

# The impact of the social media industry as a commercial determinant of health on the digital food environment for children and adolescents: a scoping review

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## ABSTRACT

**Introduction** There is emerging evidence that the social media industry contributes to adverse health outcomes by shaping the digital food environment for children and adolescents (aged 0–18). The aim of this scoping review was to determine the extent of research on how the social media industry, including the broader online landscape, influences the digital food environment and affects child and adolescent health.

**Methods** A scoping review was conducted in the electronic databases of PubMed, Scopus and PsycINFO, along with forward and reverse citation searching for peer-reviewed articles published in English between 2000 and May 2023. A qualitative descriptive synthesis of the included articles was performed to identify trends, themes and research gaps in the current literature.

**Results** The review identified 36 articles for inclusion. Most research was conducted in high-income countries and publications have increased since 2021. The review found most children and adolescents are exposed to food advertisements on social media and most advertised food is ultra-processed. Heightened by a lack of social media advertising awareness, digital food marketing influences children and youth's consumption and food behaviour. Voluntary children's food marketing regulations are ineffective for the online environment. Countering unhealthy food marketing will require media literacy and government regulation.

**Conclusion** The social media industry may act as a commercial determinant of health to shape the digital food environment as an extension of the obesogenic environment. Further research should explore approaches to monitor unhealthy food marketing practices and understand social media's role in the digital food environment.

## INTRODUCTION

The reach and influence of social media continues to grow worldwide, as does its impact on the health and nutrition of children and youth. Social media includes all 'digital technologies that allow people to connect,

### WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The global child and adolescent obesity health crisis is worsened by the obesogenic environment, which encompasses factors including the digital food environment. Recent research indicates the social media industry acts as a commercial determinant of health (CDoH), exacerbating health disparities and drawing increased attention to the social media industry's role in shaping the online obesogenic environment, particularly the digital food environment.

### WHAT THIS STUDY ADDS

⇒ Results from this study indicate the social media industry may act as a CDoH to influence the digital food environment for children and adolescents. The study found that digital marketing techniques have a near universal reach and effectively promote unhealthy food consumption which significantly influence children and adolescents' consumption and food behaviour. Additionally, the study revealed that self-regulation of food marketing is ineffective in the online environment, and media literacy and critical thinking are necessary to counteract its impact on adolescents.

### HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ As the first review of this topic, the results will influence research directions including the need to recognise the digital food environment and social media's impact on global health and nutrition. Efforts should include approaches to monitor unhealthy food marketing practices. Recognising the ineffectiveness of self-regulation, the focus should shift to government regulation to ensure policies are properly adapted to the social media environment.

interact, produce and share content'.<sup>1</sup> In the USA, over 95% of adolescents have a smartphone or access to one, and over 35% of adolescents report using one of the top five most popular social media platforms almost

constantly.<sup>2</sup> The use of social media has been associated with negative impacts on physical health, mental health consequences and incidences of cyberbullying along with positive influences such as increased social connectivity and improved access to health and nutritional information.<sup>3</sup> Social media platforms can also influence health in ways that users may not be aware of including advertising health-harming products, tracking and collecting user data, and amplifying specific ideas, resources and content that may be detrimental to health. The digital world has also been recognised as a significant driver of health inequity in access to health services and in health outcomes.<sup>4</sup>

Obesity is a global health crisis affecting children and youth in developed and developing countries across the world. Childhood obesity increases the risk of developing non-communicable diseases (NCDs), including diabetes and cardiovascular disease.<sup>5</sup> The term ‘obesogenic environment’ has been coined to describe “the sum of the influences that the surroundings, opportunities or conditions of life have on promoting obesity in individuals and populations.”<sup>6</sup> The powerful influences of the environment are such that obesity may result from people responding normally to the obesogenic environments they encounter in their daily life.<sup>7</sup> Notably, changes in the global food system are recognised as contributing to increases in obesity in almost all countries in recent decades.<sup>8</sup> Despite the increasing role of digital technology, such as the internet in daily life, the current approach to food environments largely overlooks the impact of the online environment in influencing health and nutrition.<sup>9</sup>

There has been a growing focus on the corporate and commercial conditions that facilitate the development of the digital food environment, as an extension of the obesogenic environment and other adverse health outcomes in society. These ‘commercial determinants of health’ (CDoH) are defined by Gilmore and colleagues as the ‘systems, practices, and pathways through which commercial actors drive health and equity’.<sup>10</sup> The CDoH have long been recognised to include the four primary industries of tobacco, alcohol, ultra-processed food and fossil fuel.<sup>11</sup> However, efforts have been made to widen the included industries to better reflect the scope of health inequality, and researchers continue to explore the role of CDoH across other industries, including social media.<sup>12</sup> Zenone and colleagues have argued that social media’s corporate and political practices are consistent with features of the CDoH.<sup>13</sup> The social media practices which are indicative behaviours of health-harming industries include targeted marketing opportunities and surveillance data, coalition building with health organisations, initiating corporate social responsibility initiatives and the promotion of self-regulation discourse.<sup>13</sup>

There is increasing attention to the social media industry’s role in shaping the obesogenic environment, and the digital food environment in particular by influencing factors including dietary intake, food purchases,

brand awareness and food marketing regulations. As early adopters and near-ubiquitous users, with 95% using YouTube and at least 67% using TikTok,<sup>2</sup> teenagers may experience the most immediate and significant harms of the social media industry’s influence on the digital food environment,<sup>14</sup> such as its negative impact on both body image and eating disorders and its connection to obesity and other NCDs.<sup>9</sup> The WHO has identified policy and regulatory controls, including restrictions on unhealthy food advertising to children, as a priority area of action.<sup>15 16</sup> Exploring the relationship between social media and its role in child and youth health will be necessary to identify opportunities for policy change. The aim of this review was to determine the scope of research activity on how the social media industry, including the broader online landscape, influences the digital food environment and affects the health of children and adolescents.

## METHODS

We undertook a comprehensive search of the literature for articles addressing the social media industry as a CDoH and its influence on the digital food environment for children and adolescents, adhering to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews.<sup>17</sup> No funding source supported this review.

### Search strategy and selection criteria

The electronic databases PubMed, Scopus and PsycINFO were searched for peer-reviewed articles published in English between 2000 and 1 May 2023. Editorials were included as they may suggest directions of future work or aid in identifying potential research gaps. Search terms were developed to include terms encompassing commercial determinants of health, social media or the online environment, children or adolescents, and health (table 1). Additional articles were included by forward and reverse citation searching. Studies were included irrespective of their study design. The studies were independently reviewed by two authors, with discrepancies resolved through discussion and consensus. Data were extracted on article characteristics (authors, year published, countries of study, study design) along with article topics and content and reviewed by the authoring team. A qualitative descriptive synthesis of the included articles was undertaken to identify trends, themes and research gaps in the current literature.

### Patient and public involvement

This scoping review did not involve patients, patient advisors or the public.

## RESULTS

### Study selection and study characteristics

Of the 227 unique studies identified for title and abstract screening, 172 were excluded for not discussing the CDoH, not involving social media or the online environment,

**Table 1** Search strategy framework example for PsychInfo with search term variations

Search term	Variations (combined with AND operator)
Term 1—commercial determinants of health	“commercial determinant of health” OR “commercial determinants of health” OR “CDOH” OR “corporate influence*” OR “corporate practice*” OR “corporate practise*” OR “corporate determinant*” OR “obesogenic environment” OR “food environment”
Term 2—social media or online environment	internet OR online OR “online environment” OR “social media” OR “instagram” OR “facebook” OR “messenger” OR “telegram” OR “discord” OR “twitter” OR “tiktok” OR “youtube” OR “whatsapp” OR “snapchat” OR “reddit”
Term 3—child or youth	child* OR “boy” OR “girl” OR kid* OR teen OR youth OR young OR minor* OR ped* OR paed* OR student OR adolescen* OR schoolchild* OR “school age”
Term 4—health	“physical health” OR “physical activity” OR obesity OR overweight OR “weight” OR BMI OR “body mass index” OR “nutrition” OR “physical health” OR “physical activity” OR health* OR unhealthy OR illness OR disease OR “well-being” OR wellbeing

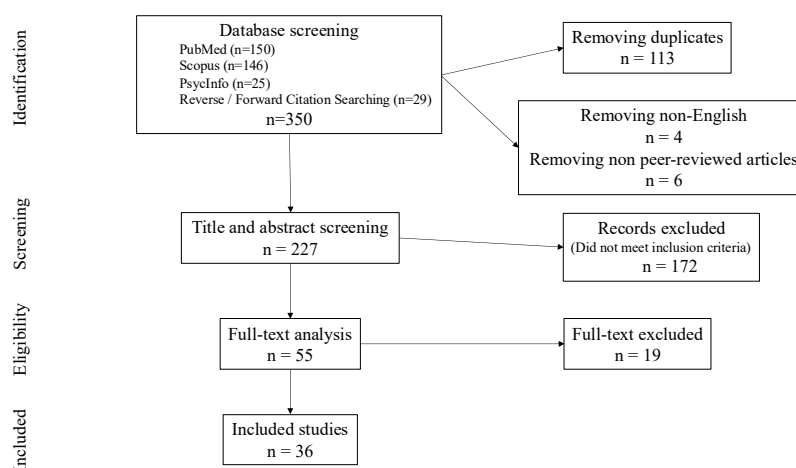
not including children or youth between the ages of 0 and 18 years old, or not discussing obesogenic-related health effects. Following full-text review, 19 of the 55 reviewed articles were determined not to be relevant to the study and were excluded. 36 articles were included and summarised in this scoping review (figure 1).

Much of the research was conducted in Canada (9 articles), Australia (8), the UK (8), and the USA (6). Other countries of study included the Netherlands (3), Mexico (3), New Zealand (2), Fiji (1), Belgium (1), Chile (1), Germany (1), Greece (1), Lithuania (1), Spain (1) and Zambia (1), with some studies involving more than one country (table 2). There has been a notable increase in publications in the last few years, with 58% (21/36) of included articles published since 2021. There was no evidence of industry sponsorship of any of the articles.

### Exposure to unhealthy food advertising online

Five studies focused on children and adolescents’ exposure to online advertising, including the amount of exposure and the types of marketing content they viewed,<sup>18–20</sup> and how exposure varied by location.<sup>21 22</sup> Three exposure studies from Canada,<sup>20</sup> Australia<sup>18</sup> and Mexico<sup>19</sup> used recordings of social media or website use to determine

the amount and type of exposure with the others using self-reported data. A 2019 Canadian study analysing social media app use recordings found 72% of children and adolescents aged 7–16 were exposed to food marketing within 10 min of using their favourite apps.<sup>20</sup> It was estimated that children aged 7–11 see marketing 30 times per week while adolescents aged 12–16 see food marketing 189 times per week when using social media apps.<sup>20</sup> A 2023 study of 347 Mexican participants aged 6–19 years using screen capture technology found 69.5% of children and adolescents were exposed to digital food marketing.<sup>19</sup> These Mexican participants were estimated to be exposed to 2.7 instances of food marketing per hour, with 8 exposures on weekdays compared with 6.7 exposures on weekend days. In Australia, a study of 95 children aged 13–17 years reported an average exposure of 17.4 food promotions per hour or 168.4 per week based on mobile device recordings.<sup>18</sup> Exposure varied between counties, with the percentage of participants aged 10–17 who self-reported seeing unhealthy food advertisements in the past 30 days on digital media across six countries varying from 27% in the UK to 60% in Chile.<sup>21</sup> In a self-reported study of 4827 parents of children under the age


**Figure 1** Flowchart of study inclusion

**Table 2** Summary of included studies

Author(s)	Year	Countries of study	Study design	Topic(s) discussed
Acton <i>et al</i> <sup>20</sup>	2023	Canada	Cross-sectional study	Food/beverage marketing exposure and marketing regulations
Amson <i>et al</i> <sup>21</sup>	2023	Canada	Cross-sectional study	Food/beverage marketing exposure
Boyland <i>et al</i>	2022	UK	Systematic review and meta-analysis	Marketing regulations (association with outcomes)
Boyland and Whalen <sup>34</sup>	2015	UK and others	Narrative review	Social media marketing and marketing regulations (self-regulation)
Coates <i>et al</i> <sup>26</sup>	2019	UK	Randomised control trial	Social media marketing (influencers)
Coleman <i>et al</i> <sup>32</sup>	2022	UK and others	Rapid literature review	Social media marketing influences and marketing regulations
Demers-Potvin <i>et al</i> <sup>18</sup>	2022	Canada, Australia, Chile, Mexico, UK, USA	Cross-sectional study	Food/beverage marketing exposure
Dunlop <i>et al</i> <sup>40</sup>	2016	Australia and others	Review article	Social media marketing and marketing regulations
Elliott <i>et al</i> <sup>45</sup>	2022	Canada and others	Editorial	Media literacy
Folkvord and Hermans <sup>49</sup>	2020	Netherlands and others	Narrative review	Social media marketing (promoting health)
Folkvord <i>et al</i> <sup>48</sup>	2022	Netherlands and others	Narrative review	Social media marketing (promoting health)
Gerritsen <i>et al</i> <sup>24</sup>	2021	New Zealand	Content analysis	Social media marketing and marketing regulations
Gilmour <i>et al</i> <sup>29</sup>	2020	UK	Qualitative study	Social media marketing influences
Gómez and Rajmil <sup>36</sup>	2022	Spain	Editorial	Marketing regulations (self-regulation)
Hudders <i>et al</i> <sup>25</sup>	2021	Belgium and others	Narrative review	Social media marketing (influencers)
Hunt <sup>44</sup>	2021	Australia	Content analysis	Social media marketing and marketing regulations
Jane and Gibson <sup>39</sup>	2018	UK	Content analysis	Marketing regulations
Kelly <i>et al</i> <sup>18</sup>	2021	Australia	Cross-sectional observational study	Food/beverage marketing exposure
Korn <i>et al</i> <sup>43</sup>	2021	USA	Cross-sectional study	Marketing regulations (support for)
Kraak and Story <sup>37</sup>	2015	USA	Case study	Marketing regulations
McCarthy <i>et al</i> <sup>33</sup>	2022	Netherlands and others	Systematic review	Social media marketing influences
Mukanu <i>et al</i> <sup>28</sup>	2022	Zambia	Qualitative study	Social media marketing influences
Nieto <i>et al</i> <sup>19</sup>	2023	Mexico	Content analysis	Food/beverage marketing exposure
Plaisime <i>et al</i> <sup>46</sup>	2020	USA	Cross-sectional study	Social media marketing (promoting health)
Potvin Kent and Pauzé <sup>22</sup>	2018a	Canada	Content analysis	Food/beverage marketing exposure and marketing regulations
Potvin Kent and Pauzé <sup>23</sup>	2018b	Canada	Content analysis	Food/beverage marketing exposure and marketing regulations
Potvin Kent <i>et al</i> <sup>17</sup>	2019	Canada	Cross-sectional study and Quantitative study	Food/beverage marketing exposure
Potvin Kent <i>et al</i> <sup>35</sup>	2022	Canada	Scoping review	Food/beverage marketing exposure
Rageliene and Grønhøj <sup>30</sup>	2021	Lithuania	Mixed-methods (survey and interviews)	Social media marketing influences
Sacks <i>et al</i> <sup>38</sup>	2015	Australia, New Zealand and Fiji	Comparative study	Marketing regulations
Sainsbury <i>et al</i> <sup>41</sup>	2018	Australia	Cross-sectional study	Marketing regulations (support for)
Sonntag <i>et al</i> <sup>47</sup>	2015	Germany and others	Systematic review	Social media marketing (promoting health)
Tsochantaridou <i>et al</i> <sup>31</sup>	2023	Greece and others	Systematic review	Social media marketing influences
Vanderlee <i>et al</i> <sup>19</sup>	2021	Canada, USA, UK, Australia, Mexico	Cross-sectional study	Food/beverage marketing exposure

Continued

Table 2 Continued

Author(s)	Year	Countries of study	Study design	Topic(s) discussed
Watson <i>et al</i> <sup>42</sup>	2021	Australia	Longitudinal study	Marketing regulations (support for)
Zhou <i>et al</i> <sup>27</sup>	2020	USA	Narrative review	Social media marketing (celebrities)

of 18 years old, those in Mexico and the USA reported greater exposure to marketing for fast food and sugary drinks while viewing digital media with their children compared with parents in Australia, Canada, and the UK.<sup>22</sup>

Differences in exposure were found between sociodemographic subgroups, including gender, family income, ethnicity and age. A self-reported study of 3780 Canadians aged 10–17 reported that girls, those from lower-income families, and minority ethnicities were more exposed than boys, adolescents from higher-income families, and White participants.<sup>23</sup> However, a secondary analysis of the content viewed over 10 min of using social media for 62 Canadian adolescents aged 12–16 found that while boys and girls in Canada were exposed to similar volumes of food marketing on social media, the types of marketing techniques varied by gender.<sup>24</sup> Boys were more likely to view instances of food marketing that appealed to achievement or athleticism and featured a male as the dominant user than girls, who were more likely to view instances of food marketing featuring quizzes, surveys or polls. Two Canadian studies examined exposure by age with one study monitoring app usage finding adolescents aged 12–16 viewed more instances of food marketing on social media apps compared with those aged 7–11.<sup>20</sup> The second study found adolescents aged 13–17 self-reported seeing more unhealthy food marketing online compared with children aged 10–12.<sup>23</sup>

The content of online food advertising primarily contained ultra-processed foods. In an analysis of the top ten most popular websites used by adolescents aged 12 to 17 in Canada, there were 14.4 million food advertisements between June 2015 and May 2016, with the most frequently advertised food categories including cakes, cookies and ice cream (32.5%), cold cereal (20.5%), restaurants (18.0%) and sugar-sweetened beverages (12.0%).<sup>25</sup> On the top 10 most popular websites used by children aged 2–11 in Canada, there were 54 million food and beverage ads from June 2015 to May 2016, and more than 9 out of 10 products advertised were ultra-processed.<sup>26</sup> For both age groups, over 93% of all product ads were categorised as excessive in fat, sodium or free sugars.<sup>25 26</sup>

### Digital marketing techniques influence food behaviour and consumption

Unhealthy food marketing techniques varied across social media platforms, and companies demonstrated their ability to adapt quickly to embrace the opportunities available through digital advertising. Instagram marketing tactics tended to appeal to a younger audience by using

competitions and characters, compared with Facebook, where advertisements tended to include competitions based on user-generated content, interactive games and apps.<sup>21</sup> Companies also adapt their marketing quickly, such as during the COVID-19 pandemic, where a content analysis study found 14 of the largest 20 unhealthy food and drink brands in New Zealand employed COVID-19 themed posts or so-called ‘COVID-washing’.<sup>27</sup> The first COVID-19 themed social media post was on 6 March 2020 by Coca-Cola, and a quarter of all posts by the 14 brands over the next 4 months were COVID-19 themed, with 36% of all COVID-19-related posts drawing on feelings of community support while 23% suggested consumption was an isolation activity.<sup>27</sup>

Three studies explored the use of social media influencers, popular social media users who promote products and shape audience attitudes, to promote food products.<sup>28–30</sup> A randomised control trial of influencer marketing on food intake of 176 adolescents aged 9–11 in the UK found that influencer marketing of unhealthy foods increased adolescents’ immediate food intake, whereas the equivalent marketing of healthy foods had no effect.<sup>29</sup> In a narrative review, Zhou *et al* conducted an accountability evaluation of celebrity endorsement policies and practices in promoting food products to adolescents in the USA and concluded that limited progress had been made to strengthening the accountability structures to ensure healthy food environments.<sup>30</sup>

### The impact of digital food marketing

The significant impact of digital food marketing on children and adolescents is well established. In a meta-analysis of 80 articles and 19372 participants aged 0–19, food marketing including digital forms was associated with increased intake, choice, preference and purchase requests in children and adolescents.<sup>31</sup> Four additional reviews explored the influence of unhealthy food advertising on food consumption across media forms including digital media.<sup>32–35</sup> In a systematic review, Tsochantaridou *et al* found adolescents exposed to unhealthy food and beverage advertising showed a strong desire and intention to consume the advertised foods.<sup>32</sup> Coleman *et al*, in a rapid review, reported evidence of a relationship between exposure to unhealthy food advertisements and childhood obesity at all stages of the causal pathway, including a clear dose-response relationship.<sup>33</sup> In a systematic review by McCarthy *et al*, they suggest that social media and advergames marketing significantly affect pester behaviours, food choice and food intake of adolescents and that exposure accumulates from multiple platforms, which may contribute to habit formation.<sup>34</sup>

Finally, Boyland and Whalen concluded in a narrative review that ‘new media’, including digital media, is effective at strengthening brand awareness and encouraging product purchases by facilitating peer endorsement of and personal relationships with food and beverage brands.<sup>35</sup>

However, the perceived impact of digital food marketing on children and adolescents’ food-related behaviour varied across multiple countries. In a focus group study of grade 10 students (average age 16 years) in Zambia, adolescents reported being influenced by social media marketing and using social media to learn about eating places and what foods they should eat.<sup>36</sup> However, a UK study of adolescents found the majority of 11–13 year-olds felt the community and mass media, including social media, did not influence their attitudes or alter their food consumption as much as older adults believe.<sup>37</sup> Instead, many identified the positive influence of social media, including healthful eating and other trends such as plant-based diets. A mixed-methods Lithuanian study of 8–13 year-olds found that the frequency of food products seen on social media ads was positively linked with the willingness to consume these products despite children struggling to recall viewing food products on social media.<sup>38</sup> Additionally, social media was found to contribute to adolescents’ consumer socialisation of food by mediating the sharing of food experiences between adolescents and their peers.<sup>38</sup>

### Marketing regulations

Three review studies strongly indicated that voluntary unhealthy food marketing regulations were ineffective at reducing unhealthy food advertising and instead still promoted the consumption of unhealthy foods.<sup>33 35 39</sup> The lack of effectiveness is evident in the self-regulatory Canadian Children’s Food and Beverage Advertising Initiative (CAI), where ads included in this initiative were found to be more than two times more likely to have advertisements that were excessive in fat, sodium or free sugars compared with non-CAI ads.<sup>26</sup> To address these ineffective regulations, Gómez and Rajmil advocated in an editorial for shifting from voluntary industry participation to governmental control with potential penalty effects to ensure the reduction of unhealthy food exposure and consumption.<sup>40</sup> Additionally, a case study of brand mascot and licensed media character marketing practices in the USA recommended that regulatory measures should include accountability actions for all forms of advertising, including mascot and media character digital marketing, after finding limited progress had been made to hold involved parties accountable.<sup>41</sup>

Keeping up with the changing digital marketing environment continues to be a challenge for policymakers and existing regulations are often limited in scope. A comparative study of regulations in Australia, New Zealand and Fiji found policies on food marketing to children were generally focused on those under 12 years, only applied to some types of media and needed more transparency

about which products the policies apply to.<sup>42</sup> A qualitative analysis of policy implications in Zambia found most policies for regulating marketing were designed for traditional media, such as radio and TV, and distinct policies for social media are still underdeveloped.<sup>36</sup> For example, in the Potvin Kent and Pauzé study of 54 million unhealthy food ads on websites, 7.6 million promoted brands instead of a product which would not have been included in the definition of unhealthy digital food marketing.<sup>26</sup> This study was also unable to identify ads by country of origin, highlighting the cross-jurisdiction nature of social media.

Crafting regulations to control emerging digital marketing practices was also acknowledged as a barrier to effective regulation. Following their content analysis, Gerritsen *et al* recommended that future regulation must reconsider how we determine whether marketing is ‘targeted’ at children, as children are exposed to multiple forms of marketing in the food environment that may not meet regulation requirements.<sup>27</sup> This is exemplified by a Twitter analysis of Coca-Cola-sponsored physical activity programme in the UK called Parklives, which revealed 79% of images contained children and 45% of these images contained prominent Coca-Cola branding despite not being targeted at children.<sup>43</sup> Determining if social media content is commercial in origin or is genuinely generated by consumers acting independently was also identified as a regulatory challenge in a 2016 review of digital marketing of unhealthy products.<sup>44</sup> Despite these challenges, a rapid review of marketing restrictions to combat obesity concluded regulations are a cost-effective policy option as healthcare savings likely outweigh the cost of implementing the policy.<sup>33</sup>

Notably, strong public support for child food marketing regulations was generally reported. A 2018 survey of 2011 adults in Australia found that 75.8% supported government regulations to restrict internet advertising of unhealthy foods and beverages to children.<sup>45</sup> A separate Australian cross-sectional study of adults found that although since 2013 there has been a slight decrease in support for banning food advertising that target children, concern for advertising on the internet and social media has increased.<sup>46</sup> In a 2021 US study of 2852 adults, support was less clear, with 46.1% supporting or strongly supporting junk food advertising restrictions on social media and 40.6% remaining neutral.<sup>47</sup>

Social media acts not only as a CDoH in facilitating food marketing but also as a means of reshaping public perceptions and advancing corporate goals. A content analysis of the ultra-processed food industry’s use of Twitter in Australia found that corporations use social media to influence food and health policy debates by co-opting public health narratives, opposing regulation, supporting voluntary regulation, affecting public perceptions and using ignorance claims to distort policy narratives.<sup>48</sup>

## Media literacy and critical thinking skills for the digital food environment

Media literacy and critical thinking skills were identified as being necessary to respond to the pressures of the digital food environment. In an editorial, Elliott *et al* argued that media literacy differs from food literacy and includes the ability to analyse and evaluate content.<sup>49</sup> The lack of media literacy and awareness is evident as only 3.5% of US students in a study of 152 adolescents aged 13 to 18 reported using social media to seek health-related information.<sup>50</sup> However, when asked about specific topics, over 80% of Facebook users reported viewing sites on health topics concerning nutrition and fitness. Recommendations for promoting critical thinking regarding food marketing to children as suggested in the editorial by Elliott *et al* include capturing the range of marketing formats and current food promotion trends, including inquiry-based and cocreation activities, and supporting ongoing media literacy development.<sup>49</sup>

Recognising social media as part of the digital food environment was also identified as being key to countering the influence of unhealthy food. In a systematic review, Sonntag *et al* reported that mass media, and specifically the internet, contribute to an obesogenic environment and suggest that recognising this will be necessary to monitor and control the food industry and to develop childhood obesity prevention interventions.<sup>51</sup> Folkvord *et al* corroborated this finding in a narrative review that found that the current obesogenic environment makes unhealthy choices easy and proposed that a shift to a 'healthogenic environment' will require social media to be part of a whole-systems approach to promote healthy choices for young people.<sup>52</sup> However, healthy food promotion may remain a challenge as a review of the

promotion of healthy food found only about half of the interventions positively affected healthy food consumption.<sup>53</sup> We present the summary of the main findings and possible implications in [table 3](#).

## DISCUSSION

This scoping review identifies and describes the current literature on the impact of the social media industry as CDoH and how it influences the digital food environment for children and adolescents. Most children and youth are exposed to food and beverage advertisements on social media and the majority of advertised food is ultra-processed and excessive in fat, sodium or free sugars. Despite limited children and adolescent awareness, digital marketing techniques influence their unhealthy food consumption and food behaviour. Voluntary marketing regulations were determined to be ineffective and new government regulations must be developed and introduced specifically for the social media and online world. Combating unhealthy food marketing will require media literacy and critical thinking skills, along with recognition of the role the digital food environment plays in contributing to the obesogenic environment.

This review found that exposure to unhealthy food advertising on digital media is pervasive, although the impacts are not evenly distributed. Older adolescents and those from some countries, including the USA, may be more exposed than other groups. These findings are consistent with existing evidence that older adolescents (aged 12–17) in Canada were exposed to more unhealthy food advertising on television than children (aged 2–11), even though children were exposed to more food advertisements overall. This result may reflect the presence

**Table 3** Summary of main findings and possible implications

Topic	Data	Possible implications
Exposure to unhealthy food advertising online	A majority of children and adolescents are exposed to food advertisements on social media. Older youth in Chile, Mexico and the USA and children from minority ethnic backgrounds or lower-income families may be more exposed. Most advertised food is ultra-processed and excessive in fat, sodium or free sugars. Accurately measuring exposure is challenging.	A better understanding of which communities are most affected by unhealthy food marketing could support an action-oriented response. Continued and expanded monitoring of unhealthy food marketing on social media is needed to inform policy action.
Digital marketing techniques influence on food behaviour and consumption	Food marketing techniques vary between platforms and companies quickly adapt (eg, 'COVID-washing'). Despite a lack of advertising awareness on social media, food marketing influences consumption and food behaviour.	Understanding how marketing techniques bypass cognitive awareness and influence food behaviour can support the development of interventions and marketing regulations.
Media literacy and critical thinking skills for the digital food environment	Media literacy and critical thinking skills are needed to counter unhealthy food marketing. The digital food environment contributes to the obesogenic environment. Healthy food marketing on social media is not as effective.	New strategies and innovative approaches are needed to counter unhealthy food marketing. There is a need to recognise the online food environment as part of the obesogenic environment.
Marketing regulations	Self-regulatory policies are not effective. Unhealthy food regulations for children and adolescents have not kept up with the changing digital marketing landscape (eg, promoting brands instead of products, intended vs actual audiences) and will need to adapt to the social media environment. Social media is used to reshape public perception and influence unhealthy food policy debates.	Regulatory bodies and relevant stakeholders will have to compete with fast-paced and innovative unhealthy food marketing companies to ensure effective monitoring and regulation of industry as part of broader obesity prevention and management approach. Regulations will require global collaboration due to the transnational nature of social media.

of advertisement regulations for younger children and differences in viewership between children and adolescents.<sup>54</sup> Although one study found adolescents from lower incomes and minority ethnic backgrounds may be more exposed, overall, within the current literature on unhealthy food marketing exposure and regulation, there continues to be limited research exploring the impact on structurally marginalised groups. The lack of research in this area is notable as marginalised groups experience a disproportionate health burden of childhood obesity.<sup>55</sup> Developing effective interventions to combat the inequality and disparities that exist in childhood obesity should include considerations such as marketing exposure across subgroups, as these factors may exacerbate underlying population-level determinants such as poverty and food insecurity.

Although the studies included in our review report high social media marketing exposure levels, their results may still be artificially low, as most exposure studies used self-reported data. Demers-Potvin suggested most results under-report actual exposure due to subtle digital marketing techniques, including celebrity endorsements by influencers, advergames and other content disguised as entertainment which is more likely to bypass adolescents' cognitive awareness and not be self-reported.<sup>21</sup> Social media self-reported use data have been shown to correlate poorly with actual use data, with the most significant discrepancies found for the most prolific social media users.<sup>56</sup> Under-recognition of the exposure and influence of unhealthy food due to an absence of publicly available data on social media use and industry corporate practices contributes to the lack of research and may worsen health equity.<sup>57</sup> Additionally, exposure to food marketing was measured directly in only three countries (Australia, Mexico and Canada) while the remaining studies relied on self-reported data or examined the frequency of advertising on digital media which further questions the accuracy of exposure data across countries. Furthermore, when data are available from social media platforms, they are often sold to health-harming industries for advertising purposes, which can make it more difficult to combat unhealthy advertising practices.<sup>13</sup> An inability to identify and monitor unhealthy food marketing exposure on social media could present challenges to accurately understanding the scope and impact of the social media industry as a CDoH and suggests the need to develop new research approaches.

This review found consistent evidence that digital media marketing of unhealthy food influences children and adolescents' awareness, consumption and food intake. The role of social media marketing in influencing high-energy intake, including bypassing cognitive awareness to shape the food environment for children and youth, is consistent with the definition of an obesogenic environment driver.<sup>8</sup> Previous research has suggested that the digital and physical food environments are interconnected and influence each other largely due to digitalisation of the food environment.<sup>58</sup> However, the role

of the online environment as part of the obesogenic environment continues to be underexplored compared with the physical environment, especially in food environment frameworks.<sup>59</sup> Recognition of the online environment is particularly relevant when considering the changing food environment post COVID-19 pandemic, such as the dramatic rise in online food delivery services.<sup>60</sup> The acknowledgement of the online environment, particularly social media marketing, as part of the obesogenic environment for children and adolescents, will be important in identifying the drivers of obesity and producing effective policy responses.

Beyond promoting unhealthy food products, social media was found to be used by the ultra-processed food industry to support their company goals with practices identified as CDoH, including influencing policy debates and co-opting public health narratives. The political practices identified are consistent with the common strategies transnational corporations use to undermine the prevention and control of NCDs such as obesity.<sup>61</sup> Social media, in particular, provides an incomparable medium for facilitating corporate actions to advance stakeholders' interests, such as corporate social responsibility initiatives, which can produce more impactful outcomes on social media than with other mediums.<sup>62</sup> Therefore, the role of social media is twofold in both allowing for the effective promotion of ultra-processed products for children and adolescents while simultaneously providing the ultra-processed industry with tools and a medium for tactics to influence policy decisions in their interest.

Although public regulation and market intervention have been the only evidence-based mechanisms shown to prevent harm by the ultra-processed food industry,<sup>61</sup> regulation of this space will face challenges such as the promotion of brands instead of specific products, the difficulty in determining the difference between the intended and the actual audiences of digital marketing, and the transnational reach of social media marketing. Social media platforms are well designed to facilitate brand marketing and grow brand awareness and loyalty;<sup>63</sup> however, brand marketing may not meet the definition of unhealthy food marketing within many regulations, particularly voluntary ones.<sup>26</sup> Social media advertising techniques, including the use of influencers and peer endorsements, make it challenging to determine if the user or company generated the content and make detecting, monitoring and regulating digital advertising harder than traditional media such as television advertisements.<sup>64</sup> The inability to identify ads by country of origin as reported by Potvin Kent and Pauzé<sup>26</sup> highlights the transnational reach of social media marketing and the need for international coordination to protect children and youth from unhealthy food advertising. The lack of global coordination on regulations enables large companies to choose to operate in the jurisdiction with the most favourable regulations<sup>65</sup> while social media allows advertising to reach an audience beyond the operating jurisdiction without any accountability measures.

Additionally, the lack of recognition of the specific needs of adolescents often results in teenagers being excluded from policies intended for children or adults.<sup>66</sup> Policies, both self-regulatory and government-led policies, must be developed to address and promote the distinct needs of adolescents. Unhealthy food regulations for children and adolescents have not kept up with the changing digital marketing landscape, particularly with the rise of social media, and it is evident that the same regulations and regulatory approaches that were employed for traditional media sources will not be effective across the digital world.

This review's results will have implications and ensuring responsibilities for parents and guardians. Parents and guardians should become aware of the extent of digital food marketing and its impact on their children's health. Open discussions with children about advertisements and marketing techniques can help build awareness.<sup>67</sup> Parents and guardians should also encourage media literacy and critical thinking skills in their children so they can better evaluate the food advertisements they encounter. Given the review's finding that self-regulatory policies are ineffective, parents and guardians should advocate for government regulations to better protect children from ultra-processed and other unhealthy food marketing practices.

Our review has some limitations, mainly due to the scope and definition discrepancies of CDoH. One key limitation is that the search strategy may not encompass the full scope of CDoH. Expanding the search strategy to include additional areas, such as marketing activities, could provide additional results. Although ultra-processed food is widely regarded as a CDoH, the acknowledgement of the social media industry as a CDoH is recent, and the intersection of unhealthy food and social media as it relates to CDoH is largely unexplored and may not be identified using CDoH language.<sup>13</sup> Additionally, although the objective was to focus on the impact on children and adolescents, this may have excluded research which, while not explicitly identified as relating to children and adolescents, would have still impacted this group.

A series of research gaps exist related to this topic. First, there needs to be more research from low- and middle-income countries (LMICs) and structurally marginalised groups. The distribution of countries included in this study shows that most of the published work originated from the four high-income countries of Canada, Australia, the UK and the USA. There is a notable lack of research from LMICs despite the global reach of social media and the transnational presence of unhealthy food and beverage companies. While the under-representation of LMIC is not a unique challenge to this topic, the lack of research in these areas can perpetuate existing inequalities.<sup>68</sup> The research gap can be attributed to various causes, including lack of funding and insufficient recognition and appreciation of research from LMIC. We recommend fostering international collaborations to study social media's role

as a CDoH in LMIC, to enhance understanding of its impact across different contexts. Second, although our review aimed to scope the breadth of determinants, it may have missed some marketing research. Future CDoH research should focus on marketing activities, including advertising and promotions, to assess the impact of marketing activities and social media on the digital food environment for children and adolescents. Third, developing new research approaches to identify and monitor unhealthy food marketing exposure on social media to ensure research keeps up with changing social media user behaviour could be critical in supporting policy and regulatory development. Finally, studies exploring the role of the digital environment, including social media, as part of the obesogenic environment could contribute to better understanding the drivers of obesity in children.

## CONCLUSION

This scoping review suggests that social media industry may act as a CDoH to influence the digital food environment for children and adolescents. To our knowledge, this is the first review exploring the social media industry as a CDoH and its role in contributing to adverse health outcomes, including childhood obesity, through shaping the digital food environment. Most children and adolescents are exposed to food and beverage advertisements on social media. Despite limited awareness, these digital marketing techniques successfully promote unhealthy food consumption and food behaviour. The findings also suggest that social media is used to reshape public perception and influence unhealthy food policy debates and that self-regulatory policies are ineffective and must adapt to the social media environment. Media literacy and critical thinking along with government regulation will be critical to counter unhealthy food marketing. For children and adolescents, social media platforms and the online environment are a daily part of their life. Recognition of the digital food environment's impact on health and nutrition will be key in addressing child and adolescent health worldwide.

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