Preventive Medicine Reports 4 (2016) 397–403

Contents lists available at ScienceDirect

Preventive Medicine Reports

journal homepage: http://ees.elsevier.com/pmedr

Completeness of nutrient declarations and the average nutritional composition of pre-packaged foods in Beijing, China

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ARTICLE INFO

Article history:
Received 4 January 2016
Received in revised form 4 July 2016
Accepted 2 August 2016
Available online 6 August 2016

Keywords:
Nutrition labelling
Nutrient declaration
Nutritional composition
Pre-packaged foods
China

ABSTRACT

Increasing consumption of pre-packaged foods is likely an important driver of diet-related diseases in China. From January 2013 it became mandatory to provide a standardised nutrient declaration on pre-packaged foods in China. We collected data on pre-packaged foods from large chain supermarkets in Beijing in 2013, examined the completeness of the nutrient declaration of core required nutrients and summarised the average nutritional composition of 14 different major food groups. We also illustrated the potential use of the data by comparing sodium levels. Photos of 14,279 pre-packaged foods were collected from 16 chain supermarkets in Beijing. Data for 11,489 products were included in the evaluation of nutrient declarations and data for 10,048 in the summary analysis of average nutritional composition. Compliant nutrient declarations were displayed by 87% of products with 88% of foods displaying data for each of energy, protein, total fat, carbohydrate and sodium. Nutrients not required by the Chinese regulation were infrequently reported: saturated fat (12%), *trans* fat (17%) and sugars (11%). Mean sodium levels were higher in Chinese products compared to UK products for 8 of 11 major food categories, often markedly so (e.g. 1417 mg/100 g vs. 304 mg/100 g for convenience foods). There has been substantial uptake of the recently introduced Chinese nutrition labelling regulation which should help consumers to choose healthier foods. As the comparison against corresponding data about sodium from the United Kingdom shows, the nutrient data can also be used to identify broader opportunities for improvement of the food supply.

1. Background

Poor diet is now the world's leading cause of non-communicable diseases (Institute for Health Metrics and Evaluation (IHME), 2013) which cause 80% of deaths in China every year (World Bank, 2011). A diverse range of pre-packaged foods are now widely consumed in China due to their convenience, accessibility, palatability and affordability (Wang et al., 2012; Foo et al., 2013; Drewnowski, 2004). Unfortunately, many contain high levels of energy, fat, sugar and sodium (Swinburn et al., 2004; Moodie et al., 2013; Monteiro, 2010) and high intakes of these nutrients are known risk factors for non-communicable diseases (Popkin and Gordon-Larsen, 2004; Popkin et al., 2012).

China is now one of the largest consumers of pre-packaged foods worldwide with sales of pre-packaged foods increased by 55% from 2003 to 2009 (Euromonitor International, 2011) and a three-fold increase in per capita consumption between 1999 and 2012 (Baker and Friel, 2014). This is driving ongoing changes to dietary patterns in China and accompanying adverse health sequelae (Baker and Friel, 2014; Elliott et al., 2014; Case et al., 2007). With dietary patterns shifting towards the consumption of pre-packaged foods there is an urgent need to track the nature of the pre-packaged food supply in China. Several international public health groups are active in this area (Dunford et al., 2012; Food, 2013) using novel tools and approaches to data collection (Dunford et al., 2014).

Rather little is known about the nutritional composition of pre-packaged foods in China and the low prevalence of nutritional labels on pre-packaged foods (Huang et al., 2014) has been one important

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http://dx.doi.org/10.1016/j.pmedr.2016.08.002
2211-3355/

reason for this. CODEX recommends member states mandate the declaration of energy, protein, total fat, saturated fat, carbohydrate, total sugar and sodium (CODEX ALIMENTARIUS, 1985). China enacted a regulation on nutrition labelling of pre-packaged foods in 2011 (National Standards of People's Republic of China, National Food Safety Standard: Standard for nutrition labelling of pre-packaged foods, GB 28050-2011) effective from January 1, 2013, requiring declarations of energy, protein, total fat, carbohydrate and sodium (Ministry of Health of the People's Republic of China, 2011a).

The objectives of this research were to examine the impact of the 2013 nutrition labelling regulation on the completeness of nutrient declarations in China, and to examine the reported nutritional content of packaged foods. Furthermore, to illustrate how these data might be used to benchmark the healthfulness of different countries food supplies, we compared the sodium levels of Chinese foods against similar products in the United Kingdom, which has been targeting the reduction of sodium in processed foods (Food Standards and Agency, n.d.).

Table 1
Variables collected and their format.

Variable	Format
Product name	As per product label
Brand name	As per product label
Serves/Pack	As per product label
Serve Size	Grams or millilitres
Energy	Kilojoules/100 g or 100 ml or per serve
Protein	Grams/100 g or 100 ml or per serve
Fat, total	Grams/100 g or 100 ml or per serve
Saturated	Grams/100 g or 100 ml or per serve
Trans	Grams/100 g or 100 ml or per serve
Polyunsaturated	Grams/100 g or 100 ml or per serve
Monounsaturated	Grams/100 g or 100 ml or per serve
Carbohydrate	Grams/100 g or 100 ml or per serve
Sugars	Grams/100 g or 100 ml or per serve
Fibre	Grams/100 g or 100 ml or per serve
Sodium	Milligrams/100 g or 100 ml or per serve
Calcium	Milligrams/100 g or 100 ml or per serve
Gluten	Milligrams/100 g or 100 ml or per serve

2. Materials and methods

Ethics committee approval was not required for this survey of foods.

2.1. Store selection

The retail outlets targeted for this survey were chain supermarkets and convenience stores in Beijing, China. There are no official statistics describing grocery retailers or market share in Beijing so retailers were identified from Internet searches and one particular website (http://www.dianping.com/search/category/2/20/g187). The chain stores identified and targeted were Carrefour, Wal-Mart, Tiankelong, Jingkelong, Merry-Mart, Wu-Mart, Beijing Hualian Group (BHG), Metro-mall, Vanguard, Chaoshifa, Beijing Chengxiang Warehouse Supermarket, Huapu, Lotus, Seven Eleven (7-11), Quick, Diyatiantian, Jenny Lou's, Watsons, Yonghui supermarket, Manning, Unimart, Lotte-Mart, Modern Plaza, Shuang'an Plaza, Parkson and Yansha Youyi Shopping Center.

2.2. Data collection and processing

Six university students from Beijing were recruited, trained and provided with a smartphone application for data collection which was done between August and December in 2013. The George Institute Data Collector Application enables smartphone users around the world to scan the barcode of a pre-packaged food and to take and store photos of the food packaging (front of the food package, nutrition information panel and ingredient list) (Food, 2013). Photos were then uploaded to a central content management system for processing.

Each data collector was assigned specific food groups to collect data for and requested to visit any Beijing outlet of the identified retailers. Data collectors were asked to first collect foods that were displayed at mid-level on the shelves of the outlets to make sure the most commonly consumed foods were captured first and then to expand their data collection to the products on the shelves at higher and lower levels.

Data entry of nutritional composition for each product (Table 1) was done by four university students trained to enter data into a bespoke content management system held by The George Institute for Global Health (Dunford et al., 2012). The barcode was used as the unique identifier for each product since usual industry practice is for every stock keeping unit to have a different barcode. Nutritional data entry was checked, and corrected if necessary in the content management system, by a fifth student.

2.3. Categorization of foods

The content management system included a food categorization system developed by the Food Monitoring Group (Aad et al., 2014) that places products into 18 major food groups (Supplementary data-Appendix A: bread and bakery products, cereal and cereal products, confectionery, convenience food, dairy and dairy products, edible oils and oil emulsions, eggs, fish and fish product, fruits and vegetables, meat and meat products, non-alcoholic beverages, sauces and spreads, snack foods, sugars, honey and related products, foods for specific dietary use, unable to be categorized, vitamins and supplements, and alcoholic beverages) with option for the addition of further major subcategories and minor sub-categories within these as might be required for each country. Several additions to the categorization system were made after reviewing the People's Republic of China Standards for Uses of Food Additives: GB2760-2011 (Ministry of Health of the People's Republic of China, 2011b) and on the basis of actual foods collected- sub-categories for soy bean products, edible fungi and algae, canned fruit, candied and preserved fruit were added to the fruit and vegetable group; and sub categories for MSG and chicken essence, and cooking wines were added to the sauces and spreads group. Foods were categorized on the basis of brand name and product name by a Chinese Masters student with a background in food nutrition and a comprehensive understanding of the Chinese food supply. The analyses presented here are at the major food group level which constitutes the same 18 food groups for every country involved in the Food Monitoring Group (Dunford et al., 2012).

2.4. Outcomes

The primary outcome for evaluation of the completeness of nutrient declaration was the presence of all five mandated nutrients (energy, protein, total fat, carbohydrate and sodium). Secondary outcomes were the proportions of products displaying each individual mandated nutrient and three other nutrients important to health but not required by the Chinese regulation (saturated fat, *trans* fat, and total sugars). Mean levels and standard deviation of nutrients were also determined.

Several food types are exempt from mandatory nutrition labelling under the Chinese regulation and were excluded from our analysis – 1) fresh foods like fresh meats, fresh fish, fresh vegetables, fresh fruits and fresh eggs; 2) beverages with more than 0.5% alcohol; 3) foods with package area less than 100 cm^2 or maximum surface area less than 20 cm^2; 4) non-pre-packaged foods sold on site; 5) bottled drinking water; 6) food with recommended daily intake of less than 10 g or 10 ml. It is possible that some foods falling under exclusions 3) and 6) may have been included in the analysis because the data required for evaluation of these characteristics were not available. Finally, the 2013 Chinese regulation does not apply to health products and other foods that have special functions, so foods categorized as foods for specific dietary use, vitamins and supplements or unable to be categorized were also excluded.

2.5. Data analysis

Analyses of 14 included and eligible major food groups were based upon products for which there was a barcode and an assigned food category. Products were excluded if the photos were of insufficient quality to allow data entry, if the product had multiple nutrition information panels (i.e. variety packs) or if multiple products shared the same barcode (mostly same base product presented in different flavours). If nutrient information was displayed as per serve with serve size reported then the nutrient data per 100 g or per 100 ml was calculated using the reported information.

Proportions of products compliant and proportions reporting each nutrient were calculated for each major food group and overall by dividing the number of products that reported information on energy, protein, total fat, saturated fats, *trans* fats, carbohydrate, total sugars and sodium by the total number of eligible products. Salt, spices and monosodium glutamate (MSG) were excluded from the analysis of average nutritional composition. Nutrients were expressed per 100 g, and their mean and standard deviation (SD) values were determined for each major food group. Given that most liquid products were water-based, we assumed that 100 ml of liquid products equated to 100 g to enable standardized reporting of nutrient values. We compared the average sodium levels against the corresponding data from a survey of pre-packaged foods done in the United Kingdom in 2011 (Eyles et al., 2013) and provided more detailed data comparing the average sodium levels in soy sauces to illustrate the potential utility of the data for broader food supply evaluations. All analyses were conducted using SPSS version 21 or Microsoft Office Excel, 2013.

3. Results

Data were collected at one or more outlets for 16 of the 26 chain supermarket and convenience stores identified initially. Data were not able to be collected from 10 of the chain stores (Chaoshifa, Huapu, Quick, Diyatiantian, Watson, Manning, Unimart, Modern Plaza, Shuang'an plaza, and Parkson) because the store staff repeatedly ejected the data collection team. Ultimately, we collected data for 14,279 products. After exclusions (Fig. 1), 11,489 products were eligible for inclusion in the analyses examining the presence of nutrient declarations and 10,048 were included in the analyses of average nutritional composition. The two largest food groups were fruits and vegetables (n = 2210) and sauces and spreads (n = 1574) and the two smallest were eggs and egg products (n = 66) and edible oils and emulsions (n = 140).

3.1. Completeness of nutrient declaration and average nutrient levels in foods

Overall, 87% of products had nutrient declarations that included reporting of all five mandatory nutrients (energy, protein, total fat, carbohydrate and sodium) required by the recently introduced Chinese regulation with reporting rates for each individual nutrient varying little overall (Table 2). There was, however, substantial variation observed between the major food groups for adherence to the mandated reporting of nutrients. For example, 99% of dairy products and convenience foods were labelled with all five required nutrients while only 62% of sauces and spreads products and 74% of non-alcoholic beverages were labelled with all five required nutrients. Reporting rates were much lower for *trans*-fat (17%), saturated fat (12%) and total sugars (11%) which are not required by the new regulation.

There was substantial variability in the nutrient levels for each of the 14 major food groups reflecting the broad range of products in each group (Table 3).

3.2. Comparison of mean sodium content by major food groups, between China and the United Kingdom

The comparison of sodium levels in Chinese products against the sodium levels in corresponding food groups in the United Kingdom showed higher mean levels for 8 of the 11 comparisons possible (Fig. 2). The estimated mean sodium levels in Chinese foods were 4.7-fold greater for convenience foods (1417 vs. 304 mg/100 g), 4.4-fold greater for sauces and spreads (3176 vs. 716 mg/100 g), 3.7-fold greater for fish and fish products (1424 vs. 388 mg/100 g) and almost three times as high for fruits, vegetables and others (780 vs. 265 mg/100 g). Only for edible oils and emulsions (69 vs. 374 mg/100 g), non-alcoholic beverages (57 vs. 72 mg/100 g) and snack foods (214 vs. 252 mg/100 g) was the mean sodium content lower in the Chinese compared to the UK products (Fig. 2). Within each major food group, there were sub-categories of food groups which were only found in one country. For example, for vegetable products, baked beans, canned peas & beans, frozen potato products and instant mashed potatoes were only present in the United Kingdom whereas dried vegetables, edible fungi and algae and soy bean products were only included for China. Sensitivity analysis excluding the sub-categories of foods present in just one country did not substantially change the findings (Supplementary data-Appendix B). For example, after excluding the above-mentioned subcategories for vegetable products, the mean sodium levels were 1592 mg/100 g (n = 389) for China and 395 mg/100 g for the United Kingdom (n = 1858).

3.3. Comparison of sodium levels between different brands of soy sauces in China

We included brands that have more than four (inclusive) products in this analysis. Eight soy sauce brands and 49 products were identified with Lee Kum Kee providing the largest product variety (10 different soy sauce products). The average sodium level varied by more than 2000 mg/100 g between brands from a lower level of 6164 mg/100 g for B.B. products to the highest level of 8493 mg/100 g for Pearl River Bridge products (Table 4). There was also marked variability between individual products with the most salty soy sauce having a sodium level more than three times that of the least salty product.

4. Discussion

These data show a high level of industry compliance with recently introduced food labelling regulation in China. This is an important first step in providing Chinese consumers with the information they need to make healthier food choices. As illustrated by the comparisons made against the UK and the more detailed exploration of salt levels in soy sauces, mandatory nutrient declarations also provide data that support benchmarking of nutrient levels and the identification of products amenable to reformulation. Comparing levels of nutrients reported on declarations between products, and tracking changes in nutrient levels following policy interventions has been a cornerstone of efforts to improve the healthiness of pre-packaged and restaurant foods (Elliott et al., 2014; Eyles et al., 2013; Trevena et al., 2014). Both the data reported for average sodium levels in different brands of soy sauces and the average sodium levels reported in Chinese compared to UK foods highlight the potential for these types of data to inform food reformulation efforts in China.

A previous systematic review on nutrition labelling in China identified much lower rates (44%) of products displaying nutritional labels than are reported here (Huang et al., 2014). It is unlikely that the almost two-fold higher labelling rates observed in our study are due solely to the different sampling frames and the observed increase in the proportion of foods with complete nutritional labelling for 2013 suggests great potential for regulation to rapidly and comprehensively modify food

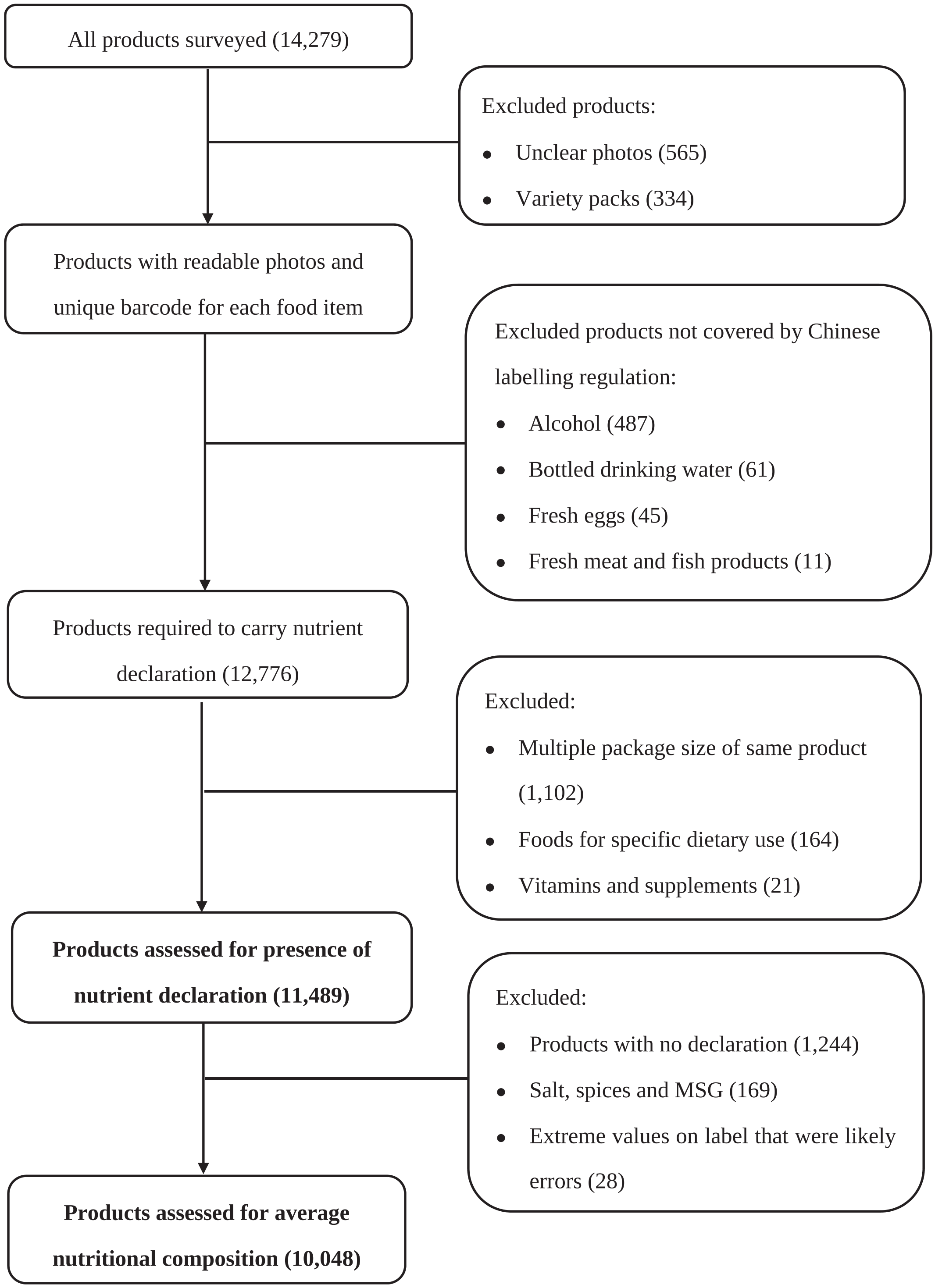

Fig. 1. Flow diagram of data exclusion.

industry practices in China. This bodes well for possible future national actions addressing the Chinese food supply. It is of note that the Chinese nutrition labelling regulation does not require display of saturated fats, *trans* fat, and total sugars and that in the absence of a regulated requirement we found only a small proportion of nutritional labels carried information about these nutrients. Further, the systematic under-reporting and likely differential reporting of values for these three nutrients means that the estimated mean levels obtained here for *trans*-fat, saturated fat and total sugars are probably significant under-estimates of true average levels.

Given the success of the recently introduced labelling regulation, it might now be appropriate for China to consider expanding the scope of the labelling requirements to include more detail about fats and sugars. Saturated fat intake increases low density lipoprotein cholesterol levels, and replacement of saturated fats with polyunsaturated fats can lower the risk of coronary heart disease (Mozaffarian et al., 2010). Likewise, *trans*-fats significantly worsen blood lipid profiles and are associated with an increased risk of coronary heart disease (NAS, 2005). Sugars too have a clear link with weight gain and obesity (Parks and Hellerstein, 2000; Malik et al., 2006) and the World Health Organization

Table 2
Number and proportion of foods reporting nutrient values, overall and separately for 14 major food groups.

Food group	Number of products included in analysis	Number (percent) of foods in category reporting each nutrient								
		Energy	Protein	Total fat	Carbohydrate	Sodium	Saturated fat	*Trans* fat	Total sugars	All five required nutrients
Dairy products	774	769 (99%)	769 (99%)	769 (99%)	769 (99%)	769 (100%)	111 (14%)	63 (8%)	95 (12%)	769 (99%)
Edible oils and oil emulsions	140	129 (92%)	131 (94%)	130 (93%)	131 (94%)	130 (99%)	66 (47%)	32 (23%)	10 (7%)	128 (91%)
Fruit, vegetable and other[a]	2210	2064 (93%)	2066 (93%)	2065 (93%)	2065 (93%)	2062 (93%)	153 (7%)	147 (7%)	173 (8%)	2060 (93%)
Confectionery	914	828 (91%)	828 (91%)	828 (91%)	828 (91%)	828 (91%)	179 (20%)	254 (28%)	186 (20%)	828 (91%)
Cereal and cereal products	869	816 (94%)	815 (94%)	816 (94%)	816 (94%)	812 (93%)	107 (12%)	72 (8%)	90 (10%)	812 (93%)
Bread and bakery products	1532	1474 (96%)	1474 (96%)	1470 (96%)	1474 (96%)	1472 (96%)	306 (20%)	787 (51%)	275 (18%)	1468 (96%)
Meat and meat products	493	482 (98%)	482 (98%)	482 (98%)	482 (98%)	481 (98%)	15 (3%)	17 (3%)	7 (1%)	481 (98%)
Fish and fish products	436	352 (81%)	352 (81%)	352 (81%)	352 (81%)	350 (80%)	57 (13%)	57 (13%)	33 (8%)	350 (80%)
Egg and egg products	66	63 (95%)	63 (95%)	63 (95%)	63 (95%)	63 (95%)	0 (0%)	0 (0%)	0 (0%)	63 (95%)
Sweetener, including honey	159	143 (90%)	143 (90%)	143 (90%)	143 (90%)	143 (90%)	1 (1%)	0 (0%)	7 (4%)	143 (90%)
Sauces and spreads	1574	977 (62%)	977 (62%)	977 (62%)	977 (62%)	977 (62%)	100 (6%)	86 (5%)	84 (5%)	977 (62%)
Non-alcoholic beverages	1329	994 (75%)	986 (74%)	985 (74%)	994 (75%)	988(74%)	179 (13%)	241 (18%)	252 (19%)	984 (74%)
Convenience food	595	589 (99%)	589 (99%)	589 (99%)	589 (99%)	589 (99%)	58 (10%)	77 (13%)	55 (9%)	589 (99%)
Snack foods	398	390 (98%)	390(98%)	390 (99%)	390 (98%)	390 (98%)	71 (18%)	129 (32%)	38 (10%)	390 (98%)
Total	11,489	10,070 (88%)	10,065 (88%)	10,059 (88%)	10,073 (88%)	10,055 (88%)	1402 (12%)	1960 (17%)	1305 (11%)	10,042 (87%)

[a] Including root and tuber, beans, edible fungi, algae, nut, and seeds.

(WHO) is considering recommendations to further limit intake of added sugars (World Health Organization, 2014). Systematic reporting of the levels of these nutrients in foods would appear warranted since it would both empower consumers and enable quantification of levels across the Chinese food supply.

The comparison of average salt levels of packaged foods in China and the United Kingdom (Eyles et al., 2013) highlights the importance of food labelling, and the systematic compilation and monitoring of food labelling data. The remarkable difference in mean sodium levels between corresponding food groups is likely to reflect variations in product mix in part, but almost certainly also derives from the addition of larger quantities of salt to many Chinese packaged foods. For example, in the sauces and spreads product group, 77% of products in China were cooking sauces, gravies and stocks compared to just 55% included in the United Kingdom. Because cooking sauces, gravies and stocks have higher sodium content than other sub-categories in the same group this will raise the average sodium level in Chinese compared to UK products. However, for every single sub-category of the sauces and spreads product group the mean sodium was higher suggesting that variation in product mix is only a part of the explanation.

There is a strong positive association between sodium consumption and blood pressure and despite some ongoing debate about the value of salt reduction for the prevention of cardiovascular diseases it remains a priority for the WHO (World Health Organization, 2013) and many countries around the world (Webster et al., 2014). It is widely recognised that reducing the sodium content of the food supply will be central to controlling the average salt intake of many populations and that this will usually be much more effective than simply educating individuals about the likely harms of salt (National Heart Foundation of Australia, 2012; World Cancer Research Fund, 2014). Accordingly, the type of data provided here describing the sodium levels in pre-packaged foods is invaluable for identifying the priority action areas for government and industry. The United Kingdom, against which comparison was made in this report, has the most successful current salt reduction program, and reformulation of processed foods to contain less sodium has underpinned success to date (Eyles et al., 2013). Robust systematic data describing the nutritional composition of foods, obtained from food labelling, was one factor central to food reformulation efforts in the United Kingdom. While the impact of food reformulation and the method by which it might be achieved in China will differ from the United Kingdom, the present data provide some immediate indications of priority action areas.

Chinese people are consuming more and more pre-packaged foods, contributing to a more diverse dietary pattern in the population and driving the epidemic of diet-related diseases like obesity, diabetes and high blood pressure (Ng et al., 2014; Ma et al., 2013; Xu et al., 2013). Nutrition labelling is considered an effective way to inform consumers about the nutritional content of food and has the potential to impact their dietary habits (Campos et al., 2011). The variation in sodium levels in different brands of soy sauces shows that there are relatively less salty

Table 3
Nutrient content for 10,048 labelled foods across 14 major food groups.

Food groups	Energy kJ/100 g	Protein g/100 g	Total fat g/100 g	Carbohydrate g/100 g	Sodium mg/100 g	Saturated fat g/100 g	*Trans* fat g/100 g	Total sugars g/100 g
Dairy products	712 (596)	6 (7)	10 (11)	13 (14)	248 (363)	7 (7)	0 (1)	10 (9)
Edible oils and oil emulsions	3472 (406)	0 (0)	94 (9)	0 (0)	69 (215)	17 (12)	1 (1)	0 (0)
Fruit, vegetable and other[a]	1168 (801)	10 (11)	12 (18)	32 (27)	780 (1442)	3 (5)	0 (2)	17 (22)
Confectionery	1561 (710)	3 (3)	13 (16)	60 (27)	74 (124)	11 (10)	0 (1)	37 (27)
Cereal and cereal products	1461 (331)	9 (5)	3 (5)	70 (15)	325 (1023)	2 (3)	0 (0)	13 (13)
Bread and bakery products	1920 (358)	7 (3)	21(9)	60 (11)	279 (219)	11 (7)	0 (1)	23 (12)
Meat and meat products	972 (485)	18 (8)	14 (12)	9 (12)	1029 (643)	7 (4)	0 (0)	1 (1)
Fish and fish products	906 (487)	24 (14)	9 (9)	11 (15)	1424 (1404)	3 (2)	0 (1)	5 (8)
Egg and egg products	636 (98)	13 (2)	10 (2)	2 (2)	792 (843)	–	–	–
Sweetener, including honey	1439 (289)	0 (2)	0 (0)	84 (15)	38 (75)	0 (0)	–	57 (39)
Sauces and spreads	950 (929)	5 (5)	16 (25)	16 (15)	3176 (3309)	4 (8)	0 (0)	9 (10)
Non-alcoholic beverages	593 (657)	2 (5)	2 (5)	28 (29)	57 (117)	3 (6)	0 (1)	20 (22)
Convenience food	1153 (529)	8 (5)	10 (8)	39 (20)	1381 (2046)	4 (4)	0 (0)	5 (6)
Snack foods	1933 (502)	8 (7)	24 (10)	54 (16)	512 (327)	10 (6)	0 (0)	12 (14)

Note: Value expressed as Mean (SD). The estimates for saturated fat, *trans*-fat and sugars were based on data for about one tenth the number of products that were available for the other nutrients.

[a] Including root and tuber, beans, edible fungi, algae, nut, and seeds.

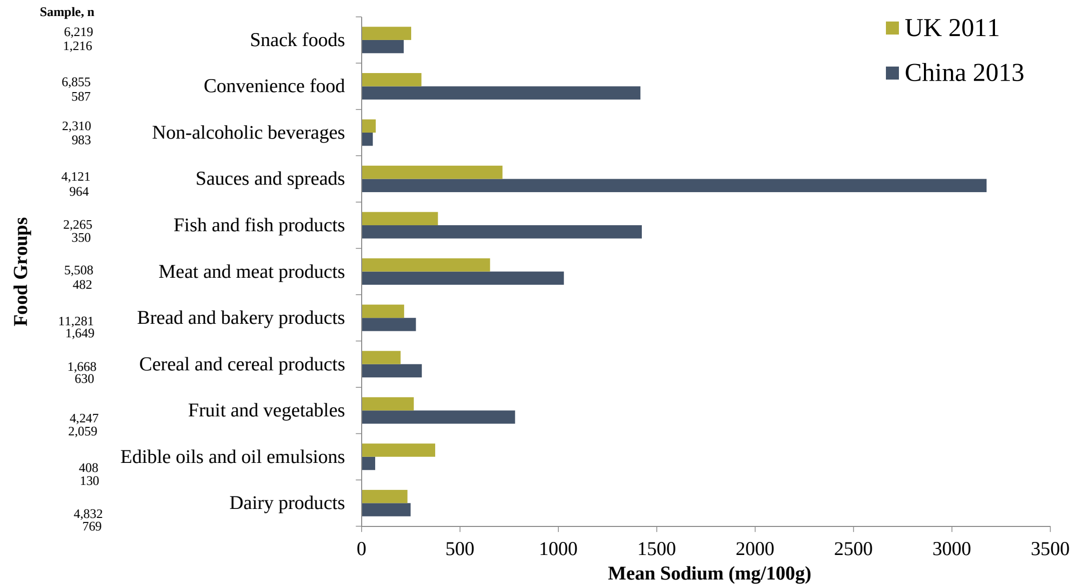

Fig. 2. Comparison of average sodium levels in different food groups between China and United Kingdom. Notes: Confectionery included under 'snack foods'. 'Bread and bakery' includes breakfast cereals and cereal bars because the UK report used for comparison included them within the corresponding definition of 'bread and bakery'.

choices available and access to nutritional label data will help consumers make healthier food choices.

This survey benefits from its large size and a design intended to achieve a broad-based and systematic sample of stores and products. However, although our survey included several major supermarket chains with large market share and captured data for the most commonly consumed foods, the practicalities of data collection meant that no data were collected for a number of chains, reducing the robustness of our findings. The extent to which our findings from Beijing are more broadly generalizable throughout China is also uncertain because while some aspects of diet are nationwide phenomena, the country is large and diverse and there are well established regional differences in cuisines and dietary patterns. The accuracy of the information displayed on the nutritional label was not validated and while studies that have been done overseas have showed good correlation between data on labels and the findings of direct chemical analysis (Fitzpatrick et al., 2014; Jumpertz et al., 2013), we are unaware of such data for China and this would be a worthwhile focus of future studies. Furthermore, given the recent introduction of mandatory labelling requirements there may be an increased risk of inaccurate labelling in China because the required expertise is only limited.

5. Conclusion

The apparently high uptake of the recent nutrition labelling regulation illustrates the enormous capacity for central Chinese government action on the food supply. With more comprehensive, systematic and repeated collection of the type of data reported here Chinese policy makers will be able to identify and implement the most appropriate policy interventions and document their efficacy on the healthfulness of the food supply. Food reformulation programs are anticipated to have great potential to ameliorate the large burden of nutrition-related chronic disease in China and the data obtained from this survey suggests that food supply interventions should be a priority.

Table 4
Sodium levels in 8 different brands of Chinese soy sauce.

Brand	Number of products	Mean sodium (mg/100 g)	SD	Range of sodium level (mg/100 g)
B.B.	4	6164	958	4980–7280
Kikkoman	8	6268	1246	3133–7333
Jiajia	9	6305	404	5845–6862
Sempio	4	6494	683	5950–7467
Lee Kum Kee	10	7023	998	4813–8340
LACC	5	7462	1396	6812–9960
Chubang	6	7713	1463	6550–8750
Pearl River Bridge	4	8493	2108	5812–10,400

Funding support

Bruce Neal is supported by an Australian Research Council Future Fellowship (DP100100295) and a National Health and Medical Research Council of Australia Senior Research Fellowship (APP100311). He works within a NHMRC Centre for Research Excellence (APP1041020) and holds an NHMRC Program Grant (APP1052555).

Conflicts of interest

None.

Contributions

Liping Huang drafted and revised the manuscript. Elizabeth Dunford, Guansheng Ma, Jason H.Y. Wu, Michelle Crino and Helen Trevena all provided critical feedbacks on the different drafts of the manuscript. Jason H.Y. Wu also suggested additional analysis. Bruce Neal provided overall guidance and supervision of the work, and reviewed and edited multiple iterations of the paper.

Transparency document

The Transparency document associated with this article can be found, in online version.

Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.pmedr.2016.08.002.

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