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Labelling completeness and sodium content of packaged foods in India

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Abstract

Objective: To estimate the proportion of products meeting Indian government labelling regulations and to examine the Na levels in packaged foods sold in India.
Design: Nutritional composition data were collected from the labels of all packaged food products sold at Indian supermarkets in between 2012 and 2014. Proportions of products compliant with the Food Safety Standards Authority of India (FSSAI) regulations and labelled with Na content, and mean Na levels were calculated. Comparisons were made against 2010 data from Hyderabad and against the UK Department of Health (DoH) 2017 Na targets.
Setting: Eleven large chain retail stores in Delhi and Hyderabad, India.
Subjects: Packaged food products (n 5686) categorised into fourteen food groups, thirty-three food categories and ninety sub-categories.
Results: More packaged food products (43 *v.* 34 %; $P < 0{\cdot}001$) were compliant with FSSAI regulations but less (32 *v.* 38 %; $P < 0{\cdot}001$) reported Na values compared with 2010. Food groups with the highest Na content were sauces and spreads (2217 mg/100 g) and convenience foods (1344 mg/100 g). Mean Na content in 2014 was higher in four food groups compared with 2010 and lower in none ($P < 0{\cdot}05$). Only 27 % of foods in sub-categories for which there are UK DoH benchmarks had Na levels below the targets.
Conclusions: Compliance with nutrient labelling in India is improving but remains low. Many packaged food products have high levels of Na and there is no evidence that Indian packaged foods are becoming less salty.

Keywords
Nutritional labelling
Processed foods
Sodium
Salt
India
UK Food Standards Agency

CVD are the leading cause of death in India and are responsible for approximately 2·3 million deaths each year, of which almost a quarter are ascribed to high blood pressure[1,2]. There were approximately 118 million individuals with hypertension in 2000 and this number is expected to reach 213 million by 2025[3]. Excess salt consumption is a leading cause of high blood pressure and has been reported as the seventh leading cause of global mortality, responsible for one in ten cardiovascular deaths worldwide[4,5].

The Indian diet is traditionally characterised by high intakes of fruits, vegetables and unprocessed coarse cereals and pulses[6]. However, National Nutrition Surveys done over the past 20 years have shown a change in consumption patterns towards more processed and restaurant foods[7]. This shift affects mainly middle- and high-income groups and appears to be driven by changes in the food environment which are making a wider range of processed food products accessible[8]. In conjunction with increased average per capita income, these types of products are accessible by a larger proportion of the population with increased risk of exposure to adverse nutrients like saturated fats, sugars and salt[4].

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The known benefits of salt reduction for lowering blood pressure make a strong case for a reduced amount of salt in the Indian food supply. A recent survey of 24 h urinary Na excretion among a population of 1395 adults in India reported an average intake of 9·27 g salt/d[9], which, when inflated to account for the minimum likely non-urinary losses of Na, equates to 10·20 g salt/d. This is consistent with a systematic review of salt intake among adult Indians which reported intake as 10·98 g/d[10]. India has ratified the WHO global monitoring framework for the prevention and control of non-communicable diseases (2013–2020)[11], which includes a target to reduce salt intake by 30 % by 2025. The design and implementation of an optimal national salt reduction strategy will require knowledge about salt intake levels around the country and the sources of salt in the food supply[12]. Packaged foods are likely a large and increasing source of dietary salt for many people in India and information about the salt levels in foods will be vital to the design of a national salt reduction programme. Many other countries have set benchmarks for the labelling of salt on foods and targets for the maximum levels of salt in key packaged food categories[13,14].

In 2011, the Food Safety and Standards Authority of India (FSSAI) introduced new national nutrition labelling regulations that require core information describing the nutritional content of processed foods to include energy (kilocalories), protein, carbohydrate and fat (grams) per 100 g or 100 ml serving of the product[15]. Data for the current survey (2012–2014) were collected after the introduction of these new requirements. A prior survey done in 2010 before the 2011 regulation provided for historical comparisons[16]. As such, we estimated: (i) the current proportion of packaged foods in India displaying the nutrition information required by the Indian regulation and how this compared with 2010; (ii) the average levels of Na in Indian packaged foods and how these compared with 2010; and (iii) the proportion of Indian packaged foods known to meet Na content targets for 2017 set by the UK Department of Health (DoH)[13]. Salt is the major source of Na in the diet (1 g Na = 2·5 g salt).

Materials and methods

The present study comprised a systematic survey of packaged foods for sale in urban Hyderabad and New Delhi, India with data collection undertaken over a 27-month period from July 2012 to September 2014.

Retail outlets surveyed

The stores were purposively selected to ensure that a broad range of foods representative of packaged products for sale in Hyderabad and New Delhi were included. There were eleven stores from which data were collected; seven retail chains (HyperCity supermarket; MORE retail; Food World; Heritage Supermarket; Ratnadeep supermarket; Dilip Supermarket; Nilgiris supermarket) and four smaller local stores (SSK Supermarket, Jubilee Kirana; General Stores, Tilaknagar Kirana; General Store, Maheshwari Kirana; General Store). Permission to collect data was obtained from each store. It was not possible to obtain permission to collect data from five other stores that were similar in size to the retail chain stores, but it is likely that product ranges in those five stores overlapped substantially with those from which data were collected.

Packaged foods included

All packaged food products that were available for sale in each store during the period of data collection were recorded. Surveys were carried out twice during the 27-month period and all data were combined. During each product survey, data collection staff captured the barcode and photographed the front of the pack, the nutrition label and the ingredients list for every packaged food item on every shelf in every outlet surveyed. This was done using a smartphone application developed by The George Institute for Global Health[17] and according to a protocol devised by an international collaborative project designed to document the nutritional composition of packaged foods globally[18]. The images collected by the smartphone application are transmitted to a data management centre in India for processing.

Data extraction

The data management centre uses a bespoke content management system to view the images and transfer data describing the product into the database. The key variables used for the current analysis were the brand name, product name, manufacturer name, serving size and presence of nutritional information per 100 g (or per 100 ml for liquids) for energy, protein, carbohydrate, sugar, total fat, Na and saturated fat. Where data were absent it was recorded as missing. Where nutritional information was provided 'as sold' or 'as prepared' then the former was used to ensure a standardised approach and to facilitate comparison against the UK DoH 2017 Na targets. Different pack sizes of the same product were recorded as separate items in the database but each product was included only once in the primary analyses.

Categorisation of foods

Foods were categorised using the system developed by the Global Food Monitoring Group[18] into fourteen main food groups: (i) bread and bakery products; (ii) cereal and grain products; (iii) confectionery; (iv) convenience foods; (v) dairy and dairy alternatives; (vi) edible oils and oil emulsions; (vii) fish and fish products; (viii) fruit and vegetables; (ix) meat and meat products; (x) non-alcoholic beverages; (xi) sauces and spreads; (xii) snack foods; (xiii) sugars, honey and related products; and (xiv) special foods. Eight of these main food groups known to contribute significant quantities of salt to the diet were further

subdivided to provide data about fourteen finer product categories known to be main contributors to salt in the diet and to enable comparison of products against matched categories with UK DoH 2017 Na targets. Alcohol, vitamins and supplements, and products that could not be categorised were excluded from the analyses. The special foods category encompasses baby food and protein supplements including protein bars.

Comparator data from 2010

Nutritional data per 100 g (or per 100 ml for liquids) for energy, protein, carbohydrate, sugar, total fat, Na and saturated fat on products collected in a survey conducted in 2010 in Hyderabad using a similar data collection protocol[16] were used to make comparisons with the current survey in terms of the proportion of packaged foods meeting FFSAI labelling requirements (reporting data about energy, protein, carbohydrate, sugar and total fat), the proportion with Na labelled, and the mean concentration of Na in foods with the requisite labelling.

Statistical analysis

Analyses were variously done for all products combined and specific food categories. There were three main sets of analyses: (i) the proportions of packaged foods in India carrying FSSAI-legislated minimum nutritional information were calculated and compared with data from 2010 using χ^2 tests. Separate analyses were done for the proportion of products carrying data about Na content; (ii) the average levels of Na in packaged foods for which data were available were calculated for 2014 and 2010 along with mean differences and 95 % CI and compared using unpaired *t* tests. These comparisons were repeated using medians since some data were asymmetrically distributed; and (iii) the proportion of packaged foods 'known to meet' maximum Na content targets for 2017 set by the UK DoH were calculated for fourteen food sub-categories for which direct comparison could be made. Foods were defined as 'known to meet' the target if the label reported an Na content that was below the specified target. All analyses were done using the statistical software package Stata version 13.1; *P* values less than 0·05 were considered as likely to indicate a finding that had not arisen solely by chance.

Results

Data were collected for 5789 products and 103 products were subsequently excluded as they were alcohol (*n* 6), vitamins or supplements (*n* 82) or products that could not be categorised (*n* 15). This left 5686 products in fourteen food groups upon which the main analyses were based. Packaged fruit and vegetable products, including tinned, frozen, jarred and dried fruit and vegetables, were the food group with the largest number of products comprising 21 % of the total, followed by cereal and cereal products (14 %) and non-alcoholic beverages (12 %). Fish and fish products had the least number of products, making up <1 % (*n* 46) of the total. The data set from 2010 included 4166 products distributed across the same fourteen food groups. In the 2010 data the largest food groups were packaged fruit and vegetable products (19 %), cereal and cereal products (12 %) and bread and bakery products (11 %), and the fewest numbers of items were in fish and fish products (1 %).

Compliance with national labelling regulations

Forty-three per cent of products (*n* 2468) met the FSSAI regulations for labelling and 32 % (*n* 1812) were labelled for Na content (Table 1). Across the fourteen food groups there were nine groups for which the proportion meeting FSSAI requirements had increased since 2010 and five for which there was no difference (Table 2). Overall, the proportion meeting FSSAI labelling requirements increased from 34 to 43 % ($P < 0{\cdot}001$) over this period. In terms of Na labelling there were six food groups for which the proportion labelled with Na decreased significantly, and overall the proportion declined from 38 to 32 % ($P < 0{\cdot}001$; Table 3).

Mean sodium content of packaged foods

Mean Na values were highest in sauces and spreads (2217 mg/100 g) and particularly in the meal-based sauces sub-category, which had mean Na content of 3240 mg/100 g. The food group with the lowest Na content was sugars, honey and related products (44 mg/100 g), and the mean Na content of confectionery (98 mg/100 g) and non-alcoholic beverages (119 mg/100 g) was also low (Table 3). In addition to varying between food groups, Na content also varied markedly within many food groups and within food sub-categories. For example, within sauces and spreads the Na content of individual products ranged from 0 to 21 218 mg/100 g. The very wide ranges are to some extent the result of outliers but for many categories there were large numbers of very salty products.

Compared with the 2010 data there was an increase in the mean Na content of four food groups (cereal and grain products, +30 %; dairy and dairy alternatives, +99 %; non-alcoholic beverages, +103 %; sauces and spreads, +50 %; all $P < 0{\cdot}05$) and a decrease in none (Table 3). Evaluation of median values showed significant increases in the Na content of six food groups and decreases in none (see online supplementary material, Supplemental Table 1).

Proportion of packaged foods meeting UK Department of Health salt reduction targets

There were 1407 products in fourteen food sub-categories for which direct comparison could be made against 2017

Table 1 Proportion of 5686 packaged food products in 2014 meeting Food Safety and Standards Authority of India (FSSAI) guidance for nutrition labelling and proportion labelled with sodium

	Meet FSSAI regulation		Na labelled	
	n/*N*	%	*n*/*N*	%
Bread and bakery products	378/600	63	162/600	27
Biscuits	303/395	77	109/395	28
Cereal and grain products	339/771	44	225/771	29
Indian breakfast products	50/70	71	42/70	60
Breakfast cereal	96/113	85	68/113	60
Noodles	54/66	82	27/66	41
Confectionery	183/346	53	91/346	26
Convenience foods	124/174	71	116/174	67
Ready meals	70/74	95	49/74	66
Soup	43/86	50	61/86	71
Dairy and dairy alternatives	185/289	64	130/289	45
Processed cheese	15/46	33	41/46	89
Edible oils and oil emulsions	21/142	15	8/142	6
Fish and fish products	21/46	46	31/46	67
Canned fish	9/18	50	16/18	89
Fruit and vegetables	244/1219	20	308/1219	25
Canned vegetables	29/34	85	24/34	71
Pickled vegetables	45/57	79	43/57	75
Herbs and spices	516/543	95	105/543	19
Meat and meat products	15/61	25	12/61	20
Non-alcoholic beverages	310/659	47	158/659	24
Sauces and spreads	235/572	41	271/572	47
Meal-based sauces	97/187	52	98/187	52
Table sauces	23/62	37	33/62	53
Snack foods	292/504	58	200/504	40
Extruded snacks	41/60	68	9/60	15
Indian snack food	184/322	57	127/322	39
Sugars, honey and related products	26/145	18	35/145	24
Special foods	95/158	60	74/158	47
TOTAL	2468/5686	43	1812/5686	32

Na targets set by the UK DoH. Overall, 382 (27 %) products in these fourteen sub-categories could be confirmed as meeting the UK DoH 2017 Na targets (Table 4). For 755 (54 %) products there were no data about Na content available. For the remaining 652 (46 %) products with reported Na content, Na levels were known to be above the target level for 270 products (41 %). Known compliance with the 2017 UK DoH Na targets ranged from 15/34 (44 %) in the canned vegetables sub-category to 2/56 (4 %) in the savoury biscuits category.

Discussion

The data collected in the current survey of 5686 products from Indian supermarkets raise concerns about the quality of nutrition labelling as well as the levels of Na in packaged food items for sale in India. While it appears that labelling of required nutrients for packaged food has increased in several major food groups over recent years, the proportion of foods with labelling meeting local regulations is still less than half of what is available for sale. Likewise, only a third of all packaged food items had Na values reported on the label and as such it is very difficult to be sure about the Na levels of the majority of Indian packaged foods. Furthermore, benchmarking the available data against the UK Na targets shows that many products contain unnecessarily high levels of Na.

While the FSSAI labelling regulations meet some of the requirements of the international body governing food labelling, Codex Alimentarius, global guidelines set by Codex suggest the additional reporting of saturated fat and Na[19]. For consumers to make fully informed choices about the healthiness of products they want to purchase, food will need to display all relevant nutrition information, and FSSAI would do well to adopt the Codex guidance on Na and saturated fat labelling to achieve this.

Data for the current survey were collected after the 2011 introduction of the FSSAI labelling requirements. Comparison made against the 2010 data collected immediately prior allows for a direct assessment of the initial impact of the regulation. The robustness of that comparison is somewhat reduced by the different survey methodologies used and the magnitude of the difference between the proportions recorded as compliant at each time point may be biased as a consequence. However, the large proportion of foods with non-compliant packaging in the most recent survey leaves little doubt about the persisting problems with achieving even basic nutrition labelling of foods in India. The low levels of Na reporting are unsurprising given the absence of any regulatory requirement

Table 2 Comparison of the proportion of packaged food products meeting Food Safety and Standards Authority of India (FSSAI) guidance for nutrition labelling and the proportion labelled with sodium between 2010 and 2014

	Meet FSSAI regulation (%)			Na labelled (%)		
	2010	2014	*P* value†	2010	2014	*P* value†
Bread and bakery products	67	63	0·12	38	27	<0·001
Biscuits	72	77	0·17	42	28	<0·001
Cereal and grain products	44	44	0·95	45	29	<0·001
Indian breakfast products	29	71	<0·001	74	60	0·04
Breakfast cereal	68	85	0·002	71	60	0·01
Noodles	70	82	0·13	45	41	0·63
Confectionery	45	53	0·03	31	26	0·13
Convenience foods	59	71	0·03	72	67	0·31
Ready meals	51	95	<0·001	70	66	0·59
Soup	71	50	0·01	75	71	0·61
Dairy and dairy alternatives	44	64	<0·001	46	45	0·90
Processed cheese	0	33	<0·001	53	89	<0·001
Edible oils and oil emulsions	0	15	<0·001	7	6	0·68
Fish and fish products	13	46	<0·001	58	67	0·34
Canned fish	22	50	0·04	66	89	0·10
Fruit and vegetables	12	20	<0·001	32	25	<0·001
Canned vegetables	41	85	<0·001	52	71	0·12
Pickled vegetables	43	79	0·001	54	75	0·04
Herbs and spices	25	95	<0·001	28	19	<0·001
Meat and meat products	16	25	0·23	41	20	0·01
Non-alcoholic beverages	4	47	<0·001	38	24	<0·001
Sauces and spreads	42	41	0·75	49	47	0·73
Meal-based sauces	48	52	0·39	44	52	0·22
Table sauces	33	37	0·65	67	53	0·11
Snack foods	34	58	<0·001	35	40	0·16
Extruded snacks	90	68	0·05	19	15	0·66
Indian snack food	27	57	0·65	29	39	0·01
Sugars, honey and related products	11	18	0·20	16	17	0·78
Special foods	39	60	0·001	64	47	0·01
TOTAL	34	43	<0·001	38	32	<0·001

†Unpaired *t* test comparing 2010 and 2014 data.

for Na on the nutrition label and this needs to be addressed urgently. Not only does lack of Na data make it impossible for consumers to quantify or control the amount of Na they are consuming, the absence of labelled Na data will also inhibit efforts to reduce Na levels in the food supply because it will not be possible for agencies to systematically identify and target the problem areas[20,21].

The benchmarking we did against the UK DoH Na targets for 2017 showed both very high Na levels in some Indian products as well as marked within-category variability in the Na levels of products that were otherwise quite similar. The presence of products with very high Na levels is unsurprising since there has been no systematic national action to reduce Na levels in foods, nor the Na intake of the Indian population more broadly. The wide range of Na content levels within food categories shows that lower-Na formulations are both technically feasible and commercially viable for many food types. The setting of category-specific Na targets and the reformulation of foods high in Na down to the maximum acceptable level for that category is an easy early win for a national salt reduction effort and could be made a priority for India. Further, this type of reformulation programme could be commenced with minimum investment and in a short time frame by adopting or adapting targets already set in other jurisdictions[12,20]. Some national and multinational food manufacturers operating within India likely already have internal standards relating to labelling requirements and some may also have set Na reduction targets. Another fairly easy first step towards improving labelling and controlling the Na levels in foods marketed in India would be to summarise these initiatives and quantify the completeness of implementation. Periodic monitoring using repeat surveys with a standardised methodology will be important and, once again, would be greatly facilitated by concurrently mandating more complete reporting of all important nutrients on packaged foods.

Strengths of the present study are its large size, the inclusion of all products for sale in the stores surveyed, the comparison against the prior 2010 survey and the benchmarking done against the UK DoH 2017 Na targets. The restriction of the survey to Hyderabad and New Delhi is a limitation because it is unlikely that the products included in the survey are truly representative of all products available for sale in India. That said, the manufacturers with included products are the major suppliers nationally and it is likely that the products included in the study would be available in many other parts of the country.

Table 3 Comparison of the mean salt content of food products for which sodium was labelled between 2010 and 2014

	Na content (mg/100 g)					
	2010 Mean	Range	2014 Mean	Range	Difference	95 % CI
Bread and bakery products	338	1–11 420	445	2–4000	+108	−54, +270
Biscuits	276	1–1770	262	6–764	−14	−75, +47
Cereal and grain products	327	0–7000	477	0–7250	+149*	+22, +277
Indian breakfast products	857	1–2100	847	0–2110	−10	−311, +291
Breakfast cereal	355	0–7000	265	2–2100	−90	−302, +121
Noodles	517	1–2142	670	21–7250	+150	−202, +503
Confectionery	249	0–2200	98	0–347	−151	−513, +212
Convenience foods	1881	1–9970	1344	0–5378	−537	−1092, +18
Ready meals	1148	0–9970	479	0–1400	−669*	−1272, −66
Soup	2911	0–7520	2117	180–5378	−794	−1670, +82
Dairy and dairy alternatives	257	0–1521	513	0–2000	+256*	+133, +380
Processed cheese	1073	12–1521	1074	840–1730	+1	−220, +222
Edible oils and oil emulsions	202	0–1048	217	0–1048	+15	−182, +213
Fish and fish products	348	50–600	451	38–887	+104	−11, +218
Canned fish	395	50–600	457	48–870	+63	−64, +189
Fruit and vegetables	555	0–17 690	769	0–8000	+212	−22, 448
Canned vegetables	229	37–630	84	0–384	−145*	−232, −58
Pickled vegetables	1397	10–3790	1759	1–8000	+362	−475, +1200
Herbs and spices	1026	0–17 690	1468	0–8000	+442	−130, +1014
Meat and meat products	373	0–2381	414	2–1000	+40	−274, +355
Non-alcoholic beverages	59	0–1210	119	0–957	+61*	+23, +99
Sauces and spreads	1473	0–11 200	2217	0–21 218	+744*	+268, +1221
Meal-based sauces	1525	0–11 200	3240	179–21 218	+1714*	+638, +2790
Table sauces	771	10–7720	1020	1–2400	+249	−190, +687
Snack foods	573	0–2500	666	0–2300	+93	−13, +199
Extruded snacks	359	125–650	491	105–1179	+132	−361, +624
Indian snack food	646	0–2500	627	0–2000	+20	−167, +128
Sugars, honey and related products	321	0–7400	44	0–400	−278	−777, +222
Special foods	219	39–565	239	57–788	+20	−36, +76

*$P < 0{\cdot}05$.

Table 4 Comparison of sodium content in selected food categories against UK Department of Health (DoH) 2017 sodium targets

	Na content		Na content of labelled foods (mg/100 g)		UK DoH 2017 max. Na target (mg/100 g)	Products known to meet UK DoH 2017 max. Na target	
	n/*N*	%	Mean	Range	Range	*n*/*N*	%
Bread and bakery products							
Sweet biscuits	105/339	31	258	6–701	380	84/339	25
Savoury biscuits	4/56	7	515	300–764	700	2/56	4
Cereal and grain products							
Breakfast cereal	68/113	60	265	0–2110	400	49/113	43
Noodles	29/66	44	670	21–7250	350	11/66	17
Pasta	43/74	58	52	0–1000	350	42/74	57
Convenience foods							
Ready meals	49/74	66	479	0–1400	380	15/74	20
Soup	61/86	71	2117	180–5378	250	20/86	23
Dairy and dairy alternatives							
Processed cheese	41/46	89	1074	840–1730	800	9/46	20
Fish and fish products							
Canned fish	16/18	89	457	48–870	360	5/18	28
Fruit and vegetables							
Canned vegetables	24/34	71	84	0–384	50	15/34	44
Pickled vegetables	43/57	75	1759	1–8000	1500	21/57	37
Sauces and spreads							
Table sauce	33/62	53	1020	1–2400	680	6/62	10
Snack foods							
Extruded snacks	9/60	15	491	105–1179	800	8/60	13
Indian snack foods	127/322	38	627	0–2000	1000	95/322	29
TOTAL	652/1407	46				382/1407	27

The descriptions of mean Na values in Indian packaged foods need to be treated with caution because of the incomplete nature of the data, but there is certainly no evidence of any systematic reduction in the mean Na content of Indian packaged foods over recent years. The observation of a comparable pattern of change in the

analyses of median values is confirmatory of the main findings. Quality control, both by the data management centre at the time of data capture and through the application of extensive data checks during the analysis stage, has provided for a clean and coherent data set. Direct food testing by way of chemical analysis would have provided further reassurance of the validity of the Na values reported but this is an expensive process and was beyond the scope of this project. Additionally, data on the market share for each product would have allowed a more comprehensive, weighted analysis to determine the likely contribution of each food group and food category to total Na intake in the population. Finally, it is likely that some of the products for which data were collected between 2012 and 2014 are no longer on the shelves of Indian supermarkets but it is also unlikely that the product mix and its average composition are substantially different from that reported here.

Chronic diseases are substantially attributed to poor diet and are the leading cause of death and disability worldwide[1]. The present study's findings are fundamental to understanding the impact of adverse nutrients in the Indian food supply and will underpin the development of strategies to address them.

Conclusion

The Government of India has identified food labelling as an important population-based initiative for the prevention of diet-related disease[11], but while a regulation is now in place it is clear that additional enforcement will be required to achieve full compliance. Likewise, the absence of voluntary labelling of Na indicates that the regulation will need updating if it is to have the full health impact sought. Given the very large burden of disease attributed to excess Na consumption in India[3], the establishment of Na targets for key product categories would be a reasonable early step. A broad-based national salt reduction programme in India would appear to have enormous potential to avert very large numbers of premature heart attacks, strokes and other blood pressure-related diseases[20].

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Supplementary material

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