



Research report

Association between food marketing exposure and adolescents' food choices and eating behaviors[☆]

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ABSTRACT

The present study examined associations between food marketing exposure and adolescents' food choices and reported consumption of energy-dense and nutrient-poor (EDNP) foods. A cross-sectional survey of 12,188 Australian secondary students aged 12–17 years was conducted, using a web-based self-report questionnaire. Measures included students' level of exposure to commercial television and non-broadcast types of food marketing, whether they had tried a new product or requested a product they had seen advertised, and their reported consumption of fast food, sugary drinks and sweet and salty snacks. Results indicated greater exposure to commercial television, print/transport/school food marketing and digital food marketing were all independently associated with students' food choices. High commercial television viewers (>2 h/day) were more likely to report higher consumption of EDNP foods (ORs ranged from 1.31 for fast food to 1.91 for sweet snacks). Some associations between digital food marketing exposure and students' eating behaviors were found; however, print/transport/school food marketing was only related to sweet snack consumption. These study results suggest that cumulative exposure to television food advertising and other food marketing sources are positively linked to adolescents' food choices and eating behaviors. Policy changes to restrict food marketing to young people should include both television and non-broadcast media.

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Introduction

Food marketing has been identified as an important target for intervention in the prevention of childhood overweight and obesity (World Health Organization, 2006). There is strong and consistent evidence from systematic reviews that food marketing influences children's food preferences, purchases and consumption (Cairns, Angus, & Hastings, 2009; Institute of Medicine, 2006;

Livingstone & Helsper, 2004). Globally, there is a nutritional imbalance in the types of foods that are promoted to children. A recent study comparing television food advertising patterns in 13 countries across five continents found that the majority of advertised foods were non-core foods that are energy-dense and nutrient-poor (EDNP), and that the rate of EDNP food advertising was higher during children's peak viewing times (Kelly et al., 2010). Television viewing has been shown to be positively associated with children's energy intake and consumption of foods most frequently advertised (Utter, Scragg, & Schaaf, 2006; Wiecha et al., 2006).

Exposure to food marketing extends beyond broadcast media with food companies increasingly using integrated marketing campaigns to reach young people through multiple channels that complement and reinforce their promotional messages (Cairns et al., 2009). For example, a UK study found that almost half of food advertisements in magazines for children and adolescents directed readers to a related food marketing website (Cowburn & Boxer, 2007). Research indicates that young people are exposed to considerable levels of unhealthy food advertising through the

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Internet (Alvy & Calvert, 2008; Kelly, Bochynska, Kornman, & Chapman, 2008a), magazines (Cowburn & Boxer, 2007; Kelly & Chapman, 2007), product packaging (Hebden, King, Kelly, Chapman, & Innes-Hughes, 2011), in school (Molnar, Garcia, Boninger, & Merrill, 2008), and via signage around schools (Kelly, Cretikos, Rogers, & King, 2008b). Digital marketing is a growth area for food marketing, with adolescents a primary target due to their enthusiasm for new media platforms, such as social networks and mobile (smart) phones, as well as their increased spending power (Montgomery & Chester, 2009).

In Australia, there is limited government statutory regulation of food marketing to young people. Specifically, the Children's Television Standards apply only to designated "children's viewing periods" on free-to-air television (Australian Communications and Media Authority (ACMA), 2009), and thus do not place restrictions on food advertising during times when most children are likely to be watching television (i.e. 6 pm–9 pm) (ACMA, 2007). While there are a number of industry self-regulatory codes that deal with food advertising to children, they are voluntary and do not cover all forms of media and promotional strategies (e.g. in-school marketing, digital marketing) (Hebden, King, Kelly, Chapman, & Innes-Hughes, 2010; MacKay, Antonopoulos, Martin, & Swinburn, 2011). Further, these codes do not take into account food advertising targeting adolescents or families (MacKay et al., 2011).

To date, much research has explored the effects of food marketing on children, with a lack of evidence available regarding the influence of marketing on adolescents' food choices and consumption (Institute of Medicine, 2006). Understanding how food marketing may affect adolescents is important given they are at an age where they are beginning to have their own disposable income (from a part-time job or pocket money) and make independent purchase decisions. Few studies have also extended their focus beyond television food advertising to include other marketing sources such as school and the Internet (Story & French, 2004), even though these are a potentially potent source of influence.

The aim of the present study is to examine associations between various types of food marketing exposure and adolescents' food choices and their fast food, sugary drink and sweet and salty snack food consumption. These food categories were chosen as they are among the most frequently advertised EDNP foods on Australian television (Kelly, Smith, King, Flood, & Bauman, 2007). We hypothesized that adolescents with greater exposure to each source of food marketing would be more likely to: (i) have tried a new food or drink product they had seen advertised; (ii) have asked their parents/carers to buy a food or drink product they had seen advertised; and (iii) report eating higher amounts of EDNP foods such as fast food, sugary drinks, sweet snacks and salty snacks.

Method

Design and procedure

In 2009–10, the National Secondary Students' Diet and Activity (NaSSDA) survey was conducted in Australia with a nationally representative sample of students from year levels 8 to 11 (ages 12–17 years). The sampling procedure was a stratified two-stage probability design, with schools randomly selected at the first stage of sampling and classes selected within schools at the second stage. Within each Australian State and Territory, schools were stratified by the three education sectors (government, Catholic and independent) and randomly selected from each sector to ensure the distribution of schools by sector within each State or Territory was reflected in the sample. Data on students' eating,

physical activity and sedentary behaviors were collected via a web-based questionnaire, and anthropometric measurements of students' height, weight and waist circumference were taken by trained researchers in a confidential setting. Active parental consent was required for students to participate in each component of the study. Approval to conduct the study was obtained from the Human Research Ethics Committee of the Cancer Council Victoria, all appropriate education bodies in each State and Territory, and school principals.

Measures

Food marketing exposure

Students' food marketing exposure was assessed via three separate measures. These measures were developed specifically for this study in the absence of appropriate and relevant existing measures, and were successfully piloted on a sample of over 300 students. First, students were asked to indicate how long they spent watching commercial television on a typical school day, Saturday and Sunday. A weighted average daily time spent watching commercial television was calculated and collapsed into the following categories: none; 2 h or less per day (moderate viewers); more than 2 h per day (high viewers).

Second, students indicated whether they had seen a special offer, competition or giveaway for a food or drink product (i) in a magazine, (ii) on public transport or (iii) at school in the last month. Students were coded from 0 to 3 based on their number of print/transport/school marketing sources of exposure.

Third, exposure to digital forms of food marketing was assessed by asking students to indicate whether they had received (i) an email or (ii) a text message (SMS) with a special offer, competition or giveaway related to a food or drink product during the last month. Students were coded from 0 to 2 based on their number of digital marketing sources of exposures.

Food choices

Students indicated whether they had (i) tried or (ii) asked their parents/carers to buy a new food or drink product they had seen advertised in the last month.

Eating behaviors

Items from a short dietary questionnaire developed by the NSW Centre for Public Health Nutrition were used to measure students' eating behavior (Flood, Webb, & Rangan, 2005). Fast food consumption was assessed by asking "How often do you have meals or snacks such as burgers, pizza, chicken or chips from places like McDonalds, Hungry Jacks/Burger King, Pizza Hut, KFC, Red Rooster or local take away food places?". Response options ranged from "never" to "2 or more times a day", and were dichotomized as follows: less than once a week (=0) and 1–2 times or more a week (=1).

Consumption of sugary drinks was assessed by asking "How much soft drink (like Coke, lemonade), cordials or sports drinks (like Gatorade) do you usually drink? Do not include diet soft drinks." Response options ranged from "I don't drink soft drinks, cordials or sports drinks" to "5 cups or more a day", and were dichotomized as follows: 1–3 cups or less a week (=0) and 4–6 cups or more a week (=1).

Two items were used to measure consumption of sweet snacks: "How often do you eat (i) confectionery (such as lollies and chocolates) and (ii) sweet foods, such as sweet biscuits, cakes or muffins?". Responses were dichotomized to identify those students who reported eating both confectionery and sweet foods at least 3–4 times a week. Consumption of salty snacks was assessed by asking "How often do you eat potato crisps/chips or other salty snacks (such as Twisties, corn chips)?", with responses dichotomized as follows: 1–2 times or less a week (=0) and 3–4 times or

more a week (=1). It was not possible to further categorize these eating behaviors to differentiate between students who reported not consuming each EDNP food and those who indicated light consumption due to small cell sizes.

Demographics

All students were asked to report their sex, school year and home postcode. A measure of socio-economic position (SEP) was determined according to the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-Economic Disadvantage as described by the Australian Bureau of Statistics (2008), based on students' home postcode. Using the national deciles to create quintiles, students were categorized into the following SEP groups: low SEP (1st and 2nd quintiles), medium SEP (3rd and 4th quintiles), and high SEP (5th quintile). Postcode of residence was also used to classify the geographic location of students as either metropolitan or rural/regional. Height and weight measurements were used to calculate students' body mass index (BMI), which was classified into weight categories according to international standard cut-offs developed for children and adolescents (Cole, Bellizzi, Flegal, & Dietz, 2000).

Data analyses

Data were weighted by state, education sector, school year and sex to ensure the sample obtained reflected the population distribution (Australian Bureau of Statistics, 2010). Analyses were undertaken using Stata SE 11.1 (StataCorp, Texas). Descriptive statistics were used to characterize the sample. Separate logistic regression analyses examined the associations between students' level of exposure to various forms of food marketing and their food choices and eating behaviors. All models controlled for sex, school year, BMI category, SEP and geographic location and adjusted for school level clustering. As preliminary analyses indicated that associations were similar when overweight and obese students were treated both separately and together, for simplicity, these two groups were combined when controlling for BMI category in the final analyses. Due to the large sample size, a conservative level of statistical significance ($p < 0.01$) was applied.

Results

A total of 238 secondary schools were surveyed nationally (school response rate = 39%), with data collected from 14,066 students in year levels 8 to 11 (student response rate = 54%). The most common reasons for school non-participation were time demands and commitments to other surveys. Students were excluded from the sample if they were aged less than 12 or greater than 17 years on the day of the survey ($n = 53$), had not completed the survey up to a specified inclusion point ($n = 223$), or had no physical measurements taken ($n = 1515$). A further 87 students were excluded due to no SEP index value being available for their postcode.

A summary of the demographic profile of the sample is shown in Table 1. Around one in five students watched more than two hours of commercial television on average per day. Over two-thirds were exposed to at least one source of print, public transport or school food marketing in the last month, while one-quarter had received a food marketing-themed email and/or SMS.

Food choices

As presented in Table 2, compared to students who watched no commercial television, moderate viewers were more likely to report asking for a product they had seen advertised at least once in the last month. The highest viewers were more likely to have

Table 1

Demographic profile of sample ($N = 12,188$).

	<i>n</i>	Percentage
<i>Sex</i>		
Male	6460	53.0
Female	5728	47.0
<i>Year level</i>		
8	3772	31.0
9	3340	27.4
10	2647	21.7
11	2429	19.9
<i>BMI category</i>		
Healthy weight	9418	77.3
Overweight/obese	2770	22.7
<i>SEP</i>		
Low	3932	32.3
Medium	5062	41.5
High	3194	26.2
<i>Geographic location</i>		
Metropolitan	7841	64.3
Rural	4347	35.7
<i>Commercial TV viewing</i>		
None	2401	19.8
2 h or less/day	7182	59.1
More than 2 h/day	2567	21.1
<i>Number of print/transport/school marketing sources</i>		
0	3695	30.3
1	2190	18.0
2	2996	24.6
3	3307	27.1
<i>Number of digital marketing sources</i>		
0	9184	75.4
1	1765	14.5
2	1239	10.2

Based on unweighted data.

Note: Percentages are rounded so may not sum to 100%.

SEP: Socio-economic position.

both asked for a product and tried a new product they had seen advertised at least once in the last month. Exposure to print/transport/school food marketing and digital food marketing was strongly associated with students' food choices. As students' level of exposure to all forms of marketing increased, so too did the likelihood they had tried a new product or asked for a product they had seen advertised in the last month.

Eating behavior

Students who watched more than two hours of commercial television per day reported higher consumption of fast food, sugary drinks, sweet and salty snacks compared to students who watched no commercial television (see Table 2). Print/transport/school food marketing was largely unrelated to students' eating behaviors, with the only significant differences being that students exposed to two or three of these marketing sources reported higher consumption of sweet snacks than those with no exposure.

Some associations between digital food marketing exposure and students' eating behavior were found. Compared to students with no exposure to digital marketing in the last month, students who were exposed to one or two sources were more likely to have reported higher consumption of fast food, while students who were exposed to two sources reported higher consumption of sugary drinks and salty snacks.

Discussion

The results indicate that adolescents are routinely exposed to food marketing, in particular via commercial television and

Table 2Associations between food marketing exposure and adolescent food choices and eating behavior: Adjusted odds ratios (OR) and 95% confidence intervals (CI).^a

Food marketing exposure	Food choices				Eating behavior							
	Try product advertised (≥ once in last month) n = 11,795		Ask for product advertised (≥ once in last month) n = 11,795		Fast food (≥ 1–2 times/week) n = 12,035		Sugary drinks ^b (≥ 4–6 cups/week) n = 12,072		Sweet snacks ^c (≥ 3–4 times/week) n = 12,022		Salty snacks ^d (≥ 3–4 times/week) n = 12,045	
	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
<i>Commercial TV viewing</i>												
None	1		1		1		1		1		1	
2 h or less/day	1.15	1.01–1.31	1.25*	1.10–1.42	0.93	0.81–1.06	0.99	0.84–1.16	1.18	1.02–1.36	1.07	0.91–1.25
More than 2 h/day	1.48**	1.27–1.71	1.61**	1.38–1.88	1.31*	1.10–1.57	1.73**	1.43–2.09	1.91**	1.60–2.27	1.84**	1.59–2.12
<i>Number of print/transport/school marketing sources</i>												
0	1		1		1		1		1		1	
1	1.82**	1.58–2.09	1.47**	1.27–1.71	0.88	0.76–1.02	0.83	0.71–0.98	1.09	0.92–1.29	1.03	0.88–1.21
2	2.48**	2.17–2.82	2.27**	1.95–2.64	0.95	0.83–1.09	1.02	0.88–1.18	1.33*	1.10–1.62	1.03	0.87–1.20
3	3.74**	3.23–4.34	3.53**	2.98–4.19	1.03	0.90–1.18	1.03	0.89–1.19	1.54**	1.31–1.82	1.09	0.94–1.26
<i>Number of digital marketing sources</i>												
0	1		1		1		1		1		1	
1	1.47**	1.28–1.70	1.34**	1.17–1.54	1.24*	1.08–1.41	1.15	0.99–1.34	1.06	0.89–1.25	1.06	0.92–1.21
2	2.54**	2.03–3.18	3.19**	2.62–3.89	2.25**	1.89–2.67	1.34*	1.13–1.58	1.19	1.00–1.43	1.26*	1.06–1.50

* $p < 0.01$.** $p < 0.001$.^a Adjusted for sex, school year, BMI category, SEP, geographic location and all other food marketing exposure variables in the model, as well as school clustering.^b Includes soft drink, cordials and sports drinks (non-diet varieties). Cordials are non-alcoholic concentrated syrups that are usually fruit-flavored and are mixed with water before drinking.^c Includes confectionery (e.g. candy, chocolate) and other sweet foods (e.g. cookies, cakes, muffins).^d Includes potato crisps/chips and other salty snacks (e.g. cheese-flavored snacks, corn chips).

ambient media, and that cumulative exposure to food marketing is linked to their food choices and eating behaviors. As hypothesized, commercial television viewing as well as print/transport/school and digital food marketing were all positively associated with students having recently tried a new product they had seen advertised or having made a purchase request for an advertised product. We also observed a significant positive relationship between greater exposure to commercial television viewing and digital food marketing and reported consumption of EDNP foods. Increased exposure to food advertising via print/transport/school sources was related only to higher reported intake of sweet snacks.

While prior studies have demonstrated a positive link between television viewing and adolescents' consumption of commonly advertised EDNP foods (Utter et al., 2006; Wiecha et al., 2006), our study builds on that research by using a more specific measure of commercial television advertising exposure. Our finding of a possible dose–response relationship is consistent with results from studies examining the impact of advertising exposure on adolescent alcohol use (Anderson, de Bruijn, Angus, Gordon, & Hastings, 2009) and smoking prevalence (MacFadyen, Hastings, & MacKintosh, 2001), and highlights the need for tighter restrictions on the advertising of EDNP foods. Importantly, all types of food marketing exposure were independently associated with students' food choices and eating behaviors. Thus, with the shift towards more integrated marketing campaigns, it is important that any policy changes encompass the multiple media used by food companies to advertise their products to young people.

The pattern of results observed for print/transport/school food marketing in our study could possibly reflect the different marketing strategies of food companies. For example, there was a higher number of food references for chocolate and confectionery in Australian children's magazines than for fast food, sugary drinks and snack foods such as potato crisps (Kelly & Chapman, 2007). Although students' level of exposure to digital food marketing was much lower than other channels, the associations found for this type of advertising exposure were generally strong. One explanation is that digital marketing is more personalized and facilitates active engagement compared to television or ambient forms of marketing that are more passive (Montgomery & Chester, 2009).

For example, digital marketing prompts the recipient to make a conscious choice about opening a personal email and/or SMS. Further, consumers often opt-into receive digital marketing (e.g. through entering a competition on packaging or joining a website to access interactive games), which may render it more influential.

A number of study limitations should be noted. First, due to the cross-sectional design of the study, we are unable to make causal inferences about the relations between food marketing exposure and students' food choices and eating behaviors. Further research including cohort and intervention studies is needed to determine causality. Second, the exposure measures used (excepting commercial television viewing) were limited in that they focused exclusively on special offers, competitions and giveaways and did not capture all non-broadcast food advertising channels such as sport sponsorship (Sherriff, Griffiths, & Daube, 2010) and interactive online games (Lee, Choi, Quilliam, & Cole, 2009). However, as there is a lack of validated survey questions available to assess adolescent exposure to food marketing, this study contributes to the literature by attempting to quantify levels of exposure in a large national sample. For future research, it would be beneficial to include other potentially important sources of marketing exposure for adolescents such as websites and at the point-of-sale, and to broaden the scope of the measures to take into account advertising that may be simply "reminding" consumers about a particular product.

A third limitation of our study was that the data were self-reported and relied on students to recall and correctly record their behaviors as well as recognize and remember specific types of marketing efforts. Thus, our data may have been affected by social desirability bias or measurement error. For example, research indicates that young people tend to underestimate their intake of EDNP foods such as takeaway meals and soft drinks when responding to short dietary questions (Gwynn et al., 2010). We would expect, though, that the likely underestimation of these behaviors and students' level of exposure to food marketing would have weakened rather than strengthened the observed associations.

With the effects of food advertising on adolescents less established than for children, the findings from this study make an important contribution to the research area. To our knowledge, it

is the first study to indicate that exposure to food marketing via television and non-broadcast sources are independently associated with adolescents' food choices and eating behavior, and to show evidence of a dose–response relationship. While adolescents' eating patterns are complex and determined by multiple factors (e.g. parents, peers, taste, price, convenience) (Story, Neumark-Sztainer, & French, 2002), efforts to reduce time spent watching commercial television as well as restricting the amount of food advertising across all types of media are likely to represent positive steps towards improving the diets of young people.

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