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Research Article

Child-Oriented Marketing on Cereal Packaging: Associations With Sugar Content and Manufacturer Pledge

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ABSTRACT

Objective: To assess sugar content and child-oriented promotional features on packaging among cereals manufactured by companies with varying Children's Food and Beverage Advertising Initiative (CFBAI) participation.

Design: Ready-to-eat dry cereals (n = 159) were purchased from southeastern US grocery stores in September 2018. Content analysis of 159 ready-to-eat dry cereal boxes, coded for sugar content and presence of 8 child-oriented features.

Main Outcome Measures: Frequencies of each promotional feature and number of features per box, level of participation in CFBAI, and sugar content by serving and ounce.

Analysis: Chi-square tests of independence analyzed correspondence between measures of sugar content. Extent of features per box based on sugar content and CFBAI participation were assessed with analyses of variance (ANOVAs).

Results: Most cereals (81%) contained <13 g of sugar per serving, meeting the sugar content requirement for child-directed advertising. Cereals' sugar content classifications varied between sugar per serving and sugar per ounce metrics ($P < .001$). Among low-sugar per serving cereals, 28% were classified as moderate-sugar per ounce, whereas 55% of moderate-sugar per serving cereals had high-sugar per ounce. Games/activities and trade characters were especially common (62% and 49%, respectively), particularly on high-sugar per ounce cereals ($P < .001$, respectively). Child-oriented features were rare on low-sugar cereals and highest on cereals with higher sugar content per ounce produced by CFBAI-participating companies ($F8,158 = 12.33$, $P < .001$).

Conclusions and Implications: Variable cereal-suggested serving sizes may contribute to consumers' misunderstanding of sugar content. CFBAI manufacturers continue to market cereals with high sugar to children. Food and beverage regulatory policy could be strengthened if CFBAI companies apply marketing pledges to brand mascots, adopt standardized metrics for sugar content, and limit added sugar content to the recommended <6 g/serving target used by the *Special Supplemental Nutrition Program for Women, Infants, and Children* program.

Key Words: child-directed marketing, food packaging, sugars, edible grains, serving size (*J Nutr Educ Behav.* 2020; 52:215−223.)

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INTRODUCTION

In 2018, Americans spent $8.5 billion on ready-to-eat (RTE) cereal, more than any other breakfast food.[1,2] The popularity of RTE cereal as a breakfast staple, especially among children, has been a concern for those interested in promoting healthy food and beverage options. Unhealthy foods marketed specifically to children have been linked to an increased risk of childhood obesity.[3] These "fun foods" often contain high levels of sugar, fat, and sodium,[4,5] yet RTE cereal is advertised to children more than any other food category.[6–8] This is a concern because children who consume higher levels of sugar do not get enough of other essential nutrients.[9] Unhealthy diets among children have also been linked to poor diet quality, sugar addiction, obesity, and tooth decay.[10,11]

Sugar Content and Serving Size of Ready-To-Eat Cereals

Of particular concern is the substantial contribution of RTE cereals to children's sugar intake in the US, which consistently exceeds recommended levels.[12,13] Ready-to-eat cereals commonly advertised to children contain levels of sugar that fail to meet the national nutrition standards of the *Special Supplemental Nutrition Program for Women, Infants, and Children* (WIC).[5,14] Federal regulations for WIC inclusion require that

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dry cereals contain less than 6 g of sugar per ounce of cereal.[14] The Dietary Guidelines for Americans, an evidence-based advisory tool for nutrition education materials distributed by the US Government, suggests less than 10% of total calories should be from added sugars.[13] The American Heart Association also recommends that children and adolescents limit daily added sugar intake to 6 teaspoons (25 g).[15] A total of 78% of children's RTE cereals has been shown to contain in a single serving more than a quarter of the daily recommended sugar limit for children.[16] Moreover, children often eat as much as twice the amount of recommended RTE cereal in a single serving, pushing their daily sugar intake even higher.[17]

Serving sizes, which are guided by Food and Drug Administration (FDA) standards, are often not understood by consumers, with many assuming the serving size is a recommended amount to consume rather than an indication of the amount people generally eat.[18,19] Consumers also face discrepancies between what they consider to be a single serving and what is listed as the suggested serving size, generally eating more than what is recommended. Median cereal intake for medium-weight cereal has increased to 39 g per serving, up from 30 g in 1993.[20] Facing calls to revise its Reference Amounts Customarily Consumed (RACC), the FDA increased its RACC for medium-weight cereals (weighing between 20 g and 43 g per 1 cup) to 40 g and 60 g for heavyweight cereals (weighing >43 g). The RACCs are based on 1.1 cups of dry cereal and went into effect January 1, 2020, for manufacturers with over $10 million in food sales.[19,21]

Children's Food and Beverage Advertising Initiative Guidelines

The Children's Food and Beverage Advertising Initiative (CFBAI) is an industry self-regulation program introduced in 2006 that guides companies in promoting food and beverages to children younger than 12 years.[8,19] The standards identify nutrients to both limit and encourage. By 2018, 18 food and beverage companies participated in the CFBAI (up from 10 companies in 2006), with those companies accounting for 70%–80% of children's television advertising. For a company that is a member of CFBAI to advertise its cereal to children, it must meet the following criteria per serving: <200 cal, <1.5 g of saturated fat, <290 mg of sodium, and ≤12 g added sugar. Uniform nutrition criteria were adopted in December 2013 and updated in January 2018. Large cereal manufacturing companies such as Kellogg's, General Mills, Post, and PepsiCo are members of the initiative, whereas smaller and generic store brands do not participate in the CFBAI. A report released each year identifies compliance with the program and changes in which food and beverages can be advertised to children younger than 12 years.[22]

The CFBAI guidelines apply only to advertising and stop short of regulating point-of-sale marketing tactics. Previous research has found that manufacturers comply with CFBAI pledges with television advertising.[23,24] Promotional features, such as child-oriented brand mascots and licensed media spokescharacters on food packaging also appeal to children and can influence their food and beverage choices.[13,16,17] Trade characters (brand mascots) are those owned by food and beverage companies, whereas media spokescharacters are licensed by entertainment companies to food manufacturers for a fee. Both are used to promote the sale of food and beverage products, however CFBAI standards only limit the use of third-party media spokescharacters. Media spokescharacters have been found to negatively influence children's intake of less healthy food items, though scant research has been conducted regarding trade characters.[25,26]

The nutritional quality of some children's RTE cereals has improved since CFBAI launched, and the FDA has claimed that revising RACCs will further pressure cereal manufacturers into making their cereals healthier.[8,19] Between 2009 and 2012, 13 of 16 RTE cereals targeted to children improved their nutritional quality by reducing sodium and sugar per serving and increasing fiber.[27] However, research during this period showed that manufacturers continued to promote cereals with low nutrients and high-sugar content to children using features such as trade- and spokescharacters.[16,25,28] According to the FDA, by maintaining higher RACCs for medium-weight cereals, "…fewer sugary cereals would meet CFBAI's advertising criterion, fewer would be marketed to children, and companies would reduce the sugar content of popular cereals to enable them to be marketed to children."[19]

Ready-To-Eat Cereal Comparisons by Sugar Content and Children's Food and Beverage Advertising Initiative Participation

It is unclear if the increased RACC will measurably improve children's health. To date, most research has based measures on per serving data or standardized sugar content. To assess merits of the CFBAI guidelines, comparing RTE cereals along both metrics is warranted. Of particular concern is whether cereals approved through CFBAI for promotion to children based on sugar (ie, ≤12 g sugar per serving) also contain relatively low levels of sugar per ounce.

Of further interest is the extent to which manufacturers apply CFBAI standards to RTE cereal packaging, given that the CFBAI guidelines pertain only to television and other advertising. This study fills these gaps by exploring links between child-oriented marketing tactics used by cereal manufacturers on product packaging (such as trade- and spokescharacters) and the amount of sugar as expressed in both sugar per ounce and sugar per suggested serving. In addition, analyses explore whether RTE cereal manufacturers that participate in the CFBAI's self-regulatory program market sugary cereals differently than non–CFBAI-participating cereals in the US marketplace.

METHODS

Cereal boxes were collected during a 1-week period in September 2018. Researchers purchased every box of RTE

Table 1. Manufacturers and Sugar Content Characteristics of RTE Cereals Included in Study Sample

Cereal Characteristics	Total	CFBAI− Cereal Listed, n = 17	CFBAI− Cereal Not Listed, n = 93	Not in CFBAI, n = 49	*P* Value
Manufacturer, % (n)					
General Mills	31 (49)	20 (10)	79 (39)	–	–
Kellogg's	23 (37)	11 (4)	89 (33)	–	–
PepsiCo (Quaker)	3 (5)	0.0 (0)	100 (5)	–	–
Post	12 (19)	16 (3)	84 (16)	–	–
Harris Teeter	16 (25)	–	–	100 (25)	–
Nature's Path	1 (2)	–	–	100 (2)	–
Walmart	14 (22)	–	–	100 (22)	–
Suggested serving, g, mean (SD)	37.3 (11.15)	28.8 (1.59)[a]	36.9 (11.43)[b]	41.0 (10.89)[b]	<.001
Suggested serving, cups, mean (SD)[c]	0.9 (0.23)	0.9 (0.20)[a]	0.9 (0.18)[a]	1.0 (0.28)[b]	.002
Cereal density in grams per cup, mean (SD)[c]	42.8 (16.80)	34.9 (5.39)	43.1 (14.92)	44.9 (21.44)	.10
Moderate-density, 20–42.99 g/cup, % (n)[d]	71 (113)	100 (17)[a]	73 (64)[b]	65 (32)[b]	.02
High-density, ≥ 43 g/cup, % (n)[d]	26 (41)	0 (0)[a]	27 (24)[b]	35 (17)[b]	.02
Sugar per suggested serving, g, mean (SD)	9.2 (4.17)	8.8 (2.24)	9.1 (3.80)	9.5 (5.28)	.82
Sugar per ounce, g, mean (SD)	7.2 (3.03)	8.7 (2.22)[a]	7.3 (2.85)[a,b]	6.6 (3.44)[b]	.047

CFBAI indicates Children's Food and Beverage Advertising Initiative; RTE, ready-to-eat.
[a,b]Denotes means along the row that are statistically different from each other ($P < .05$); [c]The density of 5 boxes of cereal could not be determined because they did not list a serving size in cups (n = 154); [d]Results of chi-square goodness of fit tests ($P < .05$).
Note: Study was conducted between September 2018 and June 2019 to assess the sugar content, serving sizes, and child-targeted promotional features of name brand and generic brand cereals in the US. Sample was selected in September 2018 by purchasing every name brand and generic brand nongranola RTE cereal in 2 grocery stores (Harris Teeter and Walmart) in a midsized city in the southeastern US. In cases of duplicate boxes of the same cereal, 1 version was randomly selected for coding, resulting in a final sample of 159 cereal boxes. Designations signify whether manufacturer is included in the CFBAI and whether the cereal is specifically listed by manufacturer as meeting nutritional requirements for advertising to children. Unless otherwise noted, ANOVA tests assessed differences in means based on CFBAI participation categories.

cold cereal (excluding granolas) from a Walmart Supercenter in a midsize southeastern US city and every nongranola store brand from a nearby southeastern US grocery store chain (Harris Teeter). These 2 stores were chosen to have multiple generic brands in the sample and to obtain cereals from stores that serve multiple demographic groups. In total, 196 boxes of RTE cereal were purchased. Of these, 65 boxes were duplicate products, such as a regular and a larger "family size" box of the same cereal. In these cases, 1 of the versions was randomly selected for coding. This led to a final sample of 159 boxes of different cereal products, representing 12 brands from 7 manufacturers. Human subjects were not included in the study, and thus Institutional Review Board approval was not warranted.

Coding Procedures

Coding and analysis took place at High Point University, a midsized university in North Carolina, between October 2018 and June 2019.

Serving size and sugar content. Suggested serving size in grams, suggested serving size in cups, and total grams of sugar per serving were collected from the nutrition panel on each box. Amount of added sugar was not present on nutrition labels on most boxes in the sample. The FDA has mandated the inclusion of added sugar to nutrition labels; however, this regulation does not go into effect until January 2020. The cut point for "high-sugar per serving" was 13 g (n = 31), as CFBAI guidelines mandate that cereals contain less than this amount of added sugar to advertise to children. In this study, moderate-sugar per serving RTE cereals contained between 9 and 12 g of sugar per suggested serving (n = 67), and low-sugar per serving cereals contained ≤8 g of sugar per suggested serving (n = 61).

Grams of sugar per suggested serving in each cereal were divided by the suggested serving size in grams for a standardized measure of grams of sugar per gram of cereal (mean = 0.3, SD = 0.11). This figure was multiplied by 28.3 (ie, number of grams in an ounce) for a measure of grams of sugar per ounce for each cereal (mean = 7.2, SD = 3.03). The full sample was then divided into 3 groups based on sugar grams per ounce. Low-sugar per ounce cereals contained ≤6 g of sugar per ounce (ie, 1.5 teaspoons; n = 56), as defined by WIC guidelines.[14–16] The middle

third of cereals contained between 6.01 and 9.00 g of sugar per ounce (ie, 1.5–2.25 teaspoons; n = 50) and were deemed moderate-sugar per ounce cereals. Finally, the top third of cereals contained >9 g of sugar per ounce (n = 53) and were deemed high-sugar per ounce in this study.[29]

Children's Food and Beverage Advertising Initiative participation. Children's Food and Beverage Advertising Initiative participation for cereals fell into 3 categories. "Not in CFBAI" products included generic, store brands, and small independent brands that are not included in the CFBAI program (n = 49). The larger food and beverage manufacturers are participants in the CFBAI programs; their cereals were divided between the 2 additional categories. Kellogg's, General Mills, and Post list several specific cereals meeting CFBAI nutrition criteria for advertising to children.[22] All cereals in the sample that were explicitly listed by companies as meeting nutrition criteria in February 2018 were coded as "CFBAI–cereal listed" (n = 17). Cereals not on the lists of those meeting nutrition criteria were coded as "CFBAI–cereal not listed" (n = 93).

Child-oriented features. Three coders analyzed child-oriented features on the sample of RTE cereal boxes. Features were selected based on previous literature regarding child-oriented promotional features on children's food and beverage packaging.[30,31] All sides of each box were examined for the presence (yes = 1) of the following 8 features: trade characters (ie, mascots), spokescharacters (ie, licensed media characters or personalities), children's games/activities, images of animals, images of children, fun colors of cereal, fun shapes of cereal (eg, animal shapes or letter shapes), and toys or prizes within the box. To establish intercoder reliability, 16% of the sample was double-coded (25 boxes). Kappa coefficients between coders for specific features ranged from 0.69 to 1.0, with an overall average of 0.88.[32]

Statistical Analysis

The SPSS software for Windows (version 25, IBM Corp, Armonk, NY, 2017) was used for statistical analyses. One-way analysis of variance (ANOVA) tests were used to assess differences in mean serving sizes, cereal density (grams of cereal per cup measure), sugar per serving, and sugar per ounce based on CFBAI participation (not in CFBAI, CFBAI–cereal listed, and CFBAI–cereal not listed).

To assess the extent to which the sugar content metric applied by the CFBAI as acceptable for advertising to children (<13 g of sugar per suggested serving) corresponded to the categories of sugar level per ounce, a chi-square test of independence was used. The test examined whether cereals classified as low-, moderate-, or high-sugar per serving had the parallel designation for sugar per ounce (eg, the percentage of low-sugar per serving cereals also classified as low-sugar per ounce).

Descriptive analyses (%) assessed frequency of each child-promotional feature in the full sample of cereal boxes and the mean number of different features per box (ie, index of child-promotional features). Subsequent chi-square goodness of fit tests assessed variations in rates of each feature based on sugar per serving and sugar per ounce. Because 16 tests were conducted, a Bonferroni adjustment was used. An α level was set at .003 (ie, .05/16). Two 1-way ANOVAs assessed differences in the mean number of features per box based on sugar per serving and sugar per ounce classifications ($\alpha = .05$). These analyses were repeated to assess rates of individual features and mean number of features per box for cereals in each of the 3 CFBAI categories (chi-square $\alpha = .05/8$, or .006).

Finally, factorial ANOVAs assessed relationships between average number of child-oriented features on each box and the level of participation in the CFBAI (manufacturer in CFBAI–cereal listed; manufacturer in CFBAI–cereal not listed; and manufacturer not in CFBAI) and level of sugar (low, moderate, or high). Separate analyses were conducted for levels of sugar per suggested serving and sugar per ounce.

RESULTS

Cereal density (grams per cup of cereal) was calculated by dividing the serving size in grams by the serving size in cups. As shown in Table 1, the majority of RTE cereals in this sample (71%) were medium-weight by FDA standards (20–42.99 g/cup). Cereals explicitly listed by manufacturers as meeting CFBAI nutritional criteria (ie, Children's Food and Beverage Advertising Initiative–cereal listed) had significantly smaller suggested serving sizes than CFBAI–not listed cereals and cereals produced by non-CFBAI manufacturers (ie, generic store brands; $F2,158 = 8.34$, $P < .001$). Children's Food and Beverage Advertising Initiative–cereal listed products also tended to have lower density on average, compared with CFBAI–cereal not listed and non-CFBAI cereals, though differences did not reach statistical significance.

Most cereals in the sample (128 of 159) contained <13 g of total sugar per suggested serving, including all CFBAI–cereal listed and 82% of CFBAI–cereal not listed products. Although there were no significant differences among the grams of sugar per suggested serving, cereals listed as meeting CFBAI requirements had more sugar per ounce on average, compared with cereals produced by companies not participating in CFBAI. Children's Food and Beverage Advertising Initiative–cereals not listed did not differ significantly from either other group. Moreover, a chi-square analysis indicated variability in the designation of cereals based on the sugar content metric applied ($P < .001$; Table 2). More than half of the cereals with moderate-sugar per serving (9–12 g) were classified as high-sugar per ounce (≥13 g).

As shown in Table 3, displaying children's games or activities on the box was the most common feature, followed by the depiction of a trade character (ie, product mascot). Boxes claiming to have toys or prizes inside were rarely encountered, as were boxes with spokescharacters from children's popular television programs or films. The average box contained between 1 and 2 different child-oriented features.

Two features were more commonly found on boxes with moderate-sugar per serving (9–12 g), compared with low- or high-sugar per serving, including game/activity ($P = .001$) and trade character ($P < .001$; Table 3). Cereals

Table 2. Levels of Sugar per Serving and Sugar per Ounce of RTE Cereals

	Sugar per Suggested Serving of Cereal		
Sugar per Ounce of Cereal	**Low, 0–8 g**	**Moderate, 9–12 g**	**High, ≥13 g**
Low, 0–6 g	72 (44)	18 (12)	0 (0)
Moderate, 6.01–9.00 g	28 (17)	27 (18)	48 (15)
High, ≥9.01 g	0 (0)	55 (37)	52 (16)
Total	100 (61)	100 (67)	100 (31)
P value	<.001	<.001	<.001

RTE indicates ready-to-eat.

Note: Values are given as % (n). Sample was selected by purchasing every name brand and generic brand nongranola RTE cereal in 2 grocery stores (Harris Teeter and Walmart) in a midsized city in the southeastern US. In cases of duplicate boxes of the same cereal, 1 version was randomly selected for coding, resulting in a final sample of 159 cereal boxes. Results are from chi-square goodness of fit tests, following an omnibus chi-square test of independence, χ^2 (4, n = 159) = 76.81, $P < .001$. *P* values denote statistically significant differences in percentages along each column.

with moderate-sugar per serving also had a greater number of child-oriented features per box than low- and high-sugar per serving cereals ($F2,158 = 10.30$, $P < .001$).

Numerous child-oriented features were found more often on cereals designated as high-sugar per ounce (≥9.01 g/oz), including game/activity, trade character, fun colored cereal pieces, cereal pieces in fun shapes, and images of animals. High-sugar per ounce cereals also displayed more child-oriented features per box on average, compared with moderate- and low-sugar per ounce cereals ($F2,158 = 25.65$, $P < .001$).

There were differences in child-promotional feature rates based on CFBAI participation categories. As shown in Table 4, games/activities, trade characters, and displaying children on the box were most common among cereals classified as CFBAI–cereal listed, followed by CFBAI–cereal not listed ($P < .001$ respectively). This study found that non–CFBAI-participating companies did not use trade characters (mascots), licensed media spokescharacters, or images of children to market RTE cereals.

Results of the first factorial analysis of variance (ANOVA) indicated the effects of sugar per serving and CFBAI participation were significant, as was the interaction between them. Table 5 shows that cereals in the CFBAI that are specifically listed as meeting requirements and contain moderate-sugar per serving tend to contain the most child-oriented features per box, followed by moderate-sugar cereals in the CFBAI but not listed as meeting requirements. Low-sugar cereals in CFBAI that are listed as meeting requirements and low-sugar cereals not in the CFBAI displayed no child-oriented features.

The second factorial ANOVA indicated differences in features per box based on sugar per ounce and CFBAI participation. Table 5 indicates that the average number of child-oriented features per box increases with sugar content level and that cereals produced by companies participating in the CFBAI (listed as meeting requirements or not) display more child-oriented features than cereals produced by companies not participating in the CFBAI. Children's Food and Beverage Advertising Initiative–cereal listed products with the highest sugar per ounce contained the most child-oriented features per box on average.

DISCUSSION

Results of this content analysis indicate that US manufacturers promote RTE cereals to children via features on the boxes in cereal aisles. Moreover, even companies that pledge to promote only relatively healthy cereals to children display a variety of child-oriented features on boxes of RTE cereals containing high amounts of sugar per ounce. These findings parallel earlier studies indicating limited improvements in the nutritional value of food products marketed to children despite adoption of the CFBAI pledges.[16,22,23,26,33,34]

The designation of a given cereal as low, moderate, or high in sugar depends in part on the metric used to assess sugar content. Many cereals classified as moderate-sugar based on grams per serving are classified as high-sugar based on sugar per ounce. This mismatch suggests that many parents may be misled by the sugar content contained in the nutrition panel of many RTE cereal boxes, potentially leading to a higher sugar intake among children than intended.

Children's games or activities and trade characters (mascots) on boxes are particularly common, especially on cereals containing moderate or high levels of sugar. Licensed media spokescharacters and indications of a toy or prize in the box were rarely encountered. These are child-marketing tactics that have received substantial criticism from scholars and policy makers, perhaps prompting cereal manufacturers to reduce their use.[24,35–37]

Child-oriented promotional features varied with the extent of sugar in the cereal, with different patterns emerging based on the metric used to assess sugar content. When looking at grams of sugar per suggested serving (the metric used by the CFBAI for child-directed advertising), fewer high-sugar cereals (≥13 g per serving) display child-promotional features. However, when applying the metric used by public health organizations such as WIC, the picture is different. Cereals with the highest sugar content, as defined by >9 g (>2 teaspoons) of sugar per ounce, often display child-oriented promotional features. These findings reinforce high rates of child-oriented features found on products with high-sugar

Table 3. Child-Oriented Promotional by Cereal Sugar Content

		Sugar per Suggested Serving of Cereal				Sugar per Ounce of Cereal			
Child-Oriented Feature	**Total Sample**	**Low, 0–8 g**	**Moderate, 9–12 g**	**High, ≥13 g**	***P* Value**	**Low, 0–6 g**	**Moderate, 6.01–9 g**	**High, ≥9.01 g**	***P* Value**
Game or activity	31 (50)	16 (10)[a]	48 (32)[b]	26 (8)[a,b]	.001	11 (6)[a]	22 (11)[a]	62 (33)[b]	<.001
Trade character (mascot)	25 (39)	10 (6)[a]	43 (29)[b]	13 (4)[a]	<.001	9 (5)[a]	16 (8)[a]	49 (26)[b]	<.001
Animals shown	19 (30)	16 (10)	25 (17)	10 (3)	.13	11 (6)[a]	14 (7)[a,b]	32 (17)[b]	.002
Cereal pieces are a fun shape	15 (24)	8 (5)	21 (14)	16 (5)	.37	5 (3)[a]	8 (4)[a]	32 (17)[b]	.001
Cereal pieces are a fun color	14 (22)	7 (4)	21 (14)	13 (4)	.10	2 (1)[a]	10 (5)[a]	30 (16)[b]	<.001
Children are shown	13 (20)	8 (5)	22 (15)	0 (0)	.006	7 (4)	8 (4)	23 (12)	.05
Spokes-character	3 (4)	5 (3)	2 (1)	0 (0)	.09	5 (3)	0 (0)	2 (1)	.06
Box contains a toy/prize	2 (3)	3 (2)	2 (1)	0 (0)	.52	4 (2)	2 (1)	0 (0)	.39
Number of different features, mean (SD)	1.2 (1.58)	0.7 (1.22)[a]	1.8 (1.83)[b]	0.8 (1.09)[a]	<.001	0.5 (1.03)[a]	0.8 (1.21)[a]	2.3 (1.78)[b]	<.001

RTE indicates ready-to-eat.

[a,b]Superscript letters denote percentages along the row that are statistically different from each other ($P < .05$).

Note: Values are given as % (n) unless otherwise noted. Sample was selected by purchasing every name brand and generic brand nongranola RTE cereal in 2 grocery stores (Harris Teeter and Walmart) in a midsized city in the southeastern US. In cases of duplicate boxes of the same cereal, 1 version was randomly selected for coding, resulting in a final sample of 159 cereal boxes. Coders assessed each box for the presence/absence of each of the 8 child-targeted promotional features. For chi-square goodness of fit tests assessing individual child-oriented features, Bonferroni adjustments to the α level was used to control family-wise error rate. An α (P value) of .003 was used for these tests (ie, .05/16 tests). The α for the ANOVA assessing number of features per box was $P = .05$.

content in previous research.[16,33,34] The high rates of child-targeted features, particularly games/activities and mascots, on relatively sugary RTE cereals suggest that children in grocery store cereal aisles are likely to be primarily attracted to cereals with higher sugar content.

Companies participating in the self-regulation program (namely, large name-brand manufacturers) appear to apply similar sugar guidelines governing advertising to children to RTE cereal packaging. This is particularly true for cereals explicitly designated as meeting CFBAI criteria, none of which contained >12 g of total sugar per serving. However, cereals explicitly listed as meeting CFBAI requirements overwhelmingly contain >9 g of sugar per ounce (equivalent to 2.25 teaspoons) — well above the nutrition limits for eligible purchase through the WIC federal food assistance program — and also display more than 3 child-oriented marketing features per box on average. This finding parallels a 2014 analysis, conducted before the updated CFBAI guidelines, which found that cereals promoted to children contained more sugar by weight (34% on average) than cereals promoted only to adults (26% sugar by weight).[16]

In considering the CFBAI self-regulatory program, Sharma and colleagues[38] questioned the underlying motivations of food and beverage manufacturers, arguing "where industry and public health objectives conflict, an industry has incentives to create a public image of concern and to promise change, but then to create weak standards with lax enforcement." The present findings suggest that large name-brand manufacturers are not consistently following the "spirit" of the CFBAI program by promoting only their healthiest offerings to children. The rates of child-oriented features on the highest-sugar RTE cereals—defined as grams of sugar per ounce—were higher for CFBAI-participating companies than the generic store brands not participating in the CFBAI. A primary consideration then is whether these industry self-regulatory program pledges are sufficient to promote child health. Some in the public health community argue that 9–12 g of sugar per

Table 4. Child-Oriented Promotional Features by CFBAI Participation

Child-Oriented Feature	Total Sample	CFBAI Participation			
		CFBAI–Cereal Listed	CFBAI–Cereal Not Listed	Not in CFBAI	*P* Value
Game or activity	31 (50)	77 (13)[a]	32 (30)[b]	14 (7)[c]	<.001
Trade character (mascot)	25 (39)	77 (13)[a]	28 (26)[b]	0 (0)[c]	<.001
Animals shown	19 (30)	24 (4)	20 (18)	8 (4)	.14
Cereal pieces are a fun shape	15 (24)	12 (2)	17 (16)	4 (2)	.08
Cereal pieces are a fun color	14 (22)	24 (4)	13 (12)	10 (5)	.37
Children are shown	13 (20)	41 (7)[a]	13 (12)[b]	0 (0)[c]	<.001
Spokes-character	3 (4)	0 (0)	3 (3)	0 (0)	.34
Box contains a toy/prize	2 (3)	6 (1)	2 (2)	0 (0)	.30
Number of different features, mean (SD)	1.2 (1.58)	2.8 (1.55)[a]	1.4 (1.59)[b]	0.4 (0.91)[c]	<.001

CFBAI indicates Children's Food and Beverage Advertising Initiative; RTE, ready-to-eat.

[a–c]Superscript letters denote percentages along the row that are statistically different from each other ($P < .05$).

Note: Values are given as % (n) unless otherwise noted. Sample was selected by purchasing every name brand and generic brand nongranola RTE cereal in 2 grocery stores (Harris Teeter and Walmart) in a midsized city in the southeastern US. In cases of duplicate boxes of the same cereal, 1 version was randomly selected for coding, resulting in a final sample of 159 cereal boxes. Coders assessed each box for the presence/absence of each of the 8 child-targeted promotional features. Designations signify whether manufacturer is included in the CFBAI, and whether the cereal is specifically listed by manufacturer as meeting nutritional requirements for advertising to children. For chi-square goodness of fit tests assessing individual child-oriented features, Bonferroni adjustments to the α level was used to control family-wise error rate. An α (P value) of .006 was used for these tests (ie, .05/8 tests). The α for the ANOVA assessing number of features per box was $P = .05$.

serving (which corresponds to roughly 2.25 to 3 teaspoons) is still unhealthy for children.[15]

Limitations

This study had several limitations. Although the current CFBAI nutrition guidelines pertain to added sugars, most nutrition labels on cereal boxes display only total sugar. Thus, the sugar per serving metric used in this analysis was slightly more conservative than the overall guideline. All CFBAI–cereal listed cereals and 82% of CFBAI–cereal not listed cereals contained <13 g of total sugar; thus, they would also contain <13 g added sugar.

With sampling, the non-CFBAI cereals comprised only 3 brands. Other generic brands may differ in their sugar content or child-oriented marketing. Small, subsidiary brands owned by the larger cereal manufacturers were considered participants in CFBAI because their parent companies were participants. Children's Food and Beverage Advertising Initiative documents make no specific reference to whether the industry regulations apply to subsidiaries, and it is not clear whether consumers and regulating bodies would expect the same guidelines to apply. Finally, the sample was drawn during a single week in September, 2018 and may have exhibited different child-oriented features during a different season or holiday period.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The present findings highlight a need to examine how parents interpret nonstandardized information on nutrition labels and whether child-oriented promotion features on packaging drive greater consumption of high-sugar products among children. Based on the current findings, the CFBAI guidelines would be strengthened in several additional ways. The adoption of a standardized metric for acceptable sugar and other nutritional content, rather than serving size, would allow easier comparisons across products and aid consumers' informed choices. Therefore, using metrics that parallel guidelines and measurements used by other organizations, such as US Department of Agriculture and FDA, would aid consumers and public health advocates. Extending the guidelines to include packaging and other point-of-purchase marketing would formalize their application beyond media advertising and might push smaller and generic brands to participate.

The findings also indicated a near-total lack of effort to promote the lowest-sugar RTE cereals to children. None of the lowest-sugar cereals explicitly listed as meeting CFBAI nutritional requirements or produced by non-CFBAI companies contained a single child-oriented feature in this sample, and those by CFBAI companies not listed as meeting nutritional requirements displayed approximately 1 feature per box on average. Future research should determine whether using these features to promote healthy RTE cereals could lead consumers to choose more healthy options for children. There is some evidence that children are encouraged to consume healthy food and beverage options when such marketing techniques are used to promote them leading some researchers and public health advocates to urge their use in advertising and marketing of objectively healthy products.[25,26]

Table 5. Child-Oriented Features per Box Based on CFBAI Participation and Sugar Content

	Sugar per Suggested Serving of Cereal[a]			Sugar per Ounce of Cereal[b]			
CFBAI Category	**Low, 0–8 g**	**Moderate, 9–12 g**	**High, ≥13 g**	**Low, 0–6 g**	**Moderate, 6.01–9.00 g**	**High, ≥9.01 g**	**Total**
Company in CFBAI–cereal listed	0 (0.0)	3.2 (1.21)	–	0 (0.0)	2.3 (0.50)	3.6 (1.21)	2.8 (1.55)
	n = 2	n = 15	n = 0	n = 2	n = 4	n = 11	n = 17
Company in CFBAI–cereal not listed	1.1 (1.36)	2.0 (1.88)	0.5 (0.72)	0.9 (1.21)	1.0 (1.32)	2.2 (1.90)	1.4 (1.59)
	n = 40	n = 36	n = 17	n = 33	n = 31	n = 29	n = 93
Company not in CFBAI	0 (0.0)	0.2 (0.54)	1.1 (1.38)	0 (0.0)	0 (0.0)	1.4 (1.33)	0.4 (0.91)
	n = 19	n = 16	n = 14	n = 21	n = 15	n = 13	n = 49
Total	0.7 (1.22)	1.8 (1.83)	0.8 (1.09)	0.5 (1.03)	0.8 (1.21)	2.3 (1.78)	1.2 (1.57)
	n = 61	n = 67	n = 31	n = 56	n = 50	n = 53	n = 159

CFBAI indicates Children's Food and Beverage Advertising Initiative; RTE, ready-to-eat.
[a]$F_{7,158} = 11.68$, $P < .001$; sugar content $P = .001$; CFBAI category $P = .002$; interaction $P < .001$; [b]$F_{8,158} = 12.33$, $P < .001$; sugar content $P < .001$; CFBAI category $P < .001$; interaction $P = .28$.
Note: Sample was selected by purchasing every name brand and generic brand nongranola RTE cereal in 2 grocery stores (Harris Teeter and Walmart) in a midsized city in the southeastern US. In cases of duplicate boxes of the same cereal, 1 version was randomly selected for coding, resulting in a final sample of 159 cereal boxes. Designations signify whether manufacturer is included in the CFBAI, and whether the cereal is specifically listed by manufacturer as meeting nutritional requirements for advertising to children. Values represent the mean number of child-oriented features per box, parenthetical values are SD. Factorial ANOVAs were used to assess main and interactive effects of sugar content and CFBAI participation.

REFERENCES

1. Burrows D. America's most popular breakfast cereals (and the stocks behind them). *Kiplinger*. October 11, 2018. http://www.kiplinger.com/slideshow/investing/T052-S001-america-s-most-popular-breakfast-cereals-stocks/index.html. Accessed October 16, 2019.
2. Hale T. Breakfast on the rise. Frozen & Refrigerated Buyer Magazine. 2019; (January-February):18–20.
3. Harris JL, Pomeranz JL, Lobstein T, Brownell KD. A crisis in the marketplace: how food marketing contributes to childhood obesity and what can be done. *Annu Rev Public Health*. 2009;30:211–225.
4. Elliott C. Marketing fun foods: a profile and analysis of supermarket food messages targeted at children. *Can Public Policy*. 2008;34:259–273.
5. Schwartz MB, Vartanian LR, Wharton CM, Brownell KD. Examining the nutritional quality of breakfast cereals marketed to children. *J Am Diet Assoc*. 2008;108:702–705.
6. Harrison K, Marske AL. Nutritional content of foods advertised during the television programs children watch most. *Am J Public Health*. 2005;95:1568–1574.
7. Powell LM, Schermbeck RM, Chaloupka FJ. Nutritional content of food and beverage products in television advertisements seen on children's programming. *Child Obes*. 2013;9:524–531.
8. Enright M, Eskenazi L. The Children's Food & Beverage Advertising Initiative Category-Specific Uniform Nutrition Criteria. 2018 White Paper. 2nd ed. Arlington, VA: Council of Better Business Bureaus; 2018. https://bbbnp-bbbp-stf-use1-01.s3.amazonaws.com/docs/default-source/cfbai/cfbai-white-paper_1-18-2019.pdf?sfvrsn=6bde3f80_2. Accessed October 22, 2019.
9. Kranz S, Smiciklas-Wright H, Siega-Riz AM, Mitchell D. Adverse effect of high added sugar consumption on dietary intake in American preschoolers. *J Pediatr*. 2005;146:105–111.
10. Avena NM, Rada P, Hoebel BG. Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake. *Neurosci Biobehav Rev*. 2008;32:20–39.
11. Dye BA, Shenkin JD, Ogden CL, Marshall TA, Levy SM, Kanellis MJ. The

relationship between healthful eating practices and dental caries in children aged 2–5 years in the United States, 1988–1994. *J Am Dent Assoc*. 2004;135:55–66.
12. Slining MM, Popkin BM. Trends in intakes and sources of solid fats and added sugars among US children and adolescents: 1994–2010. *Pediatr Obes*. 2013;8:307–324.
13. US Department of Agriculture. *Dietary Guidelines for Americans 2015–2020*. 8th ed. Washington, DC: Government Printing Office; 2015. http://health.gov/dietaryguidelines/2015/guidelines/. Accessed December 30, 2019.
14. US Department of Agriculture. Special Supplemental Nutrition Program for Women, Infants and Children. 2018. http://www.fns.usda.gov/wic/about-wic. Accessed October 22, 2019.
15. Vos MB, Kaar JL, Welsh JA, et al. Added sugars and cardiovascular disease risk in children: a scientific statement from the American Heart Association. *Circulation*. 2017;135:e1017–e1034.
16. Environmental Working Group. Children's cereals: sugar by the pound. Washington, DC: Environmental Working Group; 2014. http://static.ewg.org/reports/2014/cereals/pdf/2014-EWG-Cereals-Report.pdf. Accessed December 30, 2019.
17. Albertson AM, Thompson DR, Franko DL, Holschuh NM. Weight indicators and nutrient intake in children and adolescents do not vary by sugar content in ready-to-eat cereal: results from National Health and Nutrition Examination Survey 2001–2006. *Nutr Res*. 2011;31:229–236.
18. Zhang Y, Kantor MA, Juan W. Usage and understanding of serving size information on food labels in the United States. *Am J Health Promot*. 2016;30:181–187.
19. Food and Drug Administration. Food labeling: serving sizes of foods that can reasonably be consumed at one eating occasion; dual-column labeling; updating, modifying, and establishing certain reference amounts customarily consumed; serving size for breath mints; and technical amendments. 21 CFR Part 101 (2016). http://www.regulations.gov/document?D=FDA-2004-N-0258-0136. Accessed October 22, 2019.
20. National Heart, Lung, and Blood Institute. *Portion Distortion*. Bethesda, MD: National Institutes of Health. http://www.nhlbi.nih.gov/health/educational/wecan/eat-right/portion-distortion.htm. Accessed October 22, 2019.
21. Food and Drug Administration. Food Labeling: Revision of the Nutrition and Supplement Facts Labels and Serving Sizes of Foods That Can Reasonably Be Consumed at One Eating Occasion; Dual-Column Labeling; Updating, Modifying, and Establishing Certain Reference Amounts Customarily Consumed; Serving Size for Breath Mints; and Technical Amendments; Extension of Compliance Dates. 21 CFR Part 101 (2018). https://www.regulations.gov/document?D=FDA-2004-N-0258-0312. Accessed January 23, 2020.
22. Better Business Bureau National Programs. Children's Food and Beverage Advertising Initiative: Foods and Beverages That Meet the CFBAI Category-Specific Uniform Nutrition Criteria That May Be in Child-Directed Advertising. Arlington, VA: Better Business Bureau; 2018. http://bbbprograms.org/programs/CFBAI/cfbai-nutrition-criteria–product-list/. Accessed October 22, 2019.
23. Kunkel DL, Castonguay JS, Filer CR. Evaluating industry self-regulation of food marketing to children. *Am J Prev Med*. 2015;49:181–187.
24. Kunkel D, Castonguay J, Wright PJ, McKinley CJ. Solution or smokescreen? Evaluating industry self-regulation of televised food marketing to children. *Commun Law Policy*. 2014;19:263–292.
25. Kraak VI, Story M. Influence of food companies' brand mascots and entertainment companies' cartoon media characters on children's diet and health: a systematic review and research needs. *Obes Rev*. 2015;16:107–126.
26. Lapierre MA, Vaala SE, Linebarger DL. Influence of licensed spokescharacters and health cues on children's ratings of cereal taste. *Arch Pediatr Adolesc Med*. 2011;165:229–234.
27. Harris J, Schwartz M, Brownell K, et al. Cereal FACTS 2012: limited progress in the nutrition quality and marketing of children's cereals. Hartford, CT: Rudd Center for Food Policy and Obesity; 2012. http://www.cerealfacts.org/media/Cereal_FACTS_Report_2012_7.12.pdf. Accessed October 22, 2019.
28. Leonard B, Campbell MC, Manning KC. Kids, caregivers, and cartoons: the impact of licensed characters on food choices and consumption. *J Public Policy Mark*. 2019;38:214–231.
29. Longacre MR, Drake KM, Titus LJ, et al. Child-targeted TV advertising and preschoolers' consumption of high-sugar breakfast cereals. *Appetite*. 2017;108:295–302.
30. Ogba I-E, Johnson R. How packaging affects the product preferences of children and the buyer behaviour of their parents in the food industry. *Young Consum*. 2010;11:77–89.
31. Page R, Montgomery K, Ponder A, Richard A. Targeting children in the cereal aisle: promotional techniques and content features on ready-to-eat cereal product packaging. *Am J Health Educ*. 2008;39:272–282.
32. Landis JR, Koch GG. The measurement of observer agreement for categorical data. *Biometrics*. 1997;33:159–174.
33. Lapierre MA, Brown AM, Houtzer HV, Thomas TJ. Child-directed and nutrition-focused marketing cues on food packaging: links to nutritional content. *Public Health Nutr*. 2017;20:765–773.
34. Kraak V, Story M. An accountability evaluation for the industry's responsible use of brand mascots and licensed media characters to market a healthy diet to A merican children. *Obes Rev*. 2015;16:433–453.
35. Castonguay J, Kunkel D, Wright P, Duff C. Healthy characters? An investigation of marketing practices in children's food advertising. *J Nutr Educ Behav*. 2013;45:571–577.
36. Harris JL, Schwartz MB, Brownell KD. Marketing foods to children and adolescents: licensed characters and other promotions on packaged foods in the supermarket. *Public Health Nutr*. 2010;13:409–417.
37. Kelly B, Hattersley L, King L, Flood V. Persuasive food marketing to children: use of cartoons and competitions in Australian commercial television advertisements. *Health Promot Int*. 2008;23:337–344.
38. Sharma LL, Teret SP, Brownell KD. The food industry and self-regulation: standards to promote success and to avoid public health failures. *Am J Public Health*. 2010;100:240–246.