



Digital Feast

Navigating a digital marketing mix, and the impact on children and young people's dietary attitudes and behaviours

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This report should be referred to as follows:

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Cancer Research UK

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Foreword

Our children are the future and we know that their future may be blighted if they become obese, not least because of the link between obesity and cancer. It is incumbent on us to find the best way to ensure as healthy a future for them.

This report, from the Institute for Social Marketing at the University of Stirling and Cancer Research UK, is the first time that existing research has been synthesised to outline the many impacts of digital marketing of HFSS foods to children. The importance of this, and the differences of digital marketing to more traditional routes, cannot be underestimated. Children immerse themselves in brands through games, apps, augmented reality and user-generated content, which positions them as particularly susceptible to the type and range of advertising that is so cleverly targeted to them. It is digital advertising that becomes the entertainment. One of the things that has always struck me about regulating this space is that it is not like above the line broadcasting; if we see an ad on television that we think is breaching regulations we can complain, but key here is that we see many ads that are not targeted to us. On Twitter, Facebook, Snapchat and Instagram the consumer influences which brands they see, as they may have already shown a preference for a similar brand or interest. There is less room for others to see and complain about the content. A parent is unlikely to follow the same brands as their child.

The report's conclusions highlight just how engaged HFSS marketers are with digital technology and its opportunities and this has led to the extensive presence of marketing for these food and drinks with content that

clearly engages children and young people. This inevitably leads to subsequent positive attitudes to the brands. Because children are digital natives, this is the world they operate in and knowing the brands and what they are saying gives them social capital. Their parents are on the outside looking in, and we need to ensure they are supported to be able to monitor and control how their children are engaging with apparently harmless everyday brands.

This report comes at a critical time as the UK Government consults on introducing further restrictions on junk food marketing. The evidence presented highlights the need for the UK Governments and regulatory bodies to engage with the actuality of digital marketing and reassess how it should be regulated. Hopefully it will also encourage greater support for parents to become more aware of the kind of engagement their children have with brands, and for manufacturers to take a more responsible approach to their methods of engagement with children in the digital environment.



Professor Isabelle Szmigin

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Executive Summary

Overweight and obesity is the second leading cause of cancer in the UK after smoking. Overweight and obesity causes 13 different types of cancer and over 22,000 cancer cases each year in the UK^[1]. It is estimated that each year, obesity costs the NHS in England £6.1bn and the wider UK economy £27bn^[2].

Childhood obesity rates in the UK are among the worst in Western Europe, with a third of children leaving primary school with obesity^[3]. It is vital to understand what is driving these alarming obesity rates, and what can be done to address the issue.

Research has consistently shown that marketing for food and drinks high in fat, salt and sugar (HFSS) negatively influence dietary-related knowledge, attitudes, consumption and health outcomes in young people^[4, 5, 6, 7]. This research has so far largely focused on the impact of TV advertising, but the marketing landscape has changed; digital marketing and advertising is now as, or more, prevalent in young people's lives than TV advertising.

In 2017, digital advertising accounted for over half of total UK advertising spend (£11.6bn)^[8]. Digital media provides unique strengths for marketers; it is low cost, marketing can be tailored to specific audiences, content can be user-generated, and internet use across all age groups is very high^[9, 10, 11, 12, 13, 14]. Internet use is particularly high in younger age groups; 99% of 12-15 year olds go online for over 20 hours a week^[15].

The food and drink industry have embraced digital media and put it at the

centre of their marketing strategies. Food and drink producers are using a sophisticated range of digital marketing strategies, ranging from smartphone apps to social media. Within each activity, they also use a wide variety of creative and stimulating marketing activities to create engaging and attractive content.

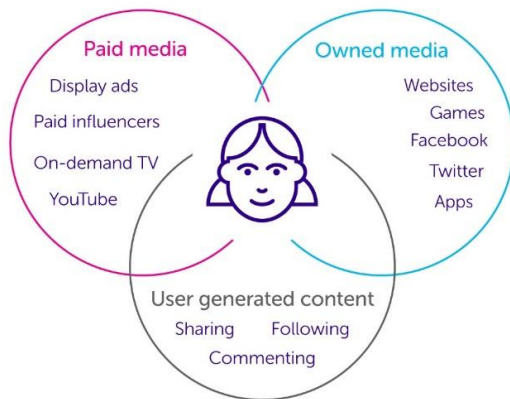
As digital marketing becomes more widespread and its impact more well-documented, there is a need to bring together the evidence on what effect this may have on children's health. This report shows the pressing need for regulatory change, across all media platforms, and provides evidence to underpin policy action.

Key Findings

Children and young people are exposed to and participate with HFSS marketing across multiple digital channels

An interacting network of marketing across multiple digital channels means children and young people must navigate a digital marketing mix. This includes explicit marketing (such as social media pages) and subtle marketing (such as celebrity endorsement). This is all in addition to both traditional and digital versions of TV and out-of-home advertising.

Each brand uses an interacting network of marketing across multiple digital channels



The food and drink industry use digital media to reinforce and amplify brand and product messages

A key component of digital HFSS marketing is brand immersion, achieved by repeatedly presenting key brand components (such as logos), promoting other products within the brand, and cross-referencing across digital and traditional forms of marketing.

A variety of tactics are used in digital marketing content to promote food consumption, and content mostly promotes unhealthy foods

Consumption of products is promoted by marketing strategies such as repetitive images of the product to stimulate cravings or linking consumption or product purchase to a competition entry. Most food and drink products promoted through digital marketing have little nutritional benefit. A disproportionate number of food and drink websites advertising low nutritional foods were found to be those which are targeted to children and teenagers.

HFSS digital marketing rarely shows health information, even less so in content aimed at young people

Health information on nutrition, diet or physical activity is rare, and information which does appear is inconsistent or strategically ambiguous. Health information appears less often in content aimed at young people, compared to content intended for a general audience.

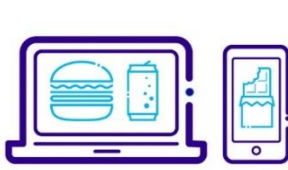
Digital marketing for HFSS food and drinks reaches and appeals to children and young people

Digital marketing for foods and drinks is placed in online spaces used by children and young people. Asking young people to share content or invite others gets even greater reach. The food and drink and advertising industry's use of tactics such as branded characters, advergames, quizzes and youth-oriented language appeals to younger age groups.

Children have low digital marketing literacy

Young people are more likely to have difficulty recalling or recognising subtle marketing tactics. This includes knowing that marketing may be tailored through their browsing history or realising there is a commercial goal of an advergame. User-generated content also blurs the boundaries between commercial and peer activity.

Food and drink marketing uses a range of tactics which can impact children and young people



Junk food marketing **reaches** children and young people...



... using tactics which **engage** and appeal to them...



...which **influences** diet, associated with consuming more unhealthy food and drinks

Seeing digital HFSS marketing is positively associated with obesity-relevant outcomes in children and young people

Seeing HFSS ads makes children more likely to have positive attitudes towards HFSS brands and products. Being aware of and participating with digital HFSS marketing is also linked to obesity-relevant outcomes such as consuming HFSS food and drinks, pestering parents to buy HFSS products and changes in bodyweight or obesity status.

Parents find it difficult to monitor and control the digital marketing that children are exposed to online

Extensive HFSS marketing across a variety of platforms means that parents face challenges in understanding how much digital marketing their children have been exposed to and how it can influence them.

What should government do?

Decisive policy action at a national level is key to achieving the UK Government's ambition of halving childhood obesity rates by 2030. The UK Government must introduce a comprehensive 9pm watershed for HFSS ads across all forms of media, including all digital media.

This would reduce children's exposure, support parents to help keep their family healthy, provide a consistent approach for industry, and minimise the risk of displacement of HFSS marketing to other media.

Methodology

This report is a structured narrative review. It was split into two themes:

- 1) Digital HFSS marketing, utilising peer-reviewed content and key grey literature (known as content analyses research)
- 2) Exposure to HFSS marketing and the association with consumption, based on experimental studies, cross-sectional research and qualitative studies (known as consumer research).

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1 Introduction

In the United Kingdom (UK), an estimated 28% of 2 to 15 year olds are either overweight or obese (Public Health England, 2017) ^[2]. Childhood obesity has lasting lifetime effects, with obese children and adolescents being five times more likely to remain so as adults ^[16]. This is significant on both an individual level, as obesity causes a number of health conditions including 13 types of cancer ^[1], and an economic level (through working days and lives lost), with an estimated cost to wider society of £27 billion each year, £6.1 billion of which are NHS costs alone ^[2]. Accordingly, childhood obesity remains a crucial topic for both researchers and policy makers to address ^[17].

Reviews of research consistently indicate that exposure to marketing communications for HFSS foods and drinks is associated with poor dietary knowledge, attitudes, and behaviours in young people ^[6, 7, 18, 19]. Marketing strategies for food and drinks, along with other fast moving consumer goods such as alcohol, tobacco and gambling, frequently employ a multi-layered 'marketing mix' to influence all stages of the consumer and retail process ^[20, 7, 21, 22, 23]. In the UK, this has created a sophisticated network of interacting marketing communications, which includes mass media advertising (e.g. television), broader and subtle marketing communications (e.g. sponsorship), consumer marketing (e.g. price offers and promotions), and stakeholder marketing (e.g. corporate social responsibility). These marketing mix activities are carried out not only by producers, but also by the retailers (e.g. supermarkets) and hospitality industries (e.g. restaurants and bars) who distribute and sell the products.

Advances in media technology, and greater use of new media across the population, has fuelled interest in how digital media can enhance the efficacy of marketing ^[24, 25, 26]. In 2017, online advertising accounted for over half of total UK advertising spend (£11.6bn), double the expenditure on television advertising and greater than all other advertising formats combined. Developing innovative and effective ways to use digital media as a marketing tool is also highly profitable for the platform operators. For example, Facebook and Google reportedly account for one-fifth of global advertising spend (\$109 billion) ^[27], with the former's advertising revenue growing 49% between 2016 and 2017 ^[28]. Spend on traditional advertising forms, such as television, has remained constant ^[15]. This highlights the importance of continuing to address the impact of traditional marketing on dietary attitudes and behaviours in addition to digital marketing.

Compared to marketing through traditional media (such as television), digital media provides several unique strengths and opportunities for marketers ^[13]. For example, as 90% of adults in the UK are recent internet users¹, digital media provides an opportunity for marketing to reach large parts of the population ^[29]. This reach is particularly true for younger audiences, as almost all 16-35 years olds in the UK are recent users¹ (99%) ^[29] and they engage in range of online behaviours across many digital devices ^[25, 26]. Digital marketing also has comparatively lower costs, and the ability to target digital marketing to specific audiences means there are lower risks associated ^[9, 10, 11, 12].

¹ Have used the internet in the last three months.

The real-time nature of digital media also means that marketing strategies, particularly those capitalising on real-world events or popular culture^[30], can be quickly disseminated without the need for high production costs or the time associated with disseminating marketing through traditional media (e.g. print press or billboards).

Producers of fast moving consumer goods have taken advantage of the new opportunities provided by digital media to influence and interact with consumers, and there is growing evidence that new forms of marketing can influence health behaviours^[31, 32, 33, 34, 35]. Concerns have been raised about whether digital marketing for such products is more powerful and less controllable than marketing through traditional media (such as television). Examples of reported concerns include the ability to target marketing at specific audiences, the ability for marketing to be accessed in almost any context (e.g. mobile devices), marketing being virally spread (including globally), co-option of users into the marketing process, and the challenge of effectively applying age restriction gateways^[20, 36, 37].

Producers and advertisers of food and drinks high in fat, salt, and sugar (HFSS) have similarly taken advantage of the opportunities provided by digital media to offer new ways to reach, influence, and interact with consumers^[31, 38, 39, 40, 41]. Constant innovation in digital technology has now resulted in a new 'digital marketing mix' which represents a sophisticated and interacting combination of paid media (e.g. display adverts, banner adverts, video adverts), owned media (e.g. websites and social media content), and user-generated content (e.g. fan photos on social media). Children and young people must navigate this digital marketing mix in addition to more traditional forms of marketing, such as television and out of home.

Concerns about the marketing of HFSS food and drinks through digital media are also accompanied by debates about the merits and efficacy of current marketing control policies. There remains scope to explore alternative ways to refine the design, efficacy, and effectiveness of control policies for marketing for HFSS food and drinks through digital media.

This narrative review investigates how HFSS food and drinks are marketed through digital media, young people's exposure to such marketing, and what association there is between digital marketing and dietary-related knowledge, attitudes, and behaviours.

2 Research Aims and Objectives

A structured narrative review was conducted, to review and critically assess evidence:

1. On the digital channels and creative strategies used to market HFSS food and drinks, and to what extent they may appeal to children and young people.
2. Exploring children and young people's awareness of, and engagement with, digital marketing for HFSS food and drinks, and what association it has with dietary-related knowledge, attitudes, and behaviours.

The synthesis of evidence in this report aims to move the debate on from *whether* digital marketing for HFSS food and drink products is associated with consumption, to understanding *how* this association takes place and what mechanisms underpin it.

3 Methods

The report begins by summarising the importance of marketing to the food and drinks industry and the shift to digital marketing. It then reviews evidence from two branches of research that have explored digital marketing of food and drinks: content analysis research and consumer research.

The evidence is presented as a structured narrative review, an established method used in academic research to review the design and reported effects of alcohol, tobacco, gambling, and food marketing^[42, 33, 43, 44, 19, 45].

Research that has explored how food and drinks (including HFSS products) are marketed through digital media, young people's experiences of this marketing, and how it impacts on dietary-related attitudes and consumption, typically falls into two categories:

- A) **Content analysis research**, which examines where digital marketing appears, what marketing techniques are used, and how it may influence behaviour
- B) **Consumer research**, which explores awareness of, and participation with, such marketing and the association with dietary-related knowledge, attitudes, and consumption.

This narrative review includes both categories, captured in the following themes:

3.1. Content Analysis Research: How HFSS food and drinks are marketed through digital media

Content analysis research focused on where, and how, HFSS food and drinks are marketed through digital media and contained three sub-themes:

- A) Marketing placement, design, interaction, and brand immersion;
- B) Marketing practices that might reach and influence children and young people; and
- C) Framing consumption and impact on dietary choices and attitudes.

Identification of literature

This part of the review draws upon peer-reviewed content analyses of digital marketing for HFSS food and drinks and key grey literature (e.g. reports from charities). Relevant literature was identified through snowball sampling, purposive key word searches of academic databases, citations in grey literature, and through academic contacts.

Content analysis research focuses on the marketing output as the unit of analysis (e.g. the display advert, social media posts, or an advergame). This research can fulfil many goals: for example, to identify and describe marketing features, explore how brands and consumption are framed to consumers, categorise which audiences the content may appeal to, and describe how marketing may shape dietary-related knowledge, attitudes, and consumption.

Content analysis research can also be either qualitative (seeking to provide detailed insights into the features of advertising), quantitative (seeking to quantify occurrence of particular advertising features), or a combination of both approaches.

3.2. Consumer Research: Exposure to digital marketing for HFSS food and drinks, and the association with knowledge, attitudes, and consumption

Consumer research focused on awareness of, and participation with, digital marketing for HFSS food and drinks, and the association with dietary-related knowledge, attitudes, and behaviour (e.g. eating habits, purchase intentions, and food choice).

Identification of literature

This part of the review is based on three types of evidence, mostly drawn from both peer-reviewed studies and some from grey literature. Relevant literature was identified through snowball sampling, purposive key word searches of academic databases, citations in grey literature, and through academic contacts.

Consumer studies focus on the audience as the unit of analysis. They explore how much digital marketing for HFSS food and drinks consumers are exposed to. They can also explore whether there is a *direct* association between exposure to marketing and dietary-related outcomes, and how marketing may *indirectly* influence consumption through social cognitions and attitudes towards food and drinks (including HFSS products). Finally, consumer research can examine consumer awareness, knowledge, and attitudes towards how foods and drinks are marketed online (including HFSS products).

To fulfil these goals, consumer research falls into three research categories:

- A) Experimental studies
- B) Cross-sectional research
- C) Qualitative studies

Analysis

For both content analysis and consumer research, information on the sample used, digital marketing channels analysed, research methods used (e.g. measurement of exposure to marketing and key dietary outcomes), and key findings were extracted. The results were then analysed thematically, by research method type.

4 Results

4.1. Studies identified

40 content analysis research studies, 25 experimental research studies, 9 cross sectional studies and 8 qualitative studies were included in this review. Literature searches were performed between March 2018 and January 2019.

The studies included in the narrative review varied in their terminology used to describe food and drinks, including 'HFSS,' 'unhealthy,' 'less healthy' or 'non-healthy.' The term 'HFSS' will be used throughout the report to represent the breadth of food and drink products and varied language used across the literature reviewed.

4.1.1. Content analysis research

Study characteristics

Forty content analyses of food and drink marketing were considered for this narrative review, covering studies published 2006–2019. This includes research from the United States (US), Australia, Canada, the UK, the Republic of Ireland (hereafter 'Ireland'), Hungary, New Zealand, Brazil, Austria, Malaysia, and Egypt. It also includes studies that sampled international marketing or content from across several countries.

Digital formats assessed in included studies

The review includes research into many digital formats, including websites, display advertisements, smartphone apps, social media pages, photo-sharing websites, YouTube videos, and advergames. Some studies only focused on a small or specific number of food and drink companies or brands, for example products advertised during children's television programmes. Others reviewed marketing from a large range of brands across food and drink types.

4.1.2. Consumer research

Experimental research

Study characteristics

Twenty-five experimental studies were considered for the narrative review, published between 2009-2019. The evidence was geographically diverse, and included studies from Australia, the US, Austria, Belgium, Spain, Sweden, Mexico, Holland, and Portugal. The samples included children, those at varied stages of adolescence, young adulthood and adults (total included age range 4-59). Most studies had an explicit focus on HFSS food and drinks, although some examined the effect of digital marketing on wider food choice.

Methodologies used by included studies

The nature of the experimental designs varied, and included between group examinations, pre-and-post-test examinations, eye-tracking examinations and naturalistic experimental designs. Most studies used real or study-specific advergames as the marketing stimuli, covering a range of formats (e.g. racing, strategy and adventure) and HFSS food and drink brands or products. Examples of digital marketing that were not based on advergames included social media and websites, in-store digital screens, and social influencer content. Most studies employed multiple experimental conditions to examine the effect of marketing for HFSS food and drinks versus either marketing for a non-HFSS food and drinks (or healthier food choice), a non-food-related brand (e.g. a toy brand), or a control group with no marketing exposure.

The outcome variables in experimental studies were diverse, with many capturing a combination of reactions to the marketing stimuli, knowledge and attitudes towards advertised products and brands, and consumption behaviour or intentions.

Concerning the marketing stimuli, some studies measured length of time spent engaging with digital marketing, attitudes towards the advergame stimuli, and whether participants could determine the commercial or persuasive intent of the game. Concerning the food and drink products promoted, outcome measures included attitudes towards the brands or products and post-exposure brand recognition or recall. Concerning response to the persuasive intent of the marketing, outcomes included actual consumption (including studies which provided both advertised HFSS food and drinks products and healthier alternatives) and self-reported intentions to eat, purchase, or request purchase for the advertised food and drinks.

Cross-sectional studies

Study characteristics

Nine cross-sectional studies were considered in this narrative review, published between 2012-2019. All nine studies were based on measurement at a single time point. No repeat cross-sectional studies were identified. Two studies presented separate analyses of the same dataset ^[5, 4].

Methodologies used by included studies

Across all nine studies, there was an aggregate sample of over 20,000 children and young people. This included research from across the UK, Australia, the US and Canada. It includes studies which sampled children, young people across all stages of adolescence, and those in young adulthood.

Combined, the nine studies measured several different digital marketing techniques. This included self-reported awareness of, and participation with, food and drink marketing on social media, online games, online videos, and e-mail marketing. Several studies, particularly those with children and younger adolescents, used time spent online or watching commercial TV on-demand as a proxy measurement for marketing exposure. One study was based on structured observation of young people while they were using their social media accounts ^[46].

Qualitative studies

Study characteristics

Eight qualitative studies, published between 2014-2018, are included in this narrative review. This included studies from Australia, Ireland, the UK, Egypt, and Belgium. The studies focused exclusively on children and young people (ages ranged from 5-24 years across studies), focused exclusively on parents, or sampled a combination of children and parents.

Methodologies used by included studies

Most studies used semi-structured in-depth interviews (either paired interviews with parents and children or individually) or semi-structured focus groups. One study captured open-ended written responses through an online survey with parents^[47]. Combined, the eight studies provide insight into a range of digital marketing strategies for HFSS food and drink, including social media, brand websites, all forms of digital marketing, and interactive and immersive marketing such as placement in video, advergames, and personalised pre-roll adverts. In most studies, participants were shown examples of digital marketing for food and drinks (including HFSS products) to inform and stimulate the discussions. The studies provide insight into marketing for a variety of products, including all junk food, energy drinks, all forms of food marketing and a range of HFSS food and drink products.

Results from both content research and consumer research have been presented together to highlight the key findings of the report and will be referred to collectively as ‘the evidence.’

4.2. Key Findings

4.2.1. Children and young people are exposed to digital marketing for HFSS food and drink

Consistent evidence was found suggesting that young people were exposed to digital marketing for HFSS food and drinks through a variety of online channels. This included explicit marketing such as social media^[4, 40], online videos^[48], and online games^[49], and also subtle or implicit marketing such as celebrity endorsement or social influencer content (sometimes referred to as ‘native advertising’)^[46].

The evidence showed that digital marketing for HFSS food and drinks might appear in online spaces that reach, or are accessible to, children and young people. For example, several studies reported that food and drink marketing (including HFSS products) appeared on websites popular with children and young people, with appeal to these age groups often determined using established market research data^[50, 51].

Several studies examined the websites of food and drink brands promoted during television programmes aimed at children and young people, or magazines popular with these age groups, thus highlighting how they may be signposted to digital content through advertising in traditional media^[52, 53, 54].

It was also reported that marketing attempted to extend the reach to other young people by

asking audiences to virally share content or invite others to participate [55, 56, 57, 58, 59].

Several studies provided evidence of cumulative exposure to digital marketing. For example, one study found that one-in-ten 12-17 year olds in Australia had seen at least two instances of digital marketing for HFSS foods and drinks in the past month [60], while another estimated that children in Australia saw food and drink marketing on social media 30 times per week (1,560 annually) and adolescents 189 times per week (9,828 annually)^[61].

Demographic differences

Awareness of digital marketing for HFSS food and drinks appeared to be greater in those who were categorised as obese^[5, 4] and in those who had previously consumed HFSS products^[31]. Although research in Scotland suggested that awareness of HFSS food and drink marketing on social media did not vary by age, gender, or level of deprivation^[40], real-time observations of social media use suggested that adolescents (ages 12-16) did see more marketing on social media than younger children (ages 7-11)^[61]. One study found that HFSS food and drink brands on Instagram had, on average, over a million followers, and that audience members were willing to like and comment on content^[62].

4.2.2. Digital marketing for HFSS food and drink is designed to engage consumers and stimulate interest

The evidence highlighted that digital marketing for food and drink (including HFSS) products uses a variety of designs and marketing strategies to create appealing, entertaining, informative, and engaging content.

One study reported 21 promotional activities across the Facebook pages, websites, and smartphone apps of three prominent HFSS food and drink brands. These included visually stimulating images and videos (e.g. flash animations), music, games, loyalty schemes, promotions, and competitions. Eighty-five percent of the marketing analysed used four or more of these features simultaneously^[38]. A second study found similar features on the Facebook pages for HFSS food and drink brands^[63].

For marketing through traditional media (e.g. advertising on TV or in magazines) audience members are typically passive observers who have limited opportunity to dictate or interact with marketing. The evidence, however, indicated that digital marketing for food and drinks has capitalised on the opportunities provided by digital media to enable audiences to participate with, respond to, or co-create, marketing content – thus extending beyond a passive role.

An analysis of Australian websites for eight HFSS food and drink brands found that marketing captured and maintained attention through viral marketing strategies (e.g. ‘tell a friend’), asking consumers to register to access website features, advergames, chat rooms or forums, interactive brand characters, recipe ideas, and downloadable games and activities (e.g. party ideas and screensavers)^[64]. Similar techniques were reported in the US^[55, 58, 65, 66], Canada^[67], the UK^[56, 54], and New Zealand^[68].

Many of the studies reviewed provided evidence of advergames and highlighted how such marketing can maintain attention by having multiple game levels, leader boards to incentivise competition, prompts to ‘play again’, customisable games, and immersive virtual reality

worlds [69, 57, 70, 52, 59].

On social media, interactivity was fostered through quizzes and polls, instigating conversations with consumers, embedded apps and games, competitions, and asking users to interact (e.g. like, comment, and share) [38, 47, 63, 71].

Research suggested that such marketing techniques appear to be successful in stimulating consumer attention and interest. One study, using an eye-tracking method with children in Austria, found that HFSS food cues embedded in a digital video received significantly more visual attention than healthy foods, with the effect amplified when characters interacted with the food products [72].

4.2.3. The food and drink industry use digital media to reinforce and amplify brand and product messages

Brand immersion was highlighted as a central component of digital marketing for HFSS food and drinks, where one brand is marketed using a combination of platforms and strategies. This ranged from subtle reinforcement and familiarisation with brand iconography (e.g. logos) to fully interactive virtual branded worlds or advergames [47, 70]. Almost all content analysis research reported that digital marketing contained extensive and repetitive presentation of key brand components (e.g. names, logos, slogan, packaging, products, and branded spokespersons or characters) [55, 65, 51].

One study reported that food and drink brand websites achieved brand immersion through logos, promotion of other brand variants (brand stretching) or new brand developments, depictions of products and packaging, and giveaways or competitions for branded prizes or experiences [68]. Other studies found similar results when examining the Facebook pages of HFSS food and drink brands [73, 63].

Several studies highlighted that larger multinational companies may maintain multiple activities on the same digital platform to tailor promotion to brand variants or geographical regions [62, 74, 38, 69, 63].

4.2.4. A variety of tactics are used in digital marketing content to promote food consumption

The evidence highlighted that suggestions to consume were a central component of the marketing message. This included:

- Explicit prompts to consume (e.g. a 'call to action' to purchase)
- Repetitive images of the product and packaging to stimulate cravings
- Providing incentives or offers to aid consumption (e.g. discounts)
- Encouraging the audience to participate in activities that included consumption (e.g. recipes involving the product).

In other instances, consumption suggestions were implicit. For example:

- Tying consumption or product purchase to a competition entry^[38]
- Promoting wider activities which implied consumption (e.g. branded party ideas or games^[64])
- Product purchase being necessary to unlock special and limited edition features or receive free gifts^[55, 58]
- Implying normative beliefs by showing consumption within the target audience^[75, 56, 76]

In advergames, marketing also encouraged consumption through operant conditioning (i.e. learning by reward) by providing in-game rewards in exchange for participating with or consuming the product^[69, 70, 77, 54].

4.2.5. Digital marketing content mostly promotes unhealthy foods

The evidence consistently indicated that the food and drinks promoted through digital marketing appear to have limited nutritional benefit (i.e. HFSS products). This seemed to be especially the case for products which are likely to appeal to, and be consumed by, young people.

A UK study found that over 80% of food and drink websites were associated with food and drinks classed as HFSS by the Food Standards Agency^[56], a finding consistent with earlier research^[54]. A follow-up study also found that most food and drink products promoted on the Facebook pages and YouTube channels of top food brands in New Zealand were also classified as only for 'occasional' consumption according to national guidelines^[68]. An analysis of social media accounts for retailers at an Australian university also found that over a third of Facebook and Instagram posts promoted HFSS foods and drinks^[78]. Similar results were reported in the US^[55, 50, 51, 66], Australia^[63, 79], Brazil^[73], and Ireland^[47].

In contrast, other studies reported that food and drinks that have greater nutritional benefit are rarely promoted online. For example, one study found that less than 10% of advergames were classified as promoting healthy products according to US guidelines, including in advergames that reached children^[80]. Another reported that only 1% of display advertisements for food and drinks that appeared on popular children's websites were for fruit and vegetables^[81]. When both healthy and HFSS options were presented in the same digital marketing content, content analysis research suggested that the latter are more likely to appear in branded and visually stimulating graphics to capture attention and engagement^[79, 70].

The impact of exposure to digital marketing for healthier food and drinks, and its potential application to improve health behaviours was more mixed. Several studies highlighted that exposure to digital marketing for healthier food and drinks can also increase consumption, intentions to consume, and attitudes towards such healthier products^[82, 83, 84]. This, however, was not always the case; one study found that children in the Netherlands who played an

advergame that promoted fruit, did not consume more fruit post-exposure than those in the control condition^[85].

4.2.6. HFSS digital marketing rarely shows health information

The evidence raised questions about the extent to which digital marketing attempts to promote healthy nutrition, maintaining a balanced diet, and the importance of physical activity (referred to collectively here as 'health information').

One study, for example, found that less than a fifth of Facebook pages, websites, and smartphone apps of three top-selling food and drinks brands contained health information^[38]. A similarly low frequency was also reported on brand and corporate websites^[74, 67], in advergames^[77], and for Instagram marketing^[62].

Even when information on healthy consumption and physical activity was included in digital marketing, the evidence suggests that only limited or selective advice is provided. One study reported that less than half of websites for food and drink manufacturers contained completed nutritional information for all products^[74]. Another found that websites often focused more on sensory and emotive benefits of products (e.g. taste, texture, appearance, aroma, fun and popularity) and specific nutrition claims (e.g. micro-nutrients and additives), as opposed to information on healthy eating strategies^[79]. Websites often placed greater emphasis on physical activity as opposed to moderated food and drink consumption [86]. Elsewhere it was suggested that phrasing sometimes used strategically ambiguous language (e.g. 'fruit flavour') that do not make the health properties clear to the audience or may imply healthier attributes that are not present^[67].

It was also suggested that digital marketing which did present information on nutrition, physical activity, and diet often co-presented this with explicit or implied suggestions to consume which effectively conflates the two, a concept known as '*nutri-washing*'^[87]. For example, some brand websites included suggestions of the product as part of a balanced diet^[66], some advergames implied consumption can boost the health, strength or energy of the main character^[70], and other content focused on product properties which may be considered healthy (e.g. wholegrain) to deflect focus from characteristics with limited nutrition (e.g. high sugar).

4.2.7. The nature and content of digital marketing for HFSS food and drink may specifically resonate with, and appeal to, younger audiences

Across studies and digital marketing platforms, explicit design features and methods of appeal to young people included:

- Emotive and youth-orientated language [47, 75, 56]
- Attention grabbing content (e.g. flash animations, videos, graphics, and music) [47, 56]
- Depicting young people [76]
- Branded characters (including cartoon designs) [47, 56]
- Advergimes based on the formats or themes which young people play recreationally (e.g. adventure, sport, fantasy, and simulation) [69, 88].
- Competitions, quizzes, polls or giveaways for prizes that might appeal to younger age groups [47, 56, 57, 53]
- Downloads and customisable content
- Chat rooms

Studies provided evidence that websites for HFSS food and drink brands may contain explicit sections directed at children and young people [55, 86, 64, 65, 66, 76].

The evidence also suggested that the appeal to young people may also be subtle and indirect, such as reference to celebrities, cartoon characters, or sportspersons popular with young people [73, 47, 63, 79], and references to movies and television shows, real world stories, music, pop culture, and events [68, 63, 67, 64, 66]. Appeal was also suggested through the use of humour [38, 56], embedding brand and product promotion into activities that young people may engage in (e.g. cake recipes or art activities) [75, 79], and marketing products accessible to young people (e.g. affordable with pocket money) [38, 51, 53].

4.2.8. Exposure to digital HFSS marketing is linked to stronger positive attitudes and brand recognition amongst children

The evidence suggested that exposure to, and engagement with, digital marketing increases positive attitudes towards HFSS food and drink brands.

One study found that playing an advergame increased positive attitudes towards a HFSS cereal brand among children aged 7-10 years in Europe (e.g. it is fun, it tastes great), particularly when the game content was optimally engaging and recognition of the commercial intention was low^[89]. Similarly, it was found elsewhere that attitudes towards a HFSS food brand among adolescents in Spain (e.g. like vs. dislike) were significantly higher after playing an advergame, with the effect strongest when the brand featured prominently during game play^[90]. Another study indicated that advergames appeared to have a stronger

impact on positive brand attitudes among children in Belgium, compared to a traditional TV adverts^[91]. Similar trends were reported elsewhere ^[92, 93, 94].

The evidence also demonstrated that digital marketing can also positively influence brand knowledge among young people, with several studies reporting that playing an advergame increased recognition and recall of HFSS food and drink brands, particularly when the brand was prominently placed in the advergame or there was high congruence between the game design and advertised brand ^[95, 96, 97]. This included a study that demonstrated brand recall up to a week after playing ^[98].

One study explored to what extent the association between digital marketing for energy drinks and purchase intentions was mediated through various cognitive pathways. Message interpretation research suggests that the effect of marketing extends beyond the simplicity of the direct dose-response relationship with exposure reported in most cross-sectional studies. Instead, it is suggested that the later information processing stages that occur following exposure, and the effect that marketing narratives have on emotional and cognitive processes, should be considered just as important as the initial exposure ^[99, 100]. On this topic, one study reported that the association between engagement with digital marketing and energy drink use was mediated by increased positive attitudes towards such products (i.e. the belief that energy drinks improve performance mentally and physically) and increased subjective norms about energy drink consumption (i.e. the belief that energy drinks are commonly consumed by students and peers)^[49]. This research also found that the association was mediated through reduced perceived behavioural control (i.e. confidence of refusing to drink even under peer pressure).

4.2.9. HFSS marketing and consumption is linked positively to self-identity and self-gain by young people

The evidence highlighted that although many young people exhibited an initial indifference to marketing, when probed they expressed positive attitudes towards marketing that they had seen previously for HFSS food and drinks. One study, for example, found young people in Australia considered such marketing on social media to stimulate curiosity, be visually appealing, hold cultural and social capital, and contribute to social exchanges and experiences. Only a minority considered such content to be annoying^[101].

Moreover, it was reported in one study that young people in Ireland used HFSS food and drink marketing on social media as a personal statement of their own tastes and preferences and as an opportunity to narrate their own self-identity and develop cultural and social capital among peers^[102]. Other research found that young adults had positive reactions to energy drink marketing on social media which featured brand characters, used emotive content, expressed corporate social responsibility, and linked to other aspects of popular culture (e.g. sports)^[82].

Across the evidence reviewed, the factors which appeared to facilitate positive attitudes

included endorsement and positive reactions from other users, humorous and entertaining content, visually stimulating designs, personalised marketing, content which matched the audiences' interests, and marketing that was subtle, immersive, and interactive^[103, 82, 71]. Research also highlighted the importance of perceived self-gain as driver of engagement, including to win prizes or giveaways (which stimulated a 'collectors mentality'), be informed about the latest price offers, discounts, and promotions, or learn about new products in order to contribute to social exchanges^[101, 71].

4.2.10. Children have low digital marketing literacy

The evidence consistently highlighted the complexities that young people experience in clearly recognising digital marketing.

Although the majority of studies reported that young people were aware of digital marketing for HFSS food and drinks, unprompted recall (i.e. before being shown any marketing examples) often centred on explicit forms of online advertising such as banner ads, click-through adverts, or pop-ups. In comparison, unless prompted, young people had difficulties in recalling subtler or implicit forms of marketing (e.g. advergames, branded social networking pages, and brand placement in videos) and exhibited limited awareness that marketing may have been deliberately personalised to complement their browsing history and interests^[103, 102, 104]. Despite initial challenges in recognising marketing, however, when prompted with stimuli young people demonstrated knowledge and recall of similar instances of digital marketing that they had seen previously (e.g. social media pages).

There was also evidence that initial recognition of the marketing intention of digital content among young people is low. One study found that most children in the US reported that the primary purpose of an advergame was about becoming a pop star (as opposed to being made by a cereal brand) and that it was intended to be either entertaining or informative (as opposed to having a selling intention)^[105]. The same study also found that children often misattributed the 'agent' responsible for creating the content, with most suggesting it was created by popstars and celebrities or researchers, with only one-in-ten identifying it was created by a food brand. Similar findings were also reported in a follow-up study^[106].

A study from Belgium reported that, unless prompted, most 9-11 year olds had limited understanding of the persuasive intent of interactive marketing^[103]. Moreover, most young people also considered that online advertising had to be explicit in order to influence behaviour (e.g. pop-ups), thus underestimating the influence of implicit advertising.

4.2.11. More HFSS products and less health information are shown in digital marketing content aimed at young people

Evidence showed that three quarters of food and drink brand websites advertised low nutritional foods (e.g. sweet snacks and breakfast cereals), with the proportion doing so

greater for websites targeted at children and adolescents versus the general population^[68]. Other research found that websites often only presented basic nutritional information (e.g. ingredients and nutrition facts), with a lower proportion doing so for websites targeted at children and young people^[66].

A study of websites for food and drink manufacturers advertised on children's television in the US also estimated that a website visitor was only exposed to a pro-nutrition or pro-physical activity message once per 45 brand identifiers^[52]. There was also evidence that such information appears more often in content aimed at a general audience, as opposed to content aimed at young people^[66].

4.2.12. Exposure to digital HFSS marketing is linked to greater consumption of HFSS products by children

The evidence suggested that exposure to, and engagement with, digital marketing for HFSS food and drinks can increase consumption of such products among young people. This includes studies comparing the effect of digital marketing for HFSS food and drinks to marketing for healthier alternatives, and studies in which participants could choose between HFSS and healthier alternatives to consume^[107, 108, 109, 85, 97, 84].

One study found that playing an advergame which promoted HFSS foods increased caloric intake of such products among children in the Netherlands and Spain, even in the conditions when a warning was displayed to indicate the content was marketing and when healthier alternative foods were also available^[110]. Another study similarly found that playing an advergame that promoted HFSS food and drinks increased selection of, and liking towards, HFSS foods^[83].

Studies also showed the effect of such marketing on young people might be lagged if immediate consumption opportunities are not present, for example being associated with greater self-reported intentions to ask parents to purchase the marketed product^[111].

In addition, the evidence suggested that young people consistently recognised that digital marketing for HFSS food and drinks influenced their consumption behaviour.

A study of adolescents aged 11-16 years old in Australia, for example, suggested that repeated exposure to marketing on social media had changed their eating habits, created peer or social pressure to consume HFSS foods, stimulated curiosity and cravings to try advertised products, and appeared to normalise and socialise consumption of junk foods^[101]. Such influence was reported even when their parents had advised that such products were unhealthy. These attitudes appeared consistent across age groups. For example, younger children in Australia (aged 8-11 years old) also acknowledged that marketing for HFSS foods stimulated cravings to consume and led to pestering parents or guardians to purchase advertised products, despite acknowledging the potential familial conflict this may create^[104].

There was also evidence that engagement with digital marketing for HFSS food and drinks (or other less healthier products) may have a stronger association with consumption than exposure to traditional advertising on television^[111, 91].

4.2.13. Exposure to HFSS digital marketing was positively associated with obesity-relevant outcomes in children

There is growing evidence that new forms of marketing can influence health behaviours [31, 32, 33, 34, 35].

Seven out of the nine cross sectional studies² explored what direct association (if any) existed between exposure to digital marketing for HFSS food and drinks (or media use as a proxy) and dietary-related outcomes. This included: consumption of HFSS food and drink products [48, 49, 51]; requesting parental purchase (i.e. 'pester power') [60]; spending pocket money on HFSS food and drinks [112]; and changes in body weight or obesity status [4].

The evidence consistently indicated that awareness of, and participation with, digital marketing for HFSS food and drinks was positively associated obesity-relevant outcomes.

For example, one study found that the likelihood of 11-19 year olds in the UK being obese increased two and half times when a respondent recalled seeing HFSS food adverts on social media every day^[4]. Another study found that 12-17 year olds in Australia who recalled seeing two or more forms of digital marketing in the past month were two and a half times more likely to have tried a product they saw advertised and at least three times more likely to have asked parents to purchase a product they saw advertised^[60]. Another study found that increased time spent online among 7-11 year olds in the UK (used as a proxy for marketing exposure) was associated with increased likelihood of buying HFSS food and drink with pocket money, increased likelihood of pestering parents to purchase products, and increased likelihood of eating HFSS foods^[112].

All associations remained even after controlling for demographic variables.

4.2.14. Parents find it difficult to monitor and control the digital marketing that children are exposed to online

Parental media literacy

Challenges in recognising digital marketing also extended to parents. Similar to young people, parents' unprompted knowledge of digital marketing for HFSS food and drink focused mostly on explicit adverts, such as pop-ups or banner adverts [47, 113]. In comparison, recognition and recall of subtler forms of marketing, such as advergames and social media, appeared limited [113, 104]. Instead, several studies found that parents still identified marketing through traditional media (e.g. TV and in-store) as being more likely to reach and influence their

² The exceptions were Cairns (2015) and Potvin Kent et al. (2019), which had no outcome measure related to diet or consumption. Although Thai et al (2017) did not separate out the association between traditional and digital in the analysis, it was retained given that the aggregate marketing was awareness was still associated with dietary outcomes.

children^[47, 101, 113], which was suggested to be a result of conflating their own experiences of marketing when growing up to be congruent to their children's current experience.

As a consequence, few parents recalled talking to their children about digital marketing^[47], which highlights the challenges that parents face in regulating what content children see online if they have limited knowledge of the marketing techniques used.

When prompted with examples of subtle digital marketing, however, parents expressed concerns about the implicit and subliminal nature, how it may collect and use personal information, how it attempted to co-opt users into the marketing process, how it used celebrities and sportspersons to create appeal, how it facilitated marketing exposure beyond parental supervision, and how it potentially misled young people about the HFSS nature of products^[47, 101, 113, 104].

Parental attitudes to marketing

Parents broadly recognised that marketing for HFSS food and drinks could influence consumption and attitudes and, despite trying to encourage healthy eating, were able to recall instances of marketing influencing their children (e.g. 'pester power')^[101, 113, 104].

However, the evidence suggested this broad recognition had several caveats. Despite recognising the influence of marketing, parents in the UK suggested that their child would ignore online adverts, would only be receptive to the entertainment value but not the persuasive intent, that parents were in control of what their children saw online, and that it was mostly other people's children who were influenced by marketing^[113]. Across studies, parents also exhibited a consistent perspective that healthy eating was mostly driven by individual and social determinants, and that effective parenting would moderate or supersede the influence of commercial determinants such as marketing^[101, 113, 104].

Impact of HFSS digital marketing on parents

Studies found that digital marketing may attempt to create a favourable impression of a brand in parents by promoting corporate social responsibility and philanthropy (e.g. charity donations or supporting grassroots sport)^[73, 63]. The evidence also reported marketing features that may appeal to parents, for example activities that can be carried out with children (e.g. art activities, birthday party ideas), consumption suggestions (e.g. lunch box ideas or recipes), competitions for prizes to be enjoyed by a family, and apps and games which help track child's growth and milestones (including consumption of the product)^[63, 56, 64]. There was also evidence of marketing recruiting or engaging young people to persuade their parents to purchase. Examples included direct suggestions that young consumers should ask parents to purchase products^[65, 76] or use of normative language to imply perceived parental approval (e.g. "*even your mum would approve*")^[75]. Suggestions that children and young people should instigate purchasing intentions in parents is significant, given that reviews of research have found that marketing does increase purchase request behaviour and that 'pester power' is a persuasive determinant of purchasing decisions for HFSS food and drinks^[114, 115].

4.2.15. Potential mitigation measures against the exposure to HFSS digital marketing

Age verification

The evidence highlighted that attempts to verify audience age or restrict exposure among children has several limitations.

Across studies age verification or parental gateways were not consistently used [68, 80, 56, 88, 54]. Attempts to regulate age that were reported either varied in quality, presented information using language which could be inaccessible to younger audiences (e.g. legal jargon), were underpinned by weak designs (e.g. tick boxes), or were reliant on young people providing accurate age information [47, 64, 79].

Protective notifications and ad warnings

A similar trend was also reported for ‘ad-break’ messages – that is information that explicitly notes that the content is advertising or suggestions for the audience to limit screen time. In the research reviewed, such content was either inconsistently used, unclear or ambiguously phrased, or juxtaposed against more visually stimulating marketing content [86, 116, 67, 65, 76]. Given the challenges that children and young people experience in recognising the persuasive effects of marketing, the lack of standardised measures to control their exposure may have implications for how such content influences their knowledge, attitudes, and consumption.

Several experimental studies also highlighted that displaying protective warnings which highlight that the content is marketing also has limited effect. One study, for example, found that playing an advergame promoting HFSS snacks increased caloric intake among children in Netherlands and Spain, irrespective of whether a protective message was displayed^[110]. Similarly, another study found that displaying a protective message did not increase the ability of children in the US to identify the persuasive intent of an advergame or knowledge of who was responsible for producing (e.g. pop star versus a food brand)^[105].

Children’s media literacy

However, several studies highlighted the critical ability of young people to identify the persuasive intent of digital marketing can act as an important moderator to the ability to influence attitudes and behaviour [93, 106, 89].

Hierarchy within the marketing mix

Children and young people must navigate this digital marketing mix in addition to more traditional forms of marketing. Several studies reported that young people were also aware of a range of marketing through traditional channels and that, in certain instances, such awareness was still greater than digital channels^[31, 4, 117, 40, 60].

5 Discussion

Five key conclusions are clear from this review:

1. Marketing for HFSS food and drinks appears frequently and extensively across digital media, including that seen by children. The food and drink industry (including producers of HFSS products) have taken advantage of the opportunities provided by digital media – both as a direct form of marketing communication, and in extending the reach and efficacy of their wider marketing mix.
2. Digital marketing is based on sophisticated and engaging content that fosters interaction and creates brand immersion, and some content may reach and appeal to young people, who engage with it.
3. Digital food and drink marketing content mostly promotes unhealthy foods, and the promotion of health information was either limited or strategically ambiguous.
4. Exposure of children and young people to HFSS digital marketing content is associated with positive brand and product reactions, consumption of HFSS food and drinks, and future intentions to consume such products. This increased consumption can influence health behaviours and is associated with obesity-related outcomes.
5. Both young people and parents experience challenges in identifying digital marketing. There are important caveats in parents' understanding of what marketing their children see, how it may influence consumption, and how they themselves are influenced by such marketing.

Food and drink producers have taken advantage of the opportunities provided by digital and new media – from smartphone apps and advergames to social media pages and video sharing – to create explicit and implicit ways of promoting their brands and products through online spaces. There is also evidence from content analysis research that digital marketing uses a variety of creative, sophisticated, and stimulating marketing strategies to produce attractive and engaging content, with audience participation and brand immersion at the forefront of activities. It is also suggested that digital marketing for HFSS food and drinks may reach and appeal to young people based on where the marketing is placed, the design features used, and through topical or cultural associations that may resonate with younger audiences. This digital marketing mix, which is also intertwined with traditional forms of marketing through cross-referencing and overall brand recall, results in an immersion in HFSS marketing which children and young people must navigate.

The evidence base indicates that food and drink digital marketing mostly promotes products that have limited nutritional benefit (e.g. HFSS), and that explicit and implicit suggestions to consume are a central part of the marketing messages. Healthy food and drinks appear to be rarely promoted and, even when they are present, are often juxtaposed against more visually stimulating content for HFSS alternatives. Digital marketing does not routinely present

information on nutrition, diet, and physical activity. Even when such content is present, the clarity and likely efficacy of any messages to encourage health behaviours is inconsistent, does not feature prominently in the marketing, and appears secondary to the goal of promoting either the brand or consumption of HFSS alternatives.

Research suggests that exposure to digital marketing content is associated with future intentions to consume (e.g. 'pester power'), increased consumption of HFSS food and drinks, and positive brand or product reactions. This association appears consistent in studies sampling children, adolescents, and young adults. Both young people and parents experience challenges in recognising digital marketing or the promotional intentions of subtle digital marketing activities. It is also suggested that parents experience challenges in understanding of how much digital marketing their children see and how this digital marketing might influence them.

Digital exceptionalism

Whilst engaging directly with content is not limited to digital forms of marketing, the scale of opportunities for such interaction, and the depth possible, is of a different magnitude. Interaction helps to prolong contact with the marketing message, which offers greater opportunity for marketers to foster the desired positive attitude towards the brand or product. This is important as conceptually similar research into alcohol marketing suggests that participation with online marketing messages has a stronger association with consumption than awareness [118, 119, 120, 121].

'User-generated branding' content is significant because it blurs the boundaries between commercial and peer activity, as perceived peer approval enhances the credibility of the marketing message, and because such content can extend outside brand-controlled spaces (e.g. into personal social media profiles or user-created videos on YouTube) [122, 123, 124].

Concerns have been raised about whether digital marketing for such products is more powerful and less controllable than marketing through traditional media (such as television). Examples of reported concerns include the ability to target marketing at specific audiences, the ability for marketing to be accessed in almost any context (e.g. mobile devices), because marketing can be virally spread (including globally), because users can be co-opted into the marketing process, and because age restriction gateways are difficult to effectively apply [20, 36, 37].

Exploiting the gaps in children's cognitive development

The reach and appeal of HFSS digital marketing to young people is important given that children are yet to fully develop their cognitive capacity to distinguish marketing from other media content, understand how to critically determine and interpret marketing intentions, and build resilience to marketing messages. This makes them potentially more susceptible to marketing [47, 125, 126, 127]. Exposure to such messages also occurs when children are first developing their understanding about the nutritional content of food and drinks and choosing to eat a balanced diet, and thus any impact may have a lasting impact on their knowledge, attitudes, and behaviours [128].

These findings begin to move the debate on from *whether* digital marketing for HFSS food and drink products is associated with consumption, to *how* this association takes place and what mechanisms underpin it. This mirrors research that has identified similar cognitive pathways for products such as alcohol^[129].

5.2. Strengths and limitations

There are some limitations to this study. Literature was not systematically searched using a pre-defined protocol, and therefore we cannot be confident that all relevant studies on the topic were identified. Selection of studies for inclusion was also not guided by a pre-defined list of eligibility criteria. The methodological rigour of each study was not systematically appraised, albeit this did enable the inclusion of important grey literature (e.g. reports from charities) and qualitative studies that might have otherwise been excluded. Moreover, for both content and consumer research, information was extracted in a consistent format which provided a uniform descriptive summary of each study. However, as the review is not based on a systematic protocol which considers standardised and quantifiable outcomes, any inferences and comparisons between studies are based on qualitative, thematic, and descriptive appraisal by the researchers. It is also noted that any examples of marketing included were selected to illustrate themes in the review. They were not chosen to be, nor can they be considered, generalisable to all digital marketing for HFSS food and drinks in the UK.

There are also general limitations of the studies included in this review. Only a handful of studies were conducted in the UK, and many of these were unable to show a causal relationship between digital marketing exposure and either attitudes and consumption. Although there is a wealth of research from other countries, it is possible that the marketing stimuli sampled in such research may not be wholly representative of marketing practice in the UK. Research into digital marketing also often suffers from a time lag, in that marketing technology may have moved on by the time the research is published. For example, many of the studies reviewed focused on advergames or websites, and there was comparatively limited assessment of more recent techniques such as social influencers or video sharing content (e.g. YouTube). It is therefore likely that current evidence is not wholly representative of contemporary digital marketing practice, exposure among young people, and the association with attitudinal and behavioural outcomes. Furthermore, most consumer research was experimental in nature, with a comparatively smaller amount of cross-sectional studies or qualitative research. Consequently, the artificial scenarios developed for these studies may not be reflective of real-world exposure and reactions to marketing.

Concerning strengths, this review drew upon a diverse range of research into digital marketing for HFSS food and drinks. This included both content analysis research, which provided insight into digital marketing practice, and consumer research that provided evidence of an association with attitudes and behavioural outcomes. Within both strands, the review included both quantitative studies, which examined the marketing techniques used in a large sample of advertising or which used controlled experimentation to examine the impact of marketing, and qualitative research that provided in-depth understanding of marketing techniques used and consumer experiences. The research reviewed was demographically diverse, including studies from multiple countries, different HFSS food and

drink brands or products, and across different stages of development (from childhood to young adulthood). The review also covered a variety of digital marketing techniques, ranging from traditional dotcom websites to innovative marketing through social media (e.g. social influencers). To provide a comprehensive review, the study also drew upon both peer-reviewed studies in the academic literature and key grey literature, the latter of which provided important contextual understanding. The decision to employ a narrative, rather than systematic, approach enabled the review to cover a wide range of issues within the topic and flexibility in the interpretation and critique of the literature^[130].

Despite the associated limitations, the studies reviewed in this report do build a picture of how digital HFSS marketing plays a role in children and young people's dietary attitudes, knowledge and behaviour.

5.3. Future research directions

This review highlights several avenues for further research. Only a limited number of studies explored the design, exposure, and potential influence of digital marketing for HFSS food and drinks among young people in the UK. In particular, there was a lack of data which demonstrated whether the relationship between marketing and consumption was causal, leaving open the possibility of reverse causality. While this could be addressed through further experimental studies which analyse the effect of marketing in a controlled setting^[131], robust data based on longitudinal consumer research or natural experimental designs would increase the ecological validity of conclusions. In the UK, similar approaches have been used to explore the effect of alcohol marketing^[132] and the impact of television restrictions for HFSS food and drink marketing^[133]. There is also only a small number of qualitative studies in the UK, and these have mainly focused on the perspectives of parents^[113]. Further research is required to better understand the experiences and attitudes of children and young people towards digital marketing for HFSS food and drinks, and how it may shape both attitudes and behaviour.

Most cross-sectional research in the UK has also only explored whether there is a direct relationship between marketing exposure (and screen-time) and dietary behaviour^[5, 4]. Although exposure represents a critical first step, the effect of marketing extends beyond the simplicity of a dose-response relationship with exposure. It is instead suggested that the later information processing stages that occur following exposure, and the effect that marketing narratives have on emotional and cognitive processes, should be considered just as important^[99, 100]. This is supported by content analysis research which shows how marketing uses messages and themes which may influence behaviour through emotional and cognitive responses, such as references to popular cultures or visually stimulating designs. It is also supported by qualitative and experimental research which shows how these messages are interpreted by young people and how they may influence brand and dietary attitudes. The importance of message interpretation is supported by one cross-sectional study into energy drink marketing on digital media in Australia, which demonstrated that the association between marketing and consumption intentions was mediated through attitudes, subjective norms and perceived behaviour control [82]. More research, based on real-world exposure in the UK, is needed to explore *how* marketing may influence consumption, to help move the

debate on from *whether* there is a direct relationship.

A key further avenue of research to investigate is, from an equity perspective, which children and young people are more vulnerable to the impacts of digital HFSS marketing, who is more exposed and what impact on equity further regulatory restrictions would achieve.

6 Policy Recommendations

Through its comprehensive assessment of how the tactics employed in digital marketing for HFSS food and drink influence children's dietary preferences and behaviours, this report demonstrates the urgent need for policy action to regulate the online marketing space.

In June 2018, the UK Government published Chapter Two of its Childhood Obesity Plan, which contained an ambitious aim of halving childhood obesity rates by 2030. There is no 'silver bullet' to reducing obesity, and tackling this issue will require a UK-wide, whole-system approach. However, decisive policy action at a national level – and implemented without delay – will be key to achieving the UK Government's goal. It is noteworthy that both the Scottish and Welsh Governments support a UK-wide 9pm watershed for junk food advertising and look to Westminster to make this happen. As the UK Government consults on introducing further restrictions on HFSS marketing on TV and online, this review provides vital evidence which can inform policy makers.

While TV (including catch-up and on-demand programming) remains popular with children, the use of online platforms by young people has been increasing, and has overtaken TV viewing amongst older children. To reflect this, current regulations on HFSS advertising online were introduced by the Committee of Advertising Practice in July 2017. However, the 25% audience threshold means that high numbers of children can still be exposed to adverts for unhealthy food, especially on platforms popular with both adults and children. In addition, there is a lack of clarity about the definitions of content particularly appealing to children; the regulations are hard to monitor and enforce; and getting hold of the data to assess the threshold is difficult, especially with lack of industry-wide recognised standards.

The self-regulatory nature of the regime in the UK also has limitations: it is reactive, has few meaningful sanctions for non-compliance, and moves too slowly to keep pace with digital marketing campaigns.

To protect children from HFSS advertising on all forms of media they are exposed to in and out of the home, Government must introduce a comprehensive 9pm watershed across all forms of media. This includes linear TV, catch-up and TV on-demand services and also, in recognition of the importance that brands place on digital advertising, online and social media. To ensure consistency in regulation with TV and a level playing field between platforms, and to avoid displacement of advertising spend to online, restrictions must apply across all digital media.

The case for further regulation of junk food marketing is underpinned by the findings that marketing for HFSS food and drinks does reach children online and is likely to appeal to them. With the rise of subtle forms of marketing, and children's difficulties in distinguishing them from organic content, comprehensive regulation across all digital platforms becomes particularly important.

The United Nations Convention on the Rights of the Child sets out the rights which governments must guarantee for children^[134]. This includes the right to health. The

Convention dictates that all children deserve equal protection. If we were to apply this approach to HFSS marketing, a policy might fail to meet this principle if it risked creating two classes of children, one of which it was acceptable to market HFSS food and drink to. We do not believe that it is equitable to specify an acceptable number of children that could be exposed to adverts for HFSS products. The rights of all children to be protected from exposure to HFSS food and drink advertising should be prioritised.

The UK Government's consultation on restricting HFSS advertising has sought views on exemptions to rules online. We believe that the number of children exposed to HFSS adverts on TV or online must be as close to zero as possible, as we do not believe that any number of children exposed is acceptable. As existing methods to determine a user's age online are not sufficiently accurate, companies cannot guarantee that children are not exposed to these adverts. Furthermore, it is currently not possible to independently monitor and verify these numbers because online media platforms do not share audience data for their adverts.

Exactly how to regulate online marketing appropriately, and who is best to oversee that process, will be a key question for the UK Government in the coming months, and this area will be a focus of future research from Cancer Research UK.

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