

Research and Professional Briefs

Examining the Nutritional Quality of Breakfast Cereals Marketed to Children

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ABSTRACT

There are both public health and food industry initiatives aimed at increasing breakfast consumption among children, particularly the consumption of ready-to-eat cereals. The purpose of this study was to determine whether there were identifiable differences in nutritional quality between cereals that are primarily marketed to children and cereals that are not marketed to children. Of the 161 cereals identified between January and February 2006, 46% were classified as being marketed to children (eg, packaging contained a licensed character or contained an activity directed at children). Multivariate analyses of variance were used to compare children's cereals and nonchildren's cereals with respect to their nutritional content, focusing on nutrients required to be reported on the Nutrition Facts panel (including energy). Compared to nonchildren's cereals, children's cereals were denser in energy, sugar, and sodium, but were less dense in fiber and protein. The proportion of children's and nonchildren's cereals that did and did not meet national nutritional guidelines for foods served in schools were compared using χ^2 analysis. The majority of children's cereals (66%) failed to meet national nutrition standards, particularly with respect to sugar content. *t* tests were used to compare the nutritional quality of children's cereals with nutrient-content claims and health claims to those without such claims. Although the specific claims were generally justified by the nutritional content of the product, there were few differences with respect to the overall nutrition profile. Overall, there were important differ-

ences in nutritional quality between children's cereals and nonchildren's cereals. Dietary advice for children to increase consumption of ready-to-eat breakfast cereals should identify and recommend those cereals with the best nutrient profiles.

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Breakfast has been described as the most important meal of the day. There is considerable evidence that individuals who consume breakfast, including ready-to-eat (RTE) cereals, have better overall nutrition profiles, show improvements in cognitive functioning, and might be less likely to be overweight (1). Despite the reported benefits of breakfast consumption, there has been an increase during the past few decades in the number of children who go to school without having breakfast (2). Currently, 6.5% of 4- to 8-year-olds, 20.5% of 9- to 13-year-olds, and 36.1% of 14- to 18-year-olds do not consume breakfast regularly (3).

There have recently been both public health and food industry initiatives aimed at increasing breakfast consumption among children, particularly the consumption of RTE cereals. The School Nutrition Association encourages schools participating in the National School Breakfast Program to serve a breakfast of cereal and juice in the classroom (4). RTE cereals were also featured in the media campaign "Got Breakfast?" by the Alliance to End Hunger (5), and the food industry itself has invested heavily in promoting cereals for breakfast (6). According to a recent report, between one quarter and one half of children aged 4 to 18 years regularly consume cereal for breakfast (3). An unanswered question is whether the promotion of all cereals is equally justifiable given their nutritional profiles.

Another important issue concerns the nutrient content claims and health claims that appear on many cereal packages. Products that display nutrient content claims and health claims have the potential to create a halo effect such that consumers perceive the product as more healthful than warranted, or ignore other relevant nutrition information (7). Importantly, these halo effects can result in overconsumption of a product because they lead to inflated estimates of the appropriate serving size (8).

In light of the reported benefits of consuming RTE cereals, the massive efforts by the food industry to market foods directly to children (9), and the nutrient content and health claims that appear on many cereal packages, this study addressed two important questions: Are cereals marketed primarily to children nutritionally equivalent to cereals not marketed to children? and, Do the nutrient-content and health claims that appear on chil-

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dren's cereal packages correspond to the overall nutrition profile of those products? The answers to these questions have important implications for the currently indiscriminant efforts to promote children's consumption of RTE cereals.

METHODS

We examined the nutrition profiles of all RTE breakfast cereals available from four leading cereal manufacturers between January and February 2006. First, the boxes were obtained for all cereals available from local grocery stores. Next, the Web sites of the four companies were searched for products not found in stores. Cereals were classified as being marketed to children on the basis of one or more of the following criteria developed for this study: the package contained a licensed character, television, or movie theme (eg, Sponge Bob Squarepants or Ice Age 2; $n=30$); the package contained any other cartoon drawing (eg, Tony the Tiger or Toucan Sam; $n=19$); the package contained an activity or promotion that was directed at children (eg, inclusion of a toy in the package; $n=63$); and the product was listed as a children's cereal on the company's Web site ($n=11$). There were a total of 161 cereals, of which 73 (46%) were classified as being marketed to children, and 88 (54%) were classified as not being marketed to children.

Nutrition information was obtained directly from the cereal packages, from the company's Web site, or from online grocers. Children's cereals were compared to nonchildren's cereals on nutrients per recommended serving (as described on the Nutrition Facts panel for each cereal) as well as nutrients per gram of cereal. Analyses focused on energy and the nutrients that are required to be reported on Nutrition Facts labels (ie, energy from fat, total fat, saturated fat, cholesterol, sodium, carbohydrate, fiber, sugar, and protein).

Comparison with Selected Nutrition Standards

The nutritional values of children's and nonchildren's cereals were compared to specific nutrition standards. The 2005 Dietary Guidelines for Americans (10) recommends limits on discretionary energy (ie, energy from solid fat and added sugars) based on age, sex, and activity level. The nutritional values of children's and nonchildren's cereals were compared to the specific limits on added sugars within the allowance of discretionary energy outlined in the 2005 Dietary Guidelines for Americans (10). Next, the cereals were compared to the comprehensive guidelines for competitive foods outlined by the Alliance for a Healthier Generation (11), which were developed collaboratively by health professionals and members of the food industry. These guidelines suggest that competitive foods sold in schools should contain no more than 35% of energy from fat, no more than 10% of energy from saturated fat, no more than 35% of their weight from sugars, and no more than 230 mg sodium per serving.

Nutrient-Content and Health-Related Claims

For each children's cereal, the package was coded for nutrient-content claims, including claims that are regu-

lated by the Food and Drug Administration (eg, "low in fat") and those that are not regulated (eg, "made with whole grain"). A claim was defined as any text, symbol, or icon on the packaging that contained information about the nutrient content (12). Packages were also coded for health-related claims, including Food and Drug Administration-regulated health claims and endorsements by health organizations, like the American Heart Association.

Data Analysis

Data were analyzed using the Statistical Software Package for the Social Sciences (version 14.0, 2005, SPSS Inc, Chicago, IL). Multivariate analyses of variance were used to compare the nutrition content of children's and nonchildren's cereals. The proportion of children's and nonchildren's cereals that met national nutrition standards were examined using χ^2 analysis. Student *t* tests were used to compare children's cereals with nutrient-content and health claims to those without such claims. Values are presented as means \pm standard deviation. For all analyses, the significance level was set at $P < 0.05$.

RESULTS AND DISCUSSION

Serving Size

The mean volume of the recommended serving size of children's cereals (0.93 ± 0.17 c) was not significantly different than the mean volume of nonchildren's cereals (0.89 ± 0.23 c). However, the mean weight of the recommended serving of children's cereals (31.21 ± 6.22 g) was less than the mean weight of nonchildren's cereals (42.78 ± 12.60 g). To control for this difference in average weight per recommended serving, the nutrition profiles of the cereals were analyzed both per recommended serving and per gram of cereal.

Nutrient Content per Recommended Serving

Results revealed a significant difference between the overall nutrition profiles of children's cereals compared to nonchildren's cereals. Separate univariate analyses revealed that nonchildren's cereals were higher in energy, energy from fat, total fat, sodium, carbohydrates, fiber, and protein. There were no differences between the cereals in saturated fat, sugar, or cholesterol (no cereal reported any cholesterol) (see the first two columns of Table 1).

Nutrient Content per Gram of Cereal

As shown in the last two columns of Table 1, the pattern of results is quite different when the amount of each nutrient was examined per gram of cereal. Per gram, children's cereals were significantly higher in energy, sodium, carbohydrate, and sugar, and were significantly lower in fiber and protein. The cereals did not differ in energy from fat, total fat, saturated fat, or cholesterol. On average, children's cereals contained 8% more energy per gram, 15% more sodium per gram, and 52% more sugar per gram than did nonchildren's cereals.

Table 1. Mean \pm standard deviations (SDs) for nutrients required to be reported on Nutrition Facts labels of ready-to-eat (RTE) cereals marketed to children (children's cereals) and those not marketed to children (nonchildren's cereals) (N=161)^a

Nutrient	Nutrients per Serving of RTE Cereal		Nutrients per Gram of RTE Cereal	
	Children's	Nonchildren's	Children's	Nonchildren's
	\leftarrow <i>mean \pm SD</i> \rightarrow			
Energy (kcal)	121.51 \pm 18.18 ^w	157.50 \pm 52.44 ^x	3.92 \pm 0.22 ^y	3.65 \pm 0.44 ^z
Energy from fat (kcal)	12.05 \pm 7.90 ^w	17.73 \pm 13.41 ^x	0.40 \pm 0.27	0.40 \pm 0.27
Total fat (g)	1.29 \pm 0.91 ^w	1.91 \pm 1.54 ^x	0.04 \pm 0.03	0.04 \pm 0.03
Saturated fat (g)	0.18 \pm 0.35	0.36 \pm 0.75	0.01 \pm 0.01	0.01 \pm 0.02
Cholesterol (mg)	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00	0.00 \pm 0.00
Sodium (mg)	168.08 \pm 58.71 ^w	192.05 \pm 81.57 ^x	5.52 \pm 1.82 ^y	4.78 \pm 2.05 ^z
Carbohydrate (g)	26.30 \pm 5.03 ^w	33.99 \pm 9.94 ^x	0.84 \pm 0.05 ^y	0.80 \pm 0.05 ^z
Fiber (g)	1.29 \pm 1.22 ^w	4.01 \pm 3.12 ^x	0.04 \pm 0.03 ^y	0.10 \pm 0.09 ^z
Sugar (g)	10.99 \pm 4.04	9.93 \pm 5.30	0.36 \pm 0.13 ^y	0.23 \pm 0.10 ^z
Protein (g)	1.73 \pm 1.10 ^w	3.76 \pm 1.76 ^x	0.05 \pm 0.03 ^y	0.09 \pm 0.04 ^z

^aPairs of means with the superscripts w-x or y-z are significantly different at $P < 0.05$.

Do the Cereals Meet Selected Nutrition Guidelines?

Using the 2005 Dietary Guidelines for Americans (10), the mean proportion of daily limits on added sugars consumed by one serving of cereal were estimated for children's and nonchildren's cereals. For children's cereals, the proportion ranged from 11% of the daily limit for active boys aged 14 to 18 years to 92% of the daily limit for sedentary girls aged 9 to 13 years. For nonchildren's cereals, the numbers were slightly lower, ranging from 10% for active boys aged 14 to 18 years to 83% for sedentary girls aged 4 to 8 years. (The full table is available from the authors.) According to the 2005 Dietary Guidelines for Americans (10), "Small amounts of sugars added to nutrient-dense foods, such as breakfast cereal. . . may increase a person's intake of such foods by enhancing the palatability of these products, thus improving nutrient intake without contributing excessive calories." The finding that children's and nonchildren's cereals contained a substantial percentage of the recommended allowances of added sugar seems inconsistent with the characterization of added sugar in cereals as a small amount.

When evaluated against the nutrition standards for competitive foods sold in schools outlined by the Alliance for a Healthier Generation (11), only 34% of children's cereals could be considered in full compliance, compared to 56% of nonchildren's cereals. Children's cereals most often failed to meet these standards due to their high sugar content: 60% of children's cereals failed to meet the guideline for sugar (no more than 35% of weight), whereas only 5% of nonchildren's cereals failed to meet this guideline. Nonchildren's cereals most often failed to meet these standards due to their high sodium content: 34% of nonchildren's cereals did not meet the recommendation for sodium content (no more than 230 mg), whereas only 6% of children's cereals failed to meet this recommendation.

Nutrient-Content and Health-Related Claims

Many children's cereals contain nutrient-content claims and health claims on the packaging. As shown in Table 2,

Table 2. Mean \pm standard deviation (SD) amounts of specific nutrients per gram of children's ready-to-eat (RTE) cereals with and without nutrient-content claims^a

Nutrient	RTE cereal with claim	RTE cereal without claim
	\leftarrow <i>mean \pm SD</i> \rightarrow	
Whole-grain claim	n=34	n=32
Fiber ^b (g)	0.05 \pm 0.03 ^y	0.03 \pm 0.02 ^z
Energy (kcal)	3.91 \pm 0.26	3.91 \pm 0.19
Fat (g)	0.05 \pm 0.03 ^y	0.03 \pm 0.03 ^z
Sugar (g)	0.32 \pm 0.13 ^y	0.39 \pm 0.12 ^z
Sodium (mg)	5.66 \pm 1.85	5.33 \pm 1.85
Sugar claim	n=15	n=51
Energy (kcal)	3.82 \pm 0.26	3.94 \pm 0.22
Fat (g)	0.04 \pm 0.04	0.04 \pm 0.03
Sugar ^b (g)	0.19 \pm 0.12 ^y	0.40 \pm 0.09 ^z
Sodium (mg)	5.69 \pm 2.43	5.44 \pm 1.66
Low-fat claim	n=32	n=34
Energy (kcal)	3.89 \pm 0.15	3.93 \pm 0.28
Fat ^b (g)	0.03 \pm 0.02 ^y	0.05 \pm 0.04 ^z
Sugar (g)	0.37 \pm 0.13	0.34 \pm 0.13
Sodium (mg)	5.26 \pm 1.73	5.72 \pm 1.94
Energy claim	n=31	n=35
Energy ^b (kcal)	3.99 \pm 0.18 ^y	3.84 \pm 0.25 ^z
Fat (g)	0.05 \pm 0.03 ^y	0.03 \pm 0.03 ^z
Sugar (g)	0.36 \pm 0.13	0.35 \pm 0.13
Sodium (mg)	5.88 \pm 1.34	5.17 \pm 2.16

^aPairs of means with the superscripts y-z are significantly different at $P < 0.05$.

^bNutrient is directly related to the specific nutrient-content claim.

children's cereals with claims about whole grains had higher fiber content (one of the benefits of whole grains) than those cereals without a whole-grain claim. These cereals also had lower sugar content, but higher fat content compared to cereals without a whole-grain claim. Cereals that made a low-sugar claim had less sugar than those without a sugar claim, but they did not differ in their energy, fat, or sodium content. Similarly, cereals

with low-fat claims did have lower fat content than those without low-fat claims, but did not differ in their energy, sugar, or sodium content. Surprisingly, cereals with an energy claim actually had higher energy content than those without an energy claim. They were also higher in fat content, but did not differ in sugar or sodium. Finally, cereals that made health claims or had a health endorsement had significantly lower mean sugar content (claim=0.32 g sugar/gram cereal vs no-claim=0.39 g sugar/gram cereal), but did not differ significantly in terms of fat, sodium, fiber, protein, or energy compared to those cereals without a health claim.

Although the specific claims were generally justified by the nutritional content of the product (with the notable exception of energy claims), cereals with such claims do not have better overall nutrition profiles. These findings are particularly important in light of recent evidence that nutrition- and health-related claims can lead consumers to perceive foods as more healthful than they are and to ignore other relevant nutrition information (eg, the fact that low fat does not mean low energy) (7). In a few cases, cereals with low-sugar claims did provide a disclaimer indicating that the cereal is not a reduced-energy product, but this disclaimer was often printed in much smaller font than the low-sugar claim.

LIMITATIONS

This study was limited to the nutrition information provided on cereal boxes, and does not include data on the amount of cereal that individuals actually consume. Because the outcomes of the comparisons of children's cereals to nonchildren's cereals depend on whether the nutrients are examined by serving volume or by weight of cereal, it will be important for future research to determine how much individuals consume of different types of cereal. This study also did not include data on consumers' perceptions of the nutrition profiles of children's cereals and their nutrient-content claims and health claims. These perceptions could have important implications for the types of cereals that individuals purchase, how much cereal they eat, and how much they feed to their children.

CONCLUSIONS

Past research supports the notion that consumption of breakfast cereals leads to improved overall nutrition, lower risk of overweight, and increased cognitive functioning, particularly among children (1). Based on this previous research, there have been recommendations to encourage consumption of RTE breakfast cereals. We found important differences between children's cereals and nonchildren's cereals with respect to their nutritional

quality; specifically, children's cereals are more dense in energy, sugar, and sodium, but less dense in other important nutrients. Future research examining the benefits of cereal consumption should differentiate between cereals that are higher in nutrient density (ie, nonchildren's cereals) and those that are lower in nutrient density (ie, children's cereals). Researchers have found that the cognitive benefits of breakfast consumption were stronger for instant oatmeal than for RTE breakfast cereals (13). Thus, the reported benefits of RTE cereals might be more pronounced among the more nutrient dense nonchildren's cereals. When making recommendations to increase consumption of RTE cereals, researchers and food and nutrition professionals should focus on those cereals for which there are empirically supported benefits.

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