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Packaged Food Supply in Fiji: Nutrient Levels, Compliance with Sodium Targets and Adherence to Labelling Regulations †

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Abstract: In response to a high prevalence of NCDs in Fiji and the WHO recommendation to limit the levels of harmful nutrients in packaged foods, the Fijian Government has regulated nutrient labelling and set voluntary sodium reformulation targets. Our aim was to establish a national database of processed and packaged foods and assess compliance to labelling regulations and reformulation targets. Methods: Food labelling and nutrient composition data were collected from the labels of all packaged food products sold at five major supermarket chains in Fiji in 2018. Proportions of products compliant with Fiji labelling regulations, products labelled with sodium and sugar, products compliant with sodium reformulation targets and mean sodium and sugar content were calculated in each food category and for key manufacturers. Results: 5946 packaged food products were surveyed, of which 4278 were included for analysis. Overall compliance with labelling of all required nutrients was low, and only 14% of packaged foods in 14 major categories met Fiji national labelling regulations. However, sodium was labelled on 95.4% of products, and sugar labelled on 92.4%. The food group with the highest mean sodium content was convenience foods (1699 mg/100 g) and confectionary (52.6 g/100g) had the highest free sugar content. Sixty percent of eligible products met the voluntary Fiji sodium reformulation targets. **Conclusions**: Improving the nutritional composition of foods and improving labelling has the potential to curb the escalating burden of diet related non-communicable diseases. The food industry has a responsibility to improve the healthiness of its products to enable consumers to make healthy food choices. Our findings indicate ample opportunity for improvements in the labelling and nutritional composition of the Fijian packaged food supply.

Keywords: packaged food; sodium; sugar; labelling; Fiji; non-communicable disease

1. Introduction

Pacific Island countries are facing a non-communicable disease (NCD) crisis, and unhealthy diets are one of the biggest contributors to the increasing rates of obesity, hypertension and diabetes [1]. NCDs account for about 80% of all deaths and 50% of all premature mortality in the Pacific Islands [1]. In Fiji, where more than 30% of the population are overweight or obese [2], cardiovascular diseases account for one-third of all deaths, and one quarter of deaths are from diabetes. One of the primary reasons for such high rates of NCDs in the country is the transition away from traditional diets, which consisted mainly of fresh fruit, vegetables and fish [3] towards more readily available [4,5] and nutrient poor processed packaged foods that are high in sodium, sugar and fat [6,7].

Pacific Island leaders have been proactive in adopting a range of food policies and regulations to tackle this problem by addressing the increasing consumption of processed foods [1,8,9]. This includes taxes on sugar, regulations for sodium levels in processed foods and programs to improve food environments in specific settings such as schools and hospitals [8,10].

The World Health Organization (WHO) recommends limiting the levels of harmful nutrients in products and ensuring that consumers can access and afford healthy food [11]. In Fiji, the National Food and Nutrition Centre (NFNC) was established by the Government in 1982 to coordinate the multi-sectoral efforts needed to address the country's diet-related disease burden. The NFNC has a mission to formulate evidence-based food and nutrition policies through periodic monitoring and evaluation of the food and nutrition environment.

Setting targets for sodium levels in foods is a key component of effective salt (sodium) reduction strategies. In 2010, the Minister for Health and Medical Services in Fiji convened a consultation with key stakeholders from the food industry, government and research groups who agreed on a coordinated strategy to reduce salt intake to 5 gm/day by 2020. The *Fiji Salt Action Challenge Strategy* was endorsed by way of a Cabinet Submission in 2010, and the NFNC formed a secretariat to provide oversight and momentum.The, NFNC also worked with food industries to understand the food supply in the country, including the sources of available foods and their nutrient content. Such data has the potential to guide interventions to improve diets and enhance health across the population. Based on the contribution of different processed foods to sodium in the diet in the Pacific, the proposed maximum acceptable regional targets for sodium levels in eight selected food categories were developed and agreed by representatives at the Pacific Islands NCD Forum in September 2013 [12]. These were adopted from the Pacific Island targets established the year prior and developed by the Food Taskforce Technical Advisory Group in 2014 [13]. These included: bread, Asian sauces (soy and other Asian sauces), canned fish, canned meat, sausages, snack foods (crisps, extruded snacks, corn chips), biscuits (plain/breakfast, savoury and sweet) and flavoured noodles. The targets were modified to apply specifically to Fiji and finalised through a series of stakeholder and food industry consultations between 2012 and 2014. However, the targets remain voluntary and have not been formally ratified by the Government of Fiji.

All food products sold in Fiji are regulated through the *Food Safety Act 2003* [14] and the *Food Safety Regulations 2009* [15]. Regulations around the labelling of processed packaged food products require all pre-packaged food produced, processed, packed, distributed, or imported to be labelled in English with the following required nutritional information per 100 g (or per 100 mL for liquids) for: energy, protein, fat and carbohydrate. Nutrient declarations are mandatory for foods for which nutrient claims are made and the amount of the nutrient must be expressed as 100 g or per 100 mL in metric units and or per serving. In 2014 an amendment of the *Food and Safety (Amendment) Regulations 2014* [16] was passed which stipulates mandatory reporting of additional nutrients including trans fatty acids, sodium, sugar, fat, saturated and unsaturated fats to be labelled per 100 g (or 100 mL for liquids). Providing this nutrition information on processed packaged foods is important as it allows consumers the ability to assess the nutritional quality of their food. However, to date compliance with these regulations has not been assessed.

The overall aim of this research is to identify opportunities to improve the nutritional quality of the food supply in Fiji. The research comprises a cross-sectional survey of the packaged food supply in Fiji and objectively quantifies the nutritional composition of the main food categories using three criteria; levels of sodium and sugar in packaged food, adherence to national nutrition labelling

regulations, and compliance of packaged food products with established food reformulation targets. The findings can be used to guide policy decisions related to reformulation activities, front of pack food labelling, import controls, sales taxes and subsidies for healthier products, which in turn will improve the health of the population.

2. Materials and Methods

This research encompassed a systematic survey of packaged foods for sale in five major supermarkets (all members of key supermarket chains) in Suva, Fiji. Data were collected between November 2018 and January 2019.

2.1. Retail Outlets Surveyed

The stores were purposively selected to ensure that the majority of packaged products in Fiji were included. A total of seven supermarkets were approached and invited, two declined and the remaining five agreed to participate. Supermarkets with more than two branches were selected to ensure more than 70% of the market was captured. Written permission to collect data was obtained from each store manager prior to commencement of data collection.

2.2. Packaged Foods Included

All packaged food products for human consumption that were available for sale in each store during the period of data collection were included. During each product survey, data collection staff captured the barcode and photographed the front of the pack, the nutrition label, manufacturer details, ingredients list and product weight 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 were transmitted to a data management centre in India for processing. Data were uploaded daily into a database which was quality checked, and data was recollected where required.

2.3. Data Extraction

The data management centre used a bespoke technology system that enables the systematic, standardised and replicable collection and collation of data describing packaged foods and beverages. Images of food packaging are captured, stored and processed with key data extracted from food labels. 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, sodium, sugar, total fat, saturated fat and unsaturated fat. Where data was absent from food labels, it was recorded as missing. Different package sizes of the same product were recorded as duplicate items in the database, but each product was included only once in the primary analyses.

2.4. Categorisation of Foods

Foods were categorised using the system developed by the Global Food Monitoring Group [18] into 15 major food groups and 58 selected subcategories: (1) bread and bakery products; (2) cereal and grain products; (3) confectionery; (4) convenience foods; (5) dairy and dairy alternatives; (6) edible oils and oil emulsions; (7) eggs; (8) fish and fish products; (9) fruit and vegetables; (10) meat and meat products; (11) non-alcoholic beverages; (12) sauces and spreads; (13) snack foods; (14) sugars, honey and related products; and (15) special foods. Excluded categories were alcoholic beverages, baking powders, chewing gum, cough lollies, eggs, herbs and spices, meal kits, plain teas and coffees, plain waters, sports/protein powders, sugar, sweeteners, vitamins and supplements, yeasts and gelatines since they do not contribute significantly to nutrient intake, nor are manufacturers required to display a Nutritional Information Panel for many of these products. The

special foods category encompasses baby food and protein and diet bars. This left data for 4278 food products categorised under 14 major categories and 36 subcategories.

2.5. Manufacturers

Overall, data for the top 34 manufacturers in Fiji were reported, with manufacturers chosen based on the number of products collected during the survey. Additionally, seven Fiji local manufacturers were identified using in-country expertise. The remaining manufacturers were classified as "other", comprising of smaller manufacturers with a limited number of packaged foods and beverages under their portfolio.

2.6. Statistical Analysis

Analyses were conducted across all products and for individual food categories. There were three main sets of analyses: (i) the proportions of packaged foods compliant with Fiji nutrient labelling regulations (i.e., displaying sodium, sugar, energy, protein, carbohydrates, saturated fat, trans fat, monounsaturated fat and polyunsaturated fat), as well as separate proportions for products complying with sodium and sugar labelling; (ii) the average levels of sodium and sugar in packaged foods for which data were available; and (iii) the proportion of packaged foods meeting maximum sodium content targets for the 39 food subcategories for which the targets have been developed. Foods were defined as 'known to meet' the target if the label reported a sodium content that was at or below the specified target.

As a secondary analysis, we compared the proportions of packaged foods compliant with Fiji nutrient labelling regulations across each of the nutrients not examined in the primary analysis (i.e., energy, protein, carbohydrates, saturated fat, trans fat, monounsaturated fat and polyunsaturated fat).

All analyses were done using the statistical software package Stata/IC version 15.1 and figures generated in Microsoft Excel.

3. Results and Discussion

3.1. Nutrition Labelling

Of the 4278 products analysed, 602 (14.1%) products were fully compliant with Fiji nutrient labelling regulations [Table 1]. Sodium was labelled on 4083 (95.4%) products, and sugar labelled on 3955 (92.4%). Protein, energy, saturated fat and carbohydrates were also labelled on the majority of products and across most of the food categories, however trans-fat, monounsaturated fat and polyunsaturated fat were only labelled on a minority of products [supplementary Table S1].

Table 1. Proportion of 4278 packaged food products in 2018 meeting Fiji regulation for nutrition labelling and proportion labelled with sodium and sugar, across categories.

Category	Total Products	Meeting Fiji Nutrition Labelling Regulation		Sodium Labelled		Sugar Labelled	
	n	*n*	%	*n*	%	*n*	%
Bread and bakery products	**517**	**45**	**8.7**	**493**	**95.4**	**496**	**95.9**
Bread	54	0	0.0	51	94.4	54	100.0
Cakes, muffins and pastries	121	11	9.1	121	100.0	121	100.0
Savoury biscuits	104	17	16.3	103	99.0	103	99.0
Sweet biscuits	238	17	7.1	218	91.6	218	91.6
Cereal and grain products	**462**	**86**	**18.6**	**444**	**96.1**	**434**	**93.9**
Breakfast cereals	179	53	29.6	177	98.9	177	98.9
Cereal and nut-based bars	53	6	11.3	53	100.0	53	100.0

Noodles	59	6	10.2	55	93.2	52	88.1
Other cereal and grain products	82	11	13.4	73	89.0	70	85.4
Pasta	44	1	2.3	42	95.5	40	90.9
Rice	45	9	20.0	44	97.8	42	93.3
Confectionery	**388**	**10**	**2.6**	**367**	**94.6**	**369**	**95.1**
Chocolate and sweets	364	7	1.9	343	94.2	345	94.8
Jelly	24	3	12.5	24	100.0	24	100.0
Convenience foods	**60**	**4**	**6.7**	**60**	**100.0**	**60**	**100.0**
Ready meals	15	2	13.3	15	100.0	15	100.0
Soup	45	2	4.4	45	100.0	45	100.0
Dairy	**348**	**78**	**22.4**	**343**	**98.6**	**341**	**98.0**
Cheese	58	4	6.9	58	100.0	58	100.0
Cream	26	2	7.7	25	96.2	26	100.0
Desserts	11	1	9.1	11	100.0	11	100.0
Ice cream and edible ices	112	17	15.2	110	98.2	110	98.2
Milk	87	33	37.9	85	97.7	82	94.3
Yoghurt and yoghurt drinks	54	21	38.9	54	100.0	54	100.0
Edible oils and oil emulsions	**105**	**58**	**55.2**	**99**	**94.3**	**88**	**83.8**
Fish and fish products	**116**	**41**	**35.3**	**114**	**98.3**	**104**	**89.7**
Fruit and vegetables	**678**	**77**	**11.4**	**659**	**97.2**	**644**	**95.0**
Fruit	125	6	4.8	123	98.4	122	97.6
Jam and marmalades	81	13	16.0	77	95.1	75	92.6
Nuts and seeds	140	27	19.3	138	98.6	132	94.3
Vegetables	332	31	9.3	321	96.7	315	94.9
Meat and meat products	**105**	**5**	**4.8**	**99**	**94.3**	**70**	**66.7**
Non-alcoholic beverages	**487**	**38**	**7.8**	**434**	**89.1**	**451**	**92.6**
Beverage mixes	38	0	0.0	37	97.4	35	92.1
Coffee and tea	51	4	7.8	46	90.2	44	86.3
Cordials	26	4	15.4	14	53.8	22	84.6
Electrolyte and energy drinks	32	0	0.0	27	84.4	27	84.4
Fruit and vegetable juices	228	14	6.1	202	88.6	215	94.3
Soft drinks	94	12	12.8	92	97.9	92	97.9
Waters (flavoured)	18	4	22.2	16	88.9	16	88.9
Sauces, dressings, spreads and dips	**628**	**42**	**6.7**	**610**	**97.1**	**574**	**91.4**
Mayonnaise and salad dressings	57	6	10.5	57	100.0	53	93.0
Sauces	416	15	3.6	401	96.4	370	88.9
Spreads and dips	155	21	13.5	152	98.1	151	97.4
Snackfoods	**290**	**106**	**36.6**	**268**	**92.4**	**240**	**82.8**
Special foods	**26**	**0**	**0.0**	**25**	**96.2**	**20**	**76.9**
Sugars, honey and related products	**68**	**15**	**22.1**	**68**	**100.0**	**64**	**94.1**
Dessert additions and toppings	42	9	21.4	42	100.0	41	97.6
Honey and syrup	26	6	23.1	26	100.0	23	88.5
Total	**4278**	**605**	**14.1**	**4083**	**95.4**	**3955**	**92.4**

Of the 34 top manufacturers selected for analyses, 21 complied with sodium labelling across their products, and 19 complied with sugar labelling [Table 2]. The manufacturer with the lowest compliance to both sodium and sugar labelling was Carpenters Fiji PTE Limited (79.5% and 74.4% respectively). PepsiCo had the highest proportion of products meeting Fiji nutrient labelling regulations (33 (64.7%)).

Table 2. Proportion of 4278 packaged food products in 2018 meeting Fiji regulation for nutrition labelling and proportion labelled with sodium and sugar, across manufacturers.

Manufacturer	Total Products	Meeting Fiji Nutrition Labelling Regulation		Sodium Labelled		Sugar Labelled	
	n	*n*	%	*n*	%	*n*	%
Ashabhai & Co.	68	41	60.3	67	98.5	66	97.1
CJ Patel Group	23	9	39.1	23	100.0	22	95.7
Campbell Arnott's	45	4	8.9	43	95.6	43	95.6
Carpenters Fiji PTE	39	8	20.5	31	79.5	29	74.4
Coca Cola Amatil	40	0	0.0	40	100.0	40	100.0
Desai Brothers	37	0	0.0	34	91.9	37	100.0
Eco Farms	30	1	3.3	30	100.0	30	100.0
FMF Foods	51	24	47.1	50	98.0	50	98.0
Food Processors (Fiji)	10	0	0.0	10	100.0	8	80.0
Foods Pacific Group	16	2	12.5	16	100.0	16	100.0
General Mills	54	1	1.9	54	100.0	54	100.0
George Weston Foods	64	2	3.1	64	100.0	63	98.4
Goodman Fielder	111	36	32.4	110	99.1	89	80.2
Heinz	89	10	11.2	88	98.9	89	100.0
IGA	52	3	5.8	52	100.0	52	100.0
Kellogg's	36	4	11.1	36	100.0	36	100.0
Lion Dairy & Drinks	33	0	0.0	33	100.0	33	100.0
Lolliland	34	0	0.0	32	94.1	34	100.0
Mars	82	0	0.0	78	95.1	78	95.1
Mondelez	92	14	15.2	92	100.0	91	98.9
Motibhai Group	38	0	0.0	38	100.0	37	97.4
Nestle	82	15	18.3	78	95.1	75	91.5
Oriental Merchant	40	2	5.0	39	97.5	39	97.5
Parmalat	41	1	2.4	41	100.0	41	100.0
PepsiCo	51	33	64.7	51	100.0	51	100.0
Punjas	100	37	37.0	97	97.0	99	99.0
SPC Ardmona	35	0	0.0	35	100.0	35	100.0
San Remo	33	0	0.0	33	100.0	33	100.0
Sanitarium	36	19	52.8	36	100.0	36	100.0
Simplot	74	28	37.8	74	100.0	74	100.0
SunRice	41	5	12.2	41	100.0	39	95.1
Unilever	40	11	27.5	40	100.0	40	100.0
Whittaker's	31	0	0.0	31	100.0	31	100.0
Woolworths	143	15	10.5	142	99.3	143	100.0
All other manufacturers	2487	280	11.3	2324	93.4	2222	89.3
Total	**4278**	**605**	**14.1**	**4083**	**95.4**	**3955**	**92.4**

3.2. Sodium and Sugar Content

There was significant variability across all categories and subcategories for both sodium and sugar content [Table 3]. Food categories with the highest mean sodium content were 'convenience foods' (1699 mg/100 g) and 'sauces, dressings, spreads and dips' (1422 mg/100 g). Unsurprisingly, categories with the lowest mean sodium content were 'sugars, honey and related products' (36 mg/100 g) and 'non-alcoholic beverages' (49 mg/100 g). There was significant variability across all categories and subcategories.

Table 3. Mean sodium and sugar content of food products, surveyed in Fiji in 2018.

Category	Sodium (mg/100 g)				Sugar (g/100 g)			
	n	*mean (SD)*	*median (IQR)*	*range*	*n*	*mean (SD)*	*median (IQR)*	*range*
Bread and bakery products	**493**	**415 (301)**	**335 (306)**	**0–2000**	**496**	**24.0 (16.6)**	**26.7 (32.3)**	**0.0–64.9**
Bread	51	611 (456)	486 (415)	2–2000	54	5.1 (8.3)	2.5 (4.6)	0.0–42.8
Cakes, muffins and pastries	121	450 (246)	394 (393)	0–1184	121	33.7 (15.7)	40.2 (20.4)	0.0–64.9
Savoury biscuits	103	631 (310)	556 (370)	1–1600	103	5.8 (8.2)	3.4 (4.9)	0.0–51.4
Sweet biscuits	218	248 (140)	239 (182)	17–837	218	31.9 (9.3)	32.9 (12.2)	0.0–50.0
Cereal and grain products	**444**	**347 (872)**	**61 (361)**	**0–14,500**	**434**	**11.0 (11.8)**	**6.0 (17.4)**	**0.0–68.2**
Breakfast cereals	177	225 (214)	170 (341)	0–1000	177	16.7 (10.2)	16.7 (14.5)	0.0–41.3
Cereal and nut-based bars	53	106 (121)	57 (137)	4–467	53	25.0 (13.1)	21.6 (10.5)	0.0–68.2
Noodles	55	1179 (846)	1340 (1604)	0–2880	52	3.9 (4.1)	3.1 (4.8)	0.0–24.6
Other cereal and grain products	73	528 (1801)	17 (551)	0–14,500	70	2.6 (3.9)	1.8 (2.5)	0.0–25.0
Pasta	42	87 (180)	29 (27)	0–957	40	2.5 (1.7)	2.5 (2.0)	0.0–7.1
Rice	44	33 (133)	2 (4)	0–691	42	0.4 (0.5)	0.1 (1.0)	0.0–1.8
Confectionery	**367**	**112 (229)**	**62 (89)**	**0–3000**	**369**	**52.6 (20.2)**	**52.6 (20.2)**	**0.0–100.0**
Chocolate and sweets	343	115 (235)	63 (88)	0–3000	345	52.1 (19.7)	52.1 (19.0)	0.0–100.0
Jelly	24	66 (76)	33 (101)	0–311	24	58.7 (25.3)	62.5 (41.0)	1.0–89.0
Convenience foods	**60**	**1699 (3765)**	**300 (1098)**	**0–26000**	**60**	**4.3 (4.9)**	**2.9 (4.6)**	**0.2–25.0**
Ready meals	15	621 (658)	600 (932)	0–2432	15	3.0 (2.1)	2.5 (3.0)	0.5–7.8
Soup	45	2058 (4283)	298 (1585)	0–26000	45	4.8 (5.5)	3.0 (6.4)	0.2–25.0
Dairy	**343**	**202 (352)**	**52 (87)**	**0–1903**	**341**	**14.7 (16.0)**	**10.4 (19.6)**	**0.0–83.5**
Cheese	58	853 (432)	712 (561)	125–1903	58	2.8 (6.6)	1.0 (1.2)	0.0–45.0
Cream	25	154 (133)	191 (164)	0–470	26	35.5 (30.1)	53.0 (57.2)	1.0–83.5
Desserts	11	198 (234)	135 (174)	22–700	11	11.4 (12.5)	4.4 (27.1)	0.0–27.9
Ice cream and edible ices	110	41 (40)	37 (40)	0–261	110	21.7 (10.6)	21.8 (11.2)	2.1–67.0
Milk	85	70 (72)	47 (23)	8–390	82	10.2 (14.3)	5.0 (6.6)	0.0–56.3
Yoghurt and yoghurt drinks	54	58 (18)	52 (10)	22–118	54	10.5 (8.4)	10.5 (16.7)	0.0–31.3
Edible oils and oil emulsions	**99**	**195 (346)**	**0 (360)**	**0–1200**	**88**	**0.3 (0.5)**	**0.0 (0.6)**	**0.0–3.0**
Fish and fish products	**114**	**602 (951)**	**400 (168)**	**10–7533**	**104**	**2.0 (5.2)**	**1.0 (2.0)**	**0.0–48.0**

Fruit and vegetables	**659**	**317 (694)**	**32 (304)**	**0–5333**	**644**	**16.4 (23.1)**	**4.5 (14.8)**	**0.0–75.0**
Fruit	123	37 (195)	6 (14)	0–2100	122	30.5 (24.5)	17.0 (43.3)	0.0–75.0
Jam and marmalades	77	13 (18)	9 (10)	0–130	75	62.4 (4.6)	63.4 (4.4)	48.6–70.0
Nuts and seeds	138	190 (223)	65 (316)	0–1037	132	8.6 (11.7)	4.7 (3.6)	0.0–55.0
Vegetables	321	552 (917)	240 (589)	0–5333	315	3.3 (4.9)	2.0 (3.3)	0.0–49.7
Meat and meat products	**99**	**679 (508)**	**632 (546)**	**30–1960**	**70**	**0.7 (1.1)**	**0.3 (0.9)**	**0.0–7.6**
Non-alcoholic beverages	**434**	**49 (147)**	**8 (18)**	**0–1300**	**451**	**14.8 (20.1)**	**10.3 (4.8)**	**0.0–98.7**
Beverage mixes	37	255 (353)	30 (388)	0–1300	35	39.6 (40.1)	12.0 (77.2)	0.1–93.3
Coffee and tea	46	113 (208)	39 (68)	0–950	44	27.7 (33.2)	7.1 (54.9)	0.0–98.7
Cordials	14	23 (35)	6 (40)	1–130	22	35.0 (31.0)	38.8 (53.4)	0.0–79.8
Electrolyte and energy drinks	27	46 (28)	46 (23)	0–110	27	6.8 (4.1)	6.0 (4.8)	0.0–13.9
Fruit and vegetable juices	202	21 (63)	6 (10)	0–500	215	10.5 (6.4)	10.5 (2.5)	0.0–94.1
Soft drinks	92	8 (5)	7 (6)	0–23	92	8.8 (4.3)	10.5 (3.5)	0.0–14.0
Waters (flavoured)	16	13 (28)	1 (18)	0–113	16	4.7 (3.5)	5.2 (5.0)	0.0–12.8
Sauces, dressings, spreads and dips	**610**	**1422 (1982)**	**670 (1046)**	**0–16667**	**574**	**14.2 (15.6)**	**8.1 (17.3)**	**0.0–79.0**
Mayonnaise and salad dressings	57	713 (625)	756 (763)	0–3400	53	12.1 (10.5)	13.0 (13.0)	0.0–50.0
Sauces	401	1710 (2245)	833 (1616)	0–16667	370	13.5 (14.1)	7.1 (18.1)	0.0–79.0
Spreads and dips	152	929 (1299)	437 (632)	0–7100	151	16.6 (19.8)	9.2 (18.1)	0.0–77.3
Snackfoods	**268**	**690 (381)**	**670 (351)**	**1–4000**	**240**	**4.9 (5.8)**	**3.6 (3.6)**	**0.0–45.0**
Special foods	**25**	**103 (146)**	**21 (168)**	**1–533**	**20**	**6.3 (7.7)**	**5.3 (6.1)**	**0.0–35.0**
Sugars, honey and related products	**68**	**41 (66)**	**11 (46)**	**0–300**	**64**	**44.2 (26.1)**	**50.0 (46.3)**	**1.0–83.3**
Dessert additions and toppings	42	43 (69)	10 (64)	0–300	41	46.4 (25.4)	50.0 (24.6)	1.0–83.3
Honey and syrup	26	39 (62)	13 (25)	0–207	23	40.2 (27.4)	28.0 (50.2)	7.5–80.9
Total	**4083**	**493 (1110)**	**183 (516)**	**0–26,000**	**3,955**	**18.0 (21.5)**	**8.7 (24.9)**	**0.0–100.0**

Food categories with the highest mean sugar content were 'confectionery' (52.6 g/100 g) and 'sugars, honey and related products' (44.2 g/100 g). Categories with the lowest mean sugar content were 'edible oils and oil emulsions' (0.3 g/100 g) and 'meat and meat products' (0.7 g/100 g).

3.3. Assessing against Reformulation Targets

Of the 1188 products with sodium reformulation targets, 707 (59.5%) met the relevant target. The highest compliance was observed for 'bacon' (100%) and 'sweet, filled biscuits' (90.4%), which had reformulation targets of 1210 mg/100 g and 450 mg/100 g respectively [Table 4]. The categories of

'canned meat', 'meat-free products', 'shrimps/prawns peeled cooked/crumbed' and 'squid/calamari' did not have any products meeting sodium reformulation targets.

Table 4. Compliance of targeted food categories with voluntary Fijian sodium reformulation targets.

Category	Sub Category	Reformulation Target (mg/100 g)	Total Products	Meeting Target	
			n	*n*	%
Biscuits	Plain, dry	610	40	28	70.0
	Savoury	800	63	41	65.1
	Sweet, filled	450	135	122	90.4
	Sweet, unfilled	450	100	81	81.0
Canned fish	Fish finger/fillet	350	7	3	42.9
	Mackerel	420	29	19	65.5
	Salmon-pink	430	11	9	81.8
	Sardines	360	11	7	63.6
	Shrimps/prawns peeled cooked/crumbed	350	2	0	0.0
	Squid/calamari	350	1	0	0.0
	Tuna	390	34	14	41.2
Meat & other products	Bacon	1210	1	1	100.0
	Canned meat	540	11	0	0.0
	Luncheon meat	1030	6	3	50.0
	Meat-free products	480	1	0	0.0
	Salami	1400	6	1	16.7
	Sausages - pre-cooked	650	8	1	12.5
	Sausages - uncooked	650	23	8	34.8
	Sliced meat (ham, beef, chicken)	650	8	1	12.5
Noodles	Instant flavoured assorted - dry	370	40	8	20.0
Sauces & spreads	Asian sauces	4840	92	53	57.6
	Chilli sauce	1600	43	22	51.2
	Gravy Stock	540	33	24	72.7
	Marinade	1600	16	6	37.5
	Mayonnaise	650	16	7	43.8
	Meal-based - curry paste	490	9	3	33.3
	Meal-based sauces-other	800	70	43	61.4
	Meat accompaniment	600	15	13	86.7
	Mustard	1910	25	20	80.0
	Pasta sauce	450	40	30	75.0
	Salad dressing	940	28	18	64.3
	Tomato sauce	750	38	13	34.2
Snacks	Corn chips	560	17	9	52.9
	Extruded	750	78	35	44.9
	Other: dalo, cassava chips etc	560	8	7	87.5
	Other: rice crackers, popcorn etc	650	15	2	13.3
	Potato crisps	600	65	36	55.4
	Salt & vinegar	1000	8	5	62.5
	Snack packs–bhujas etc	650	35	14	40.0
Total			**1188**	**707**	**59.5**

Amongst manufacturers with at least three products eligible for voluntary sodium reformulation targets, Food Processors (Fiji) had the highest proportion of products meeting the

targets (n (%) = 7 (100%)) (Figure 1). None of the six Desai Brothers products, which were all in the sauces and spreads category, met the salt targets.

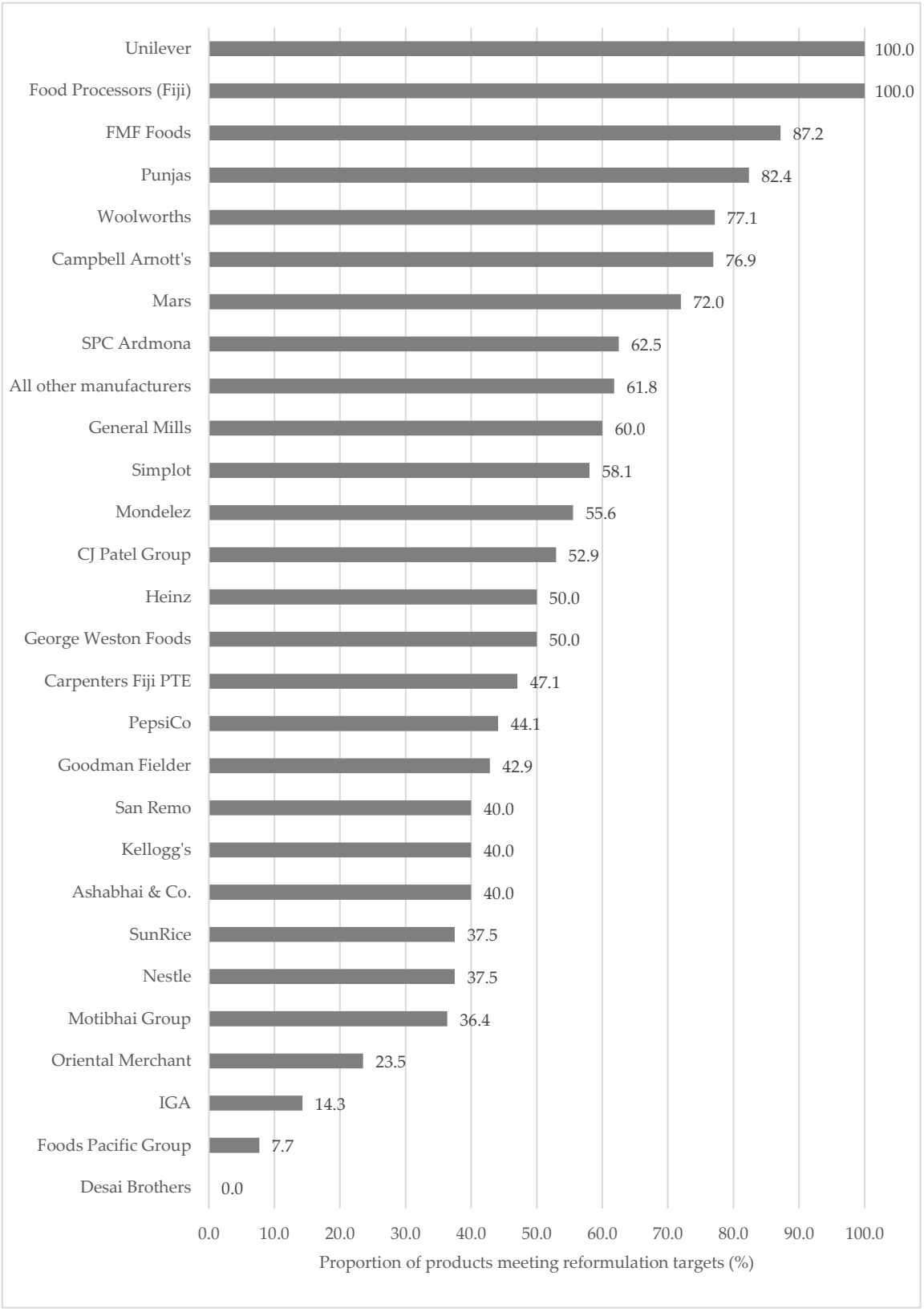

Figure 1. Compliance of International and National manufacturers producing eligible products with voluntary Fijian sodium reformulation targets.

4. Conclusions

The packaged foods and beverages available in Fiji include a high proportion of products that contain high levels of sodium and sugar, and whilst the proportion of products labelling these nutrients is high, overall compliance to labelling regulations is low. The Fijian reformulation targets are currently unratified, and progress towards meeting the targets varies between food categories. The government of Fiji needs to formally adopt the targets and develop targets for sugar based on WHO recommendations. Additionally, ongoing, sustainable political support for sodium and sugar reduction strategies is urgently required. The food industry has a responsibility to consumers to improve the healthiness of its products and make it easier to identify healthier options. There are multiple ways to achieve this, but rapid and substantive gains will be greatly facilitated with government leadership. Actions that improve the quality of the food supply have the potential to reduce overweight, obesity and premature death and disability for hundreds of thousands of Fijians.

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Supplementary Table S1. Compliance of International and National manufacturers producing eligible products with voluntary Fijian sodium reformulation targets.

Category	Total Products *(n)*	Nutrient Labelled *n(%)*						
		Energy	Protein	Carbohydrate	Saturated Fat	Trans Fat	Mono-Unsaturated Fat	Poly-Unsaturated Fat
Bread and bakery products	**517**	**506 (97.9)**	**506 (97.9)**	**506 (97.9)**	**492 (95.2)**	**283 (54.7)**	**58 (11.2)**	**58 (11.2)**
Bread	54	54 (100.0)	54 (100.0)	54 (100.0)	50 (92.6)	29 (53.7)	0 (0.0)	0 (0.0)
Cakes, muffins and pastries	121	121 (100.0)	121 (100.0)	121 (100.0)	121 (100.0)	72 (59.5)	11 (9.1)	11 (9.1)
Savoury biscuits	104	103 (99.0)	103 (99.0)	103 (99.0)	102 (98.1)	43 (41.3)	22 (21.2)	22 (21.2)
Sweet biscuits	238	228 (95.8)	228 (95.8)	228 (95.8)	219 (92.0)	139 (58.4)	25 (10.5)	25 (10.5)
Cereal and grain products	**462**	**454 (98.3)**	**453 (98.1)**	**453 (98.1)**	**423 (91.6)**	**205 (44.4)**	**98 (21.2)**	**98 (21.2)**
Breakfast cereals	179	178 (99.4)	178 (99.4)	178 (99.4)	176 (98.3)	81 (45.3)	53 (29.6)	53 (29.6)
Cereal and nut-based bars	53	53 (100.0)	53 (100.0)	53 (100.0)	53 (100.0)	16 (30.2)	12 (22.6)	12 (22.6)
Noodles	59	55 (93.2)	55 (93.2)	55 (93.2)	51 (86.4)	30 (50.8)	9 (15.3)	9 (15.3)
Other cereal and grain products	82	79 (96.3)	78 (95.1)	78 (95.1)	63 (76.8)	35 (42.7)	13 (15.9)	13 (15.9)
Pasta	44	44 (100.0)	44 (100.0)	44 (100.0)	40 (90.9)	12 (27.3)	1 (2.3)	1 (2.3)
Rice	45	45 (100.0)	45 (100.0)	45 (100.0)	40 (88.9)	31 (68.9)	10 (22.2)	10 (22.2)
Confectionery	**388**	**378 (97.4)**	**379 (97.7)**	**369 (95.1)**	**342 (88.1)**	**85 (21.9)**	**10 (2.6)**	**10 (2.6)**
Chocolate and sweets	364	354 (97.3)	355 (97.5)	345 (94.8)	324 (89.0)	79 (21.7)	7 (1.9)	7 (1.9)
Jelly	24	24 (100.0)	24 (100.0)	24 (100.0)	18 (75.0)	6 (25.0)	3 (12.5)	3 (12.5)
Convenience foods	**60**	**60 (100.0)**	**60 (100.0)**	**60 (100.0)**	**59 (98.3)**	**12 (20.0)**	**4 (6.7)**	**4 (6.7)**

Ready meals	15	15 (100.0)	15 (100.0)	15 (100.0)	15 (100.0)	5 (33.3)	2 (13.3)	2 (13.3)
Soup	45	45 (100.0)	45 (100.0)	45 (100.0)	44 (97.8)	7 (15.6)	2 (4.4)	2 (4.4)
Dairy	**348**	**346 (99.4)**	**346 (99.4)**	**344 (98.9)**	**332 (95.4)**	**143 (41.1)**	**81 (23.3)**	**81 (23.3)**
Cheese	58	58 (100.0)	58 (100.0)	58 (100.0)	58 (100.0)	22 (37.9)	4 (6.9)	4 (6.9)
Cream	26	26 (100.0)	26 (100.0)	26 (100.0)	26 (100.0)	18 (69.2)	2 (7.7)	2 (7.7)
Desserts	11	11 (100.0)	11 (100.0)	11 (100.0)	11 (100.0)	4 (36.4)	1 (9.1)	1 (9.1)
Ice cream and edible ices	112	110 (98.2)	110 (98.2)	109 (97.3)	100 (89.3)	20 (17.9)	17 (15.2)	17 (15.2)
Milk	87	87 (100.0)	87 (100.0)	86 (98.9)	83 (95.4)	57 (65.5)	35 (40.2)	35 (40.2)
Yoghurt and yoghurt drinks	54	54 (100.0)	54 (100.0)	54 (100.0)	54 (100.0)	22 (40.7)	22 (40.7)	22 (40.7)
Edible oils and oil emulsions	**105**	**105 (100.0)**	**103 (98.1)**	**104 (99.0)**	**91 (86.7)**	**65 (61.9)**	**79 (75.2)**	**74 (70.5)**
Fish and fish products	**116**	**111 (95.7)**	**114 (98.3)**	**111 (95.7)**	**112 (96.6)**	**72 (62.1)**	**46 (39.7)**	**46 (39.7)**
Fruit and vegetables	**678**	**666 (98.2)**	**669 (98.7)**	**658 (97.1)**	**630 (92.9)**	**212 (31.3)**	**89 (13.1)**	**89 (13.1)**
Fruit	125	125 (100.0)	125 (100.0)	124 (99.2)	123 (98.4)	28 (22.4)	8 (6.4)	8 (6.4)
Jam and marmalades	81	78 (96.3)	81 (100.0)	71 (87.7)	63 (77.8)	19 (23.5)	13 (16.0)	13 (16.0)
Nuts and seeds	140	138 (98.6)	138 (98.6)	138 (98.6)	127 (90.7)	60 (42.9)	33 (23.6)	33 (23.6)
Vegetables	332	325 (97.9)	325 (97.9)	325 (97.9)	317 (95.5)	105 (31.6)	35 (10.5)	35 (10.5)
Meat and meat products	**105**	**90 (85.7)**	**90 (85.7)**	**81 (77.1)**	**81 (77.1)**	**24 (22.9)**	**5 (4.8)**	**5 (4.8)**
Non-alcoholic beverages	**487**	**472 (96.9)**	**471 (96.7)**	**471 (96.7)**	**354 (72.7)**	**134 (27.5)**	**39 (8.0)**	**39 (8.0)**
Beverage mixes	38	38 (100.0)	35 (92.1)	38 (100.0)	20 (52.6)	15 (39.5)	0 (0.0)	0 (0.0)
Coffee and tea	51	51 (100.0)	51 (100.0)	51 (100.0)	45 (88.2)	27 (52.9)	5 (9.8)	5 (9.8)
Cordials	26	26 (100.0)	26 (100.0)	26 (100.0)	14 (53.8)	10 (38.5)	4 (15.4)	4 (15.4)
Electrolyte and energy drinks	32	27 (84.4)	27 (84.4)	27 (84.4)	22 (68.8)	3 (9.4)	0 (0.0)	0 (0.0)
Fruit and vegetable juices	228	222 (97.4)	224 (98.2)	221 (96.9)	178 (78.1)	61 (26.8)	14 (6.1)	14 (6.1)
Soft drinks	94	92 (97.9)	92 (97.9)	92 (97.9)	70 (74.5)	14 (14.9)	12 (12.8)	12 (12.8)
Waters (flavoured)	18	16 (88.9)	16 (88.9)	16 (88.9)	5 (27.8)	4 (22.2)	4 (22.2)	4 (22.2)
Sauces, dressings, spreads and dips	**628**	**624 (99.4)**	**622 (99.0)**	**615 (97.9)**	**528 (84.1)**	**193 (30.7)**	**42 (6.7)**	**42 (6.7)**
Mayonnaise and salad dressings	57	57 (100.0)	55 (96.5)	57 (100.0)	47 (82.5)	16 (28.1)	6 (10.5)	6 (10.5)
Sauces	416	414 (99.5)	414 (99.5)	408 (98.1)	333 (80.0)	117 (28.1)	15 (3.6)	15 (3.6)
Spreads and dips	155	153 (98.7)	153 (98.7)	150 (96.8)	148 (95.5)	60 (38.7)	21 (13.5)	21 (13.5)
Snackfoods	**290**	**275 (94.8)**	**275 (94.8)**	**274 (94.5)**	**250 (86.2)**	**193 (66.6)**	**118 (40.7)**	**118 (40.7)**
Special foods	**26**	**25 (96.2)**	**25 (96.2)**	**25 (96.2)**	**4 (15.4)**	**3 (11.5)**	**0 (0.0)**	**0 (0.0)**
Sugars, honey and related products	**68**	**68 (100.0)**	**64 (94.1)**	**68 (100.0)**	**52 (76.5)**	**21 (30.9)**	**15 (22.1)**	**15 (22.1)**
Dessert additions and toppings	42	42 (100.0)	41 (97.6)	42 (100.0)	34 (81.0)	13 (31.0)	9 (21.4)	9 (21.4)

Honey and syrup	26	26 (100.0)	23 (88.5)	26 (100.0)	18 (69.2)	8 (30.8)	6 (23.1)	6 (23.1)
Total	**4278**	**4180 (97.7)**	**4177 (97.6)**	**4139 (96.8)**	**3750 (87.7)**	**1645 (38.5)**	**684 (16.0)**	**679 (15.9)**

References

1. World Health Organization. *Western Pacific Regional Action Plan for the Prevention and Control of Noncommunicable Diseases (2014–2020)*; WHO Regional Office for the Western Pacific: Manila, Philippines, 2014.
2. World Health Organization. Non-communicable Disease (NCD) Country Profile. Available online: https://wwwwhoint/nmh/countries/fji_enpdf?ua=.2018 (23 September 2020).
3. Snowdon, W.; Thow, A.M. Trade policy and obesity prevention: Challenges and innovation in the Pacific Islands. *Obes. Rev. Off. J. Int. Assoc. Study Obes*. **2013**, *14* (Suppl. 2), 150–158.
4. Ministry of Health and Medical Services National Food and Nutrition Centre. *Fiji National Nutrition Survey 2015*; 2018.
5. The George Insttitue for Global Health. *State of the Food Supply Fiji*; University TPRCftPoOaNDaFN, ed.; 2019.
6. Charlton, K.E.; Russell, J.; Gorman, E.; Hanich, Q.; Delisle, A.; Campbell, B.; Bell, J. Fish, food security and health in Pacific Island countries and territories: A systematic literature review. *BMC Public Health* **2016**, *16*, 285.
7. Thow, A.M.; Heywood, P.; Schultz, J.; Quested, C.; Jan, S.; Colagiuri, S. Trade and the nutrition transition: Strengthening policy for health in the Pacific. *Ecol. Food Nutr*. **2011**, *50*, 18–42.
8. Reeve, E.; Thow, A.; Bell, C.; Soti-Ulberg, C. Identifying opportunities to strengthen school food environments in the Pacific: A case study in Samoa. *BMC Public Health* **2019**, doi:10.21203/rs.2.16247/v2.
9. Webster, J.; Pillay, A.; Suku, A.; Gohil, P.; Santos, J.A.; Schultz, J.; Wate, J.; Trieu, K.; Hope, S.; Snowdon, W.; et al. Process Evaluation and Costing of a Multifaceted Population-Wide Intervention to Reduce Salt Consumption in Fiji. *Nutrients* **2018**, *10*, 155.
10. Thow, A.M.; Downs, S.; Jan, S. A systematic review of the effectiveness of food taxes and subsidies to improve diets: Understanding the recent evidence. *Nutr. Rev.* **2014**, *72*, 551–565.
11. World Health Organization. *Global action plan for the prevention and control of noncommunicable diseases 2013–2020*; World Health Organization: Geneva, Switzerland, 2013.
12. Downs, S.M.; Christoforou, A.; Snowdon, W.; Dunford, E.; Hoejskov, P.; Legetic, B.; Campbell, N.; Webster, J. Setting targets for salt levels in foods: A five-step approach for low-and middle-income countries. *Food Policy* **2015**, *55*, 101–108.
13. Fiji NFaNCMoHaMS. *Health Minister Calls on the Food Industry to Reduce Salt Levels in Processed Foods in Fiji*; Food Industry Salt Action Consultation: 2010.
14. Parliament of the Fiji Islands. *Food Safety Act 2003*; 2003.
15. Parliament of the Fiji Islands. *Food Safety Regulations 2009*; 2009.
16. Parliament of the Fiji Islands. *Food and Safety (Amendment) Regulations*; Services MoHaM, ed.; Government of Fiji: 2014.
17. Dunford, E.; Trevena, H.; Goodsell, C.; Ng, K.H.; Webster, J.; Millis, A.; Goldstein, S.; Hugueniot, O.; Neal, B. FoodSwitch: A Mobile Phone App to Enable Consumers to Make Healthier Food Choices and Crowdsourcing of National Food Composition Data. *JMIR Mhealth Uhealth* **2014**, *2*, e37.
18. Dunford, E.; Webster, J.; Metzler, A.B.; Czernichow, S.; Ni Mhurchu, C.; Wolmarans, P.; Snowdon, W.; L'Abbe, M.; Li, N.; Maulik, P.K.; et al. International collaborative project to compare and monitor the nutritional composition of processed foods. *Eur. J. Prev. Cardiol.* **2012**, *19*, 1326–1332.