Title: Could Google help curb online advertising of unhealthy foods to US children?

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Abstract

Introduction: In 2020, Google took voluntary action to restrict food and beverage advertising through its online channels in the EU/UK using Google's own nutrient profiling model (NPM) to identify products eligible to be marketed to children through its Google Display Network. The objective of this study was to evaluate the potential impact of the Google policy, if applied to the US market, on restricting online advertising of the top selling packaged foods and beverages in the US.

Methods: The top 25 US food and beverage manufacturers were identified. Nutrient data for products from these manufacturers were sourced from Label Insight (a Nielsen IQ company) in 2021. Each product was examined against four NPMs – the Google NPM, the WHO Europe NPM, the PAHO NPM and the Chilean Government NPM.

Results: Under Google's NPM, 18% of 14,188 products were eligible to be advertised to children, representing US$44 billion in revenue for the top 25 US manufacturers out of the >$240 billion generated annually. The Google NPM permitted the most products to be advertised to children of all four NPMs examined.

Conclusions: US children engage extensively with online media. In lieu of government regulation, the Google advertising policy and related NPM would limit online advertising of the most unhealthful products to children, if the policy were to be applied to the US market. The effectiveness of the policy would be strengthened by refining the Google NPM to better align with NPMs developed by authoritative health agencies, including the WHO.

Introduction

More than two-thirds of American consumers' daily calories are derived from packaged food and beverages.[1] The wide availability and heavy marketing of these products makes it challenging for the US population to eat healthily and maintain a healthy body weight, particularly for children.[2] Food marketing to children is pervasive[3] and has been linked to increased preference and intake of unhealthy foods.[4] Young people's exposure to digital marketing, in particular, is prevalent[5,6] and is associated with poor diet-related outcomes.[7]

In recent years, there has been a substantial shift in children's media practices, from predominantly television-based to online such as social media, content-sharing platforms (e.g., YouTube), subscription video on demand services (e.g., Netflix and Hulu) and online games (e.g., Fortnite).[8,9] Globally, one-third of internet users are children <18 years.[8,9] Where children have gone, marketers have followed: expenditure on digital marketing to children <18 years in the US reached USD 1.7 billion by 2021 and is estimated to increase by up to 22% in the next decade.[8,9] Studies have shown that foods and beverages are advertised online more frequently than any other product category.[10]

Google has been the market leader in online advertising for over a decade.[11] Despite being commonly known as a search engine company, Google's main business is in online advertising.[11] The Google Display Network enables targeted advertising to consumers while they browse at least 35 million websites, watch YouTube videos, check their Gmail account, or use mobile apps.[12] In 2020, Alphabet (parent company for Google) generated almost $183 billion in revenue; more than 80% of which came from Google's ads business.[11]

In October 2020, Google updated their 'Other restricted businesses [advertising] policy,' to restrict high fat, sugar, salt (HFSS) food and non-alcoholic beverage advertising across the Google Display Network to users under 18 in the United Kingdom (UK) and European Union (EU) .[13] The policy was likely a response to anticipated regulation from the UK Government, which has since legislated to restrict 'paid for' HFSS online advertising to children.[14] Google's policy includes its own HFSS Food and Beverage Nutrient Profile Model (hereafter Google NPM), which provides nutritional criteria that a food or beverage must meet to be advertised to children through the Google Display Network.

In the absence of government-led policy in the US, the Children's Food and Beverage Advertising Initiative (CFBAI)[15] is a self-regulatory code of practice launched in 2007 under which 20 food and beverage companies have voluntarily pledged to limit direct advertising to children to only foods and beverages that meet specific criteria, including in digital media. The limitations of the CFBAI in effectively protecting children from exposure to unhealthy food advertising are well known,[16-18] including the lenience of the nutritional criteria used to determine which products are eligible to be marketed to children.

The objective of this study was to evaluate the potential impact of the Google policy, if applied to the US market, on restricting online advertising to children of the top selling packaged foods and beverages through the Google Display Network. The eligibility of products to be advertised based on their nutritional quality according to the Google NPM was compared to their eligibility using three other validated NPMs (from the World Health Organization (WHO) Europe, Pan American Health Organization (PAHO) and the Chilean Government). As a secondary objective, this study compared eligibility to advertise under the CFBAI (as identified on the CFBAI website), against eligibility using the Google NPM.

Methods

Study Sample

Sales revenue data for the top 25 US food and beverage manufacturers for 2020 were sourced from Euromonitor Passport. Nutrient data for all products from these 25 manufacturers were then sourced from Label Insight (a NielsenIQ company) in May 2021. The database contains information for >400,000 barcoded food and beverages, representing >80% of the US market.[19] The most recent entry for each product was used to ensure data represented current products. Information on brand name, product description, nutrient content per 100g (energy, saturated fat, total sugars, added sugars and sodium), ingredients list and product category were extracted.

A comprehensive list of brands owned by the 25 manufacturers was developed using global and US-based company websites. As sales data for 2020 were used for this analysis, any new brands or brand acquisitions since 2020 were excluded. Each product was assigned to one of 23 Euromonitor Passport food and beverage categories, one of the Google NPM's 13 categories, one of the WHO Europe NPM's 21 categories and classified as either a food or a beverage for the Chilean Government NPM. The PAHO NPM does not use category-specific criteria.

Measures

The Google NPM is publicly available on Google's website[13] and consists of a set of nutrient thresholds for 13 categories (Appendix Table 2), and a description of the types of products included/excluded. Products such as donuts, sweetened beverages and pizzas are examples of

products that are HFSS and ineligible. Plain water, 100% juice, fresh fruits and vegetables are considered outside the scope of the policy and are considered eligible.

The WHO Europe NPM was the first multi-country nutrient criteria developed specifically to restrict the marketing of unhealthy foods to children.[20] Foods and beverages are defined under 21 categories and must not exceed category-specific nutrient thresholds to be eligible for marketing to children (Appendix Table 3). Five categories, including chocolate/confectionery, sweet bakery items, fruit juices, energy drinks and frozen desserts are not permitted to be marketed to children.

The PAHO NPM was developed after the WHO Europe NPM to guide marketing restrictions for the Americas.[21] It is based on the WHO Population Nutrient Intake Goals, with nutrient thresholds based on the energy contribution of foods (e.g., <10% of energy from free sugars), rather than an amount per 100g/ml.

The Chilean Government was the first country in the Americas to have a NPM enacted into law (in 2016), applying to taxation, front-of-pack warning signs and marketing restrictions.[22] The nutrient thresholds were set to become increasingly stringent over a series of three implementation dates. The phase 2 criteria were utilized for this analysis (Appendix Table 4) as they have been adopted by other countries as final thresholds.[23]

The CFBAI criteria were set by US food and beverage manufacturers to determine whether a product is eligible for advertising to children. Applying these criteria is complex, given the manufacturer-led process is not transparent and some elements required are not listed on product packaging. The December 2021 approved product list was used in this analysis. The

Google NPM was then applied to the nutrient information for each of these products to determine the proportion eligible under the Google NPM.

Statistical Analysis

Data were analysed using Stata V17. The number of products in each category was calculated, as was the revenue (in USD $million) of included categories and companies. The proportion of products eligible under each NPM was calculated for each company, and by category, as well as the revenue derived from eligible products under each NPM. Results for each company were weighted by category sales to generate sales-weighted proportions. Fleiss' kappa statistic was used to explore agreement between the proportion of products eligible under the four NPMs. The proportion of products listed as eligible to be marketed to children by the CFBAI policy was compared to the proportion eligible under the Google NPM. As secondary data were used, IRB approval was not required.

Results

There were 14,188 products from the top 25 companies eligible for inclusion in analyses (Appendix Figure 1). The number of products associated with each company ranged from n=17 (across two food categories) for *McKee Foods Corp* to n=1,783 (across 10 food categories) for *Kraft Heinz* (Table 1).

Overall, 18% of products were eligible for advertising to children under the Google NPM. *Dean Foods Co* and *Danone Groupe* had the highest proportion of sales-weighted products eligible (77% and 74%, respectively), more than double the remaining 23 companies (Table 1). *McKee Foods Corp* and *Ferrero* had the lowest proportion of products eligible (0% and

1%, respectively) (Appendix Table 1). Six companies showed an increase in the proportion of products eligible for advertising under the Google NPM once sales-weighting was applied, indicating that a higher proportion of sales derived from eligible products under the Google NPM. Eight companies showed a decrease once sales-weighting was applied, with unhealthy products responsible for higher sales for these companies.

Figure 1 and Table 1 show the differences in proportion of products eligible for advertising to children under each NPM. Overall, there was "fair" agreement between all four NPMs (Fleiss' k = 0.41), with the highest agreement between the Google NPM and the Chilean Government NPM. The Google NPM was the least strict, with 18% of all products (sales-weighted) eligible for marketing to children followed by the Chilean Government NPM (14%), WHO Europe NPM (13%) and the PAHO NPM (6%). There were discrepancies in the relative proportion of eligible products for some companies when using the PAHO NPM and other NPM to classify products. For example, under the PAHO NPM, *Danone Groupe* had only 16% of sales-weighted products eligible for marketing to children, compared with 41% for the WHO Europe NPM, 49% for the Chilean Government NPM and 74% for the Google NPM. Companies that fared better under the Google NPM compared to the other three NPMs included those dominated by dairy products (*Danone Groupe),* breakfast cereals (*Kellogg, Post Holdings),* and sugar-sweetened beverages (*Coca-Cola, KDP, PepsiCo)*. 13 of the 25 companies fared better under the Google NPM compared to the remaining NPMs.

Although differences in proportion of products that were eligible to be advertised across the NPMs were, in some cases, small, the revenue these represent were large. For example, 16% of PepsiCo products were eligible under the Google NPM. When using the PAHO NPM, only 8% of products were eligible. This 8% difference represents over US$5 billion in revenue for

PepsiCo. Across all 25 companies, products representing US$21 billion more revenue were eligible to be marketed under the Google NPM ($35 billion) compared to the PAHO NPM ($14 billion) (Figure 1). While the differences in product marketing eligibility were much smaller between the Google NPM and the Chilean Government NPM, this still represented an increase in eligible products for the Google NPM worth US$11 billion in revenue.

When examining differences in eligibility by food category, there was no substantial agreement between all four NPMs (Fleiss' k range from -0.04 in *Concentrates* to 0.55 in *Bottled Water* (Table 2)). A larger proportion of products were eligible under the Google NPM in *Breakfast Cereals* (30%), *Carbonated Beverages* (21%), *Confectionery* (14%), *Ice Cream and Frozen Desserts* (18%) and *Ready Meals* (92%) compared to the remaining three NPMs. Appendix Figure 2(A-E) shows the top five categories for overall revenue (A) and the categories representing the largest proportion of eligible products revenue for each of the four NPMs (B-E). The *Dairy* and *Bottled Water* categories were in the top five for each of the NPMs examined. However, these categories combined represent only 12% revenue for the top 25 companies. In comparison, other food categories individually represent a higher proportion of revenue, such as *Carbonated Beverages* (14%) and *Savoury Snacks* (15%).

Of the 99 products that were identified in the CFBAI approved products list database, less than half (43%) met the eligibility criteria for the Google NPM (Appendix Table 5).

Discussion

If Google's NPM restrictions were applied to the US market, only 18% of products sold by the top 25 US food and beverage manufacturers would be eligible to be advertised to children

across the Google Display Network, representing US$44 billion of their US$240 billion annual revenue. This analysis suggests the Google NPM performs relatively similarly to the WHO Euro NPM and the Chilean Government NPM in the overall proportion of foods it classifies as eligible to be marketed to children (18% vs. 13% and 14% of products), although variation in the types of products that would be eligible to be advertised was seen among all NPMs. While there is no information publicly available on development of the Google NPM, its overall alignment with the three validated NPMs in this study suggests that some authoritative nutrition guidance was considered. The exception to this is the PAHO NPM which was much stricter than the other three NPMs examined.

Studies have shown that foods and beverages are advertised online more frequently than any other product category,[10] and that less healthy foods such as cakes, cookies, chocolate/confectionery, sugar-sweetened beverages and ice cream are among the most frequently advertised food and beverage product types online.[6,24] In a previous study measuring the extent of food advertising on television across 22 countries, ~one-third of all food advertisements derived from just 10 companies.[25] All 10 companies were transnational with a combined market value of >$900 billion and all signed up to the International Food and Beverage Alliance. Globally, the top five food categories advertised to children on television are sugar-sweetened beverages, chocolate/confectionery, ready-meals, breakfast cereals, and cakes/biscuits/pastries.[25] Under the Google NPM, only 8% of top 25 US food and beverage manufacturers' products in these categories would be eligible for marketing to children, representing 45% of company revenue.

This analysis suggests the Google NPM is stricter than the nutrition criteria underpinning the CFBAI, the only currently operating measure in the US. More than half the products that

were eligible under CFBAI were not eligible under the Google NPM, despite the Google NPM being the most lenient of the four NPMs examined in this study. The eligibility of some products to be marketed to children according to the CFBAI (e.g breakfast cereals containing 30% added sugar) highlights the permissiveness of the nutrition criteria. Such products would not be eligible under any other existing NPM applicable to the US market nor the NPMs in this study. The CFBAI criteria appear to mostly consider the nutrient contents of companies' own products, and establish cut-off points above these values so as to permit products to be advertised without restriction.

These findings provide insight into the potential impact of any move by Google to extend the application of its policy to the US market. However, while the strength of the NPM is important, it must be noted that the overall effectiveness of restrictions on marketing to children depends upon more than how unhealthy foods are defined. Factors such as the form of regulation used, how the measure defines 'children' and advertising 'directed to' children, as well as what media platforms and advertising techniques are covered, also contribute to overall public health impact. As does whether the measure is developed, implemented, monitored and enforced in a transparent and accountable way.[26]

This broader perspective is reflected in existing literature demonstrating the limited progress made by the CFBAI in protecting children from unhealthy marketing.[16-18] Along with the permissiveness of its nutrition criteria, weaknesses include its voluntary nature and poor participation (only 16/25 companies included in this study are signatories). The CFBAI only applies to marketing that is 'primarily directed to children under 13', meaning that marketing that appeals to a broader audience remains unrestricted.[27] The CFBAI is administered and enforced by industry themselves.

Compared to the CFBAI, Google's Policy has some benefits in its application to digital media. As well as having a more restrictive NPM, Google's policy ads which do not meet the NPM are only shown to users aged 18+. The Google policy was implemented rapidly in the UK/EU, first published in August 2020 and in force in October 2020. Like the CFBAI, Google's policy has limitations, including its scope being restricted to the Google Display Network and YouTube rather than broader media platforms, and that it would still allow advertising to those aged 18+ where younger children may still experience passive exposure.

In light of the known limitations of self-regulation, the WHO continues to call for Member States to introduce government-led restrictions on marketing of unhealthy foods to children.[2,28] In the US, legal barriers such as the First Amendment's protection for commercial speech have deterred political resolve to implement regulations on traditional media, and will need to be overcome to enact protections for children in the digital sphere.[29] Due to the potential lead time to develop and implement regulation - particularly in the face of industry opposition – Google's policy could be a useful first step or just one part of a more comprehensive approach. As a starting point, the inclusion of the US market in Google's policy to restrict unhealthy food advertising for minors would improve protections for children in digital advertising. Of course, online media represents only one source of food marketing exposure for children, with children also heavily exposed to food marketing in all settings where they live and play.[3]

Limitations

This study has some limitations. Euromonitor sales data were not available at the individual product level. The US food and beverage market has ~400,000 products available for sale,

and without knowing sales information for every product, results should be interpreted in a generalised manner. The Google NPM itself has limitations, with elements of the model not made clear in Google's policies. The study also did not specifically look at which products were being advertised to children through the Google Display Network. Future research combining product information with information about which products are being advertised will undoubtedly enhance the strength of the evidence base in this research area. The strengths of this study include the use of Label Insight's large database. Linking these data with Euromonitor sales data allowed for an in-depth look at foods purchased by US consumers and shows the huge amount of money generated by unhealthy products.

Conclusions

Best practice recommendations for policies to protect children from the harmful impacts of unhealthy food marketing call for comprehensive restrictions across media and settings. Self-regulatory codes of practice introduced by the food and beverage industries, including the US, apply permissive nutrition criteria to determine products that are eligible for marketing to children. In the absence of regulatory measures, the Google advertising policy applied to the US market offers an opportunity to curb online advertising to children and adolescents, led by one of the most powerful organizations in the world.

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Table 1: Proportion of products eligible for advertising to children under each nutrient profile model, by manufacturer

		Google NPM		Google NPM	WHO Europe NPM		WHO Europe NPM	PAHO NPM	PAHO NPM	Chilean NPM	Chilean NPM	
Manufacturer	**Total revenue (US $million)**	**% products eligible**		**% sales-weighted eligible**	**% products eligible**		**% sales-weighted eligible**	**% products eligible**	**% sales-weighted eligible**	**% products eligible**	**% sales-weighted eligible**	**Fleiss' Kappa[a]**
Dean Foods Co	2799	50%		77%	33%		57%	43%	74%	36%	60%	0.69
Danone Groupe	5944	74%		74%	41%		41%	16%	16%	49%	49%	0.3
Conagra	11727	25%		33%	39%		37%	6%	7%	38%	34%	0.39
Post Holdings	2029	33%		33%	13%		13%	10%	10%	0%	0%	0.22
Nestlé	16748	19%		28%	42%		40%	17%	26%	38%	35%	0.45
Hormel Foods Corp	4955	25%		25%	26%		32%	1%	2%	19%	17%	0.36
Tyson Brands Inc	6822	12%		21%	16%		24%	1%	1%	10%	13%	0.43
Keurig Dr Pepper	10472	27%		20%	22%		0%	30%	3%	16%	10%	0.52
Unilever	6479	21%		20%	0%		0%	0%	0%	3%	6%	0.03
General Mills	11947	15%		18%	15%		14%	4%	3%	13%	12%	0.45
Mondelez	9535	27%		17%	0%		0%	2%	2%	12%	6%	0.17
PepsiCo	49340	17%		16%	8%		4%	10%	6%	13%	12%	0.37
Coca-Cola	24690	17%		15%	25%		6%	32%	11%	9%	9%	0.21
Mars	9224	18%		15%	7%		4%	3%	2%	13%	11%	0.51
Campbell's	10899	11%		14%	20%		23%	6%	5%	13%	13%	0.28
Kellogg	9865	17%		14%	9%		6%	1%	0%	2%	1%	0.24
Hershey	9335	10%		10%	0%		0%	0%	0%	6%	6%	0.29
Kraft Heinz	22957	10%		10%	12%		12%	0%	0%	14%	10%	0.28

		Google NPM	Google NPM	WHO Europe NPM	WHO Europe NPM	PAHO NPM	PAHO NPM	Chilean NPM	Chilean NPM	
Manufacturer	**Total revenue (US $million)**	**% products eligible**	**% sales-weighted eligible**	**% products eligible**	**% sales-weighted eligible**	**% products eligible**	**% sales-weighted eligible**	**% products eligible**	**% sales-weighted eligible**	**Fleiss' Kappa[a]**
Grupo Bimbo	6289	7%	7%	33%	31%	1%	1%	9%	8%	0.19
JM Smucker	2142	6%	6%	3%	2%	0%	0%	7%	6%	0.4
Schwan Food Co	2219	6%	6%	7%	7%	0%	0%	8%	7%	0.39
Flowers Foods	2675	5%	5%	12%	12%	0%	0%	4%	4%	0.28
McCormick	3034	6%	5%	4%	2%	1%	0%	3%	3%	0.53
Ferrero	4215	1%	1%	0%	0%	0%	0%	1%	1%	0.22
McKee Foods Corp	2234	0%	0%	0%	0%	0%	0%	0%	0%	NA
Total for all companies	248574	18%	18%	18%	13%	5%	6%	16%	14%	0.41

a Values presented for weighted values. P<0.0001 for all. NPM = Nutrient Profile Model

Table 2: Proportion of products eligible for advertising to children under each nutrient profile model, by category

	Google NPM	Google NPM	WHO Europe NPM	WHO Europe NPM	PAHO NPM	PAHO NPM	Chilean NPM	Chilean NPM		
Manufacturer	**No. products**	**% revenue eligible**	**No. products**	**% revenue eligible**	**No. products**	**% revenue eligible**	**No. products**	**% revenue eligible**	**Fleiss' Kappa**	**p value**
Baked Goods	1791	5%	1851	20%	1633	0%	1962	6%	0.23	**<0.001**
Bottled Water	173	61%	311	73%	248	89%	311	43%	0.55	**<0.001**
Breakfast Cereals	969	30%	683	11%	668	6%	1022	0%	0.15	**<0.001**
Carbonated Beverages	156	21%	155	0%	154	0%	411	13%	0.15	**<0.001**
Concentrates	248	1%	250	1%	231	0%	292	12%	-0.04	0.93
Confectionery	1456	14%	1637	0%	1457	0%	1856	8%	0.24	**<0.001**
Dairy	1183	49%	1264	27%	1191	18%	1496	26%	0.44	**<0.001**
Ice Cream and Frozen Desserts	404	18%	431	0%	404	0%	471	1%	0.01	0.30
Juice	151	11%	152	0%	184	22%	245	16%	0.37	**<0.001**
Other Hot Drinks	91	0%	90	0%	78	2%	106	0%	0.00	0.53
Processed Fruit and Vegetables	473	36%	444	34%	441	26%	497	61%	0.53	**<0.001**
Processed Meat and Seafood	554	25%	673	28%	548	1%	705	11%	0.30	**<0.001**
Ready Meals	24	92%	27	19%	24	17%	31	29%	0.31	**<0.001**
Rice, Pasta and Noodles	70	21%	69	7%	69	0%	168	24%	0.54	**<0.001**
RTD Coffee	2261	11%	2119	36%	2120	1%	2499	35%	0.08	0.18
RTD Tea	35	43%	35	52%	35	22%	39	30%	0.13	0.00
Sauces, Dressings and Condiments	925	5%	1220	3%	932	0%	1340	3%	0.34	**<0.001**
Savoury Snacks	1556	4%	1642	1%	1544	1%	1866	0%	0.15	**<0.001**
Soup	374	15%	456	69%	373	0%	558	50%	0.03	0.10

Sports Drinks	75	15%	58	0%	58	0%	95	30%	0.08	0.04
Sweet Biscuits, Snack Bars and Fruit Snacks	1133	8%	1233	0%	1131	1%	1349	0%	0.03	0.01
Sweet Spreads	86	3%	99	0%	86	0%	102	1%	0.22	**<0.001**
Total for all categories	14188	18%	14899	13%	13609	6%	17423	14%	0.41	**<0.001**

Note: Boldface indicates statistical significance ($p<0.05$). NPM = Nutrient Profile Model

Figure legends:

Figure 1: 2020 Revenue (in USD millions) for the top 25 food and beverage manufacturers from included categories and from products eligible for advertising under the Google, WHO Europe , PAHO and Chilean Government nutrient profile models (NPM).