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Contemporary digital marketing techniques used in unhealthy food campaigns targeting young people

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ABSTRACT

The digital marketing of unhealthy foods and non-alcoholic beverages has a detrimental impact on children's eating behaviours, leading to adverse diet-related health outcomes. To inform the development of evidencebased strategies to protect children online, this study aimed to describe contemporary digital marketing techniques and industry reported impacts from unhealthy food and beverage marketing campaigns aimed at young people aged 3-17. We conducted a qualitative conceptual content analysis of 111 industry reports detailing the nature and impact of unhealthy food and beverage marketing campaigns from around the world that directly or indirectly targeted children through digital channels. We categorised and narratively describe how food and beverage companies are using digital marketing techniques, across four conceptual groups: (i) leveraging data and technology to optimise marketing, (ii) profiling and segmenting audiences, (iii) targeting and personalisation, and (iv) generating participation and engagement. Industry reported impacts on young people as a result of campaigns included i) increased exposure to, and engagement with, unhealthy food marketing, ii) purchases and consumption of unhealthy foods and beverages iii) formation of emotional brand connections and enhanced future marketing through data collection. Our findings support and extend existing literature revealing how multinational food and beverage companies are using advanced digital marketing techniques, including artificial intelligence and new technologies, to shape children's food behaviours and influence their diets worldwide. Policy actions are needed to protect children from the sophisticated digital marketing techniques used by the food and beverage industry.

1. Introduction

Young people's perceptions, behaviours and identities are significantly shaped by their surroundings (Muñoz-Rodríguez et al., 2023). For children¹ today, the digital environment is as much a part of their lives as the physical environment, a concept Floridi (2015) describes as their "onlife" (Floridi, 2015). Advertising underpins much of the digital environment architecture, and children's hyper-connectivity provides marketers extensive access to this demographic. Children are particularly susceptible to advertising, and this access allows marketers to seamlessly capitalise on children's vulnerabilities, which continue to evolve throughout their developmental stages (Livingstone, 2009; Livingstone & Helsper, 2006). The online platforms children engage with often employ business models focused on commodifying personal data and online behaviours (Kish, 2020). These practices are key elements of the "attention economy", a term that refers to the ecosystem involving the extraction and monetising of online attention and engagement (Carpentier, 2023). This current digital ecosystem presents limited safeguards for children, raising ethical concerns about their privacy and rights and harm to their health (Carpentier, 2023).

A significant public health concern is children's exposure to digital marketing for harmful products such as unhealthy food and non-

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¹ Unless stated otherwise, 'children' refers to young people aged 3–17 years of age.

alcoholic beverages (or unhealthy food marketing - UFM). UFM normalises unhealthy eating behaviours, shaping children's food preferences, choices and requests (WHO, 2022). Research shows that children are frequently exposed to UFM online (Potvin Kent et al., 2019). A 2021 Australian study found children aged 13-17 viewed over 17 online food and beverage advertisements per hour, most were for unhealthy products (Kelly et al., 2021). The negative impact of UFM on children's diets can lead to a higher risk of obesity and dietary-related diseases throughout their lives (Boyland et al., 2022; Norman et al., 2016). Research suggests the unique characteristics of digital marketing-such as its interactive and immersive nature-may have a more profound impact on children compared to UFM through traditional channels (Boyland et al., 2022; Smith & de Villiers-Botha, 2021; Smith et al., 2019). Consequently, the World Health Organisation (WHO) recommends governments adopt legal measures to safeguard children from digital UFM as a key obesity prevention measure (WHO, 2023).

The impact of digital UFM on children is influenced by their level of exposure, as well as the power of the marketing content (WHO, 2023). Exposure refers to the frequency and reach of the marketing communication, message or action (WHO, 2023), while power refers to the extent to which marketing achieves its objectives, influenced by the content of the message and the strategies used to convey that content (WHO, 2023). Marketing strategies are the broader approaches companies use to achieve long-term goals and include creative approaches such as themes, visual elements, and design aspects of marketing content - known to amplify the impact of UFM on children (WHO, 2022). On the other hand, marketing 'techniques' are the execution-level components of a marketing campaign-the types of actions, tools and practices used to implement these strategies. Techniques are more tactical and short-term in nature, focusing on 'how' strategies are implemented. Techniques include the specific channels through which marketing messages are delivered (such as social media, television, or email), the types of content used (such as videos, blog posts, or advertisements), and the actions taken to engage with consumers (such as promotions, contests, or influencer partnerships). Contemporary digital marketing techniques enable highly immersive, interactive, data-driven, targeted, and personalised advertising experiences (Montgomery & Chester, 2011; WHO. Regional Office for Europe, 2016). However, the often 'invisible' nature of these techniques combined with the complexity of the digital marketing ecosystem, the varying techniques and devices used, the lack of transparency and the pace at which the digital environment evolves, poses significant challenges for researchers (WHO. Regional Office for Europe, 2016). Academic research identifying if and how the food and beverage industry explicitly utilise these techniques to influence young people across digital channels is limited. This knowledge is crucial to support policymakers in identifying and implementing the most effective measures to protect children from harmful marketing practices used by the food and beverage industry.

Existing academic research has often focused on single digital platforms such as websites, apps or social media, primarily analysing the visible marketing elements and appeals within the marketing message, often drawing on frameworks originally designed for traditional television marketing for analysis (Boelsen-Robinson et al., 2016; Brownbill et al., 2018; Jaichuen et al., 2019; Kelly et al., 2008; Tan et al., 2018). While valuable, such analyses do not fully capture the nature of the marketing techniques unique to the contemporary digital environment (Smith et al., 2019). That is, the characteristics and attributes of the techniques that lie behind the digital strategies, encompassing the platforms and devices used (e.g., social media, mobile phones), advertising formats (e.g., videos, interactive content), and practices, tools or actions employed (e.g., personalised advertising, geolocation targeting).

The WHO has developed a report and framework to guide research on digital food marketing (WHO. Regional Office for Europe, 2019), emphasising a need for research to assess digital marketing campaigns by transnational food companies. It suggests analysing industry marketing campaign reports for current real-world data on contemporary digital marketing strategies and techniques (WHO. Regional Office for Europe, 2019).

We aimed to identify and describe the digital marketing techniques used in global marketing campaigns by food and beverage companies that directly or indirectly target children. Additionally, we aimed to identify the impact of digital unhealthy food marketing campaigns on children, as reported by the campaign creators.

2. Materials and methods

2.1. Study design

We conducted a qualitative conceptual content analysis of marketing campaign reports to identify and describe digital unhealthy food and non-alcoholic beverage marketing techniques that are used to target children directly or indirectly. Analysing campaign reports is recommended as a methodology as it can provide valuable insights into the techniques used by the food and beverage industry to reach children with marketing and support monitoring efforts (Kelly et al., 2023; Muc & Tatlow-Golden, 2023).

2.2. Data collection

The World Advertising Research Centre (WARC) provides access to reports of worldwide marketing campaign case studies describing the marketing strategy, objectives, target audience, execution and impact (results) of campaigns recognised with industry awards for their advertising effectiveness (World Advertising Research Centre, 2023). Campaign reports are published as case studies by WARC to inform the marketing industry on effective marketing. Reports of food and beverage marketing campaigns include in-depth written descriptions of the digital marketing techniques used by the food and beverage industry to successfully influence their target audience. We conducted a systematic search of the WARC database to identify relevant campaign reports. Search filters were applied to include any campaigns that (i) targeted children, or parents and families; (ii) promoted food or non-alcoholic beverage products; and (iii) employed digital channels as the primary marketing medium. To capture contemporary digital marketing techniques, we limited the search to campaign reports from the last four vears.

Reports were screened and included if the marketing campaign met the following criteria: i) promoted unhealthy food or non-alcoholic beverages as determined by WHO-EU Nutrient Profile Model (those 'not permitted') (WHO. Regional Office for Europe, 2015); (ii) were published from September 2019 to August 2023; (iii) used digital as the primary media or channel; (iv) targeted children (age 3–17 years of age) or aimed to influence children's food-related attitudes, beliefs or behaviours through targeting their caregivers. The reported target audience age (e.g. "our target audience is aged 10-16") or the use of age identifiers such as "children" and "teens" was used to identify if children were targeted. Campaigns that targeted a broader or secondary audience were included if children were the focus (e.g. where the target audience was "youth aged 10-25 years" or "teens and young adults" or "young Gen Z school students"). Reports were excluded if the marketing campaign i) was directed solely to children under the age of 36 months (as the WHO-EU Nutrient Profile Model and policy responses to unhealthy food marketing generally only apply to foods for children above 36 months) or ii) where the nutrient profile of the food or beverage could not be assessed.

2.3. Coding framework development

2.3.1. Definitions and variables

Various definitions of digital marketing techniques and terminology are used within marketing, technology, and public health literature (WHO. Regional Office for Europe, 2016). For this study, we understand digital marketing techniques as; the tactical actions, tools and practices employed at the execution level of UFM campaigns to implement marketing strategies and reach or influence children through digital channels. We define digital channels as; digital devices, digital platforms, digital media, digital data and digital technology. Digital marketing campaigns are understood as the implementation of a series of marketing activities, including various marketing strategies and techniques across digital channels, aimed at achieving the marketing objectives.

To develop the coding framework, we reviewed key protocols from World Health Organisation (WHO) (WHO. Regional Office for Europe, 2019) (WHO, 2020) and the International Network for Food and Obesity/Non-communicable Diseases Research, Monitoring and Action Support (INFORMAS) for monitoring the marketing of unhealthy food products to children and adolescents (Kelly et al., 2013). While the protocols included digital environments as part of their monitoring frameworks, the coding templates available were suited to visually analysing digital media or single digital platforms (e.g. websites and social media platforms such as Facebook). They did not provide clear guidance or methods for identifying and coding digital marketing techniques encompassing multiple digital channels or those described in campaign reports (Muc & Tatlow-Golden, 2023). To inform the development of a comprehensive coding framework, we first conducted an initial scoping review of the campaign reports. Guided by existing food marketing monitoring protocols and relevant food marketing literature (Kelly et al., 2023; Kelly et al., 2013; Nanchahal et al., 2021; Tatlow--Golden et al., 2021; WHO. Regional Office for Europe, 2019), we developed a framework suitable for a conceptual content analysis of reports describing digital marketing techniques and the impacts of campaigns across multiple digital channels. This framework focuses on capturing the operational characteristics and attributes of digital marketing techniques rather than describing the creative content or marketing message (see coding framework in Appendix A.).

2.3.2. Coding framework

To ensure consistency and rigour in the analysis, the coding framework was collaboratively developed and refined by multiple members of the research team. CD coded an initial sample of the campaign reports

Box 1

Variables informing codebook categories

Six variables informing codebook categories.

- i. Primary and secondary digital channels (device, platform, media, data, technology)
- ii. Primary and secondary target audience (age group category*, demographics, psychographics)
- iii. Food or beverage type promoted classified by WHO-EU Nutrition profile model
- iv. Primary tactical actions, tools and practices employed at the execution level of the campaign to implement marketing strategies and reach or influence target audiences through digital channels (digital marketing techniques)
- v. Reported marketing budget, year, and location-countries were classified and grouped by Income level defined by World Bank and Economy type defined by International Monetary Fund
- vi. Campaign Impacts (outcomes reported by campaigns)

Primary refers to the lead variable type reported as playing a central role in the campaign, and secondary refers to the key supporting variable type reported by the campaign, if relevant.

*Food marketing monitoring frameworks recommend grouping children into two broad age groups, "12 and under" and "13–17 years" (Muc & Tatlow-Golden, 2023). In our study campaigns varied in how they reported their target audience age or age group providing exact ages (e.g., age 12), narrow age ranges (e.g., ages 10–13), broader categories (e.g., age 6 and over, ages 10–17, aged 15–30) or non-numeric descriptors (e.g., Generation Z, children, teens). We categorised each campaign's primary target audience into one of four primary groups.

i. Children of all ages

- ii. Under 13 years
- iii. 13 years and above; and
- iv. Parents/families of children

with categories added or removed through an iterative process and refined through discussions with coauthors throughout the process. The codebook, set up in NVivo, included quantitative (yes/no) and qualitative (using descriptive text) categories for six variables (see Box 1). Independent coding between three authors (CD, FM, AC) was then conducted on an initial subset of the campaign reports to test and further refine the coding framework and ensure shared coding definitions. Throughout this process, the three coders met to discuss any discrepancies or unclear categories and codes and to update the coding framework and codebook, including detailed instructions.

Final codes were structured as main code categories (code category) with multiple subcategories (codes). For each campaign, only the digital techniques described as playing a key role and the outcomes of the campaign described as having a significant impact were recorded for the relevant code category. If multiple key techniques or significant impacts were reported, all were recorded. Data were manually extracted by reading through each campaign report, and meaning units (words/ terms, phrases, sentences or paragraphs) were coded against the relevant codes. Using the final framework, a further ten per cent of all campaign reports were independently coded by at least two of the authors to ensure reliability. Interrater reliability for the coding of the campaigns was considered acceptable, with percentage agreement scores for campaign reports coded by individual coders ranging between 80 % and 100 % for all codes. The remaining campaigns were coded by one author (CD) and regular coder meetings were held throughout the final coding process to validate coding decisions minimising the potential interpretive bias (see coding framework in Appendix A.).

2.4. Analysis

The analysis focused on the frequency and common attributes of digital marketing techniques and impacts reported across campaigns. We identified the most frequently used techniques and most commonly reported impacts which were then conceptually organised into groups. Findings are presented by first outlining campaign characteristics (location, food type, budget, target audience) and then describing the nature of the digital marketing techniques and their scope (presenting

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frequency and percentages). Finally, the reported impacts of digital food marketing campaigns are described.

3. Results

We identified 383 food marketing campaigns in the WARC database between September 2019 and August 2023, of which 111 met our inclusion criteria. Fig. 1 presents a flow chart depicting the screening process.

3.1. Characteristics of digital unhealthy food marketing campaigns

3.1.1. Campaign location and brand reach

Most digital food marketing campaigns (n = 74, 67 %) were located in upper-middle income (n = 32, 29 %) or lower-middle-income (n = 42, 38 %) countries with emerging economic markets (India, Vietnam, Indonesia, Thailand, China, Turkey, Colombia, Brazil, South Africa, Russia), particularly in Asia (n = 60, 54 %). Marketing campaigns from high-income countries with advanced economies (n = 21, 19 %) were from Japan, USA, Canada, United Kingdom, Australia, Europe, with fewer campaigns identified from lower-middle income countries with developing economies (n = 11, 10 %) (Pakistan, Philippines, Iraq) (see Appendix B).

Most campaigns (n = 99, 89 %) were for food brands or products owned by multinational companies (multinational, global, or transnational). Reports revealed these companies share data insights between their brands or products. For example, a campaign by transnational company Mondelez (for *Cadbury "Lickables"*) analysed data of consumers for their products and brands to find similar audiences;

"We started off by targeting the lowest hanging fruit - people who had bought Lickables & then explored the look-alike modelling strategy along with cross-selling audiences of Gems & Bournvita from within the brand portfolio" (Mondelez Cadbury, Chocolate, N/A Budget, India, Parents aged 22 to 45)

PepsiCo launched a mobile app that integrates marketing campaigns and offers from all its brands (e.g., Pepsi, Doritos, Lay's, Gatorade), collecting first-party data, including location and behaviour from mobile devices, that can be shared across brands.

"A promo app of PepsiCo brands, win gifts from the products that you consume. We are using all mobile ID first parties for an always on campaign ... to attract more consumers to buy PepsiCo products" (PepsiCo "KazandiRio", N/A Budget, Turkey, Gen Z)

3.1.2. Campaign budget

Among the campaigns that reported budgets (n = 52, 47 %), most (n = 32, 62 %) reported an expenditure of under five hundred thousand USD. One-third of the campaigns described operating on a limited budget or selecting digital channels for their cost-effectiveness.

3.1.3. Target audience and food type

Most campaigns promoted "soft drinks and other beverages" (n = 35, 32%), followed by chocolate (n = 18, 16%), savoury snacks (n = 16, 14%), and milk drinks (n = 12, 11%). While the majority (n = 92, 83%) directly targeted children, seventeen percent (n = 19) of the campaigns aimed to reach children indirectly through their parents. Some campaigns (n = 4, 4%) referred to marketing policies that restricted them from directly targeting children and instead targeted parents. For example;

"In a strategic shift, the brand decided to move away from marketing to kids below 13 years, targeting solely Mums ... while we had to



Identification of marketing campaign case studies via WARC Database

Fig. 1. Screening process for digital unhealthy food marketing campaigns.

engage the kids, we could not directly speak to them ... we had to direct our communication to mums, making her an accomplice" (Paddle Pop, Edible Ices, N/A Budget Indonesia, Mothers).

The most frequently targeted age group was adolescents aged 13 or above, accounting for 41 % of campaigns (n = 45). This age group was combined with adults as a single audience segment in 31 % of campaigns (n = 34). For example, a 7Up campaign targeted "*young adults*," aged 15 to 30. Twenty-seven per cent of campaigns (n = 30) targeted a second audience, including adults (n = 10) or parents (n = 12). For example, Ovaltine targeted "*Tweenagers 8–14 and moms 28–45*".

3.1.4. Multimedia campaigns

Campaigns often reported the need for consistent messaging across touchpoints (n = 76, 68 %), describing integrated techniques such as '360-degree marketing' or 'full-funnel campaigns'. Most campaigns (n = 98, 88 %) utilised multiple digital platforms and media channels, and half combined digital marketing with traditional marketing (n = 55, 50 %), such as television (n = 15, 26 %), product packaging (n = 13, 23 %), or outdoor marketing (n = 9, 16 %).

3.2. Digital marketing techniques

Digital marketing techniques used to target children or their caregivers were conceptually organised into four groups based on common characteristics: (i) Leveraging data and technology to optimise marketing, (ii) Profiling and segmenting audiences; (iii) Targeting and personalisation; (iv) Generating participation and engagement. While we have created distinct groups for the purposes of this study, it should be noted that digital marketing techniques often intersect and reinforce one another throughout the marketing cycle and should be viewed as interconnected. The four concept groups are presented in Fig. 2. The digital techniques are characterised and described in the relevant section. Refer to Appendix C for the detailed table of digital marketing techniques.

3.2.1. Leveraging data and technology to optimise marketing

Continuous use of data and technology to inform and optimise marketing strategies was evident for all marketing campaigns (n = 111, 100 %). These techniques focus on various types of data, and the systems, tools and partnerships leveraged to access and integrate data and

technology for innovative and optimised marketing.

All reports described the collection, use and analysis of diverse data types throughout the various stages of marketing from informing design, through to execution and evaluation. Data types included first-party data (information collected directly from consumers), second-party data (data obtained and shared through partnerships) and third-party data (information sourced from external sources). For example, social listening techniques were reported in seven per cent of campaigns (n = 8), which involve the collection of third-party data through tools and software that monitor and analyse online conversations and posts. Reports also described tracking techniques that collect first-party data using cookies, pixels and other technologies. Twenty campaigns reported tracking children or caregivers (n = 20, 18 %), such as tracking children indirectly through parents using Device ID tracking (n = 5, 5 %). For example, a sweet biscuit brand tracked children's media use through mothers' accounts;

"Stemming from the untapped potential of digital for targeting kids and teens within the biscuit and confectionery category, innovative formats were explored across platforms, where kids' content consumption could be tracked from their mothers' accounts" (Peek Freans RIO,Sweet Biscuits, Pakistan, \$500k-1million, Children aged 13–17 and mothers aged 25–45)

Seventy per cent of campaigns (n = 78) reported using automated marketing tools or third-party partnerships to access and utilise data and technologies effectively. Common partners referred to in campaigns included data brokers and global advertising platforms such as Meta Platforms, Google, AdColony, Tencent, InMobi, and Pokkt. For example, a Cornetto campaign describes forming partnerships to share and access data and technologies, engaging millions of teenagers with personalised marketing using real-time targeting technologies;

"Simply targeting them with super-efficiency was not enough ... we had to play an active role in their food choice ... find the right partner ... get the required data and leverage it for retargeting. Data and technology were combined with the right messaging that engaged millions of teenagers at the right time and most relevant to them" (Cornetto, Ice cream, Indonesia, N/A Budget, Generation Z)

Coca-Cola explains using an automated marketing tool to capture and analyse data, inform marketing and recruit the next generation of Coke drinkers '*at scale*';



Fig. 2. Characteristics of digital marketing techniques identified in industry reported food marketing campaigns and the impacts on youth as a result of campaigns.

"Coca-Cola is looking to recruit the next generation of Coke drinkers with the help of Grivy ... the tech enabler ... to capture consumers on their path to purchase and deliver insights at scale ... empowering the Coke brand team to make decisions based on data instead of assumptions" (Coca-Cola, Softdrinks, Indonesia, N/A Budget, Generation Z).

3.2.2. Profiling and segmenting audiences

Profiling and segmentation techniques used to understand and organise audiences were described in all marketing campaigns (n = 111, 100 %). These techniques focus on identifying and analysing children's and caregivers' characteristics and behaviours to construct audience groups for targeting, including the selection of marketing channels and techniques that would be most effective in reaching and influencing those segments.

Age-based demographics (numerical age or generation) were utilised for audience profiling and segmentation in the majority of campaigns (n = 103, 93 %). Over one-third of these campaigns (n = 40, 39 %) profiled and targeted 'Generation Z' as an audience segment. Generational identity and specific age groups within these cohorts can be determined directly from age-based data or indirectly inferred through psychographic and behavioural patterns.

3.2.2.1. Psychographics and leveraging youth affinities. Psychographic insights, include activities, attitudes, interests, personality, preferences and lifestyles of individuals, were utilised by most campaigns (n = 98, 88 %) for a deeper and more precise understanding of audience characteristics and behaviours. Psychographics informed campaign design and targeting strategies. For example, nearly 19 % of these campaigns (n = 21) leveraged psychographic insights on parenting styles, while the majority (n = 92, 82 %) focused on children's interests, attitudes and lifestyles, often targeting "passion points" like gaming and music to effectively reach and engage children.

"To reach their intended target audience effectively, Coca-Cola employed precise audience profiling to hone in on teenage gamers and music lovers" (Coca cola, Softdrinks, N/A Budget, Philippines, ages 13–19 Generation Z)

Youth affinities refer to the attributes, traits or behaviours typical of youth or youth culture. The majority of campaigns (n = 85, 76 %) utilised psychographic insights to leverage to target youth affinities and guide engagement strategies. For instance, traits and behaviours associated with "digital natives", such as mobile phone usage often guided the selection of digital channels (digital devices, platforms, and media formats) and targeting techniques. Mobile-driven marketing enhances profiling and targeting capabilities by leveraging mobile devices to track locations, monitor real-time activities, and collect online and offline behavioural data. Most campaigns tailored their marketing to mobile phones (n = 83, 75 %) as the primary digital device channel, optimising reach and engagement with youth audiences. For example;

"Pepsi targets a core audience of 15- to 24-year-old youth, Gen Z. They are digital natives, never having known a world without the internet; the mobile is an indispensable connector for all aspects of their life[...] In the light of this mobile culture, everything Pepsi did had to be designed around the smartphone" (Pepsi, Softdrink, Up to \$500K, Vietnam, 15–25 Generation Z)

Other youth affinities often leveraged by campaigns included online sharing behaviours, social connections, peer influence, short attention spans, and the need for entertainment. For example, a chocolate biscuit campaign leveraged teenagers' online sharing and tagging behaviours to increase the organic reach of the marketing message;

"By combining teens' social media sharing and tagging behaviour with relatable content, we saw the possibility of getting our own consumers to spread the word for us." (Voiz, Sweet biscuit, Up to \$500K, Thailand, Teens and Young adults).

3.2.3. Targeting and personalisation

Targeting and personalisation techniques were reported in most campaigns (n = 103, 93 %). These techniques are characterised as identifying and delivering relevant marketing to audience segments based on detailed data insights.

Targeting techniques (n = 86, 77 %) included the use of lookalike audiences to target marketing messages (n = 5, 5 %). Lookalike audiences are an automated targeting technique that finds and delivers marketing content to individuals with attributes and behaviours similar to an existing 'ideal' audience. Re-targeting strategies (n = 12, 11 %) were used to increase the precision in the targeting of marketing content and users frequency of exposure to marketing messages. For instance, Cadbury emphasised the frequency of exposure to their messages as crucial and used re-targeting techniques to ensure that their message was seen multiple times by the same 14-19-year-olds to achieve the desired behavioural change;

"Given that the communication was focused towards driving an inherent behavioural change, instead of focusing only on reach, we laid equal importance to frequency of exposure [...] We had to meticulously plan the deployment to capture audiences dropping from each step of the journey and ensure they are re-targeted with right comms." (Cadbury, Chocolate, N/A Budget, India, Young people age 14–19)

This chocolate cereal campaign reached and engaged new audiences by targeting and retargeting the friends of their existing followers and those interested in their competitors;

"We targeted and retargeted Fans of the Otees Page, Friends of Fans, & People who had shown interest in the OTEES competitors. Majority of our game players came from the "Friends of Otees Fans" audience, followed by the interest in Otees competitor audience and then our Otees Fans" (Otees, Breakfast cereal, Up to \$500K, South Africa, Youth)

Most campaigns described using personalisation techniques to ensure marketing messages were relevant to those they were served to (n = 78, 70 %). Marketing was often implemented across various channels to multiple audience segments simultaneously. Campaign reports referred to this as 'personalisation at scale' which uses data and technology to deliver customised marketing to multiple audience segments at once.

Targeting and personalisation techniques that adapt and optimise marketing based on real-time or behavioural data (online or offline behaviours) were reported in over half of the campaigns (n = 61, 54 %). Real-time marketing techniques gather and analyse live data on children or caregivers' behaviours, actions, or the environment to continuously refine both targeting precision and content personalisation. Realtime adaptions based on contextual behavioural factors such as time, weather, and location were reported in 22 % of campaigns (n = 24). Campaigns described using real-time targeting to "*trigger*" consumption (n = 4, 4 %). For example, Kitco used '*AI powered real-time technology*' to serve tailored mobile advertisements to trigger emotional eating in 13–35 year olds;

"Kitco wanted to tap into the sentiments of its target audience and leverage their behaviour of emotional binging during sporting events to connect with them in a relevant manner, at the right time, and on the right platform when they are most likely to respond to the ad" (Kitco, Savoury snacks, N/A Budget, Southern Asia, ages 13–35)

3.2.4. Generating participation and engagement

Participation and engagement marketing designed to generate

interactive and participatory experiences were reported in all campaigns (n = 111). Techniques focus on prompting and directing the online and offline actions and behaviours of children and caregivers.

Participation marketing, aimed at amplifying the reach of the marketing message organically through active user participation, such as sharing and user-generated content, was common across campaigns (n = 101, 91 %). Participation techniques included encouraging audiences to customise or co-create content (n = 37, 33 %) or often involved collaborating with Influencers (n = 64, 57 %), including micro and macro influencers, gaming influencers, and key online leaders (KOLs). Social media platforms were utilised by over ninety per cent of campaigns as their primary or secondary platform (n = 103, 93 %.) to enhance the reach and impact of a marketing message. YouTube (18 %), Facebook (14 %) and TikTok (11 %) were the most common (n = 44, 43 %) platforms reported. For example, Snickers campaign reports;

"The priority of the participatory campaign is not in the number of fans engaging with the content but in having high-energy fans .When social media enters into the mix, it injects a power to reach over to the audience's friends, organically" (Snickers, Chocolate, Up to \$500K, Japan, Teens and 20's)

Engagement marketing encouraged interactions with the marketing content for increased impact, data collection and long-term relationship building. This included interactional engagement techniques that emphasise immersive or interactive experiences, reported in most campaigns (n = 109, 98 %). For example, immersive or interactive media formats were common (n = 104, 94 %), and included extended reality (XR) technologies (augmented, virtual and mixed reality) (n = 39, 35 %), rich media formats (interactive advertising, e.g. videos, audio) (n = 77, 69 %), live streaming (n = 32, 29 %), and gaming or gamification (gaming platforms, in-game advertising, gaming elements) (n = 48, 43 %). Emerging artificial intelligence (AI) technologies were leveraged to engage with customers in real-time through virtual influencers or "digital personas" (n = 2). For example, a KFC e-sports campaign upgraded "Colonel KI", an AI persona, from a previous marketing campaign into a more advanced 'Virtual influencer' able to chat with 150 million young people in real-time;

"KFC upgraded Colonel KI from an AI persona into the hottest influencer of the eSports world [and] established the first eSports semantic analysis and intelligent feedback mechanism that enabled Colonel KI to be chatting with 150 million players in real time." (KFC, Convenience foods, \$1–3 million, China, Generation Z)

Chatbots and voice-activated media were the primary or secondary media used in eight campaigns (n = 8, 7 %) and featured as minor elements in an additional twenty (n = 20, 18 %). Described as *'innovative AI technology'*, they enable tailored conversations at the most impactful time to increase engagement. For example;

"A chatbot on 7UP messenger would constantly remind users of the game every day at the right "hottest" moment." (7Up, Soft drinks, Up to \$500K, Vietnam, ages 15 to 30)

Engagement techniques were used to direct children or caregivers' online or offline actions. Most campaigns (n = 64, 58 %) used multiple directives, including online "call-to-actions" (n = 49, 44 %), which encourage interactions through clickable or interactive text or graphic prompts such as "swipe", "play", "collect" (e.g. buttons, links, downloads, logins, codes). Offline actions were often prompted through "onpack interactions" such as QR codes on product packaging, known as connected packaging. Over a third of all campaigns (n = 35, 31 %) used directives to prompt purchases or redemptions for food or drink products, either online (e.g. "purchase now" button) or by visiting offline retail stores. For example;

"Upon tapping the call-to-action button, the user will be asked to grant the ad camera access, which launches AR technology to simulate the experience of drinking Coca-Cola. As they keep on "drinking", the bottle eventually empties out and they can now try Coca-Cola in real life by downloading the free coupon and heading to the nearest convenience store." (Coca-Cola, soft drinks, up to \$500K, Indonesia, Generation Z aged 13–19)

3.3. Reported impact and outcomes

The impacts reported as a result of digital food marketing campaigns included (i) exposure to, and engagement with, unhealthy food marketing; (ii) purchases and consumption of unhealthy foods and beverages by the target audience; and (iii) emotional connections to brands and future impact. The extent and type of impacts reported from campaigns are outlined in Table 1 below.

3.3.1. Exposure to and engagement with unhealthy food marketing

Successfully reaching and engaging audiences was a primary outcome reported in most campaigns (n = 103, 93 %). For example, this Chupa Chups campaign states;

"we garnered nearly 130 million impressions, generated over 12 million engagements (reactions, shares, views) and helped make Chupa Chups the number one jelly candy brand in Vietnam" (Chupa Chups, Confectionary, N/A budget, Vietnam, Teens aged 11–19 years)

Half of the campaigns (n = 56, 50 %) reported amplifying their reach beyond the initial targeted audience without additional costs through organic and unpaid reach.

3.3.2. Purchase and consumption of unhealthy food and beverages

Purchase and consumption impacts were reported as either direct or indirect. For example, over half of all campaigns (n = 64, 58 %) reported successfully impacting the consumption or purchasing behaviours of their target audience. This was often measured through tracking and analysis of purchase or conversion metrics (e.g. increases in sales, redemption rates, transactions), and purchase intentions, requests or consumption scores (e.g. lift metrics, click-through rates, QR code scans) for the promoted unhealthy food or beverage product. For example;

"Gamers rushed into stores to buy Butterfinger and claim their DLC (downloadable content)- with 130,000 redemptions and 325,000 codes received. And 38 % of consumers who took part in the promotion purchased at least 10 candy bars, meaning we got our candy bars into their hands again and again" (Butterfingers, Chocolate confectionery, \$1-3 million USD, United States, Younger audience)

Nearly forty per cent reported broader financial impacts of the campaign indirectly generated from increased sales (e.g. revenue, profit,

Table 1

Industry reported impacts of digital food marketing campaigns targeting children or *caregivers*.

Impact of digital food marketing campaigns	Type of impact reported by campaigns and frequency
Exposure to and engagement with unhealthy food marketing Purchase and consumption of unhealthy food and beverages	Reach and engagement: $n = 103$ Organic or unpaid reach: $n = 56$ Direct purchase and consumption metrics: $n = 64$ Indirect purchase and consumption metrics (ROI) $n = 43$ Offset sales impact of regulatory measures: $n = 6$
Emotional connections to brands and future impact	$\begin{array}{l} Shaping \ consumer-brand \ relationship \\ metrics: \ n = 42 \\ Priming \ metric \ (Top \ of \ Mind): \ n = 21 \\ Data \ collection \ and \ new \ audience \\ Insights: \ n = 51 \\ Future \ marketing \ impact: \ n = 28 \end{array}$

market share) (n = 43, 39 %). Some campaigns (n = 6, 5 %) reported offsetting the sales impact related to a "*sugar tax*", a regulatory measure aimed at reducing the consumption of high-sugar foods and beverages. As this RC Cola campaign reports;

"RC Cola reversed the sales decline caused by government's sugar tax, increased sales of RC Cola Mega by 67 %, and raised positive sentiment about the brand by 25 %" (RC Cola, Softdrink, N/A Budget, Philippines, ages 13–25)

3.3.3. Emotional connections to brands and future impact

Digital food marketing was reported to effectively shape children's consumer-brand relationships with unhealthy food and beverage brands. Nearly half of the campaigns (n = 52, 47 %) reported successfully influencing children's attitudes and perceptions, such as brand loyalty, trust, and association (measures included brand love, recall, share of voice (SOV), brand affinity, net promoter Scores (NPS), customer lifetime value (CLV), uplift rates etc.). Digital techniques were reported to strategically prime children with brands, with eighteen per cent of these campaigns (n = 21) reporting 'Top of Mind' awareness as a significant outcome, as this KFC campaign reports;

"KFC remained 'top of mind' amongst the gamer community while building long-term habitual purchase habits" (KFC, Convenience foods, \$1–3 million, China, Generation Z)

A common outcome reported in nearly half of the campaigns (n = 51, 46 %) was the collection of data and insights on children or caregivers, with many (n = 28, 25 %) explicitly stating that insights from the campaign would be used for developing future marketing strategies. For example, a Nestle Milo campaign described;

"The campaign not only provided an instant sales boost, but we also achieved 1PD of actual offline buyers [...] captured critical data enabling us to create personas and leverage learning for all future campaigns [...] sharpshooting our targeting." (Nestle Milo, Up to \$500K, Indonesia, Mothers and kids,).

4. Discussion

Using industry marketing campaign reports, we categorised how food and beverage companies use digital marketing techniques to target children (aged 3-17 years) or their caregivers into four conceptual groups: (i) leveraging data and technology to optimise marketing, (ii) profiling and segmenting audiences, (iii) targeting and personalisation, and (iv) generating participation and engagement. Digital unhealthy food marketing campaigns were reported to increase children and caregivers' exposure to, and engagement with unhealthy food marketing, encourage purchases and consumption of unhealthy foods and beverages, create emotional brand connections and enable the potential for optimised future marketing campaigns through the collection of data. Collectively, our results demonstrate the pervasive and influential ways that multinational food companies are using digital marketing techniques, including AI and other new technologies, to promote their products and brands to ultimately influence the diets of young people across the world.

4.1. Reaching and targeting young people online and offline

Our findings show food brands leverage demographic, psychographic, and behavioural data from diverse data sources, including online and offline interactions, geographical locations, social networks, and caregivers to reach and influence children with unhealthy food marketing. These techniques refer to behavioural and psychographic marketing, previously described in reports conceptualising the digital marketing techniques that can be used to reach young people with unhealthy food marketing (Montgomery & Chester, 2011; WHO. Regional Office for Europe, 2016). While our study demonstrates the use of such techniques, our findings also show they enable food brands to infer children's ages by analysing traits, characteristics and interests without relying on personally identifiable information. Furthermore, our findings show that while food brands directly target children with unhealthy food marketing on digital devices, they often target broader audiences, including mixed-age groups like Generation Z, and refine segments based on psychographic and behavioural data typical of younger age groups, particularly adolescents. This strategy allows food brands to avoid disclosing the specific age of their target audience, making their marketing practices opaque and difficult to regulate.

Our findings show that digital food marketing is effective at directly and indirectly reaching and targeting children through data-driven and technology-centric techniques. This aligns with previous research by (R. Brooks et al., 2022) and a commentary by Montgomery et al. (2019) (Montgomery et al., 2019) describing the utilisation and exploitation of Big Data and technology in promoting unhealthy foods. Building on this, our findings demonstrate that food brands are leveraging automated marketing tools, partnerships and artificial intelligence (AI) to employ sophisticated marketing techniques that rely on Big Data. As such, we found that the food industry can test, adapt and re-target children in real-time for personalised and targeted food marketing at scale.

Our findings reveal the use of behavioural targeting and personalisation techniques that align with the concept of 'tuned advertising'. Carah et al. (2024) describe tuned advertising as adaptive algorithms that dynamically adjust advertising content in real-time, continually refining how it interacts with users across various audience segments (Carah et al., 2024). In addition, audiences themselves are also algorithmically 'tuned' to engage in predictable ways such as clicking, sharing, and purchasing, which enhances the power of marketing (Carah et al., 2024).

4.2. Engagement, participation and directives to purchase

Our findings support previous research showing social media use, influencers, and peer-to-peer marketing are common digital techniques used to target children with unhealthy food marketing (WHO, 2022). Social media platforms functioned as key advertising platforms in our study, providing integrated marketing tools that extend the reach of the marketing beyond the initial target audience and into children's or caregivers' online social networks. Similar to 'pester-power', participation and engagement-driven techniques in our study use 'peer-power' by recruiting children as active participants in the marketing process through actions such as liking, generating, and sharing content within their social networks. Our research findings indicate that food and beverage brands effectively capitalised on children's 'peer power' for cost-effective marketing. Techniques were designed to leverage and exploit the sharing and communication behaviours inherent to young generations, particularly adolescents. Brooks et al. (2022) demonstrated that unhealthy food marketing on social media platforms such as TikTok generates substantial reach through encouraging branded user-generated content (Brooks et al., 2022). According to Kelly et al., (2021), online communities and peer-endorsed marketing heighten the influence of food advertisements on young people as they are viewed as more credible (Kelly et al., 2021). The digital marketing content shared by friends or followers is known to 'prime' young people, reinforcing the marketing message and extending its reach across social media and onto other digital platforms (Munsch, 2021). Coates et al. (2019) found that influencers-whom children find relatable or even see as peers-promoting unhealthy foods on social media can significantly increase children's consumption of these promoted foods (Coates et al., 2019).

Previous research investigating the messages used in digital unhealthy food marketing has shown they often encourage or "cue" consumption. Our findings support this, showing engagement techniques include 'directives' to prompt consumption-related behaviours such as purchases both online and offline. Such techniques create a seamless

link between a marketing message and the purchasing or receiving of unhealthy foods, particularly for older children who have their own purchasing power. This is supported by research showing that adolescents recognise the influence of digital food marketing on their awareness and cravings of foods promoted, and subsequent purchases and consumption of unhealthy foods (Ares et al., 2022).

4.3. Amplifying the influence of food marketing through interactive and immersive techniques

In our study interactive or immersive advertising formats were commonly used including digital games specifically designed for advertising, known as "advergames". While earlier research examining digital unhealthy food marketing to children focused on website-based advergames (WHO, 2022), our findings show a shift to advergames designed as mobile apps. Additionally, integrating "gaming" more implicitly through embedding elements and utilising popular platforms is a core component of digital techniques in our study. These techniques are often referred to as gameful designs and gamification, and include in-game advertising, e-sports, and elements incorporating repetition or rewards into advertising.

Research has shown that interactive or immersive advertising techniques can have a greater impact on children than traditional food marketing (Kelly et al., 2015). These techniques deeply engage children in environments where advertising is harder to recognise, amplifying the affective influence of marketing messages and further reducing their ability to enact the 'stop-and-think response' to defend against marketing (Rozendaal & Buijzen, 2023). Research indicates that interactive elements, including repetition and rewards, increase young people's consumption and purchase intentions for foods (Critchlow et al., 2019a; Suryani et al., 2023). Marketing researchers Sands et al. (2024) raise concerns for vulnerable groups like children about more advanced immersive advertising formats such as virtual, augmented and extended reality techniques which were also identified in our study (Sands et al., 2024). The authors argue these techniques can further amplify emotional responses, increase purchase intentions, and manipulate behaviours which advertisers can exploit (Sands et al., 2024).

4.4. Optimising future marketing campaigns through the collection of data

Food and beverage companies are developing extensive data ecosystems to optimise marketing through investing in data and technology companies, developing in-house data operations and using multiple data collection points (Chester, Montgomery, & Kopp, 2021). Our study found that while third-party data and technology partnerships to optimise data are crucial, many campaigns also reported 'data collection' across various channels as a key outcome and metric of success in their campaign. Our findings show that digital unhealthy food marketing is highly integrated across online and offline channels, with mobile devices playing a central role in data collection. Techniques were designed to prompt continuous mobile interactions, gathering data on location, time, and online and offline behaviours. This data provides insights into routines, habits and lifestyles of the user and those they are connected to or interact with (IAB Australia Mobile Advertising Council, 2017). In our study, digital elements like QR codes are frequently integrated into physical food and beverage packaging, known as connected packaging, to encourage on-pack interactions. This technique targets children in offline environments such as retail stores or at home and directs them to online marketing while collecting valuable location and behavioural data via mobile devices (Rotsios et al., 2022).

The use of emerging digital media formats reported in our study, including AI-enabled chatbots and virtual influencers, suggests food brands are shifting toward deeper relationship building strategies with children and caregivers. This move from the 'attention economy' toward the 'relationship economy' enables more comprehensive data collection and engagement (Jhawar et al., 2023). The data collected in digital

unhealthy food marketing campaigns not only optimises immediate marketing efforts but serves as 'historical data' informing predictive models to enhance future marketing strategies. This approach translates to long-term profitability for food brands while further increasing children's susceptibility to future food marketing (Smith & de Villiers-Botha, 2021; Tatlow-Golden & Garde, 2020). Underscoring the significance of the decisions made about children's data and their exposure to unhealthy food marketing today, the long-term impacts of unhealthy food marketing can extend to other harmful products and into adulthood. As Stoilova et al. (2021) explain, the digital footprints created by children and extracted for food marketing persist and can be used by marketers or other entities throughout their lives (Stoilova et al., 2021).

While many marketing techniques reported in this study relied on AI for automating and optimising digital advertising, new and emerging Generative AI will enable marketers to gain even deeper insight and analysis (Haleem et al., 2022), enhancing the impact of marketing even further. As the digital landscape evolves with the phasing out of third-party cookies, marketers are expected to shift further towards the use of AI and machine learning, first-party data collection, and alternative identifiers to maintain the effectiveness of digital marketing (Haleem et al., 2022). This shift likely means an enhanced reliance on the sophisticated data-driven and technology-centric techniques observed in this study.

4.5. Impact on consumption behaviours and autonomy of choice of young people

The food and beverage industry frequently downplay the influence of unhealthy food marketing on children's diets, often criticising the scientific evidence that demonstrates an association between such marketing and children's consumption behaviours (Boyland, 2023). The impact of unhealthy food marketing often unfolds over time (Kelly et al., 2015), making it hard for public health researchers to directly attribute purchases and consumptions to specific marketing efforts (Boyland et al., 2022). Our findings show that unhealthy food marketing influences children's consumption related behaviours directly or indirectly. Campaign reports indicated that food marketing increased purchases, sales, intentions to purchase and consumption following exposure to marketing. While brand switching may occur, campaign reports also demonstrated unhealthy food marketing shapes children's attitudes and perceptions, through brand loyalty, trust, association and priming children to be more susceptible to future marketing. These factors can contribute to lifelong dietary patterns, underscoring the ethical concerns about the impact of unhealthy marketing on children's health and well-being, privacy and rights (Boyland, 2023).

Our findings also raise significant ethical concerns regarding children's autonomy of choice. The subtle yet powerful priming effects of digital marketing techniques are worrying, given the vulnerability of children, who are still forming their likes, interests, and identities. Many digital marketing techniques were used as pathways that subtly guide children's food preferences and shape their future behaviours. Over time, this can lead children to adopt behaviours and make choices that are not inherently their own but rather those that have been iteratively shaped or 'scripted' through digital marketing efforts.

4.6. Regulation and policy approaches

Our findings demonstrate the urgent need to protect young people from unhealthy food marketing. Specifically, our findings suggest that narrow policy approaches restricted to specific online platforms or using limited definitions, such as content 'directed at children', focusing only on limiting the use of personal data or relying on age-based controls, are likely to be ineffective. As Batista et al., (2023) explains, digital marketers can identify individuals and predict their behaviour based on seemingly insignificant data points (Batista et al., 2023). Missing data can be filled in with algorithmic inferences and assumptions, allowing marketers to identify and target children who may not have extensive online interactions or have left a substantial digital footprint. The digital marketing techniques reported in our study may reach children by proxy as they often share similar psychographic traits with young adults. In the context of digital marketing, children's online social networks extend beyond peers of their own age or direct 'friends' to include influencers they follow, pages they like, and mixed-age online communities such as gaming and sporting groups. Digital unhealthy food marketing incorporating mixed-age groups, as observed in our study, or online influencers who appeal to both older and younger audiences may enable unhealthy food marketing to influence children of all ages, even when they are not the stated primary target. Furthermore, research has shown variability in the digital marketing content younger children find appealing (Valderrama et al., 2023). Additionally, older children are likely to perceive advertising as targeting them if it promotes food products they enjoy, regardless of other elements or the intended audience (Ares et al., 2024). This highlights how unhealthy food marketing can reach and influence young people even if it does not target children directly, or explicitly, or use typical child marketing appeals.

Our findings also support calls to consider the cross-border implications of digital food marketing for effective child protection policies and the need for a regional or even global approach to food marketing regulations (ASEAN & UNICEF, 2024; Tatlow-Golden & Garde, 2020). Many digital marketing techniques identified in our study, such as partnerships and automation, allow region-specific insights and marketing strategies developed by one campaign to be easily modified and localised for audiences in other regions. Furthermore, the global digital ecosystem means data insights generated by food marketers contribute to the larger pool of aggregate data on children used worldwide. While most campaigns in our study targeted audiences in middle-income countries with emerging economic markets nearly all campaigns were for brands or products owned by multinational companies, enabling the potential for knowledge and data sharing between brands and regions and opportunities to test and refine digital marketing strategies. This dynamic reflects the growing role of both food and technology corporations as commercial determinants of health, whose practices shape global food systems in ways that undermine young people's health yet operate beyond the reach of national regulatory frameworks (Lafontaine et al., 2025).

Low and middle-income countries (LMIC) targeted by campaigns in our study were characterised by emerging economic markets with large, digitally active youth populations (United Nations, 2024) making them attractive to both technology and food industries seeking market growth. Food and beverage companies in our study reported strategically moving to digital channels for direct access to young audiences online and a method to "future-proof" their brand or products. Existing research supports this and shows LMICs are being aggressively targeted by food and beverage corporations (Baker et al., 2020; Huse et al., 2022; Stuckler & Nestle, 2012). Notably, digital access in these regions has accelerated rapidly, with social media platforms and mobile devices often serving as the primary means of accessing the internet (World Bank, 2024). This growth creates opportunities for food companies to access large, highly engaged, connected youth markets through platforms engineered for advertising and data collection-highlighting the growing intersection between Big Food and Big Tech in these regions. The increase in digital access is partly driven by initiatives funded by US-based Big Tech companies aiming to connect the "next billion" users to the internet (OECD, 2019; Pisa & Polcari, 2019). For example, Meta, the parent company of Facebook, Instagram and WhatsApp, partners with mobile carriers in LMICs to provide free or low-cost access to its platforms without needing Wi-Fi or high-speed broadband (OECD, 2019). As such, for youth in many LMICs, social media platforms, particularly Facebook, have become synonymous with "the internet" (Pisa & Polcari, 2019). While these investments aim to bridge the digital divide, they raise concerns about platform dependency, data control and

corporate influence over policy and regulation (Magalhães & Couldry, 2021). Our findings point to a need for equity-focused regulatory responses to limit the influence of food and technology companies as commercial determinants of health, particularly in vulnerable regions.

The potential for the food and beverage industry to use digital marketing to undermine the effectiveness of policies aimed at preventing childhood obesity was evident in several campaigns in our study. For example, one campaign reported using digital marketing as a cost-effective strategy to offset the impacts of 'the sugar tax.' This tactic—pursuing alternative market strategies to compensate for losses due to regulatory measures—has also been observed in tobacco control. For example, when tobacco advertising restrictions were implemented in Australia, companies shifted their focus to promotions through numerous strategies, including packaging innovations, advertising in international media and sponsorships, exploiting loopholes to maintain their market share (Carter, 2003).

Overall, our findings indicate the importance of a comprehensive approach to addressing childhood diets and obesity, which includes a range of policy measures designed to shift the population toward healthier diets. In line with the WHO 2023 policy recommendations, we emphasise the need for robust, mandatory policies that restrict the marketing of unhealthy food and beverage products to children across the digital ecosystem (WHO, 2023). This objective can be achieved through a combination of sector-specific law to restrict the digital marketing of unhealthy foods and beverages and the strengthening of other complementary legal frameworks to i) prohibit the direct or indirect collection, storage, sharing, and use of data related to young people, both online and offline, recognising the future implications of data profiling during childhood and adolescence for the marketing of harmful products, ii) mandate and enforce clear labelling of paid marketing content (monetary or non-monetary) to support young people and caregivers in distinguishing marketing from organic content iii) coordinate regional and global regulations for the equitable protection of all young people, including those in low-and middle-income countries, where digital access and youth engagement are rapidly expanding iv) ensure that all regulatory approaches are technology- and platform-agnostic and adaptable to evolving and future forms of marketing. Importantly, policy responses should consider the broader spectrum of harmful marketing to which young people are exposed online as focusing on one area (e.g. food) risks shifts in marketing exposure to other harmful content such as alcohol or gambling.

5. Strengths and limitations

Our study represents a comprehensive, cross-channel analysis of the digital marketing techniques used by the food and beverage industry to target young people and influence their dietary intakes, and why the food industry uses these techniques. To our knowledge, these campaign reports have not been previously examined and represent a key source of evidence on the digital marketing techniques and potential impacts of unhealthy food marketing. The large sample of campaign reports across many countries strengthens our findings, offering an in-depth view of the nature of food marketing techniques used across the digital environment. An additional key strength is the inclusion of award-winning campaigns recognised for their effectiveness. By analysing real-world data from successful campaigns our findings reflect food marketing techniques that have had success at reaching and influencing children and families.

A limitation of our study is the majority of the dataset was coded by one author. While this approach was balanced by the collaborative development of the framework, double coding with acceptable intercoder agreement, and ongoing reflexive discussions, we acknowledge the potential for interpretive bias as a limitation of the study.

In addition, our study is limited by the scope of the marketing campaign reports, which include successful marketing campaigns published on the WARC database. While most reports originated from the Asia region, many Asian countries were not represented, and a minority were identified from outside of Asia. The reasons for this are unclear and may affect the generalisability of our findings. Our search focused on campaigns reporting digital as the core media or channel. In developed markets like the USA or Europe, marketing strategies often integrate a broader mix of media channels rather than focusing on digital, which would limit their appearance in our search results. In contrast, emerging economic markets in Asia, such as India and Vietnam, have larger youth populations, and as social media and mobile devices are the primary modes of media consumption, they may be more likely to employ digital-first campaigns. The higher concentration of digital unhealthy food marketing campaigns in low-and middle-income countries observed in our study may also reflect broader structural inequalities shaped by the intersecting power and global reach of Big Food and Big Tech.

Overall, our findings provide valuable insights into how the food and beverage industry targets children, which can inform effective policy actions to protect young people from harmful digital food marketing.

6. Conclusion

Strong government-led action is essential to safeguard young people from the invasive reach and powerful influence of digital marketing techniques employed by the food and beverage industry. Contemporary food marketing techniques leverage advanced technologies and networks in a rapidly evolving digital environment to shape and negatively influence the food behaviours and diets of young people around the world. Effective action requires comprehensive policies that address the entire digital ecosystem rather than narrow restrictions limited to specific platforms, timeframes, or marketing content perceived as appealing to, or directed at, children. Partial measures fail to account for the sophisticated and adaptable nature of contemporary digital marketing techniques used to target and influence young people and their caregivers. Without a robust and enforceable legal framework, children worldwide will continue to be lucrative targets of the food and beverage industry's aggressive digital marketing practices, increasing their lifetime risk of diet-related diseases.

CRediT authorship contribution statement

Christine Driessen: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Alexandra Chung:** Writing – review & editing, Methodology, Data curation, Conceptualization. **Florentine Martino:** Writing – review & editing, Methodology, Formal analysis, Conceptualization. **Adrian J. Cameron:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Asim Bhatti:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Oliver Huse:** Writing – review & editing, Methodology, Conceptualization. **Kathryn Backholer:** Writing – review & editing, Supervision, Methodology, Conceptualization.

Ethical statements

This study received an ethics exemption from Deakin University Human Research Ethics Committee (DUHREC) Project number 2022-195.

Data availability:

Data is subject to third-party restrictions. The data that support the findings of this study are available from a third party https://www.warc. com/. Restrictions apply to the availability of these data and under the terms and conditions, cannot be shared by the researchers.

Authorship

All authors contributed to the study design. CD developed the initial coding framework and guide and worked with AC and FM to develop the final framework and guide. CD performed data collection, coding and analysis. Collaborative discussions with CD and KB occurred throughout the analysis phase. The first draft of the manuscript was written by CD and critically revised by KB. All the authors revised or commented on the final drafts of the manuscript. All the authors read and approved the final manuscript.

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Declaration of competing interest

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

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.appet.2025.107989.

Data availability

The authors do not have permission to share data.

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