

# Television Feeds Unhealthy Food Advertising To Children In Asia: Evidence From Nine Countries Using A Harmonized Approach

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## Abstract

**Background:** Prevailing childhood obesity in Asia adds risk for future adult burden of obesity and non-communicable diseases. Weak policies across most Asian countries enables unrestricted marketing of obesogenic foods and beverages directly to children. Television is the common medium for food marketing to reach this audience.

**Objective:** This study aimed to assess the extent and nature of television food and non-alcoholic beverage marketing in nine Asian countries (Bangladesh, China, India, Malaysia, Mongolia, Nepal, Philippines, Sri Lanka and Vietnam) with capacity building from the International Network for Food and Obesity/NCD Research, Monitoring and Action Support who enabled harmonization of data collection method and content analyses.

**Methods:** Advertised foods were categorized as permitted (P) or not permitted (NP) based on the nutrient profile models (NPM) established by the WHO regional offices for South-East Asia (SEARO) and the Western Pacific (WPRO). Data were reported as rate of food advertisements (ads/h/channel) overall and persuasive strategy usage during children's peak (PVT) and non-peak

(non-PVT) viewing times.

**Results:** Cross-country comparisons, irrespective of country income level, indicated NP food advertising dominated children's popular television channels especially during PVT with rates as per WPRO/ SEARO criteria ranging from 2.40/ 2.29 ads/h/channel (Malaysia) to 9.70/ 9.41 ads/h/channel (Philippines). Persuasive strategy rates were also higher during PVT compared to non-PVT. Sugar-sweetened beverages, sugar-containing solid foods, and high salt and fat-containing snacks and fast foods were frequently advertised. Evaluation of the application of WPRO and SEARO NPMs identified inconsistencies due to regional taste and cuisine variations across Asia.

**Conclusions:** Our study clearly showed unhealthy food marketing through popular children's television channels is widely occurring in Asia and is a clear breach of child rights. Evidence outcomes will be used to advocate for stronger policy regulations to control unhealthy food marketing and strengthen strategies to promote a healthier food environment for the Asian people. Clinical Trial: Not relevant to this study as this is not a clinical trial.

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## ABSTRACT

**Background:** Prevailing childhood obesity in Asia adds risk for future adult burden of obesity and non-communicable diseases. Weak policies across most Asian countries enables unrestricted marketing of obesogenic foods and beverages directly to children. Television is the common medium for food marketing to reach this audience.

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**Conclusions:** Our study clearly showed unhealthy food marketing through popular children's television channels is widely occurring in Asia and is a clear breach of child rights. Evidence outcomes will be used to advocate for stronger policy regulations to control unhealthy food



marketing and strengthen strategies to promote a healthier food environment for the Asian people.

**Keywords:** Children; Asian Food marketing; Television; Unhealthy food; WHO Nutrient Profile Model.

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## Introduction

Childhood obesity has become a global issue, with Asia not immune to this trend. Almost half of the world's children under the age of five years who are overweight or obese are living in Asia [1], a region that is also rapidly experiencing an upsurge in the prevalence of noncommunicable diseases (NCDs) such as diabetes, cardiovascular disease and hypertension [2]. Even low- and middle-income countries (LMICs) in Asia dealing with undernutrition as the traditional public health challenge, are not exempt from the issue of childhood overweight and obesity, particularly in urban settings [1]. Childhood obesity predicts NCDs development in adulthood [3, 4].

Systematic review of evidences examining interventions to prevent childhood obesity in the Asian region found that such interventions tend to focus on children's school settings and to target behavioral modification through nutrition/health education and physical activity sessions [5]. Focusing on such nutrition and physical activity promotion programs fails to account for the effects of the wider food environment, in which unhealthy foods and beverages high in saturated and *trans* fats, added sugars and sodium (termed as high in fat, sugar and salt or HFSS) and usually highly processed [6], are greatly available, accessible and heavily promoted [7, 8]. This food environment is consistent with growing transnational and regional food business across Asia [9].

Television advertising of unhealthy foods is a big driver of children's exposure to unhealthy food marketing [10-12]. Without question, children highly exposed to powerful marketing of HFSS foods are vulnerable to negative food behaviours conducive to overweight and obesity development [13-15]. Increased exposure of children to the marketing of unhealthy foods increases purchase requests [13, 14] and develops tastes, preferences and habits [16-19] for these foods. The habituation for unhealthy foods and beverages in children through advertising exposure is suggested by the World Health Organization (WHO) to be linked to childhood obesity [20].

Television advertising spending from 2000 to 2024 in the Asia-Pacific is a rising trend, with expenditure reaching 55,692 million US dollars in 2024 [21]. Free-to-air, cable or satellite television is a major media source in Asia [22] and may be more accessible compared to digital media for low-income households [23], indicating the dominant influence of food marketing is through children's popular television channels as observed in Malaysia [24], Thailand [25] and in India [26]. Children's exposure to food advertising on television across Asia is largely unchecked because of weak or non-existent regulations [27]. Slow policy progress is perpetuated by the lack of local research to document the extent of the issue and to hold industries and policymakers to account to protect children from exploitation [8]. Further, current evidence on television food advertising is largely limited to high-income countries and efforts are needed to support monitoring in low resource settings [28]. However, some data are available for selected countries in Asia, including Malaysia [24, 29] and Korea [30], which informed for policy design for the latter country. However, these studies lacked uniform methodology as researchers adopted varying approaches to categorize nutritional profiles of advertised foods. An Asia-Pacific comparison [31] involving China, Korea, Indonesia and Malaysia benefited from the use of one standard methodology for data sourcing, recording and coding whilst nutritional comparisons were benchmarked to core and non-core food criteria rather than a standardized WHO nutrient profile model (NPM).

Acknowledging these gaps, a situational analysis was warranted to explore the extent and nature of unhealthy food and non-alcoholic beverage marketing through television across Asia. Further, protection from exploitation of children as defined in the *Conventions on the Rights of the Child* [32] and specifically from unhealthy food marketing [33] constitutes child rights, therefore emphasizing the need to conduct this research in Asia. Keeping this in mind, we report on the outcomes of a collaboration between nine Asian countries comprising seven LMICs (Bangladesh, India, Mongolia, Nepal, Philippines, Sri Lanka, and Vietnam) and two Upper Middle-Income countries (China and

Malaysia) [34]. This collaboration adopted the International Network for Food and Obesity/NCD Research, Monitoring and Action Support (INFORMAS) food promotion module's television protocol [35] which harmonized data collection procedures and enable country comparisons on key variables measuring children's exposure to unhealthy food marketing in television. INFORMAS also served as a research stakeholder by supporting intensive capacity building in executing methodology for achieving the Project's milestones.

## Methods

The nine Asian countries in this collaborative study agreed to adopt the INFORMAS protocol for food promotion [35]. Briefly this protocol requires country-specific contextual information to be collected through recording of children's popular television channel broadcasting to identify food advertisements (Ads) embedded between and during programs. Food Ads covered both solid foods and beverages. This does not include other types of marketing such as product placement in shows and sponsorship of television shows.

The INFORMAS methodology was adapted to enable a standard recording format to fit across the diverse food cultures, seasonal events and children's schooling and holiday periods of each country. Further the advent of COVID-19 introduced a disruption to obtaining country clearance, funding disbursements, and data recording schedules. This meant that data recording was not conducted simultaneously for all countries.

Depending on individual country regulations, some countries were required to obtain country clearance to conduct the study (Bangladesh, China, Mongolia, Sri Lanka and Vietnam).

## Sample selection

*Defining children's age limit-* Information on audience viewing pattern is usually sourced from advertising monitoring services but is often reported within a set children's age range of <12yrs of age [37, 38]. Children's age was defined according to local regulations and with consideration as

defined in the UN *Conventions of the Rights of the Child* [6, 32]. Practically, the definition was constrained by the definitions used by media monitoring companies, which group children by age for reporting. Most country teams set children's age as up to 18 years except for India (up to 14 years), Sri Lanka (up to 15 years), Philippines (up to 17 years) and Malaysia (up to 19 years).

*Defining popular television channels-* The top three popular television channels for each country were selected based on children's viewership data [35]. These data were available from commercial media monitoring companies in China (Kuyun), India (Broadcast Audience Research Council), Malaysia (Nielsen), Mongolia (Maxima Consulting), Philippines (Nielsen), Sri Lanka (Kantar) and Vietnam (Nielsen). In Bangladesh and Nepal, popular channels were determined based on expert opinion ( $n = 22$  and  $6$ , respectively) and cross-sectional surveys on television viewing habits with children and caregivers ( $n = 400$  and  $51$ , respectively). In China, expert consultancy and online survey results were used to validate the commercial data.

*Defining culinary ingredients-* Some countries reported that groceries such as rice, cooking oil and seasonings were also advertised during the day's program streaming. These items were targeted to homemakers as they were also television viewers during children's programmes in Asia. Collaborating teams agreed to exclude these items from recorded data as the intention was to count only packaged food and beverage products cognizant with children's exposure, direct purchasing request and consumption. A list of these ingredients is provided as supplementary information (Table S2).

*Defining peak viewing time (PVT) -* Television viewership data were also used to define PVT in each country. PVT represented the top five 1-hour timeslots across the broadcast day, separated for weekdays and weekend days [38].

*Training-* Online group training was conducted by the project management team (TK, GRO, SSN) with INFORMAS faculty support (SM, BK) to harmonize methodology across country teams prior to data collection.

*Recording protocol-* The recording protocol adopted by all countries was [i] a recording period within a 3-month period [ii] using convenience sampling to record for 4 weekdays and 4 weekend days, [iii] these eight recording days included normal schooling weeks and excluded any public or school holidays and special events (e.g., elections) and [iv] concurrent recording performed for three selected top channels with a recording duration up to 18 hours per day (6:00 am to 12:00 am).

*Verification of recording procedures-* Recording procedures were verified individually for each country in one-to-one online sessions with follow up by faculty to trouble shoot issues. All country teams met the minimum data collection requirement. Some teams completed recording in 2020 (China, Malaysia, Vietnam). Four teams re-recorded in 2021 (Bangladesh, Mongolia, Philippines, Nepal) due to limited viewership data access, school re-opening post-COVID lockdown, and data corruption issues. India and Sri Lanka teams completed recording after mid-2022 due to delay in obtaining country clearance. Recording was performed by most countries using their own research teams, with the exception when outsourcing to providers by China (Kuyun) and Mongolia (Maxima Consulting).

## **Coding for healthy vs unhealthy foods**

Each country team assigned at least two researchers (student, research assistant and/or co-investigator) to perform the coding. Ongoing support was provided by the project management team and INFORMAS Faculty. The primary coding steps involved:

[i] Coding variables included broadcast TV channel, date, day, program name/category and timeslot. The timeslot variable was classified into PVT or non-peak viewing time (non-PVT).

[ii] All Ads in the recorded data were first categorized into food and non-food items. Advertised food products required brand information (name, description, and parent company).

[iii] Recorded data of advertised foods and beverages was coded according to the nutrient profile models (NPMs) proposed by the WHO regional offices for Western Pacific (WPRO) [39] and WHO regional offices for South-East Asia (SEARO) [40] which allow for classification of foods that

should be 'permitted' and 'not permitted' to be marketed to children based on nutrient thresholds [39, 40]. Both models were used as the sampled countries spanned both regions. Additionally, the INFORMAS food classification system was adopted for food products not included in the NPM classifications, such as infant formula, alcohol and dietary supplements [35].

[iv] Where multiple food products were promoted in an advertisement, coding was performed for up to three most prominent food products as defined by INFORMAS protocol [35]. In cases where coders were unable to determine the level of prominence, coding priority was based on the first products shown or coding from top-left quadrant of the Food Ads for sequencing purpose [35].

[v] Market surveys preferably conducted in physical stores or through online resources were required to be performed by each country team to retrieve an advertised product's nutrient values to facilitate nutrient profiling. Products without nutrition information were labelled as "insufficient NIP". Products that were not covered by the WHO NPMs (eg., 1-3 years follow-up formulae) were identified as "not applicable".

[vi] Data was excluded for banner Ads and product placements during programs.

*Reliability testing-* Inter-coder reliability (IRR) testing within each country was performed involving researchers participating in the dataset coding. This required a randomly selected hour of television recording for testing reliability between coders according to the formula [35]:

- $\text{Agreement} / (\text{Agreement} + \text{Disagreement}) \times 100$

The minimum required IRR score was 90% agreement between researchers but if this was not achieved then additional training was provided, and the coding reliability re-tested with another television recording sample. Once the minimum IRR was achieved within country then, inter-coder reliability testing between countries was conducted. This required each country to submit coded data by the primary coder for a random hour of recording to the project management team, who coded each dataset and served as a comparator. The minimum required score was 80% agreement and if this was not achieved then a second or even a third IRR testing trial would be conducted for a different

hour of recording, following further training.

## **Coding for Persuasive Power Strategies**

Additional coding was performed for persuasive power strategies of marketing involving use of power strategies and premium offers [35]. Up to three strategies per Food Ad were recorded.

## **Data Processing**

*Cleaning-* Upon completion of data entry, cleaned Excel datasets were provided to the project management team for cross-checking. Country teams corrected datasets based on feedback. Differences were resolved through discussion with the project management team and/or INFORMAS faculty.

*Aggregation-* Data was weighted based on weekdays and weekends days. Ads were aggregated into hourly timeslot intervals. Factors explored for Ad rate analysis were [i] Children's viewing time (PVT vs. non-PVT), [ii] Marketing permissibility (permitted vs. not permitted) and [iii] Usage of persuasive power strategies.

## **Ethics Approval**

Depending on individual country regulations, some countries were exempted from obtaining ethics approval (India, Malaysia, Nepal, Philippines) whilst Bangladesh (IPH/AW/IRB/2020-21/03), China (No. 202023), Mongolia (No.253), Sri Lanka (EC-20-047) and Vietnam (IRB-VN01057/IORG0008555) obtained this clearance.

## **Statistical Analysis**

Statistical analysis was performed using IBM SPSS<sup>®</sup> (Version 26.0). A data analysis training workshop was conducted (KC, SM, BK) to provide country teams with training on data analyses. The project management team conducted the final consolidation analyses for all countries.

Outputs for descriptive analysis to understand the extent of television food marketing was reported as mean  $\pm$  SD for all rate parameters (ads/h/channel) as per All Food Ads, Permitted Food Ad and Not



Permitted Food Ad and their ratios (permitted: not permitted) for both WPRO and SEARO NPMs. Wilcoxon signed-rank tests assessed comparisons between permitted vs. not permitted Ads. Additionally, Mann-Whitney U test assessed rate comparisons between not permitted Food Ads between PVT and non-PVT. Outputs for understanding persuasive marketing strategies engaged for not permitted Food Ads, interpreted as power strategies and premium offers, were similarly assessed. Frequency analysis was then performed to understand the popularity of categories of not permitted Food Ads promoted on television according to WPRO and SEARO NPMs. Coded items were consolidated and the corresponding proportion in percentage was calculated to facilitate identifying the top five most frequently advertised not permitted food categories. Significance threshold was set at  $P < .05$ .

## Results

### Country Comparisons of Food Ad Rates for Permitted and Not Permitted Foods

For all nine Asian countries investigated, Food Ad rates for not permitted foods were significantly higher (all  $P < .05$ ) compared to permitted foods (**Table 1**). This trend was consistent whether applying the criteria of the WPRO or SEARO NPMs. Ad rates of not permitted foods as per WPRO criteria were highest for the Philippines followed by Sri Lanka > Mongolia > India > Bangladesh > China > Nepal > Vietnam > Malaysia. This trend was also mostly similar with the SEARO criteria except for China and Bangladesh. However, comparisons between countries regarding the concentration of not permitted Food Ad rates interpreted as ratio of permitted: not permitted Ads indicated they were lowest for Sri Lanka and China. Whereas the ratio of permitted: not permitted Food Ads was highest in Malaysia and Vietnam, due to fewer small numbers of permitted foods promoted. Of interest, ratios for India and Bangladesh were higher with WPRO criteria but low with SEARO criteria.

Table 1. Food Ad Rates for Asian countries as per WPRO and SEARO criteria

**Food Ad Rates  
Ads/h/Channel (mean  $\pm$ SD)**

Country	All Food Ads <sup>a</sup>	WPRO				SEARO			
		Permitted	Not Permitted	P- value	P: NP	Permitted	Not Permitted	P- value	P: NP
Bangladesh	8.17 $\pm$ 8.32	0.43 $\pm$ 1.21	6.23 $\pm$ 6.67	< .001	1: 14.5	0.72 $\pm$ 1.29	4.25 $\pm$ 6.00	< .001	1: 5.9
China	11.53 $\pm$ 10.07	2.13 $\pm$ 2.84	5.03 $\pm$ 8.57	< .001	1: 2.4	1.57 $\pm$ 2.07	5.49 $\pm$ 9.60	< .001	1: 3.5
India	9.31 $\pm$ 5.97	0.46 $\pm$ 0.89	7.75 $\pm$ 5.36	< .001	1: 16.8	2.08 $\pm$ 2.39	5.73 $\pm$ 4.56	< .001	1: 2.8
Malaysia	4.07 $\pm$ 6.48	0.01 $\pm$ 0.11	2.40 $\pm$ 3.88	< .001	1: 240	0.19 $\pm$ 0.50	2.29 $\pm$ 3.71	< .001	1: 12.1
Mongolia	11.37 $\pm$ 10.80	0.72 $\pm$ 1.30	7.97 $\pm$ 7.67	< .001	1: 11.1	0.72 $\pm$ 1.83	7.91 $\pm$ 7.46	< .001	1: 11.0
Nepal	4.62 $\pm$ 4.58	0.11 $\pm$ 0.36	3.89 $\pm$ 4.06	< .001	1: 35.4	0.11 $\pm$ 0.36	3.47 $\pm$ 3.64	< .001	1: 31.5
Philippines	15.00 $\pm$ 15.12	0.75 $\pm$ 1.18	9.70 $\pm$ 9.85	< .001	1: 12.9	0.93 $\pm$ 1.38	9.41 $\pm$ 9.47	< .001	1: 10.1
Sri Lanka	16.68 $\pm$ 11.26	3.43 $\pm$ 3.55	9.08 $\pm$ 6.84	< .001	1: 2.6	3.15 $\pm$ 3.29	9.37 $\pm$ 7.16	< .001	1: 3.0
Vietnam	3.34 $\pm$ 6.86	0.02 $\pm$ 0.15	2.69 $\pm$ 5.77	< .001	1: 134.5	0	2.74 $\pm$ 5.90	< .001	--- <sup>b</sup>

**Footnote:**

<sup>a</sup>All Food Ads include solid foods and beverages advertised. Includes Ads for culinary ingredients, nutritional supplements, baby food, and follow-up formula. Additionally, the term also covers Ads for food companies, retailers, and outlets that do not promote specific food products.

<sup>b</sup>For Vietnam P:NP could not be determined with SEARO criteria.

**Abbreviations:** Ads= advertisements; NP= not permitted ; P= permitted; SEARO= South-East Asia Regional Office ; WPRO= Western Pacific Regional Office

### Extent of Food Ads during Peak and Non-Peak Viewing Times

We further measured the appearance of not permitted Food Ads during peak (PVT) and non-peak viewing times (non-PVT) for all nine countries (**Table 2**). For most countries, not permitted Food Ad rates occurring during PVT were significantly higher compared to rates during non-PVT regardless of NPM models. In India and Nepal, there was no difference in the rates of not permitted Food Ads between PVT and non-PVT irrespective of NPM criteria. In China, the rates of not permitted Food Ads when classified using the SEARO model, were significantly higher during non-PVT. The difference as observed for China as per WPRO (1.45 ads/h/channel) and SEARO (1.29 ads/h/channel) remained still comparable but not significant.

Regardless of NPM criteria, not permitted Food Ad rates during PVT compared to non-PVT were ~1.7 times higher for Mongolia (WPRO: 11.19 vs 6.62 ads/h/channel, SEARO: 10.99 vs 6.62 ads/h/channel), 2 times higher for Malaysia (WPRO: 3.58 vs 1.95 ads/h/channel, SEARO: 3.45 vs 1.85 ads/h/channel) and Bangladesh (WPRO: 9.31 vs 5.04 ads/h/channel, SEARO: 6.73 vs 3.30 ads/h/channel) and 3 times higher for Vietnam (WPRO: 5.66 vs 1.54 ads/h/channel, SEARO: 5.62 vs 1.63 ads/h/channel).

Table 2. Appearance of Not Permitted Food Advertising during Peak and Non-Peak Viewing Times on Television

Not Permitted Food Ad Rates <sup>a</sup> Ads/h/Channel (mean ±SD)						
Country	WPRO			SEARO		
	PVT	Non-PVT	P- value	PVT	Non-PVT	P- value
Bangladesh	9.31 ± 8.00	5.04 ± 5.65	< .001	6.73 ± 7.11	3.30 ± 5.22	< .001
China	3.98 ± 5.80	5.43 ± 9.40	.24	4.56 ± 6.60	5.85 ± 10.51	.02
India	7.54 ± 4.34	7.84 ± 5.70	.86	5.70 ± 3.92	5.75 ± 4.78	.38
Malaysia	3.58 ± 4.76	1.95 ± 3.37	< .001	3.45 ± 4.72	1.85 ± 3.14	< .001
Mongolia	11.19 ± 8.60	6.62 ± 6.81	< .001	10.99 ± 8.33	6.62 ± 6.66	< .001
Nepal	3.67 ± 3.80	3.97 ± 4.15	.53	3.38 ± 3.51	3.50 ± 3.69	.84
Philippines	12.26 ± 10.87	8.71 ± 9.24	< .001	11.84 ± 10.47	8.48 ± 8.89	< .001
Sri Lanka	11.35 ± 6.31	8.21 ± 6.84	< .001	11.55 ± 6.21	8.53 ± 7.32	< .001
Vietnam	5.66 ± 7.18	1.54 ± 4.65	< .001	5.62 ± 7.32	1.63 ± 4.81	< .001

**Footnote:**

<sup>a</sup>Not permitted Food Ads include solid foods and beverages. It excludes Ads for culinary ingredients, nutritional supplements, baby food, and follow-up formula.

**Abbreviations:** Ads= advertisements; PVT = Peak Viewing Time; SEARO= South-East Asia Regional Office ; WPRO= Western Pacific Regional Office

## Defining Engagement of Persuasive Strategies in Not Permitted Food Ads

We applied content analyses to also probe the nature of engagement of persuasive strategies for not permitted Food Ads targeting children in the context of power strategies and premium offers with comparisons during PVT and non-PVT periods (**Table 3**).

Rates for power strategies irrespective of NPMs were significantly higher ( $P<.05$ ) for most countries during PVT than non-PVT, been highest for the Philippines (WPRO: 8.91 ads/h/channel; SEARO: 8.82 ads/h/channel) and lowest for Malaysia (WPRO: 1.88 ads/h/channel; SEARO: 1.84

ads/h/channel). Contrarily rates of power strategies for not permitted foods in China and Nepal were significantly higher during non-PVT compared to PVT, when classified using WPRO criteria. Whereas power strategy rates in India remained similar during PVT and non-PVT irrespective of the NPM.

When probing premium offers given for not permitted Food Ads, rates were significantly higher ( $P < .05$ ) during PVT compared to non-PVT for most countries by either WPRO or SEARO criteria, being the highest for Bangladesh (WPRO: 1.59 ads/h/channel; SEARO: 1.59 ads/h/channel), and lowest for China (WPRO: 0.06 ads/h/channel; SEARO: 0.05 ads/h/channel) irrespective of NPM. No premium offers were recorded during PVT and non-PVT on Nepal TV.

### **Nature of Most Frequently (%) Advertised Not Permitted Food Categories**

We observed the highest frequency (%) of Ads for not permitted food categories featured on television irrespective of NPMs were driven by HFSS foods and beverages (**Figure 1**) which varied between countries and likely reflected local popular tastes. When categorized by WPRO criteria, the highest rates occurred for *Other beverages* in Nepal, Bangladesh and Mongolia; *Savoury snacks* in China; *Chocolate and sugar confectionery, energy bars, and sweet toppings and desserts* in India and Sri Lanka; *Ready-made, convenience foods and composite dishes* in Malaysia; *Milk drinks* in Vietnam and the Philippines. When categorized by SEARO criteria these were still reflecting local taste preferences for HFSS products as per *Water-based flavored drinks* in Bangladesh and Nepal, *Milk and dairy based drinks* in Vietnam, Philippines and Mongolia, *Confectionery* in India and Sri Lanka, *Composite foods (Prepared foods)* in Malaysia, and *Cheese and analogues* in China.

We further appraised the combined share of the sugar and non-sugar sweetener-based beverage products for each country (**Figure 2**) which featured majorly amongst the top 5 frequently advertised not permitted foods. As per WPRO criteria, this totaled 72.2% in Bangladesh; 67.4% in Vietnam; 66.6% in Nepal; 51.1% in the Philippines; 36.7% in China; 33.8% in Mongolia; 32.8% in India; 29.7% in Sri Lanka; 24.2% in Malaysia. Of note, the WPRO category for *Energy drinks, tea and*

*coffee* included beverages marketed without sweetening agents such as teas and coffees which likely targeted adult consumers. With SEARO criteria this data changed: 68.3% in Nepal> 55.5% in Bangladesh> 54.3% in Vietnam> 52.9% in Mongolia> 43.3% in the



Table 3. Persuasive Strategies in Not Permitted Food Ads during Peak and Non-Peak viewing Times

Not Permitted Food Ad Rates <sup>a</sup>												
Ads/h/Channel (mean ±SD)												
Country	Power Strategies						Premium Offers					
	WPRO			SEARO			WPRO			SEARO		
	PV T	Non - PV T	P- valu e	PV T	Non - PV T	P- valu e	PV T	Non - PVT	P- valu e	PV T	Non - PVT	P- value
Bangladesh	5.24	3.28	< .001	3.31	1.97	< .001	1.59	0.58	< .001	1.59	0.58	< .001
	± 4.45	± 3.57		± 3.57	± 3.12		± 2.22	± 1.52		± 2.22	± 1.52	
China	2.71	3.56	.02	3.71	4.51	.052	0.06	0.05	.13	0.05	0	< .001
	± 2.92	± 6.64		± 4.74	± 7.60		± 0.26	± 0.25		± 0.24		
India	5.06	5.21	.88	4.30	4.08	.11	0.49	0.47	.43	0.40	0.33	.005
	± 3.16	± 4.00		± 2.74	± 3.20		± 0.86	± 0.92		± 0.77	± 0.84	
Malaysia	1.88	0.82	< .001	1.84	0.80	< .001	0.77	0.36	< .001	0.76	0.34	< .001
	± 2.87	± 1.49		± 2.90	± 1.42		± 1.14	± 0.78		± 1.10	± 0.71	
Mongolia	7.06	4.64	< .001	6.90	4.68	< .001	0.95	0.38	< .001	0.92	0.54	< .001
	± 7.30	± 5.96		± 6.89	± 5.81		± 1.64	± 0.96		± 1.42	± 1.04	
Nepal	2.06	2.40	.049	1.77	1.94	.12	0	0	-	0	0	-
	± 2.53	± 2.71		± 2.24	± 2.23							
Philippines	8.91	6.38	< .001	8.82	6.32	< .001	0.53	0.44	.009	0.53	0.44	.009
	± 7.88	± 6.83		± 7.77	± 6.71		± 0.76	± 0.78		± 0.76	± 0.78	
Sri Lanka	4.74	3.50	< .001	5.46	4.21	< .001	1.25	0.97	.002	1.14	0.75	< .001
	± 4.02	± 3.49		± 4.07	± 3.98		± 1.67	± 1.68		± 1.68	± 1.60	
Vietnam	3.98	1.17	< .001	4.17	1.28	< .001	1.10	0.26	< .001	1.07	0.27	< .001
	± 5.58	± 3.65		± 5.79	± 3.87		± 1.46	± 0.77		± 1.44	± 0.79	

**Footnote:**

<sup>a</sup>Not permitted Food Ads include solid foods and beverages. It excludes Ads for culinary ingredients, nutritional supplements, baby food, and follow-up formula.

**Abbreviations:** Ads= advertisements; PVT = Peak Viewing Time; SEARO= South-East Asia Regional Office ; WPRO= Western Pacific Regional Office

Philippines> 22.7% in Sri Lanka> 19.9 % in Malaysia; 14.2 % in China> 8.4% in India.

High sugar-containing foods were also frequently advertised (**Figure 3**). Combined share as indicated for the WPRO criteria was highest for Sri Lanka (40.7%)> India (32.3%)> Malaysia (28.1%)> Nepal (22.8%) > China (17.3%)> Mongolia (16.7%)> Bangladesh (15.5%)> Philippines (10.2%)> Vietnam (6.1%). With SEARO criteria some differences were indicated as per India (44.6%)> Sri Lanka (40.1%)> Malaysia (29.0%)> Bangladesh (22.3%)> Nepal (20.3%) > Mongolia (16.7%)> Philippines (14.7%)> China (6.7%)> Vietnam (5.8%).

Not permitted Food Ads characterized by high sodium and high fat content as per both NPM thresholds were among the top five frequently advertised in China. These identified as *Savoury snacks* (34.0%) under WPRO whereas *Cheese and analogues* (34.8%) and *Ready-to-eat savouries (savoury snack foods): Potato, cereal or starch-based (from roots, tuber, or legumes) and animal based (from skin)* (24.0%) were products categorized under SEARO (**Figure 4**). For Malaysia, Mongolia and Philippines such high advertising frequency trends were observed relating to *Ready-made and convenience foods and composite dishes* under WPRO and *Composite foods (prepared foods)* under SEARO criteria.

## Discussion

The rapid economic growth occurring in Asia over the last decades accompanied by nutrition transition has unfortunately seeded childhood obesity in many countries. The phenomena of obesity transition occurring through globalization of trade and growth of transnational and regional food businesses, has been nurtured through increased access to unhealthy foods and beverages [9, 41-43]. Much of the food manufactured for the Asian market promotes HFSS foods and beverages, and the extent of their marketing channeled through children's settings such as

popular television is little understood in Asia [11, 24, 25, 29, 31, 44]. This research provides the first baseline evidence on the extent and nature of unhealthy television food marketing to children and adolescents across nine Asian countries (Bangladesh, China, India, Malaysia, Mongolia, Nepal, Philippines, Sri Lanka, and Vietnam) using the uniform approach of INFORMAS [35]. Participating countries represented low- and middle-income countries at various stages of epidemiological, demographic and nutrition transitions, presenting an opportunity to compare and contrast the results. Policy commitments to regulate unhealthy food marketing on television and other media is not mandatory in most Asian countries [27] and for some of the participating countries in this study there is reliance on industry commitments to self-regulate.

By adopting INFORMAS methodology to harmonize measurement approaches, we showed conclusively that unhealthy foods defined as ‘not permitted’ by WHO criteria for the NPMs established for the WPRO and SEARO regions in Asia [39, 40] overwhelmingly dominated food advertising through children’s popular television channels in the nine Asian countries studied. The Ad rate was highly varied between countries, ranging from almost ten ‘not permitted’ food advertisements per hour in the Philippines and Sri Lanka to two per hour in Malaysia. The rates observed in the current study were lower than the earlier cross-country study in the Asia Pacific in 2014, which used a different food classification system, by which the rate of ‘non-core’ (unhealthy) food advertising ranged between 2.3 advertisements per hour in South Korea and 16.7 in Indonesia [31]. This finding aligns with most studies on television food marketing benchmarking Food Ads to standards of perceived thresholds for the ‘danger’ nutrients – fat, sugar and sodium- in foods being advertised [45-47].

With the exception of India, China and Nepal, most countries observed higher rates of not



permitted Food Ads during the broadcast periods most popular with children compared to non-peak viewing times. This aligns with the earlier studies, which also found higher rates of unhealthy food advertising during children's peak viewing times [31, 38, 48]. Uniquely, China had significantly lower rates of not permitted Food Ads during children's peak viewing times, based on the SEARO classification. This may be attributed to local advertising regulations in China, which require several advertising slots to be reserved for public service Ads (including healthy food such as fresh fruit) during these broadcast periods [49].

The use of persuasive marketing techniques in not permitted Food Ads was also significantly higher during children's peak viewing times in most countries, and concurs with previous multi-country studies showing higher rates of promotional characters and premium offers during children peak viewing times compared to non-peak viewing times [31, 38]. Taken together, the higher rate of unhealthy food marketing during broadcast times that are most popular with children and the higher use of persuasive marketing techniques that are likely to appeal to children at these broadcast times, suggests that advertisers are targeting children with advertising for unhealthy foods.

As this study used both the WPRO and SEARO nutrient profiling models (NPM) to classify advertised foods, it became possible to explore differences in the performance of these systems in categorizing food marketing across Asian countries. Application of the SEARO model compared to WPRO model tended to lead to a lower ratio of 'permitted' to 'not permitted' advertised foods for most countries, except China and Sri Lanka where ratios were comparable between NPM models. Differences occurred when healthy food and beverage items such as plain mineral water were included under WPRO but not in the SEARO model. Another reason for higher ratios associated with WPRO was the exclusion of culinary ingredients many of which

would have been identified as permitted Food Ads. Most studies investigating content analyses to NPMs [12, 37, 38, 50, 51] have been benchmarked to the WHO Europe Regional Office [52].

Further to comparing WPRO or SEARO criteria, in the case of beverages that are categorized into fewer groups under WPRO, this accommodates more products within a group as seen when carbonated and chocolate malt drinks are typically grouped under *Other beverages*. Whereas under SEARO these beverages are grouped separately as carbonated drinks under *Water-based flavored drinks* and chocolate malt beverage products under *Cereal, grain, tree nut-based beverages*. In scrutinizing the combined share of beverages amongst the top five frequently advertised not permitted foods, we noted India and China generated higher rates as per WPRO criteria with two categories, namely *Energy drinks, tea and coffee* and *Other beverages*; but with SEARO criteria having only one category, i.e. *Water-based flavoured drink*, the combined share became lower. Under WPRO, *Energy drinks, tea and coffee* were not permitted regardless of nutrient level and were classified together for all product inclusion [39]. Whereas with SEARO category *Coffee, coffee substitutes, tea, herbal infusions* had a total sugar threshold of 2g, and further, energy drinks were categorized under *Water-based flavoured drink* [40]. SEARO is the NPM model adopted by India and other South Asian countries (Nepal, Sri Lanka, Bangladesh) whereas WPRO is applicable to China.

Even when considering sugar concentrated solid food products, differences between NPM models could be explained by categories such as *Chocolate and sugar confectionery, energy bars, and sweet toppings and desserts* as well as *Cakes, sweet biscuits and pastries, other sweet bakery products, dry mixes for making such* being categorized as not permitted under WPRO regardless of nutrient level [39]. As regards high sodium and high fat thresholds defining permitted and not permitted foods applicable to the *Cheese* category, a major difference was

attributed to the SEARO's additional criteria not allowing products with added sugar (0g) [39, 40].

We observed advertising of fast foods is a concern for Malaysia, Mongolia and Philippines indicated by high advertising frequency trends for *Ready made and convenience foods and composite dishes* under WPRO and *Composite foods (prepared foods)* under SEARO criteria. This finding related to Malaysia indicates a failure of a self-regulatory policy known as the *Guideline on the Advertising and Nutrition Information Labelling of Fast Foods* which was introduced in 2008 to restrict advertising of fast food during children's programs such as cartoons if  $\geq 4\%$  of children 4 to 9 years old comprise the television viewing audience [53, 54].

A feature of television advertising in Asia is featuring culinary ingredients even during peak viewing times [24, 26, 44]. It is noted that peak viewing time for Asian countries equates to prime time for Asian families, running between 6pm to 11pm which also attracts the whole family. It is not surprising that this period also carries Ads for culinary ingredients targeting women. Additionally, culinary items featured in Ads were not identifiable as per serving size on the packaging as they are ingredients combined with other ingredients in cooking meals. We therefore excluded culinary ingredients from our analyses as culinary practices are unique to the Asian region with recipes prepared in the home requiring many staples (uncooked rice, cooking oil, spices, seasoning powder, uncooked meat, chicken or vegetable stock, recipe premix, plain sugar, stevia, plain flour, breading mix, lentils, and coconut milk). For Malaysia and Vietnam, items such as *uncooked rice* and *soybean cooking oil* would otherwise be identified as permitted foods as per WPRO criteria (*supplementary Table S2*).

A major strength of this study was harmonized measurement approaches for all nine Asian

countries enabled comparisons between countries and two WHO nutrient profile models for determining the extent, intensity and nature of unhealthy food marketing on television. The comparative assessment of WPRO and SEARO NPMs across the nine Asian countries facilitated identifying inconsistencies in their application to categorize Food Ads due to regional and cuisine differences, therefore indicating room for improvement across models. The findings overall will become the baseline evidence to inform future research, policy and advocacy actions to strengthen local regulatory framework in each country. The generated evidence therefore, overwhelmingly supports an urgent call for mandatory policy action in Asian countries to restrict children's exposure to unhealthy food marketing on television so as to protect them from the harmful impact of food marketing [6]. Ultimately, a comprehensive regulatory framework and consistent monitoring over time should enable the reduction of exposure and power of unhealthy food marketing directed to children and adolescents.

A major benefit in conducting this study was the collaboration achieved between country teams and INFORMAS experts enabled exchange of technical knowledge and building capacity of researchers across the nine Asian countries for monitoring television food marketing directed to children. In the immediate future, there is a need to conduct a similar study on digital food marketing in Asia, as the food industry is expected to shift their marketing strategy to digital media platforms. Across LMICs, building collaborative capacity for research such as this study and advocating for mandatory policies to restrict unhealthy food marketing are transformative actions necessary to offset the obesogenic food environment of children.

## Conclusion

This Project's collaboration and using harmonized methodology generated country-level evidence for nine Asian countries on the exposure and power of unhealthy food marketing in television to children. Cross country comparisons, irrespective of country income level, indicated unhealthy food advertising dominated children's popular television channels especially during peak viewing times with frequent advertising of sugar-sweetened beverages, sugar-containing solid food and snacks and fast foods high in salt and fat. Clearly unhealthy food marketing through popular children's television channels is occurring widely in Asia and is a clear breach of child rights. Evidence outcomes will be used to advocate for stronger policy regulations and their subsequent implementation to control unhealthy food marketing, which will strengthen strategies promoting a healthier food environment for the Asian population.

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### **Author's Contributions**

TK, BS, SMR, JZ, NK, BJ, RKP, EQB, TT and NTTTT conceptualized the project and contributed to the study design. TK, GRO and SSN served as the project management team in providing training and data management for all participating countries. SM and BK provided capacity building in the adoption of the INFORMAS protocol. They together with KC also provided faculty support in the training involved for data analyses. Data collection and coding was mainly managed by individual countries' principal investigator (PI) and co-PI (TK, MJS, GRO, SMR, MAU, TY, JZ, NK, NKS, BJ, ED, RKP, RP, EQB, ACR, TT, PW, NTTTT and PTH). The project management team consolidated the data from all participating country, and conducted the statistical analysis. KC reviewed each country's results. TK, GRO and SSN developed the first draft of the manuscript. All authors reviewed, revised and approved the final manuscript.

### **Conflicts of Interest**

None declared.

## Data Availability

Data is available upon reasonable request. Access to data depends on each country's individual decision.

## Abbreviations

Ads: Advertisements

HFSS: High in fat, sugar and salt

INFORMAS: International Network for Food and Obesity/NCD Research, Monitoring and Action Support

IRR: Inter-coder reliability

LMICs: Low- and middle-income countries

NCDs: Noncommunicable diseases

NPM: Nutrient profile model

PVT: Peak viewing time

SEARO: WHO regional offices for South-East Asia

UMIC: Upper-middle income country

WHO: World Health Organization

WPRO: WHO regional offices for Western Pacific

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### **Legend for Figure 1**

**Title:** Top 5 (%) most frequently advertised not permitted foods by WPRO and SEARO Criteria.

#### **Footnotes:**

Abbreviations: UMIC = Upper middle income country; LMIC = Lower middle income country; SEARO= South-East Asia Regional Office; WPRO= Western Pacific Regional Office; <sup>a</sup>Example of *Other beverages* includes chocolate malt beverage, juice drinks, mineral water, and carbonated soft drinks.

### **Legend for Figure 2**



**Title:** Top 5 (%) most frequently advertised not permitted products by WPRO and SEARO criteria as per combined estimates for Sugar and Non-sugar Sweetener-based Beverage Products.

**FootNotes:**

Abbreviations: UMIC = Upper middle income country; LMIC = Lower middle income country; SEARO= South-East Asia Regional Office; WPRO= Western Pacific Regional Office

**Legend for Figure 3**

**Title:** Top 5 (%) most frequently advertised not permitted products by WPRO and SEARO criteria as per combined estimates for Sugar Concentrated Solid Food Products.

**FootNotes:**

Abbreviations: UMIC = Upper middle income country; LMIC = Lower middle income country; SEARO= South-East Asia Regional Office; WPRO= Western Pacific Regional Office

**Legend for Figure 4**

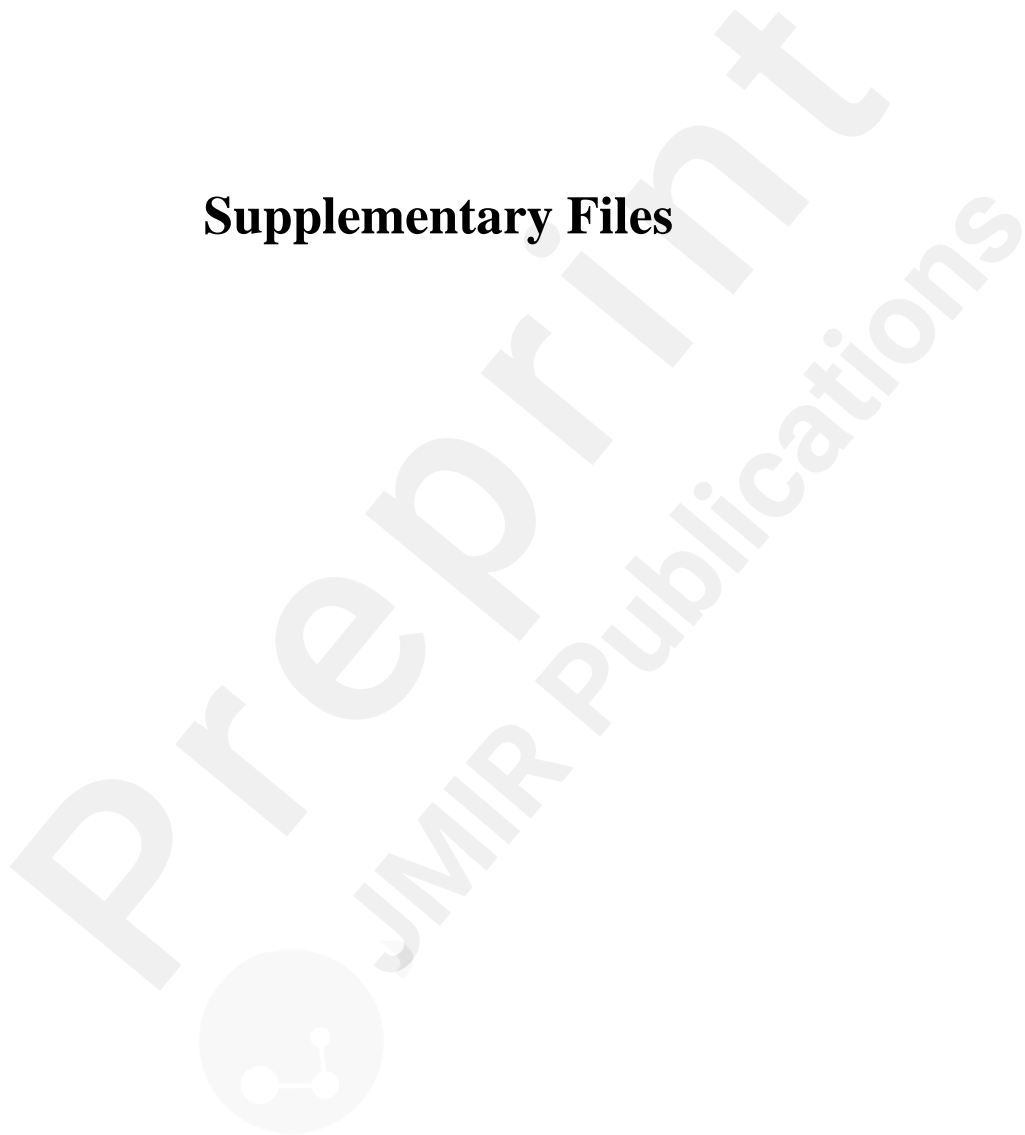
**Title:** Top 5 (%) most frequently advertised not permitted products by WPRO and SEARO criteria as per combined estimates for High Sodium and High Fat Containing Food Products.

**FootNotes:**

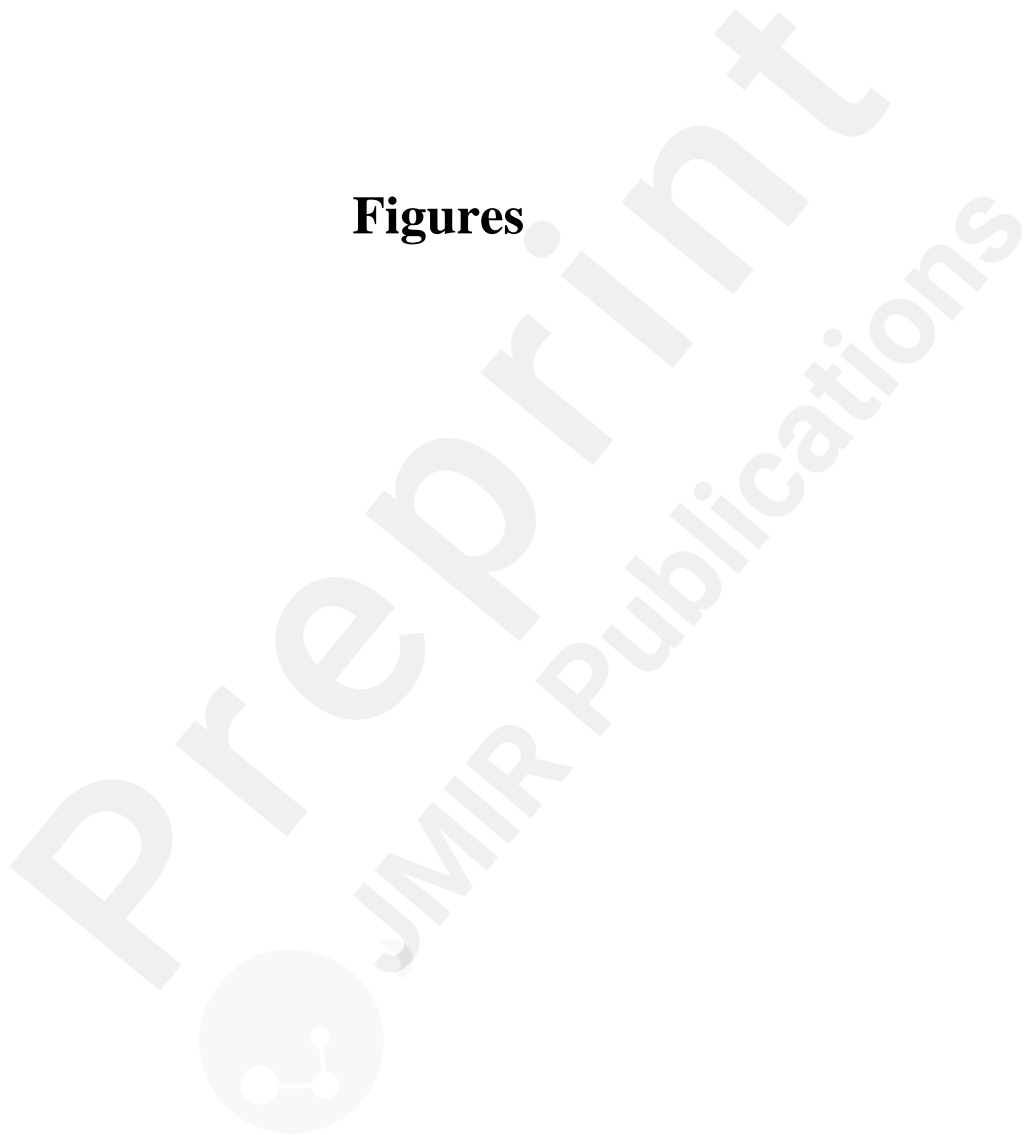
Abbreviations: UMIC = Upper middle income country; LMIC = Lower middle income country; SEARO= South-East Asia Regional Office; WPRO= Western Pacific Regional Office

<sup>a</sup>Relevant products were not detected for Sri Lanka as per WPRO and SEARO criteria in Figure 4.

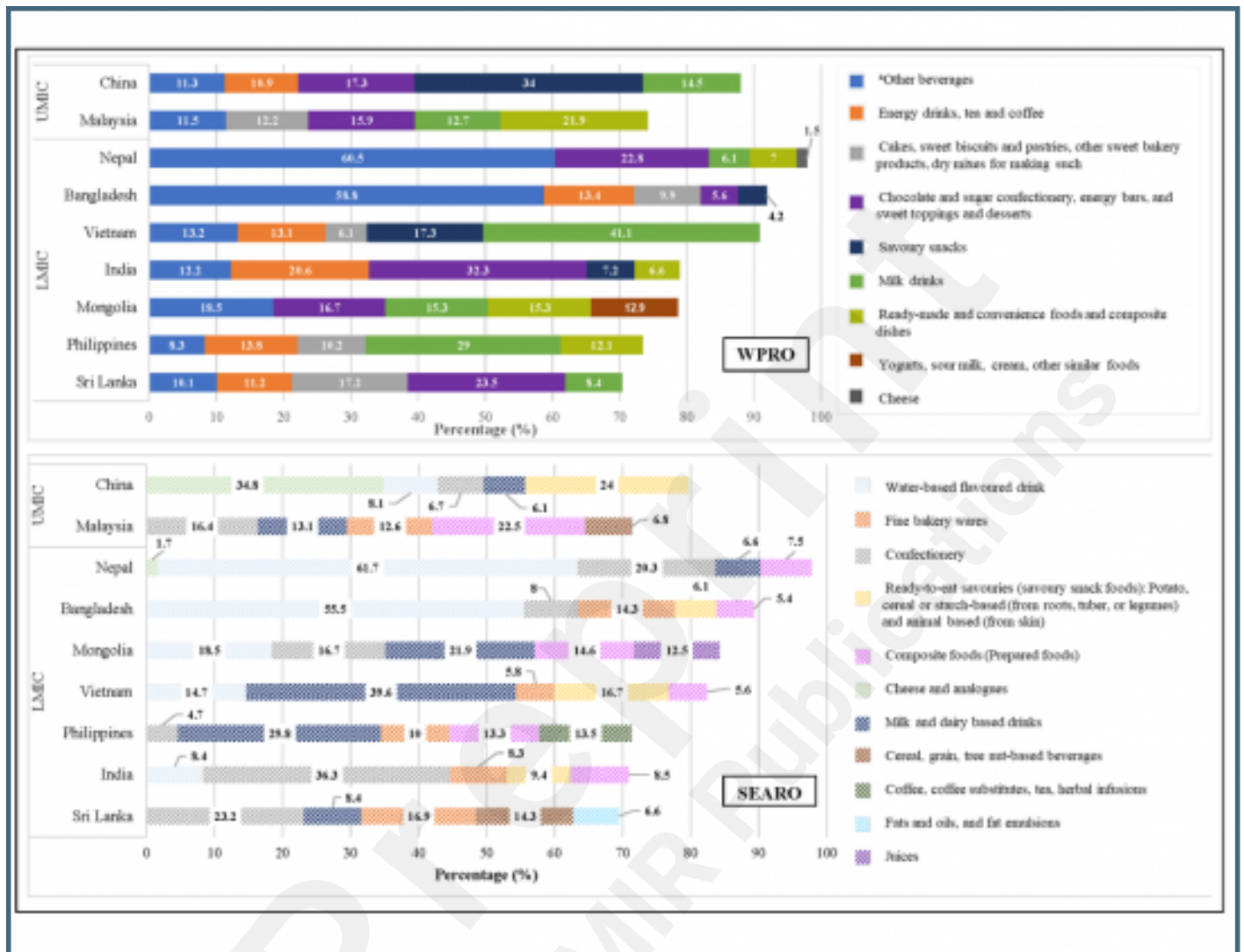
## Supplementary Files



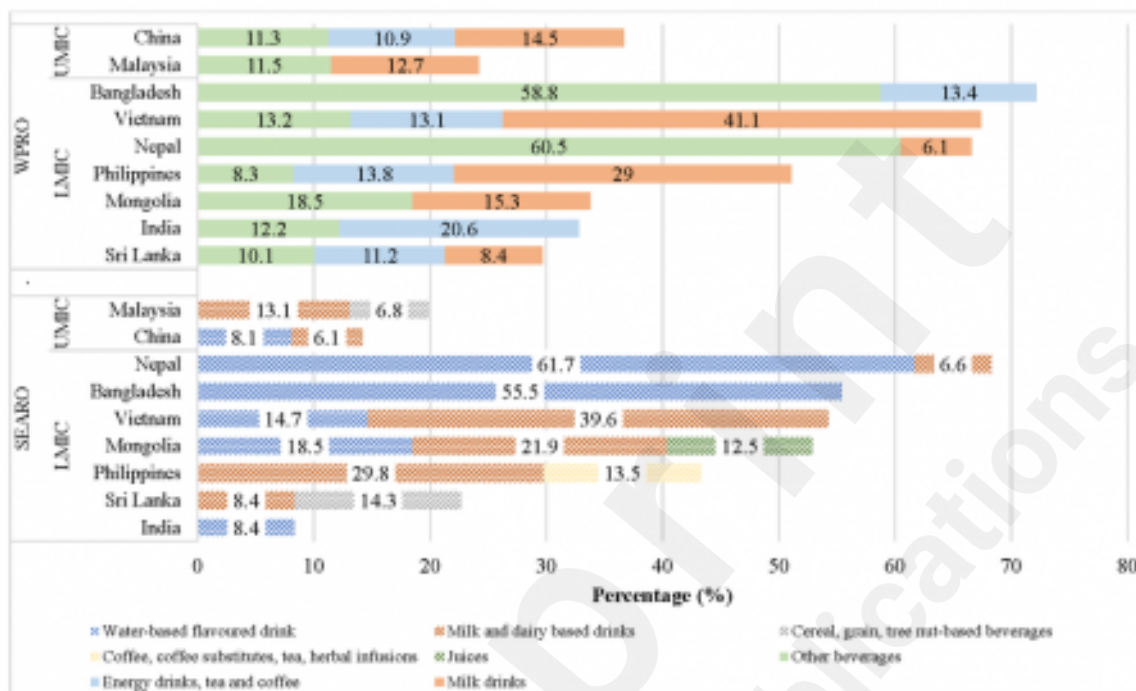
## Figures



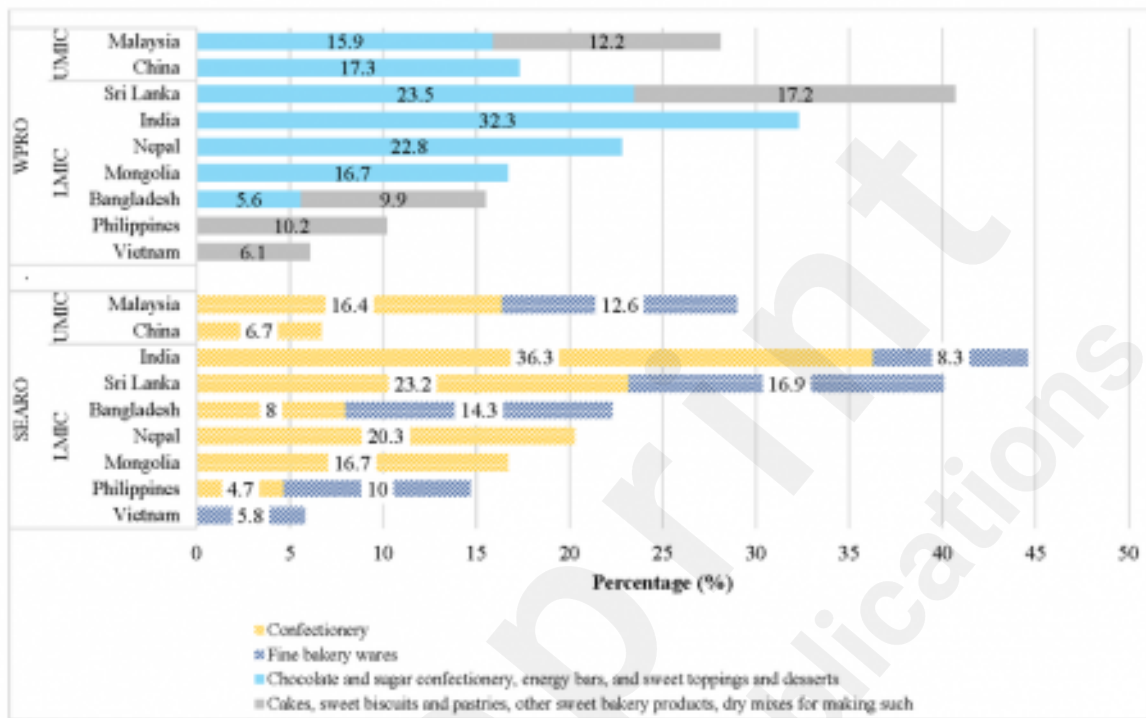
Top 5 (%) Most frequently advertised not permitted foods by WPRO and SEARO criteria. aExample of Other beverages includes chocolate malt beverage, juice drinks, mineral water, and carbonated soft drinks.



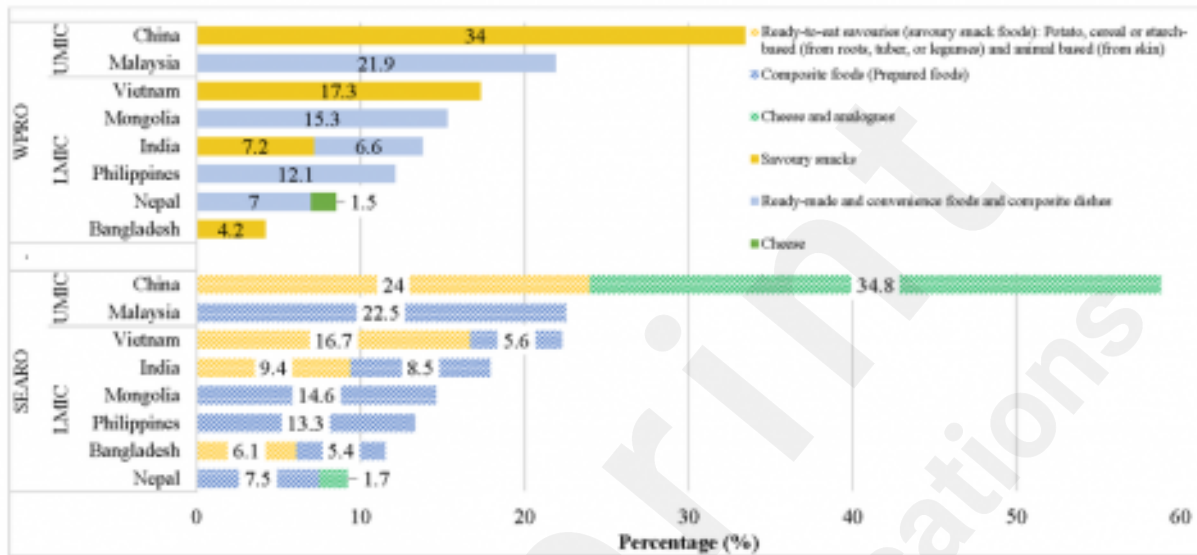
Top 5 (%) most frequently advertised not permitted products by WPRO and SEARO criteria as per combined estimates for Sugar and Non-sugar Sweetener-based Beverage Products.



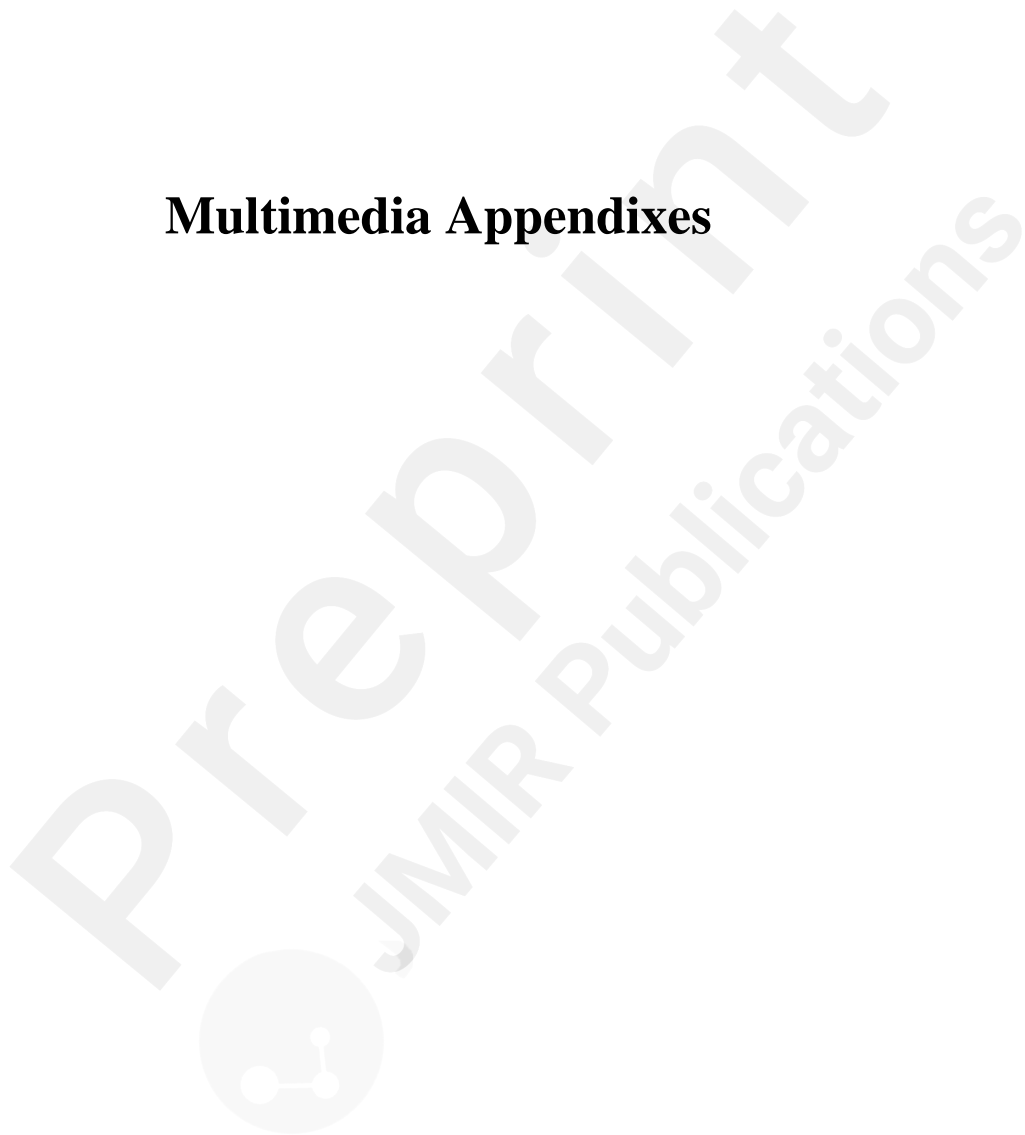
Top 5 (%) most frequently advertised not permitted products by WPRO and SEARO criteria as per combined estimates for Sugar and Non-sugar Sweetener-based Beverage Products.



Top 5 (%) most frequently advertised not permitted products by WPRO and SEARO criteria as per combined estimates for High Sodium and High Fat Containing Food Products. aRelevant products were not detected for Sri Lanka as per WPRO and SEARO criteria in Figure 4.



## Multimedia Appendixes





Supplementary table.

URL: <http://asset.jmir.pub/assets/61de664bc8658ecd0280a7aa55755722.docx>

