

# Product variety in Australian snacks and drinks: how can the consumer make a healthy choice?

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## Abstract

*Objective:* To estimate the proportion of 'healthy' snack food and beverage choices available to an Australian consumer.

*Design:* A survey of product Nutrition Information Panels (NIP) and product labels on snack foods and beverages offered for sale. Data on nutrient content were compared with criteria from different nutrient profile systems to estimate the proportion of items conforming to a 'healthy' choice.

*Setting:* A large supermarket in metropolitan Melbourne, Australia.

*Results:* A consumer could choose from 1070 different snack foods and 863 different drinks. Flavour variety was more common in snacks (maximum thirteen per product) while variation in container size was more common for drinks (up to ten per product). Recommended serving size for snacks varied greatly (18–100 g) while the serving size for drinks frequently did not correspond to the size of the container. Depending on the nutrient profile system selected, only 9–22% of snack foods presented for sale could be deemed 'nutritious' by multiple criteria. Similarly, only 14–27% of beverages met 'healthy' criteria.

*Conclusions:* As one factor to help reduce the obesogenic environment, the supply balance needs to be shifted in favour of 'healthier' snack foods and beverages, e.g. by reformulation of many products by the food industry and their presentation in smaller, standardised portion-size packaging.

**Keywords**  
Nutrition  
Food  
Beverages  
Snack  
Nutrition assessment  
Labelling

Obesity is a growing epidemic worldwide<sup>(1)</sup>. In Australia, half of men and nearly one-third of adult women are now overweight<sup>(2)</sup>, as are about 20% of children and adolescents<sup>(3)</sup> and up to 15% of pre-school children<sup>(4)</sup>. The high prevalence of obesity brings considerable risk of chronic disease<sup>(1)</sup>, imposes a considerable economic cost<sup>(5)</sup> and presents a growing imperative to modify the predominantly obesogenic environment<sup>(6,7)</sup>. Adding to the effects of sedentary lifestyles<sup>(8)</sup>, many factors promote excessive food consumption<sup>(9)</sup>. These include aggressive food advertising, the ready availability and low price of energy-dense foods presented in large portion sizes, and the trend to consume more and more convenience foods away from home<sup>(10,11)</sup>. In Australia, expert opinion has identified the growing consumption of convenience foods as an important factor in the increase of obesity<sup>(7)</sup>. Moreover, convenience foods can erode an individual's control of his/her own diet, since it is the manufacturer who determines nutrient content and portion size<sup>(7)</sup>. Apart from take-away restaurant foods, snacks form one important category of convenience foods.

The term 'snack' is used in the present paper to refer to foods and drinks that can easily be consumed outside the

context of the three main meals: breakfast, lunch and dinner<sup>(12,13)</sup>. Snack foods therefore are readily portable. Although nutrient content may be quite variable, snacks are often pleurably savoury or sweet<sup>(14)</sup> and some may be of high energy density<sup>(13)</sup>. Calorific beverages are often consumed with a food snack, providing considerable additional energy intake<sup>(15)</sup>. In contrast to meals, which are generally taken in the company of others, snacking can be a solitary activity<sup>(13)</sup>. Snack consumption in Australia is high<sup>(16)</sup>, as it is in the USA and other Western countries<sup>(17,18)</sup>, and may average nine snacks per week among adults<sup>(19)</sup>. Australian children also regularly consume snacks. A cross-sectional survey of school foods eaten by 5–12-year-old children in one region of Australia found that over 90% had energy-dense, micronutrient-poor snacks in their lunchbox<sup>(20)</sup>. Recommendations to reduce the intake of snack foods therefore form part of current weight management strategies directed at Australian children<sup>(21)</sup>. Australians also have a high consumption of soft drinks<sup>(22)</sup> and in children this has been linked to obesity in later adolescence<sup>(23,24)</sup>.

The present study sought to quantify the availability, nutrient profile and cost of snack foods and beverages

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offered for sale in an Australian metropolitan setting, using data from the Nutrition Information Panel (NIP) displayed on all food and beverage packaging<sup>(25)</sup>. Consumers may not consult food labels<sup>(26)</sup> or may have difficulty comparing the NIP on different foods to select healthy choices<sup>(27)</sup>. In addition, we argue here that the profusion of choice available makes finding 'healthy' snacks or drinks very difficult for the consumer. We have analysed this variety in order to determine the proportion of snacks and beverages that can be deemed 'healthy' using different nutrient profile models<sup>(28)</sup>, including the current New South Wales (NSW) Department of Health and UK 'traffic light' criteria<sup>(29,30)</sup>. We also provide data on variation in recommended serving size and nutrient content.

## Methods

### Data collection

In Australia, two supermarket chains currently control 80% of food sales. Surveys were undertaken to record information on the packaging of all snack foods and drinks presented for sale in a single large supermarket from one of these chains in metropolitan Melbourne. Data were collected as described previously<sup>(31)</sup>. A survey of all snacks (and fresh fruit) was conducted in September 2004 while information on beverages was collected in December 2006.

For this study, snacks were selected as non-perishable packaged foods that could be readily consumed outside a regular mealtime<sup>(12)</sup>. Foods that required utensils to eat (e.g. yoghurt) were excluded. Snacks were assessed in sixteen categories. *Cakes & pies* included jam tarts, fruit pies, sponges and fruit cakes. *Biscuits (cookies)* were: (1) *plain sweet* – without fillings, icing or topping; (2) *rich sweet* – high in fat with nuts, dried fruit or chocolate chips and with fillings, topping or icing; or (3) *chocolate* – chocolate-coated. *Rich breads* were muffins, iced buns, doughnuts, scones and croissants. *Muesli bars* were toasted grain bars ('health' or 'snack' bars). 'Breakfast bars' as replacement meals rather than snacks<sup>(31)</sup> were excluded. *Fruit slices* and *cereal slices* had a cake base and a fruit/cereal filling. *Chips & twisties* included chips/crisps and extruded twists or rings. *Pretzels* and *popcorn* included salted/sweetened varieties. *Low-fat crackers* and *savoury biscuits* contained <5 g fat/100 g and >5 g fat/100 g, respectively. *Dips & snacks* were crackers packaged with a dip/spread. *Fruit snacks* were bars of dried fruit and/or sweetened fruit pulp. *Dried fruit* included banana chips and coated dried fruit clusters. *Nut mixtures* included seeds, coated nuts, and nut mixtures containing some dried fruit.

Beverages were grouped according to a proposed US beverage guidance system<sup>(15)</sup>. Seven types of drink were identified within Level 6 (calorically sweetened

beverages), the least recommended category. The first of these, *carbonated drinks*, included 'soft drinks' (sugar-sweetened beverages) as well as 'mixer drinks' or 'soft drinks' designed to be added to alcohol. *Electrolyte drinks* and *formulated caffeinated drinks* were drinks conforming to Standards 2.6.2 and 2.6.4, respectively, of the Australian and New Zealand Food Standards Code (ANZFS)C<sup>(32)</sup>. *Iced teas* were drinks based on tea extract, flavoured with fruit juice. *Cordials* were sweet liquid or powdered concentrates to be made up with water. *Fruit drinks* (ANZFS)C Standard 2.6.2<sup>(32)</sup> contained  $\geq 50$  ml fruit juice/l while *flavoured mineral waters* were still or carbonated water flavoured with <50 ml fruit juice/l. Level 5 beverages were caloric beverages containing some nutrients<sup>(15)</sup>. *Fruit juices* could also contain a little vegetable juice and included carbonated varieties and non-alcoholic wines (grape juice). *Vegetable juices* were made solely from vegetables and included tomato juice. *Full-cream milks* came either from animal sources (ANZFS)C Standard 2.5.1<sup>(32)</sup> or from soy, rice or oats. *Flavoured milks* included all milk-based drinks with added sugars and flavours, while *enriched milks* were food supplements enriched with vitamins and minerals (ANZFS)C Standard 2.9.3<sup>(32)</sup>. *Powders for milk* and *powders for water* were designed to be added to milk or water, respectively, the latter similar in taste and texture to a milk-based drink. Level 4 beverages were all non-caloric drinks<sup>(15)</sup>, including all artificially sweetened carbonated beverages and liquid or powdered cordial concentrates as well as a few diet varieties of formulated caffeinated drinks, electrolyte drinks or fruit drinks. Level 3 beverages consisted of low-fat milks<sup>(15)</sup> from animal sources (ANZFS)C Standard 2.5.1<sup>(32)</sup> or other reduced-fat milks of plant origin. Level 2 beverages (tea and coffee)<sup>(15)</sup> were excluded. Level 1 beverages<sup>(15)</sup> were *plain waters* in still or carbonated form.

Data taken from the product label and the NIP were recorded on standardised entry sheets as described elsewhere<sup>(31)</sup>. Nutrient content for powdered or concentrated products was based on the final drink made up according to the manufacturer's instructions. Data for *powders for milk* have been based on drinks made up with reduced-fat cow's milk. Where the same beverage was present in many bottle sizes, nutrient and cost information were taken from the bottle at or nearest in size to one litre.

### Data analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS for Windows) statistical software package version 14.0.1 (SPSS Inc., Chicago, IL, USA). Items in each food/beverage category were assessed as the sum of products and product varieties (flavour alternatives for a given product). For beverages, bottles or packs of different sizes were also counted. Due to non-symmetrical distribution of data, aggregates are presented as the median and interquartile range.

**Table 1** Quantity, variety and serving size of snack foods and drinks available for sale at a Melbourne supermarket. Serving size for fresh fruit is also given. Total number represents the number of products plus product varieties

| Snacks           | Total number | Percentage with varieties* | Serving size (g)† | Beverages (level)‡         | Total number | Percentage with varieties* | Percentage in multiple sizes* | Serving size (ml)† |
|------------------|--------------|----------------------------|-------------------|----------------------------|--------------|----------------------------|-------------------------------|--------------------|
| Cakes & pies     | 83           | 23 (4)                     | 44 (15)           | Calorically sweetened (6)  |              |                            |                               |                    |
| Sweet biscuits   |              |                            |                   | Carbonated/flavoured       | 106          | 13 (5)                     | 31 (10)                       | 250 (0)            |
| Plain sweet      | 69           | 17 (13)                    | 18 (23)           | Electrolyte                | 26           | 27 (8)                     | 19 (3)                        | 250 (50)           |
| Rich sweet       | 155          | 19 (7)                     | 23 (23)           | Formulated caffeinated     | 9            | 55 (3)                     | 77 (4)                        | 250 (73)           |
| Chocolate        | 22           | 14 (13)                    | 35 (6)            | Iced teas                  | 11           | 64 (4)                     | 36 (3)                        | 275 (95)           |
| Rich breads      | 29           | 24 (11)                    | 100 (70)          | Cordials                   | 69           | 29 (10)                    | 33 (3)                        | 250 (50)           |
| Muesli bars      | 93           | 27 (8)                     | 34 (14)           | Fruit drinks               | 73           | 22 (6)                     | 26 (4)                        | 250 (50)           |
| Fruit slices     | 55           | 29 (6)                     | 38 (5)            | Flavoured mineral waters   | 20           | 30 (5)                     | 15 (2)                        | 250 (38)           |
| Cereal slices    | 28           | 25 (6)                     | 45 (41)           | Caloric with nutrients (5) |              |                            |                               |                    |
| Chips & twisties | 147          | 22 (9)                     | 50 (5)            | Fruit juices               | 217          | 20 (8)                     | 33 (5)                        | 200 (50)           |
| Pretzels         | 9            | 22 (3)                     | 50 (0)            | Vegetable juices           | 9            | 11 (3)                     | 33 (3)                        | 225 (50)           |
| Popcorn          | 15           | 40 (3)                     | 80 (70)           | Full-fat plain milks       | 22           | 16 (2)                     | 41 (6)                        | 250 (0)            |
| Low-fat crackers | 90           | 21 (10)                    | 25 (18)           | Flavoured milks            | 42           | 26 (6)                     | 24 (7)                        | 250 (0)            |
| Savoury biscuits | 120          | 49 (10)                    | 35 (16)           | Enriched milks             | 13           | 31 (5)                     | 31 (3)                        | 250 (0)            |
| Dips & snacks    | 25           | 28 (4)                     | 26 (17)           | Powders for milk           | 36           | 25 (5)                     | 28 (5)                        | 219 (16)           |
| Fruit snacks     | 69           | 26 (6)                     | 20 (10)           | Powders for water          | 63           | 29 (8)                     | 8 (2)                         | 188 (29)           |
| Dried fruit      | 20           | 10 (3)                     | 40 (30)           | Non-caloric (4)            |              |                            |                               |                    |
| Nut mixtures     | 41           | 10 (3)                     | 40 (15)           | Diet beverages§            | 75           | 19 (7)                     | 35 (10)                       | 250 (550)          |
| Fresh fruit      |              |                            | 142 (68)          | Milks (3)                  |              |                            |                               |                    |
|                  |              |                            |                   | Reduced-fat                | 32           | 0 (1)                      | 37 (5)                        | 250 (0)            |
|                  |              |                            |                   | Waters (1)                 |              |                            |                               |                    |
|                  |              |                            |                   | Still/carbonated           | 40           | 3 (3)                      | 50 (8)                        | 250 (0)            |

\*Maximum number per product given in parentheses.

†Median values are given with the interquartile range in parentheses.

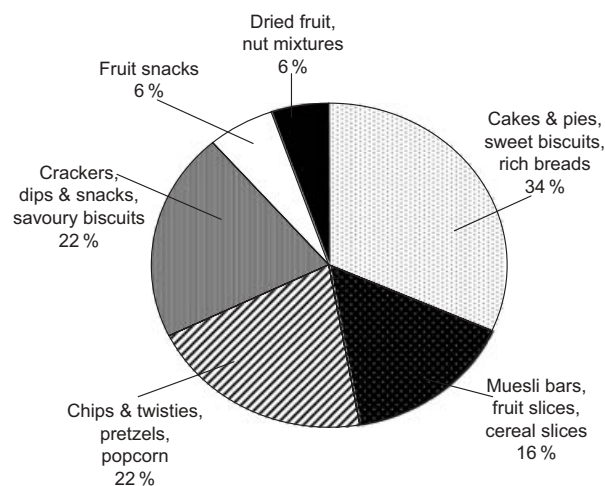
‡Based on the US beverage guidance system<sup>(15)</sup>.

§Includes low-calorie cordials (*n* 26), carbonated drinks (*n* 41), formulated caffeinated drinks (*n* 3), fruit drinks (*n* 3), one iced tea, one electrolyte drink.

To determine the proportion of snacks that could be designated as 'healthy', snacks were assessed according to criteria developed by the NSW Department of Health and Department of Education and Training for school canteens<sup>(29)</sup>; and by criteria developed for an Australian food company<sup>(19)</sup>. In addition, snacks were also assessed by the UK signpost criteria<sup>(30)</sup> defining the green/amber (low/medium) or amber/red (medium/high) boundaries. Beverages were assessed by the NSW canteen criteria<sup>(29)</sup> (energy  $\leq 300$  kJ/serving, sodium  $\leq 100$  mg/serving). As data were taken only from beverage packs of approximately one litre capacity, these criteria were applied to the recommended serving sizing rather than to the packet as sold. Beverages were also assessed by the UK signpost criteria<sup>(30)</sup>.

## Results

One thousand and seventy different snacks were available for selection in this one supermarket location (Table 1). *Cakes & pies*, *sweet biscuits* and *rich breads* made up the greatest proportion of these snack items (Fig. 1). Overall 25% of snacks came in multiple flavour varieties (maximum of thirteen varieties per product) (Table 1). Flavour variety was greatest for *savoury biscuits* (49% with varieties) and least evident for *dried fruit* or *nut mixtures* (only 10% had varieties). In all snacks, there was a marked lack of uniformity in recommended serving sizes. These ranged from a median of 18 g (for *plain sweet*



**Fig. 1** Proportion of snack food items in different categories found at a metropolitan supermarket in Australia

*biscuits*) to 100 g (*sweet breads*). A median serving of *fresh fruit* (142 g) was appreciably larger than any serving recommended for snack foods.

A consumer also had the choice of 863 different drinks (Table 1), only 14% of which were non-caloric (Level 1 or 4) and only 4% of which were nutritious (Level 3) (Fig. 2). Beverages came in up to ten flavour varieties, with the most variety evident in the *enriched milks* and *flavoured waters*. Drink variety was also greatly expanded by the presence of multiple bottle or pack sizes. Overall, 28% of drinks came in more than one size, with up to ten

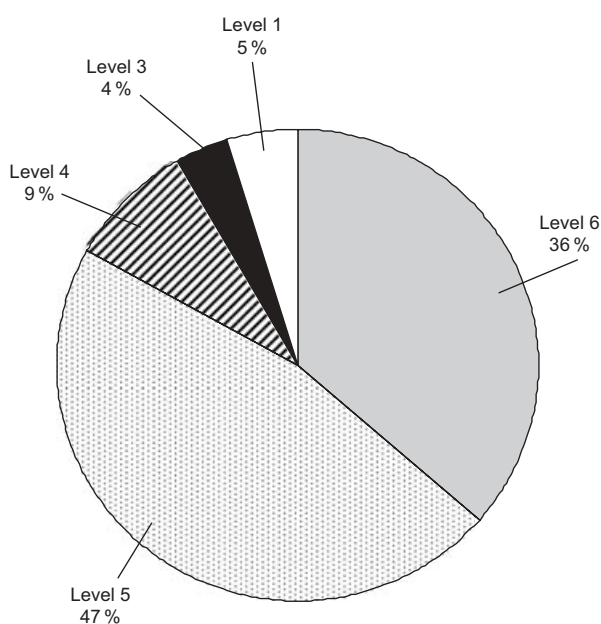
different sizes present for a given item. Despite the variety of bottle or pack size, the recommended serving size given for most drinks was 250 ml. The smallest median serving size was for *powdered drinks* designed to be made up with water (188 ml) while the largest was for *iced tea* (275 ml).

For snack foods, the highest median energy content per serving was found in *popcorn*, *rich breads* and *chips & twisties* (Table 2). *Chips & twisties* also had the highest median content per serving of total and saturated fat. *Pretzels* and *dips & snacks* had the highest median content of sodium. For beverages, the *flavoured milks* and *enriched milks* had the highest median energy

content per serving (Table 3). *Enriched milks* also had the highest median content per serving of protein and total carbohydrate. The *formulated caffeinated drinks* had the highest median content of sugars and sodium.

Snack foods were assessed to determine how many were compliant with criteria developed by the NSW State Government for school canteens<sup>(29)</sup> (Table 4). Many snacks complied with at least one criterion, but overall only 22% were compliant with all three criteria for a 'nutritious' snack (i.e. low energy, low saturated fat and low sodium). *Fruit snacks* showed the highest percentage overall compliance (67%). When a criterion for dietary fibre content (>0.3 g/100 kJ) was applied to snacks where information was available on the NIP (only 540 of 1070 items), the proportion of snacks deemed 'nutritious' by all four criteria fell to only 9%. Application of a different nutrient profile developed for a food manufacturer<sup>(19)</sup> (energy <600 kJ/serving, saturated fat <2 g/serving, sodium <300 mg/100 g) gave similar results to the analysis in relation to NSW canteen criteria, in that overall only 20% of snack foods were compliant for all three criteria for a 'nutritious' snack (data not shown).

Both the NSW school canteen criteria and the manufacturer's criteria assess foods on a nutrient per serving basis. Yet there are very large variations in serving size between snacks that may affect results (Table 1). Snacks were therefore also assessed by the UK signpost criteria<sup>(30)</sup> comparing nutrients in a constant weight of food (Table 4). Overall, by this assessment only 1% of snacks met all four 'green' criteria (fat ≤3 g/100 g, saturated fat ≤1.5 g/100 g, total sugars ≤5 g/100 g and salt ≤0.3 g/100 g) while only 9% avoided qualifying for any 'red' signs. Some foods that met all three NSW canteen criteria still attracted 'red' labels by UK signpost criteria; e.g. *biscuits*, *rich breads*, *muesli bars* and *fruit slices*. Conversely, more *pretzels*, *popcorn*, *low-fat crackers*



**Fig. 2** Proportion of beverages in different nutritional categories<sup>(15)</sup> found at a metropolitan supermarket in Australia

**Table 2** The macronutrient content of snacks found in an Australian supermarket. Values are given as median (interquartile range)

| Snacks           | Energy (kJ/serving) | Protein (g/serving) | Total fat (g/serving) | Saturated fat (g/serving) | Carbohydrate (g/serving) | Sodium (mg/100 g) |
|------------------|---------------------|---------------------|-----------------------|---------------------------|--------------------------|-------------------|
| Cakes & pies     | 657 (282)           | 2.0 (1.1)           | 6.2 (4.5)             | 2.3 (1.8)                 | 24.1 (10.8)              | 350 (157)         |
| Sweet biscuits   |                     |                     |                       |                           |                          |                   |
| Plain sweet      | 336 (413)           | 1.2 (1.4)           | 3.2 (3.5)             | 1.5 (1.3)                 | 13.2 (14.5)              | 283 (226)         |
| Rich sweet       | 452 (461)           | 1.2 (1.2)           | 4.4 (5.2)             | 2.3 (2.7)                 | 14.1 (14.9)              | 264 (172)         |
| Chocolate        | 731 (123)           | 2.1 (0.6)           | 8.5 (3.9)             | 4.2 (1.6)                 | 21.0 (6.0)               | 210 (205)         |
| Rich breads      | 1452 (1147)         | 5.0 (4.6)           | 10.2 (14.9)           | 3.0 (5.1)                 | 49.3 (31.2)              | 338 (111)         |
| Muesli bars      | 637 (285)           | 2.4 (1.9)           | 5.1 (6.1)             | 2.1 (2.5)                 | 21.5 (4.4)               | 100 (155)         |
| Fruit slices     | 547 (86)            | 1.8 (0.5)           | 1.4 (2.3)             | 0.5 (1.2)                 | 26.4 (3.4)               | 158 (89)          |
| Cereal slices    | 702 (997)           | 2.1 (1.8)           | 4.4 (16.4)            | 1.2 (7.0)                 | 29.4 (17.0)              | 183 (211)         |
| Chips & twisties | 1044 (117)          | 4.4 (0.9)           | 14.2 (4.0)            | 6.4 (5.6)                 | 25.6 (6.3)               | 652 (443)         |
| Pretzels         | 811 (101)           | 5.0 (2.0)           | 1.6 (2.9)             | 0.3 (0.4)                 | 38.0 (3.0)               | 1200 (590)        |
| Popcorn          | 1635 (1328)         | 4.3 (6.3)           | 9.4 (20.0)            | 3.2 (7.6)                 | 35.6 (30.9)              | 780 (967)         |
| Low-fat crackers | 397 (315)           | 2.0 (1.7)           | 0.5 (0.6)             | 0.1 (0)                   | 19.8 (15.8)              | 395 (412)         |
| Savoury biscuits | 576 (361)           | 3.0 (1.8)           | 3.9 (3.4)             | 1.1 (2.2)                 | 18.9 (11.4)              | 778 (468)         |
| Dips & snacks    | 495 (314)           | 3.0 (2.7)           | 6.8 (5.1)             | 3.5 (2.7)                 | 9.2 (7.0)                | 906 (441)         |
| Fruit snacks     | 314 (239)           | 0.4 (0.7)           | 0.8 (0.8)             | 0.5 (0.7)                 | 15.6 (4.3)               | 110 (127)         |
| Dried fruit      | 487 (441)           | 0.8 (1.1)           | 0.3 (5.4)             | 0.1 (5.0)                 | 24.2 (17.4)              | 37 (81)           |
| Nut mixtures     | 820 (450)           | 5.0 (3.0)           | 13.9 (11.6)           | 1.5 (2.3)                 | 3.6 (15.6)               | 11 (55)           |
| TOTAL            | 596 (435)           | 2.1 (2.2)           | 4.7 (7.8)             | 1.7 (3.1)                 | 21.0 (13.7)              | 320 (423)         |

**Table 3** The macronutrient content of beverages offered for sale in an Australian supermarket. Values are given as median (interquartile range)

| Beverages (level)*         | Energy (kJ/serving) | Protein (g/serving) | Carbohydrate (g/serving) | Total sugars (g/serving) | Total fat (g/serving) | Sodium (mg/100 g) |
|----------------------------|---------------------|---------------------|--------------------------|--------------------------|-----------------------|-------------------|
| Calorically sweetened (6)  |                     |                     |                          |                          |                       |                   |
| Carbonated/flavoured       | 394 (127)           | 0 (0)               | 23.0 (7.1)               | 22.8 (8.0)               | 0 (0)                 | 18 (10)           |
| Electrolyte                | 270 (13)            | 0 (0)               | 15.0 (0.2)               | 15.0 (0.8)               | 0 (0)                 | 58 (62)           |
| Formulated caffeinated     | 480 (106)           | 0.1 (0.6)           | 28.3 (5.8)               | 28.0 (3.8)               | 0.1 (0.6)             | 165 (237)         |
| Iced teas                  | 465 (183)           | 0.1 (0.1)           | 27.3 (16.2)              | 27.3 (10.7)              | 0.0 (0.1)             | 17 (12)           |
| Cordials                   | 350 (52)            | 0.0 (1.0)           | 20.5 (3.5)               | 20.1 (3.4)               | 0.0 (1.0)             | 10 (5)            |
| Fruit drinks               | 467 (164)           | 1.0 (1.1)           | 27.6 (9.9)               | 27.5 (9.1)               | 0.2 (1.0)             | 13 (17)           |
| Flavoured mineral waters   | 113 (150)           | 0.0 (0.8)           | 6.3 (7.3)                | 6.3 (7.4)                | 0.0 (0.8)             | 10 (8)            |
| Caloric with nutrients (5) |                     |                     |                          |                          |                       |                   |
| Fruit juices               | 396 (90)            | 1.0 (0.0)           | 22.0 (6.1)               | 21.0 (5.9)               | 1.0 (1.0)             | 12 (9)            |
| Vegetable juices           | 190 (44)            | 2.0 (1.5)           | 0.25 (0.8)               | 8.7 (2.9)                | 0.3 (0.8)             | 350 (269)         |
| Full-fat plain milks       | 664 (26)            | 8.0 (0.3)           | 12.0 (1.0)               | 12.0 (1.0)               | 8.5 (0.9)             | 118 (45)          |
| Flavoured milks            | 705 (323)           | 8.0 (1.8)           | 22.0 (9.3)               | 22.0 (10.8)              | 4.5 (3.9)             | 133 (60)          |
| Enriched milks             | 850 (277)           | 12.5 (11.0)         | 31.0 (14.5)              | 18.5 (5.9)               | 3.8 (1.4)             | 188 (118)         |
| Powders for milk           | 642 (182)           | 7.9 (1.6)           | 23.0 (6.8)               | 19.7 (4.9)               | 3.3 (0.8)             | 127 (28)          |
| Powders for water          | 252 (132)           | 1.8 (1.4)           | 10.0 (4.1)               | 7.8 (5.8)                | 1.6 (1.8)             | 69 (82)           |
| Non-caloric (4)            |                     |                     |                          |                          |                       |                   |
| Diet beverages             | 18 (24)             | 0.0 (0.1)           | 0.8 (1.3)                | 0.5 (1.8)                | 0 (0)                 | 20 (15)           |
| Milks (3)                  |                     |                     |                          |                          |                       |                   |
| Reduced-fat                | 459 (152)           | 8.5 (1.5)           | 13.0 (2.1)               | 13.0 (2.1)               | 2.2 (3.0)             | 129 (42)          |
| Waters (1)                 |                     |                     |                          |                          |                       |                   |
| Still/carbonated           | 0 (0)               | 0 (0)               | 0 (0)                    | 0 (0)                    | 0 (0)                 | 0 (6)             |

\*Based on the US beverage guidance system<sup>(15)</sup>.

**Table 4** Percentage of snack foods complying with New South Wales (NSW) canteen criteria<sup>(29)</sup> or with the green/amber boundary in UK nutritional signpost labelling<sup>(30)</sup>

| Category         | Percentage of foods in each category compliant with criteria |                            |                      |                |   |                                   |                          |                          |                      |
|------------------|--|----------------------------|----------------------|----------------|---|-----------------------------------|--------------------------|--------------------------|----------------------|
|                  | NSW canteen criteria   |                            |                      |                | Criteria on the UK nutritional signpost labelling |                                   |                          |                          |                      |
|                  | Energy <600 kJ/serving (<900 kJ/serving)                     | Saturated fat <3 g/serving | Sodium <200 mg/100 g | All 3 criteria | Total fat Green: ≤3 g/100 g                       | Saturated fat Green: ≤1.5 g/100 g | Sugars Green: ≤5 g/100 g | Salt Green: ≤0.3 g/100 g | All green† (no red)‡ |
| Cakes & pies*    | 84   | 59                         | 16                   | 5              | 6   | 10                                | 1                        | 41                       | 1 (1)                |
| Biscuits         |  |                            |                      |                |   |                                   |                          |                          |                      |
| Plain sweet      | 59   | 83                         | 33                   | 20             | 3   | 4                                 | 0                        | 19                       | 0 (0)                |
| Rich sweet       | 38   | 61                         | 27                   | 17             | 0   | 6                                 | 0                        | 11                       | 0 (0)                |
| Chocolate        | 27   | 81                         | 48                   | 10             | 0   | 0                                 | 0                        | 18                       | 0 (0)                |
| Rich breads*     | 31   | 48                         | 7                    | 3              | 7   | 13                                | 3                        | 0                        | 0 (0)                |
| Muesli bars      | 43   | 66                         | 74                   | 23             | 4   | 7                                 | 0                        | 56                       | 0 (1)                |
| Fruit slices*    | 91   | 71                         | 67                   | 46             | 48  | 50                                | 0                        | 15                       | 0 (0)                |
| Cereal slices*   | 68   | 68                         | 61                   | 36             | 21  | 32                                | 0                        | 18                       | 0 (0)                |
| Chips & twisties | 15   | 30                         | 9                    | 0              | 1   | 1                                 | 91                       | 7                        | 1 (1)                |
| Pretzels         | 0  | 100                        | 0                    | 0              | 9   | 89                                | 89                       | 0                        | 0 (11)               |
| Popcorn          | 0  | 47                         | 13                   | 0              | 15  | 13                                | 80                       | 7                        | 0 (13)               |
| Low-fat crackers | 89   | 100                        | 17                   | 17             | 69  | 90                                | 88                       | 7                        | 6 (67)               |
| Savoury biscuits | 51   | 81                         | 1                    | 0              | 0   | 27                                | 74                       | 0                        | 0 (18)               |
| Dips & snacks    | 64   | 40                         | 8                    | 4              | 4   | 4                                 | 64                       | 4                        | 0 (4)                |
| Fruit snacks     | 90   | 91                         | 77                   | 67             | 22  | 41                                | 1                        | 57                       | 0 (1)                |
| Dried fruit      | 55   | 65                         | 95                   | 40             | 65  | 60                                | 0                        | 80                       | 0 (0)                |
| Nut mixtures     | 22   | 71                         | 85                   | 22             | 48  | 10                                | 54                       | 80                       | 0 (2)                |
| TOTAL            | 53   | 67                         | 33                   | 22             | 14  | 22                                | 34                       | 20                       | 1 (9)                |

\*Energy criterion used for this group was <900 kJ/serving.

†All green: complying with the criteria given in columns to the left.

‡No red: compliant with four out of four criteria – total fat ≤20 g/100 g, saturated fat ≤5 g/100 g, sugars ≤15 g/100 g and salt <1.5 g/100 g.

and *savoury biscuits* satisfied UK signpost criteria than multiple NSW canteen criteria.

When beverages were assessed by NSW canteen criteria (energy ≤300 kJ/serving, sodium ≤100 mg/serving),

27% met both criteria. Our analysis, however, was based on recommended serving size whereas this nutrient profile was really designed to apply to the whole carton or bottle as sold in canteens, and not applicable in our

**Table 5** Proportion of beverages in different categories complying with the nutritional criteria applying to drinks in the UK signposting recommendations<sup>(30)</sup>

| Category                          | Percentage compliant with recommendation |                 |                         |                    |                  |                  |                  |                   | Meeting all criteria for green |
|-----------------------------------|--|-----------------|-------------------------|--------------------|------------------|------------------|------------------|-------------------|--------------------------------|
|                                   | Total fat per 100 g                      |                 | Saturated fat per 100 g |                    | Sugars per 100 g |                  | Sodium per 100 g |                   |                                |
|                                   | Green: <1.5 g                            | Amber: 1.5–10 g | Green: <0.75 g          | Amber: <0.75–2.5 g | Green: <2.5 g    | Amber: 2.5–7.5 g | Green: <118 mg   | Amber: 118–590 mg |                                |
| <b>Calorically sweetened (6)</b>  |  |                 |                         |                    |                  |                  |                  |                   |                                |
| Carbonated/flavoured              | 100                                      | 0               | 100                     | 0                  | 0                | 13               | 100              | 0                 | 0                              |
| Electrolyte                       | 100                                      | 0               | 100                     | 0                  | 0                | 69               | 100              | 0                 | 0                              |
| Formulated caffeinated            | 100                                      | 0               | 78                      | 22                 | 0                | 0                | 0                | 100               | 0                              |
| Iced teas                         | 100                                      | 0               | 100                     | 0                  | 0                | 55               | 100              | 0                 | 0                              |
| Cordials                          | 100                                      | 0               | 84                      | 16                 | 0                | 10               | 100              | 0                 | 0                              |
| Fruit drinks                      | 100                                      | 0               | 100                     | 0                  | 0                | 0                | 100              | 0                 | 0                              |
| Flavoured mineral waters          | 100                                      | 0               | 100                     | 0                  | 20               | 80               | 100              | 0                 | 20                             |
| <b>Caloric with nutrients (5)</b> |  |                 |                         |                    |                  |                  |                  |                   |                                |
| Fruit juices                      | 100                                      | 0               | 96                      | 4                  | 0                | 4                | 100              | 0                 | 0                              |
| Vegetable juices                  | 56                                       | 44              | 100                     | 0                  | 33               | 67               | 11               | 89                | 11                             |
| Full-fat plain milks              | 0  | 100             | 0                       | 77                 | 0                | 100              | 100              | 0                 | 0                              |
| Flavoured milks                   | 17                                       | 83              | 33                      | 67                 | 0                | 29               | 0                | 0                 | 0                              |
| Enriched milks                    | 15                                       | 85              | 69                      | 31                 | 0                | 85               | 100              | 0                 | 0                              |
| Powders for milk                  | 28                                       | 72              | 0                       | 100                | 0                | 19               | 97               | 3                 | 0                              |
| Powders for water                 | 71                                       | 29              | 49                      | 51                 | 29               | 64               | 100              | 0                 | 24                             |
| <b>Non-caloric (4)</b>            |  |                 |                         |                    |                  |                  |                  |                   |                                |
| Diet beverages                    | 100                                      | 0               | 81                      | 19                 | 93               | 7                | 99               | 1                 | 75                             |
| <b>Milks (3)</b>                  |  |                 |                         |                    |                  |                  |                  |                   |                                |
| Reduced-fat                       | 84                                       | 16              | 50                      | 50                 | 0                | 100              | 28               | 72                | 0                              |
| <b>Waters (1)</b>                 |  |                 |                         |                    |                  |                  |                  |                   |                                |
| Still/carbonated                  | 100                                      | 0               | 100                     | 0                  | 100              | 0                | 100              | 0                 | 100                            |
| <b>TOTAL</b>                      | <b>86</b>                                | <b>14</b>       | <b>80</b>               | <b>20</b>          | <b>16</b>        | <b>24</b>        | <b>90</b>        | <b>5</b>          | <b>14</b>                      |

study. Beverages therefore were also assessed by the more detailed UK signpost criteria<sup>(30)</sup> that are applied on a per 100 g basis (Table 5). In this analysis, overall, only 1% of Level 6 beverages and 4% of Level 5 beverages met all four 'low' criteria.

## Discussion

The present study indicates that an Australian consumer, entering a large metropolitan supermarket to select a snack or beverage, is overwhelmed by food choice (Table 1). While our study examines only one store, there is considerable uniformity between stores in Australia due to the dominance of only two supermarket chains. Nutrient content (Tables 2 and 3) clearly shows that the product diversity is generally not nutritionally beneficial (capable of enhancing overall diet quality)<sup>(33)</sup> but is mere product diversity aimed at increasing sales<sup>(34)</sup>. 'Line extensions' (new flavours for a well-established product), 'me-too' foods (mirroring rival products) and multiple packaging are strategies employed to stimulate consumer demand<sup>(35)</sup> even though this is driving an obesity epidemic<sup>(18)</sup>. Among overwhelming product diversity how is the consumer to select 'healthy' snacks and drinks?

'Nutrient profiling' or the categorising of foods in terms of nutritional composition<sup>(28)</sup> can aid consumers<sup>(36)</sup> although there is debate about the optimal system<sup>(37)</sup>. In the USA, where food labels report the content of many micronutrients<sup>(38)</sup>, continuous nutrient indices such as the Naturally Nutrient Rich (NNR) score may be used<sup>(39)</sup>. In Australia, this approach is precluded since only

macronutrient and sodium content are mandatory<sup>(25)</sup>. If the NIP carried information on calcium, zinc, iron, magnesium and folate, micronutrients of importance in snacks<sup>(19)</sup>, this would aid consumer choice and allow a continuous nutrient index to be developed for local use.

The 'healthiness' of snack foods and beverages was first assessed against macronutrient-related criteria recently developed in New South Wales as a tool for planning school canteen menus<sup>(29)</sup>. This nutrient profile was consistent with four of five inclusion criteria used in other studies in that it is published, has clear guidelines, includes use of data on more than one nutrient and is based on absolute nutrient values<sup>(37)</sup>. One limitation, however, is that this profile was developed for school-children rather than for adults. Only 22% of snacks and 27% of beverages available on the supermarket shelf fulfilled the multiple criteria of this nutrient profile. Another limitation in applying the NSW canteen guidelines is that these criteria depend on highly variable serving size (Table 1) potentially open to manipulation by manufacturers to improve the appearance of the nutrient profile. The consumer may also consume the whole packet or drink an entire beverage carton or bottle of drink rather than limit their consumption to a single designated serving<sup>(38)</sup>. If serving-based nutrient profiling is employed, there is a strong need for serving sizes to be standardised.

UK signpost criteria<sup>(39)</sup> based on nutrient content per 100 g were also applied to snacks (Table 4), markedly reducing the number of categories high in 'healthy' items. It was also of interest that while many fruit snacks passed

the three NSW canteen criteria, fruit snacks by UK signpost criteria usually bore a 'red' high sugar warning. This indicates the importance of the sugar criterion, since fruit snacks include foods such as 'roll-ups', energy-dense snacks of fruit paste, sugars and maltodextrin, that are arguably not healthy. To avoid excluding whole fruit, however, any sugar criterion applied generally to foods should specify added sugar<sup>(39)</sup> or non-milk extrinsic sugar<sup>(37)</sup>.

The US guidance system for beverages<sup>(15)</sup> proved useful for profiling Australian beverages and served to indicate how caloric Level 5 and 6 beverages dominate supermarket shelves (Table 1, Fig. 2). These drinks are not satiating and may promote excessive energy intake and weight gain<sup>(15)</sup>. The NSW canteen nutrient profiles<sup>(29)</sup> proved less applicable to supermarket beverages than to snacks owing to their reliance on container size as sold. UK signpost recommendations<sup>(30)</sup> avoid this difficulty and when applied indicate that only 14% of beverages are 'healthy' by multiple criteria (Table 5).

There have been recent calls for the adoption of UK 'traffic light' signals on Australian foods<sup>(39)</sup> and the present data (Tables 4 and 5) support the utility of this system. However, while clear front-of-package labelling is important to guide consumer choice, other measures must also be considered to reduce the overwhelming preponderance of nutrient-poor snacks and beverages on supermarket shelves. The Australian food industry can be innovative and there have been initiatives made to reformulate snacks<sup>(40)</sup>. A strong response is now urgently needed to create a diversity of snacks and beverages with reduced energy density, and reduced amounts of fat, salt and added sugar<sup>(18)</sup>, presented to consumers in standardised portion size packs<sup>(11)</sup>.

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