


Nutritional content and quality of processed foods and beverages advertised near schools in three cities in the north of Spain

Maria del Mar Fernandez-Alvarez^{1,2} | Edurne Zabaleta-del-Olmo^{3,4,5} |
Judit Cachero-Rodríguez^{1,2} | Rubén Martín-Payo^{1,2} 

¹Faculty of Medicine and Health Sciences, University of Oviedo, Oviedo, Spain

²PRECAM Research Team, Health Research Institute of the Principality of Asturias, Oviedo, Spain

³Fundació Institut Universitari per a la recerca a l'Atenció Primària de Salut Jordi Gol i Gurina (IDIAPJGol), Barcelona, Spain

⁴Nursing Department, Faculty of Nursing, Universitat de Girona, Girona, Spain

⁵Gerència Territorial de Barcelona, Institut Català de la Salut, Barcelona, Spain

Correspondence

Rubén Martín-Payo, Faculty of Medicine & Health Sciences, University of Oviedo, Campus del Cristo, 33006 Oviedo, Spain.
Email: martinruben@uniovi.es

Abstract

The advertisement of food and beverages on television and social media has been widely assessed, evidencing its powerful influence on children's dietary patterns and the development of childhood obesity. However, there is a gap in the evidence about advertisements near schools. The aim of this study was to describe and classify the nutritional quality and information of processed foods and alcoholic and non-alcoholic beverages advertised near schools in three cities in the north of Spain. A descriptive analysis was performed from September to December 2021 in the cities of Oviedo, Gijón and Avilés in the Principality of Asturias (Spain). The nutritional quality and information of processed foods or beverages advertised within a 500m radius of schools were assessed. The Nutri-Score system was used for the classification of the nutritional quality of products and nutritional information, calories, fat, saturated fat, carbohydrates, sugars, protein and salt in 100g or ml of each product was calculated. A total of 73.5% of the products were classified as “foods to eat less often and in small amounts,” and 22.6% and 46.3% were classified as D or E, respectively, according to the Nutri-Score system. Finally, 57.5%, 56.4% and 78.5% of the products showed a medium to high content of fat, saturated fat and sugar, respectively. In conclusion, the food and drink advertisements surrounding schools in the assessed cities promote many products of low nutritional value, rich in fat, saturated fat and sugars, which have high obesogenic potential.

KEYWORDS

advertising, alcoholic beverages, beverages, food, paediatric obesity

INTRODUCTION

According to the World Health Organization (WHO), childhood obesity is one of the biggest international challenges for contemporary society (World Health Organization, 2015). In fact, due to its magnitude and significance, it can be considered one of the most important health problems in our times (Caballero, 2019). Estimated prevalence rates of overweight and obesity in children aged 5–19 years are up to 31% in European countries (NCD Risk Factor Collaboration, 2017). In

Spain, prevalence has shown an upward trend in the last decades (Bravo-Saquicela et al., 2022).

Several factors are associated with this situation. For example, the emergence of certain enhancing factors favouring sedentary lifestyles (Aranceta-Bartrina & Pérez-Rodrigo, 2016; Kenney & Gortmaker, 2017) or low adherence to effective nutritional patterns to fight childhood obesity (Aranceta-Bartrina & Pérez-Rodrigo, 2016; da Rocha et al., 2021). Experts suggest that to fight this problem it is essential to promote lifestyles and a healthier diet (López-Sobaler et al., 2021).

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This is a challenging task according to Caballero (2019) as factors associated with obesity cannot be individually or collectively addressed, and instead require global actions focused on environmental, political or business-related factors. Among the recommended actions, limiting the marketing of unhealthy food and beverages is a key element. Various authors conclude that this type of marketing influences food preferences after being exposed to advertisements and results in an increased intake of the products advertised (Sadeghirad et al., 2016; Vanderlee et al., 2021). The assessment of the marketing strategies and the characteristics of the advertised products, as well as their influence on children, usually focuses on the media preferred by children, such as television or social media (McCarthy et al., 2022). In a study developed by Vilaro et al. (2017), 32h of US children's television were assessed, and it was observed that 54.6% of the advertisements were about unhealthy products and that 95.5% of food advertisements used persuasive strategies. Similar results for television advertisement were found by Nucci et al. (2020) in Italy, where of all the products specifically targeting children, 94.3% were unhealthy and used persuasive marketing. Similar features are observed in social media (McCarthy et al., 2022; Tsai et al., 2022). In children's online video channels, unhealthy food and beverages are frequently advertised (Tsai et al., 2022). In a study conducted by Tsai et al. (2022) more than 165 YouTube videos were assessed, with a total of more than 1.1 billion views, and unhealthy products were advertised in more than 67% of the videos.

Another form of advertising which children can access and has not been as widely studied, probably because they are not specific to this population, is outdoor advertisement in influence areas for children, such as, for example, schools' proximity areas. Some authors have already assessed the characteristics of these advertisements. Trapp et al. (2021) assessed the advertisements surrounding schools in Perth (Australia), where 1708 food advertisements were identified, of which 74% were for unhealthy products and only 8% were for healthy products. Similar results were found by Dia et al. (2021) in Kampala (Uganda), with a total of 1034 advertisements, 86% for unhealthy products and only 7% for healthy products.

While in Spain there are specific regulations for the marketing of food and beverages in schools (Gobierno de España, 2011), which establish that food marketing promotions in schools should focus on the promotion of healthy food and physical activity habits for the prevention of obesity, there are no regulations regarding marketing near schools. No scientific literature about studies assessing the quality of food and beverages advertised near schools in Spain has been found either. This study is the result of taking into consideration

the influence that these advertisements might have on children (Sadeghirad et al., 2016) with the aim of classifying and describing the nutritional content and quality of processed foods and alcoholic and non-alcoholic beverages advertised near schools in three cities in the north of Spain.

METHODS

Design

This cross-sectional study was conducted between September and December 2021 in the cities of Oviedo, Gijón and Avilés in the Principality of Asturias (Spain). The Principality of Asturias is an autonomous community with approximately 1 million inhabitants. Most of the child population resides in these cities (Sadei, 2021).

Units of analysis

We selected all the primary public and state Catholic schools from the three cities ($n = 104$). Taking into consideration the location of each school, and using Google Maps coordinates, a 500m radius was drawn, the radius of influence for advertisements as previously suggested by other authors (Parnell et al., 2019; Trapp et al., 2021; Vandevijvere et al., 2018).

All advertisements for processed foods or beverages were included (products subjected to industrial processes and/or packaging), both alcoholic and non-alcoholic, that could be seen by children in their commute to and from school. Assessment of all advertisements was considered, regardless of their location, if they fulfilled the criteria specified (i.e. bus stops, shop windows, facades). Advertisements still visible from the street but located inside stores (i.e. seen through shop windows) were excluded.

Data collection

Data collection and analysis were performed by two researchers and two collaborators in a 10-week period. Initially, two collaborators visited the selected areas to identify and take pictures of any relevant advertisements. Meanwhile, they filled in a digital form in situ that collected data on the location of the advertisement and the name and brand of the products identified. Subsequently, two researchers validated the information from the forms, compared it with the pictures taken and performed the assessment of the nutritional content and quality of the advertised food and drink products.

Classification of advertised products (coding)

Products were initially categorised by groups following the Eatwell Guide (Public Health England, 2018) and alcohol was treated as an independent category. This categorisation was used because it arranges the advertised products into food groups, and it allows us to objectively assess if the percentage observed meets the criteria for a healthy and balanced diet. The nutritional quality of the products followed the Nutri-Score categorisation (Santé publique France, 2022). The Nutri-Score system classifies food and beverages by their nutritional quality into five possible categories ranging from A (high nutritional value) to E (low nutritional value) (Santé publique France, 2022). Nutritional information, kilocalories (kcal), fat, saturated fat, carbohydrate, sugars, proteins and salt per 100 g or ml of each product were obtained from the picture of the product and, in those cases where they could not be identified following this procedure, the Open Fact Foods database (2022) was used. Subsequently, fat, saturated fat, sugar and salt content was classified as low, medium or high following the Guide to creating a front-of-pack (FoP) nutrition label for pre-packed products sold through retail outlets from the United Kingdom (Department of Health et al., 2016).

Data analysis

A descriptive analysis of the variables using the median and the interquartile range (IQR) or percentage depending on the nature of the variable was performed. Chi-square test was used to assess differences in the food distribution between cities according to Nutri-Score. IBM SPSS Statistics version 27 was used for all analyses.

RESULTS

A total of 104 of the schools selected were assessed (100%), with 48 from Gijón (46.1%), 35 from Oviedo (33.7%) and 21 from Avilés (20.2%) for outdoor food

and drink advertising within a 500 m radius. The total number of advertised products was 1598, with 1167 from Gijón (73%), 279 from Oviedo (17.5%) and 152 (9.5%) from Avilés.

Classification of products by groups

According to the classification proposed in the Eatwell Guide (Public Health England, 2018), and as shown in Table 1, the highest percentage of advertised products belong to the category “Foods to eat less often and in small amounts.”

Quality and nutritional information of processed food and beverages

Following the classification proposed by Nutri-Score (Santé publique France, 2022), most advertised products belong to category E (low nutritional value) (Table 2).

Following the reference intakes proposed by the Department of Health et al. (2016) most products presented medium to high levels of fat, saturated fat, sugars and salt, with 46.9% of products classified as containing high levels of saturated fat (Table 3).

DISCUSSION

The findings of the present study found that the nutritional value of processed food and beverages advertised around schools in the assessed cities in Northern Spain is suboptimal as most belong to Nutri-Score category E, low nutritional value (Santé publique France, 2022). Furthermore, a high percentage have a medium to high proportion of fat, saturated fat and sugars.

Most of the products observed can be “classified as eat less often and in small amounts” according to the Eatwell Guide. This includes products such as chocolate, cakes, biscuits, full-sugar soft drinks, butter and ice-cream (Public Health England, 2018). The goal

Group	%
Foods to eat less often and in small amounts	73.5
Water, lower fat milk, sugar-free drinks, tea and coffee	9.0
Alcohol	7.6
Dairy and dairy alternatives	5.3
Beans, pulses, fish, eggs, meat and other proteins	1.9
Oils and spreads	1.6
Potatoes, bread, rice, pasta and other Starchy carbohydrates	0.9
Fruit and vegetables	0.2

TABLE 1 Products' frequency (%) according to the Eatwell guide food groups ($n = 1598$)

TABLE 2 Distribution of food (%) according to Nutri-Score ($n = 1441$)

Group*	% total (n)	% Gijón (n)	% Oviedo (n)	% Avilés (n)	p
A	1.9 (28)	1.3 (14) ^a	2.1 (5) ^{a,b}	6.5 (9) ^b	<0.001
B	14.5 (209)	11.1(118) ^a	20.4 (49) ^b	30.4 (42) ^b	<0.001
C	14.7 (212)	15.8 (168) ^a	14.2 (34) ^{a,b}	7.2 (10) ^b	0.027
D	22.6 (325)	24.1 (256) ^a	20.8 (50) ^{a,b}	13.8 (19) ^b	0.019
E	46.3 (667)	47.7 (507)	42.5 (102)	42.0 (58)	0.198

Note: Different superscript letters denote the significant differences.

*A (high nutritional value) to E (low nutritional value).

TABLE 3 Percentage of fat, saturated fat, sugars and salt of the products according to the reference intakes, guide of the Food Standards Agency ($n = 1598$)

Percentage	Fat	Saturated fat	Sugars	Salt
Low	42.5	43.6	21.5	82.7
Medium	27.1	9.5	43.8	12.6
High	30.4	46.9	34.7	4.8

of these guidelines is to inform the population about the percentage of each food group to eat weekly for a healthy and balanced diet. Considering the current findings, we pose the following question: What would happen if only the products assessed in the present study were included in children's diets? The answer is obvious, as such a diet would be neither healthy nor balanced.

Generally, the data are consistent with previous studies (Dia et al., 2021; Parnell et al., 2019; Trapp et al., 2021). It seems that, regardless of geographical factors, and therefore cultural or socio-economic factors, there is a marked tendency to advertise unhealthy products versus healthy products, with a clear preference for sugar-sweetened beverages or alcohol, among others. This finding is especially worrying considering that the intake of sugar-sweetened drinks, fats and sodium, higher in central European countries, shows an association with the most common health problems in children, such as obesity (GBD 2017 Diet Collaborators, 2019). Hence, it is necessary to highlight that the advertisement of products high in fat, sugar and salt is one of the environmental factors considered as a contributor to the obesity epidemic. The results of the study conducted by Martin-Biggers et al. (2013) conclude that there is a higher obesity rate in the geographical areas where more space is devoted to the advertisement of sweets, particularly sugar-sweetened beverages.

Another aspect to consider, related to obesity and other health problems, is the considerable percentage of advertisements devoted to alcoholic beverages. Children are particularly vulnerable both to the intake, associated with lack of experience with the harms and the harms related to the intake of alcoholic beverages (Babor et al., 2017). Previous research

highlighted that the availability of alcohol in areas where children live is associated with an increased intake (Azar et al., 2016; Morrison et al., 2019) or even the initiation of intake (Boniface et al., 2022). A systematic review by Bryden et al. (2012) emphasises the existence of signs of a direct association between alcohol outlet density and advertisement exposure at the community level and increased alcohol intake in children. While there is not a regulation that can be clearly applied to the setting of the present study in Spain, from an ethical point of view and based on the evidence available, there might be a need to adopt special measures for the marketing and distribution of advertisements featuring alcoholic beverages near schools.

The classification of the assessed products according to the Nutri-Score scale revealed their suboptimal nutritional quality, as most were categorised as D or E (low nutritional value) (Santé publique France, 2022). The tendency to include products categorised as D or E seems common in marketing strategies most often including children's products (Richonnet et al., 2021) and is consistent with other authors' content analyses of food and drink advertising in mass media. In a study developed by Escalon et al. (2021) in France, it was observed that foods belonging to categories D or E tend to be advertised on television in the time slots during which children watch on television. A similar trend is observed in Spain, where the marketing of foods or beverages viewed by children on television include 34% and 13% of products classified as D and E, respectively (Montaña et al., 2019). An unexpected finding was the differences found in the cities in the food distribution according to Nutri-Score. This could probably be explained as a marketing strategy but, since it has not been analysed in depth, future studies should consider these results.

It seems contradictory that institutions and health-care authorities manifest their concern for childhood obesity while findings such as the one described in the present study and in the referenced literature are observed. The abundance of unhealthy food and drink advertising surrounding schools is even more flagrant when evidence shows that the intake of products with lower scores in scales such as Nutri-Score, that is, products with suboptimal nutritional quality, are

associated with weight gain as well as severe health problems in childhood (International Agency for Cancer Research, 2021).

Several factors must be considered for outdoor advertisements. On the one hand, exposure to advertising for unhealthy products can promote intake in children (Boswell & Kober, 2016; Boyland et al., 2022; Smith et al., 2019), which supports the need to establish actions and public health regulations with the aim of reducing children's exposure (Boyland et al., 2016). In countries with such regulations, for example Ireland and Finland, the advertisement of unhealthy products aimed at children decreases, and so does the intake of these products (Chung et al., 2022). However, Spain lacks these types of regulations and only the PAOS (*Código de regulación de la Publicidad de Productos Alimentarios dirigida a Menores, Prevención de la Obesidad y Salud/code for regulation of the advertising of food products for minors aimed at prevent their obesity and promote their health*) is available, which does not seem efficient as evidenced by the findings reported by several authors (Frauca & García, 2021; Gobierno de España, 2012; León-Flández et al., 2017) and as confirmed by the findings of the present study.

On the other hand, children are an especially vulnerable target of unhealthy food and beverage marketers as their ability to recognise the persuasive intent of advertising is limited making them more susceptible to these campaigns (European Commission, 2021), especially when well-known or socially accepted brands are involved (Coates et al., 2019; Ponce-Blandón et al., 2020) or promotional elements are included (Bennett et al., 2020; Dixon et al., 2017). This signals a need to implement pedagogical strategies for parents, for example advise parents on healthy food purchases, not only because they are in great part responsible for their children's diets but also because as several authors state, there seems to be a tendency among parents to underestimate children's excess weight (Fernández-Álvarez et al., 2021; Ramiro-González et al., 2017), which prevents them from adopting preventing or managing measures, that is, if something is not perceived as a problem, it will not be solved.

Finally, it is important to highlight that barely any studies have been found assessing the influence of unhealthy products advertised near schools. On the contrary, studies focused on the influence of television or social media (Boyland et al., 2022) have been found. Findings from this study make this problem visible and highlight the need for research assessing how such marketing impacts children.

Strengths, limitations and future directions

One of the limitations of the present study is that only three cities were assessed, so the findings could

vary if other areas in the same region were studied. However, considering that these are advertisements by sector businesses, it is likely that the campaigns are used extensively in other regions, and therefore the findings could be similar. However, while the results encourage reflection, we do not recommend extrapolating the results. But this limitation is also one of the study's strengths, as it confirms the possibility of mapping food and beverage advertisements near schools. Also, it must be considered a limitation that non-processed food or beverages could not be included because it is impossible to code using Nutri-Score or the UK nutrition label for pre-packed products.

Studies show that exposure to food advertising increases food intake in children (Boyland et al., 2016). Therefore, study findings may be useful to support public health policies aimed at building environments supportive of healthy eating.

Evidence from the present study draws attention to a gap in the literature concerning the potentially influential role of outdoor advertising near schools in influencing children's food and beverage intake. Additionally, the study can also be a starting point for future studies with similar objectives that aim to provide real-life evidence about advertisements near schools. As previously indicated, there is a gap in the literature for this context despite the influence that advertisements have on children (Sadeghirad et al., 2016).

CONCLUSIONS

The findings of the present study allow us to confirm the prevalence of processed foods and beverages with suboptimal nutritional value, rich in fat, saturated fat and sugars, in advertisements near schools in the assessed cities. The intake of these products can contribute to childhood obesity. Hence, we advocate reviewing the regulations relating to advertising near schools with the aim of reducing or eliminating advertisements for unhealthy products and promoting advertising of healthy products.

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CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

DATA AVAILABILITY STATEMENT

No data are available.

ETHICS STATEMENT

This research did not require ethical approval because no humans or animals took part in the research process.

ORCID

Rubén Martín-Payo  <https://orcid.org/0000-0001-7835-4616>

REFERENCES

- Aranceta-Bartrina, J. & Pérez-Rodrigo, C. (2016) Determinants of childhood obesity: ANIBES study. *Nutricion Hospitalaria*, 33(Suppl 4), 339. Available from: <https://doi.org/10.20960/nh.339>
- Azar, D., White, V., Coomber, K., Faulkner, A., Livingston, M., Chikritzhs, T. et al. (2016) The association between alcohol outlet density and alcohol use among urban and regional Australian adolescents. *Addiction (Abingdon, England)*, 111(1), 65–72. Available from: <https://doi.org/10.1111/add.13143>
- Babor, T.F., Robaina, K., Noel, J.K. & Ritson, E.B. (2017) Vulnerability to alcohol-related problems: a policy brief with implications for the regulation of alcohol marketing. *Addiction (Abingdon, England)*, 112(Suppl 1), 94–101. Available from: <https://doi.org/10.1111/add.13626>
- Bennett, R., Zorbas, C., Huse, O., Peeters, A., Cameron, A.J., Sacks, G. et al. (2020) Prevalence of healthy and unhealthy food and beverage price promotions and their potential influence on shopper purchasing behaviour: a systematic review of the literature. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 21(1), e12948. Available from: <https://doi.org/10.1111/obr.12948>
- Boniface, S., Critchlow, N., Severi, K., MacKintosh, A.M., Hooper, L., Thomas, C. et al. (2022) Underage Adolescents' reactions to adverts for beer and Spirit brands and associations with higher risk drinking and susceptibility to drink: a cross-sectional study in the UK. *Alcohol and Alcoholism (Oxford, Oxfordshire)*, 57(3), 347–356. Available from: <https://doi.org/10.1093/alcalc/agab018>
- Boswell, R.G. & Kober, H. (2016) Food cue reactivity and craving predict eating and weight gain: a meta-analytic review. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 17(2), 159–177. Available from: <https://doi.org/10.1111/obr.12354>
- Boyland, E., McGale, L., Maden, M., Hounsoume, J., Boland, A., Angus, K. et al. (2022) Association of Food and Nonalcoholic Beverage Marketing with Children and Adolescents' eating behaviors and health: a systematic review and meta-analysis. *JAMA Pediatrics*, 176, e221037. Available from: <https://doi.org/10.1001/jamapediatrics.2022.1037>
- Boyland, E.J., Nolan, S., Kelly, B., Tudur-Smith, C., Jones, A., Halford, J.C. et al. (2016) Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and nonalcoholic beverage advertising on intake in children and adults. *The American Journal of Clinical Nutrition*, 103(2), 519–533. Available from: <https://doi.org/10.3945/ajcn.115.120022>
- Bravo-Saquicela, D.M., Sabag, A., Rezende, L. & Rey-Lopez, J.P. (2022) Has the prevalence of childhood obesity in Spain plateaued? A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 19(9), 5240. Available from: <https://doi.org/10.3390/ijerph19095240>
- Bryden, A., Roberts, B., McKee, M. & Petticrew, M. (2012) A systematic review of the influence on alcohol use of community level availability and marketing of alcohol. *Health & Place*, 18(2), 349–357. Available from: <https://doi.org/10.1016/j.healthplace.2011.11.003>
- Caballero, B. (2019) Humans against obesity: who will win? *Advances in Nutrition*, 10(S1), S4–S9. Available from: <https://doi.org/10.1093/advances/nmy055>
- Chung, A., Zorbas, C., Riesenber, D., Sartori, A., Kennington, K., Ananthapavan, J. et al. (2022) Policies to restrict unhealthy food and beverage advertising in outdoor spaces and on publicly owned assets: a scoping review of the literature. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 23(2), e13386. Available from: <https://doi.org/10.1111/obr.13386>
- Coates, A.E., Hardman, C.A., Halford, J., Christiansen, P. & Boyland, E.J. (2019) The effect of influencer marketing of food and a “protective” advertising disclosure on children's food intake. *Pediatric Obesity*, 14(10), e12540. Available from: <https://doi.org/10.1111/ijpo.12540>
- da Rocha, B., Rico-Campà, A., Romanos-Nanclares, A., Ciriza, E., Barbosa, K., Martínez-González, M.Á. et al. (2021) Adherence to Mediterranean diet is inversely associated with the consumption of ultra-processed foods among Spanish children: the SENDO project. *Public Health Nutrition*, 24(11), 3294–3303. Available from: <https://doi.org/10.1017/S1368980020001524>
- Department of Health, The Food Standards Agency, and devolved administrations in Scotland, Northern Ireland and Wales & British Retail Consortium. (2016) *Guide to creating a front of pack nutrition label for pre-packed products sold through retail outlets*. Available at: https://www.food.gov.uk/sites/default/files/media/document/fop-guidance_0.pdf [Accessed 17th May 2022].
- Dia, O., Løvhaug, A.L., Rukundo, P.M. & Torheim, L.E. (2021) Mapping of outdoor food and beverage advertising around primary and secondary schools in Kampala city, Uganda. *BMC Public Health*, 21(1), 707. Available from: <https://doi.org/10.1186/s12889-021-10661-8>
- Dixon, H., Niven, P., Scully, M. & Wakefield, M. (2017) Food marketing with movie character toys: effects on young children's preferences for unhealthy and healthier fast food meals. *Appetite*, 117, 342–350. Available from: <https://doi.org/10.1016/j.appet.2017.07.014>
- Escalon, H., Courbet, D., Julia, C., Srour, B., Hercberg, S. & Serry, A.J. (2021) Exposure of French children and adolescents to advertising for foods high in fat, sugar or salt. *Nutrients*, 13(11), 3741. Available from: <https://doi.org/10.3390/nu13113741>
- European Commission. (2021) *Health promotion and disease prevention knowledge gateway*. Available at: https://knowledge4policy.ec.europa.eu/health-promotion-knowledge-gateway/topic/food-non-alcoholic-beverage-marketing-children-adolescents_en [Accessed 17th May 2022].
- Fernández-Álvarez, M., Martín-Payo, R., Zabaleta-Del-Olmo, E., García-García, R., González-Méndez, X. & Carrasco-Santos, S. (2021) Concordance between the weight of Spanish adolescent soccer players, their self-perceived weight, and their weight as perceived by their parents. *Journal of Pediatric Nursing*, 60, e13–e18. Available from: <https://doi.org/10.1016/j.pedn.2021.02.011>
- Frauca, J.R. & García, R.C. (2021) ¿Siguen España ofreciendo brindis al sol en cuestión de obesidad infantil? [Does Spain still offer a toast to the sun on the issue of childhood obesity?]. *Atencion Primaria*, 53(1), 1–2. Available from: <https://doi.org/10.1016/j.aprim.2020.11.002>

- GBD 2017 Diet Collaborators. (2019) Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the global burden of disease study 2017. *Lancet (London, England)*, 393(10184), 1958–1972. Available from: [https://doi.org/10.1016/S0140-6736\(19\)30041-8](https://doi.org/10.1016/S0140-6736(19)30041-8)
- Gobierno de España. (2011) *Ley 17/2011, de 5 de julio, de seguridad alimentaria y nutrición*. Available at: <https://www.boe.es/buscar/act.php?id=BOE-A-2011-11604> [Accessed 17th May 2022].
- Gobierno de España. (2012) *Código de correulación de la publicidad de alimentos y bebidas dirigida a Menores, prevención de la obesidad y salud (código PAOS)*. Available at: https://www.aesan.gob.es/AECOSAN/docs/documentos/nutricion/Nuevo_Codigo_PAOS_2012_espanol.pdf [Accessed 17th May 2022].
- International Agency for Cancer Research. (2021) *The Nutri-Score: a science-based front-of-pack nutrition label*. Available at: https://www.iarc.who.int/wp-content/uploads/2021/09/IARC_Evidence_Summary_Brief_2.pdf [Accessed 17th May 2022].
- Kenney, E.L. & Gortmaker, S.L. (2017) United States Adolescents' Television, computer, videogame, smartphone, and tablet use: associations with sugary drinks, sleep, physical activity, and obesity. *The Journal of Pediatrics*, 182, 144–149. Available from: <https://doi.org/10.1016/j.jpeds.2016.11.015>
- León-Flández, K., Rico-Gómez, A., Moya-Geromin, M.Á., Romero-Fernández, M., Bosqued-Estefanía, M.J., Damián, J. et al. (2017) Evaluation of compliance with the Spanish code of self-regulation of food and drinks advertising directed at children under the age of 12 years in Spain, 2012. *Public Health*, 150, 121–129. Available from: <https://doi.org/10.1016/j.puhe.2017.05.013>
- López-Sobaler, A.M., Aparicio, A., Salas-González, M.D., Loria Kohen, V. & Bermejo López, L.M. (2021) Childhood obesity in Spain and associated factors. *Nutricion Hospitalaria*, 38(Spec No2), 27–30. Available from: <https://doi.org/10.20960/nh.03793>
- Martin-Biggers, J., Yorkin, M., Aljallad, C., Ciecierski, C., Akhabue, I., McKinley, J. et al. (2013) What foods are US supermarkets promoting? A content analysis of supermarket sales circulars. *Appetite*, 62, 160–165. Available from: <https://doi.org/10.1016/j.appet.2012.12.001>
- McCarthy, C.M., de Vries, R. & Mackenbach, J.D. (2022) The influence of unhealthy food and beverage marketing through social media and advergingaming on diet-related outcomes in children—a systematic review. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 23(6), e13441. Available from: <https://doi.org/10.1111/obr.13441>
- Montaña, M., Jiménez-Morales, M. & Vázquez, M. (2019) Food advertising and prevention of childhood obesity in Spain: analysis of the nutritional value of the products and discursive strategies used in the ads Most viewed by children from 2016 to 2018. *Nutrients*, 11(12), 2873. Available from: <https://doi.org/10.3390/nu11122873>
- Morrison, C.N., Byrnes, H.F., Miller, B.A., Wiehe, S.E., Ponicki, W.R. & Wiebe, D.J. (2019) Exposure to alcohol outlets, alcohol access, and alcohol consumption among adolescents. *Drug and Alcohol Dependence*, 205, 107622. Available from: <https://doi.org/10.1016/j.drugalcdep.2019.107622>
- NCD Risk Factor Collaboration (NCD-RisC). (2017) Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. *Lancet (London, England)*, 390(10113), 2627–2642. Available from: [https://doi.org/10.1016/S0140-6736\(17\)32129-3](https://doi.org/10.1016/S0140-6736(17)32129-3)
- Nucci, D., Rabica, F., Dallagiocoma, G., Fatigoni, C. & Gianfredi, V. (2020) Are the Italian children exposed to advertisements of nutritionally appropriate foods? *Foods (Basel, Switzerland)*, 9(11), 1632. Available from: <https://doi.org/10.3390/foods9111632>
- Open Food Facts – Spain. (2022) *Open Food Facts food products database*. Available at: <https://es-en.openfoodfacts.org/> [Accessed 17th May 2022].
- Parnell, A., Edmunds, M., Pierce, H. & Stoneham, M.J. (2019) The volume and type of unhealthy bus shelter advertising around schools in Perth, Western Australia: results from an explorative study. *Health Promotion Journal of Australia: Official Journal of Australian Association of Health Promotion Professionals*, 30(1), 88–93. Available from: <https://doi.org/10.1002/hpja.55>
- Ponce-Blandón, J.A., Pabón-Carrasco, M., Romero-Castillo, R., Romero-Martín, M., Jiménez-Picón, N. & Lomas-Campos, M. (2020) Effects of advertising on food consumption preferences in children. *Nutrients*, 12(11), 3337. Available from: <https://doi.org/10.3390/nu12113337>
- Public Health England. (2018) *The eatwell guide*. Available at: <https://www.gov.uk/government/publications/the-eatwell-guide> [Accessed 17th May 2022].
- Ramiro-González, M.D., Sanz-Barbero, B. & Royo-Bordonada, M.Á. (2017) Childhood excess weight in Spain from 2006 to 2012. Determinants and parental misperception. *Revista Española de Cardiología (English ed.)*, 70(8), 656–663. Available from: <https://doi.org/10.1016/j.rec.2017.02.026>
- Richonnet, C., Mosser, F., Favre, E., Robert, M., Martin, F. & Thiebaut, I. (2021) Nutritional quality and degree of processing of Children's foods assessment on the French market. *Nutrients*, 14(1), 171. Available from: <https://doi.org/10.3390/nu14010171>
- Sadeghirad, B., Duhaney, T., Motaghipisheh, S., Campbell, N.R. & Johnston, B.C. (2016) Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. *Obesity Reviews: An Official Journal of the International Association for the Study of Obesity*, 17(10), 945–959. Available from: <https://doi.org/10.1111/obr.12445>
- Sadei. (2021) *Padrones de habitantes*. Available at: https://www.sadei.es/sadei/poblacion/padrones-de-habitantes_167_1_ap.html [Accessed 31st October 2022].
- Santé Publique France. (2022) *Nutri-Score*. Available at: <https://www.santepubliquefrance.fr/en/nutri-score> [Accessed 17th May 2022]
- Smith, R., Kelly, B., Yeatman, H. & Boyland, E. (2019) Food marketing influences Children's attitudes, preferences and consumption: a systematic critical review. *Nutrients*, 11(4), 875. Available from: <https://doi.org/10.3390/nu11040875>
- Trapp, G., Hooper, P., Thornton, L., Kennington, K., Sartori, A., Wickens, N. et al. (2021) Children's exposure to outdoor food advertising near primary and secondary schools in Australia. *Health Promotion Journal of Australia: Official Journal of Australian Association of Health Promotion Professionals*, 33, 642–648. Available from: <https://doi.org/10.1002/hpja.532>
- Tsai, K.A., Pan, P., Liang, C., Stent-Torriani, A., Prat, L., Cassidy, O. et al. (2022) Food and beverage product appearances in educational, Child-Targeted YouTube Videos. *Childhood Obesity (Print)*. Online ahead of print. Available from: <https://doi.org/10.1089/chi.2021.0232>
- Vanderlee, L., Czoli, C.D., Pauzé, E., Potvin Kent, M., White, C.M. & Hammond, D. (2021) A comparison of self-reported exposure to fast food and sugary drinks marketing among parents of children across five countries. *Preventive Medicine*, 147, 106521. Available from: <https://doi.org/10.1016/j.pymed.2021.106521>
- Vandevijvere, S., Molloy, J., Hassen de Medeiros, N. & Swinburn, B. (2018) Unhealthy food marketing around New Zealand schools: a national study. *International Journal of Public Health*, 63(9),

1099–1107. Available from: <https://doi.org/10.1007/s00038-018-1158-7>

Vilaro, M.J., Barnett, T.E., Watson, A.M., Merten, J.W. & Mathews, A.E. (2017) Weekday and weekend food advertising varies on children's television in the USA but persuasive techniques and unhealthy items still dominate. *Public Health*, 142, 22–30. Available from: <https://doi.org/10.1016/j.puhe.2016.10.011>

World Health Organization. (2015) *European regional consultation of the WHO Commission on Ending Childhood Obesity*. Available at: <https://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/news/news/2015/06/european-regional-consultation-of-the-who-commission-on-ending-childhood-obesity> [Accessed 17th May 2022].

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