

Non-core food product advertising on free-to-air television in Hong Kong

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Abstract

Objective: To study the extent and nature of free-to-air television advertisements for non-core products (e.g. fast food or soda) directed at children in Hong Kong.

Design: Television programs from two major Hong Kong free-to-air television channels airing between 6:00 and 24:00 from October 2018 to January 2019 were recorded. Eight nonconsecutive days (four weekdays and four weekend days) were selected for analysis. Pearson's χ^2 tests were conducted to compare the pattern of food advertisements by program categories, days of the week, television viewing periods, and persuasive marketing techniques.

Setting: Free-to-air television programs.

Participants: N/A.

Results: Of the 10,348 commercials identified, 18.4% were for foods, and 35.2% of these were for non-core items. Baby and toddler milk formula (19.5%) were the most advertised food products, while the most frequently advertised non-core food was fast foods (12.3%). There was a higher non-core to core product ratio during prime time than the children's time slot (7 vs. 1.7). Non-sports celebrity endorsement (27.1%) was the most frequently used persuasive marketing technique overall, while that for non-core products was sensory characteristics (38.2%). Most food product placements recorded were non-core products, mentions of local and fast food restaurants, and recipe additions.

Conclusions: Non-core products were highly advertised in Hong Kong, while core product advertising was infrequent. Regulations on junk food advertising in Hong Kong should focus on prime time, as well as on food product placement, to reduce children's exposure to persuasive junk food marketing.

Keywords: junk food, non-core food product advertising; television; Hong Kong; product placement

24 INTRODUCTION

25 Childhood obesity is one of the most prevalent 21st-century epidemics around the world⁽¹⁾, including Hong
26 Kong, where the term “children” is commonly used to refer to any person aged 17 years or below⁽²⁾. The
27 Department of Health estimates that one in five Hong Kong primary school students is now overweight
28 or obese⁽³⁾. Insulin resistance and lowered taste sensitivity among obese children may potentially hinder
29 their ability to manage their weight in the future^(4,5,6), and many of them are likely to stay obese through
30 adolescence and adulthood⁽⁷⁾. Advertising for non-core food products, defined as items which are surplus
31 to a healthy diet (such as fast food, candy, or soda)⁽⁸⁾, is believed to be one possible cause of childhood
32 obesity^(9,10). Advertisements promoting energy-dense and micronutrient-poor foods are potentially
33 associated with a higher prevalence of childhood obesity, while those encouraging healthier diets have a
34 weaker negative association with the proportion of obese children⁽¹¹⁾. In contrast to other countries, in
35 Hong Kong, non-core food product advertisements on television appear to be less specifically directed at
36 children, and a wide range of culturally specific foods are promoted. Furthermore, the Hong Kong free-
37 to-air television market is dominated by two broadcasters (TVB and ViuTV)⁽¹²⁾, with TVB having the
38 biggest share of the audience and market^(13,14). The third broadcaster only broadcasts to selected buildings
39 with their optical network, and as such has a much smaller market share. Such a concentrated market is
40 unlike those in any Western countries previously studied, and whether this influences the types of food
41 advertisements shown is worth investigating.

42
43 Apart from the advertisements aired during commercial breaks, product placement has emerged as a new
44 marketing technique to incorporate product promotion into television programs. This new technique is
45 known as “indirect advertising”⁽¹⁵⁾. Indirect advertising is not restricted if “it is presented in a natural and
46 unobtrusive manner having regard to the program context and genre” and “there is no direct
47 encouragement of purchase or use of products/services”⁽¹⁵⁾. A number of studies have shown that the
48 audience feels hungrier when they see food on the screen and that they can recall the product better after
49 being exposed to product placements. The effect can be strengthened by repeating product exposure or
50 having characters interact with food products. The reminder effect is hence considered to potentially affect
51 the final product choice^(16,17,18). Research on indirect advertising in the Hong Kong market is still at an
52 early stage, where there are neither qualitative nor quantitative assessments.

53
54 Previous studies on the extent and nature of television food advertising concluded that the non-core food

55 advertising rate was higher during children's viewing time^(19,20,21,22,23,24). On the contrary, the literature
56 shows that prime time is more likely to be associated with the airing of advertisements for non-core
57 products than advertisements for core products (defined as items that form part of a healthy diet such as
58 vegetables and fruits)^(25,26,27,28). As programs (and advertisements) aired during prime time are expected
59 to have higher ratings, and children are not prohibited from watching television during prime time, both
60 children's peak viewing time and prime time should be analyzed in order to carry out a comprehensive
61 study on junk food advertising.

62

63 Although children are not the direct purchasers, they are allowed to exercise their food preferences⁽²⁹⁾. An
64 econometric study estimates that a ban on fast food advertising could reduce the number of overweight
65 children by 18%⁽³⁰⁾. Non-core food and beverage advertising is regulated in various ways in different
66 countries. For example, in South Korea, advertising for all empty calorie (energy-dense and nutrient-poor)
67 foods was prohibited during the children's time slot⁽³¹⁾. In contrast, high fat, sugar, and salt (HFSS) food
68 product advertising is restricted mandatorily in Taiwan, Ireland, and Chile, either by banning junk food
69 advertising during times when children may watch television (e.g., non-school time) or regulating the
70 persuasive power of advertisements, such as by disallowing them from being directed at children (e.g.,
71 through the use of cartoons)^(32,33,34). Norway and Sweden have even banned all food advertising on
72 television designed to attract the attention of children^(32,34,35). The UK took the lead in introducing a
73 statutory ban on food advertising for children. In 2007, the Office of Communications (OfCom), a UK
74 government-approved authority, implemented a nutrient profiling model to score food products based on
75 their negative nutrient content that can be offset by positive nutrients⁽³³⁾. Food and beverages with scores
76 ≥ 4 and ≥ 1 , respectively, cannot be advertised on television⁽³³⁾. OfCom estimates that children were
77 exposed to 37% less HFSS advertising on television in 2009, two years after the regulation was
78 introduced⁽³⁶⁾. There is no comparable legislation or policy regarding junk food advertising in Hong Kong,
79 likely owing to the lack of underlying data to support the development of such regulations.

80

81 Therefore, the objective of this study is to examine the characteristics of free-to-air television
82 advertisements for non-core products directed at children in Hong Kong. This study aims to describe and
83 compare the pattern of food advertising in different television viewing periods and program categories,
84 and to assess the use of persuasive food marketing techniques in food advertisements to assist the Hong
85 Kong government in formulating regulations on non-core food advertising.

86 **METHODS**

87 *Sampling*

88 The INFORMAS research protocol was adopted in this study⁽³⁷⁾. This international protocol aims to
89 monitor the frequency and level of children's exposure to non-core food and non-alcoholic beverage
90 promotion, as well as the power of such promotions. Programs and advertisements broadcast on the two
91 major free-to-air channels in Hong Kong, TVB Jade (channel 81) and ViuTV (channel 99), were recorded
92 from Sunday, October 28, 2018 to Saturday, January 26, 2019. A random sample of eight nonconsecutive
93 days (four non-repeating weekdays and four weekend days) was selected for data coding and analysis, per
94 the INFORMAS protocol⁽³⁷⁾. Nonconsecutive days in consecutive weeks were chosen to minimize
95 repeating advertisements during the rebroadcasting period while ensuring data stability. Also, holidays
96 were excluded to avoid an overabundance of holiday-related advertisements. Television programs were
97 recorded between 06:00 and 24:00 each day, for a total time of 144 hours per channel.

98

99 *Television viewing periods*

100 Television viewing periods were defined as children's vs. non-children's time slots, and prime time vs.
101 non-prime time, by referring to the electronic program guide. The children's time slot was defined as
102 16:00–18:00 daily and 9:00–11:00 on Saturdays and Sundays. Programs broadcast during these periods
103 were all aimed at children (cartoons, children's variety shows, and educational programs); other periods
104 were defined as the non-children's time slot for comparison. Prime time was defined as 20:00–23:00 daily.
105 Programs broadcast in these periods were dramas and variety shows with a higher rating; other periods
106 were grouped as non-prime time for comparison.

107

108 *Data coding*

109 As per the INFORMAS protocol, channel, date, day of the week, program name and category during
110 which the advertisement was shown, advertisement product type, and food advertisement data (time slot,
111 company name, product name, product category, power of advertising (e.g., cartoon character or image of
112 a child, premium offers [e.g., price discount], brand benefit claims [e.g., new brand development],
113 nutrition and health claims, and advercation [e.g., product ingredient detail]) were coded⁽³⁷⁾. Product
114 advertisements were also analyzed for the total occurrence in terms of repeating rate (i.e., number of times
115 the product was advertised within the sampling period). For the most frequently advertised product, the
116 use of persuasive food marketing techniques was assessed independently.

117

118 For indirect advertising, another coding system was developed to analyze the power of product placement.
119 Similar to the abovementioned protocol for commercials, basic information such as time of advertising
120 and category of food being advertised was recorded. For persuasive marketing strategies, a seven-level
121 model was used.

122

- 123 1. Logos or text message addressing the brand name
- 124 2. Products prominently displayed or in the background, no direct interaction with the products
- 125 3. Interaction with the products (e.g., eating, using), no description of the products
- 126 4. Interaction with the products, description of sensory characteristics (taste, texture, appearance,
127 aroma)
- 128 5. Interaction with the products, description of nutrients, and other functional claims
- 129 6. Product promotion as one of the program sections
- 130 7. Product promotion throughout the program

131

132 All advertisements were screened and coded. For food classification, we adopted the INFORMAS
133 classification of “core products,” “non-core products,” and “miscellaneous” based on food nature and
134 processing methods (**Table S1**)⁽³⁷⁾. According to the Australian Dietary Guidelines, healthy foods were
135 categorized as “core foods” as they should be the main components of a balanced diet; while non-core
136 food products are considered surplus to a balanced diet⁽⁸⁾. As products under the miscellaneous category
137 were heterogeneous, they were analyzed separately.

138

139 *Statistical analysis*

140 Data were analyzed using SPSS (version 25, IBM Corp. New York, USA). Frequency of food product
141 advertising was calculated and analyzed. Pearson’s χ^2 test was conducted to compare the proportions of
142 food advertisements for different program categories, days of the week, television viewing periods, and
143 persuasive marketing techniques, with $p < 0.05$ considered statistically significant.

144

145 **RESULTS**

146 **Direct advertising during commercial breaks**

147 *Overall food advertising*

148 During the study period, there were a total of 10,348 advertisements, of which 18.4% were for foods.
149 Prime time had a higher proportion of advertisements for foods (25.6%) than the overall sampling period,
150 while the children's time slot had a similar proportion of advertisements for foods (18.0%) as the overall
151 sampling period. Although non-core products were frequently advertised, comprising 35.2% of all food
152 advertisements, the most frequently advertised product type overall was baby and toddler milk formula
153 (19.5%), followed by dietary supplements (12.9%). Meanwhile, the entire core products group only
154 accounted for 8.5% of the food advertisements recorded (**Figure 1**). Furthermore, for core product
155 advertising, very different patterns were observed during the children's time slot and prime time. During
156 the children's time slot, core product advertisements stood at 18.3%, compared to 6.8% during the non-
157 children's time slot ($\chi^2_1 = 38.97, p < 0.001$). During prime time, core product advertisements decreased to
158 4.8%, compared to 9.6% during non-prime time ($\chi^2_1 = 10.64, p = 0.001$). Hence, the non-core product to
159 core product advertisement ratio was the highest during prime time (7:1) and the lowest during the
160 children's time slot (1.7:1). There were no significant differences between weekdays and weekends for
161 core and non-core product advertisement distribution ($p > 0.05$).

162 163 *Core and non-core product advertising across television viewing periods*

164 The food advertising pattern during prime time was similar to the overall distribution. Fast foods, which
165 were overall the most frequently advertised non-core products (12.3% of all food advertisements), were
166 also the most advertised non-core products during prime time (12.1% of all food advertisements during
167 prime time) (**Figure 2a**). With regard to core products, meat and meat alternatives were the most
168 frequently captured overall (3.8%) and also during prime time (2.6%) (**Figure 2b**). However, the pattern
169 during the children's time slot was less coherent. Chocolate and candy (10.1% of all food advertisements
170 during the children's time slot) (**Figure 2a**) and healthy snacks (7.8%) (**Figure 2b**) were the most
171 advertised non-core and core products, respectively. Vegetable and fruit advertisements were spotted only
172 five times during the 288 hours of study. Vegetable advertisement was absent in both prime time and the
173 children's time slot while fruit advertisement was only spotted once during prime time and once during
174 the children's time slot.

175 176 *Persuasive marketing techniques*

177 Approximately 56% of food advertisements used persuasive marketing techniques, with endorsement by
178 non-sports celebrities (27.1%) being the most frequently used. In non-core product advertising,

179 highlighting sensory characteristics was the most common strategy (38.3%) and there were more non-core
180 products utilizing this marketing technique than core and miscellaneous foods ($\chi^2_1 = 87.12, p < 0.001$).
181 Meanwhile, core products placed more emphasis on claims ($\chi^2_1 = 80.90, p < 0.001$) (**Table 1a**). For the
182 most advertised product type, baby and toddler milk formula, including general nutrition advertisement
183 (82.0%), nutrient and functional claims (79.8%), and emphasizing “for kids” (51.9%), were the common
184 marketing techniques (**Table 1b**). It is also the main product type utilizing nutrient and other functional
185 claims in their advertisements ($\chi^2_1 = 911.12, p < 0.001$).

186

187 *Repeating rate*

188 Television advertisements had a high repeating rate. Twenty-three out of 253 advertisements repeated over
189 20 times during the study, and five of them repeated over 50 times. The most frequently advertised product
190 was a baby milk formula; this advertisement was aired 99 times. The most frequently advertised non-core
191 and core product brands were “Pizza Hut’s Hawaiian paradise pizza and Portuguese chicken rice” (52
192 times) and the “Donald Russell sirloin steak” (37 times), respectively (**Table S2**).

193

194 **Indirect advertising through product placements**

195 *Prevalence of food product placements and distribution by food categories*

196 A total of 51 food product placements, 37 on TVB and 14 on ViuTV, were recorded during the study, with
197 an average of 3.2 food product placements per channel per day. Non-core products were the most
198 frequently advertised group, accounting for 45.1% of all product placements. In contrast, core products
199 were again the least advertised (7.8%) (**Figure 3**).

200

201 *Distribution of food product placements by television program and persuasive strategy*

202 The main type of program that included indirect advertising was variety shows (47.1%) (**Figure 4**). Of
203 the 51 programs with product placements, 61.4% were newly produced local programs, 21.1% were
204 acquired programs, and 17.5% were rebroadcast programs. The major advertising strategies for food
205 product placement were displaying the products prominently or keeping them in the background without
206 direct interaction with them (27.5%). On the contrary, in 17.6% of food product placements, the product
207 was promoted in one of the program sections (**Table 2**).

208

209 **DISCUSSION**

210 This study examined the pattern of food advertising across television viewing periods and program
211 categories, and assessed the use of persuasive marketing techniques in food advertisements. Baby and
212 toddler milk formula and dietary supplements were identified as two major product types being promoted
213 on Hong Kong television. Regarding food categories, non-core products were the most frequently
214 advertised (35.2% of food advertisements) in Hong Kong, which is in line with international
215 studies^(19,20,21,22,23,24). The rate of non-core product advertising in Hong Kong was 2.3 advertisements per
216 channel hour, which is lower than the reported global average of 3.4⁽²⁰⁾ and the Asia-Pacific average of
217 6.0⁽²²⁾. However, as the proportion of core product advertising in Hong Kong was quite low, the non-core
218 product to core product advertising ratio (4.0:1) was higher than in the UK (2.9:1)⁽²⁰⁾ and South Korea
219 (1.6:1)⁽³⁸⁾.

220

221 *Quality of food advertised*

222 The types of food products advertised in Hong Kong were, on the whole, unsatisfactory. According to the
223 World Health Organization, the food marketed to children is mainly HFSS products⁽³⁹⁾. Advertisements
224 for HFSS food products were commonly found in Hong Kong's television commercials, such that fast
225 food, chocolate and candy, sweets or high-fat savory biscuits, and sugar-sweetened drinks were some of
226 the leading food products being advertised. Owing to the high non-core product to core product ratio in
227 Hong Kong, the quantity of non-core product advertising needs to be reviewed. In the meantime, the
228 quality of core product advertising should also be studied. The most worrying finding is that there is a
229 severe lack of vegetable and fruit advertisements in Hong Kong. In the 288 sample hours, vegetables and
230 fruits were advertised only five times (0.26% of food advertisements). This proportion is much lower than
231 the Asia-Pacific average (2%)⁽²²⁾. Hence, the nature and extent of food advertising must be regulated to
232 reduce children's exposure to low-quality food in Hong Kong. The government must incorporate a scoring
233 system, perhaps by referring to the UK's nutrient profiling model, in order to review and screen food
234 product advertisements based on their quality.

235

236 *Food advertising patterns across television viewing periods*

237 Despite the consistent findings across the world^(19,20,21,22,23,24), we did not observe a higher rate of non-
238 core food product advertising during the children's time slot. However, with a higher non-core to core
239 product ratio and an overall increased food advertising rate during prime time, children in Hong Kong are
240 exposed to considerably more non-core product advertising. This phenomenon is not unique to Hong Kong.

241 In the UK, children were frequently exposed to non-core product advertising during prime time such that,
242 in the worst case, nine non-core product advertisements were aired in half an hour⁽²⁸⁾. Worse still,
243 researchers determined that children nowadays watch the most television during prime time, not the
244 designated “children’s time slot”⁽²⁷⁾. Hence, when developing regulations on non-core food product
245 advertising in Hong Kong, the focus must be on prime time. Simply borrowing regulations from other
246 countries where the focus is largely on the children’s time slot will not prove effective in protecting
247 children in Hong Kong from junk food advertising.

248

249 *Persuasive marketing techniques in food advertising*

250 Our results reflect that when it comes to food products, advertisers in Hong Kong utilize a different set of
251 persuasive marketing techniques than advertisers in other countries. Techniques commonly used in non-
252 core product advertising in other countries, such as promotional characters and premium
253 offers^(19,20,21,22,23,24), are not frequently used in Hong Kong. Instead, non-core product advertising in Hong
254 Kong emphasizes sensory characteristics (e.g., appearance and taste) and emotive claims (e.g., having fun
255 and happiness). It may be that the non-core food product advertisements in Hong Kong are not specifically
256 aimed at children but the general television audience. When adults are part of their target group, food
257 companies may reduce the use of cartoon characters in favor of more general and pleasant stimuli, such
258 as visual elements, in their advertisements. However, unlike other countries where health claims are
259 commonly used in non-core food product marketing⁽⁴⁰⁾, in Hong Kong, health claims (especially nutrient
260 and other functional claims) are utilized mostly in baby and toddler milk formula advertising, as the
261 purchase decision for these products relies heavily on their nutrition profile. This could also suggest that
262 food companies believe that other features of their products, such as the sensory characteristics mentioned
263 above, are more appealing to their target audience than health benefits.

264

265 *Most advertised products in Hong Kong and the possible consequences of overwhelming advertising*

266 A substantial number of advertisements for baby and toddler milk formula and dietary supplements were
267 recorded in this study. Although these products are less influential to children, excessive advertising may
268 lead to negative feedback. In 2013, infant and follow-up formula consumption volume in Hong Kong was
269 12.9 times higher than the average of high-income countries (19.9 kg per infant/child)⁽⁴¹⁾. Although the
270 data are considered to be greatly affected by cross-border purchases by mainland Chinese, in 2018, long
271 after the regulation on export of powdered formula introduced in 2013, milk formula brands were still the

272 top spending advertisers of TVB (which has a market share in TV broadcasting of over 85%⁽⁴²⁾). As
273 nutritional benefits are usually emphasized while the strengths of breast milk are understated⁽⁴³⁾,
274 researchers have found that overabundant infant formula advertising may convey the message that
275 breastfeeding is not necessarily associated with desirable outcomes, thus reducing the number of women
276 who breastfeed their infants⁽⁴⁴⁾. As per the latest survey, in Hong Kong in 2018, the exclusive breastfeeding
277 rate for the first six months was 26.3%⁽⁴⁵⁾, much lower than the global average of 38% and the WHO
278 target of 50%^(46,47). Considering the potential link between breastfeeding and reduced risk of childhood
279 obesity indicated in systematic reviews^(48,49), in 2017, in an effort to improve breastfeeding rates, the
280 voluntary “Hong Kong Code” was implemented. According to this code, which aims to “protect
281 breastfeeding and contribute to the provision of safe and adequate nutrition for infants and young children,
282 based on adequate and unbiased information and through appropriate marketing”⁽⁵⁰⁾, milk formula for
283 children under 36 months old cannot be promoted on television. Our results showed that the code was
284 breached by many baby and toddler milk formula manufacturers, suggesting the abidance to the voluntary
285 code was low. Although we determined that it was mostly advertisements of stage 4 milk formula that
286 were aired during the study period, the images of happy and intelligent kids under three years old may
287 still persuade mothers to choose formula over breastmilk. The high repetition rate and overwhelming
288 health claims in baby milk formula advertising, which lie outside the scope of the Hong Kong Code, may
289 have an excessively negative impact on mothers’ confidence in breastfeeding⁽⁴⁴⁾.

290

291 Meanwhile, there is a paucity of breastfeeding support policies in Hong Kong. Although the government
292 is considering introducing regulations prohibiting discrimination against public breastfeeding, they cannot
293 protect mothers from harassment. Worse still, spaces and equipment aiding breastfeeding are insufficient
294 in both offices and public areas in Hong Kong as they are not required by law. Therefore, to improve the
295 exclusive breastfeeding rate, the government should implement mandatory regulations for employers to
296 provide secure and well-equipped environments for breastfeeding.

297

298 Health products containing Chinese herbs are another culturally specific food type being heavily promoted
299 in Hong Kong. Herb-containing products were not considered as food according to the INFORMAS
300 protocol; however, these products were captured from time to time throughout the study. Thus, the
301 television audience is actually being exposed to numerous dietary supplements containing pharmaceutical
302 or Chinese herbal ingredients. Some of the products may not fulfill their functional claims while the

303 general public may misunderstand the claims and their own needs. At present, there are no specific
304 regulations on dietary supplements. Even the very definition of what constitutes a “dietary supplement”
305 is ambiguous; the concept is a mixture of food and drugs. The government should, thus, clarify what
306 constitutes a “dietary supplement” and restrict the related advertisements before misleading advertising
307 poses a health risk to consumers.

308

309 *Food product placements in Hong Kong*

310 In Hong Kong, the food products used for placements are even healthier than those directly advertised
311 in commercials: over 80% of product placements in programs are for non-core products, local and fast
312 food restaurants, and recipe additions (oil and sauce). The majority of non-core product placements in
313 Hong Kong are included in variety shows and series, which are not specifically aimed at school-age
314 children. This is a unique finding when compared to the UK and Ireland, where fast food and sugar-
315 sweetened beverages were mainly incorporated into teen programs⁽⁵¹⁾. Therefore, assessing the quality,
316 not quantity, of food product placement in Hong Kong may be important when assessing persuasive power.
317 Over a quarter of food product placements in Hong Kong involve no direct interaction with the product,
318 but the exposure rate is indeed very high. Repeated exposure of the same product makes the product
319 placement more impressive. Besides, half of the food product placements involved interactions with the
320 products, such that familiar program settings would strengthen the recall effect, making consumers more
321 willing to choose the products^(16,17,18). Although the direct effect of food product placement on childhood
322 obesity is yet to be investigated, taking the persuasiveness of product placement into account, non-core
323 food product placement, which cannot be easily avoided, can have far-reaching repercussions on health.
324 Therefore, the government should not further loosen the regulations on food product placement but control
325 the quality and quantity of food product placement in television programs (especially variety, series, and
326 soap opera).

327

328 *Limitations*

329 The methodological problems in the research design limit our interpretations. The validity and
330 repeatability of the results are potentially affected by the single rater’s background knowledge. Moreover,
331 our exploratory study included only eight nonconsecutive days from October 2018 to January 2019 in the
332 dataset. As children’s vacation period and some seasonal variations in advertising were missed, the
333 generalizability of our findings is limited.

334

335 *Future directions*

336 As a Western protocol may not accurately reflect the Hong Kong scenario with regard to advertisement
337 types and persuasive marketing techniques, a more culturally specific coding system must be developed.

338 As program preview is surprisingly found as a major advertisement type in Hong Kong during the study,
339 future research should include program previews involving scenes featuring a substantial amount of
340 cooking or eating as food advertisements.

341

342 Given our observation of frequent breaches to the voluntary Hong Kong Code, its effectiveness should be
343 formally evaluated, for example via annual audits of the number of breaches to confirm changes in baby
344 and toddler milk formula promotion practice, or lack thereof. Studies investigating the effectiveness of
345 visual and audible messages during baby milk formula advertisements to remind consumers that
346 breastfeeding is the preferred feeding mode should also be conducted. Information gathered from these
347 studies will provide the government with a strong evidence base to support further expansion of its efforts
348 in promoting breastfeeding in Hong Kong via legislation (e.g. a total ban of formula milk promotions) and
349 other strategies.

350

351 Determining whether Chinese (or Korean) herbal ingredients should be classified as drugs or dietary
352 supplements is also required. This study could not fully assess the nature and extent of product placement
353 because of the difficulty in quantifying the occurrence of products. Instead, the duration of food product
354 placement can be assessed in future studies. Moving away from free-to-air television, advertisements on
355 new platforms could also be studied. Owing to the shortened product life cycle, the present situation in
356 Hong Kong is such that there are fewer advertisements on television, with companies trying to promote
357 their products on social media platforms or video sharing websites, which allow a shorter promotion period.
358 Moreover, the new generation in Hong Kong is more fascinated with social media and online videos, such
359 that children and teenagers could face greater exposure to advertising on these platforms than on television.
360 Future studies should, therefore, examine the nature and extent of non-core food product advertising on
361 social media platforms or video sharing websites.

362

363 **CONCLUSION**

364 The overall results indicate that non-core products, such as fast food, candy, or soda, are the most

365 advertised food category in Hong Kong in both commercials and product placements, and core product
366 advertising is noteworthily low. In contrast to existing research from other countries, the highest non-core
367 product to core product ratio was found during prime time but not the children's time slot. Therefore,
368 instead of focusing on just the children's time slot, non-core food advertising during prime time should
369 also be regulated. The worryingly unhealthy nature of food product placements observed in this study
370 suggests that this new marketing strategy should not be ignored in non-core food marketing policy
371 development. The substantial number of advertisements for baby and toddler milk formula observed in
372 this study suggests that the voluntary advertising code was not abided by all manufacturers, and a total
373 ban of the promotion of these products may be required to shield new parents from the exposure of milk
374 formula promotions.

375

376 **Additional file**

377 **Table S1.** Rate of advertisements per hour by food category. **Table S2.** Frequency of food and beverage
378 advertisements by brand.

379

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486 **Table 1a** Persuasive marketing techniques applied in food and drinks advertisements during commercial breaks

Persuasive marketing techniques ^a	advs ^b		non-core products		core products		misc products	
	<i>n</i> ^c	%	<i>n</i> ^c	%	<i>n</i> ^c	%	<i>n</i> ^c	%
Power of advertising								
no strategies used	838	44.0	427	63.6	41	25.5	370	34.5
strategies used	1067	56.0	244	36.4	121	74.5	702	65.5
<i>Celebrity (non-sports)</i>	516	27.1	157	23.4	64	39.8	295	27.5
<i>'For kids'</i>	297	15.6	29	4.3	28	17.4	240	22.4
<i>Non-sports/historical events/festivals</i>	116	6.1	22	3.3	5	3.1	89	8.3
<i>Awards</i>	55	2.9	2	0.3	2	1.2	51	4.8
<i>Cartoon/Company owned character</i>	49	2.6	12	1.8	21	13.0	16	1.5
<i>Licensed character</i>	20	1.0	14	2.1	0	0.0	6	0.6
<i>Sports event</i>	8	0.4	8	1.2	0	0.0	0	0.0
<i>Famous sportsperson</i>	6	0.3	0	0.0	0	0.0	6	0.6
Premium offers								
no premium offers	1445	75.9	490	73.0	99	60.9	857	79.9
with premium offers	460	24.1	181	27.0	63	39.1	215	20.1
<i>Price discount</i>	204	10.7	136	20.3	9	5.6	59	5.5
<i>Gift or collectable</i>	197	10.4	18	2.7	44	27.3	134	12.5
<i>20% extra or other</i>	29	1.5	6	0.9	10	6.2	13	1.2
<i>Limited edition</i>	16	0.8	16	2.4	0	0.0	0	0.0
<i>Pay 2 take 3 or other</i>	14	0.7	5	0.7	0	0.0	9	0.8
Brand benefit claims								
no strategies used	349	18.3	75	11.2	23	14.3	251	23.4
strategies used	1556	81.7	596	88.8	139	85.7	821	76.6
<i>Emotive claims (fun, feelings, popularity)</i>	485	25.5	198	29.5	24	14.9	263	24.5
<i>Sensory based characteristics (taste, texture, appearance, aroma)</i>	458	24.0	257	38.3	57	35.4	144	13.4
<i>Suggested users are children or whole family</i>	218	11.4	99	14.8	25	15.5	94	8.8
<i>Price</i>	138	7.2	19	2.8	11	6.8	108	10.1
<i>New brand development</i>	130	6.8	14	2.1	7	4.3	109	10.2

	advs ^b		non-core products		core products		misc products	
	<i>n</i> ^c	%	<i>n</i> ^c	%	<i>n</i> ^c	%	<i>n</i> ^c	%
Persuasive marketing techniques^a								
<i>Suggested use</i>	57	3.0	8	1.2	6	3.7	43	4.0
<i>Puffery (claiming to be advantageous over other products)</i>	54	2.8	1	0.1	8	5.0	45	4.2
<i>Convenience</i>	16	0.8	0	0.0	0	0.0	16	1.5
Claims								
no claim present	1089	57.2	578	86.1	38	23.6	473	44.1
claim present	816	42.8	93	13.9	124	76.4	599	55.9
<i>Nutrient & other function claim</i>	416	21.8	12	1.8	0	0.0	404	37.7
<i>Health related ingredients claims</i>	130	6.8	19	2.8	0	0.0	110	10.3
<i>Other claims (e.g. organic)</i>	127	6.7	9	1.3	86	52.8	33	3.1
<i>General health claims</i>	75	3.9	46	6.9	0	0.0	29	2.7
<i>Nutrient comparative claims</i>	39	2.0	0	0.0	38	23.6	1	0.1
<i>Nutrient content claims</i>	25	1.3	7	1.0	0	0.0	18	1.7
<i>Reduction of disease risk claims</i>	4	0.2	0	0.0	0	0.0	4	0.4
Advercation								
no advercation present	1216	63.8	627	93.4	148	91.3	442	41.2
advercation present	689	36.2	44	6.6	14	8.7	630	58.8
<i>General nutrition</i>	457	24.0	0	0.0	1	0.6	456	42.5
<i>Details on product ingredients</i>	232	12.2	44	6.6	13	8.1	175	16.3

487 ^a Categories with no input were not listed

488 ^b Include core products, non-core products and miscellaneous

489 ^c *n* for each technique category: overall = 1905; non-core products = 671; core products = 162; miscellaneous products = 1072.

490 **Table 1b** Persuasive marketing techniques applied in baby and toddler milk formula advertisements ($n =$
 491 372 for each technique category) during commercial breaks

Persuasive marketing techniques ^a	advs	
	n	%
Power of advertising		
no strategies used	6	1.6
strategies used	366	98.4
<i>'For kids'</i>	193	51.9
<i>Celebrity (non-sports)</i>	141	37.9
<i>Awards</i>	32	8.5
Premium offers		
no premium offers	372	100
Brand benefit claims		
no strategies used	88	23.7
strategies used	284	76.3
<i>Emotive claims (fun, feelings, popularity)</i>	186	50.0
<i>New brand development</i>	90	24.2
<i>Suggested users are children or whole family</i>	8	2.2
Claims		
no claim present	6	1.6
claim present	366	98.4
<i>Nutrient & other function claim</i>	297	79.8
<i>Health related ingredients claims</i>	40	10.8
<i>Other claims (e.g. organic)</i>	29	7.8
Advercation		
no advercation present	67	18.0
advercation present	305	82.0
<i>General nutrition</i>	305	82.0

492 ^a Categories with no input were not listed

493 **Table 2:** Advertising strategies used in food product placements ($n = 51$)

Advertising strategies	Product Placement	
	n	%
No interactions with the product	28	54.9
<i>logos or text message addressing the brand name</i>	14	27.5
<i>products prominently displayed or in the background, no direct interaction with the products</i>	14	27.5
With interactions with the product	23	45.1
<i>interaction with the products (e.g. eating, using), no description of the products</i>	9	17.6
<i>interaction with the products, description on the sensory based characteristics (taste, texture, appearance, aroma)</i>	5	9.8
<i>interaction with the products, description of nutrient and other functional claims</i>	0	0.0
<i>product promotion is included as one of the program sections</i>	9	17.6
<i>product is being promoted throughout the program</i>	0	0.0

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495

496 **FIGURE LEGENDS**

497 **Figure 1** – Types of products advertised ($n = 1905$)

498 **Figure 2** – (a) Top 6 types of non-core products advertised overall and by viewing time periods; and (b)

499 Top 6 types of core products advertised overall and by viewing time periods. Number of food

500 advertisements analyzed: overall: $n = 1905$; children's time: $n = 268$; and prime time: $n = 461$

501 **Figure 3** – Types of products advertised as product placements

502 **Figure 4** – Types of programs with product placements ($n = 51$)

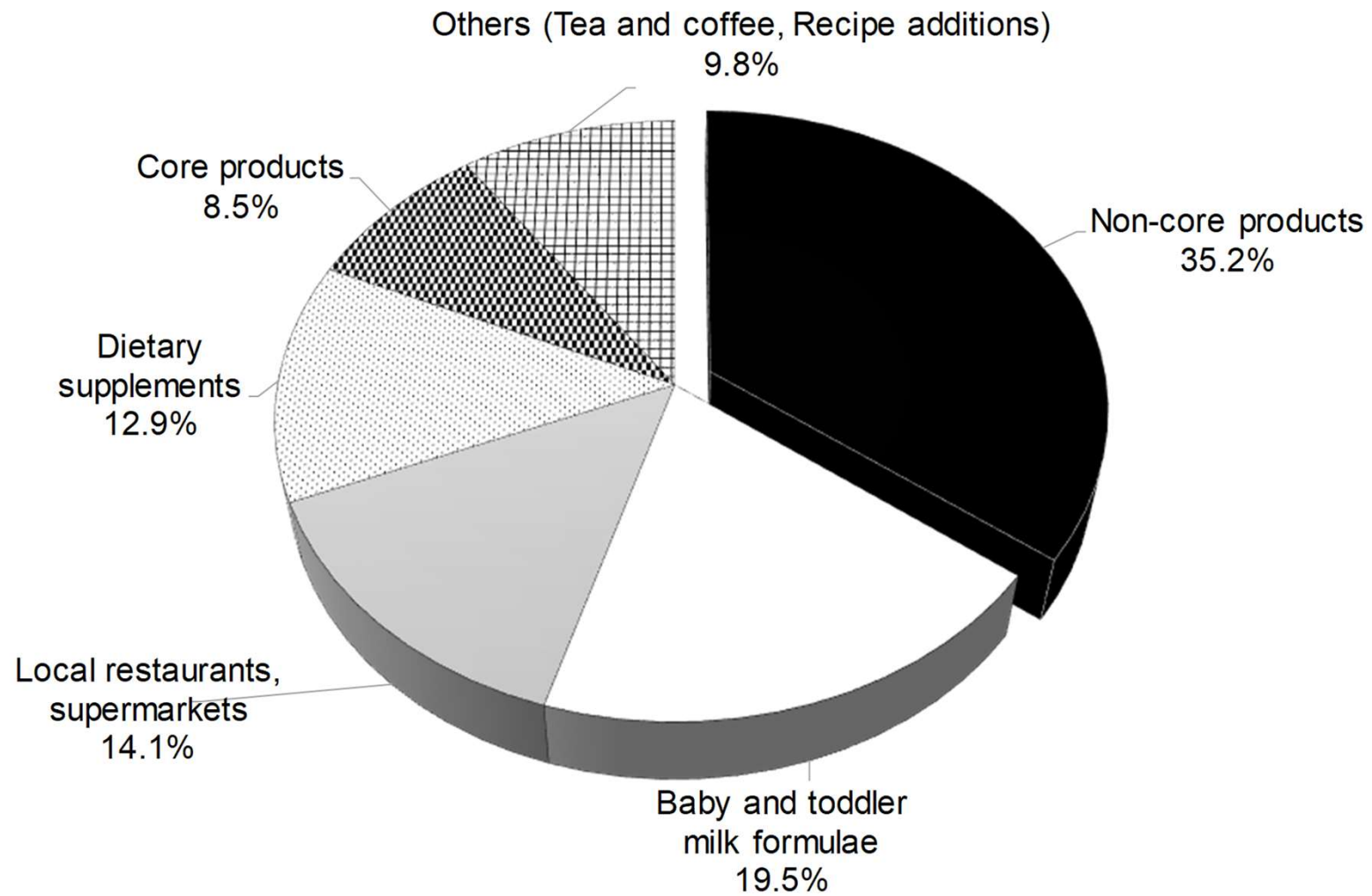


Figure 1 – Types of products advertised ($n = 1905$)

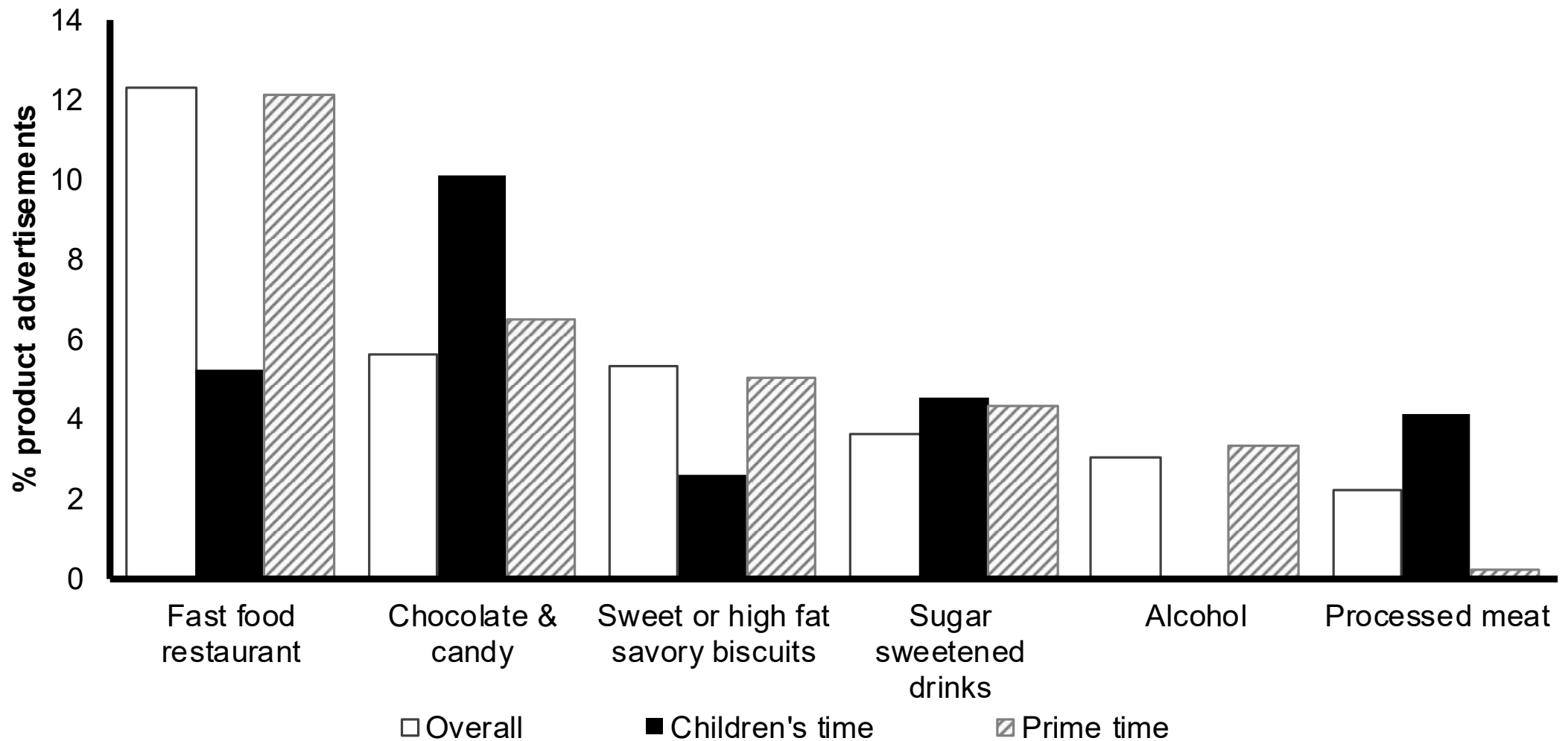


Figure 2 – (a) Top 6 types of non-core products advertised overall and by viewing time periods. Number of food advertisements analyzed: overall: $n = 1905$; children's time: $n = 268$; and prime time: $n = 461$

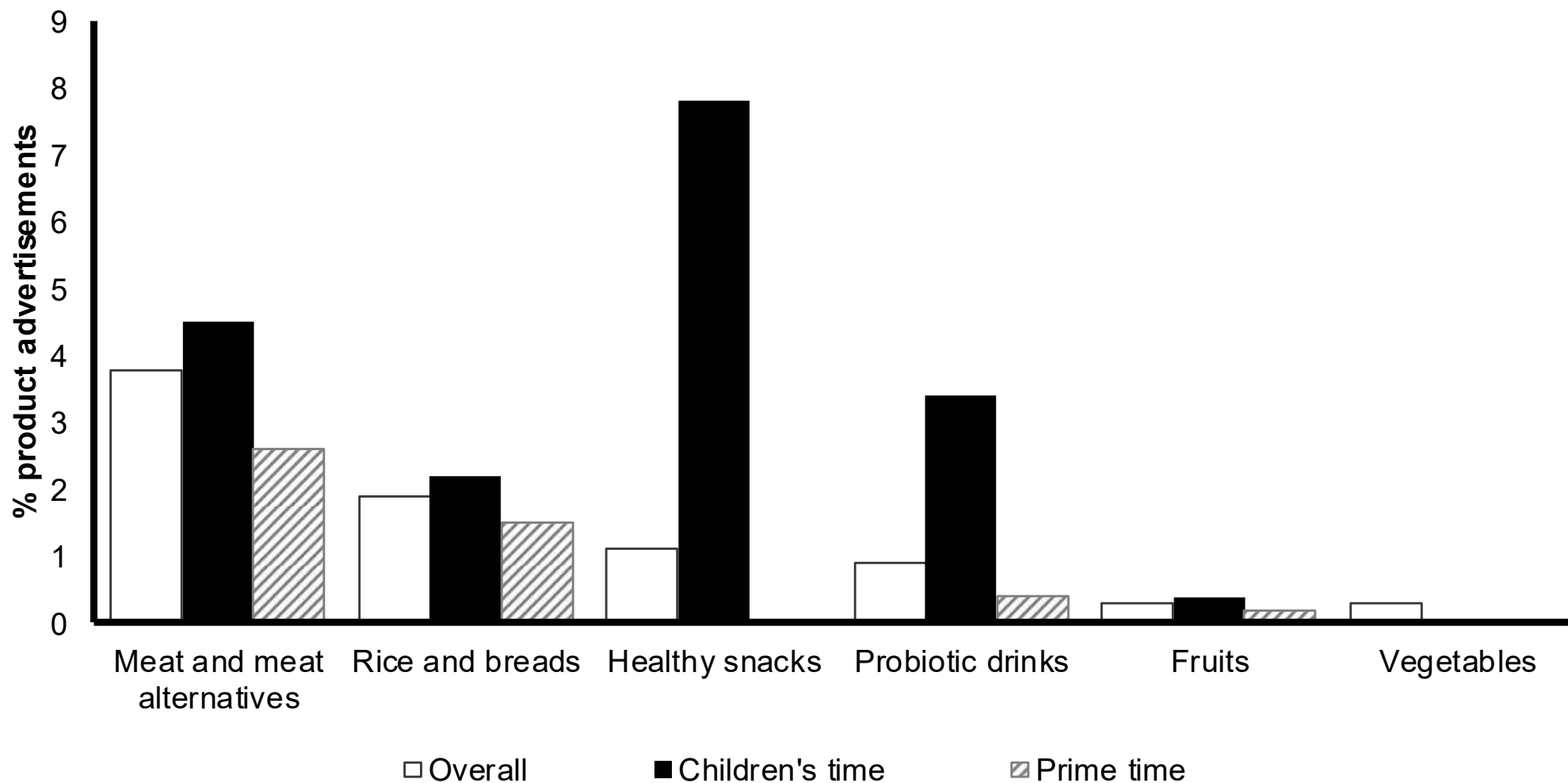


Figure 2 – (b) Top 6 types of core products advertised overall and by viewing time periods. Number of food advertisements analyzed: overall: $n = 1905$; children's time: $n = 268$; and prime time: $n = 461$

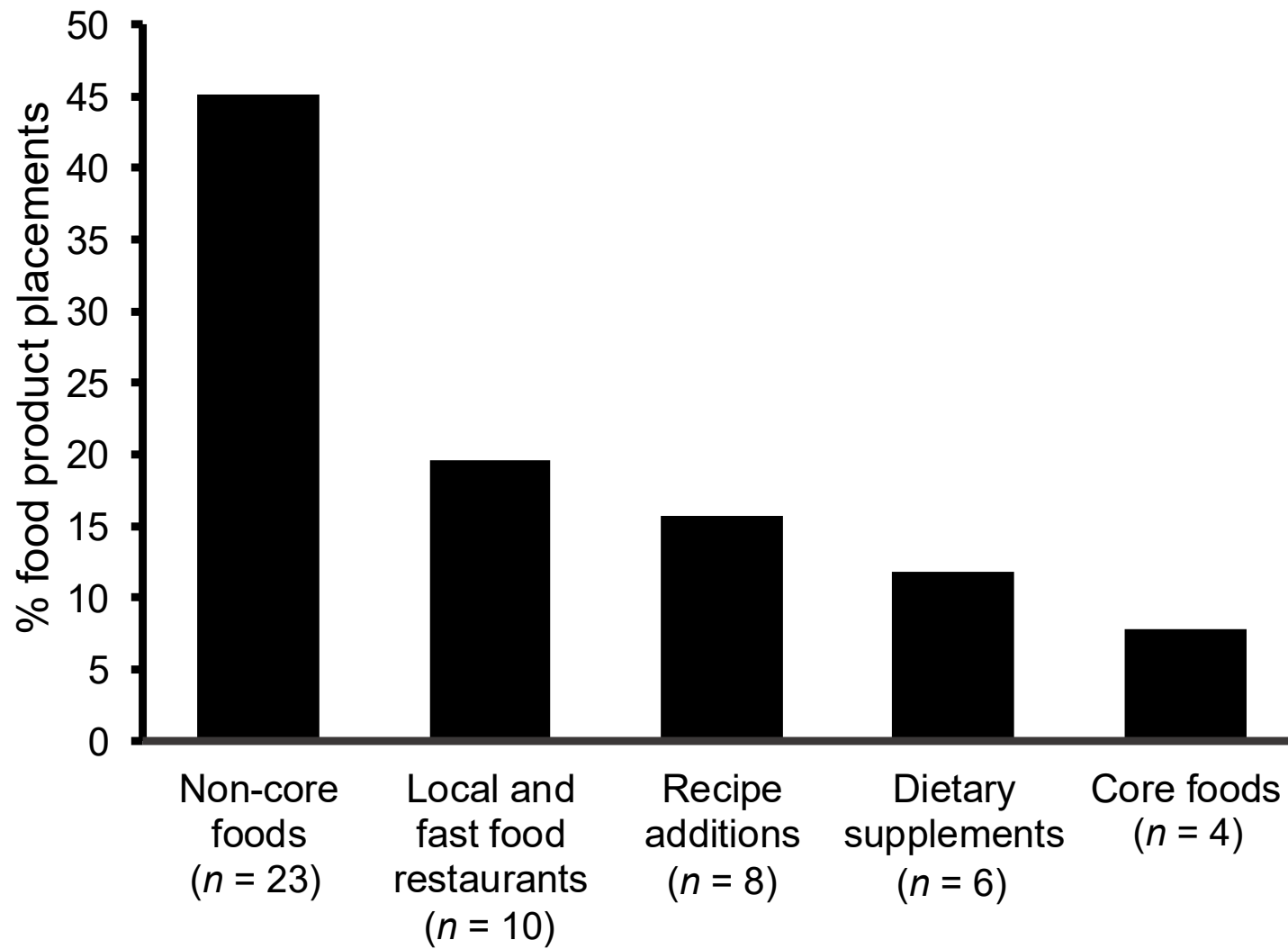


Figure 3 – Types of products advertised as product placements

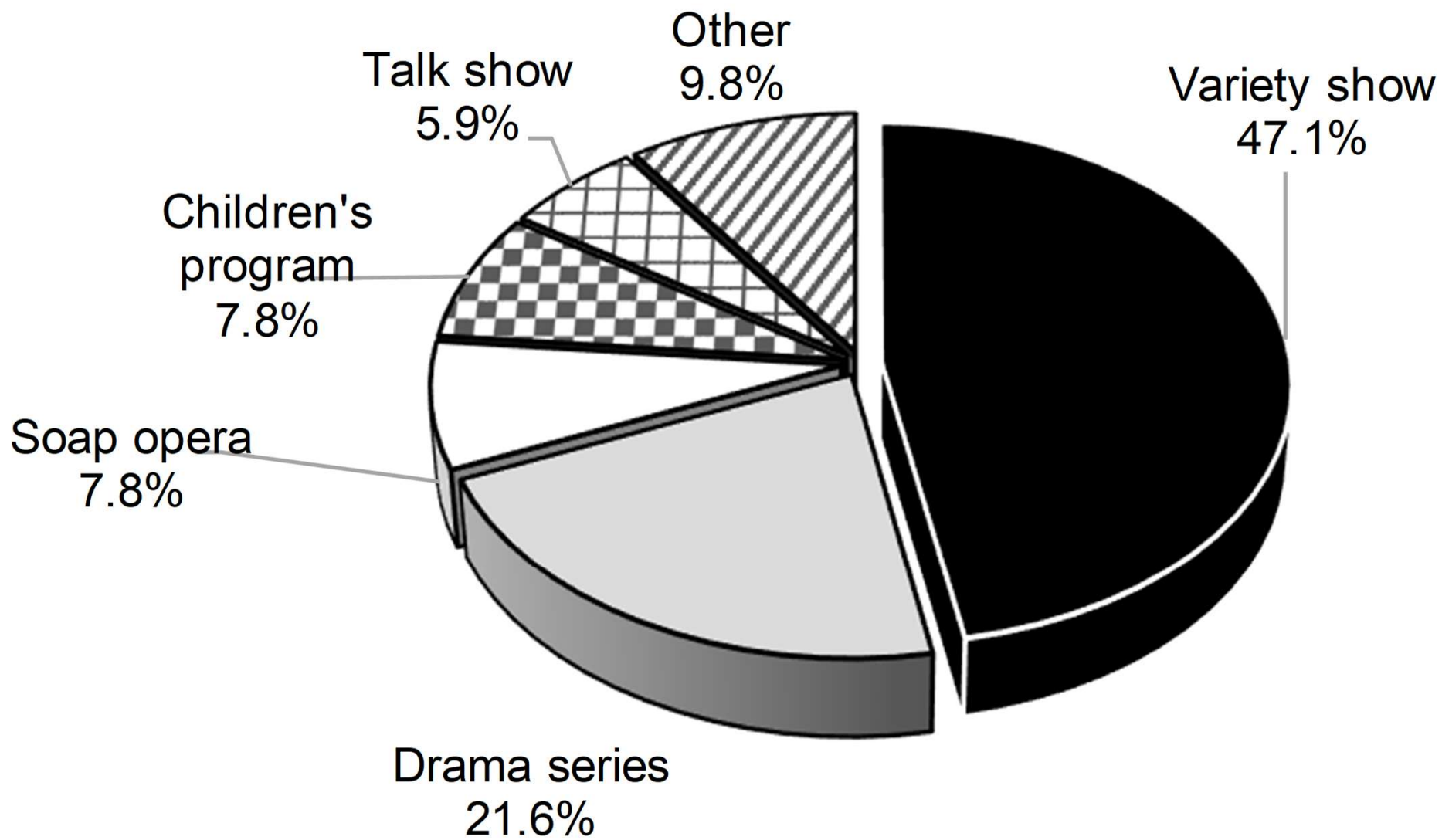


Figure 4 – Types of programs with product placements ($n = 51$)

Table S1 Rate of advertisements per hour by food category.

Food category	Frequency (n)	% within category	Rate of advertisements (ads per channel hour)
Core products	161		
1. Bread and rice	37	23.0%	0.13
2. Low sugar and high fibre breakfast cereals	0	0.0%	0
3. Fruits and fruit products	5	3.1%	0.02
4. Vegetables and vegetable products	5	3.1%	0.02
5. Probiotic drinks	17	10.6%	0.06
6. Meat and meat alternatives	73	45.3%	0.25
7. Oils high in mono- or polyunsaturated fat	0	0.0%	0
8. Low fat/salt meals	0	0.0%	0
9. Healthy snacks	21	13.0%	0.07
10. Baby foods	0	0.0%	0
11. Bottled water	3	1.9%	0.01
Non-core products	671		
12. High sugar breakfast cereals	4	0.6%	0.01
13. Flavored/fried instant rice and noodle products	7	1.0%	0.02
14. Sweet or high fat savory biscuits	101	15.1%	0.35
15. Processed meat	41	6.1%	0.14
16. Sweet snack foods	23	3.4%	0.08
17. Savory snack foods	10	1.5%	0.03
18. Fruit juice/drinks (<98% fruit)	6	0.9%	0.02
19. Full cream milks and yoghurts and cheese and their alternatives	0	0.0%	0
20. Ice cream, iced confection and desserts	0	0.0%	0
21. Chocolate and candy	106	15.8%	0.37
22. Fast food	235	35.0%	0.82
23. High fat/salt meals	2	0.3%	0.01
24. Other high fat/salt products	11	1.6%	0.04

Food category	Frequency (n)	% within category	Rate of advertisements (ads per channel hour)
25. Sugar sweetened drinks	68	10.1%	0.24
26. Alcohol	57	8.5%	0.20
Miscellaneous	1073		
27. Recipe additions	87	8.1%	0.30
28. Dietary supplements	246	22.9%	0.85
29. Tea and coffee	100	9.3%	0.35
30. Baby and toddler milk formulae	372	34.7%	1.29
31. Fast food (only healthier options advertised)	28	2.6%	0.10
33. Fast-food (no foods or drinks advertised)	3	0.3%	0.01
34. Local restaurant	79	7.4%	0.27
35. Supermarkets (only core and healthier foods advertised)	25	2.3%	0.09
36. Supermarkets (not only core and healthier foods advertised)	79	7.4%	0.27
37. Supermarkets (no foods or drinks advertised)	54	5.0%	0.19
Total	1905		

Table S2 Frequency of food and beverage advertisements by brand.

Brand and product ^a	Frequency (n)	Food category
Abbott Similac HMO 4	99	Baby milk formulae
Kitagawahanbee Japanese Hojicha	83	Unsweetened tea
Mead Johnson Enfakid 4	61	Baby milk formulae
Friso Prestige Growing Up Formula 4	59	Baby milk formulae
Pizza Hut's Hawaiian Paradise Pizza and Portuguese Chicken Rice	52	Fast foods
McDonald's x Chef Nic The Signature Collection	49	Fast foods
Wyeth Illuma 4	46	Baby milk formulae
Black & White	43	Recipe additions
Kee Wah Chinese Bridal Cake	41	Sweet breads
Donald Russell Sirloin Steak	37	Meat
Pizza Hut Afternoon Tea	36	Fast foods
Maltesers	35	Chocolate
Lindt Lindor	34	Chocolate
Nestle NAN Pro 4	32	Baby milk formulae
Pocky	30	Sweet biscuits
HiPP Combiotic 2	29	Baby milk formulae
Macallan	29	Alcohol
Redoxon Triple Action Effervescent Tablets	23	Dietary supplements
Anlene Gold High Calcium Milk Powder	21	Adult milk formulae
HiPP Organic Fruit Pouches	21	Healthy snacks
Airwaves	20	Sugar-free chewing gums
PARKnSHOP (fusion, taste, international, etc)	20	Supermarkets
McDonald's x Chef Nic The Signature Collection (side dishes)	18	Fast foods
Chewy Premium Thai Mali Rice	17	Rice
Annum ASSURA	17	Pregnancy formulae
CowGate Happy Kid 4	17	Baby milk formulae
Pizza Hut's Cheezroni Pizza	17	Fast foods
Yakult Low Sugar Live Lactobacillus	17	Probiotic drinks
MaxChoice New Zealand Wild Abalone	16	Seafoods
CalVive Effervescent Tablets	16	Dietary supplements
Calcichew D3 Chewable Tablets	16	Dietary supplements

^a Only products recorded over 15 times are listed