10.1 ± 0.48 versus 6.19 ± 0.50 g/30 g, $P < 0.001$) compared with non-child oriented cereals. Cereals with health claims were not significantly healthier than those without claims.
CONCLUSIONS: In Guatemala, cereals targeting children were generally of poor nutritional quality. Cereals displaying health claims were also not healthier than those without such claims. Our findings support the need for regulations restricting the use of child-oriented marketing and health claims for certain products.

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INTRODUCTION

Obesity has become a worldwide public health problem, as rates rise in many low- and middle-income countries (LMICs).[1] Food marketing has been identified as a potentially important driver of overconsumption, and its prevalence continues to grow worldwide.[2] The most heavily marketed foods are predominantly nutrient poor and calorie dense. Food marketing is associated with increased preferences for the advertised foods and short-term consumption behavior.[3–6] Most food marketing research has been conducted in high-income countries, while less is known about its prevalence in LMICs. In addition, most research has focused on television and internet marketing. However, product packaging advertising can directly influence consumers at the point-of-purchase and increase consumption.[7] Such advertising has become an important way for food manufacturers and retailers to promote and distinguish their products.[8] On package advertising takes many different forms, including health claims, cartoon/licensed characters, celebrity endorsements, toys/prizes, contests or charitable donation opportunities.

Breakfast cereals have a long history of being marketed for health promotion.[9] For example, in Australia breakfast cereals are among the food categories with the highest percentage of products carrying health or nutrition claims (54% of cereals).[10] Breakfast cereals are also heavily marketed to children in the United States. Child-oriented cereals have been shown to contain more calories, sugar and sodium, and less fiber and protein, than non-child-oriented cereals.[11] Ready-to-eat breakfast cereals are becoming a larger part of Guatemalan diets, especially among children. A study in Quetzaltenango, the second largest city in Guatemala, found that ready-to-eat breakfast cereals were consumed by 41% of elementary school children over a 24- h dietary recall period and served as key sources of selected micronutrients,[12] although such cereals were more commonly reported in higher socioeconomic populations (73.2%) than in lower ones (26.8%).[13] In addition, cereals are popularly sold in single-serving packages around Guatemalan schools, along with other sweet and savory snacks,[14] which may encourage consumption. To the best of our knowledge, there are no data on cereal advertising in LMICs.

Guatemala, an LMIC with a Gross Domestic Product per capita of US $3351, compared with US $49 965 in the United States,[15] is at the initial stages of the obesity epidemic.[16] Guatemala regulates the use of health, nutrient-related and disease risk reduction claims by food companies,[17] but it is unknown whether such standards are stringent enough to differentiate between healthy and unhealthy foods as determined by objective measures of energy, sugar, sodium and dietary fiber content. Furthermore, as of January 2015 there are no regulations in Guatemala regarding the nutritional quality of foods advertised specifically at children. Therefore, we sought to quantify the prevalence and types of marketing on breakfast cereals in Guatemala and assess the nutritional quality of cereals with and without certain marketing strategies.

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MATERIALS AND METHODS

Sample

One box from all available cereals, including different flavors, was purchased from Supertiendas Paiz in Guatemala City, Guatemala, during July 2013. Supertiendas Paiz is a major supermarket owned by an international retail corporation, with 31 different locations throughout the country, and is the largest supermarket chain in Guatemala City. According to the Municipality of Guatemala, the supermarket selected for this study is located in an urban sector of Guatemala City of middle to high socioeconomic status (Zone 10).[18,19]

Product packaging advertising

We identified marketing strategies on cereal boxes using a codebook developed specifically for this study. The codebook was pretested in a subsample of the cereals and then edited accordingly. Cereal name, brand and parent company were recorded. The text and imagery on the front, back and sides of the package were coded into three categories: Child-Oriented Marketing, Product Claims and Health-Evoking Imagery. For data collection, two coders separately analyzed each cereal. For the same cereals with more than one package design each package was coded separately. Tri packs were excluded. Discrepancies, most of which involved one coder missing a marketing strategy, were discussed and disagreements resolved between the coders. Each marketing strategy coded is described below.

Child-oriented marketing. Child-oriented marketing included strategies intended to appeal to children or to encourage them to interact with the product. We coded for the presence of cartoon characters, spokes-characters (characters specific to the brand), licensed characters, games/puzzles, child-oriented giveaways and cross-promotions with movie tie-ins or television shows.

Product claims. Product claims referred to written statements about the cereal that tout beneficial features. We coded five categories. The first was 'General Health' about a cereal's healthfulness (for example, 'healthy,' 'nutritious,' 'lowers cholesterol' and 'good for heart'). The second was 'Nutrient/Ingredient' that indicates the presence or absence of specific nutrients or ingredients. These include nutrients or ingredients that should be consumed (for example, vitamins), or avoided (for example, total or saturated fat, trans fat and sodium), and other types of nutrient/ingredient claims (for example, 'contains eight essential vitamins and minerals' and 'no high fructose corn syrup'). The third category was 'Natural,' which stresses the pure or unadulterated quality of the cereal (for example, no artificial colors/flavors/sweeteners and organic). The fourth category was 'Quality' and refers to a cereal's excellence or superiority (for example, 'gourmet,' 'best' and 'authentic'). The fifth category was 'Fun/Happiness,' which refers to experiencing fun, happiness and so on, as a result of cereal consumption.

Health-evoking imagery. Health-evoking imagery included images on the product associated with general health, healthy eating or healthy behaviors. We noted images of live animals, athletes, checkmarks, farmland or farming references, fruits/vegetables, hearts, milk, nature scenery, person/people, sports references, sun/sun rays and whole grains/corn.

Outcomes

To assess nutritional quality, we calculated an overall nutrition score for each cereal using the Nutrient Profile Model (NPM) developed in the United Kingdom to identify healthy foods that are appropriate to advertise to children on television.[20,21] The NPM is also used in Australia,[22] and has been validated against ratings made by professional nutritionists.[23] We chose the NPM as it yields a continuous score that provides relative evaluations of products, and includes only nutrients that are well-justified based on existing science, without awarding merit for micronutrient fortification.

The NPM calculates a score based on total calories, proportions of both healthy (fiber and protein) and unhealthy (saturated fat, sugar and sodium) nutrients, and specific food items (unprocessed fruit, nut and vegetable content). The amount of unprocessed fruit, nut and vegetable content was excluded because this information was not available and cereals are unlikely to have any three as a primary ingredient. Calorie and nutrient amounts were obtained from the cereals' nutrition labels. NPM scores can range from −15 (healthier) to +34 (less healthy). Based on the UK criteria for products that can be advertised to children, those receiving a score of $\leqslant 3$ points are considered to be 'healthy.' This healthy designation therefore takes into account the overall nutritional quality of the cereal, instead of assessing nutrition solely based on a single 'good' or 'bad' ingredient.[21] We also examined the amount of calories, sugar, dietary fiber and sodium in each cereal. To control for potential differences in serving sizes between products, we evaluated each outcome standardized to 30 g of cereal (an average serving size).

Statistical analyses

The presence or absence of child-oriented marketing, product claims or health-evoking imagery was coded as dichotomous variables. To assess the extent to which each marketing strategy was associated with cereal nutrition quality, we conducted separate linear regressions including the marketing strategy category as the predictor for each nutritional quality outcome. Cereals with differing package designs or flavor variants were clustered, and regression with robust variance was used to account for such correlations between various flavor variants and sizes of the same cereal. We also identified the most common specific marketing strategies within each broad category (those that were present on more than 25% of cereals) and analyzed outcomes against each specific strategy (for example, use of licensed characters) to understand which marketing techniques were driving effects.

To determine whether certain cereal companies were predominantly responsible for various marketing strategies, we also examined the mean total number of child-oriented marketing strategies, product claims and health-evoking images by company. There were a total of 14 unique companies. Therefore, we kept the four companies with the most cereals as individual variables in the analysis (Kellogg's, with 34 cereals, Nestle, 18 cereals, Malt-O-Meal, 11 cereals and Quaker, 10 cereals), then categorized the remainder of the companies into 'Other North American companies' (Glutino, Nature's Path, Post, General Mills and Kashi, 16 cereals total) and 'Other Central American companies' (Excellent, Gran Dia, Sabemas, Suli and McCallum's, 17 cereals total). All analyses were conducted with SAS statistical software package 9.2 (SAS Institute, Cary, NC, USA), using two-tailed tests. To control for multiple comparisons (21 different advertising strategies were assessed against each outcome variable), we used a Bonferroni-corrected alpha level of 0.002 as the threshold for significance.

RESULTS

A total of 106 cereals were purchased and analyzed. Cereals were organized into 61 different clusters based on size and flavor. Mean ($\pm$ s.d.) NPM score was 10.5 ± 5.35 and dietary fiber and sugar content per 30 g serving were 1.70 ± 1.29 g and 8.21 ± 4.08 g, respectively. Child-oriented marketing appeared on 54 cereals (50.9%); the most common strategy was the use of spokes-characters (Table 1). Most cereals (94, 88.7%) contained a product claim on the front of the package. There was an average of 5.10 ± 2.83 product claims per package. The most common specific claims (present on more than 25% of cereals) were 'Nutritious,' 'Quality' and specific claims about whole grain, cholesterol, fat and vitamin/mineral content. Health-evoking imagery was found on almost all cereals (102, 96.2%). Milk was the most common health-evoking image (91, 85.9%). In total, all but two of the cereals contained some kind of product claim or health-evoking imagery.

After adjustment for multiple comparisons, cereals with child-oriented marketing were significantly less healthy overall ($P < 0.001$) and had significantly higher sugar content ($P < 0.001$) compared with their counterparts with no child-oriented marketing (Table 2). The most common child-oriented strategy was the use of spokescharacters; cereals with spokes-characters had higher NPM scores ($P < 0.001$) and more sugar ($P < 0.001$) than those without.

We also found no differences in nutritional quality between cereals with and without product claims (Table 3). The one exception was that cereals with claims about nutrients/ingredients that should be consumed had significantly lower NPM scores ($P = 0.002$), less sugar ($P = 0.002$) and more dietary fiber ($P < 0.001$)

Table 1. Frequency of marketing strategies on 106 cereal boxes

Category of marketing strategy	*Cereals with marketing strategy, (n = 106)* N *(%)*	*Most common specific marketing strategies within each category*[a]	*Cereals with each specific marketing strategy,* N *(%)*
Child-oriented marketing	54 (50.9)	Spokescharacter	33 (31.1)
Location of all product claims			
No claims	6 (5.7)		
Front of package	94 (88.7)		
Places other than front of package	6 (5.7)		
General claims	44 (41.5)	Nutritious	29 (27.4)
Nutrient/ingredient claims	99 (93.4)		
Nutrient/ingredient to be consumed	73 (68.9)	Whole grain	40 (37.7)
Nutrient/ingredient to avoid	55 (51.9)	Cholesterol	48 (45.3)
		Total fat	51 (48.1)
Other nutrient/ingredient claims	94 (88.7)	Contains vitamins and minerals	73 (68.9)
Natural claims	24 (22.6)		
Quality claims	42 (39.6)	Quality	38 (35.9)
Fun claims	33 (31.1)		
Health imagery	102 (96.2)	Milk	91 (85.9)
		Fruits and/or vegetables	45 (42.5)
		Whole grains	42 (39.6)
		Sports references	30 (28.3)
		Checkmark	29 (27.4)
		Picture of a woman	27 (25.5)

Cereals were from one major supermarket in Guatemala City, Guatemala, July 2013. [a]Most common specific marketing strategies refer to specific child-oriented marketing practices, claims or images appearing on more than 25% of cereals.

Table 2. Nutrient Profile Model (NPM) scores and nutrient amounts per 30 g of cereal by child-oriented marketing strategy

	N 106	*NPM score*			*Calories*			*Sugar (g)*			*Dietary fiber (g)*[a]			*Sodium (mg)*		
		Mean	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P
Any child marketing																
Yes	54	13.0	0.55	< 0.001[b]	115.0	0.79	0.016	10.1	0.48	< 0.001[b]	1.27	0.11	0.012	143.5	5.38	0.851
No	52	7.90	0.74		110.2	1.22		6.19	0.50		2.17	0.22		141.4	6.88	
Spokescharacter																
Yes	33	13.4	0.56	< 0.001[b]	114.2	0.92	0.220	10.8	0.58	< 0.001[b]	1.23	0.12	0.015	140.1	7.11	0.761
No	73	9.22	0.66		111.9	1.01		7.03	0.45		1.92	0.17		143.6	5.43	

Cereals were from one major supermarket in Guatemala City, Guatemala, July 2013. [a]One cereal missing information on dietary fiber. [b]Denotes significance based on a Bonferroni-corrected alpha level of 0.002.

than those without such claims, signifying they were indeed healthier. This difference was not seen for cereals with claims about nutrients/ingredients to avoid (for example, sodium and saturated fat). Although cereals with other nutrient/ingredient claims were found to have fewer calories than cereals without such claims, this did not reach our Bonferroni-adjusted threshold for statistical significance (112.1 ± 0.82 versus 117.1 ± 1.20, $P = 0.003$), and the cereals did not differ in any other nutrients. Specific claims about whole grains, quality, cholesterol, fat or vitamin/mineral content did not denote significantly healthier cereals.

Since almost all of the cereals contained health-evoking imagery, we examined differences in nutritional quality between cereals with and without the most common specific health-evoking images (Table 4). Cereals with pictures of fruits or vegetables had significantly healthier NPM scores than cereals without such pictures ($P = 0.002$). However, cereals containing sports imagery had significantly more sugar than cereals without such images ($P = 0.001$); no other differences were detected.

The differences between companies in terms of both total number of product claims and total number of health-evoking images were statistically significant (Table 5). Kellogg's cereals had the most total product claims per cereal box (6.59 ± 2.74) and Nestle cereals had the most total health-evoking images per cereal box (4.11 ± 1.18). Although Nestle also contained the most child-oriented marketing per cereal box (2.22 ± 2.13), the differences between cereal companies were not statistically significant for this marketing strategy. Taking all marketing strategies into account, Kellogg's contained the greatest number per cereal (11.8 ± 2.97), followed by Nestle, Other North American cereals and Malt-O-Meal. Quaker had the least number of marketing strategies per cereal (5.40 ± 3.84).

DISCUSSION

According to our findings, child-oriented and health-related product package advertising are highly prevalent on Guatemala breakfast cereal boxes. Furthermore, based on a validated nutritional quality assessment tool, child-oriented cereals were found to have poorer nutritional quality compared with those not marketed to children. In Guatemala, numerous other nutrient-poor foods, in addition to cereals, are also being heavily advertised to children. A study of school kiosks and convenience stores near public schools in an urban community found that 35% of snack food packaging contained child-oriented marketing, and most

Table 3. Nutrient Profile Model (NPM) scores and nutrient amounts per 30 g of cereal by product claims

	N 106	*NPM score*			*Calories*			*Sugar (g)*			*Dietary fiber (g)*[a]			*Sodium (mg)*		
		Mean	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P
General claims																
Yes	44	10.1	0.83	0.661	112.8	1.26	0.911	8.27	0.64	0.922	1.94	0.20	0.273	144.7	6.94	0.727
No	62	10.8	0.67		112.5	0.93		8.16	0.51		1.53	0.16		140.9	5.56	
Nutrient/ingredient to be consumed																
Yes	73	9.23	0.60	0.002[b]	111.1	0.97	0.006	7.24	0.43	0.002[b]	2.03	0.16	< 0.001[b]	142.7	5.18	0.946
No	33	13.3	0.82		116.1	0.87		10.3	0.74		0.97	0.12		141.9	8.00	
Nutrient/ingredient to avoid																
Yes	55	10.2	0.73	0.665	111.1	1.19	0.119	8.29	0.55	0.869	1.86	0.21	0.362	140.4	5.77	0.682
No	51	10.8	0.74		114.2	0.85		8.12	0.58		1.53	0.13		144.8	6.53	
Other nutrient/ingredient claims																
Yes	94	10.4	0.55	0.462	112.1	0.82	0.003	8.18	0.42	0.873	1.75	0.14	0.246	141.9	4.68	0.689
No	12	11.7	1.59		117.1	1.20		8.39	1.14		1.34	0.28		146.8	11.2	
Natural claims																
Yes	24	11.1	1.11	0.608	112.2	2.09	0.838	8.34	0.84	0.865	1.92	0.38	0.561	150.0	9.62	0.444
No	82	10.3	0.59		112.8	0.77		8.17	0.45		1.64	0.12		140.3	4.84	
Quality claims																
Yes	42	11.9	0.71	0.085	111.9	1.20	0.573	9.56	0.63	0.042	1.49	0.22	0.327	142.1	7.30	0.958
No	64	9.59	0.70		113.1	0.97		7.32	0.49		1.85	0.15		142.7	5.38	
Fun claims																
Yes	33	11.8	0.66	0.084	113.3	1.09	0.573	9.25	0.60	0.084	1.50	0.18	0.324	138.7	6.39	0.549
No	73	9.90	0.68		112.3	0.98		7.73	0.50		1.80	0.16		144.2	5.60	

Cereals were from one major supermarket in Guatemala City, Guatemala, July 2013. [a]One cereal missing information on dietary fiber. [b]Denotes significance based on a Bonferroni-corrected alpha level of 0.002.

Table 4. Nutrient Profile Model (NPM) scores and nutrient amounts per 30 g of cereal by common health-evoking images[a]

	N 106	*NPM score*			*Calories*			*Sugar (g)*			*Dietary fiber (g)*[b]			*Sodium (mg)*		
		Mean	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P	*Mean*	*s.e.*	P
Checkmark																
Yes	29	11.6	0.71	0.240	114.6	0.90	0.163	8.57	0.73	0.635	1.44	0.13	0.250	148.7	9.96	0.527
No	77	10.1	0.66		111.9	0.97		8.07	0.47		1.80	0.17		140.1	4.65	
Fruits/vegetables																
Yes	45	8.78	0.69	0.002[c]	111.1	1.25	0.061	7.11	0.57	0.010	1.90	0.21	0.143	136.2	5.71	0.267
No	61	11.8	0.71		113.8	0.91		9.01	0.53		1.56	0.15		147.1	6.20	
Milk																
Yes	91	10.5	0.54	0.964	112.6	0.83	0.842	8.30	0.40	0.687	1.73	0.14	0.681	140.8	4.31	0.458
No	15	10.6	1.68		113.1	1.77		7.61	1.41		1.52	0.32		152.9	16.0	
Picture of a woman																
Yes	27	7.33	1.02	0.023	107.3	1.79	0.008	6.15	0.62	0.022	2.54	0.33	0.045	143.4	5.93	0.902
No	79	11.6	0.56		114.4	0.71		8.91	0.47		1.41	0.11		142.2	5.46	
Sports references																
Yes	30	12.6	0.87	0.016	113.0	1.18	0.699	10.4	0.77	0.001[c]	1.44	0.21	0.177	139.5	7.87	0.688
No	76	9.68	0.62		112.5	0.95		7.33	0.43		1.81	0.15		143.7	5.20	
Whole grains/corn																
Yes	42	9.07	0.57	0.052	111.6	1.26	0.410	6.82	0.48	0.010	2.24	0.21	0.012	140.8	7.26	0.801
No	64	11.5	0.76		113.3	0.93		9.11	0.55		1.36	0.14		143.6	5.40	

Cereals were from one major supermarket in Guatemala City, Guatemala, July 2013. [a]Common health-evoking images refer to images appearing on $>25\%$ of cereals. [b]One cereal missing information on dietary fiber. [c]Denotes significance based on a Bonferroni-corrected alpha level of 0.002.

Table 5. Mean number (s.d.) of total child-oriented marketing strategies, product claims and health-evoking images per cereal box by company

	Company						P-*value*
	Kellogg's N = *34*	*Malt-O-Meal* N = *11*	*Nestle* N = *18*	*Quaker* N = *10*	*Other North American* N = *16*	*Other Central American* N = *17*	
# Total child-oriented marketing	1.74 (2.02)	0.82 (0.87)	2.22 (2.13)	1.00 (1.15)	1.38 (2.45)	0.53 (1.18)	0.086
# Total product claims	6.59 (2.74)	6.00 (1.84)	4.22 (1.17)	2.30 (2.26)	5.94 (2.26)	3.35 (3.32)	< 0.001
# Total health- evoking images	3.44 (1.65)	2.27 (1.01)	4.11 (1.18)	2.10 (1.10)	3.38 (1.26)	1.82 (1.38)	< 0.001
# All marketing strategies	11.8 (2.97)	9.09 (2.81)	10.6 (1.92)	5.40 (3.84)	10.7 (2.75)	5.71 (4.41)	< 0.001

Cereals were from one major supermarket in Guatemala City, Guatemala, July 2013.

used some variety of promotional character (for example, licensed, brand-specific or sports characters and cartoons). As with cereals, most of these child-oriented snacks were also classified as less healthy according to the NPM.[14]

In our study, the most common form of child-oriented marketing on cereal packages was the use of licensed spokes-characters, and cereals with such characters were less healthier than cereals without. The use of these characters can have powerful influences on children. Studies in Guatemala and the United States found that the use of licensed characters on food packaging influenced children to think a snack with a licensed character on it tasted better than an identical snack without the character; the children were also more likely to want the snack with a character on it.[6,24] This effect was even more pronounced for younger children in the Guatemala study,[24] indicating the potential for overconsumption of unhealthy foods to begin at very young ages.

We did not find cereals with health claims or health-evoking images to have better nutritional quality than their counterparts with no claims or images. This is concerning since such marketing strategies have the potential to create a 'health halo' around products that can influence consumers to think these foods are healthier than may be the case.[25,26] Our findings are consistent with previous work from higher-income countries showing that health-related advertising often has limited associations with actual nutritional quality.[10,27] For example, in the United States, a study of over 56 000 foods in North Dakota found that 49% contained nutrition marketing (for example, health claims and nutrient content claims). Of products that were specifically marketed to children, 71% contained nutrition marketing, and of those, 59% were high in saturated fat, sodium and/or sugar, with more than half high in sugar.[28] In addition, another study in Toronto found that 17% of foods with a front-of-package reference to fiber were 'foods to limit' according to Canada's Food Guide, and that many high fiber foods in fact bore no front-of-package references to fiber.[29]

It has been shown that consumers perceive foods with on-package health references to be generally more nutritious than foods without.[30,31] In the United States, a study of parents of young children showed that most misinterpreted the meaning of nutrition-related claims commonly found on children's cereals, believing that cereals with claims were healthier than cereals without, and consequently were more willing to buy them.[32] Furthermore, individuals exposed to foods with on-package health references have been found to select larger portion sizes and to perceive the foods to be lower in calories.[33] Thus, health-related advertising could encourage overconsumption, especially if placed on foods with high levels of nutrients to limit (for example, calories and sugar), and low levels of nutrients to consume (for example, fiber), as is the case with many breakfast cereals. There were, however, some claims and images that were consistently associated with better nutritional quality, including claims emphasizing the presence of nutrients/ingredients that should be consumed (for example, fiber or vitamins).

We also found that the presence of sports imagery was associated with higher sugar content. In another study, consumers were found to increase both their portion sizes and actual food consumption in the presence of a fitness cue (labeling trail mix as 'fitness trail mix' versus simply 'trail mix'), and perceived themselves to be closer to desired fitness levels upon eating the food.[34] Taken together with our findings, it suggests that such sports and fitness advertising could paradoxically lead to dietary choices and behaviors that are at odds with consumers' intentions for healthy lifestyles.

Our study did show statistically significant differences in overall total number of marketing strategies per cereal among companies. Kellogg's is the leading company in breakfast cereals in Guatemala,[35] and also contains the largest number of marketing strategies per cereal box. However, the differences in total marketing strategies between the top four cereal companies in this study were minimal. Furthermore, there were no significant differences between companies in total child-oriented marketing strategies per cereal. Taken together, these findings indicate that although large transnational companies do advertise more, many different companies nevertheless contribute to the considerable and multifaceted marketing on breakfast cereals in Guatemala.

The results from the current study should be considered in the context of its limitations. First, we selected cereals from only one supermarket in Guatemala City. Although this was the largest supermarket chain nationwide, the selected cereals likely do not represent all cereals sold in the country and therefore prevented us from capturing the full extent of product packaging advertising. Furthermore, findings may not be generalizable to advertising practices in rural areas. More research is also necessary to examine whether our results extend to other heavily advertised food groups, such as chips, cookies, crackers or sugar-sweetened beverages. Finally, we used a conservative threshold to control for multiple comparisons, which could have led us to understate the differences between cereals with certain claims or images. Although this study has limitations, there are a number of strengths. To the best of our knowledge, this is the first study documenting breakfast cereal advertising and nutritional quality (using a validated and policy-relevant tool) in an LMIC. In addition, we coded for a range of marketing strategies, including health-related imagery, on which scant research has been published. Finally, although this study focuses on cereals purchased in Guatemala, we believe that many of our conclusions may apply to cereals found worldwide, given the multinational reach of many of these companies.

Food and beverage marketing to children has had a long history of promoting products of poor nutritionally quality worldwide.[3] In recent years, pledges have been made by the food industry, including transnational companies such as Coca-Cola, Kellogg's and Nestle, to improve the quality of foods

marketed to children worldwide. However, such industry-led initiatives have been criticized for not applying rigorous enough standards.[36] In this study, we found that child-oriented and health-related product packaging advertising is pervasive in Guatemala. Our data suggest that child-oriented marketing strategies were found on the unhealthiest cereals in Guatemala, and in most cases, health claims on cereals did not signify healthier products. The findings from this study suggest a need for self-regulatory or regulatory efforts to reduce the use of child-oriented marketing and health-related advertising practices on products of poor nutritional quality in Guatemala.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTIONS

JS contributed to the study design, conducted the data analysis and led the writing. PL contributed to the study design and data collection. VC contributed to the study design and data collection. JB helped interpret the data and provided critical feedback on drafts of the manuscript. CR contributed to the study design, helped interpret the data, and provided critical feedback on drafts of the manuscript. All authors read and approved the final manuscript.

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