



# How Does the Healthfulness of the US Food Supply Compare to International Guidelines for Marketing to Children and Adolescents?

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## Abstract

**Objectives** Food marketing to children is pervasive and linked to increased preference and intake of unhealthy foods. The World Health Organization (WHO) developed the only multi-country nutrient criteria, and Chile recently released the world's most comprehensive regulation to identify foods that should not be marketed to children. Our objective was to examine the proportion of US packaged food and beverage products eligible for marketing to children under the WHO Europe Nutrient Profile Model (NPM) and the 2019 Chilean regulation. **Methods** Data for this study are from Label Insight's 2017 Open Access branded food database. Each product was assigned to one of 13 food categories, and nutritional content compared to both the NPM and Chilean criteria. The proportion of US products meeting criteria for marketing to children using both schemes was examined overall and by category. Agreement between the two criteria was examined using Cohen's Kappa. **Results** Of 17,740 US products, 21% were eligible to be marketed to children using the WHO criteria and 26% using the Chilean criteria. 'Egg and egg products' and 'Seafood' had the highest proportion of products eligible for marketing to children under both schemes. 'Confectionery' and 'Snack foods' had the lowest proportion eligible. **Conclusions for practice** The WHO NPM and Chilean criteria both restrict less healthy items from being marketed to children. Regulatory agencies in the US developing policies should consider the implementation of nutrient criteria to restrict the marketing of less healthy foods and beverages to children and adolescents.

**Keywords** Food marketing · Processed foods · Public health nutrition · Nutrient profiling

## Significance

This is the first study to demonstrate the proportion of US packaged food products that would be eligible for marketing to children under the multi-country World Health Organization Nutrient Profile Model and the recently implemented Chilean regulations. We found that approximately a quarter of packaged food products would be eligible for marketing to children and adolescents under each scheme, and we also found that 90% of products contained at least one added sugar, saturated fat or sodium ingredient. With more than 2/3 of calories in the American diet deriving from packaged foods, this finding is of huge public health importance, and demonstrates the importance in implementing a standardized scheme to determine which food and beverage products can be marketed to children and adolescents.

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## Introduction

American consumers are exposed to an extensive variety of packaged food and drink products, with the latest figures showing that more than two-thirds of daily calories comes from processed packaged food products (Ng et al. 2014). The wide availability and heavy marketing of many of these products, especially those with a high content of fat, added sugar or sodium, makes it challenging for the American population to eat healthily and maintain a healthy body weight, particularly for children (World Health Organization [WHO] 2010). Food marketing to children is pervasive and has been linked to increased preference and intake of unhealthy foods (Cairns et al. 2013; and; Hastings et al. 2003). The World Health Organization (WHO) has responded to this issue by recommending that greater efforts be made to reduce children's exposure to advertising for foods (WHO 2010).

In the US, a number of initiatives have emerged over the past decade to try to address this issue. For example, in 2006, 17 top food and beverage companies signed up for the Better Business Bureau's voluntary Child Food and Beverage Advertising Initiative (CFBAI), which promised that child-directed advertisements would include only healthier foods (based on company-specific nutrient criteria) (Better Business Bureau 2017). However, this scheme has to date shown poor success, and with only 18 companies involved to date, is unlikely to be representative of all food products in the US market where it is estimated to be between 200,000 and 400,000 food and beverage items available for purchase (Federal Trade Commission 2012). In 2011, the Interagency Working Group on Foods Marketed to Children (IWG), a working group made up of four federal agencies, proposed nutrition criteria for identifying foods acceptable to advertise to children (Interagency Working Group of Food Marketed to Children 2011) suggesting that a national set of recommendations on marketing to children would be released. However, these guidelines were never finalized and it is unknown whether they will ever be adapted or published for use in the US.

The WHO Europe Region's Nutrient Profile Model is the only multi-country nutrient criteria developed specifically in relation to marketing to children in the developed world (WHO 2015). This model is designed for use by governments for the purposes of restricting food marketing to children. Meanwhile, beginning in July 2016, Chile has implemented the most comprehensive set of obesity-preventive regulations to date in the world, including strict regulations for the marketing of foods to children < 14 years of age (World Cancer Research Fund International [WCRFI] 2017). This law was the first of its kind to include both limits on channel of advertisement (those

with a high proportion of child viewers) as well as content of advertisement (strategies appealing to children, such as cartoons, licensed characters, spokespeople, games, movie tie-ins, and also brand characters) across multiple venues (internet, on packages, in stores) and not just television, and connect what is banned from marketing to a series of front-of-package warning labels so that it is transparent to consumers what is healthy and what is not. Both the WHO and Chilean criteria are used to inform government policy surrounding marketing to children. However, as the two schemes use different criteria to determine a product's eligibility to be marketed to children, it may be useful to examine how different sets of criteria would affect the proportion of products in the US that would be eligible for marketing to children.

There are a wealth of studies that have examined the levels of advertising to children and adolescents in the US (Chambers et al. 2015; Galbraith-Emmai and; Lobstein 2013; Ronit and Jensen 2014). However, there is currently no research examining what proportion of the US packaged food supply would be eligible for marketing to children. As such, our objective was to examine the proportion of US food and beverage products that would be eligible for marketing to children under the multi-country WHO Euro Nutrient Profile Model (NPM), and separately under the comprehensive, simpler Chilean regulations. This study did not include data on what products are currently being advertised to children, and focuses solely on the healthfulness of US products and whether they meet international standards for marketing to children and adolescents. Understanding the scope of US products subject to marketing regulations is critical to informing policy in terms of both potential public health impact as well as understanding and predicting potential food industry response, including reformulation.

## Methods

### Data Collection

Data for this study are from the largest publicly available branded food composition database in the US. Label Insight, who provide data solutions that allow transparency between CPG brands, retailers and consumers, launched the Open Data initiative in 2017 (Label Insight 2017). The initiative provides researchers with open access to granular food composition data not previously available to the research community. Researchers are granted the freedom to publish their findings based on Label Insight's data without restriction. The database is updated daily, and contains information on more than 200,000 barcoded food and beverage items (representing > 85% of all products

sold in the US food supply over the past 3 years). We used Label Insight data extracted in January 2017.

Nutrient data were extracted for 295,606 barcoded food and beverage items from the Label Insight portal. The following fields of information were extracted: Universal Product Code (UPC), brand name, product description, serving size (g/mL), energy content (calories), total fat (g/serve), saturated fat (g/serve), total sugar (g/serve), sodium (mg/serve) and ingredients list. After removal of products with duplicate UPCs ( $n = 285$ ), bulk items not designed for individual consumer purchase ( $n = 835$ ), products with implausible nutrient values (defined as  $> 100$  g of total fat, saturated fat or sugars per 100 g) ( $n = 298$ ), products that do not display a nutrition facts panel (such as tea, coffee etc) ( $n = 82,248$ ) as these are not included in the WHO category definitions, and products that were considered to be variety packs with multiple NFPs or single ingredient items that cannot be reformulated (such as sugar) ( $n = 30,899$ ), there were 181,041 products remaining. We then used Nielsen Homescan data to identify food and beverage items purchased by US households with children  $< 16$  years. These items were matched to the Label Insight database using the UPC (product barcode). 17,740 items were matched between the two databases.

### Food Categorization

Each food and beverage item was assigned to 1 of 13 major food categories and 42 subcategories based on the *Food Monitoring Group's* categorization system (Supplementary Table 1) (Dunford et al. 2012). This is a global system used to examine the healthfulness of national food supplies. Each individual product was also assigned to one of the 21 WHO Euro NPM categories for the purposes of assigning the nutrient criteria.

### Assignment of WHO NPM Criteria

After each product had been assigned to a WHO NPM category, the nutritional content of the food product was compared to the relevant thresholds and criteria, shown in Supplementary Table 2. A product was deemed ineligible if it exceeded one or more of the nutrient criteria. The criteria are category-specific and include criteria for energy, added sugars, added non-sugar sweeteners, total sugars, total fat, saturated fat and sodium. As added sugars and non-sugar sweeteners are not yet declared in the Nutrition Facts Panel for US products, each item's ingredient list was checked for the presence of added sugar and non-sugar sweetener ingredients as per the WHO NPM criteria.

### Assignment of Chilean Marketing Criteria

While the Chilean regulation was first implemented in July 2016, the nutrient thresholds were set to becoming increasingly stringent over a series of three implementation dates, beginning in 2016 and ending in 2019, to allow for reformulation. For the current study, the 2019 thresholds were used since these represent what will eventually be the final thresholds for foods and beverages. In order to be deemed ineligible for marketing to children, a product must contain added sugar, added sodium, or added saturated fat and exceed nutrient thresholds for calories, sugar, sodium, or saturated fat (WCRFI 2017). Thus, nutritional content of each food product was compared to the relevant thresholds from the 2019 Chilean regulation for energy, saturated fat, total sugars and sodium per 100 g, shown in Supplementary Table 3. Each product's ingredient list was searched (using a keyword search) for the presence of these added sugar, sodium, or saturated fat ingredients. Products that either exceeded the nutrient thresholds and also contained one or more added sugar, sodium or saturated fat ingredients were deemed ineligible for marketing to children. SAS version 9.4 was used to undertake this part of the analysis.

### Statistical Analysis

The number and proportion of US products meeting both WHO Euro NPM and Chilean criteria for marketing to children were examined overall and by food category. Agreement between the WHO NPM and the Chilean criteria was examined using Cohen's Kappa. Differences in energy, saturated fat, total sugars and sodium content per 100 g between eligible and ineligible products under both the WHO and Chilean criteria were also examined, using Students t-test, with a p value of  $< 0.05$  considered to be significant. In addition, the proportion of products containing added sugars and non-sugar sweeteners using the WHO definition was examined, as well as the proportion of products containing added sugar, added saturated fat and added sodium ingredients under the Chilean definition. All analyses were undertaken using Stata version 14.1.

## Results

### Products Meeting WHO Criteria

Using the WHO criteria, 'Seafood and seafood products' had the highest proportion of products eligible for marketing to children (91%) followed by 'Egg and egg products' (71%). 'Confectionery', 'Snack foods' and 'Edible oils' all had the lowest proportion eligible for marketing to children (0%, 2% and 5% respectively) (Table 1). Within

**Table 1** Proportion of products eligible to be marketed to children using the WHO NPM and Chilean definitions

Food category		WHO NPM criteria		Chilean criteria	
		Ineligible (%)	Eligible (%)	Ineligible (%)	Eligible (%)
Beverages	1092	90	10	54	46
Juices	465	100	0	44	56
Coffee and tea	191	92	8	66	34
Electrolyte drinks	9	89	11	78	22
Powdered drinks	157	95	5	87	13
Soft drinks	57	100	0	89	11
Waters	117	39	61	16	84
Other beverages	96	88	13	48	52
Bread and bakery products	2701	89	11	94	6
Biscuits and crackers	1231	100	0	98	2
Bread	666	60	40	85	15
Cakes, muffins and pastry	804	98	2	96	4
Cereal and cereal products	1138	82	18	83	17
Breakfast cereal	459	82	18	86	14
Cereal and nut-based bars	373	100	0	96	4
Noodles	109	44	56	48	52
Pasta	110	91	9	88	12
Rice	40	53	48	60	40
Other breakfast products	38	45	55	71	29
Other cereal products	9	0	100	0	100
Confectionery	1318	100	0	98	2
Chewing gum	13	100	0	100	0
Chocolate and sweets	1305	100	0	98	2
Convenience foods	1475	55	45	51	49
Meal kits	15	93	7	93	7
Pizza	178	90	10	88	12
Pre-prepared salads and sandwiches	198	73	27	61	39
Ready meals	783	49	51	45	55
Soup	293	37	63	37	63
Other convenience foods	8	100	0	88	13
Dairy	2665	83	17	71	29
Cheese	822	90	10	84	16
Cream	106	98	2	94	6
Desserts	34	100	0	91	9
Ice cream and edible ices	716	100	0	93	7
Milk products	392	64	36	34	66
Yoghurt products	595	61	39	47	53
Edible oils	37	95	5	97	3
Eggs and egg products	7	29	71	29	71
Fruit, vegetables, nuts and legumes	2297	62	38	47	53
Fruit	537	77	23	41	59
Jam and fruit spreads	78	100	0	99	1
Nuts and seeds	784	76	24	76	24
Vegetables	898	38	62	22	78
Meat and meat products	1056	58	42	79	21
Meat alternatives	54	19	81	59	41
Processed meat	1002	60	40	80	20
Sauces, dressings and spreads	2058	86	14	74	26
Mayonnaise and salad dressings	322	93	7	89	11

**Table 1** (continued)

Food category	WHO NPM criteria		Chilean criteria		
	Ineligible (%)	Eligible (%)	Ineligible (%)	Eligible (%)	
Sauces	927	84	16	70	30
Spreads	809	85	15	72	28
Seafood and seafood products	422	9	91	33	67
Canned seafood	82	7	93	43	57
Chilled and frozen seafood	340	10	90	31	69
Snackfoods	1474	98	2	97	3
Total	17,740	79	21	74	26

subcategories there was a wide range of eligibility. For example, within the ‘Beverages’ category, 61% of *waters* were eligible for marketing to children, but 0% of *Soft drinks* and *Juices*. Similarly, in the ‘Convenience food’ category, 63% of *Soups* were eligible, but only 10% of *Pizza* products. The levels of energy, saturated fat, total sugar and sodium per 100 g were significantly different between eligible and ineligible products in the majority of food categories. Exceptions included the levels of saturated fat in beverage products (Supplementary Table 5), the sugar content of *Pre-prepared salad and sandwiches* and snack foods (Supplementary Table 6), and the sodium content of ‘Beverages’, ‘Edible oils’ and *Yoghurt* products (Supplementary Table 7).

### Products Meeting Chilean Criteria

Using the Chilean criteria, the same two categories had the highest proportion of products eligible for marketing to children that were identified using the WHO criteria, however the proportions eligible within these categories were overall lower (‘Egg and egg products’ with 71% and ‘Seafood and seafood products’ with 67%) (Table 1). Categories that had the lowest proportion of products eligible were ‘Edible oils’ (3%), ‘Confectionery’ (2%), ‘Snack foods’ (3%) and ‘Bread and bakery’ (6%) and which all had < 10% of products eligible. The ‘Beverages’ category had the largest variation in the proportion of its sub-categories meeting the criteria, with 84% of *waters* eligible, and less than 20% of *powdered drinks* and *soft drinks* eligible (Table 1). The levels of energy, saturated fat, total sugar and sodium per 100 g were significantly different between eligible and ineligible products in the majority of food categories under the Chilean criteria. Exceptions included the levels of energy in *electrolyte drinks* (Supplementary Table 4), the saturated fat content of many beverage subcategories and dairy subcategories (Supplementary Table 5), the sugar content of *cheese* (Supplementary Table 6), and the sodium content of some beverage and dairy subcategories (Supplementary Table 7).

**Table 2** Agreement between the WHO and Chilean criteria for marketing to children

	Ineligible (Chile)	Eligible (Chile)	Total
Ineligible (WHO)	12,326	1669	13,995
Eligible (WHO)	750	2995	3745
Total	13,076	4664	17,740

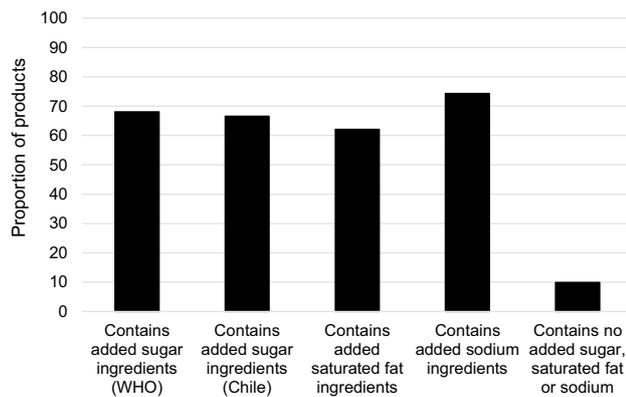
86.36% agreement (Cohen’s Kappa = 0.6244)—good agreement

### Agreement Between the WHO and Chilean Criteria

Overall, 21% of US food and beverage products were eligible to be marketed to children using the WHO NPM criteria, and 26% using the Chilean criteria (Table 1). Overall, there was good agreement (Kappa statistic = 0.6244; 86% agreement) between the two sets of criteria (Table 2). Despite good overall agreement, results differed between the two schemes when examining results by food category. For example, only 10% of beverages were eligible for marketing under the WHO NPM, whereas 46% of beverages were eligible under the Chilean scheme (Table 1). The main driver of this difference was that juices are not permitted to be marketed under the WHO NPM whereas the Chilean criteria allows products that meet the nutrient and ingredient criteria. The WHO NPM also allowed for a higher proportion of ‘Meat and meat alternatives’ (42%) and ‘Seafood and seafood products’ (91%) to be marketed to children compared to the Chilean scheme (21% and 67% respectively), due to the fact that the WHO uses solely nutrient criteria whereas the Chilean scheme restricts by both nutrients and ingredients.

### Presence of Added Sugar, Sodium and Saturated Fat Ingredients

Less than 10% of all products contained no added sugar, added saturated fat or added sodium ingredients (Fig. 1). Overall, 68% and 67% of products contained added sugars as defined using the WHO definition and Chilean definition respectively (Table 3). Almost 100% of ‘Confectionery’ products contained added sugar using both the WHO



**Fig. 1** Proportion of US products containing added sugar, saturated fat and sodium ingredients

and Chilean definitions, with > 85% of ‘Bread and bakery’ products and 78% of ‘Convenience foods’ (Table 3). Interestingly, 74% of ‘Meat and meat products’ contained added sugar, as did approximately 25% of ‘Seafood and seafood products’. The only sub-categories to have less than 20% of products containing added sugar according to both the WHO and Chilean criteria were plain cereal products, ‘Edible oils’, *Cheese and Canned seafood*.

More than 60% of the products captured in the study contained ingredients with added saturated fat, and 74% with added sodium (Table 3). Categories with more than 90% of products containing added saturated fat included ‘Bread and bakery’, ‘Edible oils’ and ‘Snack foods’. ‘Beverages’ had the lowest proportion of products (17%) with added saturated fat ingredients. Categories with more than 90% of products containing added sodium included ‘Bread and bakery’, ‘Convenience foods’ and ‘Snack foods’, with ‘Beverages’ having the lowest proportion of products with added sodium (29%).

## Discussion

This is the first study to examine what proportion of products in the US food supply would be eligible for marketing to children under the WHO NPM and Chilean schemes. We found that the vast majority of US packaged food and beverage products were ineligible to be marketed to children under both schemes, with 21% eligible using the WHO criteria and 26% using the Chilean criteria. This highlights that products being purchased by US households with children are of low nutritional quality by international standards.

Majority of research to date has focused on the marketing of “less healthy” food categories such as snack foods and confectionery to children and adolescents. Not surprisingly, we found that food categories generally viewed as “less healthy”, such as confectionery and snack foods, had

the lowest proportion of products eligible for marketing to children under both schemes. However, we also found that a large number of products in food categories consumers generally view as “healthy” such as ‘fruits, vegetables, nuts and legumes’ and ‘dairy products’ were also ineligible under both the WHO NPM and Chilean schemes. For example, yoghurt products with added sugar or sweeteners were deemed ineligible under both schemes. Of even greater concern was our finding that only 10% of all packaged food and beverage products examined had no added sugar, saturated fat or sodium ingredients. Added sugar ingredients were found not only in expected food categories such as ‘confectionery’, but also in food categories such as bread products, frozen meals, soups, sauces and spreads.

The most recent Federal Trade Commission reported that out of 44 major food and beverage companies, \$1.79 billion was spent to market their products to children and teens in 2009 (Federal Trade Commission 2012), with carbonated beverages, confectionery and snack foods representing the three top food categories with food advertising directed at teenagers. Interestingly, the Federal Trade Commission report included only 625 food and beverage products and relied solely on information provided directly from the 44 manufacturers. Similarly, the 18 major food and beverage companies signed up to the Better Business Bureau’s CFBAI have pledged that they will only market healthier foods to children and adolescents. Despite this high-level commitment, research into the scheme has demonstrated that the pledge is often not upheld, with one study reporting that 88% of CFBAI-member company advertisements seen on TV by children in 2009 promoted products high in saturated fat, sugar, or sodium (Powell et al. 2013). This study also noted that food industry pledges did not protect children aged > 11 years, and children aged 12–14 years saw more food advertisements than younger children. The most recent study looking at CFBAI companies also found that despite CFBAI pledges, companies continue to advertise confectionery products during programming with large youth audiences utilizing techniques that appeal to children (Harris et al. 2015). These findings lend support to exploring the implementation of established global schemes restricting the marketing of foods to children, such as the WHO NPM, or stricter national schemes such as Chile’s nutrient and ingredient criteria. Both the WHO NPM and Chilean criteria restrict less healthy non-discretionary items from being advertised and restrict the proportion of US packaged food products that would be able to be marketed to children.

Despite having good agreement overall between the WHO NPM and Chilean regulation in terms of the total proportion of products eligible for marketing to children (86% agreement), we did observe differences at the food category level. This was expected to a certain degree as the two schemes differ on how they define eligibility; the WHO

**Table 3** Proportion of products containing added sugars, saturated fat and sodium ingredients

Food category	n	Contains added sugar—WHO (%)	Contains added sugar—Chile (%)	Contains added saturated fat (%)	Contains added sodium (%)
Beverages	1092	64	63	17	29
Juices	465	46	46	8	24
Coffee and tea	191	85	84	24	24
Electrolyte drinks	9	78	78	11	100
Powdered drinks	157	92	92	53	61
Soft drinks	57	93	93	5	51
Waters	117	35	33	3	6
Other beverages	96	77	71	13	26
Bread and bakery products	2701	92	88	91	95
Biscuits and crackers	1231	92	88	95	93
Bread	666	86	76	79	98
Cakes, muffins and pastry	804	98	98	97	96
Cereal and cereal products	1138	82	81	71	80
Breakfast cereal	459	84	83	57	73
Cereal and nut-based bars	373	94	93	94	85
Noodles	109	54	53	48	70
Pasta	110	70	73	76	98
Rice	40	55	55	63	83
Other breakfast products	38	89	79	100	100
Other cereal products	9	0	0	0	78
Confectionery	1318	96	96	79	47
Chewing gum	13	100	100	46	0
Chocolate and sweets	1305	96	96	79	47
Convenience foods	1475	78	78	83	96
Meal kits	15	87	73	40	100
Pizza	178	94	93	99	99
Pre-prepared salads and sandwiches	198	88	86	89	93
Ready meals	783	73	73	87	96
Soup	293	74	73	58	96
Other convenience foods	8	88	88	100	100
Dairy	2665	59	58	54	58
Cheese	822	14	14	27	97
Cream	106	52	53	97	58
Desserts	34	94	94	82	82
Ice cream and edible ices	716	97	96	86	55
Milk products	392	43	42	45	39
Yoghurt products	595	86	82	49	21
Edible oils	37	16	16	97	65
Eggs and egg products	7	29	29	57	71
Fruit, vegetables, nuts and legumes	2297	39	39	35	56
Fruit	537	39	39	21	17
Jam and fruit spreads	78	97	97	8	27
Nuts and seeds	784	46	46	61	69
Vegetables	898	27	28	22	70
Meat and meat products	1056	74	73	33	90
Meat alternatives	54	67	56	69	80
Processed meat	1002	74	74	31	91
Sauces, dressings and spreads	2058	60	58	58	88

**Table 3** (continued)

Food category	n	Contains added sugar—WHO (%)	Contains added sugar—Chile (%)	Contains added saturated fat (%)	Contains added sodium (%)
Mayonnaise and salad dressings	322	72	71	84	90
Sauces	927	67	64	56	87
Spreads	809	48	46	50	89
Seafood and seafood products	422	25	24	28	75
Canned seafood	82	23	22	38	88
Chilled and frozen seafood	340	26	25	26	71
Snackfoods	1474	64	61	93	94
Total	17,740	68	67	62	74

NPM rendering entire categories ineligible and for others using nutrient-based criteria, and the Chilean regulation not excluding entire categories and instead using both nutrient and ingredient criteria to determine eligibility. The largest differences observed between the two schemes were for beverages, with the Chilean scheme resulting in a higher proportion of products eligible for marketing to children (46% vs. 10%) and the WHO NPM having a higher proportion of meat products (42% vs. 21%) and seafood products (91% vs. 67%) eligible. Previous studies have shown that even within a country, various nutrient profiling schemes can have good overall agreement, yet show differences when looking at specific food categories. It is likely that there is no “one size fits all” and that using results from studies such as the present study will help inform future policies in the US restricting marketing of products to children.

The analysis for this research used nutritional values reported on product labels and so may not accurately represent what is in the foods. However prior studies suggest that nutrition label data are generally accurate and within the FDA limits (Jumpertz et al. 2013). We also excluded all products that did not display nutrition information. This would likely have led us to underestimate the proportion of products that would be eligible for marketing to children under the Chilean scheme, as this scheme allows for the marketing of all foods that do not legally require a nutrition label (such as ground coffee and tea). This research did not examine results by individual companies, which will be in an important next step in future research in this area but was beyond the scope of the present analysis as this information was not provided in the Open Data database in a format acceptable for analysis. Similarly, we were not able to include information about product sales due to the high costs and publishing limitations with these kinds of data, and so could not examine the actual impact on intake that implementation of either the WHO or Chilean scheme would have for children and adolescents. However it is unlikely that including sales information would have led to higher proportion of products sold being eligible for marketing as evidence has shown that less healthy foods are what are generally advertised the

most (Kraak et al. 2011; Ustjanauskas et al. 2014). By using data for products that were purchased by US households with children < 16 years we feel we have addressed this limitation as best we can. It will be important in future research to extend the methods presented in this paper to include an examination of which foods are being marketed to children, and in which format they are being marketed. The form of the marketing will be an important component to consider when developing guidelines specifically for the US (Harris et al. 2013), with recent research indicating that television advertising is becoming less common, and is being replaced by online forms of marketing and sponsorship-related promotions (Powell et al. 2013). One of the key strengths of the Chilean regulation in this regard is its strict definition of what is considered marketing to children, as well as the fact that the regulation has been set up in stages, giving food companies time to reformulate their products and for consumer palates to get used to lower levels of sugar and sodium. It is likely that any scheme implemented in the US could be based on the rules underpinning the Chilean regulation.

With more than two-thirds of the diet of the average American coming from packaged food and beverages (Ng et al. 2014), and with recent both Institute of Medicine (Institute of Medicine 2006) and the Federal Trade Commission (Federal Trade Commission 2012) reports stating the importance of the industry establishing stronger nutrition standards for foods and beverages marketed to children, the implementation of a scheme such as the WHO NPM or the Chilean criteria outlined in this paper is of critical importance to ensure that US children are not exposed to advertisements for products that are high in calories, added sugar, saturated fat and sodium.

## Conclusions

The WHO NPM and Chilean criteria both restrict less healthy non-discretionary items from being advertised and restrict the proportion of US packaged food products

that would be able to be marketed to children. We found that between 21 and 26% of US foods would be eligible for marketing to children under either the WHO or Chilean approach. Federal, state, and local governments and regulatory agencies developing statutory policies should consider the implementation of nutrient criteria to restrict the marketing of less healthy foods and beverages to children and adolescents, and should consider both the WHO and Chilean approaches when developing policy for marketing of foods and beverages to children. Such policies may encourage industry to reformulate their products to be eligible for marketing, and in doing so improve the nutritional profile of products that currently provide two-thirds of the calories in the US diet.

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