

Original Article

Snack and beverage consumption and preferences in a sample of Chinese children - Are they influenced by advertising?

Peng Liu PhD^{1,2}, Yang Yu MIPH², Lesley King PhD³, Mu Li MD, PhD^{2,4}

¹*Institute of Iodine Deficiency Disorders, Center for Endemic Disease Control, Chinese Center for Disease Control, Key Lab of Etiology and Epidemiology, Education Bureau of Heilongjiang Province and Ministry of Health, Harbin Medical University, Harbin, China*

²*Sydney School of Public Health, the University of Sydney, Sydney, Australia*

³*Sydney School of Public Health, Charles Perkins Centre, The University of Sydney, Sydney, Australia*

⁴*China Studies Centre, The University of Sydney, Sydney, Australia*

Background and Objectives: The consumption of unhealthy snack and beverages can lead to childhood obesity, which has become a major concern globally. Television food advertisements may influence children's snack and beverages preferences. This article aims to explore children's snack and beverage consumption habits; examine the extent of television advertising for non-core (energy-dense, nutrient poor) snack and beverages; and assess the influence of television advertising on children's snack and beverages preferences in Harbin, China. **Methods and Study Design:** The study consisted of two components, a recall survey on the snack and beverage consumption and preferences of 9-11 years old school children; and recording snack and beverage advertisements on three popular television channels. Odds Ratio (OR) was used to estimate the likelihood of children selecting particular snack and beverages as their top three choices according to whether their preferences were influenced by television advertisements. **Results:** The majority of children consumed non-core snacks (100%) and beverages (80%) in the four weeks prior to the survey. Nearly 40% of television food advertisements were for non-core snacks and beverages. Non-core snacks (OR of 1.13) and non-core beverages (OR of 1.23) were more likely chosen as children's top three snack/beverage choices, particularly, "puffed food and tubers" snack and carbonated beverages (OR of 1.31 and 1.45, respectively). **Conclusions:** The snack and beverage preferences appeared to be influenced by television advertisements in this sample of Chinese children, highlighting the potential health and nutritional value of policy to reduce advertising of non-core foods in China.

Key Words: snack, beverages, non-core foods, television advertisement, children

INTRODUCTION

In the last two decades, the diets of the Chinese people have undergone significant changes, in association with economic progress and environmental changes.¹ As a result, overweight and obesity and other diet-related, non-communicable diseases have become a major public health concern.² Children in China, especially in urban areas, are now exposed to a wider variety of foods, including snack and beverages. Several Chinese studies have shown that frequent snacking (>3 times per week) and frequent consumption of the Western fast foods were significantly associated with obesity in school-aged children in Beijing.³ Consumption of sweetened soft drinks >4 times per week or >1,100 mL per day and having a medium to high energy intake were strong dietary risk factors in Xi'an, a major metropolitan center in north-western China.^{4,5} Further, children with permission to purchase snack with pocket money were 1.5 times more likely to be overweight or obese.⁴ At the same time, there is now significant use of television (TV) for marketing products, including foods.⁶ Food

advertising comprises a big part of the advertising market internationally⁷ and in China. A Chinese national survey in 2013 showed that television had the highest contact rate (99.5%) among different media.⁸ TV viewing time appears to be continuing to increase, as is obesity prevalence for children.⁹ Exposure to television food commercials enhanced high television viewers' preferences for branded foods and increased reported preferences for all food items (branded and non-branded) relative to the low television viewers.¹⁰ Exposure can be assessed using indicators such as frequency and repetition of messages in specified settings.¹¹ Children are increasingly recognized

Corresponding Author: Professor Mu Li, Sydney School of Public Health, China Studies Centre, The University of Sydney, Rm 307, Edward Ford Building, Sydney, NSW, Australia, 2006. Tel: +61 2 9351 5996; Fax: +61 2 9351 5049. Email: mu.li@sydney.edu.au. Manuscript received 08 June 2016. Initial review completed 26 July 2016. Revision accepted 13 August 2016. doi: 10.6133/apjcn.012017.04

as a major consumer group and a target audience for advertisements. A recent Australian study showed that TV advertising, even not directly viewing, is associated with negative dietary pattern in children.¹²

To date, there are no quantitative studies on children's exposure to food advertisements and their snack and beverage preferences in Harbin, China. This study aimed 1) to explore children's snack and beverage consumption habits in Harbin, China; 2) to examine TV advertisements of non-core snack and beverages on popular television channels; and 3) to examine the influence of TV advertising on children's snack and beverage preferences.

The results will contribute evidence regarding future strategies and potential regulations for reducing food and non-alcohol beverage marketing to children in China.

MATERIALS AND METHODS

School age children dietary behavior survey

A cross-sectional survey of school children was carried out using the validated questionnaire adapted from the Shanghai School Children Dietary Behaviour Survey-Student Questionnaire,¹³ which included questions concerning snack and beverage consumption and preferences. The questions covered the type of snacks and beverages consumed in the last four weeks, sources of information about snacks and beverages, the three most favorite snacks and beverages from a list with category names and every specific product names, and reasons for these preferences. The response options for snacks and beverages were adjusted to accommodate snacks available in Harbin market. Most of the questions had multiple choice answers.

The survey was conducted in Harbin, the capital city of Heilongjiang Province in China, and initial invitation letters were sent to 12 school principals in one district in Harbin in early 2012. The two primary schools responding first to participate in the study were recruited due to the limitation of time and resources. Informed consent was sought from the principals of schools, 3-5 grade school children and their parents. All parents were provided with an Information Sheet and invited to give consent for their children to participate. The survey was only undertaken by those students who agreed to participate in the study and whose parents signed on the consent forms. The survey was administered by researchers with assistance from school teachers. Questionnaires were handed out in self-study class time, and they took no more than 30 minutes to complete. Class teachers collected the questionnaires after they were completed and passed to the researchers. The questionnaires were checked by the researchers for completeness on the spot, and any missing data sought at that time. The survey protocol was approved by the Human Research Ethics Committee at the University of Sydney (2012/1540).

Television food advertisements

Television program recording and advertisement coding were conducted in accordance with the protocols used in a range of studies¹⁴ including a recent Asian-Pacific study reported previously.¹⁵ In summary, three TV channels were selected to cover the three levels, national television, provincial satellite television and Harbin city channel.

According to the China Television Rating Yearbook,¹⁶ the most popular channel in each of these three levels is: China Central Television 1, Heilongjiang Satellite Television and Harbin News Channel. These were recorded on hard disks by TV media 2 Box. Television broadcast data was recorded from 06:00 to 22:00 daily (16 hours/day) on two weekdays (23rd July and 24th July) and two weekends (22nd July and 28th July) in 2012. All TV data was screened by the researchers to identify advertisements for non-core snacks and beverages. This involved viewing the TV recordings (forwarding through the program content), identifying non-core snack and beverage advertisements and categorizing these advertisements. Information recorded included the broadcast time of the advertisement, the type of snack or beverage advertised, promotional characters (such as pop-star, athlete, cartoons, etc.) and the prizes offered in the advertisements.¹⁵ Television timeslots were classified and coded as weekdays or weekends, and as peak viewing hours (17:00-20:00 daily) or non-peak viewing hours (06:00-17:00 and 20:00-22:00 daily). The definition of peak and non-peak viewing hours is based on the hourly audience rating from China Television Rating Yearbook.¹⁶

Data analysis

Descriptive analyses were conducted for both children's survey responses and TV advertisements. In this research all snacks and beverages were divided into non-core or core categories according to former research,¹⁷ see Table 1. As TV advertisements of core snacks were extremely rare, they were not included in the study. Data analysis used the statistical software SPSS 19.0 (Polar Engineer and Consulting). For this study, Pearson χ^2 tests were applied to examine patterns in students' exposure to non-core snack advertisements and snack and beverage preferences. Odds Ratio (OR) was calculated to identify significant associations between children's top three snack and beverage preferences and the exposure to advertisements. Results were considered significant when $p < 0.05$ level.

RESULTS

School age children diet behavior survey

The survey collected 452 valid questionnaires, with 90% response rate, 365 from one and 87 from the other primary school. Approximately 60% (59%) of the participants were from Grade four, with others from Grade five. The majority (84%) of the participants were aged 10 or 11 years, 14% were 12 years old, and remaining 2% were 9 or 13 years old (by 31st July 2012). Among the participants, 54% were boys and 46% were girls, which was similar to the current overall gender ratio of Chinese children of this age group.¹⁸

In the four weeks prior to the survey, 100% of children reported that they had consumed non-core snacks and over 80% of children reported consuming beverages. The list of snacks and beverages used is presented in Table 1. In the survey, 46% children reported they received information about food from television, followed by internet (34%) and "newspaper and magazines" (19%).

In terms of preferences, "taste" was the most important reason (89%) that children gave for liking certain snack

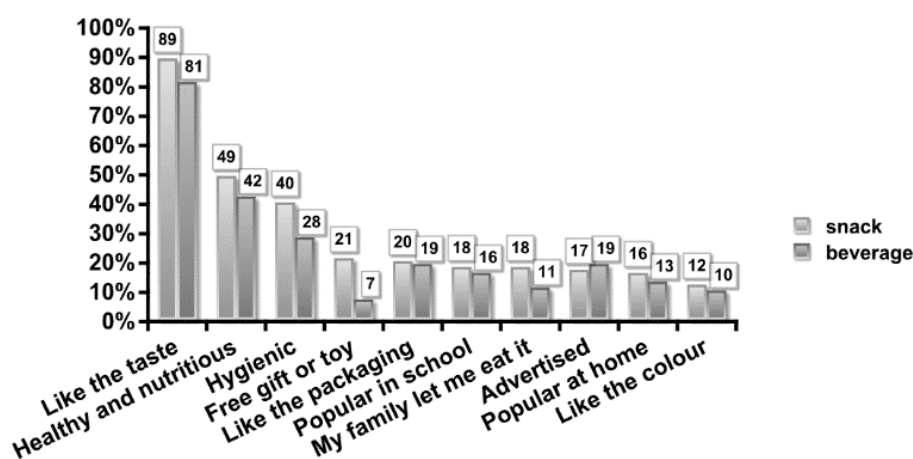
Table 1. Definition of snack and beverages in the survey

Category	Definition
Snack	All kinds of food you eat in addition to three main meals each day.
Non-core snacks	
Cooler	Ice cream, iced confection and desserts
Milk and dairy products	Milks, yoghurts, cheese and other dairy products (Contents $\geq 10\%$ Milk or other).
Sweet rice & flour products	Sweet breads, cakes, muffins, sweet buns (e.g. lotus seed, custard, red bean), sweet biscuits (include egg rolls), sweet glutinous rice balls or cakes, high fat savory biscuits, pies and pastries, sweet sticky rice or rice pudding.
Chocolate and candy	Chocolate and candy - includes marshmallows, sugar (all types), and chewing gums (exclude sugar free varieties).
Puffed food and tubers snack	Doritos, Chips, sweet potato, Fries, etc.
Dry fruit, preserved fruit	Include jelly, sugar-coated dried fruits or nuts, nut or seed based bars and slices, sweet rice bars, and tinned fruit in syrup
Meat and meat alternatives products	Meat and meat alternatives processed or preserved in salt – include frankfurts, seafood sticks, jellyfish salad, tinned meats, and all preserved ready to eat meats, poultry, fish and egg products.
Core snacks	
Fresh fruit, vegetable	Fresh fruit, vegetable
Beans or soy products	Beans or soy products, include soy milk, tofu, etc.
Nuts	Raw Nuts and other flavoured nuts products, include peanut, cashew, nut based bars, etc.
Beverages	Drinks exclude unflavoured water
Non-core beverages	
Carbonated beverages	Carbonated beverages, include Coke, sodas, etc.
Tea drinks	Sweetened or flavoured tea drinks, include ice-tea, honey tea etc.
Drink powder	To be mixed with water, soda or milk, include Melo, Tang, etc.
Energy drinks	Caffeine or other stimulants added beverages, include Red Bull, Gatorade, etc.
Milk beverages	Sweetened or flavoured milk, milk tea, peanuts milk, etc.
Fruit juice/drinks	Fruit juice/drinks, orange juice, tomato juice, etc.
Core beverages	
Plant protein based beverages	Non-sweetened plant protein based beverages, includes Soy milk, Almond milk, etc.
Plain coffee	Instant coffee, coffee, etc.
Unflavoured tea	Tea, home-made tea, etc.
Unflavoured milk	Milk, include high calcium/iron Milk and Yogurt, etc.

foods. “Healthy and nutritional” was also reported by almost half of the children (49%); and 40% of the children liked snacks because they believed that they were “hygienic”. Other reasons included “free gift or toy” and “attractive packaging”, with similar proportions of around 20%. “Popular in school” or “my family let me eat it” were reported by 18% of the children as a reason for liking snacks. “Food advertising” ranked eighth in this list, with 17% children reporting that they liked the snack be-

cause of its advertisement (Figure 1).

“Taste” was also the most important reason stated by children for liking certain types of beverages (81%). Almost half of the children liked a beverage because of its “health and nutritional” value (42%). Advertising was ranked fifth as the reason for beverage preference, and about 20% of children responded that advertisements influenced their beverages choices. “Peer pressure” from classmates (16%) and “popular at home” (13%) ranked

**Figure 1.** Reasons for snack and beverages preference in children.

after advertising. Interestingly, there were 11% children who favoured one particular type of beverage because of "my family let me eat it" (Figure 1).

Television non-core snack and beverage advertisement recording

In total, 192 hours of TV programs were recorded with 5477 advertisements identified, including 1024 food advertisements (19%). Of all food advertisements, 855 (83.5%) were for non-core foods and beverages. Among those food advertisements, there were 89 (8.7%) non-core snacks and 321 (31.3%) non-core beverages advertisements.

On average, there were 1.3 non-core snack advertisements per hour during peak viewing hours (17.00 - 20.00) and 0.3 non-core snack advertisements per hour in non-peak viewing hours (20.00-22.00). Whereas, beverage advertising was more frequent, on average, 4.7 beverage advertisements appeared during peak hours and 1.0 in non-peak hours (Table 2).

Table 2 also shows there were more non-core snack advertisements (62%) broadcast on weekends than on weekdays (38%). For non-core beverages, 52% of advertisements were broadcast on weekends and 48% on weekdays.

In terms of attracting children's attention, nearly 30% (27/89) of non-core snack advertisements had premium offers, ranging from special prizes, free gifts or toys to vouchers, while the "coolers" and "meat and meat alternatives products" advertisements were more likely to use premium offers. Further, about one third of non-core beverages, "milk and dairy products" and "meat and meat alternatives products" advertisements used promotional characters.

Televising advertising as the reason for selecting snacks and beverages

Children were categorized into two groups according to whether they reported that their snack preferences were influenced by TV advertisements or not. It was assumed for those stating their preferences were influenced by TV advertisements, they would not choose the particular snack or beverages if they were not influenced by advertisements. Table 3 shows the likelihood of those children reporting they were influenced by TV advertisements selecting particular snacks amongst their top three choices, compared with those students reporting their preferences were not influenced by advertisements. There was a significant difference in the consumption of non-core snacks between the two groups of students, those reporting they were and were not influenced by advertisements ($\chi^2=4.68$, $p=0.03$), with OR 1.13 (95% CI, 1.01, 1.27). The likelihood of children selecting a non-core snack as a top three favorite increased when they reported being influenced by TV advertisements. Among the non-core snacks, the largest difference occurs for "puffed food and tubers snack" ($\chi^2=4.01$, $p=0.05$), and OR 1.31 (95% CI, 1.01, 1.67). There were no other non-core snacks where there were statistically significant differences.

Similarly, Table 4 showed the likelihood of children selecting different types of beverages as their top 3 favorite choices, according to whether they reported being in-

fluenced by TV advertisements or not. For beverages overall, there was a statistically significant difference between the two groups ($\chi^2=11.4$, $p=0.01$), which indicated that the television advertising had increased the likelihood of children selecting these beverages (the OR value is 1.18, 95% CI: 1.07, 1.31). Among the beverages, the selection of non-core beverages was significantly increased in children reporting they were influenced by TV advertisements compared with those not ($\chi^2=5.77$, $p=0.02$), and the OR value was 1.23. In particular, the selection of carbonated beverages was significantly increased in children reporting they were influenced by TV advertisements ($\chi^2=7.25$, $p=0.01$), and the OR value was 1.45 (95% CI: 1.11, 1.91).

DISCUSSION

Snacks were common in Chinese children's daily food intake. Chinese Residents Dietary Guideline recommends that children should have healthy snacks to supplement meals.¹⁹ In this study we found that the most commonly consumed snacks by the school children were the unhealthy non-core snacks, such as puffed and tubers snack, ice cream, sweet rice and flour products, and chocolate and candy. These are excessively high in sugar and fat, which costs little energy to digest but is easy to be transformed into fat.¹⁹ Snacks with good nutritional value, such as fresh fruit and vegetables, meat and meat alternatives, nuts, and "bean or soy products" ranked relatively lower on the children's favourite snack lists.

Interestingly, "taste" was the most common reason for children choosing snacks and beverages. However, high salt and additives often constitute the taste of foods, but are also of concern, in addition to fat and sugar content. High salt intake in children and adolescents might contribute to high energy intake by increasing thirst, and thus consumption of sugar sweetened drinks. Additives including preservatives and artificial flavours are often used in the production of processed snacks. Some of the chemicals might accumulate in human organs over a period of years and generate harm to children's vulnerable immune system.²⁰ Reducing consumption of processed snacks including "puffed food and tubers products" and preserved fruit may have health benefits not limited to preventing children obesity.

Most beverages on the market, particularly those heavily advertised, have extra sugar added.²¹ It has been demonstrated that sugar in the sweetened beverages could be quickly absorbed and transformed into fat in human digestion system, contributing to overweight and obesity. Sugar delivered through beverages appears to contribute a sizable proportion of Chinese children's daily energy intake, as the most commonly consumed beverages are carbonated beverages. Other commonly consumed beverage types also have sugar added, although they are often claimed to be "healthy", they in fact belong to non-core beverages, such as tea drinks, fruit juice and fruit flavoured drinks, energy drinks and milk-based beverages. Our study suggests that food and drink advertising on television may influence children's snack and beverage preferences and consumption patterns. The Harbin primary school children reported that television plays an important role as an information source on foods and drinks.

Table 2. Television non-core snack and beverage advertising patterns

Food type	N	Peak hours [†]			Non-peak hours [‡]			Weekdays		Weekends		With premium offers		With promotional characters	
		n	% n/ N	n/h h=36	n	% n/ N	n/h h=156	n	% n/ N	n	% n/ N	n	% n/ N	n	% n/ N
Total non-core snacks	89	43	48.3	1.3	46	51.7	0.3	34	38.2	55	61.8	27	30.3	22	24.7
Total non-core beverages	321	170	53.0	4.7	151	47.0	1.0	155	48.3	166	51.7	8	2.5	102	31.8
Total	410	213	52.0	6.0	197	48.0	1.3	189	46.1	221	53.9	35	8.5	124	30.2

[†]Total peak viewing hour is 36 h, 3 h/day (from 17:00-20:00)* 3 channels *4 days = 36 h.

[‡]Total non-peak viewing hour is 156 h, 13 h/day (from 6:00-17:00 and 20:00-22:00) *3 channels *4 days = 156 h.

Table 3. The influence of advertisements on the snack preferences of children

Snack types	Students reporting their snack preferences were influenced by TV advertisements		Students reporting their snack preferences NOT influenced by TV advertisements		Pearson χ^2	<i>p</i> value	OR (95% CI)
	Number selecting as top 3 preference	Number not selected	Number selecting as top 3 preference	Number not selected			
Non-core snacks							
Puffed food and tubers snack	119	106	104	120	4.01	0.05	1.31 (1.01, 1.70)
Ice cream	98	119	91	126	0.79	0.37	1.13 (0.86, 1.48)
Dairy products	61	157	57	161	0.37	0.54	1.10 (0.81, 1.48)
Sweet rice & flour products	53	159	50	162	0.23	0.63	1.08 (0.79, 1.48)
Chocolate and candy	52	166	48	172	0.65	0.42	1.14 (0.83, 1.56)
Meat and meat alternatives products	34	181	32	184	0.22	0.64	1.09 (0.76, 1.58)
Dry fruit, preserved fruit	13	204	12	205	0.20	0.66	1.14 (0.64, 2.03)
Total non-core snacks	430	1092	393	1129	4.68	0.03	1.13 (1.01, 1.27)
Core snacks							
Fresh fruit, vegetable	52	164	50	166	0.06	0.81	1.04 (0.76, 1.42)
Nuts	32	182	30	184	0.15	0.70	1.08 (0.74, 1.58)
Beans or soy products	12	214	11	215	0.02	0.88	1.05 (0.58, 1.91)
Total core snacks	96	560	92	564	0.20	0.66	1.05 (0.84, 1.31)
Total snacks	526	1652	485	1693	2.17	0.14	1.11 (0.97, 1.28)

Table 4. The influence of advertisement on the beverages selection of children

Type of beverages	Students reporting their beverage preferences were influenced by TV advertisements		Students reporting their beverage preferences NOT influenced by TV advertisements		Pearson χ^2	<i>p</i> value	OR (95% CI)
	Number selecting as top 3 preference	Number not selected	Number selecting as top 3 preference	Number not selected			
Non-core beverages							
Carbonated beverages	118	92	98	112	7.25	0.01	1.45 (1.11, 1.91)
Tea drinks	110	98	98	110	3.00	0.08	1.27 (0.97, 1.67)
Fruit juice/drinks	61	150	51	160	2.43	0.12	1.28 (0.94, 1.73)
Energy drinks	58	156	50	163	1.40	0.24	1.21 (0.88, 1.64)
Milk beverages	46	162	42	165	0.36	0.55	1.11 (0.79, 1.55)
Drink powder	15	200	13	202	0.31	0.58	1.17 (0.68, 2.01)
Total non-core beverages	408	858	352	912	5.77	0.02	1.23 (1.04, 1.46)
Core beverages							
Plant protein based beverages	74	138	71	140	0.19	0.66	1.07 (0.80, 1.42)
Plain coffee	34	168	34	169	0.01	0.93	1.02 (0.71, 1.47)
Unflavoured tea	26	178	22	182	0.95	0.33	1.24 (0.81, 1.89)
Unflavoured milk	32	182	28	186	0.79	0.37	1.19 (0.81, 1.76)
Total core beverages	166	666	155	677	0.47	0.49	1.09 (0.85, 1.39)
Total beverages	574	1522	506	1589	11.36	0.01	1.18 (1.07, 1.31)

Data from this study showed that there is a high frequency of advertisements for non-core snacks particularly during peak viewing times, consistent with findings from other countries in the Asia-Pacific.¹⁴ The frequent and repeated exposure enhances children's memory of food products, plus many of the advertisements also introduced fun activities such as rewards, daily specials, and giveaway toys, adding to the attractiveness of the products and the impact of the advertisements. These tactics were commonly used in the non-core snack television advertisements. The impact of these advertisements on children's familiarity with these foods and their snack choices appears to be substantial.

The results of this study demonstrated childrens' explicit recognition of the influence of non-core snack and beverage advertisements on television. However, the actual prevalence and extent of influence may be greater, as children are not always aware of the specific influence of advertising on their own behaviour.²² As described in the reference, the link between TV viewing and poor diet was strongest for children who watched the most commercial television, and those who were actually exposed to advertisements embedded within programs.¹² In fact, high exposure to advertising of non-core foods is recognised as a contributor to childhood obesity.²³ As shown in this study, non-core foods are frequently advertised on Chinese television, and to date in China, there has been no policy or regulation on food advertisements targeted at children.²⁴

Regulations for television and food industry to limit non-core food advertising to children in China, particularly during children's peak viewing times, are warranted.²⁴ In 2010, WHO endorsed a set of recommendations for member countries to take action of reducing children's exposure to high fat, sugar, salt foods advertisement.²⁵ This could be achieved by regulatory and policy initiatives; "Food and beverages advertisements should not exploit children's inexperience or credulity".²⁶ It is suggested that if non-core food television advertisements were banned, the prevalence of overweight in children 3-11 years and 12-18 years could be decreased by as much as 10% and 12%, respectively.²⁷⁻²⁹

Some developed countries have taken policy action on food marketing to children; for example, France,³⁰ the UK³⁰ and Sweden.³¹ In Australia and the US, there is no government policy restriction on food marketing to children, rather self-regulation pledged by food industry to limit advertising of selected foods during children's programs.³⁰ Recent evidence showed that these pledges have not reduced children's exposure to unhealthy food marketing.^{17,22} Many Asian countries³² including China³³ have not yet moved towards developing explicit policies on food advertising targeting on children.

Limitations of research

There are a number of limitations identified in this study. The data of this research was collected in 2012; however, there has not being any change on snack or beverage advertising policy in China since then. This was a cross sectional study, and the representativeness of the data may be affected by the sampling method. The first two primary schools responded to invitation in this survey may not be the best to represent the whole research population and

cause selection bias. Television advertising, of course, is not the only factor that could influence children's snack and beverage consumption and preferences. Other reasons such as gender, family income, food availability and accessibility, other forms of media (such as poster, internet and newspaper), peer pressure and influences from their friends, classmates and family members were not explored.

In this study, programs on the three most popular channels were recorded, but there are more channels broadcast both on free air and cable television at the same time. While the study identified the most popular television channels, children's peak viewing hours and the non-core snack advertisements which children were most likely to be exposed to at a certain period of time, the advertisements watched directly by each individual child could not be identified.

Finally, it is recognized that this study is ecological, in that while we have observed high frequency of exposure to food advertising and high preference for similar snack foods, the study cannot indicate a direct causal influence. There is likely to be a number of concurrent influences, including changes in the availability of non-core foods, and increasing discretionary money available to children. Nevertheless the study does indicate that Chinese children are exposed to frequent advertising for many non-core snack foods and beverages; and that they identify these foods as preferred snack foods. This is important as an initial exploration of the links between exposure to advertising and food preferences in Chinese children.

Conclusion

Unhealthy snacks and beverages are consumed daily by Chinese children. This is likely to be influenced by a number of factors, including exposure to television advertisements. This study contributes useful evidence indicating that the high frequency of non-core snack and beverage TV advertisements appears to have an influence on children's food preferences, which is detrimental to health. Further research on Chinese children's food consumption patterns, and exposure to food marketing from television and other sources would strengthen the evidence and provide further guidance on appropriate policy actions. Given the current situation regarding food consumption patterns, food composition and advertising, and the limited regulations on both food labelling and food advertising in China, there is clearly scope for action, including implementation of the WHO recommendations on food marketing to children.

ACKNOWLEDGEMENTS

The authors would like to extend our gratefulness to Bridget Kelly for her advice on the television recording study, Deyun Qi from Hongkou District CDC of Shanghai for sharing the school age children diet behaviour questionnaire and her experience in the survey, and Kevin McGeechan for statistical guidance.

AUTHOR DISCLOSURES

The survey protocol was approved by the Human Research Ethics Committee at the University of Sydney. Informed consent was sought from the principals of schools, the participants and their parents. All parents were provided with an Information Sheet and invited to give consent for their child to participate.

The survey only included students who agreed to participate in the study and whose parents signed the consent form. The survey was administered by researchers and school teachers in the two primary schools, students were required to hand in the signed consent form first then and participate in the survey. The authors declare that they have no competing interests. The project was funded by an internal fund.

REFERENCES

1. Zhai F, Wang H, Du S, He Y, Wang Z, Ge K, Popkin BM. Prospective study on nutrition transition in China. *Nutr Rev*. 2009;67:S56-61.
2. Wang H, Zhai F. Programme and policy options for preventing obesity in China. *Obes Rev*. 2013;14:S134-40.
3. Shan XY, Xi B, Cheng H, Hou DQ, Wang Y, Mi J. Prevalence and behavioral risk factors of overweight and obesity among children aged 2-18 in Beijing, China. *Int J Pediatr Obes*. 2010;5:383-9.
4. Li M, Dibley MJ, Sibbritt D, Yan H. Factors associated with adolescents' overweight and obesity at community, school and household levels in Xi'an City, China: results of hierarchical analysis. *Eur J Clin Nutr*. 2008;62:635-43.
5. Li, M, Dibley MJ, Sibbritt DW, Yan H. Dietary habits and overweight/obesity in adolescents in Xi'an City, China. *Asia Pac J Clin Nutr*. 2010;19:76-82.
6. Jiang S. On the development trend of television advertisement. *J Nanjing Forestry University (Humanities and Social sciences Edition 2)*. 2002;3:46-8. (In Chinese)
7. International food and beverage alliance. Responsible Marketing & Advertising to Children. -IFBA letter to WHO Director-General Dr. Margaret Chan, 13 May, 2008. [cited 2016/03/16]; Available from: <https://ifballiance.org/our-commitments/responsible-marketing-advertising-to-children>.
8. Beijing Meilande Communication Strategy Consulting Corporation. Report of 2013 Meilande China television coverage and audience situation survey, 2013: 6. [cited 2016/02/29]; Available from: <http://www.cmmrmedia.com/uploads/soft/131029/1-131029103922.pdf>.
9. Anderson P M, Butcher, Kristin F. Childhood obesity: trends and potential causes. *Future Child*. 2006;16:19-45.
10. Boyland EJ, Harrold JA, Kirkham TC, Corker C, Cuddy J, Evans D, Dovey TM, Lawton CL, Blundell JE, Halford JC. Food commercials increase preference for energy-dense foods, particularly in children who watch more television. *Pediatr*. 2011;128:e93-100.
11. World Health Organization. A framework for implementing the set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva: World Health Organization; 2012.
12. Kelly B, Freeman B, King L, Chapman K, Baur L, Gill T. Television advertising, not viewing, is associated with negative dietary patterns in children. *Pediatr Obes*. 2016;11: 158-60.
13. Zhou W, Xia Q. Shanghai Yangpu District middle school and primary school children dietary behaviour survey. *Chin School Hygiene*. 2009;30:1131-2.
14. Kelly B, Halford JC, Boyland EJ, Chapman K, Bautista-Castaño I, Berg C et al. Television food advertising to children: a global perspective. *Am J Public Health*. 2010; 100:1730-6. doi: 10.1111/j.1467-789X.2004.00133.x.
15. Kelly B, Hebden L, King L, Xiao Y, Yu Y, He G et al. Children's exposure to food advertising on free-to-air television: an Asia-Pacific perspective. *Health Promot Int*. 2016;31:144-52; doi: 10.1093/heapro/dau055.
16. Wang L. China Television Rating Yearbook. Beijing: The communication university of China publishing house; 2011.
17. King L, Hebden L, Grunseit A, Kelly B, Chapman K. Building the case for independent monitoring of food advertising on Australian television. *Public Health Nutr*. 2012;4:1-6.
18. National Bureau of Statistics of the Peoples' Republic of China. Tabulation on the 2010 population census of the People's Republic of China. Beijing: National Bureau of Statistics of the Peoples' Republic of China; 2010.
19. Chinese Nutrition Society. Dietary Guideline for Chinese Residence. China: Tibet people's Publishing House; 2007.
20. Yu H. Food additives threaten children's health. *Child Hygiene J*. 2012;20:15-20. (In Chinese)
21. Malik, V S, Matthias B S, Frank B H. Intake of sugar-sweetened beverages and weight gain: a systematic review. *Am J Clin Nutr*. 2006;84:274-88.
22. Australian Food and Grocery Council. Non-core food and beverage advertising to children on Australian television research report. Australia ACT: Australian Food and Grocery Council; 2012. p. 8.
23. Cairns G, Angus K, Hastings G. The extent nature and effects of food promotion to children: a review of the evidence to December 2008. Prepared for the World Health Organization. United Kingdom: Institute for Social Marketing, University of Stirling; 2009.
24. Wang, J. Children's Health and the Government Management on Unhealthy Food Advertisements. *Journal Q*. 2011;107:7.
25. World Health Organization. Set of recommendations on the marketing of foods and non-alcoholic beverages to children. Geneva: World Health Organization; 2010.
26. World Health Organization. Global Strategy On Diet, Physical Activity and Health: Agenda Item 12.6. Proceedings of the 57th World Health Assembly. Geneva: World Health Organization; 2004.
27. Chou S, Rashad I, Grossman M. Fast-food restaurant advertising on television and its influence on childhood obesity. *J Law Econ*. 2008;51:599-618; doi: 10.1086/590132.
28. Livingstone S. New research on advertising foods to children An updated review of the literature. Television advertising of food and drink products to children Research Annexes 9-11. London: Office of Communications; 2006.
29. Magnus A, Haby MM, Carter R, Swinburn B. The cost-effectiveness of removing television advertising of high-fat and/or high-sugar food and beverages to Australian children. *Int J Obes*. 2009;33:1094-102.
30. Hawkes C, Lobstein T. Regulating the commercial promotion of food to children: a survey of actions worldwide. *Int J Pediatr Obes*. 2011;6:83-94.
31. National Council of Better Business. Children's Advertising Review Unit. National Council of Better Business. 2003. [cited 2016/02/29]; Available from: <https://www.ftc.gov/system/files/attachments/press-releases/revised-childrens-on-line-privacy-protection-rule-goes-effect-today/130701carusa-feharborapp.pdf>.
32. World Health Organization, Western Pacific Regional Office. WHO Japan-WHO regional consultation for promoting healthier dietary options for children. Manila: World Health Organization, Western Pacific Regional Office; 2012.
33. World Health Organization. Obesity and overweight fact sheet, Geneva: World Health Organization; 2013.