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Short Communication

Investigating nutrient profiling and Health Star Ratings on core dairy products in Australia

Lyndal Wellard*, Clare Hughes and Wendy L Watson
Cancer Programs Division, Cancer Council NSW, 153 Dowling Street, Woolloomooloo, NSW 2011, Australia

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Abstract

Objective: To determine whether the ratings from the Australian front-of-pack labelling scheme, Health Star Rating (HSR), and the ability to carry health claims using the Nutrient Profiling Scoring Criterion (NPSC) for core dairy products promote foods consistent with the Australian Dietary Guidelines.

Design: The Australian nutrient profiling model used for assessing eligibility for health claims was compared with the nutrient profiling model underpinning the HSR system to determine their agreement when assessing dairy products. Agreement between the extent to which products met nutrient profiling criteria and scored three stars or over using the HSR calculator was determined using Cohen's kappa tests.

Setting: The four largest supermarket chains in Sydney, Australia.

Subjects: All available products in the milk, hard cheese, soft cheese and yoghurt categories (*n* 1363) were surveyed in March–May 2014. Nutrition composition and ingredients lists were recorded for each product.

Results: There was 'good' agreement between NPSC and HSR overall ($\kappa = 0{\cdot}78$; 95% CI 0·75, 0·81; $P < 0{\cdot}001$), for hard cheeses ($\kappa = 0{\cdot}72$; 95% CI 0·65, 0·79; $P < 0{\cdot}001$) and yoghurt ($\kappa = 0{\cdot}79$; 95% CI 0·73, 0·86; $P < 0{\cdot}001$). There was 'fair' agreement for milk ($\kappa = 0{\cdot}33$; 95% CI 0·20, 0·45; $P < 0{\cdot}001$) and 'very good' agreement for soft cheese ($\kappa = 0{\cdot}84$; 95% CI 0·75, 0·92; $P < 0{\cdot}001$). Generally, products tended to have HSR consistent with other products of a similar type within their categories.

Conclusions: For dairy products, the HSR scheme largely aligned with the NPSC used for determining eligibility for health claims. Both systems appeared be consistent with the Australian Dietary Guidelines for dairy products, with lower-fat products rating higher.

Keywords
Food labelling
Food regulation
Dairy products
Nutrient profiling

Overweight and obesity rates in Australian adults have increased, from 56% in 1995 to 63% in 2011–12[1]. Food choices influence body weight and are shaped by environmental factors, including physical, social and policy, collectively termed the food environment[2].

One aspect of the food environment that may influence food choice is food labelling. Health claims are marketing tools used by manufacturers on labels to inform consumers of nutrient content or health benefits associated with their products[3]. A 2011 survey found that between 10 and 38% of Australian food categories carried health claims[4]. The last survey of the entire grocery market was in 2006, when 14% of products carried health claims[5]. In Australia, foods carrying health claims must meet the Nutrient Profiling Scoring Criterion (NPSC)[6]. The NPSC was developed by Food Standards Australia New Zealand to ensure that only healthier products carry claims purporting health benefits[6]. The NPSC considers the energy, saturated fat, Na and sugar content, along with fruit, vegetable, nut and legume, protein and fibre content[7]. Foods meeting the NPSC are permitted to carry health claims[6]. There are three food categories under the NPSC with varying nutrient cut-offs: beverages; cheeses with a high Ca content and edible oils; and all other foods[7].

Another Australian food labelling initiative that may influence food choice is the front-of-pack labelling scheme, Health Star Rating (HSR), introduced on a voluntary basis in June 2014[8]. The HSR assigns foods one

*Corresponding author: Email lyndalw@nswcc.org.au

of ten star ratings, ranging from half a star (least healthy) to five stars (most healthy)[9]. The underpinning nutrient criteria are a modified version of the NPSC, designed specifically to assign the appropriate HSR[9]. The NPSC has only two outcomes: whether a product can or cannot carry a health claim[9]. The HSR calculator rates foods on a 10-point scale and was developed to assist consumers to compare foods within a category[9]. In July 2015, there were more than 1000 products with HSR in Australian supermarkets[10].

The food industry, public health and consumer representatives were involved in the development of the HSR system[8]. Technical issues with ratings of core dairy foods (milk, cheese and yoghurt[11]) were addressed early in the HSR system development process[12]. Although the equations underpinning the calculators are similar, modifications were made to the HSR calculator for dairy foods due to their narrow range of HSR scores and the importance of core dairy foods to nutrient intake[9]. Consequently, the HSR calculator has dairy and non-dairy categories, and sub-categories for core dairy, including beverages, cheese and processed cheese, and other core dairy products[9]. Despite this, since the implementation of the HSR system, the Australian dairy industry has raised concerns that the HSR for some products, such as yoghurt and cheese, are low[13]. The Australian Dietary Guidelines recommend that adults consume two-and-a-half to four servings of core dairy foods daily, and to limit foods containing saturated fat, added salt and added sugars[11]. A serving is 250 ml of milk, 40 g of hard cheese, 120 g of ricotta cheese or 200 g of yoghurt[11]. Although the Australian Dietary Guidelines recommend reduced-fat dairy foods, full-fat versions of milk, cheese and yoghurt are still considered core dairy foods[11]. The most recent Australian dietary survey found that between 44 and 94 % of adults consume inadequate levels of Ca[14] and the majority of Ca in the Australian diet comes from dairy[15]. The possibility that the HSR is inadvertently contradicting the dietary guidelines by not promoting core dairy foods is cause for concern and should be thoroughly investigated.

These concerns may have contributed to the low uptake of the HSR by dairy companies. However, there has been no research verifying whether the HSR rates dairy foods in a way that is inconsistent with their role as core foods in the Australian Dietary Guidelines. Therefore, the aim of the present study was to determine whether the methods for calculating the HSR of core dairy products is consistent with the existing measure of healthiness, the NPSC used for assessing eligibility for health claims, and whether the HSR promotes core dairy foods in a manner consistent with the Australian Dietary Guidelines.

Methods

A survey of four core dairy categories – milk, hard cheese, soft cheese and yoghurt – was conducted (Table 1). The survey was conducted in large, Sydney stores of the four biggest Australian supermarket chains, which combined make up 91 % of market share[16], to comprehensively cover these categories. Data were collected between March and July 2014 by photographing labels, ingredients lists and Nutrition Information Panels of all available products. Each product was photographed once, even if available at multiple supermarkets.

Nutrition information (per 100 g) and percentage of fruit, vegetable, nut and legume content for each product was obtained from the Nutrition Information Panels and ingredients lists. These were entered into an Excel spreadsheet and used to calculate the NPSC score and HSR. Manufacturers were contacted to obtain missing information, such as fibre or fruit, vegetable, nut and legume content. When the manufacturer could not provide missing information (n 12, 0·9 % of total), it was estimated using an average of similar products.

The NPSC was determined using the Food Standards Australia New Zealand online calculator[7]. The online HSR calculator (version 3, January 2015)[17] was used to determine the HSR.

All data for 10 % of entries in the spreadsheet were cross-checked by a second researcher against the

Table 1 Explanation of dairy categories included and examples

Category	Included foods	Examples
Milk	Plain white and flavoured; full-fat, reduced/low-fat* and skimmed†, powdered and UHT‡ milk	Full-cream milk, chocolate milk, powdered milk
Hard cheese	Cheeses containing ≥320 mg Ca/100 g[12], including shelf-stable cheese and spreads; full-fat/regular or reduced/low-fat	Cheddar, havarti, edam, children's cheese sticks
Soft cheese	Cheeses containing <320 mg Ca/100 g[12], including shelf-stable cheese and spreads; full-fat/regular or reduced-fat	Brie, camembert, ricotta
Yoghurt	Plain, flavoured and fruit yoghurts; dessert-style yoghurts; yoghurts with added toppings, such as muesli, nuts or caramel; full-fat/regular, reduced-fat or no-fat§	Greek yoghurt, strawberry yoghurt, yoghurt with crumble topping, children's yoghurt

*Reduced-fat contains at least 25 % less than the same quantity of a reference food; low-fat contains no more than 3 g fat/100 g (solid foods) or 1·5 g fat/100 ml liquid foods[6].
†Skimmed milk contains no fat[31].
‡UHT = ultra-high temperature, or shelf-stable milk.
§No-fat = products marketed as containing no fat.

photographs, to ensure accuracy. Only minor errors in transcription of fruit and vegetable content were found and corrected, but these did not influence the NPSC or HSR calculations. Additionally, 10 % of NPSC and HSR calculations were re-calculated by a second researcher to ensure they were correct.

Proportions were calculated for the products in each category that: (i) met the NPSC; (ii) scored 3 stars and above; (iii) met the NPSC but scored 2·5 stars and below; and (iv) did not meet the NPSC but scored 3 stars and above. To compare with the NPSC that has binary outcomes (products either meet or do not meet), the cut-off of 2·5 stars or below was chosen, as this places half of the possible HSR in each group. Consistency of HSR between similar products was investigated.

Statistical analyses were conducted using the statistical software package IBM SPSS Statistics for Windows Version 19. P values of $\leq 0·05$ were considered statistically significant. Cohen's kappa was used to determine agreement between HSR (products that scored 3 stars or more) and NPSC (products that met NPSC). A κ value of less than 0·20 was considered poor; $\kappa = 0·21–0·40$ was considered fair; $\kappa = 0·41–0·60$ was considered moderate; $\kappa = 0·61–0·80$ was considered good; and $\kappa = 0·81–1·00$ was considered very good[18]. Additionally, the percentage agreement between these variables was calculated. Percentage agreement above 80 % was considered acceptable[19,20]. Together, κ and the percentage agreement were taken to determine agreement between the systems.

Results

Sample

Overall, 1363 dairy products were surveyed. This included 205 milks (15 %), 422 hard cheeses (31 %), 331 soft cheeses (24 %) and 405 yoghurts (30 %).

Number of products meeting NPSC and grouped by HSR

The number and proportion of products in each category that met the NPSC and the number and proportion of products in each HSR group are shown in Table 2. Overall, 53 % of products did not meet the NPSC. While most yoghurts and milks met the NPSC, few soft cheeses did. The majority of milks (n 189, 92 %) scored 3 stars and above, while few soft cheeses did (n 56, 17 %).

Types of products and HSR

Products surveyed tended to have HSR similar to comparable products within their categories (e.g. all flavoured milks rated similarly, Table 2). In dairy products, HSR appeared to be most influenced by the saturated fat content due to similar contents of the other nutrients assessed, with reduced- and low-fat products and skimmed milks

Table 2 Number, proportion and examples of products in each category that met the Nutrient Profiling Scoring Criterion (NPSC), by Health Star Rating (HSR), and that scored 3 or more stars

	Met NPSC		HSR, *n* and %*, and examples of products in each HSR group															
			0·5–1			1·5–2			2·5–3			3·5–4			4·5–5			≥3	
Category (*n* in category)	*n*	%	*n*	%	Examples	*n*	%	Examples	*n*	%	Examples	*n*	%	Examples	*n*	%	Examples	*n*	%
Milk (205)	143	70	0	0	No products	3	1	Full-cream flavoured	24	12	Full-cream flavoured	99	48	Full-cream plain, reduced-fat/skimmed flavoured	79	39	Reduced-fat/skimmed plain	189	92
Hard cheese (422)	148	35	23	5	Processed; pecorino; frying (e.g. haloumi); higher-fat and higher-Na cheddar	162	38	Children's processed; processed; higher-fat and higher-Na cheddar; parmesan; colby; havarti	95	23	Cheddar; flavoured cheddar; parmesan; pizza blend; edam; gouda	82	19	Reduced-fat cheddar; reduced-fat processed; fruit and nut cheddar; edam; gouda; Swiss	60	14	Children's cheddar; mozzarella; reduced-fat and lower-Na cheddar; bocconcini; reduced-fat processed	176	42
Soft cheese (331)	44	13	253	76	Camembert; higher-fat and higher-Na feta; cream cheese; blue; brie; goat's cheese; mascarpone	18	5	Cheese spread; higher-fat and higher-Na feta; ricotta; labne	19	6	Cottage; reduced-fat/Na feta; ricotta; camembert/brie with Ca added	15	5	Reduced-fat cream; light cottage; reduced-fat/Na feta; camembert/brie with Ca listed	26	8	Reduced-fat cottage; reduced-fat ricotta; reduced-fat/Na feta with higher Ca	56	17
Yoghurt (405)	301	74	46	11	Higher-fat plain Greek; dessert style (e.g. caramel flavoured); with toppings (e.g. muesli, fruit, crumble)	53	13	Plain Greek; dessert style; with toppings	125	31	Higher-fat plain, fruit and flavoured; kid's yoghurt; Greek flavoured	96	24	Reduced-fat plain, fruit and flavoured; reduced-fat plain and flavoured Greek	85	21	No-fat plain, fruit and flavoured; no-fat plain and flavoured Greek	272	67
TOTAL (1363)	636	47	322	24		236	17		263	19		292	21		250	18		693	51

*Percentages may not add to 100 due to rounding.

scoring more stars than full-fat alternatives. Ca and Na contents of soft cheeses also affected their HSR, with Ca increasing and Na reducing it.

Agreement between NPSC and HSR

There were forty-seven products (3 % of the total) that met NPSC but rated 2·5 stars or below. This included fourteen hard cheeses and one soft cheese that were high in saturated fat and/or Na, and thirty-two yoghurts that were high in saturated fat and/or had added sugars or toppings.

Additionally, 104 products (8 % of the total) did not meet the NPSC yet scored 3 stars or above, including forty-six full-fat milks, forty-two hard cheeses and thirteen soft cheeses with higher Ca and/or lower saturated fat contents, and three drinking yoghurts that were classified as beverages under NPSC. The proportion of products that met the NPSC but rated 2·5 stars or below, the proportion of products that did not meet the NPSC but scored 3 stars and above, and the proportion of products with agreement between the NPSC and HSR can be seen in Table 3.

There was 'good' agreement between the NPSC and HSR overall ($\kappa = 0{\cdot}78$; 95 % CI 0·75, 0·81; $P < 0{\cdot}001$), for hard cheeses ($\kappa = 0{\cdot}72$; 95 % CI 0·65, 0·79; $P < 0{\cdot}001$) and yoghurt ($\kappa = 0{\cdot}79$; 95 % CI 0·73, 0·86; $P < 0{\cdot}001$). For milk there was only 'fair' agreement ($\kappa = 0{\cdot}33$; 95 % CI 0·20, 0·45; $P < 0{\cdot}001$); however, for soft cheese there was 'very good' agreement ($\kappa = 0{\cdot}84$; 95 % CI 0·75, 0·92; $P < 0{\cdot}001$). The percentage agreement between the NPSC and HSR was deemed acceptable overall (89 %), for hard cheeses (87 %), soft cheeses (96 %) and yoghurt (91 %). Milks were lower, with 78 % agreement (Table 3).

Discussion

Our study found that there was generally good agreement between the NPSC and the HSR for dairy products. Only 11 % of the sample either met the NPSC but rated 2·5 or less stars, or did not meet the NPSC and rated 3 or more stars, and these were mostly due to differences in categorisation of products. That is, in NPSC, milk is categorised as a beverage where it is a core dairy beverage in HSR; and cheeses with Ca content of <320 mg/100 g are categorised as a food in the NPSC but a non-core dairy food in HSR. Our study shows there are not widespread discrepancies in the profiling of these food categories. This is not surprising as the HSR algorithm was based on the NPSC.

Flavoured and full-fat milks received more favourable HSR compared with NPSC, which may result in milk products being unable to carry health claims, yet score HSR over 3 stars. As full-fat milks are considered core dairy[11], this is one category where the NPSC may be inconsistent with the Australian Dietary Guidelines. As the NPSC is not linked with a front-of-pack scheme, it is unlikely to be confusing to consumers. It will simply mean that products carry a high HSR but no health claims. However, changing the category that milk occupies in the NPSC from a beverage to a food would increase the agreement of the two systems, allowing health claims on milks as a core dairy food, and therefore should be considered.

Of the products that met the NPSC but scored fewer than 3 stars, most were sugar-sweetened flavoured or dessert-style yoghurts. The lower HSR of these products is consistent with the Australian Dietary Guidelines, which recommends that people consume yoghurts without added sugars[11].

The products that did not meet the NPSC but scored 3 stars or more showed, at times, HSR was more lenient than the NPSC. For example, soft cheeses with Ca content of ≥320 mg/100 g earned more stars than those without a listed Ca content, despite having similar nutrient compositions. The future may see food companies listing Ca content or adding Ca to lower-Ca cheeses to increase the HSR. Similarly, reduced-Na and/or reduced-fat cheeses scored higher in HSR, and this may drive reformulation of hard cheeses in the future[21]. This may be beneficial to consumers, as small improvements in nutrient content can lead to large population benefits[22]. Further monitoring of dairy products will determine whether there are changes in nutrient composition, including reformulation, after the implementation of HSR.

The dairy food industry is advocating for all core dairy products to receive a minimum of thee stars[23]. This

Table 3 Proportion and number of products that met the NPSC but rated 2·5 stars or below, did not meet the NPSC but scored 3 stars and above, and had agreement between the Nutrient Profiling Scoring Criterion (NPSC) and Health Star Rating (HSR)

	Met the NPSC but rated 2·5 stars or below*		Did not meet the NPSC but scored 3 stars and above*		Agreement between the NPSC and HSR*	
Category	%	*n*	%	*n*	%	*n*
Milk (*n* 205)	0	0	22	46	78	159
Hard cheese (*n* 422)	3	14	10	42	87	366
Soft cheese (*n* 331)	0·3	1	4	13	96	317
Yoghurt (*n* 405)	8	32	0·7	3	91	370
TOTAL (*n* 1363)	3	47	8	104	89	1212

*Percentages may not add to 100 due to rounding.

would improve the HSR for nearly half the dairy category, but would impact particularly on yoghurts and cheeses, as their saturated fat contents contribute to a lower HSR. However, the Australian Dietary Guidelines recommend that people should consume mostly reduced-fat milk, yoghurts and cheeses[11]. Therefore from a consumers' point of view, it is appropriate for a spread of HSR to differentiate better dairy choices, and the HSR scheme appears to do this by awarding higher stars to no-fat and reduced-fat options. This may, however, lead to fewer companies that produce full-fat cheeses or higher-fat and/or sugar-added yoghurts placing HSR on their products and consequently reduce consumers' ability to compare products.

Our study found that a higher proportion of products met the NPSC (51 %) compared with a recent study conducted on the entire Australian dairy category (33 %)[24]. The difference is likely due to the fact that the present study includes only core dairy products, while the other included the entire dairy category, with non-core products such as cream being included.

The present study is limited by the quality of the Nutrition Information Panels. It is possible that some cheeses (*n* 227) earned fewer stars as Ca was not listed on the label. A small number of soft cheeses had incomplete information for some nutrients and averages of similar products were used. As neither the HSR nor NPSC for these products varied from that of similar products, the average values used were considered adequate substitutes.

Our study considered only the nutrient profiling systems underpinning food labelling in Australia. However, there is no evidence on whether these influence the purchasing choices of consumers. Therefore more research is required to determine whether health claims or HSR influence food choice.

Nutrient profiling has been shown to be an appropriate tool to identify healthier foods[25] and shape public health nutrition policy in relation to chronic disease[26]. There is debate whether nutrient profiling models should be across-the-board or category specific[27], and as such nutrient profiling has increasingly been the subject of European studies aimed at determining construct validity of various nutrient profiling models by applying them to certain food categories[28–30]. Our study is unique as it compares two nutrient profiling models that are already in use within two countries. Further research could be conducted to compare the Australian/New Zealand nutrient profiling models with international models.

Conclusion

The present study found that for core dairy products, HSR largely aligned with the NPSC. Neither system appeared to unfairly disadvantage most core dairy products, with lower-fat products earning more stars, consistent with the Australian Dietary Guideline to choose reduced-fat dairy options. The study also suggests that dairy products could be reformulated to earn a higher HSR by changing Ca, saturated fat or Na level. Overall, the HSR and NPSC provide good indications of the healthiness of dairy products within categories in Australia and may assist consumers in choosing healthier dairy products consistent with the Australian Dietary Guidelines.

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