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The types and aspects of front-of-pack food labelling schemes preferred by adults and children

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Abstract

There is strong interest in front-of-pack labels (FoPLs) as a potential mechanism for improving diets, and therefore health, at the population level. The present study examined Australian consumers' preferences for different types and attributes of FoPLs to provide additional insights into optimal methods of presenting nutrition information on the front of food packets. Much research to date has focused on two main types of FoPLs – those expressing daily intake values for specific nutrients and those utilising 'traffic light' colour coding. This study extends this work by: (i) including the new Health Star Rating system recently introduced in Australia and New Zealand; (ii) allowing a large sample of consumers to self-nominate the evaluation criteria they consider to be most important in choosing between FoPLs; (iii) oversampling consumers of lower socioeconomic status; and (iv) including children, who consume and purchase food in their own right and also influence their parents' food purchase decisions. A cross-sectional online survey of 2058 Australian consumers (1558 adults and 500 children) assessed preferences between a daily intake FoPL, a traffic light FoPL, and the Health Star Rating FoPL. Across the whole sample and among all respondent subgroups (males vs females; adults vs children; lower socioeconomic status vs medium-high socioeconomic status; normal weight vs overweight/obese), the Health Star Rating was the most preferred FoPL (44%) and the daily intake guide was the least preferred (20%). The reasons most commonly provided by respondents to explain their preference related to ease of use, interpretive content, and salience. The findings suggest that a simple to use, interpretive, star-based food label represents a population-based nutrition promotion strategy that is considered helpful by a broad range of consumers.

Key words: Food labels; Socioeconomic status; Adults; Children

Introduction

There is increasing interest in food labelling as a mechanism to improve people's diets at the population level to address high and growing levels of obesity and nutrition-related diseases (Cecchini and Warin 2016; Gregori et al. 2014, 2015). In particular, simplified nutrition labelling located on the front of packs has the potential to effectively inform consumers of the healthiness of food products and assist them in making more informed food choices (Van Kleef and Dagevos 2015). The rapid rate of growth in this field of research is evident in the increasing number of major reviews being conducted on the topic over time (Campos et al. 2011; Cecchini and Warin 2016; Cowburn and Stockley 2005; Grunert and Wills 2007; Hawley et al. 2013; Hersey et al. 2013; Van Kleef and Dagevos 2015; Volkova and Ni Mhurchu 2015).

Currently there are various types of front-of-pack labels (FoPLs) in use around the world, most of which are part of voluntary food labelling systems (Van Der Bend et al. 2014). Over the past decade, the European Union has adopted the Guideline Daily Amount system (GDA), the UK has endorsed the multiple traffic light (MTL) system, and the US has introduced the Guiding Star shelf labelling system that allocates foods a rating from zero to three stars (Crosetto et al. 2016; Fischer et al. 2011; Muller and Prevost 2016).

In Australia, the context of the present study, the Daily Intake Guide (DIG) (similar to the GDA) was first introduced in 2006, but is currently being superseded by the Health Star Rating (HSR) system that was launched in December 2014 (Australian Department of Health 2015a). Various other kinds of food labels have featured on Australian foods in recent years,

such as the Heart Foundation's Tick (recently withdrawn) and icons relating to fair trade, animal welfare, organic status, and gluten content.

Of note is that an expert review panel commissioned by a combination of federal and state governments recommended the introduction of the MTL system in Australia (Blewett et al. 2011), but this recommendation was rejected on the basis of anticipated resistance from the food industry (Australian Government 2011). Instead, efforts were made to develop an alternative food labelling system that was acceptable to all major stakeholders, resulting in the introduction of the HSR system to the Australian marketplace in mid-2014. While the DIG was an industry initiative, the HSR was developed via a tripartite planning and development process involving representatives from government, public health, and industry (Australian Department of Health 2015b). The HSR system allocates foods a star rating from half a star to five stars and provides information specific to energy and key nutrients (see Figure 1). More recently, the HSR system has also been introduced in New Zealand as a voluntary FoPL system endorsed by the New Zealand Government.

While there is general agreement that FoPLs have the potential to improve diets at the population level (Mozaffarian et al. 2012), research to date on the relative effects of different FoPLs has been hampered by the limitations associated with data collected via hypothetical food choice situations (Cecchini and Warin 2016; Volkova and Ni Mhurchu 2015). In the absence of real-world scenarios where individuals are exposed to multiple FoPLs in decision-making environments, researchers interested in how consumers compare and evaluate FoPLs have been largely limited to gauging consumers' reactions to various FoPLs in artificial conditions. These studies have focused on assessing consumers' ability to correctly interpret the information being presented (e.g. Maubach, Hoek and Mather 2014; van Herpen, Hieke

and van Trijp 2014; Watson et al. 2014) and their self-reported behavioural intentions (Aschemann-Witzel et al. 2013; Newman, Howlett and Burton 2014; Savoie et al. 2013; van Herpen and van Trijp 2011). Analysis is also complicated by difficulties associated with combining familiar and unfamiliar FoPLs, which makes it difficult to account for the effects of novelty and inexperience when interpreting results. Similarly, by the nature of the methodological design, these studies have typically included a small number of product categories, limiting their generalisability (Volkova and Ni Mhurchu 2015). Further work is needed that overcomes these limitations, such as by investigating consumer preferences among populations that have had exposure to multiple FoPLs across a range of product categories in the 'real world'.

A growing body of evidence indicates that the MTL generally outperforms the DIG across multiple criteria, such as encouraging the selection of healthier food options and reducing energy intake (Cecchini and Warin 2016). The more recent development of star rating systems in some countries indicates the need for further research that includes this form of FoPL as an additional comparison point. Some work has been conducted on the Guiding Star system (Cawley et al. 2015; Rahkovsky et al. 2013; Sutherland et al. 2010) and other notional star rating systems developed for testing purposes (Maubach et al. 2014; Hamlin and McNeill 2016). However, due to the recency of its introduction, the HSR has received little comparative analysis to date. Initial exploratory work indicates it is likely to be considered attractive and useful by consumers and to perform well relative to the DIG and MTL systems in terms of facilitating healthy product choices (Talati et al. 2016a, 2016b).

Australia provides a useful test site for comparative FoPL research given the population's experience with multiple forms of nutrition labelling. Along with the implementation of the

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DIG and HSR systems as noted above, a traffic light labelling system is used by state and federal governments to classify products sold in school canteens, hospitals, and other food supply services (Bell et al. 2013; Pettigrew et al. 2011). As a result, many Australians have some degree of familiarity with all three types of food labelling systems. This is an unusual situation that potentially permits more robust comparisons of consumers' attitudes to these FoPL systems. Accordingly, the aim of the present study was to investigate Australian consumers' preferences between these three FoPLs and the criteria used determine these preferences. The study participants were permitted to nominate their own reasons for preferring a particular FoPL, which represents an alternative approach to previous large-scale studies that have asked individuals to respond to questions relating to specific FoPL attributes (e.g., Emrich et al. 2013; Méjean et al. 2014; Siegrist, Leins-Hess and Keller 2015). By exposing consumers to multiple forms of existing FoPLs and asking them to report which they prefer and why, the present study provides insight into which evaluation criteria are considered most important to consumers and the relative importance placed on these criteria. This information is important because FoPL preferences are likely to be related to consumers' motivation to use different forms of nutrition labelling (van Kleef et al. 2008). The results can be of use to governments and health agencies in countries where stakeholders are considering the most appropriate FoPL to implement to meet consumers' information needs.

Method

As part of a larger food labelling study investigating consumers' reactions to differing FoPLs, adults and children residing across Australia were invited to participate in a national online survey on the topic of health and nutrition. The inclusion of children in the study reflects their

critical importance as both consumers and purchasers of food products, as well as powerful influencers on their parents' food purchase decisions (Quester et al. 2013). It also reflects the situation where children are often the target of unhealthy food promotion (Hawkes 2010), despite having weaker cognitive processing abilities which makes them especially vulnerable to marketing activities (John 1999; Rozendaal et al. 2011). Further, children have been nominated as a group in particular need of dietary improvement due to high levels of obesity and resulting susceptibility to a range of nutrition-related illnesses (Campos et al. 2011; Dehghan, Akhtar-Danesh, and Merchant 2005). Children as well as adults need accessible and comprehensible nutrition information to assist them in making healthy food choices (World Health Organization 2016), making it important to include both groups in FoPL research.

A web panel provider (PureProfile) undertook respondent recruitment for the study. Members of the PureProfile panel are recruited via a diverse range of strategies including radio and internet advertising, publicity, and referrals. Panel members receive small financial incentives for participating in surveys and IP addresses are monitored to avoid multiple completions by the same individuals. Eligible potential respondents could elect to participate in the survey by either using the survey link provided in invitation emails or by accessing the link via PureProfile's online portal. In the case of children, adults registered on the web panel who were known to have children in the target age range were contacted and asked to forward the survey link to their children if they were interested in participating. These conditions complied with the requirements of ethics approval obtained from the Curtin University Human Research Ethics Committee.

The web panel provider was commissioned to recruit 1500 adults (18+ years) and 500 children (aged 10-17 years) to complete the survey. The large sample meets calls for studies of adequate sample size and diversity to ensure coverage of various population subgroups (Cecchini and Warin 2016; Vyth et al. 2012). Quotas were stipulated for gender (50% male, 50% female) and socioeconomic status (SES) as assessed by postcode (as per the Australian Bureau of Statistics' Socio-Economic Indexes for Areas (SEIFA): Australian Bureau of Statistics (ABS) 2011). The SES quotas were 50% low SES (people living in neighbourhoods ranked in the most disadvantaged 40% of all postcodes) and 50% mid-high SES (people living in all other neighbourhoods). The focus on low SES consumers reflects their higher prevalence of diet-related illnesses (McLaren 2007), their often lower levels of nutrition literacy (Gregori et al. 2015), and their lower likelihood of consulting the NIP on the back of the pack (Signal et al. 2008). Previous research has typically included samples intended to be representative of national populations, with post hoc analyses undertaken by SES. The present study intentionally over-sampled consumers of lower SES to ensure the FoPL preferences of this group could be assessed in the analysis.

Items included early in the survey required respondents to view mock packs of four different food products featuring various FoPLs and rate the products on multiple criteria including perceived healthiness, tastiness, and value (Trial ID: ACTRN12616000626460 - https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=370675). To ensure equal exposure to the various FoPLs, all respondents were exposed to eight mock packs, with two representing each of the four study conditions (no FoPL, DIG, MTL, HSR). In addition, each respondent was randomly exposed to two versions of each of the four product categories: cookies, cornflakes, pizzas, and yoghurts (examples shown in Figure 1). These products were chosen to represent a broad variety of foods encompassing sweet and savoury options and

foods that would be considered a snack or a main meal. The different versions of the products varied according to FoPL, health claims, price, and/or actual healthiness (as shown in a nutrition information panel that could be optionally accessed for each product).

Insert Figure 1 about here

To assess preferences between FoPLs, at the end of the survey the respondents were shown an image depicting the DIG, MTL, and HSR FoPLs and asked to select the one they most preferred. The FoPLs were shown in the order depicted in Figure 2. Each FoPL displayed the same moderate level of healthiness (equivalent of 3 stars) to avoid any bias resulting from different nutritional profiles. Respondents could select one of the three depicted FoPLs or a fourth response option: "none of the above". An open-ended question then asked "Could you please tell us any reasons for your preference?". Other items related to the following demographic characteristics: age, gender, postcode, and self-reported height and weight (for body mass index (BMI) calculation). BMI was included as an analysis variable due to the heightened need for overweight and obese individuals to be aware of the nutritional quality of the foods they consume to enable them to make informed choices (Vyth et al. 2010).

Insert Figure 2 about here

The adult version of the survey contained 32 questions and the child version contained 29 questions. The questions were informed by a previous round of focus groups (Talati et al. 2016a, 2016b) and the instrument was initially soft-launched to assess respondents' (especially children's) ability to answer the questions. No adjustments to the instrument were necessary.

The FoPL preference scores were analysed in SPSS and the qualitative responses relating to reasons for preference were imported into NVivo11 for coding and analysis. An initial coding frame was developed according to the FoPL attributes identified in recent analyses of the three FoPLs (Talati et al. 2016a, 2016b). These attributes included those relating to the amount of information provided, ease and speed of processing, perceived trustworthiness, and visual salience. Other codes were introduced throughout the coding process as other relevant issues were raised by respondents (e.g., mention within the FoPL of serving size vs per 100g unit). In accordance with the inductive nature of the coding process and the subsequent thematic analysis (Huberman and Miles 1994), a single coder analysed the data to accommodate the need for emergent node development. In total, 35 nodes were created and used to code the data set. NVivo's matrix coding analysis function was subsequently used to identify frequencies of nominated preference reasons across the different FoPL types and respondent age categories (adult vs child).

Results

The profile sample by gender, age, SES, and BMI is shown in Table 1. In total, 2058 consumers responded to the survey, including 1558 adults (76%) and 500 children (24%). Half the respondents (50%) were male and half were of low socioeconomic status (49%) as indicated by residential postcode (ABS 2011). A quarter of the respondents (25%) did not provide their height and/or weight data, preventing calculation of BMI for these individuals. Of the remaining sample, half (38% of total sample) had a BMI of lower than 25 and the

other half (38% of total sample) had a BMI of 25 or greater, the latter indicating overweight or obese status (World Health Organization 2000).

Insert Table 1 about here

Preferred front-of-pack labelling system

Overall, the HSR was the preferred FoPL, with 44% of respondents nominating it as their favourite. This was followed by the MTL at 29% and the DIG at 20%. A small proportion of respondents (8%) did not have a preferred label. This difference was significant according to a 4 x 1 chi square test (χ^2(3, N= 2058)=558.4, p<.001).

Table 2 shows the breakdown of FoPL preferences according to demographic characteristics. Chi square tests were conducted to check for significant differences between demographic categories. Limited variation was found between the different demographic groups. The main exception was age category, with the preference for the HSR being significantly higher among children (50% vs 42% of adults: $\chi^2(1, N= 2058) = 9.71, p < .01: t(2056) = 3.14, p = .002$). This stronger preference for the HSR among children came at the expense of the DIG, which exhibited a correspondingly lower level of popularity (13% of children vs 22% of adults: $\chi^2(1, N= 2058) = 21.44, p < .001$). There was no difference in preference by age category for the MTL FoPL.

Insert Table 2 about here

There was a difference by gender, with males being significantly more likely than females to indicate they had no preference (10% vs 5%: $\chi^2(1, N= 2058) = 17.44$, $p < .001$). The one difference by SES was that lower SES respondents were significantly more likely to indicate no preference compared to those in the medium to high SES category (12% vs 4%, $\chi^2(1, N= 2058) = 41.82, p < .001$). Of note is the lack of significant differences according to BMI.

Favoured attributes of front-of-pack labelling systems

The most common reasons given for specific FoPL preference among adults and children are outlined in Table 3 and described below. Only those factors mentioned by at least 10% of respondents for at least one of the three FoPLs are shown. The frequency with which these FoPL attributes were mentioned indicate that they represent the primary evaluation criteria used by respondents to assess FoPL usefulness and relevance.

Insert Table 3 about here

DIG

Among the 407 respondents (20% of the sample) selecting the DIG as their preferred FoPL, the most common reasons given for this preference were ease of use (31%), the provision of daily intake guidelines (17%), and the perception that this FoPL is more detailed and/or informative than the other FoPLs included in the study (10%).

This is easy to understand (M, 10 (years), low SES).

Easier to read (F, 11, med SES).

It contained more and better contents. Also looked much neater and easier to read (M, 18, low SES).

It provides the information in an easy to understand format i.e., what your daily intake is and how much of that intake is contained in that product (F, 39, high SES).

Of note is that those selecting the DIG exhibited the highest rate of uncertainty as to why they considered this FoPL to be superior to the others included in the study (12% vs 10% for MTL and 5% for HSR). This uncertainty was especially apparent among children (24% vs 10% of adults). Very few respondents nominating the DIG (1%) mentioned that it is fast to understand and use.

MTL

Among the 591 respondents (29% of the sample) selecting the MTL as their preferred FoPL, the most frequently mentioned reasons for preferring this scheme were that it is colourful (35%) and easy to understand and use (35%). The colours used for the nutrient icons in the MTL were described as being both aesthetically pleasing and useful for providing information about the healthiness of food products. The two attributes of colour and ease appeared to be highly inter-related.

Easy to understand with traffic light colours (M, 10, high SES).

The colour coding is so much easier to use, because everyone recognises the colours of a traffic light (M, 22, med SES).

The colour coding makes it very easy to identify what I should be concerned about at a quick glance, which is important when shopping in the store when you are rushed, have kids nagging you, annoying other shoppers, etc. (M, 32, low SES).

It's colourful and draws your eyes to it. The others are boring and of no interest (F, 62, low SES).

The MTL were also described as somewhat more visually salient than the other FoPLs (14% vs 12% HSR and 8% DIG). This was evident in comments relating to the MTL standing out and attracting attention.

More eye-catching with its colours (M, 13, high SES)

I like the colour coding. It looks more modern and up to date. Easy to find and recognise (F, 16, low SES).

It's more graphic and colourful, thus it draws in people's attention (M, 25, high SES)

The colours draw my attention to what it's saying (F, 70, low SES)

When discussing their appreciation for the colours in the MTL, and despite selecting the MTL as their favourite FoPL, some respondents spontaneously stated a desire for the HSR to feature the colours used in the MTL. Alternatively, a star rating could be added to the MTL. It was mainly males who made this suggestion.

Colourful, green for good. Would be better if it also had the star rating (M, 13, med SES).

I like the star rating, but I also like the colour coding. Maybe you could do both, that seems the clearest to me (M, 16, high SES).

With the colours it stands out more, although with the stars it would be more helpful (M, 60, med SES).

HSR

As was the case for the other FoPLs, among the 897 respondents (44% of the sample) selecting the HSR as their preferred FoPL, ease of use was the most frequently mentioned attribute. However, the frequency of mention was higher for respondents who chose the HSR (41% vs 35% for the MTL and 31% for the DIG). Children were especially likely to appreciate the ease of using the HSR (51% vs 38% of adults selecting this FoPL).

It was the easiest to understand. I couldn't understand the others (F, 10, high SES).

Easiest to understand with the star system especially when it is hard keeping a tally of daily intake for the whole day (M, 13, low SES).

It just makes more sense. It stands out more and the health rating is a great way to measure it all up! (M, 16, med SES).

I like the rating scale of 1-5 because it is easy to interpret. It's all well and good giving the other guidelines, but do people know what they mean? For example, is 8g of fat low or high? The 1-5 is so much easier to follow. This should be the base guideline, especially for those whose eye sight is not that great (F, 67, med SES).

The star rating component of the HSR was specifically mentioned as an important attribute by more than one-third (37%) of those expressing a preference for this FoPL. Some also referred to the ability of the HSR to provide an overall health rating and/or the usefulness of this global indicator of the healthiness of the food (16%). This aspect was especially valued by children (21% vs 15% of adults).

I like the stars, it's easy to see how good it is for you (M, 11, med SES).

I like stars and I think I could help mum with the shopping using stars (F, 11, low SES).

The large overall star rating on the left side of the label makes it easy to identify how healthy it is on a scale of 1-5 (F, 35, low SES).

It has an overall rating which makes it easier; very visual (F, 38, low SES).

Finally, of the three FoPLs included in the study, the HSR was more likely to be described as fast to understand and use (14% vs 7% for the MTL and 1% for the DIG).

The star rating is faster and easier to understand (M, 12, low SES).

Easier to interpret at a glance (M, 20, med SES).

All the work has been done for you and it is quick and easy to see if it is healthy (F, 63, med SES).

Discussion

Overall FoPL preferences

Of the three FoPLs included in this study, the HSR was the most preferred and the DIG the least preferred. This finding was consistent across the gender, age, SES, and BMI subgroups included in the study. These results should be interpreted in the light of the HSR being the most recently introduced FoPL that now competes with the much more established (and continuing) existence of the DIG in supermarkets and the ongoing use of traffic light food categorisation system in schools, hospitals, and some work places.

Respondents' qualitative comments indicated that the most likely cause of this preference for the HSR is its perceived simplicity and the user-friendly nature of the star rating. The results are also consistent with the outcomes of previous focus group research that asked Australian consumers to discuss the relative merits of the same three FoPLs included in this survey (but

prior to the HSR being noticeably present in the marketplace) and found clear preference for the HSR based on its perceived utility (Talati et al. 2016a, 2016b). The higher levels of uncertainty associated with selecting the DIG suggest that those preferring this FoPL may be influenced by higher levels of familiarity rather than strong preference, and thus that preference for the HSR may increase over time as it becomes more widely used in the marketplace.

While some previous research suggests that different population subgroups may react to FoPLs differently (Gregori et al. 2015; Signal et al. 2008), the present study yielded consistent trends in FoPL preferences across age, gender, SES, and BMI categories. For all subgroups, the HSR was the most preferred FoPL. Any differences were in the strength of the trends, with the main variation in this regard being found between age groups. Children exhibited an even stronger preference for the HSR, which came at the expense of lower preference for the DIG. This outcome of a stronger preference for the HSR across diverse subgroups indicates that it could be an effective population-level intervention of comparable utility to different categories of consumers. This could potentially help reduce any health inequities resulting from the mandatory inclusion of the NIP that has been found to be most used by and useful for those with higher levels of nutrition literacy (Cowburn and Stockley 2005).

Evaluation criteria

The large sample in the present study (n = 2058) combined with the collection of qualitative data constitutes a novel approach to assessing the FoPL attributes that are of most importance to consumers. This enabled relevant evaluation criteria to emerge from the data rather than

being predetermined. Further, it allowed identification of the relative importance of different criteria through observation of the frequency with which different criteria were nominated.

The various reasons provided by respondents can be collapsed into three primary evaluation criteria: ease of use, interpretive content, and salience (Table 4). Ease of use was the most commonly expressed reason for preferring all three FoPLs, supporting the inclusion of this criterion in previous research comparing the performance of different FoPLs in survey and experimental studies (Gorton et al. 2008; Kees, Royne, and Cho 2014; Kelly et al. 2009; Möser et al. 2010; Smith et al. 2014). The notion of ease of use incorporated both the nature of the information provided and the speed with which it could be assimilated. The HSR was considered to be most effective in terms of ease of use, especially by children.

Interpretive content refers to the extent to which FoPLs provide an overall evaluation of the nutritional value of a food, as opposed to the provision of selected facts about specific nutrients within the food (Talati et al. 2016b). In the present study, the prioritising of interpretive content was apparent in respondents' mentions of the provision of nutrition assessments beyond a summary of the information in the NIP and the existence of an overall indicator (i.e., the star rating). This interpretive aspect of the HSR FoPL was appreciated for its ability to facilitate understanding and use and to increase the speed with which product assessments could be performed. This is consistent with previous research that has examined consumers' speed in performing product assessment tasks using varying FoPLs and found that faster processing speed is associated with greater understanding of and a stronger preference for that FoPL (Antúnez et al. 2015; Kelly et al. 2009).

The third criterion that was commonly used by respondents to assess the competing FoPLs is encompassed in the notion of label salience, which refers to the extent to which the label stands out within the visual field (Bialkova and van Trijp 2010). In the present study, this was evident in respondents' comments about the FoPLs' ability to attract attention and aesthetic attributes. The MTL outperformed the other two FoPLs on the salience criterion, with numerous mentions of the attractive and helpful nature of the colours featured in this FoPL. Previous research suggests that higher levels of salience are likely to increase FoPL use in the 'real world' (Bialkova, Grunert, and van Trijp 2013; Graham, Heidrick, and Hodgin 2015; van Herpen and van Trijp 2011).

Given that the HSR outperformed the MTL and DIG FoPLs on two of the three main evaluative criteria identified in this study (ease of use and interpretive content), the suggestion of some of the respondents to include colour in the nutrient icons contained within the HSR would effectively allow this FoPL to meet all three criteria deemed most important to consumers. This approach is supported by previous experimental research finding that adding colour to a monochrome DIG FoPL significantly increased consumers' ability to understand the information being conveyed and their speed of processing (Antunez et al. 2015).

It has been suggested that comparisons should be made between labels that have been developed by industry and non-industry sources (Hawley et al. 2013). In the present study, the one FoPL that was industry-generated (the DIG) received the lowest preference scores for the sample as a whole and for all population subgroups. In addition, this FoPL performed least well on all three of the major evaluative criteria used by respondents. This highlights the importance of ensuring that appropriate parties develop and implement food labelling

systems to enhance the likelihood of the resulting systems meeting consumers' nutrition information needs.

Study limitations

The main limitation of the present study was the focus on consumer preferences. Assessments were not made as to whether the respondents were able to effectively use the FoPLs in real purchase situations. This limitation is shared by most other research that has attempted to compare FoPLs due to the logistical difficulties associated with creating realistic purchase environments that can accommodate the simultaneous testing of different FoPLs. However, in the absence of appropriate real world testing grounds, it is important for future survey and experimental work to include the HSR as a comparison FoPL as it appears to have the potential to perform well against the other FoPLs that have been included in studies to date.

A further limitation of this study was the use of a web panel for participant recruitment. This prevented the calculation of a survey response rate because potential respondents could either respond to an invitation email or independently access the PureProfile web portal to select surveys they were eligible to complete. However, the use of a large sample with the application of age, gender, and SES quotas ensured that the population subgroups of specific interest had adequate representation. Indeed, the inclusion of children and the over-sampling of lower SES consumers are particular strengths of the study. However, as is the case with much health-based research, it is possible that the sample contained a higher proportion of those with greater nutrition interest and knowledge relative to the total population. The lack of BMI data for a quarter of the sample also raises the possibility that the sample was skewed on this variable.

To conclude, previous large-scale studies have used pre-identified FoPL attributes to assess consumers' reactions to different labels. The present study allowed evaluative criteria to emerge across a large sample of Australian consumers, resulting in the identification of three primary factors that appeared to drive their FoPL preferences. The results highlight the importance of ensuring FoPLs are easy to use, highly interpretative in nature, and visually salient. Compared to the DIG and MTL FoPLs, the new Health Star Rating system that has been recently introduced in Australia and New Zealand appears to excel on two of these three criteria (ease of use and interpretive content), with the potential to also become more visually salient in the future if the nutrient icons are colour-coded. The results therefore provide insight into potential means of strengthening the HSR system and provide guidance for other nations seeking to implement similar systems.

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Table 1: Sample profile by gender, age, SES*, and BMI**

Males (n=1,028)					
Age (years)	Socio Economic Status		BMI		
	Low	Medium-High	Underweight	Normal weight	Overweight/obese
	(n= 504)	(n= 524)	(n= 40)	(n= 272)	(n= 483)
10-18	132	139	32	81	63
19-35	118	117	6	78	93
36-55	126	133	0	63	145
56+	128	135	2	50	182
Females (n=1,030)					
Age (years)	Socio Economic Status		BMI		
	Low	Medium-High	Underweight	Normal weight	Overweight/obese
	(n= 511)	(n= 518)	(n= 72)	(n= 324)	(n= 359)
10-18	126	135	34	101	46
19-35	122	119	20	76	68
36-55	131	130	12	73	110
56+	132	134	6	74	135
Total (n=2,058)					
Age (years)	Socio Economic Status		BMI		
	Low	Medium-High	Underweight	Normal weight	Overweight/obese
	(n= 1015)	(n= 1042)	(n= 112)	(n= 596)	(n= 842)
10-18	258	274	66	182	109
19-35	240	236	26	154	161
36-55	257	263	12	136	255
56+	260	269	8	124	317

*Socioeconomic status as per the Australian Bureau of Statistics' (2011) Socio-Economic Indexes for Areas (SEIFA) classification.

**25% of respondents did not provide height and/or weight data.

Table 2: FoPL system preferences by demographic attributes (n=2058)

	Preferred FoPL system									
	DIG		MTL		HSR		No preference		Total	
	n	%	n	%	n	%	n	%	n	%
Gender										
Female	203	20	315	31	456	44	56[a]	5	1030	50
Male	204	20	276	27	441	43	107[b]	10	1028	50
Age category										
Adult	344[a]	22	445	29	649[a]	42	120	8	1558	76
Child	63[b]	13	146	29	248[b]	50	43	8	500	24
SES*										
Low	204	20	285	28	444	44	120[a]	12	1015	49
Med-high	203	19	306	29	453	43	43[b]	4	1043	51
BMI**										
<25	150	19	242	31	342	44	42	5	776	38
>=25	165	21	207	27	341	44	61	8	774	38
Missing	92	18	142	28	61	12	60	12	508	25
Total	407	20	591	29	897	44	163	8	2058	100

* Estimated by residential postcode as per ABS 2011

** BMI thresholds: < 18.5 underweight, 18.5 – 24.9 normal, 25.0 – 29.9 overweight, 30.0+ obese (WHO 2000)

[a,b] Within demographic groups (e.g., gender), different superscripts indicate a significant difference ($p<.01$)

Table 3: Primary preferred attributes by FoPL and age category (n=1985)*

	DIG (%)			MTL (%)			HSR (%)		
	Adults	Children	Total	Adults	Children	Total	Adults	Children	Total
	n=344	n=63	n=407	n=445	n=146	591	n=649	n=248	n=897
Easy	30	37	31	35	35	35	38	51	41
Star rating	-	-	-	-	-	-	38	36	37
Colours	1	2	1	35	37	35	-	-	-
Overall health value	-	2	-	2	1	2	15	21	16
Stands out	8	8	8	13	17	14	12	10	12
Daily intake amounts	17	14	17	-	1	-	-	-	-
Fast	1	2	1	8	3	7	15	11	14
Informative/detailed	12	3	10	6	4	5	6	6	6
Unsure	10	24	12	9	10	9	5	5	5

*Excluding "none of the above" responses; Respondents could nominate multiple attributes for each FoPL

Table 4: Primary evaluative criteria used to evaluate FoPLs

Derived FOPL Evaluation Criteria		
Ease of use	**Interpretive content**	**Salience**
Ease of understanding FoPL content	Provision of an assessment of nutritional value beyond summary information	Ability to attract attention
Speed of understanding FoPL content	Inclusion of an overall nutrition indicator	Aesthetic features

Figure 1. Example mock packs for the four product conditions: cookies, cornflakes, pizza, and yoghurt.
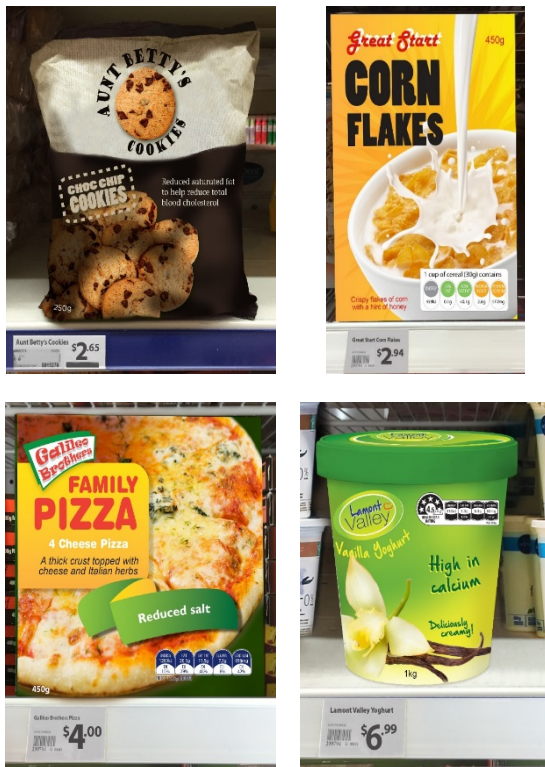
Figure 2: FoPLs included in survey: (A) the Daily Intake Guide (DIG), (B) Multiple Traffic

Lights (MTL) and (C) the Health Star Rating (HSR)