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A comparison of the Health Star Rating and nutrient profiles of branded and generic food products in Sydney supermarkets, Australia

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Abstract

Objective: To compare the Health Star Rating (HSR) and the nutritional profile of branded and generic packaged foods in Australia.

Design: In-store audits of packaged food products capturing data on HSR and nutritional content to analyse differences between branded and generic foods across ten food categories.

Setting: The audit was conducted in four major supermarket chains across various locations within metropolitan Sydney regions, Australia.

Results: A total of 6269 products were analysed with 57 % of generic products and 28 % of branded products displaying an HSR. The median HSR of branded products was significantly greater than for generic products overall (4·0 *v.* 3·5, $P < 0{\cdot}005$) and in six out of ten food categories ($P < 0{\cdot}005$). However, when branded products could be matched to their generic counterparts for paired comparisons (*n* 146), no statistical difference was observed in all ten food categories. Branded products that chose to display an HSR had significantly lower saturated fat and Na, but higher fibre contents than branded products not displaying an HSR.

Conclusions: Our data show no difference in the HSR or nutrient profiles of similar branded and generic products that display HSR. Branded products appear to exploit the voluntary nature of the HSR scheme, preferentially displaying an HSR on healthier products compared with their generic counterparts.

Keywords
Front-of-pack label
Health Star Rating
Nutrient profiling
Australia

The Health Star Rating (HSR) system was introduced in Australia and New Zealand in 2014 as a voluntary front-of-pack labelling scheme, endorsed by the Australian government[1–3]. It is derived from a modified version of the Nutrient Profiling Scoring Criterion[1–5] developed by Food Standards Australia New Zealand and features a ten-point star rating increasing in half-star increments, with the healthiest options displaying five stars[1–5]. The HSR was designed to assist consumers to easily compare the healthfulness of similar packaged foods[1–3,6]; however, development of the HSR system has been criticised for a lack of transparency and absence of an evidence base that supports the nutrient criteria cut-off points being predicative of health outcomes[7,8]. Limitations in the algorithms have been raised, as well as misalignment with the Australian Dietary Guidelines[9].

Despite these limitations, the ongoing formal review of the HSR system reported significant uptake by the food industry since 2014 and indications that this initiative has encouraged manufacturers to reformulate food products to obtain a higher HSR[10,11]. The most recent data indicate that uptake has continued to increase, although the specific uptake of branded and generic (private label) products has not been reported[9].

Retailers are continuing to expand their selection of generic products, with some supermarkets aiming for 40 % of their product range to comprise generic products within the next five years[12]. Thus, there is a need to explore the HSR uptake and HSR scores between generic products and branded products. Limited research has investigated use of other front-of-pack labelling schemes with respect to branded and generic products. Studies in the UK, USA and Switzerland all concluded that generic products were nutritionally similar to their branded product counterparts[13–15]. However, only category-level comparisons were made. In Australia, a study found that generic products had lower mean Na content in comparison to their branded product counterparts but did not consider front-of-pack labelling schemes such as the HSR[16].

The aim of the present study was to examine the HSR and nutrient profiles of branded *v.* generic products across

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different food categories, using unpaired and paired comparisons. Due to the voluntary nature of the HSR scheme, branded products with and without an HSR were also compared to assess any nutritional differences.

Methods

Data collection

The nutrient and labelling information from packaged foods was captured from four major supermarkets chains in metropolitan suburbs of Sydney, Australia: Woolworths, Coles, Aldi and IGA (Independent Grocers of Australia), between March and September 2017.

For every product, images were captured of the front- and back-of-pack nutrition information panel, ingredients list, country of origin, barcode and HSR using Lenovo Moto G4 smartphones. The brand, product name, packaging size, HSR and energy and nutrient contents (per 100 g/100 ml) displayed in the nutrition information panel were recorded in an online Excel database. Different package sizes (including multipacks) of the same product were photographed and entered into the database as a separate item but were excluded from analysis if the nutrient profiles were identical.

Food products were categorised based on a modified version of the criteria used by the Food Monitoring Group's Food Categorisation System (see online supplementary material, Supplemental Table 1)[17]. As some categories did not display an HSR for branded products, these were excluded from analysis (Discretionary Beverages and Eggs). The ten major categories were: Bread, Cereal, Convenience Food (Mixed Dishes), Dairy, Discretionary Food, Fish, Fruit and Vegetables, Meat and Alternatives, Snacks and Spreads (Supplemental Table 1). Within these major categories, products were further sorted into sub-categories and then food types (using the AUSNUT (Australian Food and Nutrient Database) codes[18,19]; Supplemental Tables 2 and 3). For example, there were fifteen types of breakfast cereal in the Cereal category, and for each individual type, the number of branded products and generic products were reported and averaged. Only products that had at least one pair of branded and generic comparison were used. Branded products were identified as those not sold exclusively by a specific supermarket and generic products were classified as those sold exclusively in Woolworths, Coles, IGA or Aldi (e.g. Homebrand, $martbuy, Black & Gold and Aldi-exclusive products).

Data analysis

Data cleaning involved removing duplicates and cross-checking outliers against original photographs. For data analysis, values '< 5', '< 1' and '< 0·1' were replaced with '5', '1' and '0·1', respectively.

Statistical analyses were conducted using the statistical software package IBM SPSS Statistics for Windows version 24.0. The Shapiro–Wilks W test indicated data were not normally distributed and therefore non-parametric tests were utilised. The Mann–Whitney U test was used to examine differences in HSR scores and nutrient contents between branded and generic product categories (Table 2), and between branded products with and without an HSR score (Table 4). Paired sample analysis was undertaken to examine differences between the same food types (i.e. comparing apples with apples). For the paired analysis, the Wilcoxon signed-rank test was used to compare HSR scores and nutritional profiles between branded and generic products (Table 3). All statistical analyses were two-tailed with $P < 0{\cdot}005$ denoting statistical significance. Ethics approval was not required for the present study.

Results

A total of 4284 branded and 1985 generic packaged products across the ten food categories were analysed. Overall, 28 % of branded products and 57 % of generic products displayed an HSR (Table 1). Large differences were observed between branded and generic products displaying the HSR in all categories. In particular, within Convenience Food, 34 % of branded products displayed an HSR compared with 81 % of generic products; and similarly, for Spreads (47 % of branded products *v.* 84 % of generic products displayed an HSR).

Table 2 shows the comparison of the median HSR and nutritional profile per 100 g between branded and generic products that display an HSR across the ten food categories (unpaired analysis). The overall median HSR for branded products was significantly greater than for generic products (4·0 *v.* 3·5, $P < 0{\cdot}001$). Six out of the ten food categories showed a significant difference in the median HSR ($P < 0{\cdot}005$), with branded products revealing higher HSR than generic products. Within branded products, the median HSR of food categories ranged from 3·5 to 5·0, whereas the median HSR of generic products ranged from 1·0 to 4·5. The greatest discrepancy in median HSR was observed in Discretionary Food, with branded products scoring a median HSR of 4·0, compared with 1·0 for the generic products ($P < 0{\cdot}001$). Similarly, for Snacks, the branded products had a median HSR of 4·0 while the generic products had a median HSR of 1·5 ($P < 0{\cdot}001$).

The overall nutritional content comparison revealed that branded products contained lower amounts of saturated fat and Na, but higher amounts of protein, fibre and sugar than generic products.

Paired analyses were undertaken using a total of 146 pairs of branded and generic products that displayed an HSR across the ten categories (Table 3). Using this approach, no differences in HSR were observed within

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Table 1 Number of branded and generic products in each food category and the number and percentage of products with a Health Star Rating (HSR) captured from an audit of four major supermarkets chains in metropolitan suburbs of Sydney, Australia, March–September 2017

			Products with HSR	
Category	Product type	Products (*n*)	*n*	%
Bread	Branded	245	57	23
	Generic	96	60	63
Cereal	Branded	375	235	63
	Generic	111	70	63
Convenience Food	Branded	580	196	34
	Generic	374	302	81
Dairy	Branded	594	97	16
	Generic	154	35	23
Discretionary Food	Branded	599	163	27
	Generic	214	99	46
Fish	Branded	314	61	19
	Generic	250	116	46
Fruit and Vegetables	Branded	839	227	27
	Generic	350	190	54
Meat and Alternatives	Branded	304	63	21
	Generic	283	175	62
Snacks	Branded	389	72	18
	Generic	134	63	47
Spreads	Branded	45	21	47
	Generic	19	16	84
Total	Branded	4284	1192	28
	Generic	1985	1126	57

any of the ten categories, although for all categories combined, the HSR was higher for branded products. Overall, branded products with HSR had significantly lower energy, saturated fat and higher fibre content than their generic counterparts.

Lastly, to determine whether branded products selectively displayed an HSR, a comparison of nutrient content was undertaken of branded products with and without utilising the star rating system (Table 4). Overall, branded products with an HSR had significantly lower saturated fat and Na contents and greater fibre content than branded products without an HSR (all $P < 0{\cdot}005$).

Discussion

The present study compared the HSR and nutrient profiles of 6269 branded and generic products across ten food categories and was the first study to complete a paired analysis between specific branded and generic foods. Overall, use of the HSR on products was substantially greater for generic products (57 %) compared with branded products (28 %).

For these products the median HSR was significantly higher for branded compared with generic products, 4·0 *v.* 3·5 respectively. However, no categories showed any statistical differences between HSR or nutritional profile when branded products could be matched to generic counterparts for paired analysis. The conflicting result is likely due to the voluntary use of the HSR on food packaging, which allows food manufacturers to display an HSR only when desirable (higher HSR)[3]. Our data support this notion as branded products without an HSR had significantly higher saturated fat and Na and significantly less fibre, and supports commitments made by major Australian retailers to implement the HSR system across their own-product range[20,21].

As the present study compared branded *v.* generic products with HSR, not entire categories, direct comparisons with similar research cannot be made. Nevertheless, similar to our findings, two studies in Switzerland (2014) and the UK (2016) reported that generic products were nutritionally similar to their branded product counterparts at a group level (no paired analysis was undertaken)[14,15]. While a previous study in Australia (2011 to 2013) found that generic products had lower mean Na content[16], our findings revealed the opposite, with a significantly lower median Na content in branded products that displayed an HSR. The difference is likely due to product reformulation since the HSR system was introduced in 2014. Ni Mhurchu *et al.* compared over 15 000 products within New Zealand between 2015 and 2016, which revealed significant reductions in Na and energy[22]. Additionally, it was found reformulations were greater in products that displayed an HSR[22].

Our data also revealed a propensity for brand manufacturers to exploit the voluntary nature of the HSR by displaying an HSR only when desirable, with branded product medians for food categories being ≥ 3·5 compared with ≥ 1·0 for generic product medians. Such limitations of

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Table 2 Comparison of the Health Star Rating (HSR) score and nutritional profile per 100 g between branded and generic products that display the HSR captured from an audit of four major supermarkets chains in metropolitan suburbs of Sydney, Australia, March–September 2017: unpaired analysis†

		HSR		Energy (kJ)		Saturated fat (g)		Sugar (g)		Na (mg)		Protein (g)		Fibre (g)	
Category	*n*	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Bread															
Branded	57	4·0	4·0–4·5	1010	950–1070	0·6	0·4–0·7	3·1	2·2–4·0	400	370–400	9·2	7·8–10·7	6·5	4·4–7·7
Generic	60	4·0	3·5–4·0	1060	1010–1130	1·0	0·5–1·0	3·1	2·6–3·9	400	350–400	8·6	7·8–9·7	4·3	3·0–5·8
P value		< 0·001*		0·001*		< 0·001*		0·760		0·493		0·240		< 0·001*	
Cereal															
Branded	235	4·0	4·0–4·5	1600	1540–1660	1·2	0·4–1·8	17·1	10·2–22·3	120	20–270	10·1	8·2–12·4	8·55	7·4–11
Generic	70	4·0	3·5–4·5	1592	1548–1670	1·3	1·0–1·8	16·3	5·3–21·5	75·5	11–311	10·8	8·4–12·7	8·6	5·8–11·4
P value		0·369		0·83		0·018		0·116		0·372		0·358		0·572	
Convenience Food															
Branded	196	3·5	3·5–4·0	323	197–454	0·7	0·3–1·1	2·1	1·3–3·2	265	238–290	3·7	1·2–5·7	1·7	1·2–2·4
Generic	302	3·5	3·0–3·5	569	356–785	1·9	1·0–3·3	2·0	1·3–3·4	272	221–350	6·0	2·8–9·2	1·6	1·2–2·4
P value		< 0·001*		< 0·001*		< 0·001*		0·584		0·164		< 0·001*		0·887	
Dairy															
Branded	97	4·0	4·0–5·0	260	158–350	0·8	0·2–1·6	4·6	2·0–8·7	247	52–265	3·5	3·0–4·3	1·6	1·4–3·2
Generic	35	3·0	2·0–4·0	1335	394–1600	16·4	2·2–21·8	2·5	1·0–4·7	404	60–652	14·7	4·3–24·6	0·0	0·0
P value		< 0·001*		< 0·001*		< 0·001*		0·001*		< 0·001*		< 0·001*		0·002*	
Discretionary Food															
Branded	163	4·0	3·0–4·0	1708	1622–1966	3·9	2·3–5·2	19	15·6–27·0	40	15·0–144	7·2	6·3–9·1	8·5	6·0–10·5
Generic	99	1·0	0·5–2·0	2040	1790–2130	10·5	5·8–14·3	30·8	22·5–37·4	166	85·0–311·0	5·8	4·7–7·0	3·4	2·4–4·8
P value		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*	
Fish															
Branded	61	4·0	3·5–4·0	788	654–873	1·0	0·8–1·4	1·7	1·0–2·9	350	264–450	13·5	11·0–18·5	1·4	1·1–2·1
Generic	116	4·0	4·0–4·0	599	437–866	1·0	0·7–2·0	1·0	0·0–1·8	333	285–398	19·3	14·8–22·9	0·5	0·0–1·0
P value		0·013		0·003*		0·799		< 0·001*		0·454		< 0·001*		< 0·001*	
Fruit and Vegetables															
Branded	227	5·0	4·5–5·0	195	161–281	0·1	0·0–0·2	6·7	2·9–9·2	9	5–36	1·0	0·5–2·6	2·0	0·5–3·3
Generic	190	4·5	3·5–5·0	257	183–397	0·2	0·1–1·0	9·4	3·3–13·2	12	5–50	1·0	0·7–2·6	2·5	1·0–4·1
P value		< 0·001*		< 0·001*		0·002*		< 0·001*		0·780		0·682		0·005	
Meat and Alternatives															
Branded	63	4·0	4·0–5·0	921	640–1490	1·1	0·6–4·4	2·7	1·0–4·4	373	21–487	14·6	9·5–17·8	6·0	3·8–7·4
Generic	175	4·0	3·0–4·5	2410	912–2600	4·9	3·1–7·2	3·1	1·7–5·2	278	10–400	16·0	8·4–21·8	6·0	3·1–8·9
P value		0·057		< 0·001*		< 0·001*		0·136		0·128		0·048		0·243	
Snacks															
Branded	72	4·0	4·0–5·0	1870	1600–2100	2·3	1·7–5·0	11·8	4·0–38·7	128	16–250	12·6	7·3–18·4	8·2	6·8–10·9
Generic	63	1·5	1·0–2·5	2170	2080–2295	7·6	3·3–12·4	2·3	1·0–7·3	517	409–760	6·6	5·6–8·1	3·5	2·8–5·1
P value		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*	
Spreads															
Branded	21	5·0	4·5–5·0	2490	2430–2560	6·8	5·9–8·8	5·2	4·1–5·7	200	10–255	27·0	25·0–29·2	7·7	6·1–7·9
Generic	16	4·5	4·0–4·5	2640	2569–2688	9·3	7·8–9·9	4·9	1·8–7·9	34	6–352	26·0	21·2–27·5	6·9	5·3–8·7
P value		0·021		0·001*		0·019		0·916		0·280		0·354		0·421	
Total															
Branded	1192	4·0	3·5–4·5	896	261–1620	0·9	0·3–2·1	5·2	2·3–15·6	158	20–290	7·0	2·7–10·6	6·0	2·0–8·6
Generic	1126	3·5	3·0–4·0	776	341–1495	1·4	0·9–3·7	3·4	1·6–10·5	243	45–365	5·9	2·7–9·5	2·4	1·4–4·3
P value		< 0·001*		0·953		< 0·001*		< 0·001*		< 0·001*		0·001*		< 0·001*	

IQR, interquartile range.
*Statistically significant at $P < 0·005$.
†Mann-Whitney *U* test

Table 3 Comparison of the Health Star Rating (HSR) score and nutritional profile per 100 g between branded and generic products that display the HSR captured from an audit of four major supermarkets chains in metropolitan suburbs of Sydney, Australia, March–September 2017: paired analysis†

		HSR		Energy (kJ)		Saturated fat (g)		Sugar (g)		Na (mg)		Protein (g)		Fibre (g)	
Category	*n*	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Bread															
Branded	16	4·0	4·0–4·5	1030	924–1103	0·6	0·4–0·7	3·1	2·3–6·0	400	383–413	9·0	5·3–11·5	6·3	5·5–9·1
Generic	16	4·0	3·5–4·0	1065	1006–1113	0·9	0·7–1·0	3·0	2·7–4·7	390	355–400	9·1	7·5–9·5	4·9	4·3–6·1
P value		0·008		0·044		0·002*		0·179		0·148		0·756		0·015	
Cereal															
Branded	15	4·0	4·0–4·5	1588	1498–1610	0·7	0·4–1·6	16·9	14·0–25·7	60	22–340	9·9	8·2–12·4	8·6	5·4–10·3
Generic	15	4·0	3·0–4·3	1616	1510–1659	1·0	0·6–2·4	22·0	14·3–26·3	162	27–345	9·5	7·0–12·0	8·6	3·4–10·4
P value		0·100		0·820		0·156		0·609		0·776		0·460		0·099	
Convenience Food															
Branded	26	3·5	3·5–3·8	823	275–1590	0·8	0·4–2·9	3·6	2·2–9·3	233	26–360	6·7	3·4–11·9	3·2	1·5–7·2
Generic	26	3·5	3·3–3·8	888	310–1616	1·1	0·7–3·6	3·6	1·8–10·0	203	27–339	6·6	3·1–12·0	2·4	1·2–5·1
P value		0·171		0·001*		< 0·001*		0·749		0·069		0·074		0·004*	
Dairy															
Branded	11	4·0	3·0–4·6	201	127–321	0·9	0·2–2·1	4·6	1·0–8·4	45	37–53	3·5	0·7–4·6	0·6	0·3–1·5
Generic	11	4·0	3·5–4·5	244	147–357	1·0	0·7–2·4	4·6	1·0–9·0	43	39–60	3·4	3·1–4·0	0·0	0·0–0·0
P value		0·673		0·594		0·286		0·790		0·722		0·657		0·109	
Discretionary Food															
Branded	17	2·0	0·6–3·8	2030	1735–2078	6·3	3·9–14·4	25·8	18·3–40·8	151	29–298	6·2	4·9–7·6	4·4	2·0–10·2
Generic	17	1·0	0·5–2·4	2040	1824–2150	10·4	5·8–14·6	30·4	21·4–40·0	156	73–278	6·0	5·0–10·1	3·6	2·1–5·3
P value		0·012		0·246		0·163		0·193		0·210		0·463		0·016	
Fish															
Branded	19	4·0	3·5–4·0	744	610–838	1·5	0·8–2·7	1·0	1·0–2·2	336	248–417	18·2	11·6–20·4	1·5	1·0–2·2
Generic	19	4·0	3·5–4·0	792	445–941	1·6	1·0–3·3	1·0	0·2–1·7	335	259–363	18·2	13·3–22·6	0·9	0·0–1·2
P value		0·868		0·904		0·931		0·179		0·260		0·015		0·180	
Fruit and Vegetables															
Branded	27	5·0	4·5–5·0	195	166–272	0·1	0·0–0·3	7·5	3·1–9·2	7	5–54	1·2	0·6–1·9	1·8	0·5–3·1
Generic	27	5·0	4·5–5·0	212	173–282	0·6	0·4–1·0	7·0	3·5–9·9	6	3–27	1·0	0·7–2·5	1·8	0·8–2·9
P value		0·612		0·088		< 0·001*		0·149		0·099		0·086		0·171	
Meat and Alternatives															
Branded	10	5·0	4·2–5·0	2553	1563–2955	4·2	3·5–5·7	4·0	2·2–4·6	4	3–86	14·6	8·7–20·4	8·0	6·4–10·1
Generic	10	4·5	4·0–5·0	2590	1615–2910	4·6	3·4–6·4	4·0	2·1–4·9	7	5–101	15·6	7·2–21·2	8·9	5·7–11·1
P value		0·872		0·799		0·241		0·959		0·575		0·721		0·401	
Spreads															
Branded	5	4·5	3·8–4·8	2560	2493–2723	8·5	6·5–9·1	5·0	2·8–6·5	156	86–463	27·5	24·5–29·1	6·7	5·8–7·3
Generic	5	4·5	4·0–4·6	2670	2592–2793	9·9	9·5–10·2	4·6	2·7–7·9	16	5–287	26·1	24·9–26·8	6·9	5·8–8·0
P value		1·000		0·078		0·078		0·498		0·078		0·343		1·0	
Total															
Branded	146	4·0	3·5–4·5	823	275–1590	0·8	0·4–2·9	3·6	2·2–9·3	233	26–360	6·7	3·4–11·9	3·2	1·5–7·2
Generic	146	4·0	3·3–4·5	888	311–1616	1·1	0·7–3·6	3·6	1·8–10·0	203	27–339	6·6	3·1–12·0	2·4	1·2–5·1
P value		0·001*		0·001*		< 0·001*		0·759		0·069		0·075		0·004*	

IQR, interquartile range.
*Statistically significant at $P < 0·005$.
†Wilcoxon signed-rank test.

Table 4 Comparison of nutritional profile per 100 g of 4284 branded packaged products with and without a Health Star Rating (HSR) captured from an audit of four major supermarkets chains in metropolitan suburbs of Sydney, Australia, March–September 2017†

		Energy (kJ)		Saturated fat (g)		Sugar (g)		Na (mg)		Protein (g)		Fibre (g)	
Category	*n*	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR	Median	IQR
Bread													
HSR	57	1010	950–1070	0·6	0·4–0·7	3·1	2·2–4·0	400	370–400	9·2	7·8–10·7	6·5	4·4–7·7
No HSR	188	1104	1020–1219	1·0	0·4–1·4	3·0	2·1–4·1	400	372–580	8·9	7·8–10·1	4·6	3·2–6·6
P value			< 0·001*		< 0·001*		0·539		0·001*		0·606		< 0·001*
Cereal													
HSR	235	1600	1540–1660	1·2	0·4–1·8	17·1	10·2–22·3	120	20–270	10·1	8·2–12·4	8·6	7·4–11·0
No HSR	140	1640	1550–1877	1·9	0·7–3·9	15·9	8·6–19·8	23	8–161	9·5	7·8–11·9	7·7	5·2–9·8
P value			< 0·001*		< 0·001*		0·062		< 0·001*		0·266		< 0·001*
Convenience Food													
HSR	196	323	197–454	0·7	0·3–1·1	2·1	1·3–3·2	265	238–290	3·7	1·2–5·7	1·7	1·2–2·4
No HSR	384	483	263–741	1·2	0·6–2·9	2·2	1·4–3·2	291	240–360	4·9	2·8–7·4	1·7	1·1–2·5
P value			< 0·001*		< 0·001*		0·460		< 0·001*		< 0·001*		0·087
Dairy													
HSR	97	260	158–350	0·8	0·2–1·6	4·6	2·0–8·7	247	52–265	3·5	3·0–4·3	1·6	1·4–3·2
No HSR	498	355	269–468	2·1	1·2–3·8	11·0	8·9–13·6	51	44–65	4·6	3·8–5·3	0·3	0·3–1·0
P value			< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*
Discretionary Food													
HSR	163	1708	1622–1966	3·9	2·3–5·2	19·0	15·6–27·0	40	15–144	7·2	6·3–9·1	8·5	6·0–10·5
No HSR	436	1929	1770–2070	8·4	4·4–12·7	29·2	21·3–36·6	207	111–328	6·6	4·9–8·9	5·3	3·0–7·6
P value			< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*
Fish													
HSR	61	788	635–873	1·0	0·8–1·4	1·7	1·0–2·9	350	264–450	13·5	11·0–18·5	1·4	1·1–2·1
No HSR	254	704	547–892	1·3	0·8–2·3	1·0	0·5–2·6	405	300–530	18·4	12·8–22·1		N/A
P value			0·326		0·032		0·005		0·028		< 0·001*		N/A
Fruit and Vegetables													
HSR	227	195	162–281	0·1	0·0–0·2	6·7	2·9–9·2	9	5–36	1·0	0·5–2·6	2·0	0·5–3·3
No HSR	612	238	171–520	0·1	0·1–0·5	8·2	3·3–11·7	10	0·5–59	1·0	0·5–3·1	1·9	1·0–5·3
P value			< 0·001*		0·173		< 0·001*		0·562		0·494		0·021
Meat and Alternatives													
HSR	63	912	640–1490	1·1	0·6–4·4	2·7	1·0–4·4	373	21–487	14·6	9·5–17·8	6·0	3·8–7·4
No HSR	240	875	670–2450	3·3	1·1–6·0	2·1	0·8–3·8	143	5–360	14·5	8·0–20·6	5·1	2·0–8·6
P value			0·963		< 0·001*		0·130		0·003*		0·536		0·750
Snacks													
HSR	72	1870	1600–2100	2·3	1·7–5·0	11·8	4·0–38·7	128	16–250	12·6	7·3–18·4	8·2	6·8–10·9
No HSR	316	2070	1990–2188	3·4	2·4–13·1	3·6	2·1–7·3	571	435–788	6·9	5·8–7·7	3·5	2·4–5·1
P value			< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*		< 0·001*
Spreads													
HSR	21	2490	2430–2560	6·8	5·9–8·8	5·2	4·1–5·7	200	10–255	27·0	25·0–29·2	7·7	6·1–7·9
No HSR	24	2515	2404–2590	8·5	6·9–10·3	8·5	5·3–11·6	289	15–560	23·8	19·6–24·6	8·8	5·9–12·5
P value			0·828		0·026		0·003*		0·148		< 0·001*		0·436
Total													
HSR	1192	896	261–1620	0·9	0·3–2·1	5·2	2·3–15·6	158	20–290	7·0	2·7–10·6	6·0	2·0–8·6
No HSR	3092	790	341–1760	1·6	0·5–4·3	5·5	2·2–13·7	182	34–390	6·0	3·7–9·8	3·2	1·3–6·4
P value			0·024		< 0·001*		0·783		< 0·001*		0·149		< 0·001*

IQR, interquartile range; N/A, not applicable.
*Statistically significant at $P < 0·005$.
†Mann–Whitney *U* test.

the voluntary HSR system were recently brought to light by Lawrence *et al.* when evaluating products within Australia categorised into food groups or discretionary foods[8]. The analysis revealed the median HSR for products that could be classified into one of the five food groups ranged between 3·5 and 4·5, while the snack foods HSR median was 4·0. Additionally, 56·7 % of all discretionary foods had an HSR ≥ 2·5. These findings are reflected in our own results, with the median HSR being >3·5 for Convenience Food, Discretionary Food and Snacks for branded products.

A similar trend has also been demonstrated previously with other voluntary food labelling schemes. In 2003, Carter *et al.* investigated use of the Daily Intake Guide (DIG) in over 4000 discretionary products and found that 75 % of the products that displayed a DIG did not report nutrients associated with negative health outcomes, such as sugar and saturated fat. Additionally, products without the DIG contained approximately ten times more saturated fat and twice as much sugar than products displaying the DIG[23]. Furthermore, generic products were found to display the DIG including saturated fat and sugar contents more frequently than branded products.

Limitations of the HSR system need to be considered when interpreting our data. Namely, the HSR algorithm can make discretionary foods appear healthier than reality, as foods are awarded stars within their category rather than across the wider food supply. Consequently, the high ratings achievable by many discretionary foods do not align with the Australian Dietary Guidelines[24]. For example, in our study the median HSR for discretionary branded Snacks (e.g. crisps and popcorn) was 4·0, which is important as high HSR scores could promote the consumption of discretionary foods, thus not aligning with the Guidelines. Consequently, strong arguments have been made to cap the HSR scores of discretionary foods to below 2·5 out of 5[7,8]. Moreover, as the HSR scoring system takes into account energy, saturated fat, protein and fibre to provide a single aggregate rating, this can veil the high sugar content. For example, branded Snacks (HSR = 4·0) contained 11·8 g/100 g sugar, significantly greater than generic Snacks with 2·3 g/100 g sugar and a median HSR of 1·5.

Some attempts to better align the HSR with dietary guidelines have been made. For example, Menday *et al.* explored whether substituting total sugar for added sugar would improve the capacity of the HSR to discriminate between 'core' (five food group foods) and 'discretionary' packaged foods[25]. The study found that using added sugar instead of total sugar assisted consumers to distinguish between 'core' foods and less healthy discretionary foods[25].

To our knowledge, the present study is the first to investigate the use of the HSR and nutritional profile in a wide range of branded and generic packaged foods using both group-level and paired analyses. There were some limitations in our present study. The products were not strictly categorised according to the Australian Dietary Guidelines' five food group foods and discretionary foods as most categories contained a combination of both. This limited the interpretation of the HSR scores from a dietary guidelines perspective. Data were not collected for some categories including oils and speciality dietary products. Several food categories were also excluded from the analysis as very few branded products displayed an HSR, such as sugar-sweetened beverages, and data were collected for products in metropolitan Sydney only. However, with 6269 products analysed, the study provided a good representation of the products available to consumers in ten food categories, thus providing a reliable sample of the packaged food products within Sydney, Australia.

Conclusion

In conclusion, our data show there is no difference in the HSR or nutrient profiles of similar branded and generic products that display an HSR. As generic products are far more likely to contain an HSR than branded products, it appears manufacturers of branded products are exploiting the voluntary nature of the HSR scheme by preferentially displaying the HSR on healthier products. Our findings in conjunction with previous research highlight limitations of the HSR scheme that need consideration to achieve the Australian government's objective to guide and assist consumers to make informed, healthier dietary habits.

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Supplementary material

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