The HFSS beat goes on

Awareness of marketing for high fat, salt and sugar foods and the association with consumption in the 2017 and 2019 Youth Obesity Policy Surveys

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Together we will beat cancer

CANCER RESEARCH UK

Reference

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Cancer Research UK is the world's largest independent charity dedicated to saving lives through research. We support research into all aspects of cancer which is achieved through the work of over 4,000 scientists, doctors and nurses. In 2018/19, we committed £546 million to fund and facilitate research in institutes, hospitals and universities across the UK.

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Foreword

My name is Dev, I'm 15 and live in Leicester.

The internet is vast, unregulated and sadly flooded with ads for unhealthy food. The unfortunate reality is that not much has changed to safeguard young people's health digitally between 2017 and 2019.

This report comes at a time when the UK Government is wrapping up a consultation on their proposal for a total restriction on all junk food advertising online. As industry spokespeople and shadowy think tanks rage against an initiative which would improve children's health, we hope this report gives you a clear view from the ground.

Advertising of unhealthy food is everywhere - including social media, TV and YouTube, where young people spend their free time - making them an easy target for these massive companies. This intentional targeting of teens must stop; and companies must start putting more emphasis on other healthier options.

Why does all this matter so much to me? Because it's about my health! How can anyone easily be or stay healthy when our whole digital environment is flooded to promote foods that are high in fat, sugar and salt?

My friends and I don't want to feel bombarded with junk food ads every day. The battleground that exists on our phones and other devices leave us victims to the savage tricks of marketing every hour of our lives.

It is accepted that there is a link between kids seeing ads and what they eat. Now we need action!

The UK Government must follow through on plans set out in their recent obesity strategy to restrict junk food marketing.

Ultimately, we need to work on creating an environment better suited to help young people to eat healthily.

I refuse to sit and watch a failed food system continue to have such a negative impact, and yet still be granted the privileges of self-regulation.

We all need to play an active role in voicing some of the battles young people face today in the digital world ... and that includes against junk food advertising.

Now is the time we must all stand up in support of a total restriction on digital junk food advertising. Because health is wealth, and Government have that role to step in where needed; so that we, young people, can prosper and become the innovative generation we want to be.

Dev Sharma
BiteBack 2030 Youth Board Member

Executive Summary

Overweight and obesity is the second biggest cause of cancer in the UK after smoking. It is causally linked to 13 types of cancer and is accountable for approximately 6% of total cancer cases per year in the UK.[1] Currently in the UK, more than six in ten adults live with overweight or obesity.[2] The UK-wide costs of overweight and obesity to the NHS are estimated to reach £9.7 billion by 2030, with wider society costs estimated to reach £49.9 billion.[3]

Children with obesity are around five times more likely than non-obese children to have obesity as an adult.[4] With over one-third of children in England leaving primary school with overweight or obese,[5] tackling childhood obesity is key for cancer prevention.

Marketing of high fat, salt and/or sugar (HFSS) food and drinks is a well-documented driver for increased consumption of unhealthy food and drinks in children and young people.[6-10] The first wave of the Youth Obesity Policy Survey (YOPS), a UK-wide repeat cross-sectional survey of 11-19-year olds, which aimed to understand young people's attitudes around diet and food marketing, was conducted in 2017. This survey showed that increased recall of HFSS advertising was associated with obesity and consumption of HFSS food and drinks.[8, 11]

Since the publication of these reports from 2017, there have been various commitments from governments across the UK to tackle obesity,[12, 13] and young people's media habits have changed.[14] There is a need to understand what shifts in the political environment and young people's behaviours may mean for their HFSS marketing awareness (i.e. what they remember seeing and where), and associations between this awareness and their dietary behaviours.

This is particularly pertinent now, as in July 2020 the UK Government announced a new strategy aimed at tackling overweight and obesity.[15] The announcement included policies to reduce the amount of HFSS marketing seen on TV via implementation of a 9pm watershed, potentially end all HFSS advertising online and restrict location- and volume-based promotions in stores.

This report supports the case for swift implementation of this new strategy. Using repeat cross-sectional data from the first and second waves of YOPS, conducted in 2017 and 2019, this report examines changes in young people's awareness of HFSS marketing over time, and to what extent (if at all) the association between marketing awareness and reported HFSS consumption remains two years on.

Key findings

Two years on from our initial reports, the data suggest that little has changed concerning HFSS marketing awareness and the association with consumption. Specifically, young people still recall a range of HFSS marketing activities, particularly adverts on TV and social media and special price offers, and increased awareness is still associated with higher reported consumption across a range of HFSS foods (Figure 1).

Most young people recalled seeing some HFSS marketing in the last month

In both 2017 and 2019, around nine in ten young people recalled seeing at least one form of HFSS marketing in the past month

in each wave.

At least half of young people recalled seeing 2-3 instances of HFSS marketing a day

In both waves, at least half of young people were estimated to have seen 2-3 or more instances of HFSS marketing a day in the past month, and there was no difference between 2017 and 2019.

Young people recall a range of marketing activities online

In both waves, a range of different online marketing activities were recalled by young people. In 2019, 85.8% of young people reported seeing HFSS adverts on social media, 68.4% saw adverts on catch up and streaming services, and 63.5% saw influencers promoting HFSS brands in the past month.

TV, social media and special price offers are still where most young people recall seeing HFSS marketing

Special price offers for HFSS foods, adverts on live TV and adverts on social media were the top three marketing activities recalled by most young people in both waves, followed by adverts on billboards. Specifically, in both 2017 and 2019, more than eight in ten young people recalled seeing HFSS food and drink marketed through TV, social media, special price offers and billboards in the past month.

While these remain the marketing activities recalled by the *most* young people, between 2017 and 2019, there was a decrease in how *often* young people recalled seeing HFSS adverts on TV and social media and special price offers. This could be reflective of changing media habits, a downward trend in young people's HFSS marketing exposure through these marketing activities, or a combination of both factors.

Young people's recall of HFSS marketing on catch-up or streaming services and radio has increased

There was an increase in the proportion of young people who recalled seeing HFSS adverts on catch-up or streaming services and hearing HFSS adverts on the radio. There was also an increase in how frequently young people recalled seeing/hearing these marketing activities. The proportion of young people who recalled seeing HFSS adverts in newspapers or magazines decreased. These findings may represent changes in HFSS marketing, media habits, or both.

Higher awareness of HFSS marketing was associated with higher monthly consumption...

In both the 2017 and 2019 data, we found that greater awareness of HFSS marketing was associated with increased monthly consumption of a range of HFSS food and drinks.

...Across a range of different HFSS foods

For all 15 HFSS foods we measured in 2019 – from sugary snacks and drinks, to savoury snacks, fast food and online takeaways - there were associations between HFSS marketing awareness and higher monthly consumption.

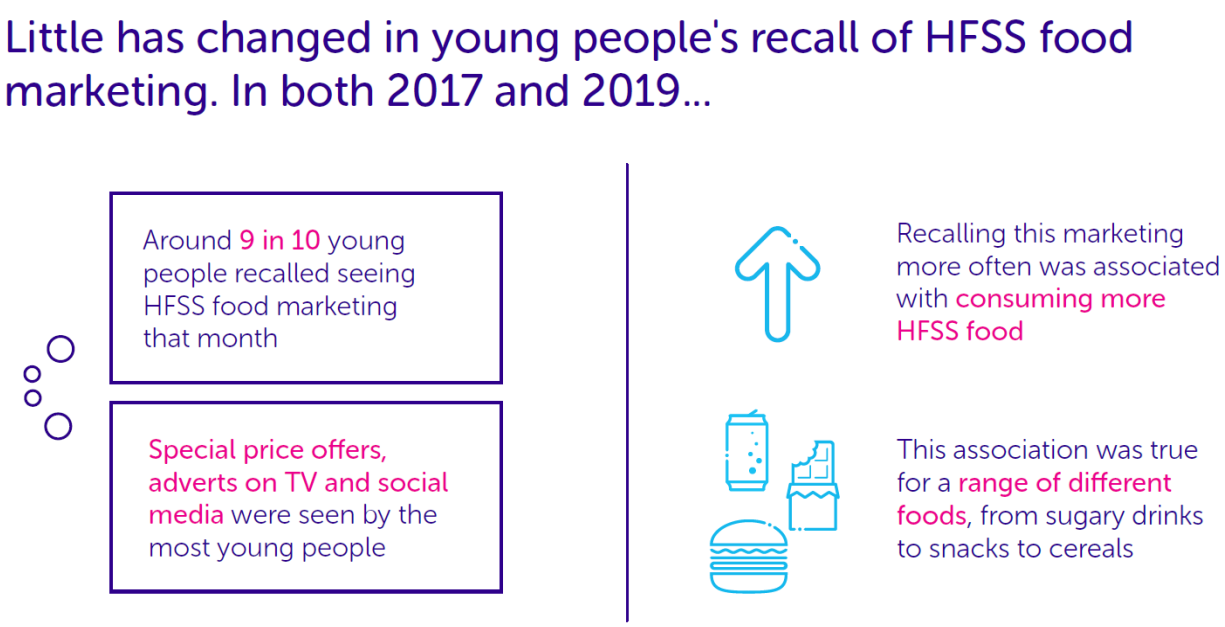
What should the UK Government do?

The UK Government must follow through on implementing the commitments set

out in their obesity strategy to restrict HFSS marketing on TV and online, and (alongside devolved governments) price promotions, within the timeframes already announced. These restrictions are supported by governments in each of the devolved nations.

An end to online HFSS advertising, including on social media and via influencers, would be a world-leading protective measure for young people's health and wellbeing and reduce their risk of developing diet-related diseases, including cancer, later in life.

Figure 1: Summary of key findings comparing young people's awareness of HFSS marketing and the association with HFSS consumption in two waves of the Youth Obesity Policy Survey



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Introduction

Overweight and obesity remains the second biggest cause of cancer in the UK after smoking, and is accountable for approximately 6% of total cancer cases (22,800 cases) per year in the United Kingdom (UK).[1] More than six in ten UK adults are overweight or obese,[2] and in 2017/18 there were 711,000 hospital admissions where obesity was a primary or secondary diagnosis.[16] By 2050, UK-wide NHS costs attributable to overweight and obesity are predicted to reach £9.7bn a year, with wider society costs estimated to reach £49.9 billion.[3]

More than one in three children in England leave primary school with overweight or obesity.[5] Children with obesity are around five times more likely than children without obesity to have obesity as an adult:[4] acting early is critical. Obesity prevalence is more than twice as high for children living in the most deprived areas than for children in the least deprived areas of the UK, rising to almost four times as high for severe obesity.[5]

The impact of obesity has been brought into even sharper focus during the COVID-19 pandemic. Emerging evidence suggests people with overweight or obesity are at a greater risk of worse outcomes from COVID-19.[17, 18] While young people appear less clinically vulnerable to COVID-19 than adults, early evidence indicates the pandemic has impacted their diets; during the first national lockdown, children ate more unhealthy food and snacks but fewer fruits and vegetables, especially those from more deprived backgrounds.[19] Media habits have also been altered, with increased screen time, more viewing of video on demand services and gaming[20] which may have implications for exposure to HFSS marketing. Addressing HFSS marketing and the diets of young people is more important than ever.

The influence of HFSS food marketing

Exposure to marketing for high fat, salt and/or sugar (HFSS) products is a well-known driver of increased consumption of HFSS food and drink.[6-9, 21, 22] In 2016 ScotCen, the Institute for Social Marketing and Health (ISMH, University of Stirling) and Cancer Research UK (CRUK) investigated young people's perceptions of HFSS marketing and found that young people feel exposed to, and may be influenced by, a wide range of HFSS marketing activities.[23] Despite showing a high level of media literacy, and an understanding of the 'persuasive intent' of marketing, young people are still vulnerable to its impact.[23] A repeat of this research in 2019 showed that young people feel HFSS marketing is pervasive and targeted to them, and are supportive of protective measures that restrict exposure to and the power of this marketing.[24] Data from the 2017 wave of the Youth Obesity Policy Survey (YOPS) showed that increased awareness of HFSS advertising was associated with obesity and consumption of HFSS food and drinks.[8, 11]

The UK Government began to address the prevalence of junk food marketing in 2008 by introducing measures to limit HFSS advertising on children's TV programming. However, existing measures do not adequately protect children from seeing HFSS marketing when they watch programmes popular with both children and adults. HFSS advertising is still allowed during family viewing time (6pm-9pm); the most popular TV viewing time for children.[25]

Media habits are also changing: Ofcom figures indicate that children and young people are shifting away from TV sets in favour of mobile devices and tablets to watch TV content, and prefer watching on YouTube over TV or on-demand.[14] More and more young people have access to technology, and are exposed to online HFSS marketing from a younger age than ever before. The UK's existing system of self-regulation for digital HFSS marketing has severe limitations, which prevent it from effectively protecting children. For example, we know children and young people consume content popular with adults, yet inaccurate methods to determine a user's age online means companies cannot ensure they are not exposing children to adverts.[26]

Changing viewing patterns and the increased popularity of online devices means it is even more essential to ensure that HFSS marketing restrictions are fit for purpose, across both TV and online.

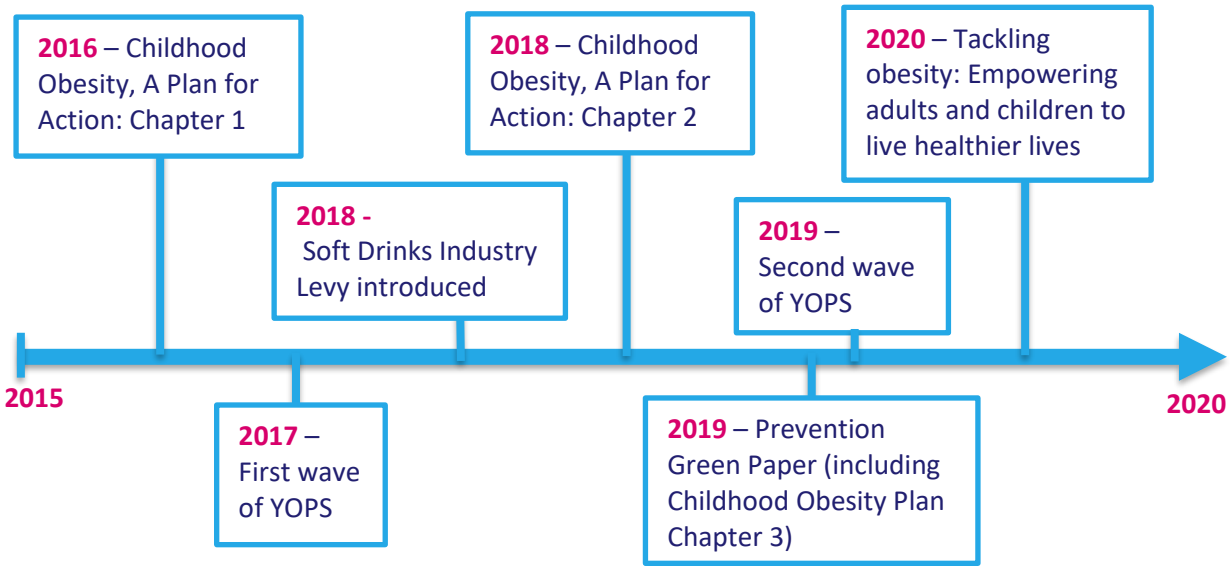
What has happened so far?

Since the first wave of the Youth Obesity Policy Survey in 2017, we have seen positive commitments made towards tackling obesity (Figure 2). The introduction of the mandatory Soft Drinks Industry Levy (SDIL) in 2018 has effectively incentivised producers to reformulate to reduce sugar content or portion size for added sugar drinks, with money raised going directly to schools.[27, 28] Voluntary sugar reduction and calorie reduction programmes aiming to encourage industry to reformulate their products, on the other hand, have seen more limited success.[29]

In response to the growing evidence highlighting the link between HFSS marketing and HFSS consumption, increasing attention has been given in terms of policy action. In 2019, the UK Government launched two consultations, focusing firstly on promotions and placement of HFSS foods in retail, and secondly on restrictions for HFSS advertising on TV and online.[12]

The COVID-19 pandemic has brought increased attention to public health and obesity. In July 2020, the UK Government unveiled a new obesity strategy aiming to tackle overweight and obesity and to help people maintain a healthy weight.[15] With respect to HFSS marketing, this outlined plans to introduce a ban on TV and online before the 9pm watershed, and to consult on a total ban online. It also committed to end promotion of HFSS products by restricting volume promotions (e.g. 'buy one get one free') and promotion of HFSS items by location (e.g. checkout, end of aisles).[15] These restrictions are supported by governments in each of the devolved nations. These commitments are welcome, given the negative consequences that exposure to HFSS marketing has on health.[21, 22, 30]

Figure 2: Timeline of recent obesity policy plans from the UK Government, the implementation of new policy and the point of data collection for the two YOPS waves[12,13, 31]



Research aims and objectives

The first YOPS wave was conducted in 2017, and a repeat wave was conducted two years later in 2019. Collecting data across two times points enables us to build up a repeat monitor of key trends concerning diet and obesity, and to evaluate what changes (if any) have occurred over time as a consequence of either policy implementation or societal changes.

By examining both waves, we provide new evidence to support the UK Government's obesity strategy and which we hope can support the development of policies to better protect young people from the effects of HFSS marketing.

The aims of this report are to compare data from the 2017 and 2019 YOPS waves to investigate changes in:

- Where young people recall seeing HFSS food and drink marketing.
- How often young people recall seeing different marketing activities for HFSS food and drink.
- How much marketing for HFSS food and drink marketing young people recall seeing in the past month.
- The association between awareness of HFSS food and drink marketing in the past month and consumption of HFSS food and drink.

While positive commitments by the UK Government have been made (see Figure 2), little policy action took place between 2017 and 2019. We therefore hypothesise that limited change over time would be observed in either awareness of HFSS marketing or association between marketing and HFSS consumption.

Methods

Survey Design

The Youth Obesity Policy Survey (YOPS) is an online repeat cross-sectional survey of UK young people aged 11-19 years old. The first wave was conducted May to July 2017 (*n*=3,348) and the second wave September to November 2019 (*n*=3,394). For both waves, participants were recruited by YouGov from their non-probabilistic online market research panel. Participants aged 16-19 years old were approached directly via e-mails invitation, whereas 11-15 year olds were recruited through e-mail invitations to existing adult panel members known to have children. For both waves, a technical pilot was conducted prior to launching the survey to check survey flow, length and participant comprehension. YouGov provided a cross-sectional survey weight for each respondent so that descriptive data could be adjusted to represent the demographic profile of the UK population (based on age, gender, ethnicity, region and Index of Multiple Deprivation (IMD) deciles). The unweighted and weighted sample characteristics are reported in the appendix (Table A1). Further detail on survey design can be found elsewhere.[7]

Measures

Demography

Data on age, gender, ethnicity (coded: White British vs. BME), resident country (coded: England, Scotland, Wales, or Northern Ireland) were provided by YouGov based on information held about panel respondents or measured using questions in the survey. Data was also collected on IMD (based on panellist postcode), a measure of deprivation within local areas based on elements such as income, crime and education.[32]

Awareness of HFSS marketing

Participants were asked '*Over the last month, how often, if at all, have you…*' and presented with a variety of marketing activities for HFSS food and drinks (Table 1). For each activity, past-month awareness was measured on a six-point scale (*1=Everyday – 6=Not in the last month*), with an additional option of '*Not sure if seen in the last month*' [2019 wave] or '*Not sure*' [2017 wave]. Ten activities were measured in both waves, while the activities of '*cinema advertising*' and '*internet celebrities/social influencers*' were only measured in the 2019 wave. The following definition of HFSS food and drinks was shown to all participants before the marketing awareness question: *'By unhealthy food or drink we mean high fat, salt or sugary foods and drinks. Some examples include: donuts, chocolate, crisps, takeaways, chips, sugary drinks and sweets.*' The term '*unhealthy food and drinks*' was used to aid comprehension among younger adolescents, who may not be familiar with the term 'high in fat, salt, or sugar' or acronym HFSS.

For each activity, the self-reported frequency of awareness was converted into the estimated number of days the participant had seen HFSS marketing in a four-week period (i.e. one month). For example, those self-reporting '*Every day*' were estimated to have seen 28 instances in a month; 28 being the minimum number of days in a calendar month. Frequency scores across all marketing activities were then summed to provide an overall estimate of past month awareness. To ensure that the data could be

compared between waves, these overall estimates excluded awareness of cinema advertising and promotion via internet celebrities, which were only measured in 2019. For both waves, an overall estimate of past-month awareness was only computed where a participant had provided a valid answer for all relevant activities (i.e. did not say '*Not sure*' or '*Not sure if seen*' to any activity). This approach is consistent with previous research employing this method.[33]

To provide meaningful interpretation, the overall estimates of past-month awareness were split into categories of low, medium, and high awareness. Those not providing a valid answer for all activities were categorised into a separate '*not stated*' category, consistent with previous research using this approach.[33] These categories were based on the unweighted cross-sectional tertile boundaries (i.e. those in the 2017 and 2019 wave separately), and not a combined sample. This ensured that the boundaries were sensitive to the time of measurement and not confounded by a loss of sensitivity by combining waves. In practice, there was little difference between waves. In wave one, the boundaries were low (<44 instances), medium (45-104 instances) and high (>105 instances). In wave two, the boundaries were low (<48 instances), medium (49-104 instances) and high (>105 instances). A sensitivity check revealed little difference if tertiles boundaries were based on weighted or unweighted data in either wave (e.g. for 2017, the weighted boundary for low awareness was <46 and the unweighted <44).

Table 1: List of marketing activities measured in both waves of YOPS and the two new activities measured in the 2019 wave

Marketing activities	Wave
Seen adverts for unhealthy food/drink in newspapers or magazines	Both waves
Seen adverts for unhealthy food/drink on TV	Both waves
Seen adverts for unhealthy food/drink on catch up/streaming services (like All 4, ITV Hub)	Both waves
Seen adverts for unhealthy food/drink on billboards in the street	Both waves
Heard radio adverts for unhealthy food/drink	Both waves
Seen pictures of unhealthy food/drink on YouTube, Tumblr, Facebook, Snapchat, Instagram, or other social networking sites	Both waves
Seen famous people in films, music videos, on TV or pictured in magazines with unhealthy food/drink	Both waves
Seen sports, games or events sponsored by unhealthy food/drink	Both waves
Seen special price offers for unhealthy food/drink	Both waves
Seen competitions or prize draws linked to unhealthy food/drink products	Both waves
Seen adverts for unhealthy food/drink in the cinema	2019 ONLY
Seen internet celebrities (e.g. YouTubers and 'social influencers') talking about, or promoting, unhealthy food/drink products	2019 ONLY

Consumption of HFSS products

Participants were asked '*How often do you usually eat or drink…?*' and provided with a range of food and drink groups, including HFSS products (e.g. cakes, crisps, soft drinks containing sugar), non-HFSS foods (fruit and vegetables), and one HFSS-alternative (sugar free soft drinks). For each, consumption was reported on a nine-point scale (*1=A few times per day – 9=Never*), with an additional option of '*Not sure*'. The product groups, as displayed to participants in each survey wave, are reported in the appendix (Table A2). Designation of whether a food/drink group was HFSS was established through consultation with obesity policy experts with reference to Public Health England's sugar reduction programme[7] when developing the 2017 YOPS, and it was

deemed that no changes in classification were warranted for the 2019 wave. To increase validity to the external food environment, some changes were made to how some groups were measured between waves. Specifically, cakes and biscuits were one combined category in the 2017 YOPS, but were split into separate categories in the 2019 wave to better reflect the unique characteristic of each. Similarly, takeaways were one category in 2017, but divided into separate items of takeaways, fast food outlets, and online deliveries for the 2019 wave to reflect the availability of these products.

As per the approach for awareness of HFSS marketing, the self-reported frequency of consuming each group was converted into an estimate of total consumption over a four-week period (i.e. one month). For example, those self-reporting that they consumed a product '*A few times a day*' were estimated to have consumed around 56 times per month (twice a day multiplied by 28 days). Unlike awareness of HFSS marketing, we did not compute a total score for HFSS consumption for two reasons. First, several product groups had changed terminology between waves (described above), which meant they could not be included in a total score comparing between two waves (i.e. cakes and biscuits would have only been counted once in 2017, but twice in 2019). As such, a total score would underestimate overall HFSS consumption. Second, it was deemed of greater policy interest to examine to what extent (if at all) the association between awareness of HFSS marketing was maintained across HFSS food groups, rather than one estimate of overall HFSS consumption. Instead, a median split was used to group participants into higher or lower past-month consumption of each food and drink group; those who scored lower than or equal to unweighted median were categorised as '*lower*' consumption, and those who scored above the median categorised as '*higher*'; those stating 'Not sure' were marked into a separate category. As per marketing awareness, and for the same reasons, the splits were based on the unweighted medians in each cross-sectional wave, and not a grand median computed across both waves combined.

Analysis

All analysis was done using SPSS version 23 and on unweighted data unless stated otherwise. For each wave, weighted descriptive statistics examined sample characteristics, the proportion of young people who reported seeing at least one instance of HFSS marketing in the past month, and the proportion who reported at least some awareness through each activity. For the latter two variables, weighted Pearson's Chi-square tests examined differences in awareness between each survey wave. Descriptive statistics also examined estimated frequency of HFSS marketing awareness in the past month for individual activities and the overall estimate across all activities combined (for those who provided a valid answer to all marketing activities). As the data were ordinal, non-parametric Mann Whitney tests examined differences in frequency (overall and by activity) between waves.

A series of binary logistic regressions were used to examine the association between awareness of HFSS marketing and monthly consumption of HFSS food and drink groups. Separate models were computed for each food and drink group. In each model, the dependent variable was higher or lower estimated monthly consumption, defined by the median splits in each wave (described above). The key independent variable in each model was past-monthly awareness of HFSS marketing across all activities (coded: low, medium, high or not stated). In each model, each of medium,

high, and not stated marketing awareness was compared to low awareness. All regression models controlled for age, gender, ethnicity, IMD quintile, country and survey wave. Variable categories and contrast coding for these covariates are reported in the appendix (Tables A4-7). All models also included a final block that tested for interactions between survey wave and awareness of HFSS marketing in the past month. This provided an opportunity to examine whether the relationship between marketing awareness and consumption of HFSS foods varied by (i.e. was affected) by survey wave.

Ethics

The University of Stirling's General University Ethics Panel reviewed both the 2017 (GUEP59) and 2019 (GUEP670) waves. YouGov's in-house team also included a lead for ethical and quality assurance, to confirm adherence to best practice throughout testing and data collection. This included ensuring informed consent was obtained, post-survey signposting to support organisations and confidentiality of personal information.

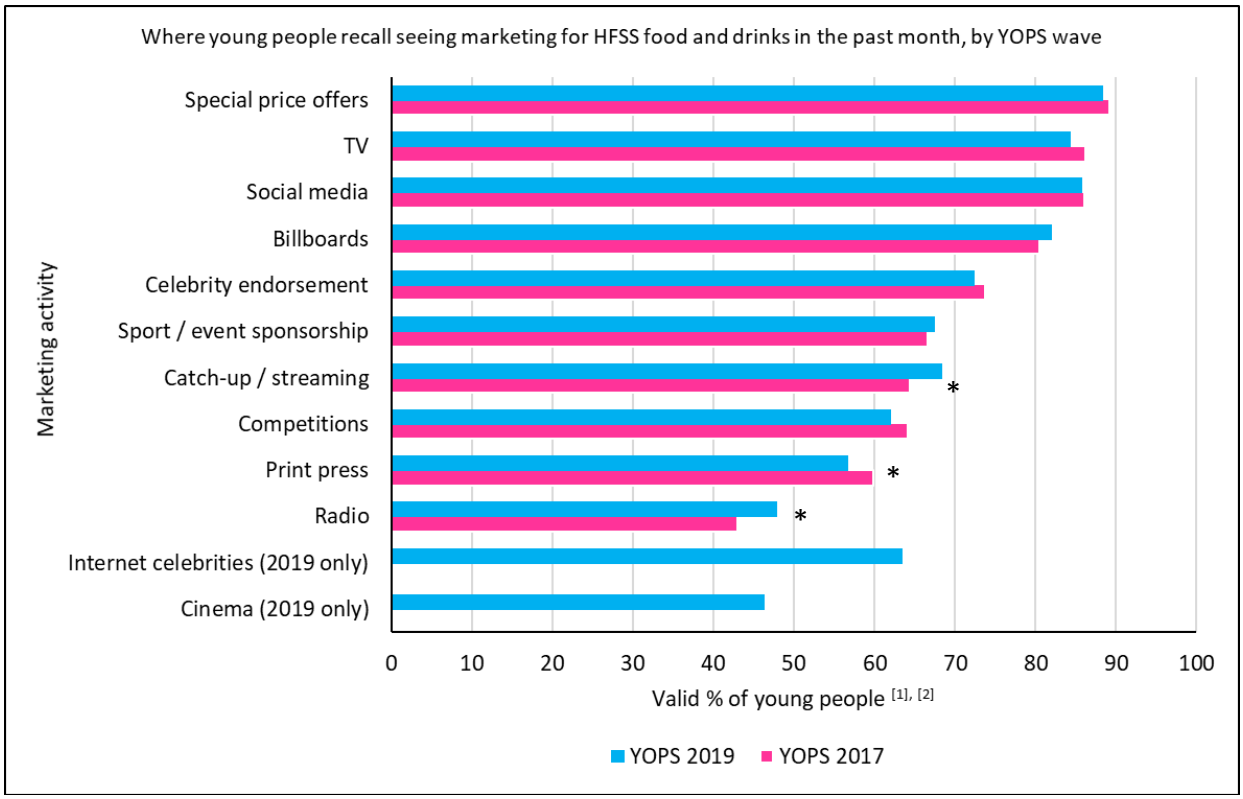
Results

Little has changed in where young people recall seeing HFSS marketing

In the 2017 YOPS, 90.8% of young people recalled seeing at least one instance of HFSS marketing in the past month, while 88.2% did in the 2019 YOPS. A Chi-square test did show this decrease to be statistically significant (χ^2=11.74, p=0.001, [Phi]ϕ=0.04), however, it is important to note that this decrease is small in proportional terms (-2.6 percentage points), the effect size is small, and awareness remained nominally high, with around nine in ten young people recalling some awareness in the past month in both YOPS waves.

For 7/10 of the marketing activities measured at both waves, there was no change in the proportion of young people who reported at least some awareness in the past month (Figure 3; full results in Table A3 in appendix). The three marketing activities where most young people recalled seeing some HFSS advertising in the past month remained the same for both waves; adverts on TV, adverts on social media and special offers. More than eight in ten young people recalled some awareness of HFSS marketing in the past month across these activities, as well as on billboards. For the two new activities added in the 2019 survey, 63.6% of young people recalled some awareness of internet celebrities (e.g. YouTubers) promoting unhealthy food and drink brands and 46.4% recalled seeing cinema advertising for unhealthy foods.

Figure 3: Percentage (%) of 11-19 year olds in the 2017 and 2019 YOPS who reported any awareness of marketing for HFSS food and drinks through each activity in the past month



Notes:
[1] Base = Those who provided a valid answer to each marketing activity in each YOPS wave; i.e. did not say '*not sure*' [YOPS 2017] or '*not sure if seen in past month*' [YOPS 2019]; [2] Percentages are weighted using cross-sectional weights; * Chi-square test statistically significant at p<0.05; Further breakdown of % and Chi-square tests reported in Table A3 in appendix.

Concerning changes between waves, there was a decrease in the proportion of young people who recalled at least some awareness of HFSS adverts in newspapers or magazines in the past month (2017: 59.9% vs. 56.8%; χ^2=4.49, *p*=0.034, ϕ=0.03). There were increases in the proportion of young people who recalled at least some awareness of HFSS adverts on catch-up/streaming services (2017: 64.4% vs. 2019: 68.4%; χ^2=8.21, *p*=0.004, ϕ=0.04) and the proportion who had heard HFSS adverts on the radio (2017: 43.0% vs. 2019: 47.9%; χ^2=10.79, *p*=0.001, ϕ=0.05). These changes may be indicative of a change in HFSS marketing, but could also be reflective of changes in media habits.

Limited change in how often young people recall seeing HFSS marketing

For each activity, we used the reporting scale to create an estimate of how many instances of HFSS marketing a participant had seen in a four-week period (i.e. a month). For example, a participant who said *'everyday'* was estimated to have seen 28 instances in the past month (28 being the minimum number of days in a calendar month), while a participant who said '3-4 times per week' was estimated to see 14 instances (3.5 per week, multiplied by 4 weeks). Further details of this conversion are reported in the methods (Table 3). Non-parametric Mann Whitney tests examined change between waves.

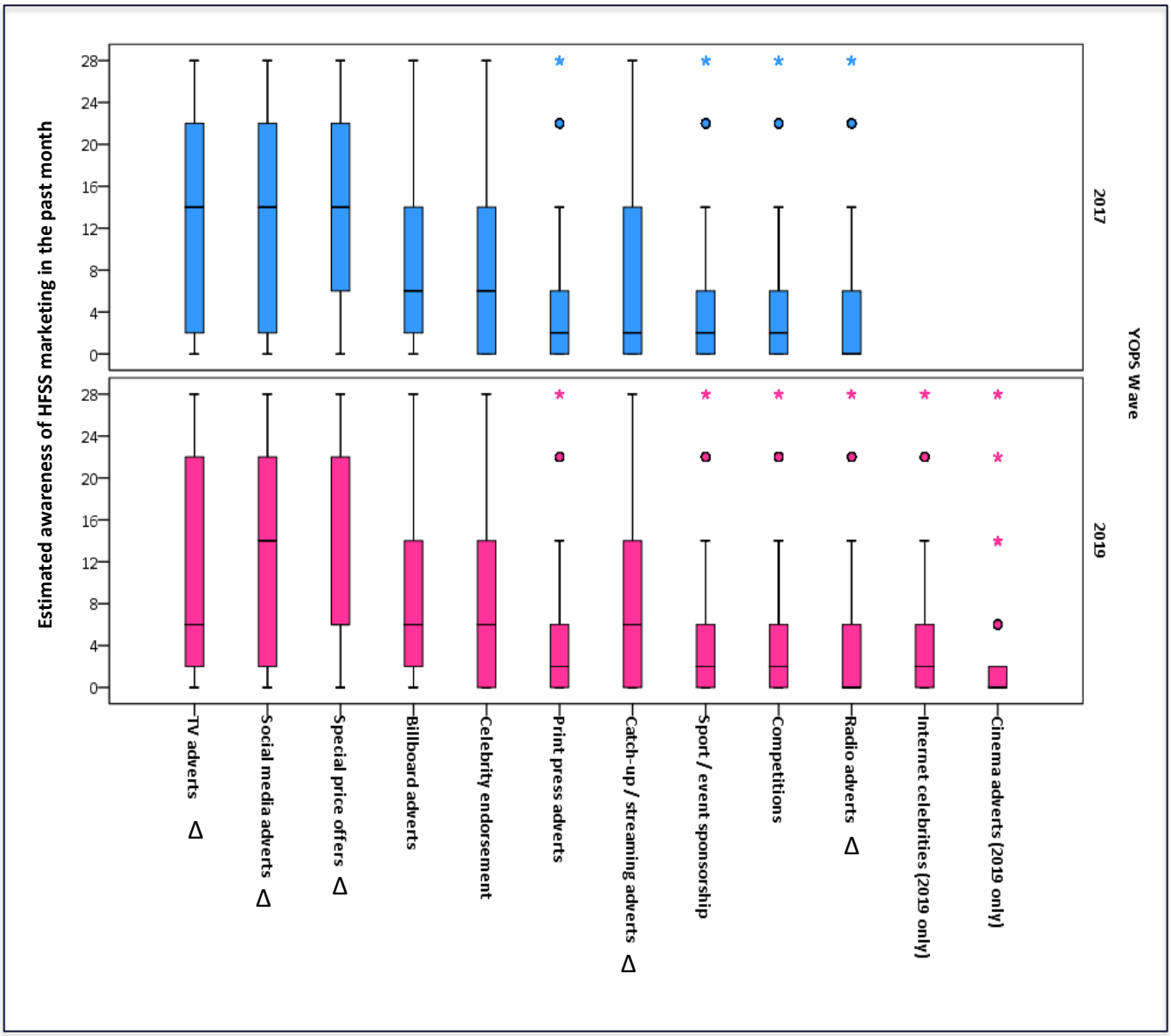
For 5/10 of the activities measured at both waves, no change was observed in estimated frequency of awareness in the past month (Figure 4; full results in Table A3 in appendix). These were adverts in newspapers and magazines, adverts on billboards, celebrity endorsement, sport and event sponsorship, and competitions. For the new activities added in the 2019 survey, the median instances recalled in the past month were two instances for internet celebrities (Inter-Quartile Range [IQR]=0-6) and zero for cinema advertising (IQR=0-2).

Increases were observed in estimated frequency of awareness for adverts on catch-up or streaming services, which increased from a median of two instances in the past month in 2017 (IQR=0-14) to six instances in the past month in 2019 (IQR=0-14; *p*<0.001, *r*=0.06). There was also an increase in frequency of hearing HFSS adverts on the radio which, although the median and the IQR remained the same in both waves (*Mdn*=0, IQR=0-6), the mean ranks in the Mann Whitney indicated frequency of awareness was higher in 2019 than 2017 (*p*=0.001), albeit the effect size for this difference was small (*r*=0.08).

Decreases in estimated frequency of awareness were observed for adverts on TV and special price offers, both of which decreased from a median of 14 instances in the past month in 2017 to six instances in the past month in 2019 (TV: *p*=0.001, *r*=0.04; Special price offers: *p*=0.003, *r*=0.04). There was also a decrease for adverts on social media which, although the median and IQR remained the same in both waves (*Mdn*=14, IQR=2-22), the mean ranks in the Mann Whitney indicated frequency of awareness was lower in 2019 versus 2017 (*p*=0.002, *r*=0.04).

As above, these changes may be indicative of a change in HFSS marketing, but could also be reflective of changes in media habits among young people.

Figure 4: Box plots showing estimated frequency of awareness for each HFSS marketing activity in the past month among 11-19 year olds, by YOPS wave



Notes:
O Indicates outlier
* Indicates extreme outlier
Δ Mann Whitney test was statistically significant between waves (p<0.05);
Base = Those who provided a valid answer to each activity in each YOPS wave; i.e. did not say '*not sure*' [YOPS 2017] or '*not sure if seen in past month*' [YOPS 2019]; Breakdown of *Mdn, IQR,* and Mann Whitney Tests in Appendix Table A3

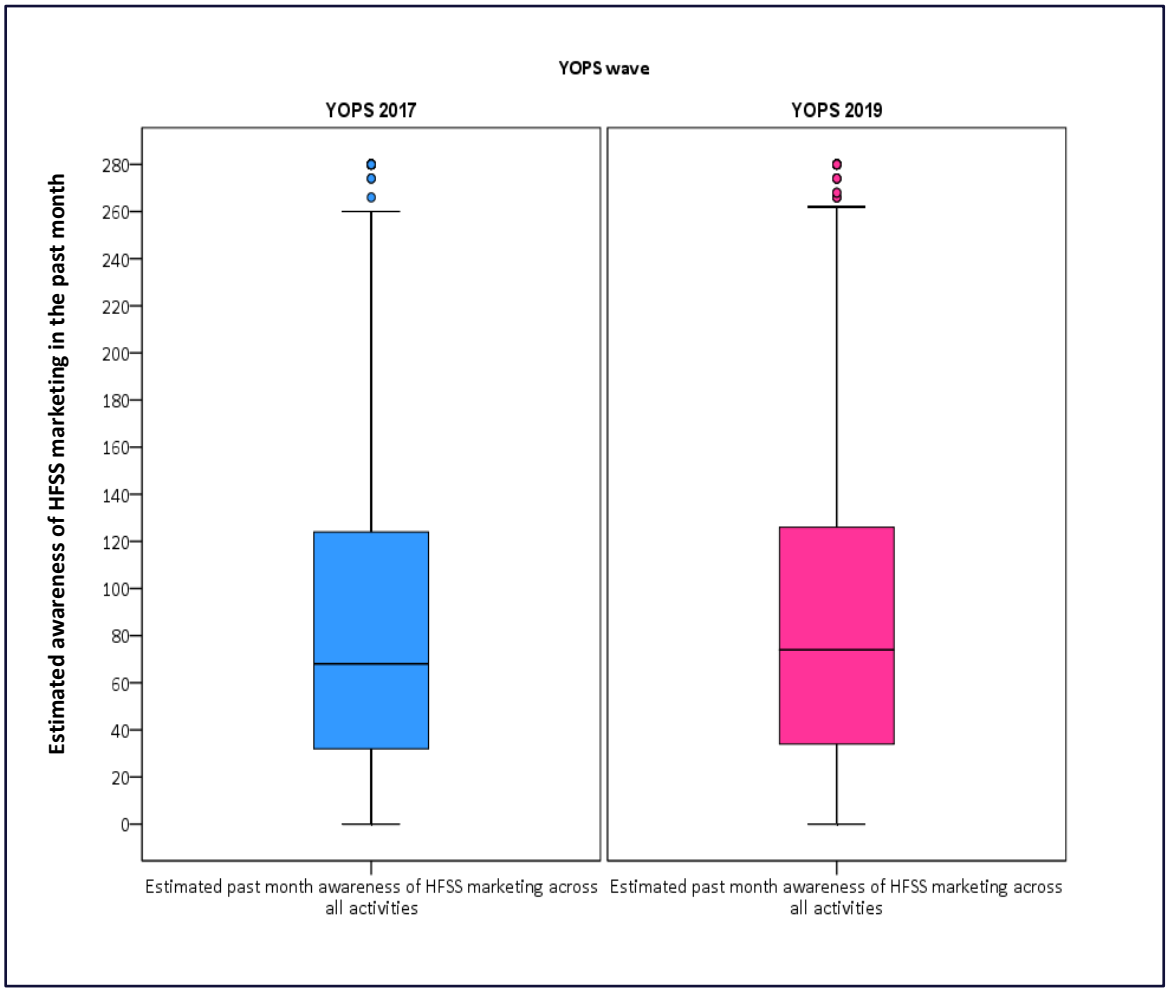
Overall awareness of HFSS marketing has not changed

We calculated an overall estimate of how much HFSS marketing a participant recalled seeing in the last month by summing the monthly estimates across marketing activities; scores could range from 0 (saw no HFSS marketing in the past month) to 280 (reporting seeing HFSS marketing 'everyday' through all the activities measured). To ensure comparability, total scores were only based on the 10 activities measured in both waves

(i.e. excluding cinema and internet celebrities). In each wave, this score was based only on those who provided a valid answer to all 10 marketing activities (YOPS 2017: *n*=1,221; YOPS 2019: 1,115; unweighted).

Across the 10 marketing activities measured in both waves of YOPS, the median aggregate past-month awareness score was 68 instances in 2017 (IQR=32-124) and 74 instances in 2019 (IQR=34-126) (Figure 5) (weighted estimates 2017: *Mdn*=70.70 and 2019: *Mdn*=78.0). In both waves, this is equivalent to at least half of young people recalling seeing 2-3 or more instances of HFSS marketing each day (i.e. 68 instances / 28 [minimum days in a calendar month]). A Mann Whitney test found no difference between waves (p=0.151, *d*=0.03).

Figure 5: Box plots showing estimated past-month awareness of HFSS food and drink marketing across all activities among 11-19 year olds, by YOPS wave



Notes:
[O] Indicates outlier
Base = Those who provided a valid answer all marketing activities in each YOPS wave; i.e. did not say '*not sure*' [YOPS 2017] or '*not sure if seen in past month*' [YOPS 2019] to any marketing activity (2017; *n*=1,1221; 2019: 1,115); To facilitate comparison, scores are based on only the 10 activities included in both the 2017 and 2019 YOPS (i.e. excluding cinema advertising and internet celebrities).

Awareness of HFSS marketing is still associated with increased consumption of HFSS foods and drinks

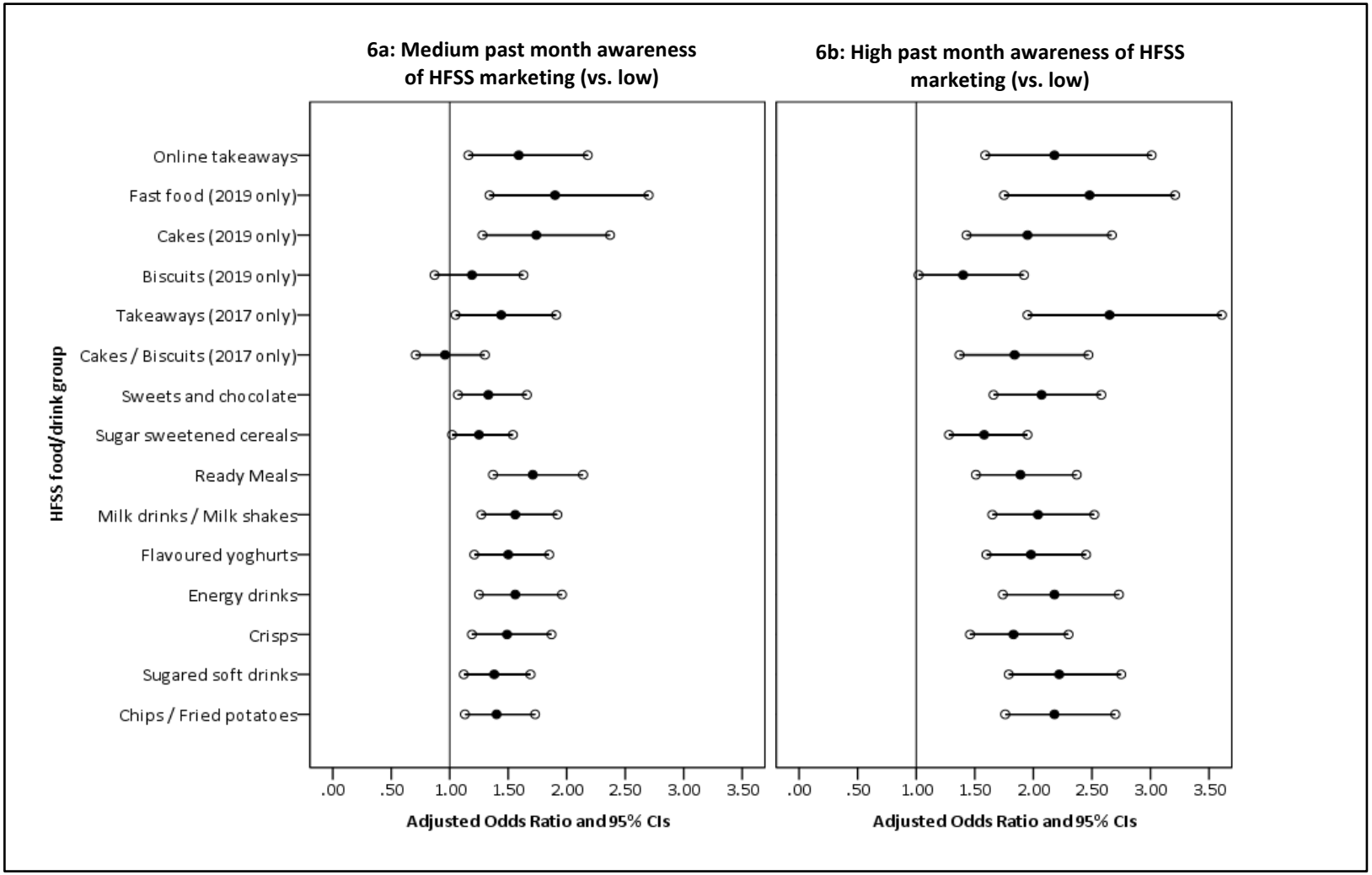
A series of logistic regressions examined the associations between past month awareness of marketing for unhealthy products (split into categories of low, medium and high) and monthly consumption of HFSS food and drink groups (split into higher and lower groups using a median split for frequency of consuming in the past month). The Adjusted Odds Ratios (OR_{Adj}), and 95% confidence intervals (95% CIs), are summarised in Figure 6a (medium past month awareness vs. low) and Figure 6b (higher past month awareness vs. low). The full regression models are reported in the appendix (Tables A4-A7).

After controlling for demographics, there were associations between past-month marketing awareness and higher monthly consumption for all 15 HFSS food and drink groups. For 13/15 of the HFSS foods, there were associations between both medium and high awareness (versus low) and higher monthly consumption. The exception was cakes and biscuits (measured in the 2017 wave only) and biscuits (treated as a separate category in the 2019 wave), where there were only associations between higher monthly awareness (versus low) and higher monthly consumption.

In most instances, the association between marketing and higher monthly consumption appeared to increase relative to marketing awareness. For example, those reporting medium awareness were around 1.4 times more likely to report higher monthly consumption of sugary soft drinks compared to those reporting low awareness (OR_{Adj}=1.38, 95% CI: 1.12, 1.69, p=0.002), whereas those with high marketing awareness were 2.2 times more likely (OR_{Adj}=2.22, 95% CI: 1.79-2.75 p<0.001). Similarly, those reporting medium marketing awareness were 1.6 times more likely to report higher monthly consumption of energy drinks than those with low awareness (OR_{Adj}=1.56, 95% CI: 1.25-1.96 p<0.001), whereas those reporting high marketing awareness were 2.2 times more likely (OR_{Adj}=2.18, 95% CI: 1.74-2.73, p<0.001).

For the nine HFSS food groups measured in both waves, a final stage in each regression model also examined interactions between survey wave and past month awareness of HFSS marketing. For all nine models, the interaction terms were not statistically significant (range *p*: 0.101 to 0.930) (summarised in Appendix Tables A4-7). This indicates that the association between marketing awareness and higher monthly consumption of the HFSS food groups did not vary by survey wave.

Figure 6: Summary of the logistic regressions examining the association between past month awareness of HFSS marketing (medium and high awareness vs. low awareness) and higher monthly consumption of HFSS foods (vs. lower) among 11-19 year olds in the UK.



Notes: All logistic regression models controlled for age, gender, ethnicity, country, IMD and survey wave; Marketing awareness groups based on splitting aggregate marketing awareness score into unweighted tertiles (low, medium, and high; based on unweighted splits); Consumption of HFSS foods based on median splits of monthly consumption (lower<=median; higher >median; unweighted); See Appendix A4-A7 for full tables and all technical notes.

Discussion

TV, social media, and special price offers are still where most young people see HFSS marketing

Two years on from the first YOPS wave, young people in the UK still recall seeing a variety of HFSS marketing activities in the past month. Specifically, in both 2017 and 2019, nine in ten young people aged 11-19 recalled some awareness of HFSS marketing in the past month. Where most young people recalled seeing HFSS marketing has also not changed: adverts on TV, adverts on social media and special price offers and adverts on billboards remain the marketing activities recalled by most young people, with more than eight in ten recalling some awareness in the past month.

In both waves, the places in which most young people recalled seeing HFSS marketing in the past month are congruent to those identified as targets policy action by the UK Government: TV adverts, social media adverts, and special price offers. However, it is also important to note that our data show it is not just these activities alone where young people recall seeing HFSS marketing; for nine of the marketing activities examined, over half of young people recalled at least some past-month awareness in both waves.

There have been some shifts in where, and how often, young people recall seeing HFSS marketing

While there has been little change overall in young people's HFSS marketing awareness (Figure 7), some shifts were observed. Fewer young people recalled HFSS adverts in newspapers and magazines in 2019 compared to 2017, and more young people recalled seeing HFSS adverts on catch-up/streaming services and hearing HFSS adverts on the radio. Young people also recalled seeing adverts on catch up and streaming services and hearing adverts on the radio more frequently in 2019, albeit these increases were small.

We know young people's media habits are changing, with Ofcom reporting an increasing desire for video on demand media over live TV. The number of children aged 5-15 who watch some form of video on demand has doubled, from 44% in 2015 to 80% in 2019.[14] Changes in how much HFSS marketing young people recall across different marketing activities could be associated with these shifting media habits, or could also be reflective of a shift in where HFSS marketing is most shown. While we cannot know from our data, ultimately this analysis does suggest that TV still holds one of the top spots for young people's HFSS marketing recall. Analysis from CRUK suggests there was a slight rise in the proportion of HFSS adverts aired on TV between 2018 and 2019.[34]

Young people recalled seeing HFSS adverts on TV and on social media and special price offers less frequently in 2019 than in 2017. This could reflect changing media habits, a downwards trend in HFSS marketing through these activities, or a combination of both factors. Despite these reductions, these are still the three marketing activities through which most young people recalled seeing at least some HFSS marketing in the past

month. Therefore, while these decreases may represent a positive foundation before any policy are implemented, the data suggest that further reductions remain possible. The data presented also provide an important baseline against which to compare changes if the UK Government do implement restrictions.

Figure 7: Little change has happened in where young people recall seeing HFSS marketing

At least half of young people were estimated to have seen 2-3 or more instances of HFSS marketing a day

There has been little change in how often young people recall seeing HFSS marketing overall. In both 2017 and 2019, at least half of young people were estimated to have seen 2-3 or more instances of HFSS marketing each day.

Due to the self-reported nature of the survey, this is likely to be an underestimate as young people would only recall the adverts they had remembered seeing. Other research indicates that the number of HFSS adverts young people are exposed to in a day could be much higher. For example, analysis of adverts shown before, during and after TV programmes most popular with children during family viewing time (6pm-9pm) found that in one hour-long programme, watched by an average of 708,400 children, 12 HFSS adverts were shown.[25] In an innovative study in New Zealand, researchers had children wear cameras to measure the number of food marketing instances they were exposed to a day. The findings showed that on average children were exposed to non-core (i.e. HFSS) food marketing 27 times a day, double that of core food marketing instances.[35]

While the self-reported nature of YOPS may explain the differences between our analysis and what is reported elsewhere via alternative methods, ultimately this study provides an important indicator that how much HFSS marketing young people recall seeing and how frequently has not changed. The data across the two waves have also

started a vital time series required to adequately assess changes over time should additional policy action be taken by the UK or devolved Governments.

Higher HFSS marketing awareness is associated with higher monthly HFSS consumption

Across all the food groups we asked about, higher past-month HFSS marketing awareness was associated with higher monthly consumption (Figure 8). For most foods, this association appeared to increase relative to marketing awareness. This association has held true in both of the repeat cross-sectional waves. This indicates that even despite some minor variations in where young people remember seeing HFSS marketing, and how much of it they recall, increased awareness remains associated with increased HFSS consumption.

Figure 8: Higher past month HFSS marketing awareness is associated with higher monthly consumption of all 15 HFSS food and drinks groups from both waves of YOPS

Strengths and limitations

The key strength of this report, and of the YOPS study, is that the 2017 and 2019 waves are the two of the largest UK representative studies on dietary behaviours and attitudes of young people since broadcast regulations were updated in 2008. Moreover, by collecting data at two time points, the study has begun to form an important repeat monitor that could be used to examine changes in marketing awareness and the associations with consumption should the UK Government implement restrictions on HFSS advertising. In addition, both waves were informed by scoping studies and pilot testing with young people.

A key limitation is the cross-sectional designs. This means the analyses cannot show causal relationships within or between waves, and the possibility of reverse causality cannot be ruled out. While causality cannot be demonstrated, directional relationships between HFSS marketing and consumption of HFSS foods have been repeatedly demonstrated elsewhere.[22, 30] Moreover, the presence of any association between HFSS marketing awareness and consumption, as demonstrated here, suggests that

marketing must play either an initiating or reinforcing role (or both), and the role it plays may vary among demographic groups.

The data also come from an online non-probabilistic market research panel. While this approach enables us to capture data from a large number of young people from across the UK, and is frequently used in other UK health policy research, the findings may have limited external generalizability to other parts of the population and data were not available to determine biases in which adult panel members were likely to encourage their children to participate. We also note that the two survey waves were conducted at different points of the year (2017: spring/summer; 2019 autumn/winter). Although we do expect any major confounding influence of seasonality, future waves would be required to determine the extent of any impact on awareness or consumption.

The use of self-reported data could result in recall errors for awareness of HFSS marketing and consumption. As such, based on previous research using momentary assessment methods,[33] it is likely the awareness reported is an underestimate of total exposure to all forms of HFSS marketing and, possibly, the association between marketing and consumption. As discussed, young people's media habits are also changing, yet we did not include assessment of how changes in media consumption and screen time correlated with changes in marketing awareness in this analysis. As such, the observed changes in marketing awareness could be a reflection of shifts in HFSS marketing itself, how young people interact with media, or a combination of both.

This analysis is based on the use of tertile splits to create categories for high, medium and low marketing awareness, and median splits to categories HFSS consumption into high and low. We acknowledge this is only one of several potential approaches to developing such categorisations and this chosen approach does have limitations. For example, in relation to HFSS consumption, the last value in the low consumption category and the first value in the high category are likely to be similar. Nevertheless, given the variability in consumption scales, ranging from not at all in the past month to a few times a day, we believe that this split does provide an adequate proxy for our analyses.

Developing an aggregate measure for awareness across all marketing activities included in the study, as employed in this study, also required us to assume that all marketing activities hold equal weighting in their associations with consumption. A similar assumption is made in the marketing activities presented in the survey, for example the combining of social media with YouTube. We recognise that, in reality, different marketing activities (and indeed different brands) will not be equally appealing or uniformly influential across all adolescent groups. Further studies looking at the impact of specific marketing activities, and specific branding, would be of value.

Future work

This report forms one strand of the analysis resulting from the 2019 wave of YOPS. Other areas of focus include young people's awareness of nutritional information and health messaging on food and drink packaging, and young people's awareness and interaction with digital marketing.

The third wave of YOPS is planned for 2021. This will allow for the continuation of comparisons across waves to examine change in diet, marketing awareness, and obesity in 11-19-year olds in the UK, and for the exploration of new topics.

We know that obesity is a complex issue with many contributing factors. Implementing all the measures that the UK Government have committed to will be a huge step towards tackling overweight and obesity. However, according to the recently published National Audit Report on childhood obesity, more will need to be done to reach Government's target of halving childhood obesity by 2030.[36] Further research should look into what additional measures could help the UK Government reach their ambition.

Policy Recommendations

The world we live in doesn't make it easy for young people to be healthy - especially when junk food is put in the spotlight by advertising.

Two years on from our initial reports on how young people felt under pressure from HFSS marketing,[7, 8, 11] young people continue to recall high levels of HFSS advertising and promotions, and this recall is associated with consuming more unhealthy food and drink.

This report builds on the existing wealth of evidence showing the negative impact that junk food advertising has on young people's dietary intake and behaviours and on consumption of excess calories. Reducing young people's exposure to advertising would appear to be an important component in helping the UK Government reach their ambition of halving childhood obesity by 2030.

To be most effective, restrictions need to follow the eyeballs and clicks of young people, and be placed where the HFSS advertising is seen as most prevalent or pervasive. This report confirms that the UK Government's obesity strategy is taking the right approach: by focusing on the very marketing activities – of TV, online platforms and social media, and special price offers – that our analysis tells us are seen by the most young people.

We know that young people feel HFSS marketing is pervasive, targeted to them and are supportive of protective measures.[19] The proposed measures, including banning HFSS products being shown on TV and online before 9pm (or even a total ban online) by the end of 2022, and ending promotion of HFSS products by volume (e.g. buy one get one free offers) and location (e.g. end of aisle displays), would help empower parents and young people themselves to make and maintain healthier habits by removing the unhealthy nudges in their environment.

It is essential that the UK Government follows through on implementing these commitments within the timeframes that have been announced.

But we also can't let young people's health suffer for another two years whilst we wait for these measures to be put in place. Industry must not consider the next two years as business as usual - they cannot continue to bombard young people with unhealthy advertising as they have done so far and they should not use this time to try and find potential loopholes in the proposals they then could exploit. On the contrary, as we saw with Soft Drinks Industry Levy, industry should see this as a transition period and start switching to advertising healthier products instead. To ensure that young people are protected until the measures are enshrined in law, the UK Government must push industry to start enacting now the changes that they will be forced to implement in two years in time.

Young people have told us that they recall junk food adverts on catch-up and streaming services and radio more frequently now. Young people's viewing habits are changing – and the more time they spend online, the higher their risk of being exposed to harmful advertising. Unhealthy advertising must no longer be allowed to play a starring role in children's minds.

It is therefore essential that the online restrictions that are put in place sufficiently protect young people from all forms of online HFSS advertising, including social media which operates in a different way to more traditional adverts. Because of how complex the online landscape is and the ways in which we engage with content online, this will require implementing a total end to all online HFSS advertising.

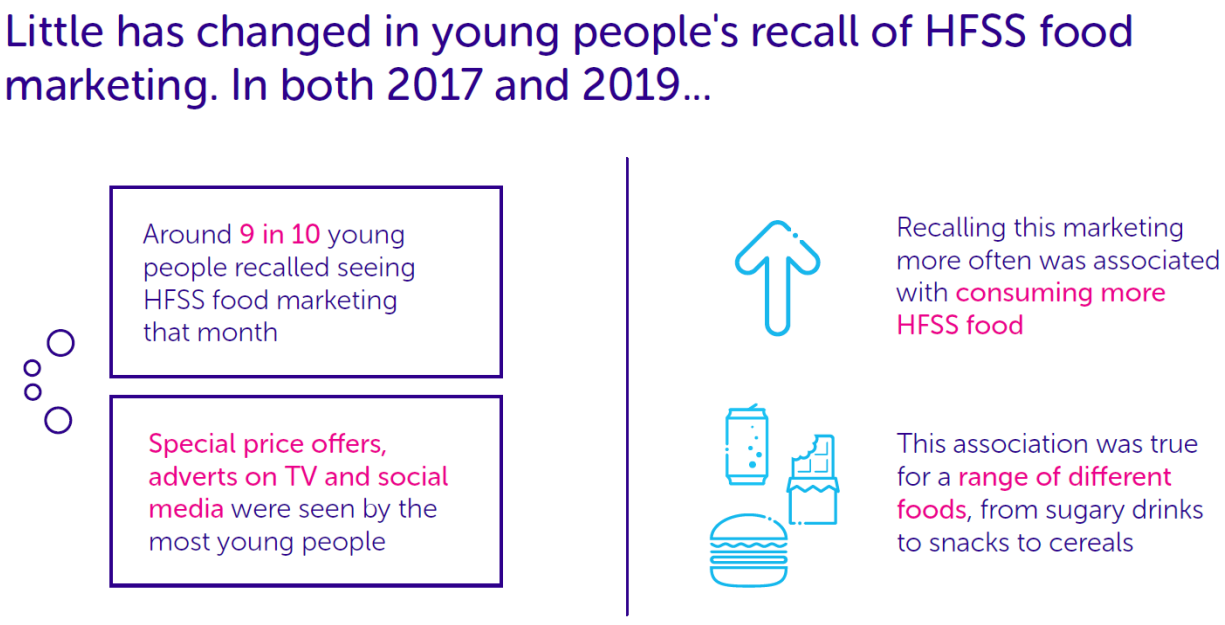
This report has shown that beyond TV, catch-up and social media, young people also recall a range of other HFSS marketing activities, including on billboards and through sports sponsorship. In order to minimise industry's opportunity to shift HFSS advertising from these spaces to less regulated channels after the restrictions are put in place, there may be a need for further interventions. This is something the UK Government should plan to assess.

Conclusion

This report used the first two waves of the Youth Obesity Policy Survey to examine changes in where, and often, 11-19 year olds in the UK recall seeing HFSS marketing, and the association between past month marketing awareness and consumption. Two years on from our initial reports, the data suggest that little has changed; young people still recall seeing HFSS marketing across a wide spectrum of marketing activities – particularly adverts on TV, special price offers, and adverts on social media - and increased past month awareness of HFSS marketing is associated with increased consumption of a range of HFSS foods (Figure 9).

This builds on existing evidence highlighting the widespread exposure to HFSS marketing young people experience. The findings presented support the swift implementation of the UK Government's recently published new obesity strategy and the commitments made to restrict the marketing of HFSS food and drink.

Figure 9: Summary of key findings comparing young people's awareness of HFSS marketing and the association with HFSS consumption in two waves of the Youth Obesity Policy



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Appendices

1 Sample Demographics

Table A1: Demographics of adolescents in the 2017 and 2019 Youth Obesity Policy Surveys

	2017 Unweighted		*2017 Weighted*		*2019 Unweighted*		*2019 Weighted*	
Variable	*%*	*n*	*%*	*n*	*%*	*n*	*%*	*n*
Gender								
Male	47.7	1,596	51.0	1,707	46.8	1,589	51.0	1,731
Female	52.3	1,752	49.0	1,641	53.2	1,805	49.0	1,663
Age								
11-15 years old	60.0	2,010	53.0	1,774	55.4	1,881	53.0	1,799
16-19 years old	40.0	1,338	47.0	1,574	44.6	1,513	47.0	1,595
Country								
England	75.7	2,534	84.4	2,826	76.5	2,597	84.4	2,865
Scotland	12.5	419	7.8	261	12.8	434	7.8	265
Wales	7.5	251	4.7	157	7.2	243	4.7	160
Northern Ireland	4.3	144	3.1	104	3.5	120	3.1	105
Ethnicity								
White	84.4	2,810	76.7	2,555	84.6	2,625	77.0	2,596
BME	15.6	520	23.3	775	15.4	478	23.0	775
IMD Quintile								
1 (most deprived)	15.9	534	20.0	670	15.5	527	20.0	679
2	20.8	695	20.0	670	17.6	596	20.0	679
3	21.8	731	20.0	670	19.8	671	20.0	679
4	23.5	787	20.0	670	20.5	696	20.0	679
5 (least deprived)	18.0	601	20.0	670	26.6	904	20.0	679

2 Survey Design

Table A2: Food groups included in the 2017 and 2019 YOPS

2017			2019		
HFSS foods	Non-HFSS foods	HFSS-alternatives	HFSS foods	Non-HFSS foods	HFSS-alternatives
Cakes & Biscuits	Fruit	Diet Coke or sugar free soft drinks	Cakes	Fruit	Diet Coke or sugar free soft drinks
			Biscuits		
Chips or fried potatoes	Vegetables		Chips or fried potatoes	Vegetables	
Coke or other soft drinks that contain sugar (not Diet coke or diet soft drinks)			Coke or other soft drinks that contain sugar (not Diet coke or diet soft drinks)		
Crisps			Crisps		
Desserts			Desserts		
Energy drinks e.g. Red Bull, Monster			Energy drinks e.g. Red Bull, Monster		
Flavoured yoghurts e.g. Muller Fruit Corner			Flavoured yoghurts e.g. Muller Fruit Corner		
Milk based drinks e.g. Yazoo			Milk based drinks e.g. Yazoo		
Ready meals e.g. frozen pizzas, chips, burgers			Ready meals e.g. frozen pizzas, chips, burgers		
Sweetened cereals e.g. Cheerios, Frosties, Coco Pops			Sweetened cereals e.g. Cheerios, Frosties, Coco Pops		
Sweets or chocolate			Sweets or chocolate		
Takeaways e.g. McDonalds or local Chinese			Fast food outlets e.g. McDonalds or Greggs		
			Takeaways delivered by online platform e.g. Deliveroo or Just Eat		

3 Young people's awareness of HFSS marketing

Table A3: Awareness of different HFSS marketing activities in the past month among 11-19 year olds in the UK and comparison between the 2017 and 2019 Youth Obesity Policy Survey waves

	Seen marketing activity in the past month						Estimated frequency of awareness in past month				
	2017		2019		Chi-Square		2017		2019		Mann Whitney [2]
Marketing activity	%	*n*	%	*n*	χ^2	*p*	*Mdn*	IQR	*Mdn*	IQR	*p*
Adverts for HFSS foods…											
… in newspapers or magazines	59.9	1,463	56.8	1,250	4.49	0.034	2	0-6	2	0-6	0.650
… on TV	86.2	2,444	84.4	2,286	3.79	0.051	14	2-22	6	2-22	0.001
… on catch-up or streaming services[1]	64.4	1,512	68.4	1,563	8.21	0.004	2	0-14	6	0-14	<0.001
… at the cinema[1]	-	-	46.4	1,135	-	-	-	-	0	0-2	-
… on billboards	80.5	2,195	82.1	2,167	2.50	0.114	6	2-14	6	2-14	0.060
… on radio	43.0	1,003	47.9	1,062	10.79	0.001	0	0-6	0	0-6	<0.001
… on YouTube, Tumblr, Facebook, Snapchat, Instagram or other social media	86.0	2,426	85.8	2,337	0.03	0.853	14	2-22	14	2-22	0.002
Famous people in films, music videos, on TV or pictured in magazines with unhealthy food and drinks	73.7	1,780	72.4	1,660	0.98	0.322	6	0-14	6	0-14	0.453
Sport / event sponsorship	66.6	1,606	67.5	1,540	0.40	0.526	2	0-6	2	0-6	0.090
Special offers	89.2	2,546	88.4	2,421	0.94	0.332	14	6-22	6	6-22	0.003
Competitions	64.1	1,546	62.0	1,400	2.14	0.144	2	0-6	2	0-6	0.362
Seen internet celebrities (e.g. YouTubers) talking about, or promoting, unhealthy food brands	-	-	63.6	1,493	-	-	-	-	2	0-6	-

Notes: Base = Those who provided a valid answer to *each* marketing activity in each wave; missing data (i.e. those saying 'not sure' to an activity) are excluded on a test-by-test basis; Descriptive data and Chi-square (χ^2) tests are weighted by cross-sectional weights; [1]Marketing activity only measured in YOPS 2019, and therefore no between-wave comparison; [2] Estimate frequency of awareness and Mann Whitney tests are un-weighted; *Mdn* = Median; IQR = Inter-quartile range.

4 Regression Tables: HFSS marketing and consumption

Table A4: Binary logistic regressions exploring the association between awareness of HFSS marketing and higher monthly consumption of HFSS food/drink groups

	Higher monthly consumption of food and drink products														
	*Chips/Fried potatoes*Δ (HFSS)			*Sugared Soft drinks*† (HFSS)			*Crisps*¥ (HFSS)			Diet/Sugar-free drinks† (Non-HFSS)			*Energy Drinks*◊ (HFSS)		
Variable and reference categories	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*
Gender															
Female	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Male	1.18	1.06-1.30	0.002	1.58	1.43-1.75	<0.001	1.24	1.12-1.38	<0.001	1.12	1.00-1.22	0.052	1.64	1.47-1.83	<0.001
Age															
11-15 years old	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
16-19 years old	1.17	1.05-1.30	0.004	1.17	1.05-1.30	0.004	0.51	0.46-0.57	<0.001	0.76	0.68-0.84	<0.001	1.97	1.76-2.20	<0.001
Ethnicity															
Other	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
White British	1.35	1.16-1.56	<0.001	1.05	0.91-1.21	0.504	1.67	1.42-1.97	<0.001	1.58	1.36-1.82	<0.001	0.76	0.66-0.88	<0.001
Country			<0.001			<0.001			0.018			0.505			0.133
England	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Scotland *(vs. England)*	1.25	1.08-1.46	0.004	1.29	1.11-1.51	0.001	0.81	0.69-0.96	0.013	1.07	0.91-1.24	0.416	0.98	0.83-1.16	0.849
Wales *(vs. England)*	1.19	0.97-1.45	0.091	1.17	0.96-1.42	0.120	0.91	0.74-1.12	0.359	0.89	0.73-1.09	0.263	0.98	0.79-1.22	0.878
N. Ireland *(vs. England)*	1.77	1.37-2.29	<0.001	1.67	1.29-2.17	<0.001	0.74	0.56-0.99	0.039	0.95	0.73-1.22	0.667	1.38	1.05-1.81	0.020
IMD			<0.001			<0.001			0.030			0.405			<0.001
1	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
2 (vs. 1)	0.83	0.70-0.99	0.034	0.86	0.72-1.02	0.080	0.83	0.70-0.99	0.044	1.09	0.91-1.29	0.350	0.98	0.82-1.17	0.787
3 (vs. 1,2)	0.92	0.80-1.06	0.264	0.93	0.81-1.07	0.293	0.90	0.77-1.04	0.140	1.02	0.89-1.17	0.782	0.85	0.73-0.98	0.027
4 (vs. 1,2,3)	0.72	0.63-0.82	<0.001	0.81	0.71-0.92	0.001	0.89	0.78-1.02	0.103	0.96	0.85-1.09	0.556	0.72	0.63-0.83	<0.001
5 (vs. 1,2,3,4)	0.82	0.72-0.93	0.001	0.76	0.67-0.85	<0.001	0.89	0.78-1.02	0.082	0.90	0.80-1.02	0.106	0.74	0.64-0.84	<0.001
Awareness of HFSS marketing			<0.001			<0.001			<0.001			<0.001			<0.001
Low	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Medium *(vs. low)*	1.40	1.13-1.73	0.002	1.38	1.12-1.69	0.002	1.49	1.19-1.87	0.001	1.43	1.17-1.76	0.001	1.56	1.25-1.96	<0.001
High *(vs. low)*	2.18	1.76-2.70	<0.001	2.22	1.79-2.75	<0.001	1.83	1.46-2.30	<0.001	2.12	1.72-2.62	<0.001	2.18	1.74-2.73	<0.001
Not stated *(vs. low)*	1.26	1.07-1.49	0.006	1.18	1.01-1.38	0.043	1.39	1.16-1.65	<0.001	1.19	1.02-1.40	0.029	1.12	0.94-1.34	0.197
YOPS Wave															
2017	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
2019	1.21	1.09-1.34	<0.001	1.06	0.95-1.17	0.299	1.17	1.05-1.30	0.004	1.18	1.06-1.30	0.002	0.95	0.85-1.06	0.386
Marketing Awareness*YOPS Wave±	Wald X^2 (3) = 5.60, *p*=0.133			Wald X^2 (3) = 6.22, *p*=0.101			Wald X^2 (3) = 0.45, *p*=0.930			Wald X^2 (3) = 3.98, *p*=0.264			Wald X^2 (3) = 2.49, *p*=0.478		

Notes: Base all participants in both waves (*n*=6,742); Dependent variable for all models, whether higher or lower monthly consumption reported (based on unweighted median splits at each wave); OR_{Adj} = Adjusted Odds Ratio; 95% CI = 95% Confidence Interval for OR_{Adj}; Data missing on one or more variables on each test Δ (*n*=361); † (*n*=367); ¥ (*n*=359); ‡ (*n*=444); ◊ (*n*=401); ± Wald Statistic for interaction effect, entered into a separate block from main effect variables; Hosmer and Lemeshow for all models *p*>0.05 (final stage, including interaction effect); Chi-square test of co-efficient for all final models *p*<0.001 (final stage, including interaction effect);

Table A5: Binary logistic regressions exploring the association between awareness of HFSS marketing and higher monthly consumption of HFSS food/drink groups

	Higher monthly consumption of food and drink products														
	*Flavoured Yoghurts*Δ (HFSS)			*Fruit*† (Non-HFSS)			*Milk-drinks/Milkshakes* ¥ (HFSS)			Ready Meals† (HFSS)			*Sugared cereals*◊ (HFSS)		
Variable and reference categories	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*
Gender															
Female	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Male	1.14	1.03-1.26	0.013	0.82	0.74-0.91	<0.001	1.30	1.17-1.43	<0.001	1.09	0.98-1.22	0.100	1.28	1.16-1.41	<0.001
Age															
11-15 years old	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
16-19 years old	0.46	0.42-0.52	<0.001	0.75	0.67-0.84	<0.001	0.60	0.54-0.67	<0.001	1.05	0.94-1.18	0.368	0.48	0.43-0.53	<0.001
Ethnicity															
Other	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
White British	1.15	0.99-1.33	0.059	1.03	0.88-1.19	0.741	0.90	0.78-1.03	0.132	1.26	1.09-1.47	0.003	0.93	0.80-1.07	0.302
Country			0.981			0.612			0.110			0.020			0.801
England	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Scotland *(vs. England)*	0.97	0.83-1.14	0.714	0.92	0.78-1.09	0.327	0.86	0.74-1.00	0.055	1.12	0.94-1.30	0.216	1.01	0.87-1.18	0.889
Wales *(vs. England)*	0.98	0.80-1.20	0.927	1.00	0.81-1.23	0.983	0.98	0.80-1.19	0.805	1.28	1.04-1.57	0.018	1.01	0.83-1.12	0.909
N. Ireland *(vs. England)*	0.98	0.75-1.28	0.886	0.87	0.66-1.15	0.323	0.80	0.62-1.04	0.091	1.32	1.01-1.73	0.039	1.14	0.88-1.48	0.319
IMD			0.007			<0.001			<0.001			<0.001			0.005
1	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
2 *(vs. 1)*	0.90	0.76-1.07	0.236	1.07	0.89-1.28	0.492	1.07	0.90-1.27	0.456	0.93	0.78-1.10	0.392	1.00	0.84-1.18	0.964
3 *(vs. 1,2)*	0.86	0.75-0.99	0.037	1.15	0.99-1.33	0.072	0.76	0.66-0.87	<0.001	0.85	0.74-0.98	0.029	0.91	0.79-1.05	0.197
4 *(vs. 1,2,3)*	0.87	0.77-0.99	0.042	1.37	1.20-1.57	<0.001	0.77	0.68-0.88	<0.001	0.76	0.66-0.87	<0.001	0.79	0.70-0.90	<0.001
5 *(vs. 1,2,3,4)*	0.86	0.76-0.97	0.017	1.24	1.09-1.41	0.001	0.83	0.74-0.94	0.004	0.72	0.63-0.82	<0.001	0.94	0.83-1.06	0.331
Awareness of HFSS marketing			<0.001			0.081			<0.001			<0.001			<0.001
Low	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Medium *(vs. low)*	1.50	1.21-1.85	<0.001	1.04	0.83-1.29	0.736	1.56	1.27-1.92	<0.001	1.71	1.37-2.14	<0.001	1.25	1.02-1.54	0.035
High *(vs. low)*	1.98	1.60-2.45	<0.001	1.30	1.05-1.62	0.018	2.04	1.65-2.52	<0.001	1.89	1.51-2.37	<0.001	1.58	1.28-1.95	<0.001
Not stated *(vs. low)*	1.15	0.97-1.35	0.103	1.08	0.91-1.27	0.385	1.13	0.96-1.32	0.133	1.35	1.13-1.61	0.001	1.09	0.93-1.28	0.303
YOPS Wave															
2017	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
2019	0.58	0.52-0.64	<0.001	0.49	0.44-0.55	<0.001	1.12	1.01-1.24	0.029	0.93	0.83-1.03	0.166	1.13	1.02-1.25	0.020
Marketing Awareness*YOPS Wave±	Wald X^2 (3) = 2.98, *p*=0.395			Wald X^2 (3) = 3.86, *p*=0.277			Wald X^2 (3) = 3.07, *p*=0.381			Wald X^2 (3) = 3.46, *p*=0.327			Wald X^2 (3) = 3.43, *p*=0.330		

Notes: Base all participants in both waves (*n*=6,742); Dependent variable for all models, whether higher or lower monthly consumption reported (based on median splits at each wave); OR_{Adj} = Adjusted Odds Ratio; 95% CI = 95% Confidence Interval for OR_{Adj} ; Data missing on one or more variables on each test Δ (*n*=412); † (*n*=377); ¥ (*n*=447); † (*n*=390); ◊ (*n*=391); ± Wald Statistic for interaction effect, entered into a separate block from main effect variables; Hosmer and Lemeshow for all models *p*>0.05 (final stage, including interaction effect); Chi-square test of co-efficients for all final models *p*<0.001 (final stage, including interaction effect);

Table A6: Binary logistic regressions exploring the association between awareness of HFSS marketing and higher monthly consumption of HFSS food/drink groups

	Higher monthly consumption of food and drink products														
	*Sweets/Chocolate*Δ (HFSS)			*Vegetables*† (Non-HFSS)			*Cakes / Biscuits* ¥ (HFSS) (2017 Only)			Takeaways† (HFSS) (2017 Only)			*Biscuits*◊ (HFSS) (2019 Only)		
Variable and reference categories	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*
Gender															
Female	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Male	1.03	0.92-1.14	0.629	0.74	0.66-0.84	<0.001	1.15	1.00-1.33	0.52	1.27	1.09-1.48	0.002	1.46	1.26-1.69	<0.001
Age															
11-15 years old	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
16-19 years old	0.80	0.72-0.90	<0.001	1.61	1.43-1.81	<0.001	0.63	0.54-0.73	<0.001	1.28	1.10-1.50	0.002	0.65	0.55-0.76	<0.001
Ethnicity															
Other	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
White British	1.21	1.04-1.41	0.012	1.06	0.90-1.24	0.504	1.15	0.93-1.41	0.191	1.05	0.85-1.30	0.650	0.98	0.79-1.22	0.863
Country			0.001			0.002			0.022			<0.001			0.001
England	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Scotland *(vs. England)*	1.28	1.09-1.49	0.002	0.73	0.61-0.88	0.001	1.03	0.83-1.28	0.793	1.32	1.05-1.66	0.016	1.20	0.96-1.50	0.119
Wales *(vs. England)*	1.08	0.89-1.33	0.439	0.80	0.64-1.00	0.055	0.89	0.68-1.18	0.429	1.01	0.75-1.36	0.938	1.08	0.80-1.45	0.625
N. Ireland *(vs. England)*	1.47	1.14-1.91	0.003	0.81	0.59-1.12	0.183	1.67	1.19-2.35	0.003	2.52	1.78-3.56	<0.001	2.15	1.46-3.18	<0.001
IMD			0.474			<0.001			0.131			<0.001			0.224
1	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
2 *(vs. 1)*	1.14	0.95-1.36	0.156	1.37	1.11-1.71	0.004	1.26	0.99-1.61	0.064	0.79	0.62-1.00	0.048	0.92	0.70-1.19	0.515
3 *(vs. 1,2)*	1.02	0.88-1.18	0.774	1.49	1.26-1.76	<0.001	1.17	0.97-1.43	0.109	0.82	0.67-1.00	0.047	1.20	0.97-1.49	0.093
4 *(vs. 1,2,3)*	0.97	0.85-1.10	0.603	1.53	1.32-1.76	<0.001	1.10	0.92-1.32	0.280	0.76	0.63-0.92	0.005	0.97	0.80-1.18	0.763
5 *(vs. 1,2,3,4)*	0.94	0.83-1.06	0.312	1.50	1.31-1.71	<0.001	1.11	0.92-1.35	0.260	0.68	0.55-0.83	<0.001	1.14	0.96-1.35	0.125
Awareness of HFSS marketing			<0.001			0.648			<0.001			<0.001			0.007
Low	REF	-	-	REF	-	-	REF	-	-	REF	-	-	REF	-	-
Medium *(vs. low)*	1.33	1.07-1.66	0.012	1.00	0.80-1.26	0.984	0.96	0.71-1.30	0.808	1.44	1.05-1.97	0.022	1.19	0.87-1.63	0.279
High *(vs. low)*	2.07	1.66-2.58	<0.001	1.00	0.79-1.26	0.978	1.84	1.37-2.47	<0.001	2.65	1.95-3.61	<0.001	1.40	1.02-1.92	0.037
Not stated *(vs. low)*	1.43	1.21-1.70	<0.001	0.93	0.77-1.12	0.392	1.29	1.03-1.62	0.028	1.34	1.04-1.72	0.023	0.94	0.74-1.20	0.622
YOPS Wave															
2017	REF	-	-	REF	-	-	-	-	-	-	-	-	-	-	-
2019	1.11	1.00-1.23	0.056	1.20	1.07-1.35	0.002	-	-	-	-	-		-	-	-
Marketing Awareness*YOPS Wave±	Wald X^2 (3) = 2.39, *p*=0.496			Wald X^2 (3) = 0.11, *p*=0.991			n/a			n/a			n/a		

Notes: Base all participants in both waves (*n*=6,742), except cakes /biscuits & takeaways (*n*=3,348; YOPS 2017 Only) and biscuits (*n*=3394; YOPS 2019 Only); Dependent variable for all models, whether higher or lower monthly consumption reported (based on median splits at each wave); OR_{Adj} = Adjusted Odds Ratio; 95% CI = 95% Confidence Interval for OR_{Adj}; Data missing on one or more variables on each test Δ (*n*=367); † (*n*=380); ¥ (*n*=53); † (*n*=55); ◊ (*n*=320); ± Wald Statistic for interaction effect, entered into a separate block from main effect variables; Hosmer and Lemeshow for all models *p*>0.05 (final stage, including interaction effect [where applicable]); Chi-square test of co-efficients for all final models *p*<0.001 (final stage, including interaction effect [where applicable]);

Table A7: Binary logistic regressions exploring the association between awareness of HFSS marketing and higher monthly consumption of HFSS food/drink groups

	Higher monthly consumption of food and drink products								
	Cakes Δ (HFSS) (2019 Only)			*Fast Food*† (HFSS) (2019 Only)			*Online takeaway* ¥ (HFSS) (2019 Only)		
Variable and reference categories	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*	OR_{Adj}	*95% CI*	*p*
Gender									
Female	REF	-	-	REF	-	-	REF	-	-
Male	1.14	0.99-1.32	0.073	1.16	0.99-1.37	0.074	0.99	0.85-1.15	0.898
Age									
11-15 years old	REF	-	-	REF	-	-	REF	-	-
16-19 years old	0.50	0.43-0.58	<0.001	1.32	1.12-1.56	0.001	1.49	1.28-1.73	<0.001
Ethnicity									
Other	REF	-	-	REF	-	-	REF	-	-
White British	1.34	1.09-1.65	0.006	0.95	0.76-1.19	0.659	1.01	0.83-1.25	0.893
Country			0.021			0.107			0.398
England	REF	-	-	REF	-	-	REF	-	-
Scotland *(vs. England)*	0.84	0.67-1.05	0.118	1.32	1.04-1.68	0.022	1.09	0.87-1.37	0.441
Wales *(vs. England)*	0.83	0.62-1.11	0.215	1.04	0.75-1.45	0.800	0.94	0.70-1.26	0.666
N. Ireland *(vs. England)*	0.58	0.39-0.87	0.008	1.27	0.83-1.95	0.268	0.74	0.49-1.12	0.159
IMD			0.127			0.004			<0.001
1	REF	-	-	REF	-	-	REF	-	-
2 *(vs. 1)*	1.05	0.81-1.35	0.735	0.90	0.68-1.19	0.460	0.69	0.53-0.89	0.004
3 *(vs. 1,2)*	1.32	1.07-1.62	0.009	1.08	0.86-1.35	0.517	0.70	0.57-0.87	0.001
4 *(vs. 1,2,3)*	1.06	0.88-1.28	0.536	0.75	0.61-0.93	0.009	0.65	0.53-0.79	<0.001
5 *(vs. 1,2,3,4)*	1.05	0.89-1.23	0.601	0.77	0.63-0.93	0.006	0.74	0.62-0.87	<0.001
Awareness of HFSS marketing			<0.001			<0.001			<0.001
Low	REF	-	-	REF	-	-	REF	-	-
Medium *(vs. low)*	1.74	1.28-2.37	<0.001	1.90	1.34-2.70	<0.001	1.59	1.16-2.18	0.004
High *(vs. low)*	1.95	1.43-2.67	<0.001	2.48	1.75-3.21	<0.001	2.18	1.59-3.01	<0.001
Not stated *(vs. low)*	1.12	0.88-1.40	0.389	1.26	0.95-1.68	0.106	1.29	1.01-1.65	0.041
YOPS Wave									
2017	-	-	-	-	-	-	-	-	-
2019	-	-	-	-	-	-	-	-	-
Marketing Awareness*YOPS Wave±		n/a			n/a			n/a	

Notes: Base all participants (*n*=3,394; YOPS 2019 Only); Dependent variable for all models, whether higher or lower monthly consumption reported (based on median splits in 2019 wave); OR_{Adj} = Adjusted Odds Ratio; 95% CI = 95% Confidence Interval for OR_{Adj}; Data missing on one or more variables on each test Δ (*n*=332); † (*n*=318); ¥ (*n*=346); ± Wald Statistic for interaction effect, entered into a separate block from main effect variables (not applicable here due to food groups only measured in one wave); Hosmer and Lemeshow for all models $p>0.05$ (final stage); Chi-square test of co-efficients for all final models $p<0.001$ (final stage);