







Children's exposure to outdoor food advertising near primary and secondary schools in Australia

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Abstract

Issue addressed: Previous research has highlighted children's frequent exposure to advertisements of unhealthy food and beverages on television. However, the food industry is increasingly utilising non-broadcast channels such as outdoor advertising (eg billboards, bus shelters, shop fronts) for product marketing. Few studies have investigated children's exposure to outdoor food advertising around primary and secondary schools. This study aimed to quantify the presence and content of outdoor food advertisements within a 500 m radius of primary and secondary schools in Perth, Western Australia.

Methods: A cross-sectional design was used to capture outdoor advertisements within a 500 m radial buffer around the school boundary. The INFORMAS protocol for monitoring outdoor advertising around child-serving institutions was used. Sixty-four primary and secondary schools in Perth, Australia, were selected using random sampling within socio-economic and population density strata.

Results: In total, 5636 outdoor advertisements were identified within a 500 m radius of all 64 schools combined and 30% were for food. Of the 1708 food advertisements, 74% were for unhealthy (non-core) food. The most frequently advertised food products were alcohol, fast food and sugar-sweetened beverages. Only 8% of food advertisements featured a healthy product. The majority of schools (75%) had at least one food advertisement within 500 m (mean 36, range 3-190). Schools in lower socio-economic areas had more food advertisements and a significantly higher proportion of unhealthy food advertisements within 250 m.

Conclusion: Outdoor advertising around schools constitutes a potential frequent source of children's exposure to unhealthy food and alcohol advertising.

So what?: Policy interventions restricting the content of outdoor food advertising near schools are needed.

KEYWORDS

children, food advertising, INFORMAS, marketing, nutrition, public health, schools

1 | INTRODUCTION

The prevalence of childhood overweight and obesity in Australia is among the highest of all developed nations, with one in four children overweight or obese.¹ Epidemiological evidence suggests there are specific eating behaviours that increase the risk of obesity. Frequent consumption of “discretionary foods,” that is, foods high in energy but low in nutritional value, such as fast foods, soft drinks, chocolate and confectionery, is one such eating behaviour and is becoming more common among Australian youth.¹ Australia's National Health Survey indicates that on any typical day in Australia, almost half of all teenage boys and one-third of teenage girls drink soft drinks¹ and around one-quarter of all teenage boys consume a burger and/or chips.¹ These types of foods often displace core nutritious foods such as vegetables, fruit and dairy from children's diets.² Indeed, less than 7% of Australian children meet the recommended daily intake for vegetables¹ and for Western Australian (WA) children specifically, ~38% of total daily energy intakes are obtained from ‘discretionary foods’.³ These dietary behaviours are inconsistent with Australian Dietary Guidelines and place young people at an increased risk of a number of diet-related conditions such as Type II diabetes, coronary heart disease and certain cancers.⁴

Previous research has highlighted a link between the food marketing environment and children's dietary preferences and consumer behaviours.⁵⁻¹⁰ For example, Harris et al⁶ found that children watching cartoons on television with food advertisements, ate 45% more snacks than children watching with non-food advertisements, and Scully et al⁷ found secondary school students who watched more than two hours of commercial television each day, reported to consume more fast food, sugar-sweetened beverages and sweets compared to children who did not watch commercial television. While most research to date has highlighted children's frequent exposure to advertisements of unhealthy food and beverages on television, the food industry is increasingly utilising non-broadcast channels such as outdoor advertising (eg billboards, bus shelters, shop fronts) for product marketing. Outdoor advertising is highly visible, continuously “on” and reaches a large, unrestricted audience. It is the only advertising medium that cannot be “turned-off,” so investigating the volume and content of outdoor advertising children are being exposed to is important to understand its potential role in children's dietary health. Previous studies of outdoor food advertising have identified the high proportion of unhealthy food or beverages in school zones,¹¹⁻¹⁴ along routes to school,^{15,16} in areas surrounding other child-serving institutions (ie day-care facilities, recreation centres and libraries),¹⁷ at train stations¹⁸⁻²⁰ and on bus shelters.^{18,21,22} Of the research investigating outdoor food advertising around schools, few studies have included *all* forms of outdoor advertising and *all* school types (ie primary, secondary and kindergarten to year 12 [K-12] schools). Therefore, this study adds to the limited literature on this topic by quantifying the presence and content of all outdoor food advertisements within a 500 m radius across all school types in Perth, WA.

2 | METHODS

The International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS)²³ protocol for monitoring outdoor advertising around child-serving institutions was used.

All Perth metropolitan Local Government Areas (LGAs) (n = 38) were stratified according to area-level socio-economic status (high vs low, measured by the Australian Bureau of Statistics Socio-Economic Index for Areas [SEIFA] Index of Relative Socio-Economic Disadvantage)²⁴ and population density (high vs low), generating four quadrants. Four LGAs were then randomly sampled from within each quadrant (n = 16 LGAs). Four schools from each of the 16 LGAs were then randomly selected (ie 64 schools in total). Where possible, two schools servicing primary students and two schools servicing secondary students were selected.

2.1 | Data collection

For each of the 64 selected schools, a navigation map was created in ArcGIS (ESRI, v10.5) to identify the area within a 500 m radial buffer around the school boundary. This ensured that the area surveyed for each school was the same; and was not impacted by the area of the school footprint or the connectivity of the surrounding street networks.

For each school, teams of trained Research Assistants used the navigation maps to traverse each road within the 500 m buffer on foot and/or by car. Data collection occurred during July–December 2019. The research team worked in pairs and used tablets loaded with a customised application (ODK Collect). For each outdoor advertisement identified, the geolocation was recorded along with up to five digital photographs. The following advertisement characteristics were also recorded:

- (i) Size (small \geq A4 but $<$ 1.3 m \times 1.9 m, medium $>$ 1.3 m \times 1.9 m but $<$ 2.0 m \times 2.5 m or large $>$ 2.0 m \times 2.5 m).
- (ii) Type (billboard, poster or banner, free-standing, painted building/wall, digital signs/LED, merchandising).
- (iii) Setting (attached to a food shop, attached to non-food shop or business, roadside, on a building, bus shelter or train station).
- (iv) Content (food or non-food advertisement).

Food advertisements were further coded and assigned to four major groups, using a food classification system developed to align with the INFORMAS protocol and the Australian Guide to Healthy Eating food categories. This included:

- (i) Healthy (core) foods: recommended to meet daily nutritional requirements.
- (ii) Discretionary/Unhealthy (non-core): surplus to daily requirements.
- (iii) Miscellaneous (ie tea/coffee/spices).
- (iv) Branding only (consisting of only a business logo/brand).

2.2 | Statistical analysis

Basic descriptive analysis was used to calculate the total counts and/or averages of outdoor advertisements, by size, type, location, content and food classification. Kruskal-Wallis tests were used to compare the ratios of unhealthy/healthy and food/non-food ads between SES, population density and school type due to the non-parametric nature of the distribution. When comparing overall counts within 250 m to counts between 250 and 500 m, chi-squared tests were used to determine the statistical significance of differences between SES, population density and school type.

3 | RESULTS

Characteristics of the outdoor advertisements identified are presented in Table 1 and a detailed breakdown of the frequency of outdoor advertised food products is presented in Table 2.

In total, 5636 outdoor advertisements were identified; 30% ($n = 1708$) were food advertisements and of these, 74% were for unhealthy foods compared to only 8% core foods. The majority of the food advertisements featured one sub-category of food (81%, $n = 1387$). The most frequently advertised food products were alcohol (24%), fast food (14%) and sugar-sweetened beverages (13%). For all small, medium and large-sized advertisements, alcohol was the most frequently advertised food product (75%, 70%, 66% respectively). Figure 1 presents six examples of images that were captured in the audit, representing a range of core and non-core food advertisements across different settings, types and sizes.

Three schools did not have any outdoor advertisements (food or non-food). The majority (75%) of schools had at least one food advertisement within 500 m (mean = 36 food advertisements; range 3-190); 70% of schools had at least one unhealthy food advertisement within 500 m (mean = 28 unhealthy food advertisements; range 1-136); 55% of schools had at least one alcohol advertisement within 500 m (mean = 10 alcohol advertisements; range 1-62); and 37% of schools had at least one healthy (core) food advertisement within 500 m (mean = 6 healthy food advertisements; range 1-19).

In terms of school type, K-12 schools had an average of 41 outdoor food advertisements (range 0-116) and a significantly ($P < .001$) higher proportion, compared to high schools, of total food advertisements, healthy and alcohol advertisements within 250 m compared to between 250 and 500 m. Primary schools had an average of 25 outdoor food advertisements (range 0-190) and secondary schools had an average of 22 outdoor food advertisements (range 0-94).

Compared to schools located in high SES areas, schools located in low SES areas had a significantly higher number of food advertisements within 250 m of the school, compared to between 250 and 500 m (50.9% vs 34.4%, $P < .001$), unhealthy food advertisements (excluding alcohol) within 250 m (40.1% vs 29.6%, $P = .002$) and alcohol advertisements within 250 m (49.4% vs 32.2%, $P = .005$), but not healthy food advertisements within 250 m. Of the 452 bus shelters

identified, 44 featured food advertising; the majority were for unhealthy foods (60%) or alcohol (27%).

There were 45 schools that had a shopping area present within 500 m. The average count of food advertisements located near a shopping centre was 7 times greater than areas with no shopping area (36 v 5).

There were significantly more non-food (2848 vs 1080) and food (1088 vs 620) advertisements surrounding schools located in high population density areas than low population density areas. However, the proportion/ratio of food advertisements to non-food advertisements was higher in low population density areas (36.5% vs 27.7%). The content of each food advertisement (ie non-core/core/miscellaneous/branding) was not significantly different between schools located within high and low population density areas.

4 | DISCUSSION

Our study found the vast majority (ie, three quarters) of outdoor food advertisements surrounding Perth schools were for unhealthy foods, with the most frequently advertised products being alcohol, fast food and sugar-sweetened beverages. This is consistent with previous research quantifying outdoor food advertising in school zones and finding a high proportion of unhealthy foods being advertised. For example, studies conducted in New Zealand, Australia, Mongolia and the Philippines found 70%–92% of all food advertisements in school zones were for unhealthy products.¹¹⁻¹³ We also found that school type and location was associated with differences in outdoor advertising exposure. For example, children attending schools which were larger in size (ie K-12), located in a low SES or high population-dense area with a shopping area nearby were exposed to a significantly higher proportion of unhealthy food and alcohol advertisements within closer proximity to the school. Considering food marketing has the potential to influence children's food preferences and consumption patterns,⁵⁻¹⁰ such immediate and repeated exposure to unhealthy food advertisements near schools, may increase the desire for children to consume unhealthy foods. Although the level and regularity of youth alcohol consumption has been declining in Australia,²⁵⁻²⁷ the high prevalence of alcohol advertising near schools found in this study and others,^{11,14} is particularly concerning given that studies conducted overseas have shown that greater exposure to alcohol marketing is associated with young people initiating alcohol use and consuming alcohol at risky levels²⁸ as well as brand recall and brand recognition.²⁹

A comprehensive mix of strategies would be needed to reduce the high level of unhealthy food advertising located on shop fronts, along roadsides, bus shelters and billboards near schools. Such strategies could include: (a) revising advertising industry codes and creating guidelines for advertising on transport corridors to impose restrictions on the density, type and content of outdoor advertisements; (b) changing land use and zoning policies to restrict unhealthy food and alcohol outlet near schools; (c) changing local government local planning policies to contain provisions relating to

TABLE 1 Characteristics of the outdoor advertisements identified within a 500 m radial buffer of Perth schools

Outdoor food advertisements (ads)	Number of food ads (N)	Percentage of food ads (%)	Percentage of all ads (%)
All outdoor ads	5636	—	—
Non-food ads	3928	—	70
Food ads	1708	30	30
Discretionary (non-core) foods	1271	74	22
Healthy (core) foods	144	11	3
Branding only	189	11	3
Miscellaneous foods	104	6	2
Size of food ads			
Small	1454	85	26
Medium	209	12	4
Large	45	3	<1
Type of food ads			
Poster or banner	904	53	16
Free-standing	726	43	13
Merchandising	48	3	<1
Billboard	6	<1	<1
Painted building/wall	13	<1	<1
Digital sign/LED sign	11	<1	<1
Setting of food ads			
Food shop	954	56	17
Roadside	508	30	9
Non-food shop/business	196	11	3
Bus shelter	44	3	<1
On a building	6	<1	<1
SES			
High SES Non-food ads	1877	69	33
High SES Food ads	832	31	15
Low SES Non-food ads	2051	70	36
Low SES Food ads	876	30	16
		Average number of food ads (M)	Standard deviation (SD)
School type			
K-12 (n = 10)			
Non-food ads	81		83
Food ads	41		39
Primary (n = 35)			
Non-Food ads	57		87
Food ads	25		37
Secondary (n = 19)			
Non-Food ads	58		65
Food ads	22		25
Presence of a shopping area near the school			
Shopping area present	36		37
No shopping area	5		9

TABLE 2 Frequency of outdoor advertised food products identified within a 500 m radial buffer around schools in Perth, WA

Food category	Number of food ads (N)	Percentage (%) of total food ads
Discretionary (non-core) food category		
Alcoholic beverages	403	24
Fast food meals (eg burgers, chips, pizza, fish and chips, kebabs)	242	14
Sugar sweetened drinks (eg soft drinks, energy drinks, flavoured & electrolyte drinks)	215	13
High fat/salt meals (eg fried foods, curry)	178	10
Ice-cream and iced confection	123	7
Sweet breads, cakes, muffins, biscuits, pastries	69	4
Full cream milks/yoghurts (>3 g/100 g fat), cheese (>15 g/100 g fat) and their alternatives	61	4
Flavoured noodles/fried rice products	38	2
Savoury snack food with added salt/fat including chips (crisps), coated nuts	27	2
Chocolate and candy	27	2
Meat and meat alternatives processed or high in salt (eg frankfurts, tinned meats)	20	1
Other high fat/salt products (eg butter, animal fats, high fat savoury sauces)	20	1
Healthy (core) food category		
Low fat meals (eg soups, sandwiches, salads, sushi)	104	6
Meat and meat alternatives, nuts and seeds	55	3
Fruits and fruit juice >98% fruit	48	3
Vegetables	45	3
Breads, rice and rice products (nothing fried)	41	2
Bottled water (unflavoured mineral/sodas)	10	<1
Healthy snacks – based on core foods (fruit/veg, grain, dairy, meat, meat alternatives)	5	<1
Low in sugar and high in fibre cereals (<20 g sugar, >5 g of dietary fibre per 100 g)	3	<1
Milk, yoghurt, cheese, probiotic drinks	2	<1
Miscellaneous food category		
Tea and coffee	191	11
Vitamin/mineral/other dietary supplements, sugar free gum	32	2
Recipe additions including soup cubes, herbs, seasonings	11	<1

the guidance or regulation of food and alcohol advertising; and (d) removing unhealthy food advertising from all state-owned assets, such as billboards, digital/LED signs and bus shelters. Only placing controls on unhealthy food advertising near schools might be ineffective given the exposure children have been shown to experience along the whole journey to school,^{15,16} around other child-serving institutions¹⁷ and while using public transportation.¹⁸⁻²² No jurisdiction around the world has implemented a comprehensive ban on advertising unhealthy food and beverages in public spaces or on publicly owned assets³⁰; however, governments are slowly beginning to make traction on this issue. For example, the Australian Capital Territory (ACT) government has banned unhealthy food and beverage advertisements on government owned buses and light rail services in the ACT³⁰ and since 2018, alcohol advertising at train stations and government owned buses in WA have been restricted.³⁰ The United Kingdom and Brazil have also introduced legislation to restrict unhealthy advertising on government-owned assets.³⁰ Taking a broader approach, Chile has enacted a “Food Labelling and Advertising Law” which prohibits the advertising of unhealthy food

and beverages directed at children and encompasses outdoor spaces as well as public owned assets.³¹

This appears to be the first study to quantify the volume and content of all outdoor food advertisements across all school level types (primary/secondary/K-12) and adds to the limited body of literature on this topic. Strengths include its use of consistent methodology (INFORMAS), large sample size, inclusion of all forms of outdoor advertising and thorough training of research staff in data collection, which included reliability testing. The study is limited by its cross-sectional design, whereby outdoor advertisements were only captured at one point in time. We were also not able to assess the proportion of food advertisements that were actually noticed or seen by the schoolchildren attending the schools. In addition, there is a possibility that some foods may have been incorrectly coded as core or non-core due to the categorical limitations of the INFORMAS protocol and lack of information about ingredients or cooking methods (eg the identification of kebabs and curries as non-core food assumes that all kebabs are fast food and all curries as high in salt/fat), thus the allocation of food advertisements to the INFORMAS

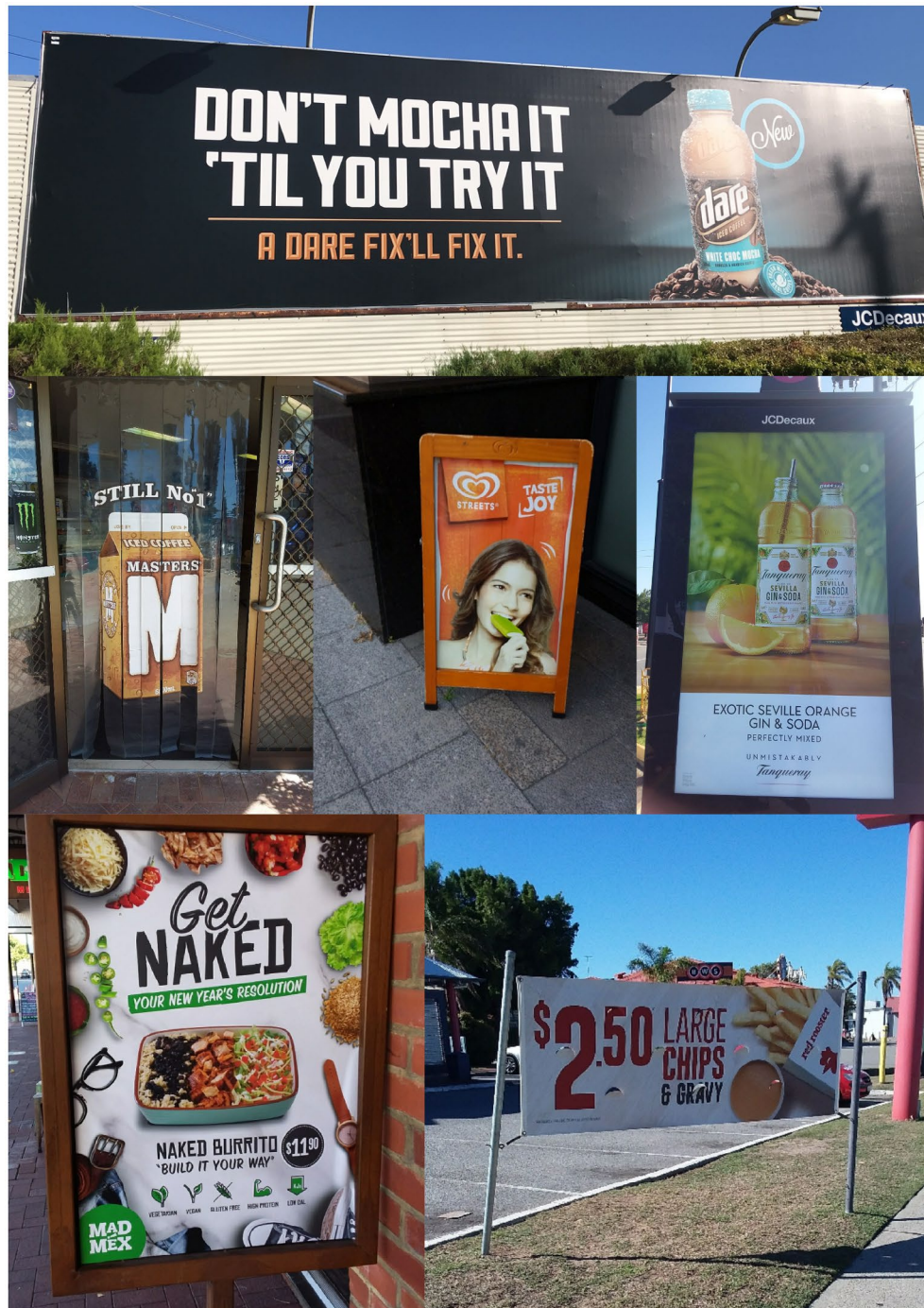


FIGURE 1 Example audit images representing a range of food types, settings, sizes and content

categories needs to be interpreted with caution. Nevertheless, our study has highlighted that outdoor advertising constitutes a potential frequent source of children's exposure to unhealthy food advertising (including alcohol) around schools in Perth, WA. While further research is needed to investigate the proportion of food advertisements that are actually noticed or seen by schoolchildren and how exposure to outdoor advertising near schools impacts children's health behaviours in an Australian context, given the large volume of outdoor food advertisements found to be present near schools in

this study, it appears that government-led initiatives to reduce children's exposure to this type of marketing are needed.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHORS CONTRIBUTIONS

GT, PH, LT, JM, KK and AS conceptualised the study. Data collection was conducted by JM and NW. NW and GT prepared the manuscript. GT, PH, NW, JM, KK and WB critically revised the paper for important intellectual content. All authors agree to be accountable for all aspects of this study and approve the final manuscript.

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