

FIVE YEAR REVIEW OF THE HEALTH STAR RATING (HSR) SYSTEM

HSR Technical Advisory Group (TAG)

**Alignment of the HSR system with
the Australian and New Zealand Dietary Guidelines:
Analysis of alignment and identification of outliers**

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Summary

The role and purpose of the TAG, as set out in its Terms of Reference, includes analysis of the performance of the HSR Calculator and HSR algorithm, to review star ratings currently being produced, and consideration of whether these align with both the Australian Dietary Guidelines and the New Zealand Eating and Activity Guidelines (the Dietary Guidelines). In this respect, the TAG was directed to consider and build upon relevant research and to analyse any outliers revealed by the Health Star Rating Advisory Committee (HSRAC).

This paper explores the issue of HSR algorithm and dietary guideline alignment. It aims to systematically assess current alignment, identify the scope and distribution of 'outlier' products, to examine their potential causes and to use this to identify evidence-informed measures to improve alignment. In doing this we:

- Considered the interrelationship between nutrients, foods and dietary patterns to contextualise how food-based dietary guidelines and front-of-pack labelling form part of comprehensive strategies to promote healthier diets
- Outlined the key practical differences between HSR and Dietary Guidelines, noting potential synergies and possible tensions in the design and purpose of both measures
- Analysed the degree of alignment between the HSR algorithm and the Dietary Guidelines using the TAG database. (Alignment with the Dietary Guidelines was assessed in relation to the HSR for foods classified as either Five Food Group and Discretionary)
- Examined the cause of outlier status, where outliers were identified as FFG products that received a HSR of <3.0, and discretionary products that received a HSR of ≥3.0.

In summary, we found:

- There were 5885 products in the TAG database: 63% were classified as FFG and 37% as discretionary foods, using the Australian Health Survey Discretionary food list.
- The mean HSR of FFG and discretionary products was 3.5 and 2.5 respectively.
- There was 72% overall alignment: 84% of FFG foods scored HSR ≥3.0, 61% of discretionary foods scored HSR <3.0
- 660 FFG outliers were identified, mainly cheese and yoghurts
- 835 discretionary outliers were identified across 31 product categories, with the majority coming from savoury sauces and gravies (31%), soups and stocks (12%), ice creams and ice confections (11%) and muesli bars (8%).

True alignment between the ADG and HSR algorithm is likely to be higher than 72% as a number of the outliers identified were subsequently assessed as being miscategorised.

Further analysis identified three groups of outliers. Group 1 consisted of actual discretionary food outliers and represented the main group of products to resolve in order to improve alignment of the HSR with dietary guidelines. Group 2 consisted of outliers that were assessed as being miscategorised based on their nutritional profile. Group 3 contained products that were challenging to assess. This was due to uncertain classification of some dairy foods as discretionary, as well as a previous decision to scale dairy foods in HSR Categories 1D, 2D and 3D to ensure differentiation between high and low fat products, in support of the dietary guidelines. As a result, some higher fat dairy foods are now obtaining a lower HSR than some discretionary foods.

Our results are consistent with findings from other studies, where the scope of potential misalignment ranges from 13-26% depending on the dataset used and HSR cut-offs

applied. All studies have consistently shown a significant difference in the mean HSR of FFG and discretionary foods. The number and type of outliers identified in the TAG database are also largely consistent with the findings of previous work.

There are a number of limitations to this research. A broad limitation is reliance on the Australian Health Survey (AHS) Discretionary Food List to classify foods. This list was developed for another purpose and this analysis showed that around one third of outliers assessed appear to be as a result of limitations of the AHS Discretionary food list rather than a failure of the HSR system. Use of this list also meant that a number of outliers were not captured such as fruit juices that obtain a high HSR or where there is poor differentiation in the HSR between refined and wholegrain foods. Another limitation is that the TAG database is likely to underrepresent the products available in the market, particularly for discretionary foods. However this database does contain up-to-date industry data.

This paper has identified a number of actual outliers that are being considered in other TAG papers. Resolving these outliers alone is estimated to improve overall alignment of the HSR with the dietary guidelines from 72% to up to 82% in the TAG dataset and potentially much higher in other datasets where alignment was measured at a higher starting point.

This paper also identifies the difficulty in assessing a range of 'healthiness' using a binary scale (FFG or discretionary) and the need for clarity on the definition of some foods and drinks as FFG or discretionary. Resolving these possible misclassifications would further improve alignment, noting that 100% alignment is unlikely to be possible with any system.

Scope of this paper and background

This work addresses a key element of the TAG's role set out in its Terms of Reference (ToR¹). The relevant excerpts are provided below:

Role and purpose

The specific role of the Technical Advisory Group is to, within the context of the Front-of-Pack Labelling (FoPL) Project Committee's - Objectives and principles for the development of a FoPL system (Appendix 2):

1. Analyse the performance of the HSR Calculator

- What star ratings are currently being produced?
- Consider whether the ratings being produced currently align with the Australian Dietary Guidelines (ADG)/Australian Guide to Healthy Eating (AGHE)/New Zealand Eating and Activity Guidelines (NZEAG).
- Consider and build on NSW research (*Technical Report: Alignment of NSW Healthy Food Provision Policy with the Health Star Rating System*) and other relevant research.
- Analyse any outliers that are revealed as directed by the HSRAC.

The 'Objectives and principles for the development of a FoPL system' referred to within the ToR above include, inter alia, the following design principle:²

5. The system should be aligned with other food regulation, public health policies, and authoritative sources of dietary advice including:

- a. Australian Dietary Guidelines³
- b. Ministerial Guidelines and Statements
- c. Nutrition, Health and Related claims regulations and industry codes.

The role of this paper is to assess the degree of alignment between the Dietary Guidelines and the HSR algorithm.⁴ It draws upon relevant submissions to the public consultation on the Five Year Review, which frequently referred to individual examples of current HSR labels that appear inappropriate, i.e. foods perceived as 'healthy' receiving a low HSR, or foods perceived as 'unhealthy' that rate highly.

Building upon the *NSW Technical Report*⁵ as directed, this paper will use TAG data to systematically assess the performance of the HSR algorithm and its alignment with the ADG across the food supply, regardless of whether a product is currently displaying the HSR label.

¹ Terms of Reference of the Technical Advisory Group to the Health Star Rating, available at [http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/content/8FFF69B2B1EC99D5CA2581BD007CAEDB/\\$File/TAG-Terms-of-Reference.pdf](http://healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/content/8FFF69B2B1EC99D5CA2581BD007CAEDB/$File/TAG-Terms-of-Reference.pdf) (accessed 9 May 2018)

² Front of pack labelling Project Committee Objectives and principles for the development of a front-of-pack labelling (FoPL) system, available at: <http://foodregulation.gov.au/internet/fr/publishing.nsf/Content/frontofpackobjectives>

³ Noting that at the time these objectives were set out, New Zealand had not decided to adopt the system. In this paper, we take these objectives as now incorporating alignment with the dietary guidelines of both countries.

⁴ The HSR system is composed of the HSR Graphic, HSR algorithm/calculator and the associated education and awareness campaign. As per the TAG ToR, this paper will focus only on the performance of the HSR algorithm/calculator.

⁵ Dunford, E., et al. (2015). *Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System*, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

Policy coherence is important not only because of the need to provide consistent dietary messaging to consumers, but also because inappropriate HSR scores or dietary guideline recommendations threaten the credibility and sustainability of both policies. The aim is to provide evidence-informed guidance on how alignment between the HSR algorithm and the Dietary Guidelines can be improved.

Key concepts and terms used in this paper

The TAG Glossary provides a full list of terms referred to throughout this paper. In addition, the following is noted:

Discretionary foods

Challenges arise with applying this definition at an individual product level given that the ADG provides a descriptive, food-based definition rather than a more objective measure of 'high in' for the specified components that are recommended to be limited. They also do not provide a comprehensive list of discretionary foods in the Australian food supply. For this reason, this paper has relied upon the AHS Discretionary Foods List to classify foods for ADG purposes as discretionary or FFG. This list continues to apply a mainly descriptive, food-based definition but to a more comprehensive range of foods than in the ADGs. For some food categories, nutrient criteria are also applied e.g. for breakfast cereals, a total sugar level of 30g/100g determines if a cereal is discretionary or not. For the purposes of this analysis, foods in the TAG database have been classified as discretionary based on their classification in this AHS list. All foods not classified as discretionary were considered to be FFG foods. FFG foods in this analysis includes foods and drinks from the Five Food Groups as well as those from the unsaturated fats group.

Extracts of references to the concept of discretionary foods from the ADG and supporting documents are provided in Appendix 1.

We also note that the terminology 'discretionary foods' is not used in New Zealand. In practice, we suggest it essentially overlaps with the New Zealand concept of foods recommended to limit because of their high saturated fat, salt or added sugar content, allowing findings from our analysis of alignment to be reasonably extrapolated to that context.

Outlier

This paper uses a HSR of 3.0 to identify a product in the TAG database whose HSR does not appear to align with its classification as FFG or discretionary and compares results against existing work using different thresholds to validate these findings. We differentiate this term from that of 'anomaly' which has a specific definition and complaint mechanism within the HSR System.

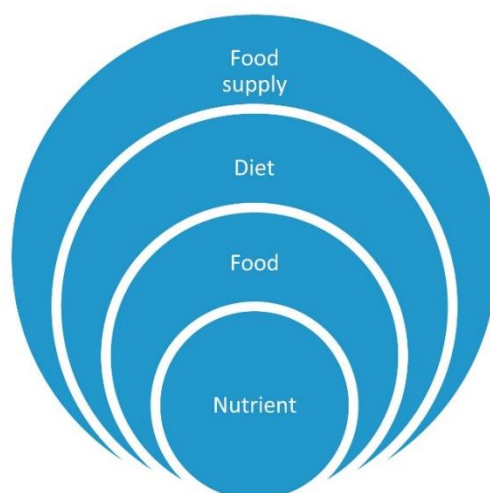
The need for comprehensive approaches to promote healthier diets

The World Health Organization (WHO) recommends a comprehensive suite of population health approaches to promote healthier diets and prevent chronic disease.⁶ Two policy areas where both Australia and New Zealand have been benchmarked as performing well against international best-practice, are in adoption of food-based dietary guidelines and front-of-pack nutrition labels.^{7,8}

While both policies are related in their intent to guide consumers towards healthier choices, they also differ in fundamental aspects of their purpose and design.

Inter-relationship of nutrients, foods and dietary patterns

The association between diet and health is underpinned by an interdependent relation between dietary patterns, foods, and food components, including nutrients. Diets are composed of foods, which in turn are composed of nutrients and other food components. While eating food is essential to health, support for the human physiologic system is based on nutrient requirements. Nutrients can have relevant positive and negative health effects: for instance, inadequate consumption of vitamins can lead to deficiencies, but overconsumption of macronutrients can lead to obesity and chronic disease.⁹ The relationship is illustrated by Figure 1 below.



*Figure 1: The inter-relationship between nutrients, foods, diet and the food supply.
Source: Tapsell, L. Dietary behaviour changes to improve nutritional quality and health outcomes Chronic Dis Transl Med 2017 Sep; 3(3): 154-158*

⁶ World Health Organization (2017). 'Best Buys' and Other Recommended Interventions for the Prevention and Control of Noncommunicable Diseases, Updated - Appendix 3 of the Global Action Plan for the Prevention and Control of Non-Communicable Diseases 2013-2020. Geneva, Switzerland.

⁷ Sacks, G. for the Food-EPI Australia project team. (2017). Policies for tackling obesity and creating healthier food environments: scorecard and priority recommendations for Australian governments. Melbourne, Deakin University.

⁸ Swinburn, B., et al. (2014). Benchmarking food environments: experts' assessments of policy gaps and priorities for the New Zealand Government, University of Auckland, Faculty of Medical and Health Sciences, School of Population Health.

¹⁷ Tapsell LC, Neale EP, Satija A, Hu FB. (2016). Foods, Nutrients, and Dietary Patterns: Interconnections and Implications for Dietary Guidelines. *Advances in Nutrition*. 7(3):445-54.

Food-based dietary guidelines

Dietary guidelines provide evidence-based statements on food choices to meet nutritional requirements and reduce the risk of chronic disease.¹⁰

They are typically used to establish a basis for public food and nutrition, health and agricultural policies and nutrition education programs to foster healthy eating. They do this by providing advice on foods, food groups and dietary patterns that provide enough of the nutrients essential for good health and also help reduce our risk of chronic disease.¹¹

The most recent ADG¹² were introduced in 2013 to promote health and wellbeing while reducing the risk of chronic disease. They were developed through the National Health and Medical Research Council (NHMRC) Guideline process. In developing the ADG, NHMRC drew upon multiple sources of evidence including the previous dietary guidelines, a graded literature review of 55,000 studies, existing Nutrient Reference Values, and modelling of the translated nutrient requirements into dietary patterns.

The NZEAG¹³ were published in 2015 to provide similar evidence-based population health advice on healthy eating and being physically active.

Both the ADG and the NZEAG provide advice on the types and amounts of foods consumers should eat to promote health and wellbeing and reduce the risk of chronic disease. Both primary guideline documents state they are intended to be used primarily by health practitioners and others who provide advice on food and nutrition, rather than directly by consumers. In Australia, the Australian Guide to Healthy Eating¹⁴ (AGHE) was developed as a supplementary tool to visually represent on a plate the proportion of foods for recommended consumption each day. This is supplemented by the Department of Health website: www.eatforhealth.gov.au which provides information for both health experts and consumers.

These two sets of Dietary Guidelines are very similar but have some important differences relevant to this paper:

- The ADG classifies foods as FFG and discretionary. The term ‘discretionary’ is not part of the NZEAG, but advice to limit foods high in saturated fat, salt and added sugars generally equates to the ADG recommendation to limit the intake of discretionary foods high in saturated fat, added sugar and added salt.
- The NZEAG provides advice to consume a variety of foods from the four food groups - these foods are similar to those in the ADG FFG with fruit and vegetables combined into one group.
- Both guidelines provide descriptive examples of foods high in saturated fat, salt and/or added sugars to limit, but no objective threshold for these nutrients that can be applied across the food supply.
- Both guidelines provide advice to consume small amounts of healthy (unsaturated) fats and oils instead of saturated fat and to drink plenty of water.

¹⁰ Tapsell LC (2017) Dietary Behaviour Changes to improve nutritional quality and health outcomes. *Chronic Dis Transl Med.* 3(3): 154–158. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5643774/>

¹¹ Food and Agricultural Organization of the United Nations (FAO). Food-Based Dietary Guidelines. <http://www.fao.org/nutrition/education/food-based-dietary-guidelines/en/> [Accessed 18 June 2018]

¹² National Health and Medical Research Council. (2013). Australian Dietary Guidelines 2013. Available at: <https://www.nhmrc.gov.au/guidelines-publications/n55>. [Accessed 05 December 2017]

¹³ Ministry of Health. (2017). Eating and Activity Guidelines for New Zealand Adults. Available at: <https://www.health.govt.nz/publication/eating-and-activity-guidelines-new-zealand-adults>. [Accessed 05 December 2017].

¹⁴ Australian Department of Health. (2017). Australian Guide to Healthy Eating | Eat For Health. Available at: <https://www.eatforhealth.gov.au/guidelines/australian-guide-healthy-eating>. [Accessed 05 December 2017].

- The NZEAG recommends 'eating fresh fruit and drinking plain water rather than drinking fruit juice' while the ADG permits a small glass of fruit juice (no added sugars) to be counted as a serve of fruit 'only occasionally'. NZEAG also recommend limiting the amount of dried fruit in the diet given its concentration of sugar and potential impact on cavity risk to teeth. The ADG notes that fruit should mostly be eaten fresh and raw, but allow 30 g of dried fruit (preferably with no added sugar) to be used occasionally as a substitute for other foods in the group. Neither fruit juice nor dried fruit is categorised as discretionary in the AHS list.
- In one of their 5 Eating Statements, the NZEAG also recommends choosing and/or preparing foods and drinks 'that are mostly 'whole' and less processed'. This is not provided as explicit advice in the ADG.

Interpretive front-of-pack nutrition labelling (FoPL)

Interpretive nutrition labels provide simplified nutrition information of food products, via text and/or symbols on the front of pre-packaged foods, to encourage and enable consumers to make healthier choices. This type of labelling has been proposed as part of a comprehensive policy response to growing rates of diet-related disease globally.¹⁵

Evidence indicates these kinds of labels appear more effective for communicating the overall nutrition quality of a food than listing nutrient content on the back-of-pack.¹⁶ They may also increase awareness of the overall nutrition quality of a food among consumers and their motivation to choose healthier products.¹⁷ There is also some evidence they may stimulate manufacturers to reformulate towards recipes with a lower level of the risk associated ('negative') nutrients or higher level of the positive nutrients or fruit, vegetable, nut and legume (FVNL content).¹⁸ FoPL systems are proliferating worldwide, but there remain significant differences in the approaches taken.

FoPL systems comprise multiple components: an underpinning classification system (usually nutrient thresholds or algorithms are created based on the overarching objectives of the FOPL system), a specified label format (e.g. stars, traffic lights); and, frequently, an accompanying education/communication strategy.

The HSR algorithm as a nutrient profiling tool to support FoPL

Nutrient profiling is the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health.¹⁹ Nutrient profiling can be used for various applications, including underpinning policies for restricting marketing of foods to children, determining the eligibility of products to display health and nutrition claims, establishing guidelines for the provision of healthy foods in public institutions and also frequently for product labelling logos or symbols, such as in the case of HSR.

Though nutrient profiling does not address all aspects of nutrition, diet and health, it is recognised by WHO as a helpful tool to use *in conjunction* with interventions aimed at

¹⁵ For example, World Health Organization (2013). Global action plan for the prevention and control of non-communicable diseases 2013-2020, and World Health Organization (2017). Implementation Plan of the WHO Commission on Ending Childhood Obesity. Geneva, Switzerland, WHO.

¹⁶ Neal, B., et al. (2017). Effects of Different Types of Front-of-Pack Labelling Information on the Healthiness of Food Purchases—A Randomised Controlled Trial. *Nutrients* 9(12): 1284.

¹⁷ Campos, S., et al. (2011). Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutr* 14(8): 1496-1506.

¹⁸ Mhurchu, C. N., et al. (2017). Effects of a Voluntary Front-of-Pack Nutrition Labelling System on Packaged Food Reformulation: The Health Star Rating System in New Zealand. *Nutrients* 9(8).

¹⁹ World Health Organization. Nutrition: Nutrition Profiling. <http://www.who.int/nutrition/topics/profiling/en/> [Accessed 18 June 2018]

improving the overall nutritional quality of diets.²⁰ This was recognised by Food Ministers in their Policy Statement preceding development of HSR, in which it was noted that FoPL is not a stand-alone strategy but can fit within the context of broader health strategies (see Appendix 2).

As a nutrient profiling tool, the role of the HSR algorithm is to combine and synthesise information about multiple components of a food to objectively differentiate between foods and drinks that are more likely to be part of a healthy diet, from those that are less healthy. Like many nutrient profiling models used for labelling, it is based upon an assumption that foods cannot be simply defined as healthy and unhealthy, but that there are many foods that are classified as intermediate between healthy and unhealthy i.e. along a continuum.

The technical development of the HSR algorithm is the subject of a separate TAG paper. For current purposes, it is worth highlighting that food components included in the HSR algorithm were inherited from the existing model used to determine eligibility for Health and Nutrient Content claims in the Australia and New Zealand Food Standards Code – the Nutrient Profiling Scoring Criterion (NPSC). The NPSC itself was derived from an earlier model designed and validated in the United Kingdom for the purposes of regulating marketing to children (the UK Ofcom model). It is important to note that the outcome of the NPSC is a yes/no threshold to determine eligibility of a food to carry health claims. For the purposes of use in the HSR system, the NPSC was subject to a further period of refinement, adaptation and testing with input from Food Standards Australia New Zealand (FSANZ) and a multi-stakeholder Technical Design Working Group. In summary, the modifications made to develop the HSR algorithm were intended to better describe differences in food composition between foods in a given food group to assist consumers in making a healthy choice when purchasing food.

The nutrients and food components addressed in the HSR algorithm are similar to those nutrients commonly referred to in FoPL globally, and also relate closely to key components of the Dietary Guidelines in Australia and New Zealand:

- Negative components are overall energy and saturated fat, sodium and total sugars. This aligns with ADG Guideline 3 and the NZEAG as foods ‘to limit’ (with notable difference between total and added sugars).
- Positive food components included are FVNL content and, in some cases, protein and fibre. This aligns with the key characteristics of foods considered to be ‘FFG’ and recommended to form the basis of a healthy diet in ADG Guideline 2 and NZEAG Eating Statement 1.
- As noted in the TAG paper that outlines the development of the HSR system:

Any nutrient profiling system and/or food categorisation system will require the drawing of lines between lists of foods and it is unlikely that all stakeholders will always agree on the foods determined to be either side of those lines.

²⁰ World Health Organization. Nutrition: Nutrition Profiling. <http://www.who.int/nutrition/topics/profiling/en/> [Accessed 1 February 2017]

Policy coherence: the importance of alignment

While inherently related in their intent to guide consumers towards healthier diets, the information provided suggests important similarities and differences in the theoretical design and purpose of the Dietary Guidelines and a FoPL system such as HSR. Table 1 below also outlines a number of practical differences in how the two initiatives operate. These differences suggest potential opportunities for the Dietary Guidelines and HSR to operate synergistically. However, as recognised by Food Ministers in their development, to do this effectively both policies need to align (Appendix 2). Policy coherence is important not only because of the need to provide consistent dietary messages to consumers, but also because inappropriate HSR scores or disagreement about the classification of foods as FFG or discretionary in the AHS Discretionary Foods List threaten the credibility and sustainability of both policies.

Table 1: Key practical differences between HSR and the Dietary Guidelines

	Dietary Guidelines	HSR
Provide advice on foods, food groups and a range of dietary patterns that support health outcomes to prevent chronic disease.	✓	×
Provide information on serve size and the number of serves of foods needed for health	✓	×
Provide information on the nutritional quality of individual food and drink products based on selected nutrient content and other food components	✓ (to some extent)	✓
Facilitate nutritional comparisons between individual food and drink products at the point of purchase	×	✓
Support product reformulation towards a healthier nutritional composition based on selected nutrients/food components	×	✓
Targeted primarily at consumers (at point of purchase)	×	✓
Targeted primarily at health professionals, policy makers, educators, food manufacturers, retailers, researchers (although information for consumers is also available)	✓	×

As shown in Table 1, the Dietary Guidelines and the HSR provide guidance at different points: the HSR provides advice on the healthiness of individual foods whereas the Dietary Guidelines provide advice on how to use these foods to build a healthy diet. This could create an expectation that foods with a high HSR are healthy options that can be used to build healthy diets. This expectation may be at odds with a system that has also been designed to show consumers how to make a healthier choice within a product category – both healthy and unhealthy product categories.

Both the Dietary Guidelines and the HSR operate in the context of a dynamic food supply in which product reformulation can result in a change in the healthiness of a product. This has the potential to create a particular area of tension with products that have been reformulated to have a higher HSR but may still be perceived to be unhealthy by the public, or may still be classified as discretionary, despite their improved nutritional profile.

The purpose of this paper is to identify areas and causes of misalignment in the HSR algorithm for the current Australian and New Zealand food supply in order to make evidence-informed recommendations about how alignment could be improved.

Issues raised by respondents to public consultation

A detailed compilation of submissions made by respondents to the Five Year Review on the issue of Dietary Guidelines alignment is provided in Appendix 3. Here we outline key issues raised by respondents and relevant existing research.

Issue 1

The HSR system is designed for packaged foods, therefore it may not support people to eat more FFG foods, many of which are fresh and unpackaged.

What is already known:

- Packaged foods in the Australian and New Zealand market include a wide variety of both FFG and discretionary foods. For example, products in FFG groups such as milk, yoghurt, cheese and/or alternatives, grains (cereal) foods and lean meats and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans food groups traditionally come in packages. Packaged fresh or minimally processed fruit and vegetable products are also appearing on the market. This suggests that as a matter of principle, the focus of the system on packaged items does not necessarily favour discretionary foods.
- The sample of 11,500 packaged foods used in the *NSW Technical Report* classified the majority of products (53%) as FFG foods.²¹ Recent work by Jones et al using a sample of 47,116 products, found 49.8% were FFG foods²², and Lawrence et al examined 1,269 new products displaying HSR on labels and found 57% were FFG foods.²³ The TAG database currently contains 5,885 items, of which 63% are FFG. Taken together, these data do not support the contention that a labelling system on packaged foods necessarily favours discretionary foods.
- This notwithstanding, the paper by Lawrence et al suggests that discretionary products voluntarily displaying the HSR on pack are those able to achieve a relatively high score, which may encourage consumers to select these foods preferentially over lower or similar scoring FFG foods. The full findings of this paper are explored in more detail later in this report.
- It is also true that many FFG foods, particularly fruit and vegetables continue to be sold without packaging. A separate TAG paper will consider performance of the HSR algorithm on unpackaged fresh and unprocessed fruit to support HSRAC with their consideration of a policy decision to extend the HSR to these products.
- Results of HSR Campaign Monitoring suggest that some believe that the HSR indicates that you should eat 'packaged over unpackaged', or to 'only eat products with a HSR'. The performance of the HSR Campaign is beyond the remit of this analysis.

²¹ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

²² Jones A, Rådholm K, Neal B. (2018). Defining 'Unhealthy': A Systematic Analysis of Alignment between the Australian Dietary Guidelines and the Health Star Rating System. *Nutrients*. 10(4):501.

²³ Lawrence, M., et al. (2018). Do Nutrient-Based Front-of-Pack Labelling Schemes Support or Undermine Food-Based Dietary Guideline Recommendations? Lessons from the Australian Health Star Rating System. *Nutrients* 10(1): 32.

Issue 2

The HSR does not adequately demarcate FFG and discretionary foods

What is already known:

- Existing peer-reviewed publications have consistently found the mean HSR of FFG foods to be higher than the mean HSR of discretionary foods.²⁴ These results are considered alongside the results of new TAG analysis later in this paper.
- At the time of HSR algorithm development, the ADG provided guidance at a descriptive level but no comprehensive list of discretionary foods was available. While classification of some foods is straightforward (e.g. vegetables, bread), binary classification becomes more difficult where foods are made of mixed components, or can vary significantly in nutritional profile (e.g. pizza, muesli bars, breakfast cereals).
- Concerns about 'adequate' demarcation give rise to consideration as to whether or not it is appropriate to have *any* overlap between the HSRs of FFG and discretionary foods.²⁵
- Recent monitoring by the Heart Foundation suggests 74% of respondents agree HSR makes it easier to find healthier options within a category, however 63% also say it helps them identify healthier options across all categories and 55% agree it makes it easier to compare products in different categories.²⁶ This suggests a need for greater clarity over whether the HSR algorithm is intended to demarcate and compare foods within or between categories, and if so, which categories are to be applied for this purpose.
- A separate TAG paper outlines the process of technical development of the HSR algorithm in detail, and includes the rationale for decisions made during the development of the HSR algorithm from the existing NPSC. It also provides relevant information about the role of FSANZ, and the multi-stakeholder members of the Technical Design Working Group as part of that process.

Issue 3

Even if alignment of the HSR algorithm with the Dietary Guidelines appears reasonable overall, there are numerous outliers

What is already known:

- Anecdotal examples of HSR scores that appear to be 'outliers' (e.g. low scoring yoghurts, high scoring muesli bars and breakfast cereals with a high sugar content) were raised consistently by respondents to the Five Year Review.
- Several research papers have now attempted to examine this issue, and results of these works are considered in detail in the discussion of our analysis.
- Policy coherence is important not only because of the need to provide consistent dietary messaging for consumers but also because even a small number of outliers may threaten the integrity and sustainability of both policies.
- Differences in the way that FoPL and food-based dietary guidelines classify foods mean that perfect alignment may not be attainable. Further information on the synergy and tension between these two types of measures is provided elsewhere in this paper.

²⁴ Dunford, op cit; Jones op cit; Lawrence op cit.

²⁵ Lawrence op cit.

²⁶ National Heart Foundation of Australia (2018). Report on the monitoring of the implementation of the Health Star Rating system: Key findings for Area of Enquiry Two – Consumer awareness and ability to use the Health Star Rating system correctly. Available on request from frontofpack@health.gov.au

The issue of Dietary Guideline alignment also elicited a number of related but specific issues such as concerns about the use of protein, added rather than total sugar, and wholegrain in the algorithm. We note where our findings intersect with these issues below, but also note that each of these will be specifically addressed by separate and much more detailed TAG papers.

Analysis of alignment using TAG database

Aim

To objectively assess the degree of alignment between the ADG/NZEAG and the HSR algorithm.

Methodology

This was a cross-sectional examination of packaged foods and beverages (hereafter ‘foods’) available in Australia and New Zealand.

Data source

We analysed items included in the TAG database. The database contains nutrition information for 5,885 packaged and unpackaged foods and drinks in the Australian and New Zealand market, provided directly by industry. HSR values for these products were calculated using industry-supplied data.

Product classification

Foods were classified into 42 sub-major food group categories based on the AGHE.²⁷ Each food in the database was also assigned a five-digit classification (the same one used for classifying foods consumed in the AHS).²⁸ They were also defined as FFG or discretionary according to ADG guidance. As ADG documentation provides limited examples of discretionary choices, we relied on the AHS Discretionary Food List as the best available reference for classifying discretionary foods for the purposes of this analysis.²⁹

For reasons noted earlier, classification as FFG or discretionary was considered to be suitable to also assess alignment of the HSR with the NZEAG.

²⁷Australian Department of Health. (2017). Australian Guide to Healthy Eating | Eat For Health. Available at: <https://www.eatforhealth.gov.au/guidelines/australian-guide-healthy-eating>. [Accessed 05 December 2017].

²⁸

<http://www.foodstandards.gov.au/science/monitoringnutrients/ausnut/ausnutdatafiles/Pages/foodclassification.aspx> [Accessed 27 April 2018]

²⁹ ABS. (2014). Australian Health Survey: Users' Guide, 2011-13 — Discretionary Food List. Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4363.0.55.001Chapter65062011-13>. [Accessed 2 February 2018].

Statistical analysis

Cross-tabulations were made of the FFG or discretionary classification, and the ten possible HSR values from 0.5 to 5.0. In the absence of formally endorsed HSR cut-offs, we identified products as outliers as follows:

- FFG outliers: products categorised as FFG but with a HSR <3.0, suggesting an inappropriately unhealthy nutritional profile; or
- Discretionary outliers: products categorised as discretionary but with a HSR ≥3.0 stars, suggesting an inappropriately healthy nutritional profile.

The cut-off point at 3 stars broadly aligns with the NPSC score for foods able to carry a health claim³⁰. The rationale for this decision is further outlined in detail in the TAG paper that outlines the development of the HSR system.

Examination of outlier cause

To further understand the reasons for outlier status of products, we examined the mean and median content of key HSR defining nutrients in each category of outliers and compared this with a comparator product. The intention of using a comparator product was to provide additional contextualised nutritional information in order to understand the products' relative healthiness. In most cases, an unbranded product equivalent was chosen as the comparator and sourced from the NUTTAB 2010 on-line searchable database³¹ with the closest descriptor chosen. If a suitable comparator was not available in NUTTAB 2010, a suitable product from the AUSNUT 2011-13 Food Nutrient database was used instead.³² In a few cases, a comparator other than a product equivalent was used, for example, 'takeaway hot chips' were used as a comparator for 'frozen oven-baked chips'. Similarly, in the high fat yoghurt category, a discretionary 'dairy dessert' choice was added as a comparator.

Five-digit classification groups containing less than five products were assessed further only if there were more than five products at a three-digit classification level e.g. all 109 yoghurts were assessed, even though some five-digit classification groups for yoghurt contained less than five products.

All other five-digit classification groups containing less than five products were not assessed. They were considered too small to be significantly contributing to misalignment with the dietary guidelines and the few products meant that meaningful comparisons could not be made. The only exception was breakfast cereals which were included because they had been identified as an outlier in other research and have attracted considerable media attention.

The drivers of outlier status were used to develop evidence-informed recommendations about which outliers TAG should address.

³⁰ Dunford, E.K.; Huang, L.; Peters, S.A.E.; Crino, M.; Neal, B.C.; Ni Mhurchu, C. (2018). Evaluation of Alignment between the Health Claims Nutrient Profiling Scoring Criterion (NPSC) and the Health Star Rating (HSR) Nutrient Profiling Models. *Nutrients*, 10, 1065.

³¹ NUTTAB 2010 Online Searchable Database, Food Standards Australia New Zealand.
<http://www.foodstandards.gov.au/science/monitoringnutrients/nutrientables/nuttab/Pages/default.aspx> [Accessed 9 April 2018]

³² AUSNUT 2011-13 Food Nutrient Database. Food Standards Australia New Zealand.
<http://www.foodstandards.gov.au/science/monitoringnutrients/ausnut/foodnutrient/Pages/default.aspx>. [Accessed 9 April 2018]

Results

5,885 products were included in the analysis. 65% were FFG and 37% were discretionary foods.

Overall alignment with classification as FFG or discretionary

Overall alignment of the HSR with FFG and discretionary foods was 72%: a total of 84% of FFG foods scored ≥ 3.0 stars, while 61% of discretionary foods scored < 3.0 stars. The range of HSRs in both groups was 0.5 to 5.0. The mean HSR of FFG and discretionary foods was 3.5 and 2.5 respectively. The HSR distribution by FFG and discretionary is shown in Figure 2.

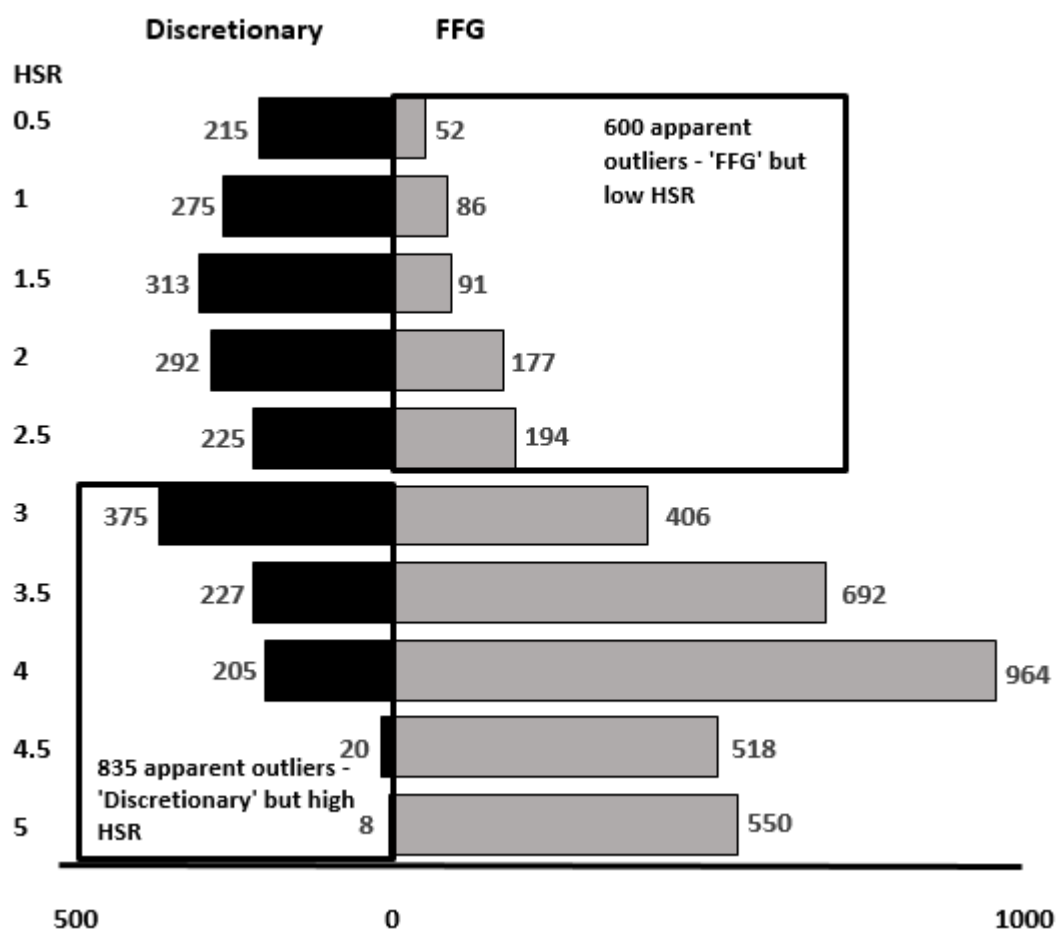
Outliers identified

As per Figure 2:

- 600 FFG outliers were identified, i.e. FFG foods with a HSR < 3.0 . 72% of these were cheeses and yoghurts.
- 835 discretionary outliers were identified i.e. discretionary foods with HSR ≥ 3.0 . These were spread across 31 product categories with the majority coming from gravies and savoury sauces (31%), soups and stocks (12%), ice creams and ice confections (11%) and muesli bars (8%).

The full analysis of the outliers can be found in Appendix 4.

Figure 2: Distribution of HSR in the TAG database by FFG and discretionary categorisation using a HSR cut-off of 3.0



Reasons for outlier status

Around 2% of the sample (11% of FFG outliers (n=66) and 8% of discretionary outliers (n=67)) were not further assessed because the number of products was considered to be too small (their five-digit classification group contained less than five products). The nutrient content of the remaining outliers was assessed against relevant product comparators and the following types of outliers were identified (see also Table 2).

GROUP 1: Actual outliers - discretionary foods with a HSR ≥ 3.0 but an unhealthy nutritional profile i.e. they are scoring higher than expected based on their nutritional composition.

- These represent around one half of discretionary outliers identified and include:
Muesli bars, recipe mixes, ice confection, ice cream, salty snacks, jelly, dairy desserts, gravies, processed meat, and a small number of breakfast cereals. All of these foods are directly being considered by TAG in other papers except for processed meat, crumbed fish, coffee-based beverages and a small number of breakfast cereals, which are looked at indirectly through other TAG papers.

GROUP 2: Miscategorised outliers consisting of:

- FFG foods with a low HSR and unhealthy nutritional profile.
These foods appear 'high' in salt, saturated fat and/or sugar, making it arguable they warrant classification as discretionary in the AHS list e.g. instant noodles, rice crackers and smoked salmon (n=35, representing 7% of FFG outliers).
- Discretionary foods with a high HSR and absolute and/or relatively healthy nutritional profile.
Where these foods are not high in salt, saturated fat or sugar it is arguable that their classification as discretionary in the AHS is not warranted e.g. tomato-based pasta sauces, vegetable-based dips, oven-baked potato products and crumbed fish OR they could be considered to have an appropriate HSR within their category e.g. healthier versions of savoury sauces (not tomato-based), pickles/chutneys and savoury breads (n=64, representing 8% of discretionary outliers).

GROUP 3: Possibly miscategorised outliers - Dairy foods with a low HSR and a relatively low nutritional profile within their category such that they obtain a lower HSR than many discretionary foods

These are predominantly cheeses and represent more than 90% of FFG outliers. Their mean HSR is around 2.0 and the concern is that they are still considered to be FFG foods and should therefore have an HSR that is higher than that of most discretionary foods. The mean HSR for discretionary foods in the TAG database is 2.5

Discussion

Our analysis suggests the scope of actual misalignment between the HSR algorithm and the ADG classification of foods as FFG or discretionary is less than the 28% initially estimated from the TAG dataset. At least one third of foods initially classified as outliers may have been misclassified because they do not have a corresponding outlier nutritional profile. One third are likely to be actual outliers; these foods are being considered in other TAG papers.

The overall alignment results are somewhat consistent with findings from other studies, summarised in Table 3, where the scope of misalignment ranges from 13-26% depending on the dataset used and HSR cut-offs applied. However, all studies have consistently shown a significant difference in the mean HSR of FFG and discretionary foods. Outliers identified in the TAG database are also largely consistent with the findings of previous work.

Table 2: Summary of types of outliers identified in this analysis

	% of outliers analysed	Description	Products	Possible options to resolve
Group 1	32%	Actual outliers: discretionary foods scoring higher than expected based on nutritional profile. <i>These represent around 50% of discretionary outliers analysed.</i>	Muesli/cereal bars, recipe/sauces mixes, ice confection, ice cream, dry gravy mixes, salty snacks, coffee-based beverages, sugar-based desserts e.g. jelly, dairy desserts, processed meat and breakfast cereals.	Change the HSR algorithm and/or HSR Category classification
Group 2	31%	Miscategorised outliers: Either FFG foods with a low HSR and unhealthy nutritional profile OR discretionary foods with a high HSR and an absolute or relatively healthy nutritional profile. <i>These represent around 7% of FFG and 50% of discretionary outliers analysed.</i>	<p><u>FFG foods with an unhealthy nutritional profile:</u> rice based crackers, instant noodles, pasta & sauce products, peanut butter, smoked salmon/anchovies.</p> <p><u>Discretionary foods with a healthy nutritional profile:</u> tomato-based sauces, vegetable-based dips, crumbed fish and oven-baked potato products.</p> <p><u>Discretionary foods with a relatively healthy nutritional profile within their category:</u> savoury sauces (not tomato-based), pickles/chutneys and savoury breads.</p>	Re-consider the FFG and discretionary classification of these products
Group 3	37%	Possibly miscategorised outliers: FFG foods with a low HSR and relatively low nutritional profile <u>within their product category</u> . <i>These represent more than 90% of FFG outliers analysed.</i>	Cheese, yoghurt, flavoured milk and custard	For consideration

Table 3: Summary of research examining alignment of the HSR with the Australian Dietary Guidelines

Study	No. Products	HSR cut-off applied	Results			Comments
			Overall alignment	FFG outliers	Discretionary outliers	
TAG database	5,885 across 54 product categories (65% FFG and 37% discretionary)	<3.0 to define FFG outliers ≥3.0 to define discretionary outliers	Overall alignment of 72%: 84% of FFG foods scored ≥3.0. 61% of discretionary foods scored < 3.0. Mean (median) HSR for FFG foods was 3.5 (4.0). Mean (median) HSR for discretionary foods was 2.5 (2.0)	Cheeses (248), yoghurts (109), milks (24) and custards (17)	Dry soups/stock cubes (130 products), muesli/cereal bars (80), dry casserole/ sauce mixes (75), ice confections (75), tomato-based pasta sauces (69), gravies (61), crumbed fish (49), non-tomato based sauces (43), potato fries/wedges (36), coffee-based beverages (22), ice-creams (21), jellies (19), crisps (18), dairy desserts (15), processed meat (31), pickles/chutneys (12), vegetable-based dips (10) and savoury filled/topped bread (9)	This dataset relied on data voluntarily provided by the food industry and may therefore not be fully representative of the food supply.
Dunford et al 2015 ³³	11,500 across 30 product categories (54% FFG and 46% discretionary)	<3.5 to define FFG outliers. ≥ 3.5 to define discretionary outliers	Overall alignment of 82%: 79% FFG foods scored ≥3.5 and 86% discretionary foods scored <3.5. Mean HSR for FFG foods was 3.7. Mean HSR for discretionary foods was 1.9. Significant difference in mean HSR between FFG and discretionary of 1.76 stars (95% CI = 1.72, 1.79,	Cheeses (228) and yoghurts (166)	Processed meats such as salami (197), salty snacks (179), crumbed frozen fish (103), oven-baked potato products (78), muesli/snack bars (70), dairy desserts (61) and ice blocks and ice creams (39). <i>Other outliers noted: fruit juices with higher HSR than whole fruit and discretionary breakfast cereals with a HSR above 3.5 stars.</i>	2013 dataset used is likely to be representative of the food supply at the time as it contains annually updated data for packaged foods and drinks from the four major supermarket retailers in Sydney. HSR values for this dataset were estimated if not publicly available.

³³ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

Study	No. Products	HSR cut-off applied	Results			Comments
			Overall alignment	FFG outliers	Discretionary outliers	
			P<0.001).			
Jones et al 2018 ³⁴	47,116 in the Australian market between 2013-2017 (49.8% FFG and 50.2% discretionary)	≤2.0 stars to define FFG outliers. ≥3.5 to define discretionary outliers	Overall alignment of 86.6%. Median (Interquartile range - IQR) of calculated HSR was 3.0. (1.5-4.0). FFG products had a median (Quartile1. Quartile 3) HSR of 4.0 (3.0 to 4.5); while discretionary foods had a median (IQR) HSR of 2.0 (1.0 to 3.0). 90.5% FFG foods scored >2.0 stars, while 82.6% of discretionary foods received a HSR <3.5.	Of the 2219 apparent outliers identified, nearly half were dairy products. More than 95% of these products were considered to be a failure of the AHS Discretionary Food List definition of discretionary foods rather than a HSR failure because they were high in at least one risk nutrient (mostly salt and saturated fat) using the thresholds set for a 'red' traffic light in the UK system as a point of comparison. The remaining 103 outliers were considered to be a failure of the HSR and were predominately fruit/fruit flavoured yoghurts and fruit flavoured teas that were not 'high in' in any risk nutrients but still received a low HSR.	Of the 4105 apparent outliers identified, more than 75% were considered to be a failure of the AHS Discretionary Food List rather than a HSR failure because they were <i>not</i> high in any risk nutrients i.e. they appeared relatively healthy. The remaining 975 outliers were considered to be a failure of the HSR algorithm and included: salty dips, relishes and chutney, salty snacks, processed meats, ready meals and meal kits, fruit bars, pickled vegetables, breakfast cereals, cereal and nut bars, sweet biscuits and, pastries and dairy desserts. These products received high scores despite being high in salt, sugar and/or saturated fat.	Very large dataset, likely to be representative of the food supply. HSR values for this dataset were estimated if not publicly available.
Lawrence et al 2018 ³⁵	1269 products in the market and displaying a HSR (57.2% FFG and 41.3% discretionary)	< 2.5 to define FFG outliers. >2.0 to define discretionary outliers.	Mean ranking of FFG foods (median 4.0) was significantly higher than the mean ranking of discretionary foods (median 2.5) ($p <$	Some foods from the following FFGs: grains (6 products), fruit (1) <i>e.g. apple juice which is not FFG in NZ displaying 5 stars</i> , meat/legumes/nuts/ seeds/eggs (10) <i>e.g. raw, unsalted nuts</i> , and dairy/alternatives (6) <i>e.g. ricotta</i>	Some snacks (28). Examples provided were a 3.0 star flavoured ice confection, a 4.0 star protein bar and recipe bases displaying 4.0 stars when rated 'as prepared' rather than 'as sold'	Study included products that were <u>displaying a HSR in the market</u> from a commercially available dataset of 12,108 products new to the market over three years

³⁴Jones A et al (2018). Defining 'Unhealthy': A Systematic Analysis of alignment between the Australian Dietary Guidelines and the Health Star Rating System. *Nutrients* 10, 501; doi:10.3390/nu10040501

³⁵ Lawrence, M., et al. (2018). Do Nutrient-Based Front-of-Pack Labelling Schemes Support or Undermine Food-Based Dietary Guideline Recommendations? Lessons from the Australian Health Star Rating System. *Nutrients* 10(1): 32.

Study	No. Products	HSR cut-off applied	Results			Comments
			Overall alignment	FFG outliers	Discretionary outliers	
			0.05). 96.6% of FFG and 56.7% of discretionary foods received a HSR \geq 2.5.	<i>cheese displaying 1.5 stars and mixed meals (2).</i>		and is therefore representative of how the HSR is currently being implemented in the market (rather than the full food supply).
Peters et al 2017 ³⁶	34,135 products (47% FFG and 53% discretionary)	NA	Alignment expressed as area under the curve was 0.817 (0.812; 0.821). Median HSR for FFG was 4.0. Median HSR for discretionary foods was 2.0.	-	-	-
Carrad et al 2015 ³⁷	20, 225 across 16 broad product categories (34% FFG and 66% discretionary)	NA	Median %Max* score was significantly higher for FFG than discretionary products in all categories ($P<0.05$). * <i>Individual product scores were converted to a percentage of the maximum possible rating</i>	Some products scoring < 3.0 stars included: breads, noodles, pasta and rices, cheese, milk and yoghurt	Some products scoring \geq 3.0 stars included: biscuits, cereal bars, sweets, jelly, dairy desserts, ice creams, jams, processed meats, sauces, snack foods and ready to eat meals. <i>It was not possible to derive specific information about outliers from this paper as the spread of star ratings were presented for product categories and not as FFG and discretionary foods.</i>	-

³⁶ Peters S et al (2017) Incorporating added sugar improves the performance of the Health Star Rating Front-of-Pack Labelling System in Australia. *Nutrients*. 2017;9:701

³⁷ Carrad A et al (2015). A Nutrient profiling assessment of packaged foods using two star-based front-of-pack labels. *Public Health Nutrition*: 19 (12), 2165-2174.

Options to improve alignment

Around one half of discretionary outliers have been identified as actual outliers. Together these outliers represent around 7% of energy intake in the Australian diet from discretionary foods. All are already being considered by the TAG directly through a specific product category report (muesli bars, salty snacks, ice confection and ice cream, jelly and dairy desserts) or indirectly through a general nutrient report or the separate reappraisal of the 'as prepared' rules in the HSR system (processed meat, coffee-based beverages, breakfast cereals, recipe bases, gravy). Table 4 summarises approaches to resolving these outliers. Details of these products, with additional contextual information are provided in Table 5.

Table 4: Approaches to resolving Group 1 (actual) outliers

Will require a change to the HSR Algorithm	Will not require a change to the HSR algorithm
<i>A change to the HSR algorithm is likely to be required to resolve these outliers. Solutions include removing these discretionary food items into a separate HSR category and re-scaling <u>or</u> not permitting positive nutrients to be counted.</i>	<i>These outliers can generally be resolved by re-classification rather than a change to the algorithm i.e. by moving the products to another HSR Category or changing the requirements in the industry guide. However, any changes will require re-scaling of products in the HSR Category affected.</i>
Muesli bars, Salty snacks, Processed meat, Ice cream, Gravies, Coffee-based beverages, Breakfast cereals	Recipe mixes, Ice confection, Jelly, Dairy desserts

Some outliers are not recommended to be addressed by the TAG because the analysis suggests they are the result of limitations of the FFG/discretionary classification rather than a failure of the HSR system, based on their nutritional profile (Group 2). This group also includes discretionary foods with a high rating that represent considerably healthier choices within their category and for this reason, may not be outliers. A list of these with a rationale is provided in Table 6.

A number of outliers were challenging to assess because of uncertainty around the definition of FFG and discretionary foods, and whether the HSR system should demarcate between FFG and discretionary foods as recommended by some respondents to the Five Year Review (Group 3). These outliers (provided in Table 7) all fall within the dairy categories (HSR Categories 1D, 2D and 3D). These outliers have arisen due to a previous decision to ensure these products align closely to the messages of Dietary Guidelines by having good differentiation between low and high fat dairy products, and also aligning to the objective of the HSR system to provide information to help consumers select healthier product choices. As a consequence of stretching the star ratings of a relatively small group of products, low scoring dairy are obtaining a lower HSR than many discretionary foods. There are concerns that this may be undermining the system and not supporting consumers to select some, in particular dairy FFG foods, over discretionary foods.

The footnote on page 6 of the Guide for Industry to the Health Star Rating Calculator states that the

Dairy foods was the one food category with a very narrow range of HSR scores due to their derivation from a single food source (milk) and giving them a slightly wider range of star ratings allows for more informed consumer choice in this product range. The star ratings for dairy foods have been designed to support the ADG which include dairy foods (no added sugar) in their foundation diets. For example, dairy products based on reduced fat milks are assigned a higher star rating than full fat milk counterparts and products with added sugar are assigned.

It is important to note that because this analysis used the FFG and discretionary definitions to define outliers, it was unable to identify outliers within FFG food categories that have been identified in other research and by stakeholder comment. These include 100% fruit juice having a higher HSR than some whole fruit and refined grains such as white bread not necessarily obtaining a lower HSR than wholegrain products such as wholemeal bread. These issues are however being addressed by other TAG papers.

Based on the TAG dataset, resolving Group 1 outliers alone is estimated to improve overall alignment of the HSR with the dietary guidelines from its current 72% to up to 82%. Addressing the possible misclassification of other outliers (Groups 2 and 3) will further improve alignment.

While improvements in alignment of the HSR with the Dietary Guidelines can be made, differences in the dietary guidelines between countries and the dynamic nature of the food supply mean that obtaining 100% alignment will not be possible.

Table 5: Group 1: Outliers recommended to be addressed by the TAG (n= 502 products, representing 60% of discretionary outliers)

This group of products consists of discretionary foods that are receiving a HSR ≥ 3.0 stars despite having an unhealthy nutritional profile.

Food or drink product	TAG database		No. of products (NSW Health report ³⁸)	Estimated total no. of product in this category ³⁹	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁰	Description of issue	Already being considered by TAG?
	Mean HSR (range)	No. products					
Discretionary foods with a high HSR but a low nutritional profile							
Muesli/cereal bars	3.8 (3.0-5.0)	83	70	172 (cereal-based bars)	0.6% from 'muesli or cereal style bars'	These products have a more favourable positive and negative nutrient composition than others in the category but there may be individual products with a higher score than expected e.g. those with added confectionary, including a yoghurt or chocolate topping. Most of these products would still be considered to be moderately high in sugar and in some case saturated fat despite their overall better nutritional profile within the category.	Yes – directly in the 'Snack bars' TAG paper
Fruit bar/fruit-based confectionary	3.3 (3.0-4.0)						
Dry casserole/ recipe mix/sauce mixes <i>Dry flavour mixes for common dishes such as chilli con carne or spaghetti bolognaise. Meat +/- vegetables +/- grains need to be added</i>	3.6 (3.0-4.0)	75	NA	186 (recipe concentrates – powder and liquid)	0.6% from 'gravies and savoury sauces' (includes tomato based sauces)	These products receive a high HSR because they have been assessed 'as prepared' as a meal with fresh ingredients added. Their content of negative nutrients when scored 'as prepared' is quite low and as a result, these products are also able to count around 4-5 protein points from the meat that would be added to the dry powder to make the meal. Assessed as a dry product only without added ingredients, their HSR would be significantly lower. When assessed 'as prepared' their nutritional profile is similar to a home-made meal equivalent except the sodium content is slightly higher. The main concern here is that consumers do not necessarily make up the product according to the directions on the pack.	Yes – directly through the reappraisal of the 'as prepared' rules – <u>on 29 June 2018 Australian and New Zealand Ministers with responsibility for food regulation agreed to limit the application of the HSR system to products 'as sold,' with specific exemptions for products which are rehydrated with water, diluted with water, drained of water or drained of brine</u>
Ice confection	3.1 (3.0-3.5)	48			1.5% from 'frozen milk'	This is an issue for products with minimal positive or negative nutrients in Category 2. These products achieve a 'neutral' rating of 3.5 while in Category 1	Yes – directly in the 'Ice confection/ice cream/jelly'

³⁸ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System. Sydney, NSW, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

³⁹ Information obtained from FoodTrack™ food and drink database and matched to most closely corresponding food and drink category. <https://www.csiro.au/en/Research/Health/CSIRO-diets/FoodTrack>

⁴⁰ ABS (2014), Australian Health Survey: Nutrition First Results - Foods and Nutrients, 2011-12, 'Table 8: Proportion of Energy from food groups'. Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/lookup/4364.0.55.007main+features12011-12> [Accessed 12 April 2018]

Food or drink product	TAG database		No. of products (NSW Health report ³⁸)	Estimated total no. of product in this category ³⁹	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁰	Description of issue	Already being considered by TAG?
	Mean HSR (range)	No. products					
			39	44 (frozen desserts- fruit based) 545 (frozen desserts-dairy and soy-based)	products'	(non-dairy beverages) they would receive a HSR of 0.5-1.0. In the case of ice confection, while high in a single negative nutrient (sugar), these products have minimal other nutrient content and are diluted by a high water content.	paper.
Ice creams ≤4.0g fat /100g	3.2 (3.0-3.5)	27			1.5% from 'frozen milk products'	These products are not necessarily healthier versions within the category. They have a lower mean saturated fat content/higher mean protein content but also higher mean sugar content than the comparator products. The low sodium content of this category may also contribute to their high rating.	Yes – directly in the 'ice confection/ice cream/jelly' paper
Ice creams 4-10g fat /100g	3.0 (3.0-3.5)	13				Analysis in Ice Confection paper showed that 12/25 products that get 3.5 stars do not pass the NPSC.	
Dry gravy mixes Gravies (prepared)	3.0 (3.0-3.5)	34 27	NA	98 (finishing sauces, including all gravy types)	0.6% from gravies and savoury sauces (includes tomato based sauces)	These products receive a HSR of 3.0 because they are rated 'as prepared' with water. The key defining nutrient is sodium and these products would obtain 28 out of a maximum 30 sodium points if rated as sold. When rated 'as prepared', they only obtain 5 sodium points. Their nutritional profile when compared with home-made gravy is lower in energy and saturated fat but higher in sodium. Their mean sodium level per 60 mL serve is 287 mg which equates to 14% of the Suggested Dietary Target for sodium of 2000 mg/day ⁴¹ .	Yes – directly through the reappraisal of the 'as prepared' rules. However, the agreed approach, which permits some products to be scored 'as prepared' with water would not address this issue - these products would continue to obtain a HSR score of 3.0 when prepared with water.
Salty snacks (crisps, corn chips and extruded snacks)	3.5 (3.0-4.5)	18	179	417 (crisps and similar snacks)	0.9% from 'potato snacks', 0.3% for 'corn snacks' and 0.2% for 'extruded or reformed snacks'	Fibre and a relatively low saturated fat and sodium content are driving the high HSR of these products, along with FVNL content for some products. They do represent healthier product within the category but are still considered to be discretionary foods to limit.	Yes – directly in the 'Salty snacks' paper
Coffee-based beverages	3.2 (3.0-4.0)	22	NA	42 (tea and coffee)	1.2% from 'coffee and coffee	These products are dry powders containing sugar and whitener that are made by adding hot water. They are slightly higher in saturated fat and less	Yes – directly in the 'as prepared' paper.

⁴¹NHMRC. (2017). Nutrient reference values - Sodium. Available at <https://www.nrv.gov.au/nutrients/sodium> [Accessed 12 April 2018]

Food or drink product	TAG database		No. of products (NSW Health report ³⁸)	Estimated total no. of product in this category ³⁹	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁰	Description of issue	Already being considered by TAG?
	Mean HSR (range)	No. products					
					substitutes'	nutritious (lower in protein and calcium) than a freshly made coffee with milk. Their HSR score would be lower as sold because of the high energy and sugar content of these products.	However, similar to gravies, the agreed approach to permit some products to be scored 'as prepared' with water would not address this issue - these products would continue to obtain a HSR score of 3.0 when prepared with water.
Sugar-based desserts e.g. Jelly	3.3 (3.0 – 3.5)	19	NA	59 (jelly only)	0.2% from 'Dishes and products other than confectionery where sugar is the major component'	Similar to ice confectionary, this is an issue for products with minimal positive or negative nutrients in Category 2.	Yes –directly in the 'ice confectionery/ice cream/jelly' TAG paper
Dairy desserts	3.2 (3.0 – 3.5)	15	61	559 (yoghurt and dairy desserts)	0.3% from 'Other dishes where milk or a milk product is the major component'	Most dairy desserts are classified as discretionary foods but are achieving a higher HSR than some FFG dairy foods that would also be consumed as a dessert such as yoghurt.	Yes – this has been identified as an anomaly and HSRAC's preferred option is to include dairy desserts in a revised category 2D – this is expected to reduce the number of dairy desserts scoring 3.0 or above.
Processed meat (including ham)	3.3 (3.0 – 4.0)	31	197	254 (small goods)	1.1% from 'processed meat'	These products are healthier versions within the category, with a relatively lower energy, saturated fat and sodium content. This enables these products to be able to count protein points which is also contributing to their high rating. However, their absolute sodium content is high (mean: 740 mg/100 g). A serving of 30 g equates to 12% of the Suggested Dietary Target of 2000 mg/day. Dietary guidelines also recommend limiting processed and cured meats as they can be high in added salt and saturated fat and are not recommended as substitutes for unprocessed meat. It may therefore not be appropriate for these products to receive a mean HSR of 3.3 despite their healthier profile within the category.	Yes, indirectly in the 'Sodium' paper.
Breakfast cereals	3.5	1	2	-	3.7% from 'breakfast	Only one product in the TAG database was found. However, this category has been raised as an area	Yes - but indirectly in the "Added sugar",

Food or drink product	TAG database		No. of products (NSW Health report ³⁸)	Estimated total no. of product in this category ³⁹	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁰	Description of issue	Already being considered by TAG?
	Mean HSR (range)	No. products					
					cereals, ready to eat' (includes non-discretionary breakfast cereals)	of misalignment in other research because a small number of products in this category are viewed as having a high sugar content. Breakfast cereals are currently classified as discretionary if they have a sugar content of >30 g/100 g but concern has been raised about products containing 20-30% sugar. The HSR algorithm takes into account the product's positive nutrients content, which in some cases results in a higher HSR than expected for higher sugar cereals (i.e. those with added fibre and/or protein). These products, while small in number have received considerable media attention.	"Wholegrains/fibre" and "Protein" papers.

Table 6: Group 2: Outliers not recommended to be addressed by the TAG

This group consists of products that could be considered to be misclassified due to limitations of the AHS Discretionary Food List classification as FFG/discretionary rather than a failure of the HSR system and are therefore not outliers. Some of these products are also too small in number, both in absolute terms and relative to the overall size of their product category, to address.

Food or drink product	Mean HSR (range)	No. of products (TAG database)	No. of products (NSW Health report ⁴²)	Estimated total no. of product in this category ⁴³	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁴	Description of issue	Reasons to not address
Five Food Group foods with a low HSR and a low nutritional profile: these foods could be considered to be misclassified as FFG and not an outlier							
Rice based crackers	2.0 (0.5 – 2.5)	11	0	389 (Savoury biscuits – all)	1.1% for 'savoury biscuits' (includes discretionary types), 9.9% for 'Mixed dishes where cereal is the major ingredient' (includes discretionary types) and 1.2% for 'Pasta and pasta products (without sauce)'	These products appear to justifiably receive a low HSR as they represent less healthy versions within their category – relatively higher in energy, saturated fat and sodium. However, some are a source of fibre. Instant noodle products should arguably be classified as discretionary, given their high energy, saturated fat and sodium content.	A small number of products (in absolute terms and relative to the size of the product category) are affected and the score seems appropriate to their nutritional composition. May be considered as part of wholegrain/fibre/biscuit TAG papers. Any future work to define discretionary foods should consider reclassifying instant noodles as discretionary.
Instant noodles	2.1 (2.0 – 2.5)	12	0	238 (processed pasta and noodles)			
Pasta & sauce products	1.2 (0.5 – 2.5)	7	0				
Peanut butter products	1.9 (1.5 – 2.5)	6	0	83 (nut and seed spreads)	1.5% for 'nuts and nut products'	These products receive a low HSR because they are relatively higher in sugar and salt than some other products in the category. However, they are also nutritious products and a source of fibre.	A small number of products (in absolute terms and relative to the size of the product category) are affected and the score seems appropriate as they

⁴² Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System. Sydney, NSW, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

⁴³ Information obtained from FoodTrack™ food and drink database and matched to most closely corresponding food and drink category. <https://www.csiro.au/en/Research/Health/CSIRO-diets/FoodTrack>

⁴⁴ ABS (2014), Australian Health Survey: Nutrition First Results - Foods and Nutrients, 2011-12, 'Table 8: Proportion of Energy from food groups'. Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/lookup/4364.0.55.007main+features12011-12> [Accessed 12 April 2018]

Food or drink product	Mean HSR (range)	No. of products (TAG database)	No. of products (NSW Health report ⁴²)	Estimated total no. of product in this category ⁴³	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁴	Description of issue	Reasons to not address
							represent the less healthy versions.
Smoked salmon/anchovies	NA	NA	NA	-	-	<p>These products were not identified in the TAG database but have been identified as outliers in other research. They receive a low HSR because of their high sodium content (1266 mg/100 g (smoked salmon) and 5480 mg/100 g (anchovies)⁴⁵).</p> <p>Smoked salmon has also been regularly used as an example of misalignment in the media, where it has been compared to a higher scoring discretionary food.</p>	A small number of products are affected, and their score seems to be appropriate as they represent the less healthy versions (i.e. high in sodium).
Discretionary foods with a high HSR but a positive nutritional profile. These foods could be considered to be misclassified as discretionary and not an outlier							
Oven-baked hot potato products (chips/wedges)	4.1 (3.0-4.5)	35	78	62 (frozen potato products)	3.2% from potatoes (includes discretionary and FFG products)	FNVL content and a relatively low saturated fat and sodium content is driving the high HSR of these products, along with fibre content for some products. They do represent healthier products within the category and have an overall healthier profile than salty snacks such as chips. However, they are still considered to be discretionary foods to limit.	Yes – ‘Salty snacks’ TAG paper will address hot potato products
Savoury sauces, tomato-based e.g. pasta sauces	3.9 (3.0 – 4.5)	69	0	350 (cooking sauces, including pasta and creamy sauces, pesto)	0.6% from gravies and savoury sauces (includes non-discretionary types)	These products receive a high HSR. Their classification as discretionary may not be appropriate. They may not be quite as healthy as a home-made version for all nutrients but have a high FVNL content and can be used to make a healthy pasta meal.	These are reasonably healthy products – arguably should not be classified as discretionary and therefore not be considered outliers. Any future work to define discretionary foods should consider reclassifying these products.

⁴⁵ NUTTAB 2010 Online Searchable Database, Food Standards Australia New Zealand. <http://www.foodstandards.gov.au/science/monitoringnutrients/nutrientables/nuttab/Pages/default.aspx> [Accessed 9 April 2018]

Food or drink product	Mean HSR (range)	No. of products (TAG database)	No. of products (NSW Health report ⁴²)	Estimated total no. of product in this category ⁴³	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁴	Description of issue	Reasons to not address
Fish and seafood products	3.5 (3.0-4.0)	49	103	198 (seafood – processed)	0.9% from 'Fish and seafood products (homemade and takeaway)'	These products have a better nutritional profile than comparator products that are generally considered to be unhealthy choices. They can obtain a high HSR because their content of negative nutrients is low enough to permit them to count protein points. They obtain 7 out of a maximum 15 protein points.	No but they could be addressed indirectly in the "protein" paper.
Vegetable/dairy/legume-based dips	3.6 (3.0-4.0)	10	0	208 (dips – all)	0.2% from dips	Similar to tomato-based pasta sauces, it is unclear why these products have been classified as discretionary as they have a reasonably healthy nutritional profile and positive benefits with vegetable content. Jones et al identified that 90% of these products could be considered a failure of the definition of discretionary rather than the HSR as they are not high in saturated fat, sodium or sugar.	A small number of products are affected. This product category should arguably not be classified as discretionary and therefore not be considered outliers. Any future work to define discretionary foods should consider reclassifying these products.
Dry soup mix. Stock cubes	3.1 (3.0-3.5) 3.5 (3.0-4.0)	101 29	0 0		0.0% from 'dry soup mix'	These products receive a high HSR because they have been scored as prepared with water or milk added. Their HSR is low if scored as sold (dry mix)	These products obtain a high HSR because they have been assessed 'as prepared' with water and/milk. They are not classified as discretionary products when made up and are therefore not outliers.
Discretionary foods with a high HSR because they have a relatively healthy nutritional profile within their category. These foods could be considered to be scoring appropriately within their category.							
Savoury sauces, not tomato based, commercial e.g. oyster sauce, soy sauce, fish sauce, mustard, pesto, black bean etc.	3.3 (3.0 – 4.0)	43	0	226 (tomato and other table sauces)	0.6% from gravies and savoury sauces (includes non-discretionary types)	A range of products in this category are receiving a high HSR including some cream-based pasta sauce, stir-fry sauces and mint sauce. The nutritional profile of these high scoring sauces is healthier than comparator products, so they are probably representing healthier products within the category. Their high score is due to their low content of negative nutrients (they are not able to count positive HSR components). Jones et al found that just over 50% of table sauces and 90% of ambient meal-based sauces could be considered a failure of the ADG rather than the HSR	These products represent healthier versions within this category and are also ingredients used to add to FFG foods to make meals. However, they could also be classified as actual discretionary outliers (Group 1).

Food or drink product	Mean HSR (range)	No. of products (TAG database)	No. of products (NSW Health report ⁴²)	Estimated total no. of product in this category ⁴³	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁴	Description of issue	Reasons to not address
						because they did not contain high levels of saturated fat, sodium or sugar.	
Pickles/chutneys	3.4 (3.0 – 4.0)	12	0	435 (relishes, chutneys and pastes)	0.1% from 'pickles, chutneys and relishes'	<p>These products have relatively lower sugar and energy content and have slightly higher fibre content than comparator products. This, combined with their high FVNL content, explains their HSR.</p> <p>Jones et al identified just under 40% of these products could be identified as a failure of the ADG rather than the HSR because they did not contain high levels of saturated fat, sodium or sugar⁴⁶</p> <p>However, the HSR algorithm does not account for the fact that these products are often preserved. The ADG provides grade C evidence that consuming preserved vegetables is associated with increased risk of some cancers.</p>	These products represent healthier versions within this category. A small number of products are affected and they are usually served in quantities < 100 g. They are also low contributors to energy intake. As per savoury sauces above, they could also be considered to be actual discretionary outliers.
Savoury filled/topped bread	3.5 (3.5-3.5)	9	0	558 (bread-all)	1.5% from 'English-style muffins, flat breads, and savoury and sweet breads'	This product category is classified as discretionary because of their high sodium content. However, these products have relatively lower sodium, energy and saturated fat, and higher fibre content than the comparator so may represent a genuinely healthier choice.	A small number of products are affected and they represent a healthier choice within the category.

⁴⁶ Jones A et al (2018). Defining 'Unhealthy': A Systematic Analysis of alignment between the Australian Dietary Guidelines and the Health Star Rating System. *Nutrients* 10, 501; doi:10.3390/nu10040501

Table 7: Group 3: Outliers requiring consideration

Food or drink category	Mean HSR (range)	No. of products (TAG database)	No. of products (NSW Health report ⁴⁷)	Estimated total no. of product in this category ⁴⁸	Estimated % energy from food group (aged 2 years and over) (Australia) ⁴⁹	Description of issue	Already being considered by TAG?	For consideration
Five Food Group dairy foods with a low HSR and a relatively low nutritional profile within their category. The key issue here is that they are scoring lower than many discretionary foods.								
Cheese	1.7 (0.5-2.5)	321	227	728 (cheeses – all types)	1.9% from 'cheese'	These products receive a lower HSR because they are less healthy choices within their category i.e. products are relatively higher in one or multiple risk nutrients – particularly saturated fat and sodium for cheese and saturated fat and sugar for yoghurt.	Some yoghurt products may be addressed by the proposal to move dairy desserts to HSR Category 2D. This will slightly increase the HSR of some yoghurts.	A decision was previously made to extend the range of HSR values for dairy foods in order to improve differentiation between high and low fat products, in line with the Dietary Guidelines. This has resulted in some dairy foods obtaining a lower HSR than some discretionary foods. <i>Should all dairy foods obtain a higher HSR than discretionary foods?</i> <i>Or is more important to continue to have differentiation between high and low saturated fat dairy products?</i> <i>Should all dairy foods be considered to be FFG foods or are some considered to be discretionary?</i>
Yoghurts	1.8 (0.5-2.5)	111	166	559 (yoghurt and dairy desserts)				
Flavoured milk drinks (full fat)	2.4 (2.0-2.5)	24	-	191 (flavoured milk and milk alternatives, includes milk modifiers)		This nutrient-based differentiation is consistent with the Australian and New Zealand dietary guidelines that recommend consuming mostly low or reduced fat dairy products: "Full fat cheese should be limited to two to three serves a week, or replaced with cheeses that have reduced levels of fat" ⁵⁰		
Custards	1.9 (0.5-2.5)	17	-			However, these products are still considered to be FFG foods and will have the same or a lower rating than many discretionary foods.		

⁴⁷ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System. Sydney, NSW, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

⁴⁸ Information obtained from FoodTrack™ food and drink database and matched to most closely corresponding food and drink category. <https://www.csiro.au/en/Research/Health/CSIRO-diets/FoodTrack>

⁴⁹ ABS (2014), Australian Health Survey: Nutrition First Results - Foods and Nutrients, 2011-12, 'Table 8: Proportion of Energy from food groups'. Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/lookup/4364.0.55.007main+features12011-12> [Accessed 12 April 2018]

⁵⁰ National Health and Medical Research Council (2013) Educator Guide. Available at: https://www.eatforhealth.gov.au/sites/default/files/files/the_guidelines/n55b_eat_for_health_educators_guide.pdf [Accessed 9 April 2018]

Strengths and limitations of this analysis

TAG database

This analysis is based on data in the TAG database but also draws from other recent research and datasets. A strength of the TAG database is that it contains up-to-date industry data. However as data was provided by industry as commercial in confidence, information from the database is not publicly available. The TAG database also underrepresents the number of food products in the supermarket, which has been estimated to be more than 20,000.⁵¹ It is also likely to underrepresent discretionary categories in particular, as other studies have indicated that around 50% of products in the supermarket are discretionary foods and drinks, compared to 37% in this dataset (See Table 3).

The level of alignment of the HSR with the ADG was found to be slightly lower using the TAG database (79%) than other research (82% and 86.5%). However despite these limitations, the possible outliers identified in the TAG dataset were consistent with other research (see Table 3).

Classification of foods as FFG or discretionary

A broader limitation of this analysis is that it relied on the AHS Discretionary Food List⁵² classification of foods as discretionary or not, to determine alignment of the HSR with the Dietary Guidelines. This definition was developed with the purpose of analysing the results of the AHS 2011-13 and was not designed to be used in this application. The definition appeared to work well to identify the main outliers, particularly for discretionary foods. However a number of possibly misclassified products were identified which may have underestimated alignment of the HSR with the Dietary Guidelines. In addition, use of the AHS List did not capture the following outliers raised by stakeholders in their responses to the HSR Five Year Review:

- Fruit juices with a higher HSR than whole fruit (fruit juice is not considered to be discretionary so was not assessed as an outlier)
- Breakfast cereals with a sugar content ≤ 30 g/100 g (respondents raised concerns about breakfast cereals with a sugar content of 20-30 g/100 g but only cereals with a sugar content > 30 g/100 g are considered to be discretionary according to the AHS List)
- Breakfast beverages which rate highly, as these products are not classified as discretionary in the AHS List, though they were raised by respondents as an area of concern
- Grains (cereal) foods where the HSR does not appear to differentiate between refined/white versions and the wholegrain/high fibre versions that are recommended to be consumed more frequently (both are considered to be FFG foods)
- Fruit, vegetables/legumes/beans and nuts, where varieties of foods within each of these groups are treated as being equally healthy by the Dietary Guidelines but the HSR values vary e.g. one fruit may obtain a higher HSR than another fruit
- Unsaturated fats and oils, where products within this group are also treated as being equally healthy by dietary guidelines but the HSR values vary e.g. olive oil has a lower HSR than canola oil.

⁵¹ Australian Institute of Health and Welfare 2012. Australia's food & nutrition 2012. Canberra: AIHW. Available at: <https://www.aihw.gov.au/getmedia/0c26b145-81fa-4a94-af38-d52515885a07/12504.pdf.aspx?inline=true> [Accessed 18 June 2018]

⁵² ABS. (2014). Australian Health Survey: Users' Guide, 2011-13 — Discretionary Food List. Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4363.0.55.001Chapter65062011-13>. [Accessed 2 February 2018]

Limitations related to the HSR algorithm

Our ability to measure alignment to the Dietary Guidelines was limited by the components of foods considered by the HSR algorithm. For example, the HSR algorithm includes total sugar but the Dietary Guidelines recommend limiting added sugars. Similarly, the HSR includes fibre but the Dietary Guidelines recommend consuming wholegrains.

Our analysis was also limited in scope to packaged products only. While existing research suggests a large number of FFG foods come in packages (suggesting that not all packaged foods are unhealthy), some foods recommended by the Dietary Guidelines (e.g. whole fresh fruit and vegetables) are generally sold without packaging. Current consideration of whether to extend HSR to these products (e.g. through shelf 'talkers') could further enhance alignment between the HSR and Dietary Guidelines.

Conclusion

This analysis was based on data from the TAG database but drew on other research and datasets. Depending on the dataset and cut-offs used, these analyses have found a starting point of alignment between the HSR algorithm and the ADG of between 72-86%. Depending on the dataset and cut-offs used, these analyses have found a starting point of alignment between the HSR algorithm and the ADGs of between 72-86%.

In the TAG dataset, one third of all outliers identified were determined to be actual discretionary food outliers (Group 1 outliers). These are currently being considered in other TAG papers and could be resolved by changes to the HSR algorithm and/or changes to the HSR Category classification. We estimate that management of Group 1 outliers alone could improve overall alignment of the HSR with dietary guidelines from 72% to up to 82% in the TAG dataset, and potentially much higher in other datasets where alignment was measured at a higher starting point.

Another one third of outliers identified were assessed as being misclassified as FFG or discretionary and may therefore not be outliers. The remaining one third of outliers identified consists of low scoring dairy foods. Consideration needs to be given to the relative importance of ensuring these foods have a higher score than discretionary products versus ensuring effective differentiation between high and low saturated fat dairy at a product category level. Whether some dairy foods should be classified as discretionary foods also needs to be considered. Addressing these groups would further improve alignment, though an ultimate percentage will depend upon the courses of action pursued.

APPENDIX 1: Available definitions of discretionary foods and drinks

1. Australian Dietary Guidelines⁵³

Discretionary foods: This includes foods and drinks not necessary to provide the nutrients the body needs, but that may add variety. However, many of these are high in saturated fats, sugars, salt and/or alcohol, and are therefore described as energy dense. They can be included sometimes in small amounts by those who are physically active but are not a necessary part of the diet.

Foods in this category include cakes, biscuits; confectionary, chocolate; pastries, pies; ice confections, butter, cream, and spreads which contain predominantly saturated fats; potato chips, crisps and other fatty or salty snack foods; sugar-sweetened soft drinks and cordials, sports and energy drinks and alcoholic drinks.

2. Australian Dietary Guidelines summary⁵⁴

Discretionary choices (page 27): 'Discretionary choices' are called that because they are not an essential or necessary part of healthy dietary patterns. These foods and drinks appear in the bottom right-hand corner of the Australian Guide to Healthy Eating on page 4. Discretionary choices are high in kilojoules, saturated fat, added sugars and/or salt or alcohol. Most Australians consume too many discretionary choices instead of choosing foods from the Five Food Groups.

Examples of discretionary choices include: most sweet biscuits, cakes, desserts and pastries; processed meats and sausages; ice-cream and other ice confections; confectionary and chocolate; savoury pastries and pies; commercial burgers; commercially fried foods; potato chips, crisps and other fatty and/or salty snack foods; cream, butter and spreads which are high in saturated fats; sugar-sweetened soft drinks and cordials, sports and energy drinks and alcoholic drinks.

If chosen, discretionary choices should be eaten only sometimes and in small amounts.

While discretionary choices can help contribute to the overall enjoyment of eating, often as part of social activities and family or cultural celebrations, most Australians need to eat these foods less often and in much smaller amounts, and greatly increase physical activity to 'burn off' the added kilojoules from discretionary choices to help prevent gaining excessive weight. If you are short, small, above your healthiest weight or not very physically active, there may be little or no room in your usual dietary pattern for any discretionary choices at all, or the portion size needs to be quite small.

⁵³ National Health and Medical Research Council. (2013) Australian Dietary Guidelines. Canberra, Australia. Available at: https://www.nhmrc.gov.au/_files_nhmrc/file/publications/n55_australian_dietary_guidelines1.pdf p 144 [Accessed 18 June 2018]

⁵⁴ National Health and Medical Research Council (2013) Australian Dietary Guidelines Summary. Canberra: National Health and Medical Research Council. Available at: https://www.nhmrc.gov.au/_files_nhmrc/file/your_health/healthy/nutrition/n55a_australian_dietary_guidelines_summary_131014_1.pdf [Accessed 9 February 2018]

Guideline 3: Limit intake of foods containing saturated fats, added salt, added sugars and alcohol (p28)

a. Limit intake of foods high in saturated fat such as many biscuits, cakes, pastries, pies, processed meats, commercial burgers, pizza, fried foods, potato chips, crisps and other savoury snacks.

- Replace high fat foods which contain predominately saturated fats such as butter, cream, cooking margarine, coconut and palm oil with foods which contain predominately polyunsaturated and monounsaturated fats such as oils, spreads, nut butters/pastes and avocado.

- Low fat diets are not suitable for children under the age of 2 years.

b. Limit intake of foods and drinks containing added salt.

- Read labels to choose lower sodium options among similar foods.
- Do not add salt to foods in cooking or at the table.

c. Limit intake of foods and drinks containing added sugars such as sugar-sweetened soft drinks and cordials, fruit drinks, vitamin waters, energy and sports drinks.

d. If you choose to drink alcohol, limit intake. For women who are pregnant, planning a pregnancy or breastfeeding, not drinking alcohol is the safest option.

Dietary patterns featuring foods and drinks containing significant amounts of saturated fats, added salt, added sugars and alcohol are associated with increased risk of obesity and chronic diseases including heart disease, stroke, type 2 diabetes and some cancers. Most of these foods and drinks are not a necessary part of our diet and are classified as discretionary choices. Australians consume too many of these foods and drinks instead of choosing foods from the Five Food Groups. Discretionary choices should be used only sometimes and in small amounts

What is a serve of discretionary foods? (page 34)

What is a serve of discretionary choices?	
A serve of Discretionary choices provides about 500-600 kilojoule:	
2 scoops (75g)	ice-cream
2 slices (50-60g)	processed meats, salami or mettwurst
1½ thick or 2 thin (50-70g)	regular sausages
½ snack-size packet (30g)	salty crackers or crisps
2-3 (35g)	sweet plain biscuits
1 (40g)	doughnut
1 slice (40g)	plain cake/small cake-type muffin
5-6 (40g)	sugar confectionary/small lollies
1 tbsp (60g)	jam or honey
½ bar (25g)	chocolate
2 tbsp (40g)	cream
1 tbsp (20g)	butter
1 can (375ml)	soft drink (sugar-sweetened)
¼ pie or pastie (60g)	commercial meat pie or pastie (individual size)
12 (60g)	fried hot chips
200ml	wine (2 standard drinks; but note this is often 1 glass for many Australian wines)
60ml	spirits (2 standard drinks)
600ml	light beer (1½ standard drinks)
400ml	standard beer (1½ standard drinks)

3. Eat for Health Educator Guide: information for nutrition educators⁵⁵

Foods in this category should be used only sometimes and in small amounts. Foods included as 'Discretionary choices' are not needed to meet nutrient requirements and do not fit into the Five Food Groups. Many discretionary choices are also high in kilojoules, saturated fat, added sugars, added salt or alcohol. However, they can contribute to the overall enjoyment of eating, often in the context of social activities and family or cultural celebrations. To help avoid gaining excessive weight, most Australians need to be thoughtful about portion sizes of discretionary choices. These foods should always be considered as 'extras' in the context of energy requirements and when selecting a healthy eating pattern.

Higher added sugars	Higher saturated fat	Higher saturated fat and added sugars	High alcohol
Energy drinks	Bacon, ham	Biscuits	Beer
Fruit drinks	Butter, cream, ghee	Cakes	Liqueurs
Honey	Certain tacos, nachos, enchilada	Chocolate/bars	Mixed alcoholic drinks
Jams, marmalade	Commercially fried foods	Dessert style custards	Port
Some sauces	Commercial burgers	Doughnuts	Sherry
Sports drinks	Crisps and extruded snacks	Iced buns	Spirits
Sugar	Dairy blends	Ice cream	Wines
Sugar confectionary	Frankfurts	Muesli bars	
Sweetened soft drinks and cordials	Fried hot chips	Puddings	
Sweetened waters and iced teas	Meat pie or pastie	Slices	
Syrups	Pastry	Some confectionary	
	Pizza	Some sauces	
	Processed meats	Sweet muffins	
	Quiche	Sweet pastries	
	Salami/mettwurst	Sweet pies and crumbles	
	Sausages (regular)		
	Some crackers		
	Some sauces		
	Spring roll		

⁵⁵ National Health and Medical Research Council (2013) Australian Dietary Guidelines Educator Guide. Available at: https://www.nhmrc.gov.au/_files_nhmrc/file/your_health/healthy/nutrition/n55b_educator_guide_140321_1.pdf [Accessed 4 April 2018]

A serve of *discretionary choices* provides about 600 kJ. Examples are:

2 scoops (75g) ice-cream	2 tablespoons (40g) cream
2 slices (50–60g) processed meats, salami or mettwurst	1 tablespoon (20g) butter
1½ thick or 2 thin (50–70g) regular sausages	200ml wine (2 standard drinks; but note this is 1 glass for most Australian wines)
½ snack size packet (30g) salty crackers or crisps	60ml spirits (2 standard drinks)
2–3 (35g) sweet biscuits	600ml light beer (1½ standard drinks)
1 (40g) doughnut	400ml regular beer (1½ standard drinks)
1 slice (40g) plain cake or small cake-type muffin	1 can (375ml) soft drink
5–6 (40g) sugar confectionary/small lollies	¼ (60g) commercial meat pie or pastie
1 tablespoons (60g) jam/honey	12 (60g) fried hot chips
½ small bar (25g) chocolate	

None of these foods are necessary for a healthy diet.

4. Australian Health Survey Discretionary Food List⁵⁶

The development of a list of discretionary foods and drink was led by the Australian Bureau of Statistics (ABS), working with a group of food and nutrition experts. The principles used to classify foods as discretionary were; that they were specified or inferred in the 2013 *Australian Dietary Guidelines* and supporting documents as discretionary and fortification of the food did not alter whether food was classified as core (i.e. FFG) or discretionary. Where it was not possible to apply these principles to a sub-group consisting of mixed foods, additional nutrient-based criteria were applied e.g. a cut-off of 30 g sugar/100 g was applied to breakfast cereal to define discretionary choices. ABS note that this list was developed specifically for the preliminary analysis of the 2011-12 NNPAS data and may not be suitable for other applications. The list of foods classified as discretionary is reported at the 2, 3, 5-digit level and 8-digit level.

⁵⁶ ABS. (2014). Australian Health Survey: Users' Guide, 2011-13 — Discretionary Food List. Available at: <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/4363.0.55.001Chapter65062011-13>. [Accessed 2 February 2018].

APPENDIX 2: Front-of-pack Labelling Project Committee

Objectives and principles for the development of a front-of-pack labelling (FoPL) system

Context

In December 2011, the Legislative and Governance Forum on Food Regulation (FoFR) agreed to support Recommendation 50 of *Labelling Logic: Review of Food Labelling Law and Policy* (the Blewett Review), namely that an interpretive Front-of-Pack Labelling (FoPL) system should be developed. In its response, FoFR was careful to emphasise its view that the divergence of stakeholder views regarding FoPL means that *government is best placed to lead a collaborative process* to deliver on this task. However, FoFR was also careful to point out that the *food labelling regulatory framework must strike a balance between seeking to ensure good public health outcomes (both short and longer term) and ensuring a strong and profitable food industry*.⁵⁷

FoFR therefore proposed *to undertake a collaborative design process with industry, public health and consumer stakeholders, with a view to reaching a broad consensus on a possible approach to interpretive FoPL*.⁵⁸

The stated aims and objectives of the process were to:

- move away from the current divisive debate and polarised views by building on the common ground among stakeholders;
- focus on addressing issues of concern, exploring new approaches and exploring possibilities for building on existing schemes;
- help avoid the proliferation of different FoPL systems and the potential for consumer confusion from conflicting or inconsistent nutrition messages.⁵⁹

The FoFR response also stated that “[i]t is important that consensus is on the basis that the approach adopted achieves the aims and objectives set out in the [Australia and New Zealand Food Regulation Ministerial Council] *Policy Statement*.” A copy of the Policy Statement is attached for reference, but key elements are extracted below to assist in discussion.

To give effect to the FoFR wishes the Department of Health and Ageing has convened a FOPL Project Committee of stakeholders to develop Front of Pack Labelling System.

To provide a foundation for the Project Committee’s task of developing a front-of-pack labelling system, this paper focuses upon three key elements of any system design process – namely objectives, scope and system design principles.

Objectives of a FoPL System

According to the FOFR Policy Statement:

A FOPL scheme is a scheme that can guide consumer choice towards healthier food options and aims to:

Guide consumer choice by:

1. Enabling direct comparison between individual foods that, within the overall diet, may

⁵⁷ Legislative and Governance Forum on Food Regulation (convening as the Australia and New Zealand Food Regulation Ministerial Council) Response to the Recommendations of *Labelling Logic: Review of Food Labelling Law and Policy* (2011); Page 8.

⁵⁸ Above, n1; Page 52

⁵⁹ Above, n1; Page 52

contribute to the risk factors of various diet related chronic diseases.

2. Being readily understandable and meaningful across socio-economic groups, culturally and linguistically diverse groups and low literacy/low numeracy groups.
3. Increasing awareness of foods that, within the overall diet, may contribute positively or negatively to the risk factors of diet related chronic diseases.

For the purposes of the Project Committee's work, this objective can more succinctly be expressed as:

'To provide convenient, relevant and readily understood nutrition information and/or guidance on food packs to assist consumers to make informed food purchases and healthier eating choices.'

Scope

The Project Committee will develop a FoPL system combining both interpretive and informative elements within the following parameters:

1. One system will be developed that is widespread, simple and interpretive
2. The priority focus will be packaged, manufactured or processed foods presented ready for sale to the consumer in the retail sector.

Design and Implementation Principles

In its response, FoFR explicitly stated that the collaborative approach should include consideration of the possibilities for building on existing schemes. It is therefore critical that a set of criteria be developed against which both new and existing schemes can be considered. In the context of this paper, these criteria are referred to as design and implementation principles, which are as follows:

Design

1. The FoPL system should synthesize, simplify and translate substantiated nutritional information and present it to inform food choice and support healthy eating.
2. The system should be widely understood including by those most at risk from poor nutrition and associated health risks.
3. The system may be based on symbols, numbers, words, colours and/or quantifiable attributes of the food products, or combinations of these elements.
4. The system should enable appropriate comparisons between foods based on agreed and consistent measures.
5. The system should be aligned with other food regulation, public health policies, and authoritative sources of dietary advice including:
 - a. Australian Dietary guidelines
 - b. Ministerial Guidelines and Statements
 - c. Nutrition, Health and Related claims regulations and industry codes.
6. The system should be based on elements that inform choice on balance by assessing both health-benefit and health-risk associated food components.
7. The system should comprise both the FoPL scheme and consumer education elements.

Implementation

8. Implementation must be practical, widespread, properly resourced and consistent with the agreed system.

9. The system must include stakeholders in a formal and agreed ongoing process of engagement.
10. The system should be fully and effectively monitored and evaluated both at a fixed time and on an ongoing basis, based on evidence, and against agreed performance indicators.
11. Implementation should include a well-resourced, on-going social marketing program led by Government and supported by industry and the wider public health sector.

APPENDIX 3: Summary of submissions related to alignment of the HSR with the Dietary Guidelines

The following is a summary of issues raised either in the Report on submissions to the Five Year Review of the Health Star Rating System⁶⁰ and/or in individual submissions. Many of the issues raised more broadly were specific to a nutrient or food and will be covered by other TAG papers e.g. added sugar, fruit juice. A search was used to identify individual submissions that included specific mention of the Australian and New Zealand dietary guidelines. These submissions were then reviewed and key themes of feedback grouped together.

Key issues raised in submission

The Report on submissions to the Five Year Review of the Health Star Rating System noted that most stakeholders felt that the HSR, as part of an integrated system of other healthy eating programs, has the potential to be a successful public health intervention, by assisting consumers to make healthier choices. However, a number of irregularities within the system where the system does not align with dietary guidelines (or consumer expectations) were raised.

The system is generally working well but some areas need to be addressed

- Some respondents noted that overall the system is working well and scores food appropriately but all respondents noted that there are some areas that need to be addressed.
- The research undertaken by The George Institute for NSW Health on the alignment with the ADG⁶¹ was quoted by many but with a mixed response as to whether the degree of alignment found in this research constituted a good degree of alignment or not (82% of products analysed had a HSR that aligned with the range corresponding to its classification as Five Food Group (FFG) foods or discretionary).
- A few noted that 100% alignment is unlikely to be attainable because of the challenging definition of discretionary foods as well as the unclear distinction between FFG and discretionary for mixed foods made up of multiple ingredients. However, there was general support for improving the alignment.
- There was also general recognition that the HSR should not be viewed as a single solution to support people to consume diets in line with dietary recommendations with respondents saying the HSR could play a part in guiding people towards healthier packaged food and drink choices but needed to be promoted in the context of a healthy diet with more fresh foods from the FFGs and advice on the number of serves and appropriate serving sizes.

The HSR is designed for packaged foods. This, along with the message ‘the more stars the healthier’ may encourage consumers to select these foods instead of foods and drinks from the Five Food Groups.

- Respondents used different terms to refer to what they considered unhealthy foods (“packaged”, “processed” or “ultra -processed”) and healthy foods from the Five Food Groups (“fresh”, “whole” and “minimally processed foods”).

⁶⁰ mpconsulting. (2017). Report on submissions to the Five Year Review of the Health Star Rating System. Available at: <http://www.healthstarrating.gov.au/internet/healthstarrating/publishing.nsf/Content/formal-review-of-the-system-after-five-years>. [Accessed 23 February 2018]

⁶¹ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System. Sydney, NSW, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

- There were diverse views as to which foods and drinks the HSR should be applied. Some suggested all foods, others recommended only 'packaged' or 'processed' foods and others recommended only foods from the FFGs. Views also varied about whether the HSR should distinguish between FFG and discretionary foods as defined in the ADG and/or reflect the level of processing of a food.
- Many had concerns that the HSR cannot be easily applied to FFG foods:
 - i. An example given was that the HSR provides different ratings for foods which are viewed as equal in the ADG e.g. some fruits, vegetables, nuts, healthy oils receiving higher scores than others. Many respondents argued that the "more stars, the healthier the choice message" does not apply in these categories.
 - ii. Another example given was that many FFG, 'whole', single ingredient foods cannot be reformulated e.g. fruits and vegetables. Some advised that because the HSR is not meant for single ingredient packaged foods, it should also not be used for single ingredient 'whole' FFG foods.
- Respondents who were concerned that the HSR encourages people to select discretionary foods cited research from the HSR Campaign Evaluation Report (2016)⁶² showing that one sixth of respondents thought that the message of the campaign was to consume more processed foods. Research presented at the Dietitians Association Conference (2017) and more recently published⁶³ showing that the discretionary foods displaying the HSR in the current market are more likely to have higher scores, was also cited.
- There were also concerns from health professionals advising that they were unwilling to educate their clients to use the system because of the high rating of some discretionary foods.
- All stakeholder sectors recommended that more consumer education on the dietary guidelines as part of HSR communications was a key complementary strategy to the HSR and that these two education campaigns should run in parallel. They also felt there was more work to be done within the HSR campaign on educating people to compare the HSR within a category as well as explain how the HSR fits in the context of healthy eating.

The HSR does not adequately distinguish between FFG and discretionary foods.

Outliers need to be addressed

- All stakeholder groups (industry, government and consumers) acknowledged that if the rating did not align with the dietary guidelines (or consumer expectations), this could jeopardise the integrity and sustainability of the system, confusing consumers and discouraging the use of HSR to inform purchasing.
 - The most common examples provided as evidence for misalignment with dietary recommendations were: some sweetened breakfast cereals and chips receiving high ratings; the low rating of some full fat dairy foods and the higher rating of fruit juice than some whole fruit.

⁶² National Heart Foundation of Australia (2018). Report on the monitoring of the implementation of the Health Star Rating system: Key findings for Area of Enquiry Two – Consumer awareness and ability to use the Health Star Rating system correctly. Available on request from frontofpack@health.gov.au [Accessed 8 April 2018].

⁶³ Lawrence, M., et al. (2018). Do Nutrient-Based Front-of-Pack Labelling Schemes Support or Undermine Food-Based Dietary Guideline Recommendations? Lessons from the Australian Health Star Rating System. *Nutrients* 10(1): 32.

- Again, many respondents referred to the NSW Health report⁶⁴ where research undertaken by The George Institute identified that while 82% of foods analysed aligned with the Australian Dietary Guidelines FFG/discretionary food classification, there was concern that 14% of discretionary foods were scoring 3.5 stars or above. Most called for the alignment to be improved but there was some recognition that 100% alignment would not be feasible.
- Many recommended that FFG foods should always obtain a higher HSR than discretionary foods, citing the example of a high sugar breakfast cereal having a higher HSR than full fat yoghurt. They suggested that using only a within category comparison is not sufficient at this level as the higher ratings of some discretionary foods undermines the system.
- Some specific recommendations to change the algorithm to improve alignment with dietary recommendations were: adding wholegrains to the algorithm; creating a separate category for discretionary foods with a capped HSR for these products; and use of added sugars rather than total sugars in the algorithm.
- Some specific recommendations to change the way in which the HSR is applied to improve alignment with dietary recommendations were: creating an unrated variant of the HSR system for unprocessed/minimally processed/single ingredient FFG foods to convey that these are healthier than processed foods with a HSR; adding an asterisk to the HSR on FFG foods to differentiate them from discretionary foods; adding a requirement for all foods to carry a statement to the effect that Five Food Group foods are recommended; changing the industry guide to only permit FVNL to be used on 'intact whole foods'; and a policy decision to award no stars to discretionary foods and five stars to fresh fruit, vegetables and nuts.

The underlying HSR algorithm/approach does not align with the ADG

- Some suggested the HSR algorithm does not align with dietary recommendations because it is based on mainly nutrients rather than foods and dietary patterns. Some suggested that 'whole' foods should receive a high HSR than processed foods, regardless of their nutritional composition and/or ingredients added.
- Others raised the inconsistency of HSR giving points for FVNL in processed foods to increase their star rating but that 100% fruit/vegetables do not necessarily score 5 stars. Many also raised the issue that 'whole' foods such as fruit, vegetables, nuts cannot be reformulated so can never obtain a higher star rating.

Governance issues were also raised with a recommendation to involve more public health nutrition expertise in decision making

The recommendations included having a representative of the NHMRC ADG group on the HSRAC and both the HSRAC and the TAG to include people with dietary guidelines expertise.

The system should be mandatory

Many respondents recommended that the system is made mandatory; advising that having the HSR on all foods would ensure that more FFG foods carried the HSR than currently and would enable a better comparison between and within categories.

Any changes to the algorithm would impact industry implementation timelines

Industry noted that any changes to the algorithm would generally be accepted by industry if there was a clear rationale and evidence they would result in better alignment of the system

⁶⁴ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System. Sydney, NSW, NSW Ministry of Health.
<http://www.health.nsw.gov.au/health/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

with dietary recommendations. However, they advised that these changes would invariably impact on industry cost and implementation timelines.

The HSR system is based on out-dated evidence

Some respondents noted that the dietary guidelines were 5 years old and that the HSR algorithm should be based on more recent evidence. Recent research related to dairy and saturated fat was often used as the example here.

APPENDIX 4: Full analysis of outliers - supplementary information from TAG analysis of alignment between HSR algorithm and the Dietary Guidelines

The initial database used in the development of the HSR system was expanded with data provided by the food industry. The complete revised database used for TAG modelling includes product nutrient data for 5,885 foods across 42 food categories based on the AGHE. Each food in the database was also assigned a 5-digit classification used for classifying foods consumed in the AHS 2011-13 and classified as discretionary (or not) according to the AHS Discretionary Foods List⁶⁵ used for the same survey. Based on this definition, 2,155 (37%) of products in the database are considered discretionary by the AHS definition with the remaining 3,730 (63%) considered to be healthy foods from the Five Food Groups and unsaturated spreads and oils (FFGs). The mean and median HSR for all FFG foods in the main HSR database is 3.5 (HSR Star Points = 7.3) and 4.0 (HSR Star Points = 8) respectively. The mean and median HSR for all discretionary foods in the main HSR database is 2-2.5 (HSR Star Points = 4.5) and 2 (HSR Star Points = 4) respectively.

To enable TAG to assess alignment of the current HSR algorithm with the Dietary Guidelines, FFG foods with a HSR <3.0 and discretionary foods with a HSR ≥3.0 were extracted from the main database for further analysis. These cut points were selected based on the development of the HSR algorithm where 2.5-3.0 stars or more was considered acceptable for foods carrying a health claim and for FFG foods.

Table 8: FFG outliers: FFG foods and drinks with a HSR <3.0

5 –digit classification ⁶⁶	Food or drink product type	No. of products	Mean HSR (range)	Estimated total no. of product in this category ⁶⁷	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁶⁸ or AUSNUT 2011-13 ⁶⁹ databases)					
Food Group: Milk, yoghurt, cheese and alternatives, mostly reduced fat										
19401	Cheese, hard cheese ripened styles (includes fetta, parmesan)	182	1.9 (0.5 – 2.5)	728 (cheeses – all types)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Calcium (mg)
					Mean (median)	1648 (1670)	21.2 (21.4)	807 (692)	24.8 (24.8)	unknown
					Regular fat comparator product	1663	21.6	684	24.6	556
					Reduced fat comparator product	1402	15.6	550	28.9	886
					Comparator products: reduced fat cheddar cheese (25%) (NUTTAB Food ID: 09B20063) and regular fat cheddar cheese (NUTTAB Food ID:09B10155)					

⁶⁵ ABS. (2014). Australian Health Survey: Users' Guide, 2011-13 — Discretionary Food List.

⁶⁶ ABS. (2014). Australian Health Survey: Users' Guide, 2011-13 — Discretionary Food List.

⁶⁷ Information obtained from FoodTrack™ food and drink database and matched to most closely corresponding food and drink category. <https://www.csiro.au/en/Research/Health/CSIRO-diets/FoodTrack>

⁶⁸ NUTTAB 2010 Online Searchable Database, Food Standards Australia New Zealand.

⁶⁹ AUSNUT 2011-13 Food Nutrient Database. Food Standards Australia New Zealand. <http://www.foodstandards.gov.au/science/monitoringnutrients/ausnut/foodnutrient/Pages/default.aspx>. [Accessed 9 April 2018]

5 –digit classification ⁶⁶	Food or drink product type	No. of products	Mean HSR (range)	Estimated total no. of product in this category ⁶⁷	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁶⁸ or AUSNUT 2011-13 ⁶⁹ databases)					
19403	Cheese, unripened styles, (includes cream and cottage cheese, regular fat)	57	1.0 (0.5 – 2.0)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Calcium (mg)
					Mean (median)	1272 (1416)	18.1 (17.9)	366 (324)	7.8 (7.5)	unknown
					Regular fat comparator product	1453	21.1	332	11.1	280
					Comparator product: cheese spread, cream cheese (NUTTAB Food ID: 09B30014)					
19404	Cheese, unripened styles, (includes cream and cottage cheese, reduced fat)	14	1.8 (1.5 – 2.0)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Calcium (mg)
					Mean (median)	835 (759)	10.2 (9.6)	383 (315)	7.0 (7.9)	unknown
					Reduced fat comparator product	921	11.5	842	10.8	800
					Comparator product: Cheese spread, cream cheese, reduced fat (AUSNUT Food ID: 09B30022)					
19406	Cheese, processed (includes processed cheddar cheeses and spreads as well as cream cheese)	39	1.5 (0.5 – 5.0)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Calcium (mg)
					Mean (median)	1314 (1290)	17.4 (17.3)	1372 (1370)	17.6 (18.2)	unknown
					Comparator product	1304	16.8	1331	20.9	556
					Comparator products: Cheese, cheddar, processed (NUTTAB Food ID: 09B10153) These cheeses have a relatively higher sodium and lower protein content than the ‘cheese, hard cheese ripened styles’ of cheese analysed above.					
19407	Cheese, processed, reduced fat (includes processed cheddar cheeses and spreads as well as cream cheese)	5	2.1 (0.5 – 2.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Calcium (mg)
					Mean (median)	1060 (1070)	12.0 (11.7)	1542 (1540)	16.8 (15.8)	unknown
					Comparator product	806	5.6	1171	24.4	886
					Comparator product: Cheese, cheddar, processed, reduced fat (~8%) (NUTTAB Food ID: 09B20069) These cheeses have relatively lower energy and saturated fat content than the regular fat versions analysed above but most are higher in sodium.					

5 –digit classification ⁶⁶	Food or drink product type	No. of products	Mean HSR (range)	Estimated total no. of product in this category ⁶⁷	Analysis							
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁶⁸ or AUSNUT 2011-13 ⁶⁹ databases)							
19408	Cheese, not further defined	2	2 (2.0)									
19405	Cheese, camembert, brie and other surface ripened cheeses	22	1.8 (0.5 – 5.0)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Calcium (mg)		
					Mean (median)	1641 (1650)	23.3 (23.0)	743.0 (661.5)	17.7 (18.6)	unknown		
					comparator product	1286	16.4	610	19.5	484		
Comparator product: Camembert (NUTTAB Food ID: 09B10158)												
19204	Yoghurt, flavoured or added fruit and/or cereal, high fat (>4 g/100g fat)	73	1.8 (0.5 – 2.5)	559 (yoghurt and dairy desserts)	Per 100g	Energy (kJ)	Sat fat (g)	Sugar (g)	FVNL (%)	Protein (g)	Calcium (mg)	
					Mean (median)	545 (548)	4.2 (4.1)	12.7 (13.3)	1.3 (0%)	4.3 (4.1)	unknown	
					FFG Comparator product	517	3.7	11.9	unknown	4.9	142	
					Discretionary comparator product	486	3.0	13.0	unknown	5.4	221	
Comparator products: FFG product: Yoghurt, natural or Greek, high fat (~6%), added mango &/or passionfruit piece (NUTTAB Food ID: 09C10148). Discretionary product: Fromais frais fruit pieces or flavoured, regular fat (5% fat) (NUTTAB Food ID: 09D10256).												
These high fat fruit yoghurts have relatively higher energy, saturated fat and sugar content than their FFG comparator.												
19201	Yoghurt, natural, regular fat and high fat (>4 g/100g fat)	20	1.8 (0.5 – 2.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	Calcium (mg)		
					Mean (median)	510 (530)	5.5 (6.0)	6.3 (5.2)	5.0 (4.8)	unknown		
					Comparator product 5% fat	441	3.0	9.0	5.7	185		
					Comparator product 10% fat	589	6.4	6.9	4.9	160		
Comparator product: Yoghurt, Greek style (~10%), natural (NUTTAB Food ID: 09C10107) and Yoghurt, Greek style, regular fat (~5%), natural (NUTTAB Food ID: 09C10143). These high/regular fat natural yoghurts have similar energy, saturated fat and protein content to the fruit yoghurts, but have relatively lower sugar content.												

5 –digit classification ⁶⁶	Food or drink product type	No. of products	Mean HSR (range)	Estimated total no. of product in this category ⁶⁷	Analysis						
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁶⁸ or AUSNUT 2011-13 ⁶⁹ databases)						
19205 19207	Yoghurt, flavoured or added fruit, full fat Yoghurt, flavoured or added fruit, reduced fat -	13	2.2(1.0 -2.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	FVNL (%)	Protein (g)	Calcium (mg)
		3	2.5 (2.5 - 2.5)		Mean (median) full fat	488 (460)	2.2 (2.1)	14.8 (14.5)	1.0 (0)	4.0 (4.0)	unknown
					Mean (median) reduced fat	416 (420)	2.5 (2.3)	12.0 (12.1)	0	4.0 (3.9)	unknown
					Regular fat comparator product	417	2.1	12.1	Unknown	4.8	164
					Low fat comparator product	367	0.2	12.6	unknown	5.4	168
		Comparator products: Yoghurt, regular fat (~3%), strawberry pieces or flavoured (NUTTAB Food ID: 09C10090) Yoghurt, low fat (<0.5%), strawberry pieces or flavoured (NUTTAB Food ID: 09C20038)									
19211	Yoghurt, added nutrients or other substances	2	2.5 (2.5)								
19801	Milk, coffee/chocolate flavoured and milk-based drinks, full fat	19	2.5 (2.5 – 2.5)	191 (flavoured milk and milk alternatives, includes milk modifiers)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	Calcium (mg)	
					Mean (median)	335 (420)	2.3 (2.3)	9.6 (12.1)	3.3 (3.9)	unknown	
					Chocolate milk comparator product	376	2.3	11.1	3.6	255	
					Comparator product: Beverage, chocolate flavour, from drinking chocolate, with regular fat milk (NUTTAB Food ID: 01B10295) These coffee/chocolate flavoured milks relatively lower sugar content than the other flavours and a higher mean HSR.						
19802	Milk, other flavoured and milk-based drinks, full fat	5	2.1 (2.0 – 2.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	Calcium (mg)	
					Mean (median)	386 (353)	2.3 (2.2)	11.6 (10.1)	3.4 (3.1)	unknown	
					Strawberry milk comparator product	347	2.4	9.5	3.4	255	
					Comparator product: Milk, cow, fluid, flavoured, strawberry, regular fat (NUTTAB Food ID:09A10169)						

5 –digit classification ⁶⁶	Food or drink product type	No. of products	Mean HSR (range)	Estimated total no. of product in this category ⁶⁷	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁶⁸ or AUSNUT 2011-13 ⁶⁹ databases)					
19602 19601	Custard, fat content <4 g/100 g Custard, fat content ≥ 4 g/100 g	15	1.8 (0.5 – 2.5)	559 (yoghurt and all dairy desserts)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	Calcium (mg)
		Mean (median)			548 (440)	2.4 (2.1)	17.5 (13.9)	4.0 (3.5)	unknown	
		Regular fat comparator product			407	2.1	12.1	3.5	120	
		Reduced fat comparator product			359	0.6	12.4	3.9	127	
		Comparator product: Custard, dairy, regular fat, vanilla, commercial (NUTTAB Food ID: 09D20111) and Custard, dairy, reduced fat, vanilla, commercial (NUTTAB Food ID: 09D20112) These custard products have relatively higher sugar and energy content than the comparator products.								
Food Group: Grain (cereal) foods, mostly wholegrain and/or high fibre varieties										
13204	Savoury biscuits, rice based (includes rice cakes)	11	2.0 (0.5 – 2.5)	389 (savoury biscuits – all)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Fibre (mg)
					Mean (median)	1911 (1950)	2.8 (1.7)	793 (854)	8.5 (8.5)	2.3 (2.4)
					Brown rice cake comparator product	1514	0.6	2	8.5	4.0
					Rice cracker comparator product	1660	0.6	369	7.6	2.2
					Comparator products: Biscuit, savoury, rice cake, from brown rice, plain (NUTTAB Food ID: 02C10100) and Biscuit, savoury, rice cracker (NUTTAB Food ID:02C10110) These rice based biscuits have relatively higher energy, saturated fat and sodium content than comparator products.					
12402	Instant noodles and noodle products, wheat based	12	2.1 (2.0 – 2.5)	238 (processed pasta and noodles)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Fibre (mg)
					Mean (median)	899 (942.5)	4.7 (4.9)	613 (622.5)	1.7 (3.75)	3.7 (1.9)
					Instant noodles comparator product	778	4.0	291	3.9	3.5
					Comparator product: two minute noodles- flavoured, boiled, drained (NUTTAB Food ID: 02A10307) These instant noodle products have relatively higher energy and sodium and lower protein content than the comparator product.					
13509	Savoury pasta/noodle and sauce dishes, saturated fat ≤5 g/100 g – these products are rated as sold (pasta and sauce powder)	6	1.8 (0.5 – 2.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Fibre (mg)
					Mean (median)	1623 (1709)	2.9 (3.4)	1562.7 (1480.0)	13.5 (14.4)	1.0 (0)
					Pasta comparator product (as sold)	514	0.74	146	3.5	2.0

5 –digit classification ⁶⁶	Food or drink product type	No. of products	Mean HSR (range)	Estimated total no. of product in this category ⁶⁷	Analysis Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁶⁸ or AUSNUT 2011-13 ⁶⁹ databases)							
					Pasta comparator product (as prepared with water, milk, margarine)	500	1.6	221	4.0	1.0		
Comparator product: Pasta dish, commercial, cooked unfilled pasta, tomato based sauce, added vegetables (AUSNUT Food ID: 02F40383) and “Pasta in cream based sauce, prepared from dry mix with milk & margarine spread (NUTTAB Food ID: 10A10425)												
Lean meats and poultry, fish, eggs, tofu, nuts and seeds and legumes/beans												
22202	Peanut products	6	1.9 (0.5 – 2.5)	83 (nut and seed spreads)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Sodium (mg)	Protein (g)	Fibre (mg)	FVNL %
					Mean (median)	2280 (2335)	5.7 (5.5)	15.9 (15.4)	639.8 (618)	15.4 (15.8)	4.6 (5.1)	50.2 (56)
					Regular comparator product	2470	8.7	8.6	471	22.2	5.8	unknown
					No added sugar or salt comparator product	2634	9.4	5.5	25	24.3	6.5	unknown
					Comparator products: Peanut butter, smooth & crunchy, added sugar & salt (NUTTAB Food ID: 11B10184) and Peanut butter, smooth & crunchy, no added sugar or salt (NUTTAB Food ID: 11B10186) These peanut products have similar energy content, lower saturated fat, fibre and protein content and higher sugar and sodium content than both the regular and the no added sugar or salt comparison products.							
Water												
11702	Purchased packaged water including mineral water	8	2.1 (2.0 – 2.5)	-	6 of these products are plain mineral water so score two stars but are eligible to obtain 5 stars. The other two appear to be water with around 50% added fruit juice and score 2.5 stars. These types of diluted fruit juice products are being considered in the TAG ‘Non-dairy beverages’ paper.							

Table 9: Discretionary outliers: discretionary foods and drinks with a HSR ≥ 3.0

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)					
21202	Dry soup mixes	101	3.1 (3.0-3.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	FVNL%
31303	Stock cubes	29	3.5 (3.0-4.0)		Mean dry soup (median)	154 (160)	0.45 (0.5)	297.9 (300)	0.65 (0.5)	0.12 (0)
					Mean stock cubes (median)	423 (385)	1.5 (1.3)	471.3 (254)	8.0 (4.4)	2.9 (0)
					Stock dry powder	900	4.4	18,400	11.3	unknown
					Soup, vegetable, dry mix	1422	2.7	2683	3.4	unknown
					Soup, vegetable prepared from instant dry mix with water	110	-	386	0.4	unknown
					Comparator products: stock dry powder (NUTTAB Food ID: 10F60095), soup, vegetable cup of soup, instant dry mix (NUTTAB Food ID: 10C10429) and soup, vegetable, cup of soup, prepared from instant dry mix with water (NUTTAB Food ID: 10C10430)					
23110	Dry savoury sauces and casserole bases and dry mixes	75	3.6 (3.0 -4.0)	186 (recipe concentrates – powder and liquid)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	
					Mean (median)	455 (458)	1.7 (1.3)	268.9 (265)	8.0 (9.3)	
					Home-made beef stroganoff	579	2.38	85	16.5	
					Home-made beef lasagne	726	3.24	153	10.5	
					No fibre or FVNL content was reported for these products so their correct rating may be higher than shown here. These products have been assessed 'as prepared' with fresh ingredients added. Assessed as a dry product, their HSR would be significantly lower. This issue has been considered by the TAG in the reappraisal of the 'as prepared' rules. Comparator products used were home-made equivalents of some recipe mix variants: <i>Casserole, homemade, beef & mushroom, homemade cream based sauce (stroganoff)</i> (AUSNUT Food ID: 08F10965) and <i>Lasagne (Lasagne), beef, no added vegetables, homemade</i> (AUSNUT Food ID: 02F40470)					

⁷⁰ Information obtained from FoodTrack™ food and drink database and matched to most closely corresponding food and drink category. <https://www.csiro.au/en/Research/Health/CSIRO-diets/FoodTrack>

⁷¹ NUTTAB 2010 Online Searchable Database, Food Standards Australia New Zealand.

⁷² AUSNUT 2011-13 Food Nutrient Database. Food Standards Australia New Zealand. <http://www.foodstandards.gov.au/science/monitoringnutrients/ausnut/foodnutrient/Pages/default.aspx>. [Accessed 9 April 2018]

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis						
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)						
23104	Savoury sauces, tomato based, commercial e.g. pasta sauces	69	3.9 (3.0 – 4.5)	350 (cooking sauces, including pasta and creamy sauces, pesto)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Sodium (mg)	Fibre (g)	FVNL % (concentrated %)
					Mean	254	0.3	6.6	400	1.7	70.5 (15.2)
					Home-made tomato-based Comparator product	110	0.01	3.7	97	1.7	unknown
					Tomato-based commercial product	227	0.15	6.1	389	2.3	unknown
					Cream-based commercial comparator product	462	5.6	3.5	619	2.0	Unknown
					Comparator product: sauce, pasta, tomato based, homemade (AUSNUT Food ID: 10A10527), sauce, pasta cream-based commercial heated (NUTTAB Food ID: 10A10401) and sauce, pasta, tomato-based. commercial (AUSNUT Food ID: 10A10448)						
					These savoury sauces have relatively higher sodium than a homemade comparator product but lower sodium than a cream-based commercial comparator product.						
23103	Savoury sauces, not tomato based, commercial e.g. Oyster sauce, soy sauce, fish sauce, mustard, pesto, black bean	43	3.2 (3.0 – 4.0)	350 (cooking sauces, including pasta and creamy sauces, pesto)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Sodium (mg)	FVNL % (%)	
					Mean (median)	347 (304)	0.9 (0.7)	5.1 (4.4)	390.9 (412.1)	26.4 (9)	
					Reduced salt soy sauce	180	0	1.8	3506	-	
					Cream-based commercial	462	5.6	3.5	619	unknown	
				98 (finishing sauces, including all gravy types)	Simmer sauce for chicken, commercial	424	3.8	3.7	240	unknown	
					Sauce mint commercial or homemade	110	0.01	3.7	97	unknown	
				226 (tomato and other table sauces)	Sauce sweet and sour commercial	786	0	37.8	660	unknown	
					Comparator product: reduced salt soy sauce (NUTTAB Food ID: 10A10398, cream-based commercial heated (NUTTAB Food ID: 10A10401, sauce, mint commercial or homemade (AUSNUT Food ID: 10A20006) and sauce, sweet and sour commercial (AUSNUT Food ID: 10A10432)						

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis						
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)						
23102 23101	Dry gravy mixes Gravies (prepared)	34 27	3.0 (3.0 – 3.5) 3.0 (3.0-3.0)		Per 100g	Energy (kJ)	Saturated fat (g)		Sodium (mg)		
					Mean (median)	159 (170)	0.4 (0.3)		478.2 (490)		
					Dry gravy powder comparator product	1200	2.4		6020		
					Gravy prepared from dry powder with water (per 100ml)	101	0.2		507		
					Home-made gravy	857	8.41		3		
					Comparator products: Gravy powder, dry mix (NUTTAB Food ID: 10A10411) and gravy prepared from dry powder with water (NUTTAB Food ID:10A10410) and Gravy prepared from pan drippings (AUSNUT Food ID: 10A10528). We assume that all of these products (even those marked as ‘dry gravy mixes’) have been assessed ‘as prepared’ with water added. As a dry product, they would score significantly lower (0.5 stars for the dry comparator product above. This issue has been considered by the TAG in the reappraisal of the ‘as prepared’ rules.						
27303	Water ice confection, gelato, sorbet	48	3.1(3.0 – 3.5)	44 (frozen desserts – fruit based) 545 (frozen desserts – dairy and soy-based)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	FVNL %	Calcium (g)
					Mean	304 (289)	0.16 (0.0)	16.2 (15.8)	0.2 (0.1)	4.6 (0)	unknown
					Ice confection water base comparator	207	0	12.7	0.2	-	2.0
					Ice confection milk based comparator	429	2.6	15.1	2.2	-	66
					Comparator products: Ice confection, stick, water-base, various flavours (NUTTAB Food ID: 12D10044) and Ice confection, stick, milk-based, various flavours (NUTTAB Food ID: 09D10205)						
					These products will be addressed in the ‘Ice confection/ice cream/jelly’ TAG paper						

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis						
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)						
19503	Ice cream, tub varieties, fat content <4 g/100 g	27	3.2 (3.0-3.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	Calcium (g)	
19505 and 19502	Ice cream, individual bar, stick and cone varieties, fat content 4 - 10 g/100 g and Ice cream, tub varieties, fat content 4 - 10 g/100 g	13	3.0 (3.0 – 3.5)		19503	632	1.7	16.2	4.7	-	
					Mean (median)	(624)	(1.7)	(20.3)	(2.2)		
					19502 and 19505	624	2.0	19.2	4.0	-	
					Mean (median)	(610)	(2.1)	(19.1)	(3.7)		
					Chocolate and biscuit stick comparator product	673	6.3	14.4	2.4	66	
					Regular fat vanilla ice cream comparator product	441	4	10.3	2.1	52	
					Comparator products: Ice cream, stick, flavoured, chocolate & biscuit crumb coated (NUTTAB Food ID: 09D10201) and Ice cream, regular fat, vanilla flavour (NUTTAB Food ID: 09D10200)						
					These products will be addressed in the ‘Ice confection/ice cream/jelly’ TAG paper						
24102	Potato products Potato e.g. wedges, chips/fries, hash browns	35 1	4.0 (3.0 – 4.5)	62 (frozen potato products)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Fibre (g)	FVNL %	Protein
Mean (median)					638 (599)	0.89 (0.6)	254 (249)	2.5 (2.5)	84.7 (89.5)	2.4 (2.3)	
Take-away fries Comparator product					968	4.5	201	3.0	unknown	3.8	
Frozen fries, par-fried in animal fat comparator product					1188	4.2	60	4.6	unknown	4.8	
Frozen fries. par-fried in canola comparator product					1188	0.6	60	4.6	unknown	4.8	
Frozen fries, no added fat comparator product					1500	1.14	13	5.6	unknown	7.7	
Frozen wedges, par fried in canola comparator product					596	0.29	277	2.1	unknown	2.7	
Frozen wedges, no added fat comparator product					784	0.38	364	2.8	unknown	3.6	

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis						
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)						
					Mashed potato comparator product (not considered to be discretionary)	417	3.5	55	0.8	unknown	2.3
					Potato bake made with cheese and cream (not considered to be discretionary)	720	7.39	79	1.4	unknown	4.9
					<p>Comparator products: Potato, chips, regular, deep fried, blended oil, from take-away outlet, salted (NUTTAB Food ID: 13A11505), Potato, chips, regular, par-fried in animal fat, purchased frozen, baked without oil (NUTTAB Food ID: 13A11504), Potato, chips, regular, par-fried in canola oil, purchased frozen, baked without oil (NUTTAB Food ID: 13A11509), Potato, fries, regular, purchased frozen, baked or roasted, no added fat (AUSNUT Food ID: 13A12393), Potato, wedges, regular, purchased frozen, par-fried in canola oil, raw (AUSNUT Food ID: 13A12386) and Potato, wedges, regular, purchased frozen, baked or roasted, no added fat (AUSNUT Food ID: 13A12387) and Potato, coliban, peeled, mashed with milk and butter (NUTTAB Food ID: 13A11604) and potato bake made with cheese and cream (AUSNUT Food ID: 13A12170).</p> <p>These products have relatively low energy, saturated fat and similar/lower sodium content than the comparator products. Most products are classified as wedges which have higher sodium content than fries comparator products.</p>						
26101 26301 26201	Potato crisps Extruded snacks Corn chips	8 9 1	3.5 (3.0 – 4.5)	417 (crisps and similar snacks)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Fibre (g)	FVNL %	Protein
					Mean (median)	2029	2.6	391.0	5.2	29.5	8.4 (7.7)
					Grain waves comparator product	2041	3.3	436	6.4	unknown	7.3
					Chips, plain, salted comparator product	2160	7.9	613	3.5	unknown	6.0
					Chips, plain unsalted comparator product	2473	9.56	43	3.5	unknown	5.9
					Chips, reduced fat salted comparator product	1617	0.7	1546	9	unknown	10.9

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)							
					Extruded cheese-flavoured snack comparator product	2081	12	982	1.2	unknown	8.8	
					<p>Comparator products: Grain waves wheat snack, plain, original (AUSNUT Food ID: 10D10149), Potato crisps or chips, plain, salted (AUSNUT Food ID: 10D10142), Potato crisps or chips, plain, unsalted (AUSNUT Food ID: 10D10146), Potato crisps or chips, plain, reduced fat, salted NUTTAB Food ID: 10D10125) and Extruded snack, cheese flavoured (NUTTAB Food ID: 10D10117)</p> <p>These salty snack products have relatively similar nutritional content to grain waves comparator product, which have relatively lower salt than salted chip and cheese snack comparator products. These products will be addressed in the ‘Salty snacks’ TAG paper.</p>							
28302	Muesli and cereal style bars, with fruit and/or nuts	34	3.9 (3.0 - 5.0)	172 (cereal-based bars)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Fibre (g)	Protein (g)	FVNL %	Concentrated FVNL %
					Mean (median)	1658 (1566)	1.9 (1.6)	19.6 (20.2)	11.1 (9.0)	9.3 (7.7)	4.7 (0)	4.7 (3.25)
					Muesli bar comparator product	1801	3.6	21.6	7.7	7.9	unknown	unknown
					<p>Comparator product: Bar, muesli or snack, with 10% dried fruit & 10% nuts (AUSNUT Food ID: 12C10495)</p> <p>These muesli bar products have similar energy, lower saturated fat and sugar and higher fibre and protein than the comparator product. These products will be addressed in the ‘Snack bar’ TAG paper.</p>							
28303	Muesli and cereal style bars, added coatings or confectionery	22	3.8 (3.0 – 5.0)		Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Fibre (g)	Protein (g)	FVNL %	Concentrated FVNL %
					Mean (median)	1676 (1635)	4.0 (4.3)	17.8 (17.8)	10.4 (10.2)	7.8 (7.0)	3.7 (0)	0.6 (0)
					Chocolate coated muesli bar comparator product	1852	7.0	23.7	7.2	8.2	unknown	unknown
					<p>Comparator product: Bar, muesli or snack, with 10% nuts, chocolate-coated (AUSNUT Food ID: 12C10544).</p> <p>These muesli bar products have relatively lower energy, saturated fat and sugar content than the chocolate coated comparator and have relatively higher fibre content. These products will be addressed in the ‘Snack bar’ TAG paper.</p>							
28301	Muesli and cereal style bars, no fruit	8	3.7 (3.0 – 4.5)		Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Fibre (g)	Protein (g)	FVNL %	Concentrated FVNL %
					Mean (median)	1702 (1630)	2.9 (3.1)	17.3 (17.8)	8.6 (8.4)	8.3 (7.7)	9.2 (0)	2.9 (0)
					Muesli bar comparator product	1439	3.4	24.5	2.6	8.4	unknown	unknown
					<p>Comparator product: Bar, muesli or snack, made from breakfast cereal (AUSNUT Food ID: 12C10464).</p> <p>These products will be addressed in the ‘Snack bar’ TAG paper.</p>							

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis								
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)								
28201	Fruit bar and fruit-based confectionery	16	3.3 (3.0 – 4.0)	85 (fruit bars and similar)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Sodium (mg)	Fibre (g)	Protein (g)	FVNL %	Concentrate FVNL %
					Mean (median)	1543 (1445)	2.0 (1.3)	42.7 (35.8)	36.7 (36.5)	6.9 (7.2)	3.2 (1.3)	55.7 (0)	55.7 (53.5)
					Fruit leather comparator product	1500	0.3	28.9	54	1.6	0.3	unknown	unknown
					Comparator products: Fruit leather (AUSNUT Food ID: 12C10438). These fruit bar products are similar in energy content to the comparator but are relatively higher in sugar, fibre and protein content.								
15501	Fin fish, battered or crumbed	27	3.8 (3.0 – 4.0)	198 (seafood – processed)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein				
15504	Fish and seafood products	20			Mean (median)	802 (850)	1.1 (0.9)	355.9 (333.0)	12.2 (11.8)				
15503	Molluscs, battered or crumbed	2			Deep fried take-away comparator product	908	4.6	406	13.3				
					Fish finger, grilled comparator product	924	3.1	320	11.6				
					Comparator product: Fish, battered or crumbed, deep fried, blended frying fat, ready to eat, (NUTTAB Food ID 05A10632) and Fish finger, crumbed, purchased frozen, grilled (NUTTAB Food ID: 05D10346) These fish products have relatively lower energy and saturated fat content to both comparator products and have similar sodium and protein content.								

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)					
11208	Coffee-based mixes, beverage – (made on water)	22	3.2 (3.0 – 4.0)	42 (tea and coffee)	Per 100ml	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	Calcium (mg)
					Mean (median)	196 (200)	1.3 (1.3)	5.9 (6.3)	1.0 (1.0)	unknown
					Coffee, flat white or latte made with reduced fat milk (not considered discretionary)	161	0.72	4.2	3.0	100
					Hot chocolate made from drinking chocolate with reduced fat milk (not considered discretionary)	288	1.01	9.9	3.9	118
					Coffee prepared from coffee mix with sugar and whitener with water	96	0.72	1.9	0.4	12
					Chai latte prepared from power with water	145	0.32	5.2	0.9	29
					Coffee mix, with beverage whitener & sugar, dry powder	1915	14.3	38.3	8.4	207
					Comparator products: coffee, flat white or latte, from ground coffee beans, with reduced fat cow's milk (AUSNUT Food ID: 01B10340), Coffee, prepared from coffee mix with sugar & whitener, no added milk (AUSNUT Food ID: 01B10416), Chai latte, prepared from chai mix powder & water, no added milk (AUSNUT ID: 01B10487) and Beverage, chocolate flavour, from drinking chocolate, with reduced fat cow's milk (AUSNUT: 01B10553) and Coffee mix, with beverage whitener & sugar, dry powder (AUSNUT Food ID: 01B10308)					
27301	Sugar-based desserts e.g. Jelly and meringues	19	3.3 (3.0 – 3.5)	59 (jelly only)	Per 100g	Energy (kJ)	Sugar (g)			
					Mean (median)	261 (242)	14.4 (13.2)			
					These products will be addressed by the ‘ice confection/ice cream/jelly’ TAG paper.					
19701	Dairy desserts, smooth or gelatine-based dairy desserts e.g. Fromais frais, panna cotta, rice pudding	15	3.2 (3.0 – 3.5)	559 (yoghurt and dairy desserts)	Per 100g	Energy (kJ)	Saturated fat (g)	Sugar (g)	Protein (g)	
					Mean (median)	409 (443)	1.3 (1.7)	12.2 (11.6)	4.0 (3.7)	
					These products will be addressed by HSRAC’s preferred option to address this anomaly (i.e. to include dairy desserts in a revised category 2D).					

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)					
18606	Processed meat, commercial sterile (includes canned meats) Processed delicatessen meat, poultry Ham Processed delicatessen meat, mammalian	12	3.3 (3.0 – 4.0)	254 (small goods)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	
18605		6			Mean (median)	401 (400)	1.1 (1.0)	740.9 (805)	13.6 (16.0)	
18602		6			Salami comparator product	1796	13.3	1495	18.9	
18604		7			Lean ham comparator product	463	2.1	1270	14.2	
					Comparator product: Danish salami (NUTTAB Food ID: 08E30281) and Ham, shoulder, lean & fat (NUTTAB Food ID: 08E30308). These processed meat products have relatively lower energy, saturated fat and sodium content than the salami comparator product. They have similar energy and saturated fat content to the lean ham comparator and have lower sodium content.					
23202	Vegetable-based pickles, chutneys and relishes Fruit-based pickles, chutneys and relishes	11	3.4 (3.0 – 4.0)	435 (relishes, chutneys and pastes)	Per 100g	Energy (kJ)	Sodium (mg)	Sugar (g)	Fibre (g)	FVNL %
23201		1			Mean (median)	301 (326)	520.9 (568)	9.0 (2.5)	2.8 (1.4)	71.9 (66.1)
					Corn relish comparator	435	268	17.8	0.7	unknown
					Chutney comparator	752	690	41.5	2.2	unknown
					Comparator products: Relish, corn, commercial (AUSNUT Food ID: 10B10075) and Chutney, commercial (AUSNUT Food ID: 10B10068) These chutneys and relishes have relatively lower energy and sugar content than both comparator products and have slightly higher fibre content.					
12304	Savoury filled or topped breads and bread rolls	9	3.5 (3.5 – 3.5)	558 (bread – all)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Fibre (g)
					Mean	993	0.7	450	8.4	3.3
					Cheese and bacon role comparator product	1186	6.3	696	13.8	1.8
					Comparator product: Bread or bread roll, topped/mixed with cheese & bacon (AUSNUT Food ID: 02F30207). These bread products have relatively lower energy, saturated fat and sodium content than the cheese and bacon comparator product. They also have higher fibre content.					

5 digit classification	Food or drink product type	No. of products	Mean HSR of products (range)	Estimated total no. of product in this category ⁷⁰	Analysis					
					Mean nutrient content for key HSR nutrients per food and drink category (comparator products, where used, were sourced from NUTTAB 2010 ⁷¹ or AUSNUT 2011-13 ⁷² databases)					
23502	Vegetable based dips	7	3.6 (3.0 – 4.0)	208 (dips – all)	Per 100g	Energy (kJ)	Saturated fat (g)	Sodium (mg)	Protein (g)	Fibre (g)
23501	Dairy based dips	2			Mean (median)	526 (355)	1.2 (0.8)	286 (280)	4.4 (1.8)	1.4 (0)
23503	Legume based dips	1			Carrot dip comparator product	666	4.3	559	2.9	2.1
					Hummus comparator product	1122	2.6	558	6.5	5.1
					Sour cream dip comparator product	835	11.4	600	4.4	0
					Comparator products: Dip, carrot, commercial (AUSNUT Food ID: 13B10327), Dip, hummus, commercial (AUSNUT Food ID: 13B20238) and Dip, sour cream-based, commercial (AUSNUT Food ID: 09A50050) These dip products have relatively lower energy, saturated fat and sodium than the comparator products.					

APPENDIX 5: Technical Report: Alignment of NSW Health Food Provision Policy with the Health Star Rating System (2015)

Summary of Methods and Key Findings

Research undertaken by NSW Health and the George Institute⁷³ analysed 11,500 products (53% FFG and 47% discretionary) across 30 food categories deemed relevant in school or workplace settings.

The George Institute's 2013 Monitoring Database used for this project is an annually updated dataset which captures nutrient information for around 20,000 packaged foods from the four major supermarket retailers in Sydney. Data is collected systematically by trained data collectors. The 2013 dataset provided the most up-to-date and complete data at the time and contained 15,164 products. As the analysis focused on food available in schools and health facilities, around 2,400 products were excluded from the analysis because: they did not contribute significantly to nutritional intake; were not commonly sold in these settings; or were ingredients used in small amounts to prepare a meal or dish. Additional products were excluded from the analysis if they had no nutrition information panel e.g. variety packs or missing data. The authors advised that exclusion of these categories was not expected to have affected the individual category results but could have affected the overall results for the following two categories that were excluded: pasta sauces and dips. These products tend to receive a high HSR because of their high tomato, vegetable or nut and legume content.

HSR values were calculated using the HSR Guide for Industry and logic rules for missing data not required in the Nutrition Information Panel (i.e. FVNL and fibre).

- Products with fibre data available in the Nutrition Information Panel or FVNL data provided by manufacturers were assigned the associated points. Products known to not contain FVNL or fibre were assigned 0 points.
- Products known to contain fibre but where data was not available were assigned an imputed value: this was the average fibre content of all products in that category in the database that had fibre data.
- For products where FVNL data was not available, the imputed value was calculated from the mean FVNL points of a random sample of product ingredients lists for the relevant food category.

11,500 products (53% FFG and 47% discretionary) across 30 food categories deemed relevant in school or workplace settings were analysed. Outliers were quantified and described, using a cut-off HSR of 3.5, and the AHS Discretionary Food List.⁷⁴ FFG and discretionary foods differed significantly in their mean HSR (for FFG foods, mean = 3.7 stars; for discretionary foods, mean = 1.9 stars). The main outliers identified in the report and outlined in Tables 10 and 11 below.

⁷³ Dunford, E., et al. (2015). Technical Report: Alignment of the NSW Healthy Food Provision Policy with the Health Star Rating System, NSW Ministry of Health. <http://www.health.nsw.gov.au/heal/Publications/health-star-rating-system.pdf> [Accessed 23 February 2018]

⁷⁴ ABS. (2014). Australian Health Survey: Users' Guide, 2011-13 — Discretionary Food List.

Table 10: Discretionary food and drink outliers (n=760) - scoring ≥ 3.5 stars

Category	Examples scoring ≥ 3.5 stars	Number of Products in Category	Mean HSR of category (range)	% scoring ≥ 3.5 stars
Snack bars	Cereal-based, fruit bars, fruit leathers	294	2.7 (0.5-5.0)	24%
Dairy desserts	Milk-based (tapioca, rice puddings & mousses) and some sponge puddings	131	2.9 (1.0-5.0)	47%
Ice blocks and ice creams	Low fat ice cream tubs & single-serve milk or fruit-based ice confections	358	2.3 (0.5-4.0)	11%
Coated frozen fish	Crumbed/battered fish and seafood	106	4.0 (2.4-4.5)	97%
Processed meats	Beef burgers, canned chicken, a few sausages, healthier luncheon meats	659	2.2 (0.5-4.5)	30%
Oven Baked Potato Products	Frozen chips/wedges/hash browns	78	3.8 (3.5-4.0)	100
Salty snacks, chips, pretzels	Corn chips, tuna/cracker packs, legume-based snacks, popcorn, some potato chips	435	1.2 (0.5-5.0)	41%

Table 11: FFG food and drink outliers (n= 1393) – scoring < 3.5 stars

Category	Examples with a low HSR	Number of Products in Category	Mean HSR of category (range)	% scoring < 3.5 stars	% scoring ≤ 1.5
Cheese	Parmesan and cream cheeses with a high saturated fat and sodium content	616	3.5 (0.5-5.0)	37%	10%
Yoghurt	Products high in energy, saturated fat and sugar	369	3.25 (0.5-5.0)	45%	14%
Fruit	Fruit in syrup, dried fruit with yoghurt coating	408	3.5 (1.4-5.0)	30%	0.7%

The report also noted other areas of possible misalignment:

- Fruit juice with a HSR ≥ 3.5 stars (mean HSR of 3.5 and range 0.5-5.0): the report noted that even though juice is categorised as a FFG food in the ADG, a high rating is not appropriate because it is recommended to be consumed only occasionally and in small serving sizes.
- Discretionary breakfast cereals with a HSR ≥ 3.5 stars; this affected only two out of 26 cereals because the AHS Discretionary Food List classifies breakfast cereals as discretionary if the total sugar content is ≥ 30 g/100 g whereas the HSR algorithm takes into account a number of nutrients, including sugar to come up with an overall rating.