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Awareness of marketing for high fat, salt, or sugar (HFSS) foods, and the association with higher weekly consumption among adolescents: A rejoinder to the UK Government's consultations on marketing regulation

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Abstract

Objective—Exposure to marketing for foods high in fat, salt, or sugar (HFSS) reportedly influences consumption, nutritional knowledge, and diet-related health among adolescents. In 2018/2019, the United Kingdom (UK) Government held two consultations about introducing new restrictions on marketing for HFSS foods. To reinforce why these restrictions are needed, we examined adolescents' awareness of marketing for HFSS foods, and the association between past-month awareness and weekly HFSS food consumption.

Design—Cross-sectional survey that measured past-month awareness of 10 marketing activities for HFSS foods (*1=Everyday–6=Not in last month*). Frequencies were converted into aggregate past-month awareness across marketing activities and grouped into three categories (low/medium/high). Consumption was self-reported for 15 foods (12 HFSS) (*1=Few times per day–9=Never*). For each, frequency was divided into higher/lower weekly consumption.

Setting—UK.

Participants—11-19 year olds (*n*=3,348).

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Conflicts of interest: Cancer Research UK – the funder – employed LB, CT, LH, and JV at the time of conducting the study. NC was on secondment as a paid consultant for the Cancer Policy Research Centre, Cancer Research UK, at the point of conducting the study. The views expressed are those of the researchers and not necessarily those of their respective funder/employer(s).

Authorship contribution: LH, CT, and VT led the study design and data acquisition. LH, CT, LB, and JV were involved in the design of the study tools. NC led on development of the research questions and conducted all the data analysis. NC conceived the manuscript idea and lead on manuscript preparation, with revisions and edits provided by LB. All authors approved the final submission.

Ethical standards disclosure: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the University of Stirling's General University Ethics Panel (GUEP59). Written informed consent was obtained from all subjects. All survey measures and study materials were designed based on preliminary focus group research and were pilot tested for cultural and age appropriateness with the target sample.

Results—Most adolescents (90.8%) reported awareness of a least one marketing activity for HFSS foods, and at least half reported seeing 70 instances in the past month. Television, social media, and price offers were the activities most frequently reported. Awareness was associated with higher weekly consumption for 10 of the 12 HFSS foods. For example, those reporting medium awareness were 1.5 times more likely to report higher weekly consumption of cakes/biscuits versus low awareness (*Odds Ratio*=1.54, *p*=0.012). Likelihood of higher weekly HFSS food consumption increased relative to level of marketing awareness.

Conclusion—Assuming there is a causal relationship between marketing awareness and consumption, the restrictions proposed by the UK Government are likely to help reduce HFSS consumption.

Keywords

Marketing; Advertising; Adolescents; HFSS; Policy

Introduction

In the United Kingdom (UK), consumers are exposed to a variety of marketing activities for food and drinks that are high in fat, salt, or sugar (hereafter ‘HFSS foods’). This includes mass media advertising to increase the visibility and attractiveness of HFSS foods^(1–4), point-of-sale promotions and price offers to stimulate purchase of HFSS foods^(5–6), and packaging or product designs that enhance the consumption experience⁽⁷⁾.

Research consistently suggests that exposure to marketing for HFSS foods influences consumption patterns, nutritional knowledge, and diet-related health (e.g. overweight and obesity) among children and adolescents^(8–10). In response to this link, the UK Government recently held two consultations on the feasibility and effectiveness of new marketing restrictions, as part of their Childhood Obesity Plan⁽¹¹⁾. The first consultation, from January 2018 to April 2019, focused on promotions (e.g. ‘buy one, get one free’) and placement of HFSS foods in the retail setting (e.g. at checkouts)⁽¹²⁾. A similar consultation was also held by the Scottish Government⁽¹³⁾. The second consultation, from March to June 2019, proposed new restrictions on advertising for HFSS foods, including limiting broadcast and online advertising to between 21:00 and 05:30⁽¹⁴⁾. As of early 2020, submissions to both consultations remain under review.

The Cancer Policy Research Centre at Cancer Research UK⁽¹⁵⁾ commissioned several studies to inform the UK Government consultations. This included focus groups which explored awareness of marketing for HFSS foods among children and adolescents, and how marketing may shape their consumption of, and attitudes towards, such products^(16–18). The research also included the 2017 Youth Obesity Policy Survey (YOPS), a cross-sectional survey with a nationally representative sample of 11-19-year-olds. The survey found that adolescents consume a variety of HFSS foods, recall exposure to a variety of marketing for HFSS foods (with reports focusing particularly on broadcast and on-demand television), and that awareness of marketing is associated with increased consumption of HFSS foods^(19–22). Similar trends were also demonstrated in a cross-sectional survey of 7-11-year-olds⁽²³⁾. Additional research to inform the consultations also included a narrative review exploring

the impact and regulation of digital marketing for HFSS foods^(24,25), and how often consumers used price promotions when purchasing HFSS foods⁽²⁶⁾.

In this short-communication, we provide an open rejoinder to the UK Government consultations by presenting new analyses from the 2017 YOPS. We examined how often adolescents recalled seeing marketing for HFSS foods, aggregate awareness across marketing activities in the past month, and what association past-month awareness had with weekly consumption of HFSS foods. We did so among 11-19-year-olds, thus highlighting that the consultations should consider how marketing may shape consumption of HFSS foods across the various stages of adolescence⁽²⁷⁾, not just in childhood.

Methods

Design

An online cross-sectional survey with 11-19-year-olds in the UK ($n=3,348$) was conducted between April and May 2017. The survey was administered by YouGov, a market research company, who recruited a sample intended to be representative of the UK population from their online panel. Participants under 16 years old were recruited through e-mail invitations to existing adult panel members (i.e. their parents), while participants aged 16 years or over received e-mail invitations directly. A survey weight (based on age, gender, ethnicity, region, and social grade) enabled descriptive data to be representative of the UK population.

Measures

Demography—Information on age (coded: 11-13 years, 14-17 years, and 18-19 years), gender, ethnicity (coded: White British or Other), resident country (coded: England, Scotland, Wales, Northern Ireland), and a measure of deprivation (Indexes of Multiple Deprivation [IMD], a quantitative measure based on a respondent's postcode and accounting for varied socio-demographic factors)⁽²⁸⁾ were obtained from existing details held about panel members or survey questions.

Weight category—Participants self-reported their height (options presented in both feet and inches or centimetres) and weight (options presented in stones and pounds, kilograms, or pounds only). For both, participants could say '*Don't Know*' or '*Prefer not to say*'. Where possible, Body Mass Index (BMI) was calculated using the weight and height data, and participants were categorised using the extended International Obesity Task Force BMI classifications (including age and gender adjustments for 11-17 year olds) as either underweight, healthy weight, overweight, or obese⁽²⁹⁾.

Awareness of marketing for HFSS foods—Participants were prompted with the statement '*Over the last month, how often, if at all, have you...*' and presented with 10 examples of marketing activities for HFSS foods (Table 1). For each marketing activity, frequency of awareness was self-reported on a six-point scale (*1=Everyday–6=Not in the past month*), or participants could indicate '*Not sure*'. Prior to answering, participants were provided with a statement indicating that the question focused on marketing for '*unhealthy food and drinks*' – a term considered more accessible to younger participants than HFSS

foods, based on preliminary focus group research⁽¹⁷⁾ and survey piloting – and examples of HFSS foods (e.g. donuts, chocolate, and takeaways).

For each marketing activity, the self-reported frequency of awareness was converted into the estimated number of days that the participant had seen marketing over a four-week period (i.e. ‘one month’). For example, an answer of ‘*Five to six times per week*’ equated to 22 reported instances of awareness in the past month (5.5 times per-week multiplied by four). An estimate of aggregate past month awareness was then obtained by summing scores across all 10 marketing activities. To provide meaningful interpretation, the aggregate scores were split into tertile categories of low, medium, and high awareness. If a participant indicated ‘*Not sure*’ to any marketing activity, they were coded as ‘*Not stated*’ for the aggregate awareness score. This was to avoid underestimating the tertiles boundaries. This replicates the method used for assessing awareness of alcohol marketing among adolescents in the UK, based on the same self-report measures used in this study. Further details on this approach are reported elsewhere⁽³⁰⁾.

Consumption of HFSS and non-HFSS foods—Participants were prompted with the statement ‘*How often do you usually eat or drink...*’ and provided with a list of 15 food and drink groups (Tables 2 and 3). This included 12 HFSS foods (e.g. crisps), two non-HFSS foods (e.g. vegetables), and one HFSS-alternative (e.g. diet drinks). The rationale for food and drink choice are reported elsewhere^(19–22). For each, consumption was self-reported on a nine-point scale (*1=A few times per day–9=Never*), with an additional option for ‘*Not sure*’. The scale responses for each food group were binary coded to indicate ‘*higher*’ or ‘*lower*’ weekly consumption. Consistent with previous research, foods were split into two groups based on calorific content, the UK’s Nutrient Profiling Model, and portion sizes^(19,22). For group one (e.g. cakes/biscuits, Table 2) ‘*higher*’ consumption was defined as two or more portions per-week. For group two (e.g. takeaways, Table 3) ‘*higher*’ consumption was defined as one or more portions per-week.

Analysis

Data were analysed using SPSS version 24 (SPSS Inc, Chicago). Weighted frequencies examined self-reported awareness of marketing for HFSS foods through each activity individually, and aggregate past-month awareness across all marketing activities. Multivariate logistic regressions were conducted with self-reported weekly consumption of the 15 food and drink groups as the dependent variables (‘*higher*’ vs. ‘*lower*’ consumption). Participants who indicated ‘*not sure*’ for a food and drink group were excluded test-by-test. Self-reported awareness of marketing for HFSS foods was the key independent variable (‘*low*’, ‘*medium*’, ‘*high*’, or ‘*not stated*’ awareness). Covariates of age, gender, ethnicity, country of residence, IMD, and weight group were also included. The reference group for categorical variables with two levels are reported in the results. For age, IMD, weight group, and aggregate marketing awareness, which had three or more levels and were ordinal data, the contrast=difference function enabled comparison of each increasing category relative to the combined preceding levels. For example, the first comparison for marketing was medium versus low awareness, and the second comparison was high awareness versus low and medium combined. Including ‘*Not stated*’ awareness as the final level, enabled comparison

of those for who an awareness score could be calculated versus those where it could not, thus retaining the maximum sample size possible in each regression⁽³⁰⁾. For country, the simple contrast function compared each of Scotland, Wales, and Northern Ireland to England. All multivariate analyses were conducted on unweighted data, as the factors used to construct the weights were included in the models.

Results

Sample characteristics

Approximately a third (32.3%) of the weighted sample were 11-13-years-old, almost half (43.7%) were 14-17-years-old, and the remainder (24.0%) were 18-19-years-old. There was an even distribution of males (51.0%) and females (49.0%). The majority of participants were white British (76.7%) and lived in England (84.4%). There was an even proportion from each quintile of deprivation (each 20.0%). After excluding participants with missing data for height or weight ($n=816$, weighted), 61.5% were categorised as healthy weight, 17.3% underweight, 16.2% overweight, and 5.0% obese.

Awareness of marketing for HFSS foods

Overall, 90.8% of the weighted sample reported seeing marketing for HFSS foods through at least one activity in the past month. Television, social media, and price offers were the marketing activities reported most frequently (all three median [mdn]=14 instances in the past month), with approximately two-thirds of participants reporting awareness of these marketing activities at least weekly (Table 1). Billboard adverts and celebrity endorsement were reported less often (both $mdn=6$ instances), albeit at least two-fifths of participants reported awareness of these marketing activities at least weekly. Print adverts, adverts on catch-up or streaming services, sport and event sponsorship, and competitions were reported less often still (all $mdn=2$ instances), although a third of participants reported awareness of these activities at least weekly. Radio adverts had the lowest frequency of recall ($mdn=0$ instances), with only a fifth of participants reporting awareness at least weekly.

Aggregate awareness of marketing for HFSS foods in the past month

The median aggregate score for marketing awareness in the past month was 70.70 (Inter Quartile Range=34-126). This translates as half of participants reporting awareness of 70 or more instances of HFSS food marketing in the past month. When split into tertiles, 32.2% of the valid sample (i.e. excluding those classed 'not stated') were categorised as low awareness (44 instances of awareness in past month), 34.0% were categorised as medium awareness (45-104 instances), and 33.8% were categorised as high awareness (105 instances).

Association between awareness of HFSS food marketing and weekly consumption of HFSS foods

The first series of multivariate logistic regressions examined the associations between self-reported awareness of marketing for HFSS foods and weekly consumption of HFSS foods from the first product group, where two or more weekly portions equalled higher consumption. After controlling for demographic factors and weight group, there were

significant associations between both medium and high awareness of marketing for HFSS foods and higher weekly consumption for sugared-sweetened drinks, cakes/biscuits, and crisps (Table 2). For each, the likelihood of higher weekly consumption increased relative to marketing awareness. For example, those reporting medium awareness of marketing for HFSS foods were 1.51 times (95% Confidence Interval [CI] 1.10-2.08) more likely to report higher weekly consumption of cakes/biscuits versus low awareness, whereas those reporting high awareness were 1.77 times more likely (95% CI 1.33-2.36) versus low and medium awareness combined. For flavoured yoghurts, confectionary/sweets, and desserts, there were only associations between high awareness of marketing for HFSS foods and higher weekly consumption.

The second series of multivariate logistic regressions examined the associations between self-reported awareness of marketing for HFSS foods and weekly consumption of HFSS foods from the second product group, where one or more weekly portions equalled higher consumption. After controlling for demographic factors and weight group, there were significant associations between both medium and high awareness of marketing for HFSS foods and higher weekly consumption for takeaways, energy drinks, and ready meals (Table 3). Consistent with the first group, likelihood of higher weekly consumption increased relative to marketing awareness. For example, those reporting medium awareness of marketing for HFSS foods were 1.46 times (95% CI: 1.02-2.08) more likely to report higher weekly consumption of takeaways versus low awareness, while those reporting high awareness were 2.16 times (95% CI 1.62-2.86) more likely versus low and medium combined. For fried potatoes, there was only an association for high awareness of marketing for HFSS foods and higher weekly consumption.

Association between awareness of marketing for HFSS foods and weekly consumption of non-HFSS foods

The final series of multivariate logistic regressions found no associations between awareness of marketing for HFSS foods and consumption of either fruit or vegetables (non-HFSS foods) (Table 2). There was an association between awareness of marketing for HFSS foods and higher weekly consumption of diet drinks, a HFSS-alternative, with those reporting high marketing awareness 1.7 times (95% CI: 1.28-2.26) more likely to report high weekly consumption of diet drinks than those reporting medium or low awareness.

Discussion

Adolescents in the UK report awareness of marketing for HFSS foods through a variety of activities, ranging from mass media (e.g. television advertising) to subtle marketing (e.g. celebrity endorsement). Television, social media, and special price offers were the marketing activities reported most frequently; at least half of adolescents reported awareness of these activities almost once every other day. This supports the specific focus on these activities in the recent UK Government consultations on marketing regulation⁽¹²⁻¹⁴⁾. The findings also show that awareness of marketing for HFSS foods is cumulative. Half of adolescents reported awareness of at least 70 instances of marketing for HFSS foods in the past month,

equating to around twice a day. A third reported awareness of at least 104 instances, equating to approximately three to four exposures a day.

Greater awareness of marketing for HFSS foods was associated with higher weekly consumption of such products, a finding consistent with previous research^(8–10). This supports the need for further marketing controls, such as those proposed in the UK Government consultations on price promotions and advertising. The findings also support the strategic approach employed by the UK Government's Childhood Obesity strategy⁽¹¹⁾, namely that greater changes in HFSS food consumption and obesity among young people may be achieved by employing a comprehensive approach to marketing regulation, rather than focusing on individual components of the 'marketing mix'⁽²⁴⁾. The findings also support the need to consider how marketing may shape consumption of HFSS foods across all adolescence, and not just among children^(27,31).

Reviews of research provide tentative support that statutory restrictions, such as those proposed by the UK Government, can be successful in reducing exposure to marketing for HFSS foods among young people, or at least that statutory measures perform better than alternatives such as self-regulation and educational strategies^(31,32). Nevertheless, reviews of the evidence also highlight that there is limited research demonstrating the real-world effectiveness of statutory restrictions. It is therefore important that any new restrictions implemented as a consequence of the UK Government consultations are robustly evaluated, ideally through longitudinal or repeat-monitoring designs that demonstrate to what extent, if at all, the restrictions generate changes in awareness of marketing for HFSS foods and consumption of such products.

The principal limitation of the study is the cross-sectional design, which cannot demonstrate a causal relationship between marketing awareness and consumption. Alternative hypotheses are that higher weekly consumption of HFSS foods leads to greater marketing exposure, recognition and recall, not vice versa. Moreover, although the findings show associations between marketing awareness and weekly consumption of HFSS foods, they do not demonstrate the overall contribution of these HFSS foods to diet nor the wider context in which they are consumed (e.g. extent of physical activity or whether it was parental purchasing that determined consumption). Nevertheless, that marketing awareness had any association with weekly consumption of HFSS foods suggests that it must play either an initiating or reinforcing role. Focusing solely on the direct association with consumption also underestimates the sophisticated influence marketing has, for example on normative beliefs and perceived norms, brand attitudes, and encouraging market shifts from non-HFSS foods or HFSS-alternatives^(16–18,33–39).

The data were self-reported and, consequently, awareness of marketing for HFSS foods and the association with consumption may be underestimated due to lapses in recall, exposure to marketing activities not measured, and influence from activities not consciously recognised as marketing (e.g. subtle celebrity endorsement and social influencers)⁽⁴⁰⁾. The results also only show awareness of marketing for HFSS foods and weekly consumption of such products at a single time point, both of which may be influenced by seasonality. They do, however, provide a baseline against which to compare the 2019 YOPS, which was conducted

October to November 2019, which will enable a test of seasonality. The results also provide a baseline against which to compare any change in regulation following the UK Government consultations; the intention being to establish a repeat-monitor similar to the Youth Tobacco Policy Survey⁽⁴¹⁾.

Finally, different marketing activities and branding will not be universally appealing and effective among all young people. Examining aggregate awareness of marketing for HFSS foods, and assuming each unit of exposure to be equal across marketing activities, may disguise important associations between individual activities and consumption of HFSS foods. Examining aggregate awareness across all marketing activities also does not account for the influence and salience of branding, nor how the design and creativity of marketing may shape consumer reactions. Further scrutiny of brand-specific exposure, and young people's own perceptions of how different marketing activities and branding shapes consumption of HFSS foods, are important avenues for future research^(37–39).

In conclusion, adolescents in the UK report awareness of a variety of marketing activities for HFSS foods and this is associated with increased weekly consumption of such products. As previous research suggests this link between marketing exposure and consumption is causal, the restrictions proposed in the UK Government consultations are therefore likely to help reduce consumption of HFSS foods. Longer-term evaluation is required to determine the impact of any regulatory change on marketing awareness and consumption.

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Table 1
Awareness of marketing activities for HFSS foods in the past month among 11-19 year olds in the UK

	Every day [28] ¹	5-6 times per week [22] ¹	3-4 times per week [14] ¹	1-2 times per week [6] ¹	Less than once a week [2] ¹	Not in the last month [0] ¹	Not sure	Reported at least weekly	Median Score (IQR) ²
Marketing activity	%	%	%	%	%	%	%	%	
Adverts for 'unhealthy food and drinks'...									
... in newspapers or magazines	5.0	3.9	8.0	13.3	13.3	29.3	27.0	30.2	2 (0-6)
... on television	15.3	10.0	17.0	20.3	10.3	11.7	15.3	62.6	14 (2-22)
... catch-up/streaming services	5.7	4.9	9.1	14.0	11.5	25.0	29.9	33.7	2 (0-14)
... on billboards	11.0	6.6	13.8	19.8	14.3	15.9	18.5	51.2	6 (2-14)
... on radio	3.3	2.0	4.8	9.6	10.3	39.7	30.4	19.7	0 (0-6)
... on YouTube, Tumblr, Facebook, Snapchat, Instagram or other social media	18.8	10.4	17.5	16.4	9.4	11.8	15.8	63.1	14 (2-22)
Famous people in films, music videos, on TV or pictured in magazines with unhealthy food and drinks	5.9	5.6	10.0	17.7	13.9	19.0	27.9	39.2	6 (0-14)
Sport, game, event sponsorship	4.6	3.8	7.9	16.8	14.9	24.1	27.7	33.1	2 (0-6)
Special offers	15.5	10.7	19.7	20.8	9.4	9.2	14.8	66.7	14 (6-22)
Competitions	4.6	4.3	7.6	13.8	16.0	25.9	28.0	30.3	2 (0-6)

Notes:

¹ Score for estimating the approximate number of days on which noticed marketing for HFSS foods in a one-month period.

² Median number of instances of marketing for HFSS foods noticed in a one-month period.

IQR = Inter quartile range

Base: All participants (n=3,348):

All data are weighted.

Table 2
Multivariate logistic regressions exploring the associations between awareness of marketing and consumption of group one of foods.

Variable and reference categories	Food and drink product types																	
	Sugar drinks ¹		Flavoured Yoghurts ¹		Sweets ¹		Cakes and Biscuits ¹		Fruit ²		Vegetables ²		Diet drinks ³		Crisps ¹		Desserts ¹	
	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p
Age																		
<i>11-13 years old</i>	Ref	n.s.	Ref	0.001	Ref	0.001	Ref	0.001	Ref	0.001	Ref	n.s.	Ref	0.011	Ref	0.001	Ref	0.001
<i>14-17 years old</i>	1.26	0.029	0.63	0.001	0.76	0.010	0.81	0.035	0.71	0.005	0.97	n.s.	1.09	n.s.	0.67	0.001	0.61	0.001
<i>18-19 years old</i>	1.08	n.s.	0.42	0.001	0.74	0.003	0.58	0.001	0.63	0.001	0.72	0.017	0.74	0.005	0.62	0.001	0.53	0.001
Gender																		
<i>Female</i>	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-
<i>Male</i>	1.76	0.001	1.14	n.s.	0.97	n.s.	1.12	n.s.	0.69	0.001	0.83	n.s.	1.28	0.006	1.27	0.005	1.20	0.033
Ethnicity																		
<i>Other</i>	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-
<i>White British</i>	1.00	n.s.	1.24	n.s.	1.44	0.001	1.13	n.s.	0.84	n.s.	1.32	n.s.	1.43	0.004	1.55	0.001	1.12	n.s.
Country																		
<i>England</i>	Ref	0.010	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	0.001	Ref	n.s.	Ref	n.s.	Ref	n.s.
<i>Wales (vs. England)</i>	1.02	n.s.	0.89	n.s.	1.02	n.s.	0.85	n.s.	0.89	n.s.	0.52	0.002	0.74	n.s.	1.00	n.s.	0.78	n.s.
<i>Scotland (vs. England)</i>	1.38	0.016	0.88	n.s.	1.30	n.s.	1.14	n.s.	1.06	n.s.	0.59	0.003	1.13	n.s.	0.86	n.s.	0.54	0.001
<i>N. Ireland (vs. England)</i>	1.64	0.011	1.34	n.s.	1.09	n.s.	1.15	n.s.	1.04	n.s.	0.64	n.s.	1.07	n.s.	1.30	n.s.	0.34	0.001
IMD																		
<i>1</i>	Ref	0.001	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	0.001	Ref	n.s.	Ref	0.049	Ref	n.s.
<i>2 (vs. 1)</i>	0.67	0.004	1.02	n.s.	1.37	0.028	1.36	0.027	1.21	n.s.	1.59	0.010	1.01	n.s.	0.97	n.s.	1.20	n.s.
<i>3 (vs. 1,2)</i>	0.98	n.s.	0.94	n.s.	1.14	n.s.	1.20	n.s.	1.08	n.s.	1.41	0.030	0.94	n.s.	0.73	0.006	1.10	n.s.
<i>4 (vs. 1,2,3)</i>	0.64	0.001	0.94	n.s.	0.99	n.s.	1.09	n.s.	1.18	n.s.	1.94	0.001	1.02	n.s.	0.86	n.s.	1.19	n.s.
<i>5 (vs. 1,2,3,4)</i>	0.75	0.014	0.90	n.s.	0.89	n.s.	0.93	n.s.	1.23	n.s.	2.34	0.001	0.98	n.s.	0.99	n.s.	1.24	n.s.
Weight status																		
<i>Underweight</i>	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	0.01	Ref	0.001	Ref	0.001	Ref	0.001	Ref	n.s.	Ref	n.s.
<i>Healthy weight (vs. u/w^d)</i>	1.13	n.s.	1.01	n.s.	1.04	n.s.	0.70	0.003	0.98	n.s.	0.91	n.s.	1.54	0.001	0.94	n.s.	1.09	n.s.
<i>Overweight (vs. u/w and healthy)</i>	1.21	n.s.	1.30	n.s.	0.97	n.s.	0.80	n.s.	0.75	0.032	0.80	n.s.	1.70	0.001	0.96	n.s.	0.94	n.s.
<i>Obese (vs. all other)</i>	1.20	n.s.	0.71	n.s.	1.36	n.s.	0.78	n.s.	0.55	0.002	0.39	0.001	3.46	0.001	1.04	n.s.	1.02	n.s.

Variable and reference categories	Food and drink product types																	
	Sugar drinks ¹		Flavoured Yoghurts ¹		Sweets ¹		Cakes and Biscuits ¹		Fruit ²		Vegetables ²		Diet drinks ³		Crisps ¹		Desserts ¹	
	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p
Marketing																		
<i>Low</i>	Ref	0.001	Ref	0.005	Ref	0.026	Ref	0.001	Ref	n.s.	Ref	n.s.	Ref	0.001	Ref	0.006	Ref	n.s.
<i>Medium (vs. low)</i>	1.79	0.001	1.35	n.s.	1.32	n.s.	1.51	0.012	1.17	n.s.	1.27	n.s.	1.39	n.s.	1.40	0.038	1.16	n.s.
<i>High (vs. low and medium)</i>	2.30	0.001	1.48	0.010	1.48	0.010	1.77	0.001	1.22	n.s.	0.95	n.s.	1.70	0.001	1.51	0.004	1.39	0.021
<i>Not stated (vs. all other)</i>	0.93	n.s.	0.84	n.s.	1.02	n.s.	1.02	n.s.	0.93	n.s.	0.90	n.s.	0.91	n.s.	1.05	n.s.	0.94	n.s.

Notes: DV for all models = High consumption (2 portions per week) vs. Low (1 portions); Hosmer & Lemeshow for all models $p > 0.05$; Chi-Square test of co-efficients for all models $p < 0.001$; AOR = Adjusted Odds Ratio

¹ HFSS products

² Non-HFSS products

³ HFSS alternatives

⁴ Underweight; Cases with missing data on one or more variables excluded model-by-model sugar drinks ($n = 895$), flavoured yoghurts ($n = 911$), sweets ($n = 892$), cake/biscuits ($n = 898$), fruit ($n = 900$), vegetables ($n = 899$), diet drinks ($n = 927$), crisps ($n = 892$), desserts ($n = 906$).

Table 3
Multivariate logistic regressions exploring the associations between awareness of marketing and consumption of group two foods.

Variable and reference categories	Food and drink product types											
	Takeaways ¹		Energy Drinks ¹		Ready meals ¹		Fried potatoes ¹		Milk drinks ¹		Sugared Cereals ¹	
	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p	AOR	p
Age												
<i>11-13 years old</i>	Ref	0.009	Ref	0.044	Ref	0.027	Ref	n.s.	Ref	0.001	Ref	0.001
<i>14-17 years old</i>	0.98	n.s.	1.44	0.022	0.78	0.012	1.01	n.s.	0.66	0.001	0.53	0.001
<i>18-19 years old</i>	1.36	0.003	0.91	n.s.	0.88	n.s.	0.90	n.s.	0.44	0.001	0.49	0.001
Gender												
<i>Female</i>	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-
<i>Male</i>	1.23	0.028	1.73	0.001	1.22	0.018	1.20	0.044	1.31	0.003	1.42	0.001
Ethnicity												
<i>Other</i>	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-	Ref	-
<i>White British</i>	1.02	n.s.	0.94	n.s.	1.35	0.008	1.39	0.005	0.83	n.s.	1.01	n.s.
Country												
<i>England</i>	Ref	0.001	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.
<i>Wales (vs. England)</i>	1.04	n.s.	0.81	n.s.	1.03	n.s.	1.00	n.s.	1.09	n.s.	1.05	n.s.
<i>Scotland (vs. England)</i>	1.32	0.045	0.90	n.s.	0.95	n.s.	1.19	n.s.	0.90	n.s.	1.01	n.s.
<i>N. Ireland (vs. England)</i>	2.14	0.001	1.78	0.025	1.14	n.s.	1.19	n.s.	0.89	n.s.	1.13	n.s.
IMD												
<i>1</i>	Ref	0.001	Ref	0.002	Ref	n.s.	Ref	n.s.	Ref	0.020	Ref	0.008
<i>2 (vs. 1)</i>	0.71	0.016	0.73	n.s.	1.02	n.s.	0.86	n.s.	1.06	n.s.	0.95	n.s.
<i>3 (vs. 1,2)</i>	0.80	n.s.	0.68	0.027	0.88	n.s.	0.99	n.s.	0.83	n.s.	0.87	n.s.
<i>4 (vs. 1,2,3)</i>	0.75	0.007	0.63	0.007	0.94	n.s.	0.88	n.s.	0.85	n.s.	0.69	0.001
<i>5 (vs. 1,2,3,4)</i>	0.68	0.002	0.75	n.s.	0.82	n.s.	0.82	n.s.	0.71	0.007	0.99	n.s.
Weight status												
<i>Underweight</i>	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.	Ref	n.s.
<i>Healthy weight (vs. u/w²)</i>	1.04	n.s.	1.20	n.s.	0.96	n.s.	0.91	n.s.	1.16	n.s.	0.77	0.025
<i>Overweight (vs. u/w and healthy)</i>	1.21	n.s.	1.52	0.019	0.88	n.s.	1.23	n.s.	1.10	n.s.	0.93	n.s.
<i>Obese (vs. all other)</i>	1.30	n.s.	0.94	n.s.	1.49	n.s.	0.91	n.s.	0.97	n.s.	1.21	n.s.
Marketing												
<i>Low</i>	Ref	0.001	Ref	0.001	Ref	0.001	Ref	0.005	Ref	0.001	Ref	n.s.
<i>Medium (vs. low)</i>	1.46	0.037	2.09	0.009	1.96	0.001	1.24	n.s.	1.26	n.s.	1.30	n.s.
<i>High (vs. low and medium)</i>	2.16	0.001	2.86	0.001	1.53	0.004	1.66	0.001	1.63	n.s.	1.28	n.s.
<i>Not stated (vs. all other)</i>	0.87	n.s.	0.63	0.001	0.86	n.s.	0.88	n.s.	0.78	0.007	0.95	n.s.

Notes: DV for all models = High consumption (1 portions per week) vs. Low (0 portions per week); Hosmer & Lemeshow for all models $p > 0.05$; Chi-square test of co-efficients for all models $p < 0.001$; AOR = Adjusted Odds Ratio

¹HFSS products

²Underweight; Cases with missing data excluded model-by-model takeaways ($n = 899$), energy drinks ($n = 914$), ready meals ($n = 901$), fried potatoes ($n = 897$), milk drinks ($n = 927$), sugar-sweetened cereals ($n = 898$).