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Article

Unhealthy food advertising on social media: policy lessons from the Australian Ad Observatory

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Abstract

The World Health Organization and public health experts are calling for urgent restrictions on the online marketing of unhealthy food. The harmful effects of exposure to advertising for 'unhealthy foods', including discretionary foods high in fat, salt or sugar, particularly for children, has prompted a proposed policy action in Australia to prohibit all online unhealthy food marketing. We used a novel data donation infrastructure, the Australian Ad Observatory, to create a dataset of 1703 ads promoting top-selling unhealthy food brands that had been placed by 141 different advertisers on 367 individual Australians' Facebook feeds. We used this dataset to identify any targeting of unhealthy food ads towards young people (18–24), investigate harmful marketing practices by four of the top advertisers (KFC, McDonald's, Cadbury and 7-Eleven); and demonstrate how online advertising may be made observable and accountable. We find indications that young people (18–24), especially young men, are being targeted by unhealthy food, especially fast food, ads. We also find that unhealthy food brands use potentially harmful marketing strategies to appeal to children, young people, parents and the broader community, including cartoon characters, and associations with popular sports and greenwashing. The policy implications of our findings are that a broad prohibition on all forms of unhealthy food advertising online is desirable to protect not only children but also young people and the broader community. Such a prohibition will go one step towards addressing the commercial and digital determinants of health caused by harmful industries' use of online automated advertising.

Keywords: unhealthy food, advertising, food marketing, online, regulation, social media, digital platforms, fast food

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Contribution to Health Promotion

- This article investigates unhealthy food advertising on Facebook in Australia to identify whether current proposals to prohibit online unhealthy food advertising would benefit not only children but also the broader community.
- Insights suggest that young people, especially men, are targeted with unhealthy food ads.
- Harmful marketing practices include co-promotion with sports, gamification and visuals appealing to children.
- These findings indicate that a broad prohibition on advertising both unhealthy food products and brands is desirable.
- This research demonstrates the value of a novel digital research tool, the Ad Observatory, to observe and monitor online marketing.

BACKGROUND

Exposure to unhealthy food marketing influences food preferences and consumption habits, particularly in children and young people (Smith *et al.*, 2019; Boyland *et al.*, 2022), contributing to diet-related non-communicable diseases (Afshin *et al*, 2019; Swinburn *et al*, 2019). There is an urgent need to regulate unhealthy food marketing to reduce exposure (Boyland *et al.*, 2022; WHO, 2023a, 2023b). Yet the regulation of food marketing is politically contested (Russell *et al.*, 2020; Sing and Backholer, 2023). Recent policy momentum

has, however, sparked renewed efforts in Australia and internationally to restrict all advertising of 'unhealthy foods', including 'foods and beverages that are high in fat, salt and/or sugar and are not needed as part of a healthy diet' to reduce children's exposure (Ofcom, 2023; Australian Government, 2024).

Online food marketing has become a problematic feature of modern 'digital food environments', 'the online settings through which flows of services and information that influence people's food and nutrition choices and behaviour are

directed' (WHO, 2021, p. 1). Inequity of access to helpful online health information and the promotion of misinformation are now recognized as 'digital determinants of health' (Kenworthy *et al.,* 2023). Engagement in commercially motivated digital environments, such as major social media platforms, is another digital determinant of health because it increases exposure to personalized and targeted marketing by health-harming industries, such as alcohol, gambling and unhealthy food industries, contributing to negative health effects (Zenone *et al.,* 2023; Kickbush and Holly, 2024; Sing and Lyons, 2024). The ubiquity of technological devices, the availability of powerful data analytics and the seamless integration of both sponsored advertising and organic 'influencer' content into social media, often designed to maximally appeal to targeted audiences (Granheim *et al.,* 2022; Bennett *et al.,* 2024; Sing and Lyons, 2024), creates a confluence of digital and commercial determinants of health that amplify health-harming impacts in ways that are 'largely out of an individual's, community's—or even a country's—control' (Kickbusch and Holly, 2024, p. 2).

Online advertising of unhealthy food

Social media platforms, such as those owned by Meta (Facebook, Instagram), now dominate the provision of online advertising. Their advertising is automated and relies on the vast amount of data about user characteristics and behaviours collected by platforms, data brokers and advertisers (Crain, 2021; Beauvisage *et al.,* 2023). This gives advertisers the ability to finely target and tune the placement, timing and even the precise tone and content of ads to capture attention (eg time spent looking) and engagement (eg likes, comments, clicks) (Carolan, 2018; Montgomery *et al.,* 2019; Paterson *et al.,* 2021; Brown *et al.,* 2024). Social media platforms' commercial reliance on advertising for profit means they are designed to engage and maintain attention (Hwang, 2020; Lyons *et al.,* 2022). Infamously, this may occur through the promotion of online content that is likely to provoke outrage, anger and hate (Munn, 2020). Online attention is also engaged through sensory pleasure, desire and even addiction, including marketing products like alcohol, gambling and unhealthy food (Goodwin, 2022; Lyons *et al.,* 2022).

Unhealthy food marketing pervades social media (eg Facebook, TikTok), content-sharing services (eg YouTube) and videogame streaming platforms (eg Twitch) (Brooks *et al.,* 2022; Çoban *et al.,* 2023; Valero-Morales *et al.,* 2023; WHO 2023a; Evans *et al.,* 2024). Previous research has suggested that online unhealthy food marketing frequently uses techniques that target the most vulnerable, including children and adolescents (Kelly *et al.,* 2021), via brand logos, cartoon characters, colourful packaging, challenges, giveaways and hashtags (Brooks *et al.,* 2022; Çoban *et al.,* 2023). Online advertising can also normalize the habitual consumption of unhealthy food due to its ubiquity and association with positive emotions and popular cultural themes, such as sporting competitions (van der Bend *et al.,* 2022; Sing and Lyons, 2024). Given the ease of access and engaging content of online media platforms (Brooks *et al.,* 2022; Çoban *et al.,* 2023), children and adolescents are likely to be highly vulnerable to unhealthy food marketing (Smith *et al.,* 2019; Boyland *et al.,* 2020). Young adults aged 18–24 are also likely to be highly susceptible to the power of online marketing to normalize brands, exploit social pressures and influence consumption attitudes (Freeman *et al.,* 2016; Brownbill *et al.,* 2018; van der Bend *et al.,* 2022). However, the targeting of unhealthy food advertising to this latter cohort is under-researched (Freeman *et al.,* 2016; Brownbill *et al.,* 2018).

Prohibiting online advertising of unhealthy food

Several jurisdictions have recently proposed strong, broad prohibitions on all unhealthy food advertising online, based on compelling evidence that such broad prohibitions are necessary to protect children from harmful exposure. The UK's prohibition on online advertising of 'less healthy food or drink products' is due to take effect from October 2025 (Ofcom, 2023). In 2024, the Australian federal government proposed a prohibition on 'marketing for unhealthy foods through online media' (Australian Government, 2024, p. 22; see also Supplementary File Part A).

'Unhealthy foods' can be defined based on nutrient content or level of processing (Monteiro *et al.,* 2019). For the purposes of this research, we use the definition set out in the 2024 Australian proposal to make our findings relevant. These define 'unhealthy foods' as 'foods and beverages that are high in fat, salt and/or sugar and are not needed as part of a healthy diet, referred to as discretionary foods in the Australian Dietary Guidelines' (Australian Government, 2024). The 2024 Australian proposal also refers to the Council of Australian Governments (COAG) Health Council's national interim guide, which sets out which foods and drinks should not be marketed to children based on the current Australian Dietary Guidelines (COAG, 2018). The COAG guide lists seven 'unhealthy' food and drink categories not recommended for promotion—sugar-sweetened drinks; confectionery; sweet snacks; savoury snacks; desserts, ice creams, ice confections; unhealthy meals from fast food restaurants and (an optional category) artificially sweetened drinks.

The design of such prohibitions raises several policy questions for which empirical evidence is relevant. One question concerns the desirability of a strong general prohibition, not age-restricted, of all online unhealthy food products and, specifically, whether it is likely to result in co-benefits of protecting young people and the broader community, and not just children.

A second question, considered by the 2024 Australian proposal, is whether such a ban should apply only to the marketing of unhealthy food products ('product marketing') or whether the promotions of brands and businesses 'synonymous' or 'associated with' unhealthy foods should also be prohibited (Australian Government, 2024, p. 15), even if no food product is displayed or marketed or where a healthy food product is displayed ('brand marketing'). For instance, a food company brand could be classified as restricted from being marketed to children 'based on the nutritional quality of their top-selling products' (Australian Government, 2024, p. 14).

A third question, which is not addressed in this article, is whether the ban should apply to both paid-for and other marketing, including brands' own media (their own websites, social media sites, apps and games) and influencer and other 'organic' or user-generated content (Australian Government, 2024).

This article does not directly address the desirability of the prohibition to protect children under 18 due to data limitations explained further below.

A potential weakness of restrictions on online advertising is the necessity for authorities and public interest-oriented

researchers to access online advertising to monitor and evaluate compliance and the achievement of policy goals. Social media platforms' lack of transparency and accountability makes this challenging. Online ads are ephemeral, served via automated computations that are not directly observable, or even explainable, and are often seen only by those to whom they are specifically targeted (Rieder and Hofmann, 2020; Trott *et al.*, 2021). The ad libraries provided by some platforms, ostensibly to aid transparency, are not comprehensive, durable or accessible enough to support meaningful observation and monitoring by individuals, authorities and public interest-oriented researchers (Hawker *et al.*, 2022). This research demonstrates research tools and methods designed to overcome these challenges.

Research aim and objectives

The aim of this research is to inform policy development for promoting healthy digital food environments by investigating trends and patterns in unhealthy food advertising on Facebook to identify first, any indications of unhealthy food ad targeting, particularly towards young people (18–24), and second, harmful marketing practices in unhealthy food advertising. Finally, the use of the Australian Ad Observatory, a novel research tool, shows how online advertising may be made observable and accountable.

METHODS

The Australian Ad Observatory

The dataset for this research was created using the Australian Ad Observatory, a novel research infrastructure that facilitates 'observability' (Rieder and Hoffman, 2020) and meaningful explanation of personalized and targeted online advertising in Australia (Burgess *et al.*, 2022). The Ad Observatory enlists the help of adult research participants (18 years and over) drawn from the Australian public who automatically donate ads directly from their own Facebook feeds as they browse. People elect to participate in the Ad Observatory by answering a short demographic survey (including age and gender) and installing a browser plugin (Obeid, 2023). Data collected about the ads include ad text, image and/or video content, and the time range of the observation. This enables researchers to investigate the content and targeting of social media ads as they are served to individuals in their private feeds, not just as displayed on brands' public pages.

The Ad Observatory was approved by the Queensland University of Technology Human Research Ethics Committee (approval number: 4555) and was ratified by the ethics committees of other universities with researchers involved in the project. Participants are completely anonymous, and the plugin does not access any personal information from participants' computers or online profiles, nor collect any non-advertising content from participants' Facebook feeds. Because the Ad Observatory relies on a convenience example of voluntary donations from adults 18 and over, it is not a normative, probability sample. Nevertheless, the donors do reflect a similar age and gender profile as publicly available information about Facebook's Australian audience, but with an under-representation of female participants under 45 and an over-representation of male participants over 55 (see Angus *et al.*, 2024a, p. 9–17).

Since its launch in October 2021, over 1909 research participants have contributed more than 737,000 separate 'observations' (individual impressions) of more than 328,000

unique Facebook ads to the Ad Observatory (Angus *et al.*, 2024a, p. 6–7). General accounts of the Ad Observatory have already been published (Burgess *et al.*, 2022; ADM+S Centre 2024; Angus *et al.*, 2024b, 2024c) and full details can be found in a technical report (Angus *et al*, 2024a).

This article is based on a subset of the total Ad Observatory collection, consisting of ads that promote unhealthy food products, unhealthy food brands and online delivery services ('the unhealthy food ads dataset' or 'the dataset'). Analyses of datasets created from the Ad Observatory concerning gambling (Parker *et al.*, 2023) and greenwashing (Gupta *et al.*, 2023) have previously been published, and analyses concerning scam and alcohol ads are in preparation. This is the first scholarly paper to investigate food ads in the Ad Observatory. The authors previously made a policy-oriented submission based on a preliminary analysis of these data (Parker *et al.*, 2024) and published a pre-print and opinion piece (Northcott and Parker, 2024; Northcott *et al.*, 2024).

Unhealthy food ads dataset

We used a 'whitelist' approach to identify ads donated to the Australian Ad Observatory of the type that would be prohibited under the current proposal to restrict 'unhealthy food' advertising online in Australia (cf Martino *et al.*, 2021). The 'whitelist' consisted of the top-selling Australian food brands and retailers of products across the 'unhealthy' food and drink categories set out in the Australian policy described above ('unhealthy food brands'). We focused on dominant brands because we anticipated that they are placing a large volume of unhealthy food ads online. Brands and retailers with 1% or more market share in Australia across the selected market categories according to Euromonitor Passport (Euromonitor International, 2022) were included. Online food delivery companies, such as Uber Eats, while not a category of unhealthy foods themselves, were also included in the whitelist given the recent and rapid expansion of online food delivery services and previous research indicating their reliance on the promotion of unhealthy foods, especially fast food (van der Lee and Sacks, 2023; Bennett *et al.*, 2024).

This resulted in a list of 98 brand names for use as search terms. After testing, 19 brand names were excluded because they resulted in unnecessary duplication of results (eg searches for the brand name McCafe did not pick up different ads to the term McDonald's). We used the resulting list of 79 brand names to generate the final dataset (Supplementary Table S1). The initial searches identified 170 separate advertisers (that is, Facebook pages) that had placed unhealthy food ads. However, some brands placed ads using multiple Facebook pages (eg different franchise locations operate separate pages that each place the same or similar ads). In such cases, we considered it more meaningful to combine ads placed by the same or related businesses into a single 'advertiser' (eg various separate Facebook pages for different Pizza Hut locations were merged to represent one advertiser, 'Pizza Hut'). This resulted in a list of 141 advertisers (described below) that placed ads promoting unhealthy food brands.

We obtained the dataset in a Microsoft Excel spreadsheet and manually discarded irrelevant ads. The dataset was further confined to ad observations donated in the 1-year period from 6 December 2021 until 6 December 2022. This is the period for which we have the most complete set of donations from the largest number of donors across the whole year (Angus *et al.*, 2024a), allowing for a more robust statistical

analysis. Each ad observation was connected to demographic information about the participant who donated it using a unique identifier. Each ad may be served multiple times and to different or the same participants which we designate as separate 'ad observations'. This resulted in a final dataset of 1703 unique unhealthy food ads and 5995 ad observations, by 367 research participants. (For further details about the creation of the dataset, see Supplementary File Part A.)

Quantitative data analysis

We used Excel to manually code the cleaned dataset to identify the appropriate Euromonitor market category or categories for each ad, based on the brand search terms that appeared in that ad, and to prepare descriptive statistics. A data scientist assisted with statistical advice on how to investigate potential demographic targeting by comparing the median proportions of unhealthy food ad observations relative to all other ad observations for different demographic groups. (For further details about the quantitative analysis, see Supplementary File Parts B, C, and D.)

Thematic analysis

For feasibility reasons, we conducted a thematic analysis (Braun and Clarke, 2006) of ads for four of the five most frequent unhealthy food brand advertisers in our dataset: KFC, McDonald's, Cadbury and 7-Eleven. These brands collectively placed 550 unique ads, observed 2261 times, amounting to 38% of all observations.

We developed a coding frame to classify ads based on whether the ad promoted (i) brands associated with unhealthy foods, but no food products, (ii) brands associated with unhealthy foods, and unhealthy foods or (iii) brands associated with unhealthy foods, and food product that is not an unhealthy food. These reflect three different policy options concerning brand marketing currently under consideration in Australia (Australian Government, 2024, p. 15). We classified foods as 'unhealthy foods' if they appeared in the examples

listed under the categories not recommended for promotion in Australian policy guidance materials (COAG, 2018). We deemed all four food brands analysed (KFC, McDonald's, Cadbury and 7-Eleven) to be associated with unhealthy foods on the basis that they are top-sellers in market categories that correspond to food and drink categories not recommended for promotion by Australian policy (COAG, 2018).

We coded for themes, such as sports, gamification, greenwashing and content appealing to children and young people. These have been identified in previous research as potentially harmful food marketing practices (Freeman *et al.*, 2016; Boelsen-Robinson *et al.*, 2016; Brownbill *et al.*, 2018; Martino *et al.*, 2021; Jones *et al.*, 2023; Robards *et al.*, 2023; Valero-Morales *et al.*, 2023).

The lead author (T.N.) developed and refined the coding frame iteratively to include concepts that emerged while coding an initial selection of 50 ads from each of the four brands. The full subset of ads (*n* = 550) was then divided equally between two authors (T.N. and K.S.). After a preliminary discussion to align coding approaches using examples from the data, T.N. and K.S. independently coded their allocated samples. As an internal robustness check, a third author (C.R.) was assigned a 10% sample to code, selected using an online random number generator tool. Inter-coder differences were considered to ensure consistency. The final interpretation of themes identified in the coded data was clarified through discussion among all authors. Ads were then sorted by theme to select illustrative examples. (Further details are provided in Supplementary File Part E.)

RESULTS

Advertisers of unhealthy food brands

Twenty of the 141 advertisers in the dataset accounted for 80% of the unhealthy food ad observations (Figure 1). Chained consumer food service brands ('fast food') were the most prominent, at 50% of all unhealthy food ad observations.
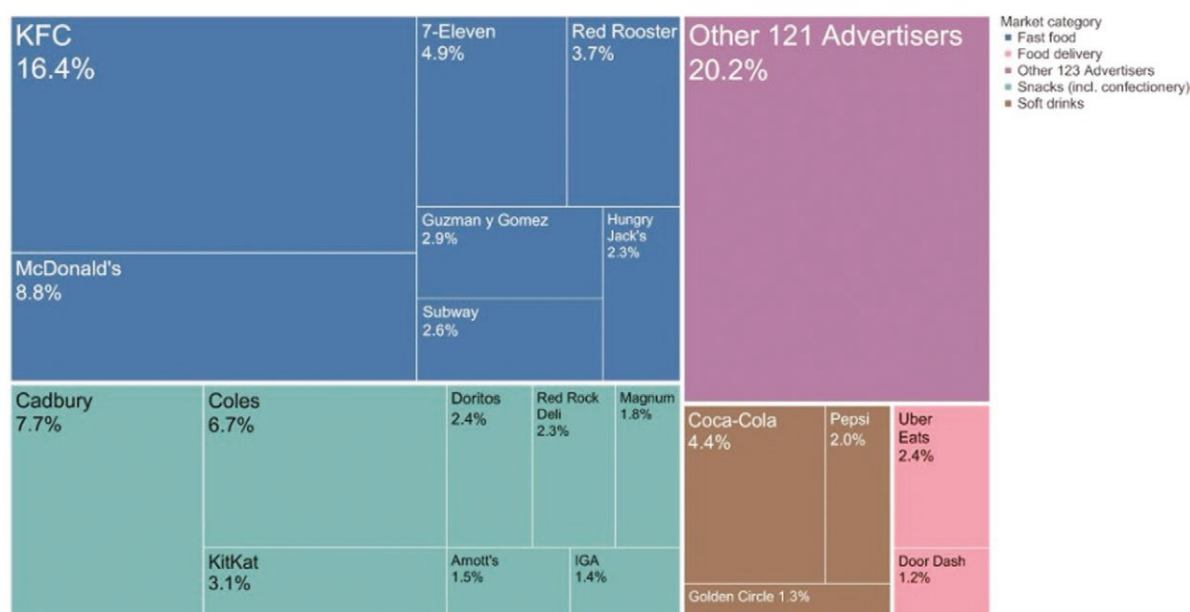

Fig. 1: Top 20 advertisers, by observation count and percentage of total (*n* = 5995) and predominant market category promoted in ads. Size of box represents the number of observations (% of total included as text), colours represent market category. (Additional details in Supplementary File Part B.)

KFC and McDonald's accounted for half of the fast food ad observations, and one-quarter of the total dataset. Snack and confectionery brands, like Cadbury, featured in one-third of the unhealthy food ad observations. Soft drink brands, such as Coca-Cola, were promoted by 11%. (See Supplementary File Part B for full details.)

Most advertisements promoted only the brand that placed the ad, but retailers typically promoted multiple unhealthy brands: for example, 7-Eleven, a convenience store chain, advertised its own fast food offerings, and a variety of unhealthy food products from other brands (eg Cadbury chocolate and Krispy Kreme doughnuts). Coles, one of two supermarkets that dominate Australian grocery sales, also promoted multiple unhealthy food products from a range of brands. Woolworths, the other dominant supermarket, had not placed any ads in the dataset, but ads placed by other brands, such as Coca-Cola, Darrell Lea (confectionery) and Peter's ice cream, cross-promoted Woolworths (eg by stating 'Only at Woolworths'). About 9% of ads promoted online food delivery companies. These ads typically cross-promoted fast food, such as in Figure 2: Subway, McDonald's and Guzman y Gomez (Mexican-style fast food chain).

Ads placed by non-food-related advertisers, especially major sports broadcasters and clubs, also promoted unhealthy food brands. The Australian Football League (AFL), a very popular competition in Australia, was especially prominent. For example, the FOX Sports TV Network offered a $250 McDonald's voucher for the best comment posted about the latest AFL round; and the Essendon [AFL] Football Club offered a draw for tickets for a President's Club Function to those who bought Coca-Cola at the upcoming game.

Demographic targeting

Male participants in the Ad Observatory were more likely to see unhealthy food ads. They comprised 62% of all participants in the Ad Observatory but 66% of those donating one or more unhealthy food ads. They donated 79% of all the unhealthy food ad observations in the dataset, compared with donating 65% of all ad observations in the Ad Observatory.

Young people aged 18–24 years old were also more likely to see unhealthy food ads. They comprised 9% of all participants in the Ad Observatory, but 20% of those who donated unhealthy food ad observations; and saw 19% of all unhealthy food observations, compared with 7% of all ad observations.

Combining these two trends, male participants aged 18–24 saw 16% of all unhealthy food ad observations, but only 5% of all ads. Fast food comprised a very high proportion of the unhealthy food ads these young men saw (71%), compared with the 50% fast food ads seen by participants in the unhealthy food ads dataset overall. This suggests that either unhealthy food advertisers (and particularly fast food advertisers) or the algorithms placing the ads are targeting male participants and young people. (All these statistics are shown in Supplementary Table S4.)

To control for variation in the number of total ad observations donated to the Ad Observatory by different participants, we calculated the proportion of unhealthy food observations relative to their total ad observation donations for each participant. We then compared the proportion of unhealthy food ad observations to total ad observations donated to the Ad Observatory by age and gender group. This confirmed that young people aged 18–24 years old in our sample saw a higher proportion of unhealthy food ads (median of 2.2% unhealthy food ads across their whole ad 'diet') than other age groups. Young men aged 18–24 saw a higher proportion of unhealthy food ads (median of 2.8%) than other age by gender groups (Supplementary Tables S5 and S6). (See Supplementary File Part C for additional explanation and details.) Further statistical investigation using probability sampling is necessary to conclude whether this pattern is representative of the whole population of Australians on Facebook.

Individual targeting

Some individuals were much more likely to be targeted with unhealthy food ads than others. In order to illustrate how individual young men might be targeted, we identified the five (anonymous) young people aged 18–24 (4 men and 1 'prefer not to say') who saw the highest frequency of unhealthy food ads (Supplementary Tables S7 and S8) and selected two online browsing sessions to show how large volumes and proportions of unhealthy food advertising can be targeted at individuals in a single session on Facebook (Figures 2 and 3).
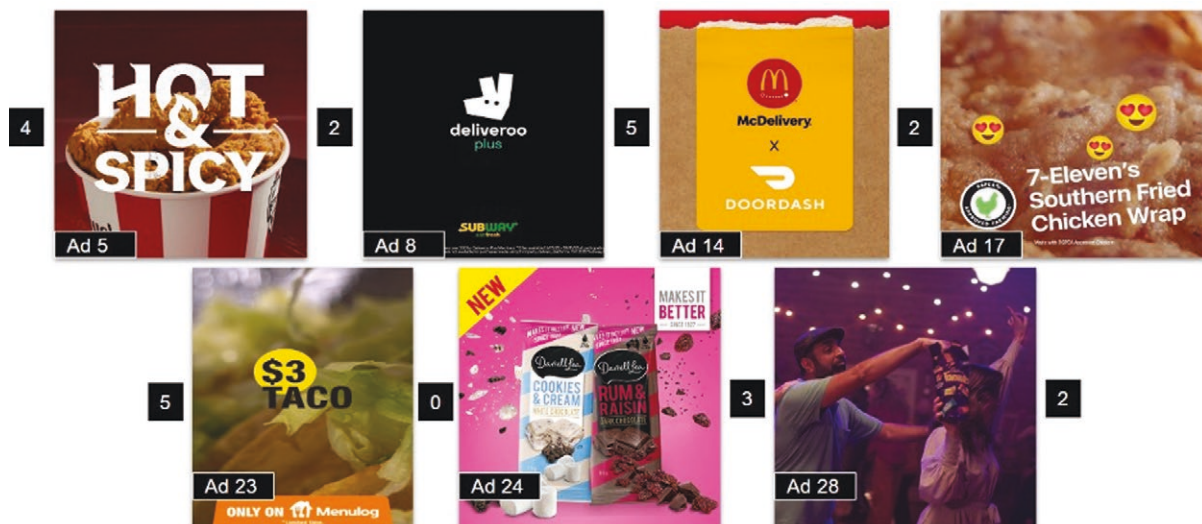

Fig. 2: Browsing session including 23% (7) unhealthy food ads ('Jimmy').

(For further details of how the most frequent observers and their browsing sessions were identified, see Supplementary File Part D.)

'Jimmy' (pseudonym), aged 18–24 years old, donated 201 unhealthy food ad observations in about 3 months, seen across 138 separate Facebook sessions. In the session shown in Figure 2, Jimmy was served seven unhealthy food ads (the largest volume of unhealthy food ads in a single session in the dataset), over the course of about 5 min. These were interspersed among other ads as indicated by the small black boxes in the figure. Another young male participant, 'Noah' (pseudonym), received 72 unhealthy food ads in 4 months across 56 sessions. In the session shown in Figure 3, three of the five ads in just under three minutes were for unhealthy foods (60%, the highest proportion in a single session in the dataset), delivered consecutively within the span of 42 s.

This starkly illustrates the gulf between the majority of participants (71%) who see no unhealthy food ads at all and those demographics and individuals, especially young men, who may be targeted by these ads. Most participants on Facebook, including parents, family and friends of the young people targeted and relevant authorities may never see these ads at all and not be aware of the extent to which some individuals and demographics are being targeted.

Brand versus product marketing

Most of the ads in the dataset showed images of unhealthy food products, but some unhealthy food ads were subtle in their display of the food. This could be due to size in the frame (Figure 2, Ad 28), packaging that obscured content or by using the food in an aesthetic rather than representational way (Figure 4, top row). These designs could easily be adapted to evade a ban on product marketing.

Some ads displayed only healthy foods, such as vegetables for kids' meals, deli-style lunches, and coffee products (Figure 5). These would still be allowed if only product marketing (and not brand marketing) were prohibited. Some relied on generic branding alone without depicting any food products (Figure 4, middle and bottom rows). A feature of many of the brand-only and healthy food ads was themes appealing to children and young people, and sports themes. This suggests brands poised to take advantage of any exemption for brand advertising by using these themes to legitimize themselves and build brand loyalty, even if they cannot explicitly display their unhealthy products.

Themes appealing to children, young people, parents and carers

Examples of ads appealing to children included those showing cartoon and game characters, such as McDonald's ads featuring the childlike minions from 'The Rise of Gru', a family film (Figure 5); and a fictional hero from 'Overwatch 2', a first-person shooter action game, alongside an offer to claim a rare skin used to customize characters in the game (Figure 6). Other themes enticing to children included children's games and family activities, such as the Cadbury scavenger hunt ad (Figure 5), and holiday-themed products and activities (such as Christmas, Halloween or Easter; see Figure 6).

In some cases, the framing of unhealthy food ads was clearly directed at parents and carers, such as a Cadbury ad, placed in collaboration with popular Australian parenting website, KidSpot, featuring a chocolate pavlova recipe using branded products. Some ads emphasized the convenience of fast food for parents and carers. Examples included a McDonald's ad that showed a woman with three bustling children in the backseat of a car eating Happy Meals, alongside ad text claiming that 'Value means more peace and quiet with a $4.95 Happy Meal and a $3 Small Sundae on our Loose Change Menu'. Another McDonald's ad, co-promoting Uber Eats, invited the viewer to 'Shout dinner with Uber Eats Family Savers, with 25% off Dinner Boxes!' and KFC 'Family Feast' ad (Figure 6) was similarly oriented. We also found numerous examples of ads for Cadbury personalized gifts and hampers, promoting convenient Christmas presents for 'family and friends', rapidly delivered Mother's and Father's Day gifts, as well as a KFC offer of free delivery on Mother's Day.

Examples of ads likely to appeal to young people offered special deals or discounts often only available in the brand's app, using ad images stylized to look like mobile devices (see the KFC and McDonald's ads in Figure 6); the gamification of ads to encourage interaction for a 'chance to win', exemplified in the 7-Eleven and Oak ad (Figure 6) and online food delivery deals (Figure 2). Other themes likely to appeal to young people included references to social media challenges, such as the #KFCBucketheadFlip challenge on TikTok; the promotion of music festivals or celebrity personalities (illustrated by KFC ads part of the same marketing campaign in Figures 4 and 5); and popular Australian sports.

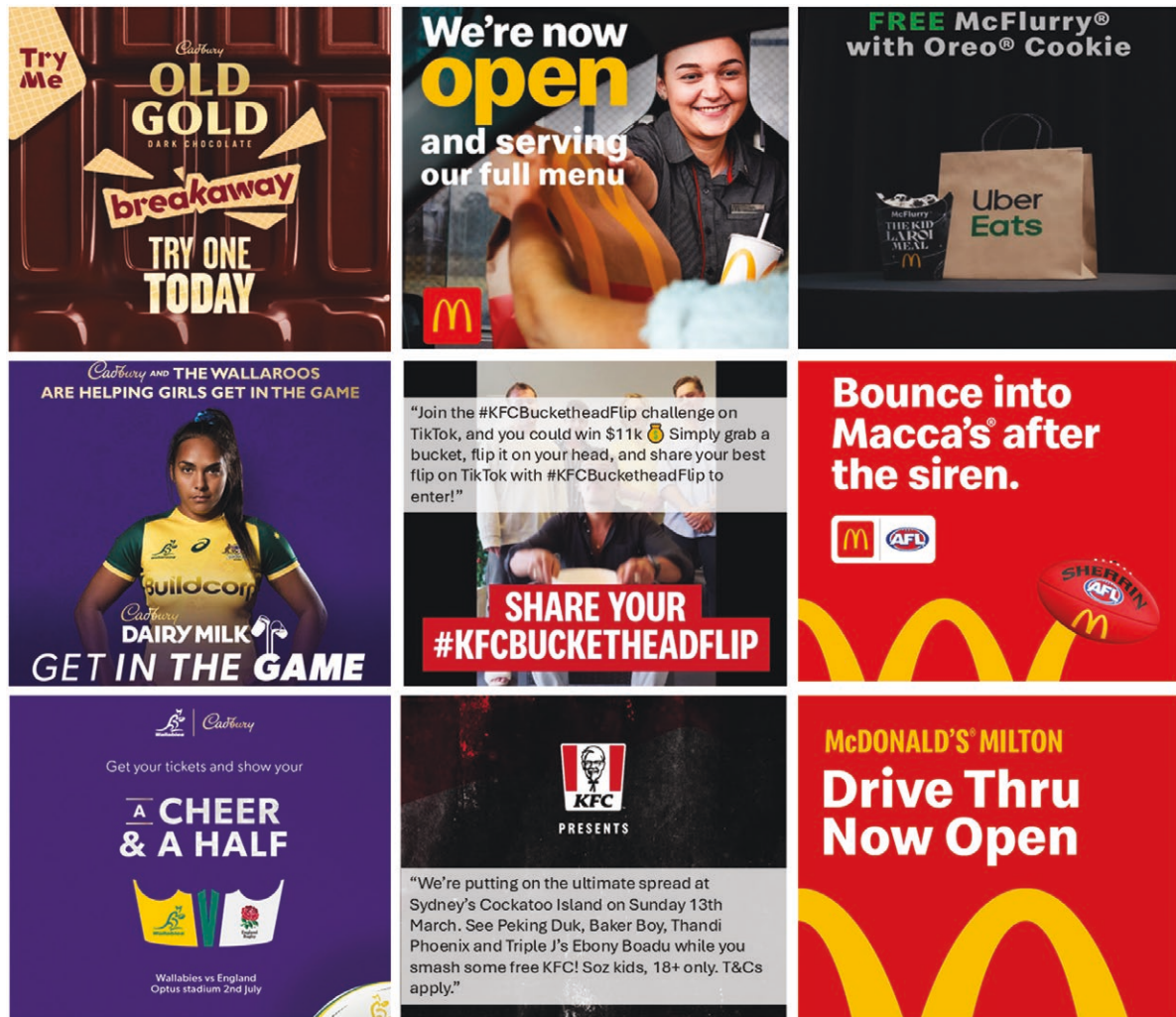**Fig. 3:** Browsing session including 60% (3) unhealthy food ads ('Noah').

Fig. 4: Examples of brand marketing that either do not show any food products or show only aestheticized or subtle images of food products. Ad text has been overlaid on the KFC ad examples.

Sports themes

Sports themes permeated the ads. Sports in unhealthy food marketing can appeal to a broad audience, including young people, and can provide the focal point of an ad with strong brand-specific elements, but no unhealthy food products. For example, a McDonald's ad with the text 'Bounce into Macca's after the siren' used the McDonald's brand's signature golden arches to mimic the path of a bounced football (Figure 4). Similarly, a Cadbury ad promoting the Australian Rugby Women's Team, the Wallaroos, positioned the Cadbury brand as 'helping girls get in the game' and pictured its ambassador female player on its purple branded backdrop alongside the signature 'dairy milk' logo (Figure 4).

Another use of sports to promote unhealthy foods is to incentivize special deals tied to an upcoming game, like KFC's ad for free delivery of a 'Friday night footy feast' (Figure 6). Similarly, KFC's 'This Origin Sunday' ad, in reference to the popular State of Origin Australian Rugby League series, offered 'free delivery with a Zinger Stacker this Ori-zing Sunday 🔥' (Figure 6). Ad metadata stored in the Ad Observatory database indicates that this ad was seen by the research participant just days before the game.

Sports clubs and broadcasters themselves cross-promoted unhealthy food, especially in relation to the AFL, which is very popular with Australian families who typically support their teams with near-religious fervour. Sports was a consistent theme across both cross-brand promotions and brand marketing for all four brands examined closely, suggesting that sports themes are likely to be extensive, sophisticated and, possibly targeted and personalized, across online unhealthy food advertising.

Social cause and environmentally themed marketing

Numerous ads, especially brand marketing, harnessed social cause marketing (Martino *et al.*, 2021). These included 'green' claims, such as Cadbury ads that prominently displayed the 'sustainable cocoa' claim (Figure 6); 7-Eleven's 'Fairtrade certified' coffee in recyclable 'packaging made with plants' (the ad text to the example in Figure 5) and 'RSPCA approved chicken' (Figure 2, Ad 17). Noah's session (Figure 3) utilized green claims to promote Pepsi soft drink in recycled plastic bottles, captioned 'Max Taste Towards No Waste'. A Doritos ad in the same session used mental health concerns, another
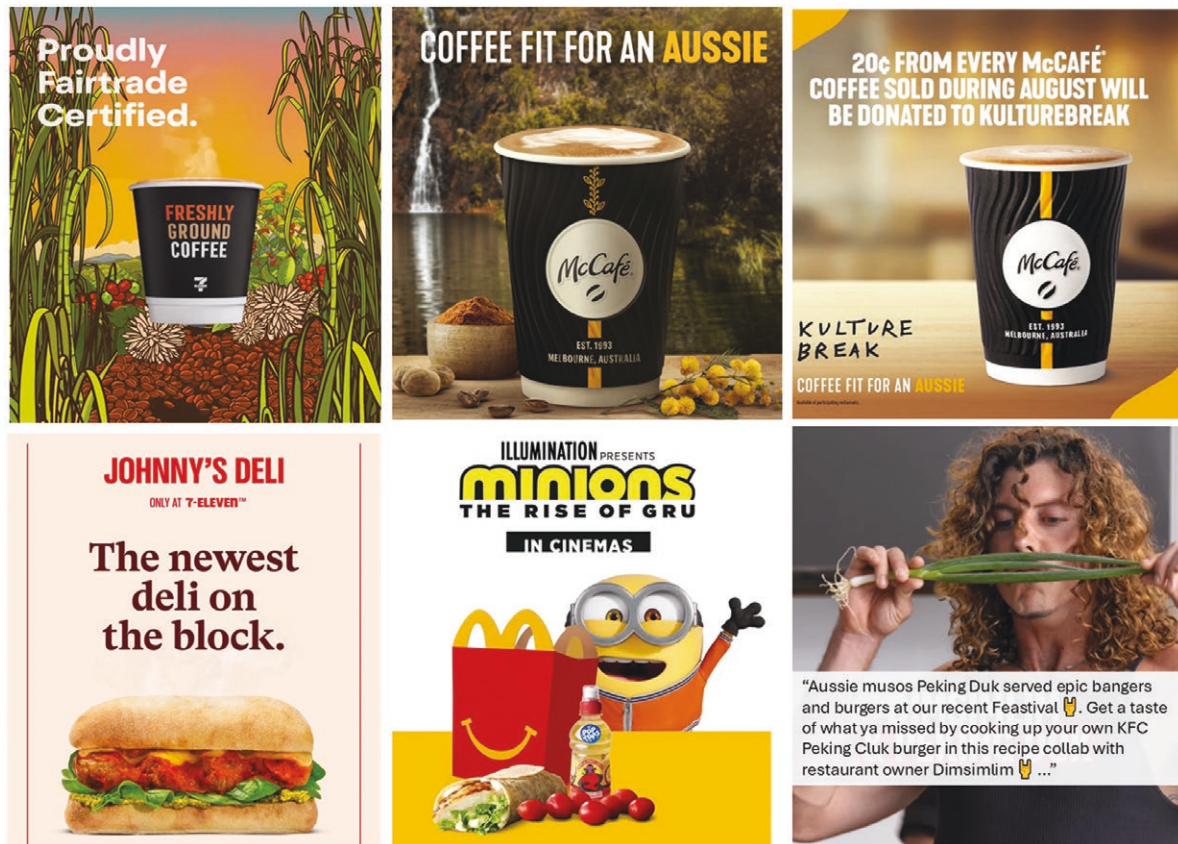
Fig. 5: Examples of brand marketing that show only 'healthy' foods or coffee products. Ad text has been overlaid on the KFC ad example to provide relevant context.

frequent theme, to promote unhealthy food in partnership with ReachOut, an online mental health service for young people. Similarly, McCafe promoted a 20-cent donation to a not-for-profit social enterprise mental health and well-being charity for young people for every coffee purchase (Figure 5).

DISCUSSION

The Ad Observatory provided a unique opportunity to identify potential patterns of demographic targeting online, investigate bursts of unhealthy food advertising in individual browsing sessions and uncover potentially harmful themes in marketing. In the following sections, we highlight four key policy implications for current proposals to prohibit unhealthy food advertising online.

Protecting not only children but also young people and the broader community

Facebook accounts are officially available only to people 13 and over. Nevertheless, previous research has found that children are frequent users of digital platforms, often without parental consent and despite official age restrictions (Boyland *et al.*, 2020; Sacks and Looi, 2020), and that food marketing across media settings is frequently designed to appeal to children (Garton *et al.*, 2022; Robards *et al.*, 2023; WHO, 2023a). Even though the Ad Observatory participants did not include children under 18, the unhealthy food advertising we investigated frequently uses child-oriented themes and appears to be designed to appeal directly to children. Advertisers may be assuming children directly participate on

Facebook, despite age restrictions on accounts, or they may be using child-friendly themes to indirectly reach children by marketing unhealthy food to parents and carers for the children under their care. Our analysis also showed numerous examples of ads designed to appeal to busy parents and carers who need a quick, convenient and appealing snack or meal for children. Both advertising strategies (appealing directly to children or appealing to parents and carers of children) create an unhealthy food environment for children and increase their exposure. Governments should prioritize the rights of children to healthy digital food environments (since digital inclusion is now essential to everyday social life), above the commercial interests of health-harming food industries to continue marketing their products to vulnerable cohorts (VicHealth, 2020; WHO and UNICEF, 2023; Zenone *et al.*, 2023).

Above and beyond the impact on children and adolescents under 18, we showed that young people aged 18–24, and especially young men, were disproportionately exposed to unhealthy food ads, predominantly fast food. This is consistent with suggestions in the literature that young adults are frequent users of social media platforms and constitute a particularly desirable demographic for marketers of fast food (Freeman *et al.*, 2014, 2016; Robards *et al.*, 2023). Previous research has shown that young people are acutely vulnerable to the harms of unhealthy food marketing (Smith *et al.*, 2019; van der Bend *et al.*, 2022), particularly in immersive digital environments (VicHealth, 2020). They also tend to be more impulsive and susceptible to shifting interpersonal influences and social pressures, such as marketing campaigns that
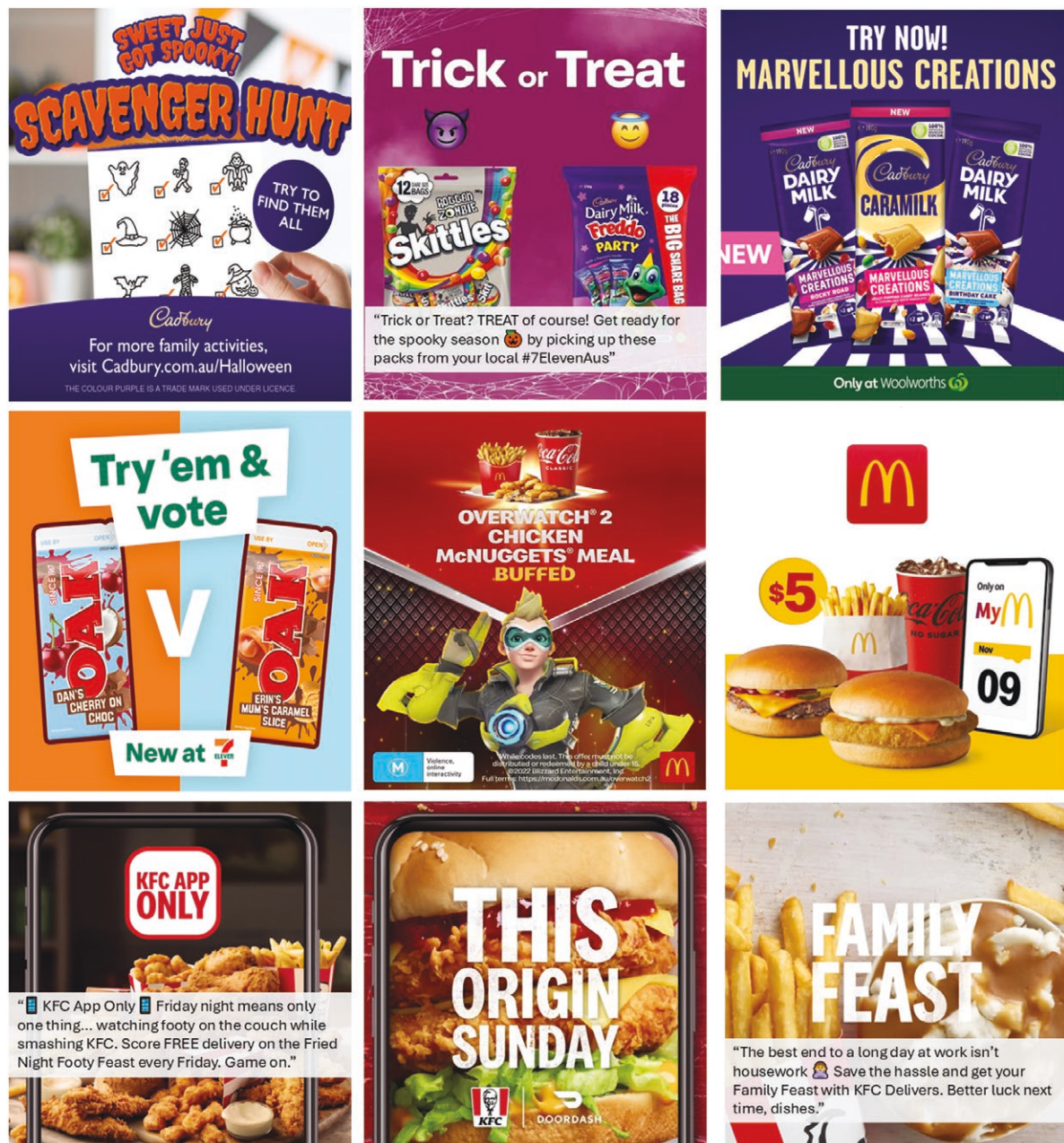
Fig. 6: Illustrations of key themes in ads placed by the top four advertisers in the dataset. Ad text has been overlaid on some ad examples to provide relevant context.

normalize brands within youth cultures and contexts (Freeman *et al.*, 2016). Ads in our dataset that present interactive peer challenges, music festivals and popular sports do precisely this. Emerging adulthood, from 18 to 25 years, is often overlooked as a life stage for establishing long-term health behaviour patterns such as unhealthy eating habits (Freeman *et al.*, 2014). While some platforms do make settings available to users to adjust one's interests and to opt out of unwanted advertising and other content, previous research has shown that such facilities are typically hidden under layers of instructions and click-throughs that make them difficult to impossible to find and use effectively, and most individuals will give up on the process (Burgess *et al.*, 2024). A broad-based ban on unhealthy food advertising would help critically protect young adults as they establish the dietary patterns that will set the scene for their future health.

Our findings reveal that online unhealthy food advertising is a consistent feature of some but not all people's online advertising diet. Unlike traditional media, online advertisers and digital platforms have detailed information about individuals and their likely interests and vulnerabilities that they can use to their commercial benefit, strategically packaged into engaging ads that are woven into people's personal social media feeds, peer networks and interactive content sharing (Carolan, 2018; Montgomery *et al.*, 2019). The Facebook sessions of young male participants Jimmy and Noah illustrated what this could look like. The emotional affordances of social media are powerful in promoting the desire for consumption among all sectors of the community (Jones *et al.*, 2023; Freeman *et al.*, 2014). As WHO puts it, 'children are not the only ones who need protection' from harmful advertising practices in the digital sphere (WHO, 2016,

p. 22). A broad-based prohibition on unhealthy food marketing online would not only ensure that children were adequately protected but would protect young people, and the broader community, including parents, carers and other role models for children and young people, from the normalization of habitual consumption of unhealthy food (Sing and Lyon, 2024).

Restricting brand and not just product advertising

The WHO (2023a) has flagged that if brand marketing is not included in policy restrictions, then advertisers may increase their brand advertising and sponsorship as a substitute for product marketing (WHO, 2023a). We found, consistently with prior studies, that dominant unhealthy food brands are already extensively using brand marketing to strategically align to appealing themes and legitimize consumption of their (unhealthy) products. Marketing strategies we identified included the use of brand logos or brand characters to foster brand loyalty (Jones et al., 2023; Valero-Morales et al., 2023); campaigns that connect the brand to fun events, like holidays and sports matches (Freeman et al., 2014); ads that align the brand to a social or health issue to enhance public perception of the brand (Martino et al., 2021) and, ads that appeal to socio-cultural values and practices important in youth culture, like popular sports athletes, clubs and matches, and other events and festivals (Freeman et al., 2016; Brownbill et al., 2018). In many cases, it is specifically the brand-only ads that green-wash, health-wash and sports-wash unhealthy food. We also found that some ads showed foods in aestheticized or obscured ways that might escape monitoring and accountability when a ban is introduced.

Evidence shows that advertising of brands primarily associated with unhealthy foods, such as fast food or confectionery brands, influence brand preferences and consumption of unhealthy food products, even in the absence of those products being featured in the ad (Masterson et al., 2018; Smith, 2013). Moreover, exposure to ads for 'healthy' meal bundles from fast food companies does not motivate healthier choices in children, but instead promotes preferences for fast food (Boyland et al., 2015).

The use of brand marketing tactics identified in our research suggests that, should restrictions be introduced that apply only to product-specific advertising, unhealthy food brands are poised to circumvent this health-promoting policy goal by utilizing brand advertising in harmful ways (Sing and Backholer, 2023). Similarly, a recent evaluation of the likely impacts of the UK restrictions indicated that food and drink companies could undermine intended public health impacts by redirecting advertising to brand, rather than product, advertising, and to sports sponsorship (Forde et al., 2022). This means that a strong prohibition on the marketing of brands synonymous with unhealthy food, and not just ads that show unhealthy food products, is urgently required. The ban should apply irrespective of whether an ad promotes 'healthy' foods.

Restricting cross-promotions

We found many examples of supermarkets (like Coles), convenience stores (like 7-Eleven) and online delivery food companies (like Uber Eats) cross-promoting unhealthy food products. Prior studies show that online food delivery companies predominantly promote unhealthy, not healthy,

options and extensively use price discounts and other marketing gimmicks to do so (Bennett et al., 2024). While previous research has suggested that online grocery stores may create opportunities for healthier choices than in-store shopping (Bennett et al., 2024), we found examples of a dominant Australian supermarket, Coles, promoting unhealthy food, and unhealthy food brands promoting another dominant Australian supermarket, Woolworths. The heavy involvement of sports-related advertisers in cross-promoting unhealthy food brands is especially pernicious as it gives the impression that brands synonymous with unhealthy food, are health-promoting through sport. Furthermore, the sports themes in these ads are often angled towards children and families.

The heavy cross-promotion of unhealthy food by supermarkets, sports clubs and online delivery companies has implications for the design and implementation of any restrictions on unhealthy food advertising online. First, the restriction should be worded strongly and broadly enough to capture all promotions of unhealthy food online, no matter the advertiser. Secondly, the monitoring and compliance strategy should incorporate the ability to search the content of ads for text, images and logos promoting unhealthy food, as we were able to do using the Ad Observatory.

Monitoring of digital platforms

A major barrier to the implementation of prohibitions on online unhealthy food advertising is monitoring digital platforms for compliance (Sing and Backholer, 2023). A limitation of both the Australian and the UK prohibitions on unhealthy food advertising is that they are proposed to apply only to advertisers and do not put any additional obligations on platforms themselves to make observable the patterns of advertising that occur online. Our analysis shows that it is, in principle, feasible to use methods and infrastructures such as those developed by the Australian Ad Observatory to observe the ads shown to individuals on social media platforms (Rieder and Hoffman, 2020; Burgess et al., 2022), and make advertisers and the platforms themselves accountable for unlawful or harmful marketing practices. To make restrictions on online unhealthy food advertising effective over time, platforms should be required to make online advertising observable by authorities and public interest-oriented researchers. Authorities should also use tools like those developed by the Australian Ad Observatory to create ongoing, systematic, public interest-oriented research and monitoring infrastructures for online advertising. Public investment in this infrastructure is essential since even though some platforms do provide ad libraries that purport to make their advertising practices transparent, these are incomplete, ephemeral (ads typically disappear once the ad campaign is no longer live) and do not provide reliable, meaningful information about how ads have been targeted and shown to different groups, and whether vulnerable individuals have been targeted (Burgess et al., 2024).

Strengths and limitations

Our results are highly relevant to a large proportion of online advertising in Australia, and globally: Meta's ad platform, which is used for Facebook and Instagram, dominates Australian online advertising, exceeding advertising on YouTube, TikTok, Snap and Twitter combined by a factor of

four to five (ACCC, 2023, p. 10). It is one of the two ad platform operators (with Alphabet) that constitute a near duopoly of online advertising in most markets around the world (van der Vlist, 2022; Kininmonth and Lobato, 2023). To our knowledge, no other studies have examined such a comprehensive dataset to analyse the nature of unhealthy food marketing online.

The Ad Observatory is not a normative, probability sample, and for ethical reasons, we did not ask children under 18 to participate in the research. Our findings are therefore indicative for further statistically representative work but cannot be used to draw inferences. Our findings likely under-estimate the prevalence of unhealthy food advertising online targeted at young people due to the lower participation of young people in our sample and our reliance on ads from the browser version of Facebook, rather than mobile apps and other platforms (such as TikTok) where young people are more active. The dataset also excludes unhealthy advertising by businesses with less than 1% market share, meaning that unhealthy food advertising by some substantial businesses and all small and medium-sized entities is not represented.

Due to our reliance on data donations, the participants provided an uneven volume and frequency of ads. We addressed this by comparing the proportions of unhealthy food ads against participants' total donations to the Ad Observatory. Another limitation was the lack of evidence about the context in which participants saw the ads on Facebook, measures of participant attention (pausing on an ad) and engagement (clicks and likes), and investigation of the use of settings provided by Meta to adjust the nature of advertising seen. Future research should invite research participants to narrate their own experiences of why and how they see the ads they do and how they try to influence the ads they see (see, eg Robards *et al.*, 2023).

CONCLUSION

Our findings suggest that proposed strong broad prohibitions on all unhealthy food advertising online would benefit not only children and their parents or carers but also young people and the broader community; that it should prohibit brand as well as product advertising and that it should be broad enough to apply to all advertisers that cross-promote unhealthy food. Social media platforms themselves should also have a mandated legal responsibility to implement any prohibition and to help promote a healthy online environment by enabling the public monitoring of online advertising. The study also demonstrated the value of novel research methods, like those employed by the Ad Observatory, to observe and monitor unhealthy food marketing online. Government support for monitoring mechanisms based on tools like those demonstrated by the Ad Observatory will be critical for the effective implementation of restrictions on online marketing. As online media become ubiquitous and embed ever more sophisticated data analytics and generative artificial intelligence capabilities, such measures will increasingly be needed to enable public oversight of the commercial and digital determinants of health in online media.

SUPPLEMENTARY MATERIAL

Supplementary material is available at *Health Promotion International* online.

AUTHOR CONTRIBUTIONS

C.P. and T.N. conceived and designed the study as part of the Ad Observatory program of work. T.N. led the acquisition of the dataset for this research, and the analysis and interpretation of data. D.A. and A.O. were responsible for the acquisition of the initial data via overall responsibility for the Ad Observatory and for creating the unhealthy food ads dataset and various data required for analysis and interpretation. D.A. contributed to the statistical analysis, its interpretation and visualization. K.S. and C.R. contributed to the thematic analysis and its interpretation. T.N. and C.P. drafted the work. K.S., C.R., D.A. and A.O. assisted with drafting and reviewing the work for critical intellectual content.

CONFLICT OF INTEREST

The authors have no conflicting interests to report.

DATA AVAILABILITY

Full information about the Ad Observatory including code for the plugin is available at the project webpage (ADM+S Centre, 2024) and github (Obeid, 2023). Ad Observatory code and data are also currently in the process of being archived and made publicly available through the Australian Internet Observatory. The ads will be archived but some demographic information will be redacted in compliance with the ethics approval for the project.

AD IMAGES AND COPYRIGHT

In relation to ad images and text reproduced in this article: We rely on the exception to copyright in relation to 'fair dealing for research and study purposes' in section 40 of the Copyright Act 1968 (Cth) and similar provisions in other jurisdictions. There are public interest purposes for conducting our research project. Supporting factors for the use of

this exception include the fact that the images we captured are not highly artistic works to which creators might be deeply and personally connected. Furthermore, it would be unreasonably burdensome for our research to obtain licences from each advertiser for every advertisement we collect.

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