



Unhealthy food marketing around New Zealand schools: a national study

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Received: 21 December 2017 / Revised: 29 July 2018 / Accepted: 14 August 2018 / Published online: 27 August 2018
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Abstract

Objectives This is the first nationwide analysis of food marketing around New Zealand (NZ) schools.

Methods Zones (500-m network buffers) were created around a sample of 950 schools (37.5% of total) using ArcGIS. Foods advertised were classified according to the NZ Food and Beverage Classification System and the World Health Organization (WHO) Europe Nutrient Profile Model. Convenience, fast food and takeaway outlets were mapped.

Results About 65% of foods were not permitted to be marketed to children by the WHO model. The median and maximum number of non-permitted foods was 16.2 per km² and 805.9 per km², and the median number of junk food advertisements was 10.6 per km² for urban schools. The proportion of junk food advertisements was significantly higher around schools with the highest (50.7% vs. 37.4%, $p < 0.001$) compared to the lowest number of socio-economically deprived children. Sugar-sweetened beverages ($N = 4584$, 20.4%) and fast food ($N = 4329$, 19.2%) were most frequently marketed. The median and maximum number of unhealthy outlets around schools was 5 and 212, respectively.

Conclusions NZ schools are surrounded by unhealthy food marketing. Regulations to restrict such marketing need to be implemented.

Keywords Food marketing · School zones · New Zealand · Food environments

Introduction

The prevalence of childhood obesity has increased dramatically worldwide since the 1980s (Ng et al. 2014). The most recent New Zealand Health Survey 2015–2016 showed that one in three children aged 2–14 years are overweight or obese. In addition, there are substantial inequalities in overweight and obesity among different ethnic groups and between more and less socio-economically deprived areas (Ministry of Health 2016).

One of the factors known to influence unhealthy food and beverage choices related to childhood obesity is food and beverage marketing (Boyland et al. 2016; Cairns et al. 2013a, b). A review of studies conducted in New Zealand indicated that advertisements through a wide range of

platforms are predominantly for unhealthy foods (Vandevijvere and Swinburn 2015).

In 2010, the World Health Assembly endorsed a set of recommendations (Resolution WHA63.14) on the marketing of foods and non-alcoholic beverages to children (World Health organization 2010). These recommendations aim to guide Member States in developing new and/or strengthening existing policies on food and non-alcoholic beverage marketing to children. A recent review, however, suggests there is insufficient progress by Member States globally to implement comprehensive regulations to protect children from unhealthy food and beverage marketing (Kraak et al. 2016).

Currently, in New Zealand, advertising is self-regulated by the industry-lead Advertising Standards Authority (ASA), who recently published the Children and Young People's Advertising Code (Advertising Standards Authority 2017), which went into effect beginning of October 2017.

The Code (Advertising Standards Authority 2017) includes restrictions for advertising of 'occasional' (i.e.

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unhealthy) foods and beverages to children under 14 years of age, especially in children's settings.

However, research has consistently shown that self-regulation does not significantly reduce children's exposure to unhealthy food marketing (Galbraith-Emami and Lobstein 2013; Vandevijvere and Swinburn 2015) and a critical review of the Children and Young People's Advertising Code by 77 New Zealand health professors indicates that the future impact of this Code on reducing exposure of children to unhealthy food marketing is uncertain (Swinburn et al. 2017). New Zealand public health organisations have expressed concern over the inadequacy of the voluntary self-regulatory system in New Zealand, repeatedly advocating for the introduction of government restrictions on unhealthy food advertising (Vandevijvere et al. 2015, 2017).

The Code is unclear about whether 'school zones' (i.e. areas around the school) are considered a children's setting, and if so, how these zones are defined (Advertising Standards Authority 2017). Previous studies (Adams et al. 2011; Hillier et al. 2009; Kelly et al. 2008; Walton et al. 2009) internationally have consistently found that the majority of food advertisements around schools are for unhealthy foods and that the density of those advertisements varies by neighbourhood characteristics. There is only one previous small study on advertising around New Zealand schools including only four primary schools. In three of the four schools, a high percentage of students were likely to pass food outlets and outdoor food advertisements on route to school (Walton et al. 2009). A previous nationwide New Zealand study on unhealthy food outlets (including fast food, takeaway and convenience outlets) in school zones found that the median density was 2.4 outlets per km² and maximum density was 85 per km² within 500 m of urban schools.

The median road distance to the closest convenience store from urban schools was significantly higher for the least (617 m) versus the most deprived (521 m) schools (Vandevijvere et al. 2016).

The aim of this study was to analyse, for the first time, the extent and nature of food marketing around a large sample of New Zealand schools and formulate implications for policy.

Methods

Ethics approval for this study was obtained from the University of Auckland Human Participants Ethics Committee (Reference Number 012330). This is a cross-sectional survey, covering the entire New Zealand territory, excluding the offshore islands for which the population is extremely low.

Data sources

The list of New Zealand schools and their longitude and latitude coordinates and decile of socio-economic deprivation were derived from the Ministry of Education online Education Counts database (Ministry of Education 2016) ($N = 2529$ schools). Most of the schools (75%) are located on the North Island of New Zealand. The school decile indicates the socio-economic characteristics of the students the school draws upon for its school roll. Decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas Decile 10 schools are the 10% of schools with the lowest proportion of such students.

For this study, deciles of socio-economic deprivation of schools were translated into tertiles of deprivation (Tertile 1: Deciles 1–3; Tertile 3: Deciles 8–10).

In addition, urban schools were defined as schools in major urban areas, minor urban areas and secondary urban areas, as per the Education Counts database (Ministry of Education 2016).

Land Parcel Information for schools and the New Zealand road centerlines network were retrieved from Land Information New Zealand (updated August 2014).

Sampling of schools

A convenience but large sample of 950 schools across the country was included in the study, representing about 37.5% of the total number of schools in New Zealand.

For a subsample of 535 of those schools, a more detailed assessment of food advertising was conducted (see further).

Definition and creation of school zones

School zones can be defined in several ways (e.g. radial or network buffers from the centre, the entrance or the boundaries of the school). In this study, 500-m road network buffers were created from the school boundaries using ArcGIS. The spatial interact/select by location method was used to find and select the school areas from the Land Information New Zealand data set. School addresses (points) were laid over the primary school parcels. The parcels (polygons) that contained the address of schools (points) were selected and separated to form the 'NZ schools polygon shape file'.

The selected parcel areas were manually verified using Google Street View to ensure schools were present within those areas and the boundaries of each of the schools were manually verified and updated where necessary.

For each school, the area of the school was subtracted from the network buffer area to create the school food

zones. Detailed maps of the school zones were printed and made accessible through mobile phones.

Food classification systems

Three different food classification systems were used in this study to define unhealthy foods:

- The ASA Children and Young People's Advertising Code (Advertising Standards Authority 2017) uses the Ministry of Health Food and Beverage Classification system (updated in March 2016), (Heart Foundation 2016; Ministry of Health 2007) categorizing foods into 'occasional', 'everyday' and 'sometimes' foods. 'Everyday' foods are from the four core food groups, whilst 'sometimes' foods are mostly processed foods with some added fat and/or salt and/or sugar, and 'occasional' (i.e. unhealthy) foods (e.g. sugar-sweetened beverages, confectionery) are high in saturated fat and/or salt and/or added sugar. (Heart Foundation 2016; Ministry of Health 2007)
- The WHO Europe nutrient profiling model was specifically designed for the purpose of restricting the marketing of unhealthy foods to children (World Health Organisation 2015). It classifies foods into 'permitted' or 'non-permitted' to be marketed to children. It encompasses 17 food categories, including fruit, vegetables, and ready-made meals. Certain food categories are not permitted to be marketed to children under any circumstances. These include chocolate and confectionery, cakes and sweet biscuits, juices and energy drinks. Conversely, unprocessed meat and fish and fresh/frozen fruit and vegetables can be marketed without restriction. Maximum nutrient level cut points are applied to determine the eligibility of foods in all other categories to be marketed to children (World Health Organisation 2015).
- An additional definition on 'junk food' was developed to allow data collectors to readily register junk food advertisements without taking pictures and/or needing to consult food composition information. Junk food was defined as confectionary/chocolate; ice cream/frozen yoghurt/sorbet; sugar-sweetened beverages (soft drinks, fruit and vegetable juices, flavoured milks); artificially sweetened beverages; energy and sports drinks; crisps; snack bars (muesli, granola and fruit); biscuits/cakes/muffins/pastries; 2-min noodles/instant soups; deep fried foods; pies/sausage rolls; and burgers/pizzas.

Data collection

Data collection was carried out between July and November 2016. All streets within the zones of selected schools were surveyed. Data collection was conducted by a group of researchers and District Health Board members after training. Selected sites were visited on a single occasion.

Advertisements were defined as signs of at least A4 size with branded information, pictures or logos, and included billboards, posters, free standing signs, neon signs, stickers, electronic boards, banners, bus shelter signs and signs on outdoor furniture, bridge/awning signs and painted buildings. Signage, defined as symbols or words that are used for store identification, were excluded. However, store signage that also had a product logo and served not just as a store identifier but also as promotional material for a product were considered advertisements. Non-food advertisements and signage were not collected as part of this study.

For each of the schools ($N = 950$), the total number of food advertisements as well as the number of junk food advertisements was registered on a data collection sheet. In addition, addresses of convenience stores and fast food and takeaway outlets were also registered for each school. Convenience stores included bakeries, dairies, service stations and confectionery outlets.

For the sample of schools ($N = 535$) that underwent a more detailed assessment, pictures were taken of all foods advertised in the school zones and coded and analysed afterwards by two researchers. A sample of advertisements was coded by both researchers and discrepancies resolved before coding the remainder of the advertisements.

Data coding

Data coding was performed in 2017. Each food within each advertisement was coded and assigned to a food group and to each of the three different food classification systems as junk food/non-junk food, permitted/non-permitted to be marketed and everyday/sometimes/occasional. An advertisement was considered junk food, occasional or non-permitted if at least one of the foods depicted within the advertisement was junk food, occasional or non-permitted. Advertisements for companies/brands without depicting foods were included but analysed separately. When there was insufficient information to classify a food within an advertisement, it was coded as 'unspecified'. When the food classification system used was non-applicable for particular foods, these were coded as 'non-applicable'.

In the cases where school food zones overlap, the foods and advertisements were included for each school.

Table 1 Characteristics of schools included in the study sample (New Zealand, 2016)

	All schools in study sample <i>N</i> (%)	Schools (detailed assessment) <i>N</i> (%)	All schools in New Zealand <i>N</i> (%)
Total schools	950 (100)	535 (100)	2529 (100)
Rural/urban areas			
Urban areas (including minor, major and secondary)	843 (88.7)	489 (91.4)	1850 (73.2)
Rural areas	107 (11.3)	45 (8.4)	679 (26.8)
Location			
North Island	911 (95.9)	496 (92.7)	1880 (74.5)
South Island	39 (4.1)	39 (7.3)	644 (25.5)
Socio-economic deprivation (School decile)			
Deciles 1–3	357 (37.6)	172 (32.1)	780 (30.8)
Deciles 4–7	298 (31.4)	161 (30.1)	956 (37.8)
Deciles 8–10	272 (28.6)	183 (34.2)	752 (29.7)
Missing	23 (2.4)	19 (3.6)	41 (1.6)
Type of school			
Full primary school (year 1–8)	293 (30.8)	165 (30.8)	1068 (42.2)
Secondary school (year 9–13)	156 (16.4)	87 (16.3)	368 (14.6)
Contributing school (year 1–6)	354 (37.3)	201 (37.6)	766 (30.3)
Composite school (year 1–13)	59 (6.2)	34 (6.4)	166 (6.6)
Intermediate school (year 7–8)	69 (7.3)	41 (7.7)	117 (4.6)
Other school	19 (2.0)	7 (1.3)	44 (1.7)

Presence of promotional characters (including cartoon/company-owned characters, licensed characters, amateur sportspersons, non-sports celebrities, movie tie-ins, famous sportspersons, ‘for kids’ messaging) and premium offers (including game and app downloads, contests, ‘Pay 2 take 3’ or other, ‘20% extra’ or other, limited edition offers/products, social charities, gifts or collectibles, price discounts, or loyalty programs) within advertisements were also recorded.

Spatial and statistical analysis

ArcMap, version 10.2, and SAS, version 9.3, were used to conduct the analyses. Descriptive statistics (median, Interquartile range and minimum/maximum) were used to assess the number and proportion of occasional, non-permitted and junk food advertisements around New Zealand schools. The number of occasional, non-permitted and junk food advertisements was expressed per km² and was compared between urban and rural schools using two-sided Mann–Whitney tests. Kruskal–Wallis tests were used to compare the median number and proportion of occasional, non-permitted and junk food advertisements among school socio-economic deprivation tertiles. The Spearman rank correlation coefficient was calculated to assess correlation

between number of outlets and advertisements in school food zones.

Results

Characteristics of schools and school food zones included in the study

In total, 950 schools (more than one-third of total schools in New Zealand) were included in this study (Table 1), the majority (89%) in urban areas, 95.9% on the North Island and roughly one-third in each tertile of socio-economic deprivation (higher, medium, lower proportions of children from lower socio-economic communities).

About 75% of schools were full primary (year 1–8), contributing (year 1–6) or composite (year 1–13) schools and 16% were secondary (year 9–13) schools. Compared to all New Zealand schools, the study sample had more schools in urban areas and on the North Island.

For more than half (56.3%, *N* = 535) of the schools, a more detailed assessment was performed where pictures were taken of all food advertisements in the school zones (Table 1).

Table 2 Number and proportion of junk food advertisements around schools (excluding advertisements for brands/companies without specific foods depicted) (New Zealand, 2016)

	All schools	Urban schools	Rural schools	Low decile schools	Medium decile schools	High decile schools
Number of junk food advertisements						
N schools	950	836	107	357	298	272
P25	2	3	0	4	0	0
Median	9	11 [§]	0	10 [#]	10	8
P75	19	21	3	19	21	17
Min	0	0	0	0	0	0
Max	347	347	32	112	347	305
Number of junk food advertisements per km ²						
N schools	944*	836	107	357	298	272
P25	1.7	3.3	0	3.5	0	0
Median	8.7	10.6 [§]	0	9.6 [#]	9.4	7.2
P75	19.0	20.3	2.9	18.9	20.5	16.9
Min	0	0	0	0	0	0
Max	395.5	395.5	28.9	140.9	395.5	367.5
Proportion of junk food advertisements						
N schools	945	835	103	356	294	272
P25	20.7	27.7	0	29.7	0	0
Median	43.8	46.1 [§]	0	50.7 [§]	41.4	37.4
P75	71.4	73.7	48.0	77.8	74.7	60.0
Min	0	0	0	0	0	0
Max	100	100	100	100	100	100

*For six schools no school zone could be created in ArcGIS

[#]No significant difference ($p > 0.05$) between low, medium and high decile schools

[§]Significant difference ($p < 0.001$) between rural and urban schools and between low and high decile schools

For 6 out of 950 or 4 out of 535 schools, no school food zone could be created in ArcGIS. The median area size of New Zealand school food zones ($N = 944$) was 1.06 km² (IQR = 0.96–1.13 km²).

There were 194 out of 950 (20.4%) schools that did not have any food marketing in the school zones and 206 out of 950 schools (21.7%) that did not have any junk food marketing in the school zones (data not shown).

Food advertisements around New Zealand schools

The total number of food advertisements and junk food advertisements identified around the 950 schools in New Zealand was 30494 and 14310, respectively. The median number of junk food advertisements around New Zealand schools was 9 (8.7 per km²) for all schools and 11 (10.6 per km²) for urban schools. The median proportion of junk food advertisements was 43.8% for all schools and 46.1% for urban schools. The maximum number of junk food advertisements found was 347 (or 395.5 per km²). The

median number of junk food advertisements was lower in the least compared to the most and medium deprived schools, but the difference was not significant ($p > 0.05$). However, the median proportion of junk food advertisements was significantly higher around schools with the highest compared to the lowest number of socio-economically deprived children ($p < 0.001$) (Table 2).

The subsample of schools with a more detailed assessment of advertisements ($N = 535$) showed that there was a total of 14,564 advertisements found for food or food brands/companies across those 535 schools. The median number of food advertisements not permitted to be marketed to children, defined as per the WHO Europe nutrient profiling model, was 9.4 per km² or 11.0 per km² for urban schools. When using the Ministry of Health food and beverage classification system, as used in the Advertising Standards Authority children and young people advertising code, those figures are similar (Table 3). The maximum number of advertisements not permitted to be marketed to children by WHO found in the school zones was 468.5 per km².

Table 3 Number of unhealthy food advertisements per km² around New Zealand schools (excluding advertisements for brands/companies without foods depicted) (New Zealand, 2016)

	All schools	Urban schools	Rural schools	Low decile schools	Medium decile schools	High decile schools
World Health Organization Europe Food Classification System						
N schools	531*	485	45	172	161	183
P25	1.7	3.8	0	5.2	0	0.9
Median	9.4	11.0 [§]	0	10.7 [#]	7.9	8.5
P75	20.9	21.8	0.9	20.8	23.4	19.5
Min	0	0	0	0	0	0
Max	468.5	468.5	24.7	95.3	468.5	461.5
Ministry of health food classification system						
N schools	531*	485	45	172	161	183
P25	1.7	3.3	0	4.4	0	0.7
Median	8.9	10.9 [§]	0	10.0 [#]	8.4	8.3
P75	19.6	20.1	0.5	19.5	20.7	18.4
Min	0	0	0	0	0	0
Max	454.8	454.8	21.8	95.3	454.8	454.3

*For four schools, no school zone could be created in ArcGIS

[#]No significant difference ($p > 0.05$) between low, medium and high decile schools

[§]Significant difference ($p < 0.001$) between rural and urban schools

The median number of unhealthy food ads was higher for low compared to medium and high decile schools, for both food classification systems used, but the differences were not significant ($p > 0.05$) (Table 3).

About 28.1% of food advertisements ($N = 4089$) included a premium offer, most predominantly price discounts and to a lesser extent contests. Promotional characters were less commonly used and found within only 3.5% of food advertisements ($N = 516$). Promotional characters used included cartoon/company-owned characters, licensed characters, movie tie-ins, celebrities and famous sports persons and 'for kids' images and messages (data not shown).

Foods marketed around New Zealand schools

In total, there were 22511 foods or brands/companies marketed across the 535 schools for which a detailed assessment was undertaken. About 55.2% of foods advertised ($N = 12,431$, excluding companies/brands $N = 1199$) were junk food.

About 65% of foods would not be permitted to be marketed to children according to the WHO nutrient profiling system, about 61% of foods marketed were classified as occasional according to the Ministry of Health Food and Beverage Classification system, and about 5% of food

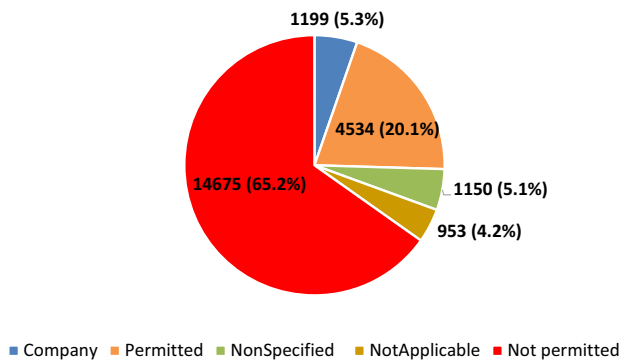
advertisements was for companies/brands (without foods depicted in the ads) (Fig. 1).

For both food classification systems, there were about 5% of foods (5.1% for the WHO system and 5.7% for the MOH system) that could not be classified as healthy/unhealthy due to lack of sufficient information from the pictures (e.g. mainly composite meals/dishes from take-away outlets). For 4.2% (WHO system) or 4.7% of foods (MOH system), the nutrient profiling systems were non-applicable (e.g. coffee, tea, supplements).

The median number of foods not permitted to be marketed to children by WHO around New Zealand schools was 13.9 per km² or 16.2 per km² for urban schools, and the maximum number of such foods was 805.9 per km² (data not shown).

Excluding food brands/company advertisements, the food categories most frequently advertised around the schools were sugar-sweetened beverages ($N = 4584$, 20.4%), fast food like pizzas and burgers ($N = 4329$, 19.2%), sweet bread, biscuits, cakes, muffins, pies and pastries ($N = 1970$, 8.8%), ice cream and desserts ($N = 1911$, 8.5%) and diet soft drinks ($N = 968$, 4.3%). Vegetables and vegetable products without added fats, sugars or salt ($N = 699$, 3.1%) and fruits and fruit products without added fats, sugars or salt ($N = 619$, 2.7%) were advertised to a much lesser extent (data not shown).

N and % of foods not permitted to be marketed to children according to the WHO Europe food classification system



N and % of occasional foods according to the Ministry of Health Classification system (updated in March 2016)

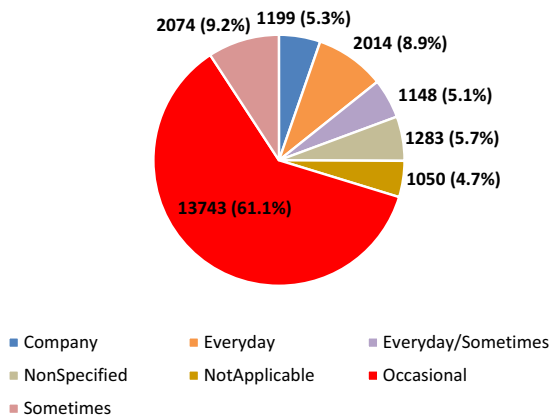


Fig. 1 Foods and food brands/companies identified in advertisements around New Zealand schools according to two food classification systems (New Zealand, 2016)

Outlets versus advertisements in the school zones

For 746 schools, outlets (convenience stores, fast food and takeaway outlets) were registered in the school zones.

Eighty-three of those zones (11.1%) did not have any outlets. The maximum total outlets found in school zones was 212 (61 for convenience stores and 151 for fast food and takeaway outlets), whilst the median number was 2 for both convenience and fast food/takeaway outlets and 5 for the total number of unhealthy food outlets. There was a strong correlation between number of unhealthy food outlets and number of advertisements found in the school zones ($\rho = 0.81, p < 0.001$) (Table 4).

Table 4 Number of food outlets (convenience stores and fast food and takeaway outlets) registered around New Zealand schools (New Zealand 2016)

	Convenience stores	Fast food and takeaway outlets	Total outlets
N schools	746	746	746
P25	1	1	2
Median	2	2	5
P75	4	6	10
Min	0	0	0
Max	61	151	212
Correlation with number of food advertisements	0.77	0.78	0.81

Discussion

This study evaluated a large sample of New Zealand school neighbourhoods and found that New Zealand schools are surrounded by junk food marketing. About two-thirds of the foods marketed around New Zealand schools are not permitted to be marketed to children by the WHO Europe nutrient profiling model, and 60% would be restricted to be marketed under the new Children and Young People’s Advertising Code (Advertising Standards Authority 2017). In addition, the proportion of junk food advertisements is higher around schools with a higher proportion of pupils from lower socio-economic communities compared to schools with a lower proportion of such pupils. The latter was also found in a study in Northern England (Adams et al. 2011).

In view of the impact of food advertising on children’s food preferences (Boyland et al. 2016), policy implications include the implementation of government regulations to protect children from the exposure to junk food marketing on the way from home to school and vice versa, such as recommended repeatedly by public health experts in New Zealand (Vandevijvere et al. 2015, 2017). In South Korea, Green Food Zones were implemented in 2010. The special Act on the Safety Management of Children’s Dietary Life bans the sale and advertising of fast food and soda within 200 metres of schools. In 2016, Green Food Zones existed at over 10,000 schools (Bae et al. 2012).

Since progress on implementing the Resolution WHA63.14 to restrict unhealthy food and beverage marketing to children by countries is quite slow (Kraak et al. 2016; Roberto et al. 2015), immediate implications of the study include the explicit recognition of school zones as a children’s setting in the Advertising Standards Authority self-regulatory Code, which restricts occasional food advertising in children’s settings. If school zones were considered as a children’s setting, major changes will be

needed as the majority of advertisements are currently for sugar-sweetened beverages and fast food.

This study has some key strengths and limitations. This is the first nationwide study on food marketing around New Zealand schools, and a large sample of schools was included. Advertisements and outlets were registered on-site. School boundaries were manually verified and accurately determined.

Limitations include the convenience sample, the underrepresentation of South Island schools and the lack of collection of longitude and latitude coordinates for the advertisements, which would have allowed to differentiate between advertisements closer and further from the school boundaries.

The study did not consider individual children's journeys from home to school, and therefore actual exposure of children to junk food advertising was not calculated.

In conclusion, New Zealand schools are surrounded by junk food marketing. School zones need to be explicitly recognized as a children's setting in the Advertising Standards Authority self-regulatory Code, which restricts occasional food advertising in children's settings, and government regulations need to be implemented to restrict unhealthy food marketing around schools.

Acknowledgements The authors want to thank Euan Forsyth and Zaynel Sushil for their work on creating the school areas and school food zones in ArcGIS.

Compliance with ethical standards

Conflict of interest The authors declare no conflicts of interest exist.

Ethical statement All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

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