See corresponding editorial on page 298.

A systematic survey of the sodium contents of processed foods[1,2]

Jacqueline L Webster, Elizabeth K Dunford, and Bruce C Neal

ABSTRACT

Background: Processed foods are major contributors to population dietary salt intake. Parts of the Australian food industry have started to decrease salt in a number of products. A definitive baseline assessment of current sodium concentrations in foods is key to targeting reformulation strategies and monitoring progress.

Objectives: Our objectives were to systematically collate data on the sodium content of Australian processed food products and compare sodium values against maximum target levels established by the UK Food Standards Agency (UK FSA).

Design: Categories of processed foods that contribute the majority of salt to Australian diets were identified. Food-composition data were sought for all products in these categories, and the sodium content in mg/100 g (or mg/100 mL for liquids) was recorded for each. Mean sodium values were calculated for each grouping and compared with the UK FSA benchmarks.

Results: Sodium data were collected for 7221 products in 10 food groups, 33 food categories, and 90 food subcategories. The food groups that were highest in sodium were sauces and spreads (1283 mg/100 g) and processed meats (846 mg/100 g). Cereal and cereal products (206 mg/100 g) and fruit and vegetables (211 mg/100 g) were the lowest in sodium. Sixty-three percent of food categories had mean sodium concentrations above the UK FSA targets, and most had wide ranges between the most and least salty product.

Conclusions: Many products, particularly breads, processed meats, and sauces, have salt amounts above reasonable benchmarks. The variation in salt concentrations between comparable products suggests that reformulation is highly feasible for many foods. *Am J Clin Nutr* 2010;91:413–20.

INTRODUCTION

It is now well established that excess dietary salt consumed throughout life causes blood pressure to rise with age (1, 2) and greatly increases the risk of cardiovascular diseases (3–6). These diseases are leading causes of death and disability in many Western countries, and in Australia they are responsible for >30% of mortality [45,000 deaths/y (7)]. In addition, cardiovascular diseases consume >10% of the country's total allocated health system expenditure (8), and high blood pressure equals smoking as the leading cause of disease burden (9). Although there is no current definitive estimate of population dietary salt intakes in Australia, it is widely accepted that average consumption is well above the government's suggested dietary target of 4 g/d (10), and that approximately three-quarters of salt in the diet comes from processed foods (11).

There is a consensus that the reduction of salt consumption will lower blood pressure, with great potential to produce significant individual and population health benefits (12–18). Furthermore, centrally implemented salt-reduction strategies led by government and the food-processing industry are projected to be highly cost-effective (17, 19, 20). On this basis, a number of countries and individual corporations are already working to decrease the salt content of processed foods (20–22), and there is strong evidence that this can decrease mean population salt consumption (23). In Australia, the Australian Division of World Action on Salt and Health (AWASH) is driving a strategy to decrease population salt intakes (24).

A central component of the AWASH strategy is to secure sector-wide commitments from the food industry to decrease the salt content of processed foods. It is often asserted that the salt content of Australian processed food products is already lower than that of other countries, although this is not always the case. For example, whereas the salt content of some breakfast cereal products is lower in Australia, other products have higher salt content than in other countries (25).

The setting of sodium targets for food categories and the establishment of a database to monitor the sodium content of foods have been core to the success of national salt-reduction programs (21). To build on this, AWASH has established a comprehensive brand-specific food composition database to record and monitor the sodium content of processed foods in Australia. As a basis for a national target-setting process, this study also compared the 2008 sodium concentrations of Australian foods to the maximum sodium targets set by the UK Food Standards Agency (UK FSA).

METHODS

This study comprised a systematic survey of Australian processed foods, with data collection done over a 6-mo period between July and December 2008 and analysis and reporting carried out in 2009. The primary objective of the survey was to establish the mean sodium concentrations of the main food categories that contribute salt to the diet and to provide a baseline against which it will be possible to objectively quantify progress to decrease salt through reformulation. A secondary objective was to compare the sodium content of Australian products against the maximum targets set by the UK FSA, to identify priority areas

[1] From the George Institute for International Health, Sydney, Australia.
[2] Address correspondence to E Dunford, PO Box M201, Missenden Road, Camperdown NSW, 2050 Australia. E-mail: edunford@george.org.au.

Received September 17, 2009. Accepted for publication November 6, 2009.
First published online December 2, 2009; doi: 10.3945/ajcn.2009.28688.

Supplemental Material can be found at:
http://www.ajcn.org/cgi/content/full/ajcn.2009.28688/DC1

for salt reduction in Australian products and to inform a national target-setting process.

Identification of processed foods that contribute salt to the diet

The foods included in this survey were selected on the basis of a review of the scientific literature that addressed the contribution of different types of processed foods to salt in the diet. The starting point was a recent salt-modeling exercise done by Food Standards Australia New Zealand (FSANZ) as part of an investigation into proposed mandatory iodine fortification (11). This provided quantitative conclusions about the contribution of different food groups to daily salt intake for the average Australian with the use of the best available evidence from national sources. The main food groups identified in the FSANZ modeling project were estimated to cover 83% of the salt from processed foods. To achieve more comprehensive coverage, the FSANZ findings were complemented with information drawn from comparable studies done in other developed country populations with dietary patterns broadly similar to those of Australians (26, 27).

Definitions of food categories and subcategories

The food categories and subcategories used here were also defined on the basis of a review of the applicable scientific literature (11, 26) and an examination of existing food composition databases. The 3 systems that most heavily influenced our categorization were those of FSANZ, the UK FSA, and the *Retail World's Australasian Grocery Guide* (the *Grocery Guide*) (28–30). FSANZ uses a food categorization system developed for the management of legislation related to food labeling in Australia (29), the UK FSA has a classification system established specifically for the purpose of working with industry to achieve sector-wide reformulation of products with lower salt content (31), and the *Grocery Guide* lists annual market share data for groups of products sold in supermarkets in Australia (28). Accordingly, for this database, foods were categorized with the use of a hierarchic system into 10 food groups, 33 food categories, 90 food subcategories (major), and 14 food subcategories (minor). The overarching principle that underlay the categorization system was that it be applicable to industry, so that it could be used to monitor future changes and to inform the negotiation and monitoring of sector-wide sodium targets for processed foods.

Identification of products for inclusion in the database

We used the *Grocery Guide* as the starting point for the selection of the individual food products for inclusion in the database. For each of the food subcategories we compiled a comprehensive list of products with the use of information provided in the *Grocery Guide* and then sought food composition data for each product identified. There were 4 main sources from which we obtained information about food composition for the database: *1*) data provided directly by food-processing companies as spreadsheets or printed materials, *2*) data extracted from company websites, *3*) data taken from other nutrient databases, and *4*) data copied from the nutrition information panels (NIPs) on in-store product labels at 2 major Australian supermarkets. With the use of these 4 data sources we sought to obtain data for as many products as possible in each food subcategory. Where exactly the same food was presented in different packaging or in different serving sizes, only one entry was made in the database unless the product was marketed as a different brand.

Variables collected

For each food item, the brand name, product name, serving size, sodium per serving, and sodium per 100 g (or per 100 mL for fluids) were the minimum data recorded. Each product was assigned indicator variables for food group, food category, and food subcategories in accordance with the classification system defined. The data entry process was verified with the use of a number of methods. First, sodium data for all products obtained from other nutrient databases were screened by an author (EKD) for plausibility before inclusion in the database, to identify outliers. Second, a random sample of 5% of entries was selected, and the information in the database was compared with the original data source. And third, another sample of 5% of the data obtained direct from industry, websites, or other databases was also checked directly against the information displayed on the NIPs on the products on the supermarket shelves. Where there was a discrepancy in sodium content between the original value and the NIP, the NIP value was retained. The sodium content of foods was variously calculated or directly estimated, but it was not possible to ascertain the method used for each product. Likewise, it was not possible to obtain sales data for many individual products.

Data analysis

The mean sodium concentration was calculated for each food group, food category, and food subcategory and presented alongside the range. The percentage market share covered by the products in each food category and subcategory was estimated with the use of data provided in the *Grocery Guide*. There were some limitations to the estimation of coverage because in some instances the *Grocery Guide* provides market share for groups of products and not individual items. As such, where the market share data for products listed in the *Grocery Guide* could be related directly to our product subcategories, we were able to make exact estimates of coverage. Where market share data for groups of products in the *Grocery Guide* did not match exactly the definition of our food product subcategory, or where market share data were unavailable, we estimated the minimum possible coverage provided by the products we included in the database (and indicated coverage as "greater than" the plausible minimum). If even that was not possible, we simply used a dash to indicate missing data. Finally, where the definitions of our food product subcategories were directly comparable to the definitions of groupings of products used by the UK FSA, the proportion of Australian products that met the UK FSA maximum salt targets was reported (31).

RESULTS

Sodium data were collected for 7221 products in 10 food groups, 33 food categories, and 90 subcategories (major) (**Table 1**). In addition, data were collected for a further 14 subcategories (minor), which allowed a more detailed analysis in cases in

TABLE 1
Sodium content of processed foods in Australia and percentage of products that meet UK Food Standards Agency (UK FSA) sodium targets

Food group[1]	No. of products	Market share covered	Range	Mean[2]	UK FSA 2012 target	≤UK FSA target
		%	*mg/100g*	*mg/100g*	*mg/100g*	%
Bread and bakery products	—	—	0–2900	467	—	—
Bread	—	—	5–2900	531	—	—
White	51	—	250–600	461	370	6
Whole-meal	25	—	243–535	449	370	4
Mixed-grain	72	—	195–804	447	370	13
Fruit	22	>73	225–1218	500	370	68
Flat	33	—	75–799	492	370	30
Other	97	—	5–2900	672	450	21
Biscuits	—	—	0–1770	477	—	—
Sweet, filled	89	>70	70–528	194	450	98
Sweet, unfilled	209	>70	11–640	285	450	91
Plain dry	118	>80	0–1310	562	550	38
Savory	187	>80	120–1770	771	550	24
Cakes, muffins, and pastries	—	—	6–2695	343	—	—
Cakes	99	>75	16–800	315	350	62
Cake mixes	81	81	6–2695	382	—	—
Pastries	24	—	63–825	328	200	25
Cereal and cereal products	—	—	0–2335	206	—	—
Cereal bars	160	>86	5–463	144	—	—
Noodles	—	—	1–2335	402	—	—
Plain	42	93	1–1101	310	150	40
Flavored	15	44	236–2335	661	150	0
Breakfast cereals	—	—	0–1063	217	—	—
Ready to Eat	218	100	4–1063	264	400	77
Hot	42	99	0–158	23	400	100
Other	20	—	0–600	113	400	90
Pasta	—	—	2–1310	179	—	—
Plain dry	208	96	2–510	24	150	99
Canned	40	85	30–800	348	150	8
Fresh	26	87	5–930	358	150	4
Packet	28	77	135–1310	923	150	4
Rice	—	—	0–1020	187	—	—
Flavored	31	>73	144–1020	537	250	13
Plain	64	—	0–416	18	80	97
Couscous side dishes	6	—	0–805	412	—	—
Flour	32	—	1–850	275	—	—
Meat and meat products	—	—	0–3300	846	—	—
Processed meat	—	—	55–3300	912	—	—
Bacon	47	92	920–1950	1243	1150	30
Sausages and hot dogs	96	91	229–2157	825	450	3
Sliced meat	123	92	120–1720	1042	500	5
Salami	80	85	480–3300	1273	700	5
Meat burgers	28	—	55–1046	480	300	25
Canned meat	18	95	310–1179	686	500	33
Meat with pastry	66	98	230–2182	501	450	50
Meat alternatives	—	—	0–930	293	—	—
Plain	19	—	0–480	100	280	79
Meat-free bacon	1	—	930	930	850	0
Others	39	—	1–930	388	600	79
Dairy	—	—	1–1900	353	—	—
Cheese	—	—	24–1900	725	—	—
Hard	294	>87	24–1740	738	750	73
High-salt	49	—	580–1630	1112	750	2
Others	245	—	24–1740	663	750	88
Soft	134	—	32–1900	549	300	27
Processed	29	—	520–1857	1402	900	14
Yogurt and yogurt drinks	214	—	15–120	68	—	—

(Continued)

TABLE 1 (*Continued*)

Food group[1]	No. of products	Market share covered	Range	Mean[2]	UK FSA 2012 target	≤UK FSA target
		%	*mg/100g*	*mg/100g*	*mg/100g*	%
Milk	—	—	—	—	—	—
Plain dairy	66	>90	21–80	51	—	—
Flavored dairy	67	—	18–145	58	—	—
Soy	41	100	40–93	59	—	—
Other	5	—	16–62	38	—	—
Cream	45	—	17–138	38	—	—
Desserts	—	—	—	—	—	—
Prepared	122	98	12–360	76	200	98
Mixes	12	—	39–610	186	200	83
Ice cream	125	—	14–125	67	—	—
Edible oils and emulsions	—	—	5–1300	419	—	—
Butter and margarine	—	—	—	—	—	—
Regular butter	33	>98	146–976	535	600	61
Margarine	57	—	5–1300	427	650	91
Salt-reduced butter	9	—	200–350	294	450	100
Unsalted butter	8	—	18–19	19	40	100
Fish and fish products	—	—	32–6000	512	—	—
Canned fish	—	—	32–6000	501	—	—
Tuna	180	99	130–950	405	450	64
Salmon	92	—	47–1170	453	370	25
Sardines	27	—	57–740	342	500	78
Anchovies	5	>83	5400–6000	5607	—	—
Other	42	—	32–3000	568	500	57
Chilled fish	14	—	350–1170	789	—	—
Frozen fish	10	>30	185–590	370	—	—
Fruit and vegetables	—	—	0–5000	211	—	—
Vegetables	—	—	0–5000	362	—	—
Canned vegetables	332	>88	0–782	227	50	18
Tomato	78	>88	0–686	146	50	37
Legumes	103	>94	0–520	216	50	26
Baked beans	30	100	170–500	357	300	20
Corn	32	100	0–470	201	50	13
Other canned vegetables	94	>88	2–782	262	50	6
Pickled vegetables	167	89	5–5000	977	—	—
Frozen potato	48	77	5–500	211	300	63
Frozen vegetables (excluding potato)	151	93	1–280	40	—	—
Fruit	—	—	0–250	27	—	—
Dried fruit	104	81	0–250	43	—	—
Fruit bars	32	—	3–215	78	—	—
Fruit in juice/syrup	167	>99	0–184	9	—	—
Other fruit products	14	—	1–78	20	—	—
Jams and marmalades	124	100	0–147	19	—	—
Nuts and seeds	—	—	—	—	—	—
Unsalted	147	91	0–150	11	—	—
Salted	68	—	68–1360	381	—	—
Snack foods	—	—	3–2960	797	—	—
Crisps and snacks	—	—	—	—	—	—
Potato crisps	80	99	30–1404	641	650	65
Salt and vinegar	12	—	724–1400	1168	1000	17
Extruded snacks	26	—	364–1880	1085	1000	35
Corn chips	27	—	4–930	579	650	67
Others	29	—	3–2960	861	—	—
Snack packs	33	>80	315–2132	938	—	—
Convenience foods	—	—	13–640	301	—	—
Pizza	17	>88	305–583	408	500	88
Soup	265	>99	13–640	304	290	41
Ready meals	—	—	120–590	279	—	—
Frozen	89	>75	120–590	265	450	97
Ambient	19	>30	121–527	340	450	84

(Continued)

TABLE 1 (*Continued*)

Food group[1]	No. of products	Market share covered	Range	Mean[2]	UK FSA 2012 target	≤UK FSA target
		%	*mg/100g*	*mg/100g*	*mg/100g*	*%*
Sauces and spreads	—	—	1–27,105	1283	—	—
Sauces	—	—	1–27,105	1587	—	—
Table sauces	—	—	10–2150	943	—	—
Tomato sauce	27	95	10–1540	834	730	30
Chili sauce	28	>78	259–2150	1084	—	—
Barbecue sauce	12	98	449–1191	799	600	25
Steak/Worcestershire	8	>84	550–1833	1035	600	13
Asian sauces	33	>70	121–10,600	4426	—	—
Mustard	23	>91	826–4895	1881	—	—
Marinade	37	>64	500–5987	1808	2000	73
Meat accompaniment	15	—	1–215	43	—	—
Tomato paste	18	>73	30–1352	500	330	28
Meal-based sauces	—	—	—	—	—	—
Powdered	56	>92	360–8100	3679	800	9
Ambient	188	—	144–3900	651	800	24
Liquid	73	—	217–3720	1129	800	52
Pasta sauce	135	>63	140–2020	499	330	24
Gravy	51	78	199–1900	525	—	—
Stock	33	>99	240–27,105	6108	—	—
Mayonnaise and dressings	—	—	—	—	—	—
Mayonnaise	29	>96	170–1087	621	750	86
Dressings	51	—	11–1998	986	700	12
Spreads	—	—	6–6003	553	—	—
Peanut butter	43	100	6–720	379	—	—
Relishes	28	>79	100–1390	645	—	—
Other savory	8	—	327–1500	775	—	—
Pâté	26	>79	470–1000	707	—	—
Sweet spreads	7	—	33–268	98	—	—
Yeast extract	3	—	3380–4667	3816	—	—
Dips	146	>93	100–6003	502	—	—

[1] Food groups are divided into food category, food subcategory (major), and subcategory (minor).
[2] Mean sodium concentration values have not been weighted by sales data.

which the numbers of products were large or there were clearly defined groups of products within the subcategory. The number of products in a subcategory ranged from 1 (meat-free bacon) to 332 (canned vegetables), which reflected both the huge choice available within some product ranges and the great variability in the size of product ranges between different food types.

Estimates of coverage were possible for 75/90 major subcategories (as well as an additional 5 minor subcategories). For those 80 subcategories with market share data, 65 (74%) had >80% and 45 (51%) had >90% coverage. Only 5 categories (6%) had <70% coverage.

Mean sodium content

There was wide variability in sodium content within and between most food categories. Exceptions to this were unsalted butter (range: 18–19 mg/100 g) at one end of the spectrum and anchovies (range: 5400–6000 mg/100 g) at the other, where sodium content was broadly constant across the product range. For most other categories, the highest sodium product had a sodium concentration at least one-half greater than that of the product with the lowest sodium, and for some categories the differences were extreme. There was more than a 6-fold difference in the sodium content of hard cheeses (240–1740 mg/100 g), a 14-fold difference in the sodium content of sliced meats (120–1720 mg/100g), and a 100-fold difference in the sodium content of frozen potato products (5–500 mg/100 g).

The food groups with the highest mean sodium content were sauces and spreads (1283 mg/100 g), followed by processed meats (846 mg/100 g). Cereal and cereal products (206 mg/100 g) and fruit and vegetables (211 mg/100 g) had the lowest mean sodium content. Stock was the highest sodium food subcategory, with a mean sodium content of 6108 mg/100 g and a maximum of 27,105 mg/100 g. The lowest was fruit in juice/syrup (9 mg/100 g), with the lowest sodium varieties being sodium free. The mean sodium concentrations in the processed food groups that contribute the most sodium to the average Australian diet were 846 mg/100 g (meat and meat products), 467 mg/100 g (bread and bakery products), 353 mg/100 g (dairy), 206 mg/100 g (cereal and cereal products), and 1283 mg/100 g (sauces and spreads).

Comparison of sodium content against established targets

Almost one-half (40/90, 44%) of the product subcategories had a mean sodium content that would be classified as high (>500 mg/100 g), and less than one-fifth (17/90, 19%) had a mean sodium content that would be classified as low (<120 mg/100 g). For 2 food categories and 69 food subcategories (58 major, 11 minor), it was possible to make direct comparisons against

UK FSA targets. For 63% (45/71) of these comparisons, the mean sodium concentrations were above the UK FSA maximum targets. Food categories that included many subcategories above target were breads, processed meats, sauces, and canned vegetables. Food categories that included a greater proportion of subcategories at or below UK FSA targets were breakfast cereals, sweet biscuits, butters and margarines, and ready meals.

DISCUSSION

These data provide a comprehensive baseline assessment on which a sector-wide strategy for salt reduction in Australian processed foods can be designed and monitored. The database will be updated annually, which means that, for the first time, it will be possible to objectively show the effect of food reformulation programs. Significantly, the survey showed that sodium concentrations vary markedly across the product ranges within most food subcategories. As noted in prior smaller-scale work done in Australia and overseas (26, 32), the highest- and lowest-salt foods within a category frequently vary in salt content by $\geq$50%. This variability shows that it is technically feasible to produce lower-salt products for most food types, so significant progress in salt reduction can reasonably be expected for many food categories. In conjunction with work that shows that progressive small reductions in the sodium content of foods do not influence consumer acceptability or taste (33, 34), there is a strong argument for the implementation of a sector-wide program of salt reduction.

The United Kingdom and Finland have the most active nationwide salt-reduction programs (21), and New York City leads the way in the United States (35). With three-quarters of daily salt consumption derived from processed foods (11), a wide-ranging food reformulation program with salt targets for individual product categories is at the core of most salt-reduction strategies. The UK FSA salt targets were developed through a broad-based consultation with the food industry and independent food technologists, with a view to achieving an average population salt intake of $<$6 g/d (31). The targets for each food category were agreed upon on the basis of feasibility, in terms of both the technical aspects of food production and consumer acceptability. These voluntary targets have provided industry with clear goals and have established a level playing field on which transparent and objective assessment of progress can be made. Both average and maximum sodium targets were provided to allow for substantial variability in the sodium content of some food categories. By 2008 the UK salt-reduction campaign had successfully achieved a reduction in mean population salt intake from 9.5 to 8.6 g/d, driven primarily by significant falls in the salt content of key food categories (36).

Some major Australian corporations have already done work or made commitments to future salt reduction across their product ranges (37). Existing programs that target large reductions in individual products with the goal of the provision of a healthier alternative are reported to have removed several hundred tons of salt from the Australian food supply each year (38). Such programs make a welcome contribution but, given that total annual consumption of salt by the Australian population is $>$50,000 tons (with a mean intake of $\approx$8 g/person per day), the overall effect of such interventions is likely to be limited. In addition, to achieve a significant health gain, the provision of lower-salt alternatives requires both that consumers choose the new product and that the product be responsible for a large proportion of daily salt intake. In practice this is rarely the case. Category-wide reductions in salt content, even if small, have much greater potential to achieve health gain because they modify the entire daily salt intake. As such, many Australian food companies have committed to reductions across the whole range of their products. However, more than one-half of Australian food subcategories have average sodium concentrations above corresponding UK FSA maximum salt targets, and there remains much to be done with food reformulation in Australia. The sodium data in this article were not weighted by sales, but the sodium content of Australian processed foods was benchmarked against the UK FSA targets, which has been very helpful. In conjunction with the FSANZ modeling data, the process has clearly identified those product categories where salt reduction is needed most urgently.

These findings provide the basis for negotiations toward salt targets for relevant food categories in Australia. This should be done jointly with the food industry, informed by the process led by the UK FSA. Whereas UK FSA targets will serve as an excellent basis for the immediate commencement of reformulation efforts, additional work is needed to develop targets for unique aspects of the Australian market. Local criteria that already exist, such as those used for the National Heart Foundation of Australia's Tick Program, could usefully inform such developments (39), and comprehensive sales data would greatly strengthen the process.

A key strength of this survey is its large scale and the systematic and objective approach taken to the identification of foods for inclusion. The database has $>$10 times the number of products in prior reports of this type (26) and has brand-specific information on products to enable tailored feedback to individual food manufacturers. Although there are estimated to be $>$30,000 different processed food products available for purchase in Australian supermarkets (40), a large number are simply different sizes and formats of packaging for the same product. Goods such as beverages, sugar products, confectionery, and eggs were not included in the database because they contribute little salt to the diet. As such, the 7221 products included in this database represent the composition of the majority of processed foods that contribute salt to the Australian diet. The quality-control processes implemented identified only a few minor errors and provide reassurance that the database is robust. Direct chemical analysis of a sample of foods would further enhance the perceived validity of the data but, given that a significant number of the larger companies already conduct their own quality-control programs, it is unlikely that significant changes to our conclusions would result.

More complete data on market share for each product would have enabled a weighted analysis that would have better estimated the likely contribution of each food subcategory to total salt intake. As it is, the differential market share of higher- and lower-salt products in any given product category means that the reported mean salt concentration is unlikely to translate directly into the quantity of salt delivered to the population from this source. Greater sales of the higher-salt products would result in more salt from this source than implied by the reported mean, and vice versa.

In conclusion, it has been possible to make a sound baseline assessment of the mean sodium content of processed foods that contribute the majority of salt to Australian diets. These data will inform the development of a strategy to decrease salt in processed foods and enable objective monitoring of the effect of food industry reformulation efforts through annual updates. The Australian government should take leadership and engage the food industry in a sector-wide, transparent reformulation effort that will progressively decrease salt intake in Australia. The establishment of salt targets for all relevant product categories is the next step, and leading industry players within Australia have indicated a willingness to embark on this process. A national salt-reduction program has enormous potential to avert chronic disease through blood pressure lowering (41, 42) at a fraction of the cost of drug therapies for the management of hypertension (20) and should be a national health priority.

The authors' responsibilities were as follows— JLW (senior project manager): development of overall strategy, research design, interpretation of results, and draft of the manuscript; EKD (research assistant): data collection, analysis, and review of the manuscript; and BCN: oversight of the entire project with input into design and interpretation of findings and substantive review of the manuscript. BCN is the Chairman of the Australian Division of World Action on Salt and Health. JLW was previously responsible for the implementation of the UK FSA salt-reduction strategy, which included the initial consultation on salt targets. The authors declared no other conflicts of interest.

REFERENCES

1. Havas S, Dickinson B, Wilson M. The urgent need to reduce sodium consumption. JAMA 2007;298:1439–41.
2. Intersalt Cooperative Research Group. Intersalt: an international study of electrolyte excretion and blood pressure: results for 24 hour urinary sodium and potassium excretion. BMJ 1988;297:319–28.
3. Asia Pacific Cohort Studies Collaboration. Blood pressure and cardiovascular diseases in the Asia-Pacific region. J Hypertens 2003;21: 707–16.
4. Prospective Studies Collaboration. Cholesterol, diastolic blood pressure, and stroke: 13,000 strokes in 450,000 people in 45 prospective cohorts. Lancet 1995;346:1647–53.
5. Blood Pressure Lower Treatment Trialists' Collaboration. Effects of ACE inhibitors, calcium antagonists and other blood pressure lowering drugs: results of prospectively designed overviews of randomised trials. Lancet 2000;355:1955–64.
6. Turnbull F; Blood Pressure Lower Treatment Trialists' Collaboration. Effects of different blood-pressure-lowering regimens on major cardiovascular events: results of prospectively-designed overviews of randomised trials. Lancet 2003;362:1527–35.
7. Australian Institute of Health and Welfare. Australia's health 2008: the eleventh biennial health report of the Australian Institute of Health and Welfare. Canberra, Australia: Australian Institute of Health and Welfare, 2008.
8. Australian Institute of Health and Welfare. Health expenditure Australia 2003-4. Canberra, Australia: Australian Institute of Health and Welfare, 2005.
9. Begg S, Vos T, Barker B, Stevenson C, Stanley L, Lopez AD. The burden of disease and injury in Australia 2003. PHE 82. Canberra, Australia: Australian Institute of Health and Welfare, 2007.
10. National Health and Medical Research Council of Australia. Nutrient reference values for Australia and New Zealand. Canberra, Australia: NHMRC, 2006.
11. Food Standards Australia New Zealand. P230: consideration of mandatory fortification with iodine. Canberra, Australia: FSANZ, 2007.
12. James WP, Ralph A, Sanchez-Castillo C. The dominance of salt in manufactured food in the sodium intake of affluent societies. Lancet 1987;1:426–9.
13. Law MR, Frost CD, Wald NJ. By how much does dietary salt reduction lower blood pressure? III Analysis of data from trials of salt reduction. BMJ 1991;302:819–24.
14. Law MR, Frost CD, Wald NJ. By how much does dietary salt reduction lower blood pressure? I Analysis of observational data among populations. BMJ 1991;302:811–6.
15. Frost CD, Law MR, Wald NJ. By how much does dietary salt reduction lower blood pressure? II Analysis of observational data within populations. BMJ 1991;302:815–9.
16. MacGregor GA, Sever PS. Salt: overwhelming evidence but still no action: can a consensus be reached with the food industry? BMJ 1996; 312:1287–9.
17. Asaria P, Chisholm D, Mathers C, Ezzati M, Beaglehole R. Chronic disease prevention: health effects and financial costs of strategies to reduce salt intake and control tobacco use. Lancet 2007;370:2044–53.
18. National Health and Medical Research Council of Australia. Dietary guidelines for Australian adults. Canberra, Australia: NHMRC, 2003.
19. Murray CJ, Lauer JA, Hutubessy RC, et al. Effectiveness and costs of interventions to lower systolic blood pressure and cholesterol: a global and regional analysis on reduction of cardiovascular-disease risk. Lancet 2003;361:717–25.
20. World Health Organization. Reducing salt intake in populations: report of a WHO Forum and Technical Meeting. Geneva, Switzerland: World Health Organization, 2007.
21. Food Standards Agency. Salt. Version current 1 August 2009. Available from: http://www.food.gov.uk/healthiereating/salt/ (cited 13 August 2009).
22. French Food Standards Agency. Version current 3 August 2009. Available from: http://www.afssa.fr/ (cited 3 August 2009).
23. National Centre for Social Research and Medical Research Council Human Nutrition Research. An assessment of dietary sodium levels among adults (aged 19-64) in the UK general population in 2008, based on analysis of dietary sodium in 24 hour urine samples. London, United Kingdom: National Centre for Social Research, 2008.
24. Webster J, Dunford E, Barzi F, Neal B. Just add a pinch of salt!-Current directions for the use of salt in recipes in Australian magazines. Eur J Public Health (Epub ahead of print 7 August 2009).
25. World Action on Salt and Health. International Products Review. Version current 3 August 2009. Available from: http://www.worldactiononsalt.com/media/recent_press_releases.htm (cited 3 August 2009).
26. Grimes C, Nowson CA, Lawrence M. An evaluation of the reported sodium content of Australian food products. Int J Food Sci Technol 2008;43:2219–29.
27. Thomson BM. Nutritional modelling: distributions of salt intake from processed foods in New Zealand. BrJ Nutr 2009;102:757–65.
28. Retail Media Pty Ltd. Retail World's Australasian Grocery Guide. 18th ed. Sydney, Australia: Retail Media, 2007.
29. Food Standards Australia New Zealand. Australia New Zealand food standards code. Canberra, Australia: FSANZ, 2007.
30. Food Standards Agency. Processed food databank: sampling round two: February 2007–September 2007. Version current 10 August 2009. Available from: http://www.food.gov.uk/multimedia/pdfs/fsis0108.pdf (cited 10 August 2009).
31. Food Standards Agency. Salt reduction targets: March 2010–12. Version current 3 August 2009. Available from: http://www.food.gov.uk/multimedia/spreadsheets/salttargets20102012.xls (cited 5 August 2009).
32. Center for Science in the Public Interest. Salt assault: brand-name comparisons of processed foods. Washington DC: CSPI, 2008.
33. Rodgers A, Neal B. Less salt does not necessarily mean less taste. Lancet 1999;353:1332.
34. Girgis S, Neal B, Prescott J, et al. A one-quarter reduction in the salt content of bread can be made without detection. Eur J Clin Nutr 2003; 57:616–20.
35. New York City Department of Health and Mental Hygiene. NYC starts a nationwide initiative to cut the salt in restaurants and processed food. Available from: http://www.nyc.gov/html/doh/html/cardio/cardio-salt-initiative.shtml (cited 27 October 2009).
36. Joint Health Surveys Unit. An assessment of dietary sodium levels among adults (aged 19-64) in the general population, based on analysis of dietary sodium in 24 hour urine samples. London, United Kingdom: National Centre for Social Research, 2006.
37. Webster J, Nowson C, Neal B. Working with the food industry to reduce salt in processed foods: a strategy for action. Sydney, Australia: Australian Division of World Action on Salt and Health, The George Institute for International Health, 2008.

38. Williams P, McMahon A, Boustead R. A case study of sodium reduction in breakfast cereals and the impact of the Pick the Tick food information program in Australia. Health Promot Int 2003;18:51–6.
39. National Heart Foundation of Australia. Tick program. Version current 5 August 2009. Available from: http://www.heartfoundation.org.au/Professional_Information/Tick/Pages/default.aspx (cited 10 August 2009).
40. Food Standards Australia New Zealand. COOL revisited: benefit cost analysis of country of origin labelling. Version current 1 August 2009. Available from: http://www.foodstandards.gov.au/_srcfiles/NZIER%20COOL%20CBA.doc (cited 10 August 2009).
41. Cutler JA, Follmann D, Allender P. Randomized trials of sodium reduction: an overview. Am J Clin Nutr 1997;65:643S–51S.
42. Cook NR, Cutler JA, Obarzanek E, et al. Long term effects of dietary sodium reduction on cardiovascular disease outcomes: observational follow-up of the trials of hypertension prevention (TOHP). BMJ 2007; 334:885–8.