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The nature and extent of food marketing on Facebook, Instagram, and YouTube posts in Mexico

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Abstract

Food and beverage marketing appealing to children and adolescents has an impact on their food preferences, purchases requests, consumption patterns, health outcomes and obesity. The objective of this study was to assess the nature and extent of food and beverage marketing on Facebook, Instagram, and YouTube posts in Mexico. This was a content analysis that followed the World Health Organization CLICK methodology to comprehend the landscape of digital food marketing campaigns of the top selling food products and brands and the most popular accounts carried out between September and October 2020. A total of 926 posts from 12 food and beverages products and 8 brands were included. Facebook was the social media platform with the most posts and greatest engagement. The most prevalent marketing techniques were brand logo, image of packaging, image of the product itself, hashtags, and engagement to consume. 50% of the posts were assessed as appealing to children, 66% to adolescents and 80% to either children or adolescents. Ninety-one percent of products (n=1250) were classified as unhealthy according to the Mexican warning labels nutrient profile; 93% of the food promoted on posts appealing to either children or adolescents were unhealthy. Hashtags commonly referred to the COVID-19 pandemic. Most of the unhealthy food digital marketing features marketing techniques that appeal to children or adolescents, moreover, the use of the pandemic hashtag reflected brands' responsiveness to the environment at the time of the study. The present data contribute to evidence supporting the strengthening of food marketing regulations in Mexico.

Introduction

Digital marketing is a cost-effective strategy that the food and beverage industry have adopted to appeal to children and adolescents through social media, websites, advergames, among others digital channels.^{1,2} The food and beverage industry create, design, and upload social media content with powerful, aspirational, and emotion-based messages, so that their followers become not only a receiver, but also a sender who communicates and interacts with their content. Moreover, digital marketing strategies include targeted messages that appeal to users' preferences, increasing their effectiveness.³⁻⁵

The effectiveness of digital food marketing depends not only on the messages' reach and frequency (exposure), but on the creative content, design, and execution of those messages (nature).⁶ Given the substantial challenges in assessing exposure of children and adolescents to digital food marketing,⁷ measuring the extent of digital food campaigns (i.e., the number and proportion of advertisements) provides information about potential exposure.^{8,9}

Food and beverage marketing appealing to children and adolescents has an impact on their food preferences, purchases requests, consumption patterns, health outcomes and ultimately, contributes to childhood obesity.^{10,11} Since 2010 the World Health Organization (WHO) has been calling for action to limit children and adolescents' marketing exposure, and now advocates that this should encompass the digital environment; moreover, regional recommendations have been published by the Pan American Health Organization (PAHO).^{12,13} Nevertheless, few countries have established legally binding regulations of digital food marketing to young children and adolescents. The United Kingdom has established online advertising restrictions for products high in sugar, fat and salt, although their implementation is currently delayed.¹⁴ In Norway, voluntary guidelines to limit the exposure of unhealthy food marketing including digital spaces such as social media and websites were published.¹⁵ In Ireland, a voluntary Non-Broadcast Code covers social media, but enforcement mechanisms have not been implemented.¹⁶ In Latin America, the Chilean and Peruvian laws forbid the advertising of unhealthy products to children including all the media where kids are exposed.^{17,18}

In Mexico, the regulation of food marketing has been permissive, even when mandatory regulations were adopted since 2014. Those restrictions only concerned television and cinema and did not follow international recommendations to limit children's exposure to food marketing.¹⁹ Mexican children and adolescents are still exposed to aggressive food marketing not only on traditional media but on other channels including the internet.²⁰ The lack of serious action to protect children from the harmful food marketing, could have heavily contributed to the current obesity epidemic faced by the country where 1 in 3 children and 2 in 5 adolescents live with overweight or obesity.²¹ Stricter restrictions will be implemented in March 2023, forbidding the use of marketing strategies appealing to children (i.e., characters, animations, cartoons, celebrities, digital games, etc.) including the digital space, however, the restrictions do not encompass adolescents.²²

Monitoring the digital environment contributes to setting and strengthening recommendations and regulations. Some studies have described the nature and extent of food marketing through content analyses of social media posts based on sales values and popularity.^{5,23-25} In Mexico, a previous study evaluated the nature and extent of the digital marketing of popular food and beverages products and brands in social media and websites, demonstrating that most of the products advertised were unhealthy.²⁰ However, it did not consider the top-selling food and beverage products or brands. Given the association between unhealthy food marketing and childhood overweight and obesity,²⁶ and the obesity pandemic that Mexico faces, ongoing monitoring is required to inform and support Mexican public health policies aimed to regulate and improve the digital environment where up to 76% of the

Mexican children and adolescents are active users, especially on social media platforms.^{27,28} Therefore, the objective of this study was to assess the nature and extent of food and beverage marketing on Facebook, Instagram, and YouTube posts in Mexico. The top selling food products and brands and the most popular Facebook accounts were considered.

Methods

A content analysis was carried out based on the protocols and templates “Monitoring of Marketing of Unhealthy Products to Children and Adolescents” from the WHO Europe Office which were adapted to the Mexican context. These protocols are part of the called CLICK monitoring framework which include a step-by-step guidance to comprehend the landscape of campaigns. It includes systematic variables and methods to ensure consistency in the design of assessment campaigns studies including three stages: preparation, data collection and data analysis.^{9,29}

Preparation stage

First, the most popular social media platforms used by Mexican children and adolescents were identified (Supplementary material 1), being Facebook, Instagram, and YouTube in 2018-2019, according to the most recent national data available in the time of the study.^{27,28} Second, the top-selling food and beverage products and brands in Mexico according to Euromonitor 2019,³⁰ and the most popular Facebook fan pages of foods and beverage products and brands in Mexico according to Socialbakers’ 2019 were retrieved³¹ (Supplementary material 2-3). From the above-mentioned lists, only accounts mainly featuring the following food categories were considered: sweetened non-dairy beverages, snacks, candies and desserts, sweet cereals and sweetened dairy drinks. These products are high in free sugars, saturated fat, trans fat and salt, and their consumption are linked to overweight and obesity and other non-communicable diseases;³² also, they are highly consumed by Mexican children and adolescents according to the Mexican National Health and Nutrition Survey.³³ Thus, the assessment of such products’ digital campaigns would provide evidence to support policies to improve digital environments.²⁹

Third, brand or product Facebook fan pages, Instagram accounts and YouTube channels, hereafter, referred as “accounts” were hand searched. The inclusion criteria were: i) The brand or product had a Facebook account, but not necessarily an Instagram or YouTube account, ii) The brand or product Facebook account had posted content in the last month prior to data collection (September 2020), iii) The account was verified or official, and iv) The account was identified as a Mexican brand or product (i.e., “Mx, Mexico” in his name). One brand and its products (Coca-Cola or Coke) were excluded from the study as they stopped their activity on social media during the study period, which coincided with the COVID-19 pandemic. The company declared that they were supporting the “#StopHateForProfit” campaign joining other global companies who were asking Facebook to stop valuing profits over racism, antisemitism, and all forms of hate.³⁴ Finally, to ensure representation of both food and beverage products, 10 unique food products or brands and 10 unique beverage products or brands were included.

Coder training and inter-rater reliability

A training manual and a Microsoft Excel spread sheet based on the WHO Protocols and Templates were developed.⁹ 15-hours of online training was provided to seven coders to perform a content analysis, all of them with a BSc in nutrition. The coordinators of the project and coders read the manual together; then 20 examples were completed in the Microsoft Excel spread sheet using different posts from those included in the final sample. Next, each coder individually coded 15 posts, and results were assessed and discussed, the coordinators identified frequent mistakes and questions, and they concurred with discrepancies. Once all queries were solved, a pilot test with a

randomly selected subsample of 40 posts was carried out. Inter-rater reliability was calculated using Cohen's kappa statistical measure, resulting in a coefficient of 0.83 [95% confidence interval 0.81-0.85].

Data collection

Coders logged into their personal social media accounts and looked for the food and beverage products and brands accounts. Accounts' basic information (i.e., name of the account, likes/followers, place) and posts including images, videos, text, date, views, likes, shares, and comments, among others were recorder. The first 20 available unique posts retrospectively, on Facebook and Instagram accounts, and the 20 most popular videos on YouTube accounts were coded. Some accounts had fewer than 20 posts, so only available post were captured. When a post was shared twice in the same account, only the first one was considered as unique. Data were collected between September and October 2020.

Content analysis

Accounts and posts were coded using a codebook with two sections, the first to capture the marketing extent, including the account's number of followers, brand ad, and products description. The second section captured the nature of marketing including the use of brand characters, licensed characters, hashtags, health, or nutrition claims, among others. Common marketing techniques that could potentially appeal to children and to adolescents were identified and listed based on previous studies to determine the extent of posts appealing to a) children and b) adolescents.^{6,35} Operationalization of each variable is available in the Supplementary material 4.

Hashtag analysis

A list of all the hashtags that appeared in the posts was made (n=1,685) accounting for 503 unique hashtags. A word cloud that included the top 100 hashtags was created in the NVivo software version 12 in the original language (Spanish) and translated to English.

Nutritional assessment of food and beverage products

The nutritional quality of the products advertised was assessed. Food products were categorized into groups based on the European WHO nutrient profile categories; this decision was made because the Mexican warning label system does not establish food categories. Furthermore, the European food categories were developed with the purpose of restricting the marketing of food and beverages to children and adolescents considering the most consumed and advertised products.⁹ All the products presented in each post were recorded (n=1,396), except those that were not recognizable (i.e., low quality images or a generic soda can [n=21]). When a product appeared twice or more in a single post, the product was recorded only once, however, when the product appeared again on a different post or social media platform, the product was recorded as a new observation, thus, a single product could be registered more than once if it appeared on different posts.

Nutritional data were collected from food and beverage websites of all the packaged food and beverages (i.e., chips, soda, confectionary) and, if not available elsewhere, from the 'What's in the Foods You Eat' tool of the United States Department of Agriculture for non-packaged ready-to-eat food and beverages (i.e., paninis, coffee).³⁶

Data on calories, added sugars, saturated fat, trans fat, sodium, fiber per portion and non-nutritive sweeteners (NNS) or caffeine (yes/no) were collected and standardized to 100g/ml of product. The overall nutritional features of the products were assessed: whether the calories and critical nutrients content (added sugars, saturated fat, trans fat or sodium) were excessive (warning labels), and

whether they contained added NNS, or caffeine (precautionary legends) based on the first stage of the Mexican nutrient profile model of the front-of-pack labelling system (Supplementary material 5). Products with an excess content of calories or any critical nutrient or that contained added NNS, or caffeine, were considered 'unhealthy', and should not be advertised to children and adolescents. The number of products classified as unhealthy were calculated from the posts appealing to children, adolescents and either children or adolescents. Only those posts promoting food or beverages (food ads) were considered, thus, brand ads were excluded from this analysis (n=173).

Ethical considerations

The study did not involve human participation or collect personal data, however, the study was reviewed and approved by the Committees of Research, Ethics, and Biosafety of the Mexican National Institute of Public Health as part of a larger protocol (board number: 1648).

Statistical analysis

Numeric variables were skewed according to Shapiro-Wilk test; therefore, they were presented as medians and 25-75 percentiles. Categorical variables were presented as frequencies and percentages to describe marketing strategies and the proportion of products that exceeded the cut-off point for calories, critical nutrients or NNS or caffeine.

Results

Food and beverage products and brands included

A list of food and beverage products or brands from Euromonitor (n=40) and Socialbakers (n=45) was retrieved; 21 products or brands were excluded due to a lack of activity on social media on the period of data collection, and 28 were out of scope, i.e., beans, plain milk, or baby food. Finally, 12 food and beverage products and 8 brands were included (Table 1) accounting for 52 accounts across three social media platforms (Facebook, n=20; Instagram, n=15; YouTube, n=17). Facebook was the social media platform with by far the most followers of the brand and product accounts analysed (median 1,123,058) followed by YouTube (median 16,100), and Instagram (median 6,453).

Content analysis

From the 52 accounts, 926 posts were coded and analysed, most of them from Facebook (n=417), followed by Instagram (n=289), and YouTube (n=220). Of the total posts, 95.0% were unique posts and were commonly uploaded on weekdays (89.7%). Most posts showed a specific product (82.2%), whereas the rest were brand ads. Facebook posts were those with more likes (median, p25-p75: 216, 29-1,380) and comments (median, p25-p75: 14, 2-81). The most prevalent marketing techniques were brand logo (91.7%), packaging image (65.7%), product image (65.3%), hashtags (58.0%), and engagement to consume (54.6%). The use of jingle sounds, downloadable material, and advergaming were less common (<5.0%) (Table 2).

More posts assessed as appealing to children were found on Facebook (62.6%), followed by YouTube (50.5%) and Instagram (31.1%). More posts appealing to adolescents were found on Facebook (73.6%), compared to Instagram (66.1%), and YouTube (50.0%). The techniques that commonly appealed to children included the use of licensed characters, especially to promote sugary drinks products. Also, brand cartoons and cartoons were commonly displayed in those posts. Marketing techniques appealing to adolescents were related to challenges, giveaways, self-esteem, and pop culture represented by memes. 80.0% of the posts were assessed as appealing to either children or adolescents, a few examples of these marketing techniques are displayed in Supplementary material 6. Some accounts featured the same or a very similar image or video on different media platforms.

The most frequent hashtags were #StayAtHome (n = 58), #share (n = 38), #BigCola (n=30), #Mexico (n=25) and #MakeltYours (n=24). The hashtag word cloud showed words related to the pandemic (i.e., stay at home) and to brand names. The size of each word is proportional to the number of times the hashtag appeared (Figure 1). The hashtag word cloud is also available in the original language at supplementary material 7.

Nutritional assessment

Between one and 17 products appeared in a single post. The nutritional quality of 1,375 products was assessed (564 from YouTube, 519 from Facebook, and 292 from Instagram), the sample included multiple instances of the same product when the product appeared on different posts or social media platforms. The greatest proportion of products found on the three social media sites were beverages with added sugar or NNS, and juices (41.7%). Cakes, cookies, and pastries (11.6%), and chocolates and confectionery (10.3%) were also found. A few ads for water, milk drinks, and corn products across the three social media platforms were found (Table 3).

Most of the products had an excessive content of calories (83.9%) and added sugars (80.3%); 21.2% and 11.4% of the products contained added NNS and caffeine, respectively; and 7.4% had excessive sodium content. None contained an excessive content of trans fat. Only 9.1% of the products did not exceed the cut-off point for any critical nutrients or did not contain added NNS or caffeine. Most of the products exceeded the cut-off points for two (40.4%) or three (37.5%) critical nutrients or contained NNS or caffeine. The proportion of products classified as unhealthy among the food ads appealing to children were 91.9%, 96.1% among those appealing to adolescents and 92.6.% among those appealing to either children or adolescents (Table 4).

Discussion

This study showed that most of the unhealthy food digital marketing on Facebook, Instagram, and YouTube was appealing to children or adolescents. The extent of food and beverages marketing on Facebook was larger compared to Instagram, and YouTube, since not all the food and beverage products and brands had accounts across all platforms. In Argentina and the Philippines similar studies were carried out following the WHO's protocols assessing Facebook, Instagram, and YouTube posts. In the Philippines more posts were retrieved from Facebook as in the present study, however, in Argentina, more posts were retrieved from Instagram positioning it as the most popular site. The three studies pointed out that most of the products assessed should not be advertised to children and adolescents.^{24,25}

These findings corroborated the nature of marketing techniques commonly used by the most consumed or popular food and beverage products and brands around the world. For example, the use of brand elements was reported in nearly every post analyzed (91.3%), as previously observed in the most popular Facebook accounts of food and beverages in Australia (100%) and Brazil (100%).^{23,37} Brand logo use increases consumers' awareness (recall and recognition) of the brands itself which is a main purpose of marketing strategies, moreover a brand logo could be linked by children and adolescents to brands, food types, sports or attributes and ultimately influence purchase decisions, consumption and generate loyalty to the brand that could last until adulthood.³⁸⁻⁴⁰

Brand characters were observed in one out of four posts. This strategy is recognized by its power to influence children's preferences, choices, and consumption, especially for unhealthy foods and beverages compared to fruits and vegetables.⁴¹

Different organizations such as the WHO and the PAHO recommend forbidding the use of brand characters to promote unhealthy food.^{12,13}

A low level of engagement from the followers of each platform was observed considering the relatively low number of likes, comments, or shares in the posts, in comparison with the total number of followers in each account, despite the use of incentives to engage with the posts (i.e., “like emoji” or the legend “comment or share with your friends”). This phenomenon had been previously described as passive users who only see the content but do not actively participate.⁵

The hashtag analysis showed that brands were using the COVID-19 pandemic, then central to life in Mexico. Hashtags can link posts and accounts and they are promoted not only online but on other channels and in the products themselves, encouraging consumers to interact with the brand, i.e., uploading a photo.⁴⁰ The hashtags identified related to the COVID-19 pandemic were #StayAtHome and #AtHome and references to food delivery (#delivery, #ubereats and #subwaydelivery). A study conducted in Uruguay also reported the use of #StayAtHome (#QuédateEnCasa in Spanish) as a secondary technique presented in posts uploaded during strict lockdown.⁴² Moreover, a study conducted in Brazil during the lockdown reported that free delivery was a prevalent marketing strategy among food delivery platforms, specially to promote unhealthy food and beverages.⁴³ Other study reported that #OpenForDelivery was a frequent hashtag used on food delivery’s Instagram accounts from Australia, the United Kingdom, and the United States of America during the first wave of COVID-19.⁴⁴ In the Philippines, fast food brands promoted on-line services highlighting hygienic locations and featuring influencers, and consumers collecting their takeaways during the 2020 lockdown.²⁵ These are clear representations of how the unhealthy food and beverage industry, adapted their marketing strategies to current settings, and aligns itself with messages that are ostensibly health-oriented to associate their brands with positive values.

Almost all the products exceeded the thresholds for critical nutrients or contained added NNS or caffeine according to the nutrient profile model of the Mexican warning label system. Most of the products that were promoted on ads appealing to children, adolescents or both were unhealthy. Similarly, in an Argentinian study, all the assessed products were categorized as “not allowed to be advertised” online.²⁴ None of the assessed products had an excessive content of trans fat, this welcome finding may reflect the global effort from agencies, governments, and food industry to eliminate the content of trans fat.⁴⁵

Most of the posts were promoting sugary drinks, and a previous study reported that sugary drinks were the products with the greatest number of followers in Mexico.²⁰ This is a concern, since sugary drinks are not recommended for daily consumption, yet these are the food group with the highest intake above maximum recommended intake in Mexico.⁴⁶ Furthermore, a study carried out in the USA reported that almost 50% of adolescents included reported engaging with social media accounts of sugary drinks, with Hispanic adolescents more likely to engage with brands in comparison with non-Hispanic whites.¹⁰ Some posts (n=11) included images of drinkable water, however most of those were also promoting the brand or other products i.e., showing products such as soda and juices rather than promoting water consumption.

Finally, more posts were classified as appealing to adolescents (two-thirds) in comparison to those appealing to children (nearly half). Similarly, Potvin et al, reported a higher exposure of adolescents to food marketing in comparison with children (55% vs 83%).¹¹ In the Philippines, 72% and 84% of the posts were appealing to children and adolescents, respectively.²⁵

Protecting children and adolescents from unhealthy food marketing is crucial since exposure increases their chances to consume those products.⁴⁷ Increased consumption of unhealthy food is associated with overweight and obesity, that could be triggered by exposure to food marketing.²⁶ None of the platforms included has strong strategies to protect the young ones from unhealthy marketing,⁴⁷ thus governments should establish robust policies to protect children and adolescents. In Mexico, current marketing regulations did not include online channels or follow international recommendations, and industry self-regulations are lenient.^{20,48} By March 2023, a new regulation will be implemented in Mexico which forbids the marketing of unhealthy food and beverages targeted at children including the digital space however, it does not encompass adolescents nor third party strategies such as influencers promoting products, also implementation and surveillance mechanisms are not clear.²² Thus, the regulation must be strengthened since Mexican adolescents have a higher presence on social media (~90% have Facebook accounts) and higher obesity prevalence in comparison with children.²¹ Also, previous studies demonstrated that adolescents had more engagement to ads shared by peers or celebrities in comparison to children, techniques that are not included in the new regulation.⁴ Furthermore, an increase in the extent of marketing appealing to adolescents and the use of alternative strategies such as brand ads or influencers sharing branded content could be expected in the following years as a way to still marketing food online.

Limitations

This study presented some limitations. First, demographic information about the followers of the assessed accounts were not retrieved as it is not public available (i.e., sex, age, education level, etc.); but it is possible that Mexican children and adolescents were exposed to these posts since they are users of the platforms included and it is likely that other users share those posts (organic reach). For example, social media users who followed food and beverage accounts could get engaged with their content: commenting, tagging friends, sharing. This activity could appear in the news feed of the users' friends and the most popular content appears higher up in the news feed and more often. The reach of this marketing could include those users beyond followers such as children and adolescents.⁹

Second, "Coca-Cola", the top selling beverage brand in Mexico, was not included because they stopped their marketing during the data collection phase, however, other best-selling and the most popular Facebook accounts of food and beverage products and brands in Mexico were included.

Third, only three social media platforms were included and paid posts were not considered, i.e., the included platforms offer to run target ads (i.e., sex, age, location) via Meta Ads Manager or YouTube Ads.^{49,50} Further analysis considering other platforms and paid posts should be performed as marketing techniques could change overtime. Lastly, the present study does not provide data on the impact on children's consumption, preferences, or food choices, but there is ample evidence that indicates 'unequivocally' that these are affected by food marketing.³²

Despite the limitations of this study, according to the author's knowledge, this was the first study to assess the nature and extent of digital food marketing in the most used social media platforms by Mexican children and adolescent following standardized protocols,²⁹ thus, findings can be compared to data from other countries that had followed those protocols. Moreover, marketing strategies employed during the strict COVID-19 lockdown were captured.

Conclusion

Most of the unhealthy food digital marketing on Facebook, Instagram, and YouTube features marketing techniques that appeal to children and adolescents. Moreover, the marketing techniques employed verified how food industry easily adapt their strategies to the current environment, in this

case the COVID-19 pandemic. The present data contribute to evidence supporting the strengthening of food marketing regulations in Mexico.

Conflict of interest All authors have nothing to report.

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Author Contributions SB, CN and IVM designed and obtained the funding for the study. MTG and EB designed the WHO Protocols codebook and definitions and provided expert guidance to UNICEF for this project. IVM and CN contributed to the adaptation of the codebook and definitions to the Mexican context. TA helped to choose which food and beverages and brands were included in the study. IVM trained coders, cleaned the database, wrote the first draft, and performed the statistical analyses. IVM and AG executed the study. All authors revised the manuscript critically for intellectual content.

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TABLE 1. Selected food and beverages products and brands and their number of followers on each social media platform. Data collected during September-October 2020.

Product/brand	Social media platform		
	Facebook	Instagram	YouTube
<i>All pages</i> Median(p25-p75)	1,123,058 (341,016-2,045,485)	6,453 (3,441-25,600)	16,100 (2,510-26,900)
<i>Food</i>			
Bimbo	2,045,485	37,000	58,100
Bubulubu	1,417,085	7,218	-
Chips Barcel	1,295,420	7,870	2,510
Crunch	2,107,034	6,453	4,300
Kelloggs	1,123,058	25,600	18,600
Marinela	599,558	-	16,100
Papas Sabritas	3,511,878	-	37,200
Ricolino	526,862	-	26,900
Starbucks	4,252,715	889,603	28,200
Subway	2,227,373	28,828	6,300
<i>Beverages</i>			
Big Cola	4,951,040	203	75
Boing	846,741	320	640
Café Olé	753,691	6,026	NA
Jugos Natura	262,472	3,441	1
Jumex	1,185,703	11,323	22,100
Jumex Frutzzo	341,016	1,096	2,050
Lulu	246,571	-	-
Pato Pascual	247,917	-	138
Red Cola	1,702,268	3,722	7,980
Squirt	156,255	723	-

Notes: (-): Food and beverage product or brand that does not have an account on the selected social media platform.
 NA: Not available (subscribers not available).

TABLE 2. Nature and extent of Facebook, Instagram, and YouTube posts of the top selling or the most popular food and beverages products and brands in Mexico*

	Facebook (n=417)		Instagram (n=289)		YouTube (n=220)	
	n	%	n	%	n	%
Extent						
Unique post	399	95.6	287	99.3	206	93.6
Day of publication						
<i>Weekdays</i>	375	89.9	245	84.8	211	95.9
<i>Weekend</i>	42	10.1	44	15.2	9	4.1
Brand ad or product ad						
Brand ad	97	23.3	52	18.0	24	10.9
Product ad	320	76.7	237	82.0	196	89.1
Nature						
Post type						
<i>Only text</i>	2	0.5	0	0.0	0	0.0
<i>Text and image</i>	224	54.4	176	60.9	0	0.0
<i>Video and text</i>	186	45.2	113	39.1	220	100.0
Likes/reactions post						
(<i>Median, p25-p75</i>)	216	29-1,380	86	38-766	20	6-57
Comments post						
(<i>Median, p25-p75</i>)	14	2-81	3	0-17	2	0-11
Shares post						
(<i>Median, p25-p75</i>)	16	4-69	-	-	-	-
Video views						
(<i>Median, p25-p75</i>)	77,276	3,700-229,000	837	161-23,686	125,116	3,046-964,482
Use of brand logos	400	95.2	231	79.9	218	99.0
Image of packaging	274	65.7	176	60.9	158	71.8
Image of product itself	252	60.4	186	64.3	167	75.9
Hashtag	230	55.2	216	74.7	91	41.4
Engagement to consume	205	49.2	160	55.4	141	64.1
Engagement to interact with the post	130	31.1	62	21.4	32	14.5
Brand characters	87	20.8	38	13.1	89	40.4
Website address	96	23.0	3	1.0	29	13.1
Special day	66	15.8	39	13.4	18	8.1
Physical activity depicted	52	12.5	17	5.9	43	19.6
Health or nutrition claims	65	15.6	14	4.8	17	7.7
Engagement to buy	58	13.9	16	5.5	15	6.8
Link to other social media platforms	34	8.1	1	0.3	47	21.3
Celebrity endorsers	37	8.9	15	5.2	18	8.2
Premium and no premium offers	46	11.0	4	1.4	19	8.6
Marketing appeal						
Children	261	62.6	90	31.1	111	50.5
Adolescents	307	73.6	191	66.1	110	50.0
Either children or adolescents	358	85.9	216	74.7	166	75.5

Notes: * Marketing techniques employed with a frequency <5% were omitted from the table: Sponsorship; sport, music & events; tie promotion; philanthropy; advergame, licensed character, downloadable material; jingle sound.

-: Data not shown on the screen platforms.

Definitions available in the supplementary material.

TABLE 3. Food categories* of the top selling or the most popular food and beverage products in Mexico posted on Facebook, Instagram, and YouTube.

Food category [^]	Facebook (n=564)		Instagram (n=519)		YouTube (292)	
	n	%	n	%	n	%
Drinks with added sugars or non-nutritive sweeteners and juices	247	47.9	134	46.0	193	34.2
Cakes, cookies, and pastries	51	9.8	14	4.8	94	16.6
Chocolate and sugar confectionery, energy bars, sweet toppings, desserts	61	11.7	31	10.6	50	8.8
Savoury snacks	42	8.0	16	5.5	45	7.9
Coffee and coffee with milk	37	7.1	49	16.8	58	10.2
Fast food	29	5.5	24	8.2	29	5.1
Breakfast cereals	21	4.0	17	5.8	51	9.0

Notes: *Food products were categorized into groups based on the European WHO Nutrient Profile categories.

[^]Food categories with a frequency <5% were omitted from the table: Bread, bread products and crisp breads; yoghurts, sour milk, cream, and other similar foods; water; milk drinks; corn products.

TABLE 4. Nutritional quality of the top selling or the most popular foods and beverages products posted on social media according to the Mexican Nutrient Profile (Phase 1).

	Facebook (n=519)		Instagram (n=292)		YouTube (n=564)	
	n	%	n	%	n	%
Excessive content of						
Calories	450	86.5	236	80.8	468	82.9
Sugars	424	81.7	237	81.1	441	78.2
Saturated fat	143	27.5	66	22.6	156	27.6
Sodium	40	7.7	21	7.1	42	7.4
Non-caloric sweeteners*	128	24.6	93	31.8	71	12.6
Caffeine*	60	11.5	33	11.3	64	11.3
Trans fat	0	0.0	0	0.0	0	0.0
Number of critical nutrients in excessive amount and any content of sweeteners or caffeine per product						
Zero	37	7.1	29	9.9	59	10.4
One	24	4.6	19	6.5	24	4.2
Two	206	39.7	99	33.9	250	44.3
Three	199	38.3	111	38.0	206	36.5
Four	53	10.2	34	11.6	25	4.4
Products classified as unhealthy that were appealing to[^]						
	Facebook ¹		Instagram ²		YouTube ³	
Children	341	94.2	82	87.2	310	90.6
Adolescents	351	97.8	185	93.9	210	95.5
Either children or adolescents	412	94.5	206	91.6	384	91.2

Notes: *Any content of non-caloric sweeteners or caffeine.

[^] Products that exceeded the thresholds for critical nutrients or added NNS or caffeine according to the nutrient profile model of the Mexican warning label system.

¹. Posts classified on Facebook as appealing to children (n=362), adolescents (n=359), and either children or adolescents (n=436).

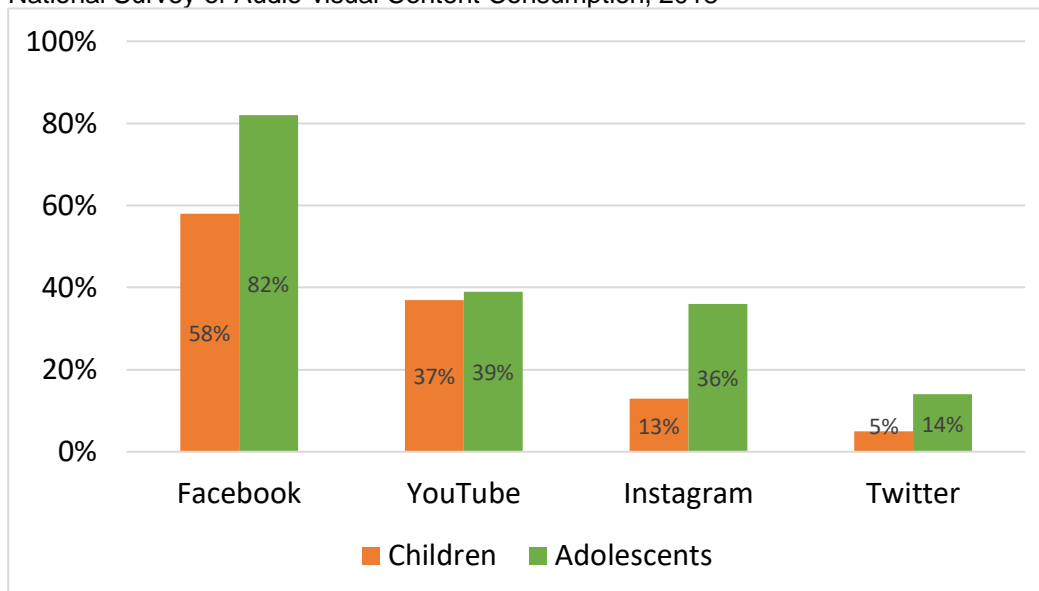
². Posts classified on Instagram as appealing to children (n=94), adolescents (n=197), and either children or adolescents (n=225).

³. Posts classified on YouTube as appealing to children (n=342), adolescents (n=220), and either children or adolescents (n=421).

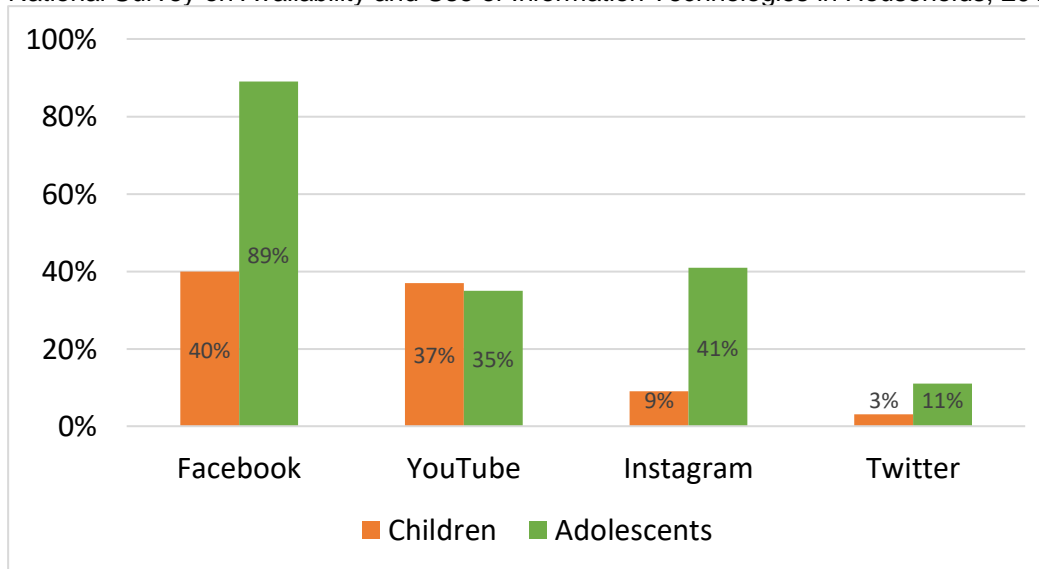
Supplementary materials

Supplementary material 1. Percentage of children and adolescent's users of social media in Mexico.

A) National Survey of Audio-visual Content Consumption, 2018*



B) National Survey on Availability and Use of Information Technologies in Households, 2019[†]



* n=3,226 children social media users; 6,816 adolescent's social media users.

[†] n= 448 children social media users; 1,652 adolescent's social media users.

Supplementary material 2. Top-selling food and beverage products and brands. Data source: Euromonitor 2019

Beverage products and brands	Food products and brands
1. Coca-Cola [^]	1. Lala [*]
2. Pepsi [^]	2. Bimbo ^o
3. Bonafont [*]	3. Alpura [*]
4. Ciel [*]	4. Gamesa [^]
5. Del Valle [^]	5. La Costeña [*]

6. Diet Coke [^]	6. Marinela ^o
7. Red Cola ^o	7. Tía Rosa [*]
8. Fanta [^]	8. Sabritas ^o
9. Levité [*]	9. Maruchan [*]
10. Peñafiel [^]	10. Trident/Dirol [^]
11. Santa María [*]	11. Kellogg's ^o
12. Sprite [^]	12. Fud [*]
13. Jumex ^o	13. Noche Buena [*]
14. E Pura [*]	14. Nido [*]
15. Big ^o	15. Dolores [*]
16. Squirt ^o	16. McCormick [^]
17. Nestlé Pureza Vital [*]	17. Ricolino ^o
18. Boing ^o	18. Herdez [*]
19. Santorini [*]	19. Cheetos ^a
20. Lift ^a	20. Doritos ^a

^oIncluded food or beverage products or brands in the analysis.

[^]Products excluded due to no activity on social media in the last month.

^{*}Food and beverage categories are not part of scope: sweetened non-dairy beverages, snacks, candies and desserts, sweet cereals, and sweetened dairy drinks.

^aExcluded due to sample size already completed.

Supplementary material 3. Most popular Facebook fan pages. Data source: Socialbakers

<i>Beverage products and brands[§]</i>	<i>Food products and brands</i>
1. Bonafont*	1. Crunch México [°]
2. Jarritos [°]	2. Friso México*
3. Red cola [°]	3. Bimbo [°]
4. Gatorade^	4. La Villita*
5. Jumex [°]	5. Ruffles^
6. Boing de frutas [°]	6. Quesos NocheBuena*
7. Vive 100% México^	7. Mamut^
8. Café Olé [°]	8. Barcel [°]
9. Coffée-Mate México*	9. Queso Philadelphia*
10. Ciel*	10. Lyncott*
11. Del Valle Mexico^	11. Lala México*
12. Kermato*	12. Bubulubu [°]
13. Sidral Mundet^	13. Chips Barcel [°]
14. Jumex Frutzzo [°]	14. Freskas ^a
15. Peñafiel^	15. Chef JoseRa Castillo ^a
16. Limón & Nada Mx^	16. Starbucks México [°]
17. Silk*	17. Subway México [°]
18. Coca-Cola FEMSA México^	18. Carl's Jr. México ^a
19. V8 Splash LATAM^	19. Burger King México ^a
20. Fresca^	20. Krispy Kreme México ^a
21. Jugos-Natura [°]	
22. Twinings México*	
23. Pato Pascual [°]	
24. Lulú [°]	
25. Frutos de vida ^a	

[°]Included food or beverage products or brands

^Products with no activity on social media in the last month

*Food and beverage categories that are not part of scope

^aExcluded due to sample size was already completed

[§]More beverage products were included in the list to complete sample size

Supplementary material 4. Definitions of the extent and nature variables.







Extent	
Unique post	Post with original text and images and not re-shared.
Day of publication	
Weekdays	Post uploaded between Monday to Friday.
Weekend	Post uploaded Saturdays or Sundays.
Brand ad or product ad	
Brand ad	If the ad is for a brand but does not specify which product.
Product ad	If the ad promotes a specific product graphical or textually.
Nature	
Post type	
Only text	Text post with no image or video.
Text and image	Text post with images but no video.
Video and text	Text post with video.
Likes/reactions post	Number of likes and reactions the post has received at the time of capturing.
Comments post	Number of comments the post has received at the time of capturing.
Shares post	Number of shares the post has received at the time of capturing.
Video views	Number of views the post has received at the time of capturing, only applies to videos post.
Use of brand logos	Brand logo shown within the post excluding the logo post "icon".
Image of packaging	Image of the product packaging, do not apply for brand ads.
Image of product itself	Image of the product itself, do not apply for brand ads.
Brand characters	Characters that have been created for the sole purpose of promoting a product or brand.
Licensed characters	Character that has been created for an animated programme or movie and is then licensed by brands to appear in their promotions.
Celebrity endorsers	Famous person who uses public recognition to recommend or co-present a brand or product.
Website address	A link for the company website presented textual or graphically.
Link to other social media platforms	A link for the other social media account presented textual or graphically.
Hashtag	A word or phrase followed by the sign "#" presented textual or graphically.
Engagement to interact with the post	A prompt to like, share, tag, comments or post a text, image or video presented textual or graphically.
Engagement to buy	A prompt to buy the product presented textual or graphically, i.e., "buy now" or link to pay.
Engagement to consume	A prompt to consume the product presented textual or graphically, i.e., "try it".
Advergame	A prompt to try a game that was developed by the brand to promote itself or a product.
Sport, music, or other events	A prompt to assist to a future event or to remember a past event.
Special day	A link to national holidays or popular days on the internet, i.e., TBT or Valentine's Day.
Premium and no premium offers	Giveaways, collectible, vouchers, rebates, or competitions/contests to win products or other items.
Sponsorship	Is there a health claim within the post (text on screen or mentioned verbally in a video)? Where more than one claim is made, code the main claim using the list below. If there is more than one main claim, code the health claim that was mentioned first.
Health or nutrition claims	A claim about nutrition or health presented textual or graphically, excluding mandatory claims.
Downloaded material	Material downloadable such as puzzle or draws.
Tie promotion	The post promotes a second product when a first one is bought.
Philanthropy	The post disclaimed corporate social responsibility.
Physical activity depicted	The post feature characters doing physical activity, i.e., running, jumping, playing sport and other energetic activities) beyond casual walking or simply moving, excluding mandatory claims.
Jingles sound	The post features a signature 'jingle' (i.e., McDonald's "I'm lovin' it", only applies to video post.
Marketing appealing to	

Children	Any marketing message that is aimed at children or attracts children. Examples of this includes: use of strong, bright, vibrant colors, large letters and little text; children's voices; boys or girls real or illustrated; children's music or sounds such as songs with distorted voices; invite to collect items; draw/drawings; animated characters and eye-catching editing effects; real objects caricatured, forests, magic, fantasy, tales, animals, smiles, friends, surprise, non-human figures (objects/food with "humanized" arms, hands, legs, eyes); growing up, games or Toys (trendy cartoons, dolls, etc), characters from movies directed at children, cartoons or programs directed at children or athletes, food or drinks aimed at boys or girls for example (yogurt with cereals, milk drinks for children). Mentions school lunch or school.
Adolescents	Any marketing message that is aimed at adolescents or attracts adolescents. Examples of this includes: Personalities from TV shows, movies for over 13 years (even if they include alcohol, bars, clubs, profanity, violence, nudity), "idols" or celebrities are shown, sports, popularity, cool, competitiveness, leadership, excelling, good vibe, fashion, rebellion, daring, adventurous, fearless, no stress, flow, flirt, break up, best friends, crush, energy, disorder, acne, party, independence, technology, relationships, use of memes.
Children & adolescents	The previous definitions for children and adolescents mentioned.

Supplementary material 5. Phase 1 of the Nutrient Profile Model of the Mexican front of package warning labelling system for identifying products excessive in energy, sugar, fats, and sodium, and added sweeteners or caffeine.

	Energy	Sugar	Saturated fat	Trans fat	Sodium	Sweeteners	Caffeine
Food	≥275 total kcal	≥10% of total energy from free sugars	≥10% of total energy from saturated fat	≥1% of total energy from trans fat	≥350mg	Any amount of added sweeteners	Any amount of added caffeine
Beverages	≥70 total kcal or 10% of total energy from free sugars				≥350mg or ≥45mg in non-caloric beverages		

Supplementary material 6. Examples of marketing techniques employed on social media by food and beverage products and brands appealing to a) children and b) adolescents.

Children	Adolescents
 <p>COMO Mexicola NO HAY DOS</p> <p>Para celebrar esta gran fiesta, compartimos el sabor de México con Mexicola. Y es que en México somos creativos, alegres, sabrosos, se entregamos, queremos y muchas cosas más que nos distinguen y nos hacen únicos. Por eso Mexicola es el refresco 100% mexicano que ahora presenta una nueva formulación y un atractivo diseño hecho en su lata de 355 ml. Mexicola es nuestro refresco con un gran sabor es el refresco más grande. Y todos lo pedimos porque somos mexicanos. Nada igual para compartir con amigos o la familia y ahora en refresco, los sabores y deliciosos platillos mexicanos son la mejor combinación para que no te olvides de saborear. No olvides que como Mexicola, ¡no hay dos!</p> <p>#FiestaPatitas #ESaborDeMexico #NuestroMismoSabor #ComMexicolaHayDos #DíaMexicano #Wuachi #Lata355ml #Mexicola</p>	 <p>Tu ex te dice que ya lo pensó bien y que mejor si quiere regresar contigo, tu tercer emoji es tu respuesta: BOING!</p> <p>boingoficialmx • Seguir</p> <p>boingoficialmx Comenta solo con 3 emojis y el tercero es tu respuesta. #Boinglovers #Boing No olvides compartir 0</p> <p>04 Jun 1 Respuesta Responder</p> <p>04 Jun 1 Respuesta Responder</p> <p>04 Jun 1 Respuesta Responder</p> <p>15 Me gusta</p> <p>12 DE JUNIO DE 2019</p> <p>Inicia sesión para indicar que te gusta o comentar.</p>
 <p>¡DIVIÉRTETE COMO OSO!</p> <p>Jumex oficial @ Ya llegaron a Jumex los personajes favoritos! Encuéntralos en tus Jumex Mini 200 ml y 290 ml. También descubre todo lo que preparamos para ti en: www.cartoonnetwork.com.mx/jumex #Jumex #CartoonNetwork #SocialToon #Cartoon #WeAreBears</p> <p>8 Jun</p> <p>Juro que estos son los mejores que los compro siempre</p> <p>224 Me gusta</p> <p>13 DE JUNIO</p> <p>Añade un comentario...</p> <p>Publicar</p> <p>#CartoonNetwork #CN #JUMEX</p> <p>COME FRUTAS Y VERDURAS</p>	 <p>MIS AMIGOS, TENGO GANAS DE UN OLE OREO BIEN FRIO. Yo: TENEMOS.</p> <p>Instacafele • Seguir</p> <p>Instacafele Asi la situación, ¿se les antoja? #WuevraCafele</p> <p>16 Jun</p> <p>16 Jun 2 Me gusta Responder</p> <p>Ver respuestas (1)</p> <p>16 Jun 2 Me gusta Responder</p> <p>Ver respuestas (1)</p> <p>16 Jun 3 Me gusta Responder</p> <p>251 Me gusta</p> <p>24 DE JUNIO</p> <p>Activar Wix</p> <p>Ve a Configurar</p> <p>Publicar</p> <p>Agrega un comentario...</p>
 <p>Un verdadero amigo es aquel que cuando te caes... se ríe de ti</p> <p>BOING!</p> <p>Feliz Día De La Amistad</p> <p>boingoficialmx • Seguir</p> <p>boingoficialmx 30 de julio "Día de la Amistad" 🎉🎉 #delsamistad #amistad #amigo #frutasamigaz #boing #boinglovers</p> <p>02 Jun</p> <p>02 Jun Responder</p> <p>25 Me gusta</p> <p>30 DE JUNIO DE 2019</p> <p>Inicia sesión para indicar que te gusta o comentar.</p>	 <p>LINKEDIN FACEBOOK</p> <p>INSTAGRAM TINDER</p> <p>crunch_mx • Seguir</p> <p>crunch_mx No importa el mood, lo nuestro es hacer ruido. 🎉 #DollyPersonChallenge #No #FridayVibes #QuienEsCrunch</p> <p>16 Jun</p> <p>16 Jun Responder</p> <p>Toda la familia wamior lo quiere</p> <p>16 Jun Responder</p> <p>16 Jun Responder</p> <p>261 Me gusta</p> <p>14 DE JUNIO</p> <p>Agrega un comentario...</p> <p>Publicar</p>

Supplementary material 7. Word cloud with the top 100 popular hashtags in Spanish published on Facebook, Instagram, and YouTube posts of the top selling or the most popular food and beverages products and brands in Mexico.

