

## Supporting document 4

# Rapid evidence assessment on consumer knowledge, attitudes, and behaviours relating to sugars, fats and oils in the ingredient list

## Labelling Review Recommendation 12

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### Executive summary

Food Standards Australia New Zealand (FSANZ) has undertaken a rapid evidence assessment (REA) of the relevant literature on consumer knowledge, attitudes and behaviours relating to sugars, fats and oils in the ingredient list. The key findings of the REA are outlined below.

#### **Consumer understanding of sugars, fats, oils, in food:**

- Most of the studies on understanding have focussed on fats, with relatively few addressing consumer understanding of sugar or carbohydrates
- There are sizeable sub-proportions of consumers who have little understanding of sugars, fats, and oils
- The health messages to reduce fat intake appear to be successful, however
  - consumers are less sure about specifically which fats to reduce
  - consumers knowledge of the types of fats in different foods appears to be mixed
- There are sizeable sub-proportions of consumers who do not appear to understand the relative sugar concentrations of various beverages. In particular, the idea that some beverages (e.g. fruit juice, milk, vegetable juice) contain energy in the form of natural sugars appears to be less well understood. Added sweetness, e.g. use of sweeteners, may lead consumers to overestimate relative sugar levels in beverages
- It is not clear how consumer understanding of the various sugars, fats, and oils influences consumer interpretations of ingredient lists.

#### **Consumer use of the ingredient list:**

- Up to 52% of consumers report using the ingredient list; though it is lower in studies that look at general use rather than use in first time purchases
- Grocery shoppers who are more likely to use the ingredient list have one or more of the following attributes: female; higher formal education; greater nutrition knowledge; higher income
- The ingredient list is used by consumers who are wishing to avoid particular ingredients, so their dietary requirements/choices (e.g. allergen, religious, ethical) are met

- Little information on the use of the ingredient list to obtain information on specific sugars, fats, and oils was located. The one series of studies that examined this issue found that a reasonably large proportion of consumers used the ingredient list to obtain information on these nutrients in order to identify products to avoid. However, consumers also have beliefs about the sorts of products that are, for example, high in fat, and may rely on these beliefs instead of checking the ingredient list.
- Consumers appear to value the ingredient list highly, even though relatively few appear to use this label element.

**Consumer understanding of the ingredient list:**

- Relatively few studies were located that addressed consumer understanding
- No Australia/New Zealand studies were found
- The few international studies suggest that there is consumer confusion about the comprehensiveness of the ingredient list and some of the ingredient terms used.

**Influence of the ingredient list on consumer behaviour:**

- There appears to be little impact of the ingredient list on purchase decisions
- Three USA studies examined the impact of ingredient list use on consumption, giving mixed findings.

**Consumer preferences for sugars, fats, oils information in the ingredient list:**

- Based on the international literature, sizeable proportions of consumers find ingredient lists to be difficult to understand
- No study examined the outcome of grouping added sugars, fats, and oils in the ingredient list.

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# 1 Introduction

The purpose of this rapid evidence assessment (REA) is to provide a concise statement of Australian and New Zealanders' knowledge, attitudes and behaviours relating to the expression of added sugars, fats, and oils in the statement of ingredients ("ingredient list"). It forms part of the evidence base that informs the FSANZ response to the wider Recommendation 12 project objective of providing an analysis of the impact of the terms 'added sugars', 'added fats' and/or 'added vegetable oils' when used in the ingredient list and followed by bracketed lists of sugars, fats and/or vegetable oils that are added as separate ingredients. The impact examined by this REA is whether Recommendation 12 would further assist consumer understanding, and use of food label information, in support of food choices consistent with dietary guidelines.

The overall objective for this work was to outline the likely effects of grouping added sugars, and grouping added fats and/or vegetable oils, on consumers' attitudes, knowledge and behaviours. Overseas research was included in scope due to the lack of studies conducted in Australia and New Zealand in this area.

The objective was addressed by identifying consumer:

- understanding about sugars, fats, and oils in food
- use and understanding of the ingredient list
- use of sugars, fats, and oils information in the ingredient list,<sup>1</sup> particularly for purchase and consumption decisions
- preferences for how this information is expressed in the ingredient list, excluding format and presentation.

The secondary objective was to:

- identify and describe the factors that moderate consumers' motivation or ability to seek out, understand, and use information about sugars, fats, and oils in the ingredient list.

The REA literature was identified by searching relevant online research databases licensed by FSANZ, through targeted website searching, and by using professional networks. All research documents identified through this process were reviewed for relevancy, resulting in the 55 studies used in this report. More detail on the search and review process is provided in Appendix 2.

This REA is organised such that the content addresses each primary objective in turn. Detail based on the secondary objective is included throughout the narrative. Each section contains a summary of the key points, showing the main messages from the research in that area. The final section of the report body outlines the limitations of the research literature. Technical and methodological detail on each piece of research is provided in two tables in Appendix 1. Table A1.1 provides an overview of the study type and outcome measures of relevance to this REA. Table A1.2 summarises the internal and external validity of each study. The possible scores for the internal and external validity ratings for the studies are low, medium, and high. This review primarily relies on overseas research findings, and the results may not completely generalise to Australia and New Zealand.

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<sup>1</sup> Searches were for sugar, fat, oil, and so detected both "natural" and "added" sugar.

## 2 How well do consumers understand sugar, fats, and oils?

Key points:

- 27 relevant studies were identified, of which 13 were conducted in Australia/New Zealand
- Most of the studies on understanding have focussed on fats, with relatively few addressing consumer understanding of sugar or carbohydrates
- There are sizeable sub-proportions of consumers who have little understanding of sugars, fats, and oils
- The health messages to reduce fat intake appear to be successful, however
  - consumers are less sure about specifically which fats to reduce
  - consumers knowledge of the types of fats in different foods appears to be mixed
- There are sizeable sub-proportions of consumers who do not appear to understand the relative sugar concentrations of various beverages
  - In particular, the idea that some beverages (e.g. fruit juice, milk, vegetable juice) contain energy in the form of natural sugars appears to be less well understood
  - Added sweetness, e.g. use of sweeteners, may lead consumers to overestimate relative sugar levels in beverages
- It is not clear how consumer understanding of the various sugars, fats, and oils influences consumer interpretations of ingredient lists.

Some international studies have examined the level of consumer understanding of sugar, fats, and oils. Because of the number of studies, the results for sugar are reported first, followed by the results for fats and oils. Studies that examined both types of nutrients have the relevant findings cited separately.

### 2.1 What is the general level of consumer understanding internationally?

#### 2.1.1 Understanding of fats and oils

The level of consumer understanding of fats and oils differs depending on the particular nutrient being assessed. A 1996 Norwegian qualitative study examined consumer use and understanding of food labels found some understanding that polyunsaturated fats and oils were healthier (Wandel and Bugge 1996). One study of Polish consumers found no significant difference in self-reported understanding of total fat (88% of female consumers compared to 79% of male consumers), and female consumers were more likely to understand cholesterol (72% compared to 57% of male consumers) (Rejman and Kasperska 2011). Female consumers were also more likely to understand omega-3 and omega-6 fat (43% compared to 24%). Few female or male consumers understood unsaturated fat (36% and 25%, respectively), saturated fat (27% and 18%), or trans fats (20% and 12%), and none of these differences were significant.

The European cross-country study by BEUC (2005) found that 49% of respondents knew that unsaturated fatty acids were “good for you”, 47% knew that saturated fatty acids were not “good for you”, and 19% could explain what a trans fatty acid was. The later cross-country study by EUFIC (2008) found that over 60% of respondents correctly knew that the health recommendation was to eat less fat. However, over half of respondents incorrectly thought that polyunsaturated fat intake should be reduced. Over 45% knew to eat less/avoid saturated fats and trans fats, and eat more omega-3 fats.

A cross-country study of grocery shoppers, conducted in 2007/2008, found that 51% of those in high-income countries<sup>2</sup> reported being confused about fats, and 64% believed that “Government, experts, food companies and media give contradictory messages about fats” (Diekman and Malcolm 2009). Forty-five percent of grocery shoppers in high-income countries reported a lack of knowledge about the health benefits of fats, although between 65% and 89% indicated familiarity with various different types of fats.<sup>3</sup> While 77% responded that omega-3 fat was generally good for their health, and 67% responded that saturated fat was generally bad (17% did not know either way), only 49% responded that trans fat was generally bad (40% did not know), 40% thought that polyunsaturated fat was generally good (25% did not know), and 33% thought that monounsaturated fat was generally good (34% did not know).

A United States of America (USA) study based on a 2004 population survey found that awareness of fat differed by type of fat, from a high of 95% being aware of saturated fat to a low of 61% being aware of “n-3 fatty acids” (Lin and Yen 2010).<sup>4</sup> Being white was associated with having a higher awareness for all fats, and being female or having a college education was associated with higher awareness of some fats. Those who reported they had heard of a fat were then asked – for that fat – to identify its effect on heart disease risk. This means that the subset of respondents for each of the following results is different, because the percentage relates to the people who were asked the question. The risk associated with saturated fat was the best understood, with 78% knowing that saturated fat increases the risk of heart disease. However, only 48% knew that trans fat, and 39% knew that partially hydrogenated oil, increase the risk of heart disease. Of those aware of each fat, while 51% knew that n-3 fatty acids lower the risk of heart disease, only 16% were aware of the effect for monounsaturated fat (16% thought it increased risk) and 15% were aware of the effect for polyunsaturated fat (21% thought it increased risk). Having a college education was associated with higher knowledge of heart disease risk across all the fats, and being male or African American was associated with lower knowledge for some fats.

A later USA study compared knowledge of fats before and after the American Heart Association ran a national fat and oil awareness campaign in April 2007 (Eckel et al. 2009). Only the 2007 (i.e. post campaign) results are reported here, but the 2006 results follow the same trends. Over 70% of respondents knew that animal fats, saturated fats, and trans fats increase the risk of heart disease,<sup>5</sup> and n-3 fatty acids<sup>6</sup> decrease the risk. Over 50% of respondents knew that partially hydrogenated oils<sup>7</sup> increase the risk, and that polyunsaturated fats and monounsaturated fats decrease the risk.<sup>8</sup> Only 44% of respondents knew that tropical oils increased the risk and 28% that vegetable oils (e.g. canola oil, corn oil) decreased the risk.

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<sup>2</sup> Both high-income and low- and middle-income countries were included, but only the results for developed countries are reported here. The ten developed countries were: Belgium; Czech Republic; Germany; France; The Netherlands; Poland; Spain; Sweden; United Kingdom; United States of America.

<sup>3</sup> The types of fats were: omega-3; omega-6; essential fat; monounsaturated fat; polyunsaturated fat; trans fat; saturated fat.

<sup>4</sup> Results for awareness of the other fats: 77% for polyunsaturated fat; 68% for partially hydrogenated oil; 67% for trans fat; 62% for monounsaturated fat.

<sup>5</sup> 81%, 77%, 71%, respectively.

<sup>6</sup> 74%.

<sup>7</sup> 56%.

<sup>8</sup> 60% and 63%, respectively.

Eckel et al. (2009) also tested people's knowledge of the types of food products that typically contain saturated fat and/or trans fats. Again, only the 2007 results are reported in this summary. The results are shown in Table 1 below. For the seven foods that typically contain saturated fats, between 43% and 71% of respondents correctly identified the food as containing saturated fat. However, for the seven foods that typically don't contain saturated fats, between 26% (chicken) and 72% (French fries) of respondents incorrectly identified the presence. Respondents performed more poorly on trans fats knowledge. Of the seven foods that typically contain trans fats, between 53% (French fries) and 29% (crackers) of respondents correctly identified the food as containing trans fats. Of the seven foods that typically don't contain trans fats, between 40% (lard) and 16% (chicken) of respondents incorrectly identified the presence. These results indicate that few USA consumers have a good understanding of the types of foods that typically contain saturated fats and trans fats. While some of the foods tested are used as ingredients and would appear in ingredient lists (e.g. lard, butter, vegetable shortening), it is not clear what type of impact the perceptions around fat content would have on consumers reading an ingredient list.

**Table 1. Proportion of consumers who indicated that the food product contained this type of fat. Correct response identified by a shaded box.**

Food products	Which of these foods, if any, typically contain saturated fats? (%)	Which of these foods, if any, typically contain trans fats? (%)
French fries	72	53
Lard	71	40
Butter	69	35
Fatty beef	68	36
Doughnuts	68	51
Pastries	58	46
Hard margarine	56	41
Vegetable shortening	55	39
Cookies	53	44
Dairy products	46	22
Soft tub margarine	45	36
Whole milk	43	19
Crackers	28	29
Chicken	26	16
None of the above	11	19

A Spanish study of 100 consumers found that the type of fat information provided for sweet biscuits could influence the perceptions of product healthiness (Tarancón et al. 2014). Participants were divided into a “low fats knowledge” group and a “high fats knowledge group” on the basis of the number of correct responses to a questionnaire about fats. The fat content of the biscuits was due to shortening, olive oil, or sunflower oil, and the fat concentration was set to either 10% or 15%<sup>9</sup> (6 sweet biscuit conditions).<sup>10</sup> When the participants were presented with a food label for the sweet biscuits, which included a Nutrition Facts label,<sup>11</sup> the low knowledge group results showed that both fat content options for the shortening sweet biscuits were viewed as equally unhealthy, whereas for both oils the 10% fat content variants were viewed as more healthy than the 15% variants. For the high knowledge group, in all cases the 15% variant was viewed as less healthy than the 10% variant. While the high knowledge group viewed both shortening variants as unhealthier than any of the oil variants, the low knowledge group viewed both shortening variants as equivalent to the 15% sunflower oil with respect to healthiness. The authors concluded that the low knowledge group did not use the Nutrition Facts label information to evaluate the healthiness of the shortening variants. It appears, at least for consumers with little fats knowledge, that the source of the fats in a food may be more important than the total fat content.<sup>12</sup>

### **2.1.2 Understanding of sugar**

In their study of Polish consumers, Rejman and Kasperska (2011) found that sugar was the best understood nutrient, with women significantly more likely to declare that sugar was a term that was clear to them (91% compared to 80% for males). The European cross-country study by BEUC (2005) found that only 51% of respondents could correctly describe a carbohydrate.

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<sup>9</sup> The 10% fat variant is the healthiest in every pair.

<sup>10</sup> Neither shortening variant label contained any information on the fat source, so it was not the use of shortening per se that influenced these results. The biscuits containing oil were labelled with the oil source (e.g. “with olive oil), and the two 10% oil variants were also labelled with “low in saturated fat”. The sweet biscuits were formulated so that all 10% variants contained 367 kcal/100g and all 15% variants contained 413 kcal/100g.

<sup>11</sup> At the time of the study, food labels in Spain were not required to carry nutrition labelling unless claims were made. Therefore study participants may not have been familiar with the Nutrition Facts label, which is a USA approach. Study participants were not shown an ingredient list.

<sup>12</sup> The results for the low knowledge group are hard to interpret from a fat influence perspective because none of the fat values in the Nutrition Facts label appear to be driving the shortening variants scores for unhealthiness. The presence of the “low in saturated fat” claim does not drive all the differences, as even the sunflower and olive oil high-fat variants (which had no claim) showed a trend of being given the same or better healthiness rating as the low-fat shortening variant.

## **2.2 What is the general level of consumer understanding in Australia and New Zealand?**

### **2.2.1 Understanding of fats**

A survey of female Australian dieters found only 65% of respondents knew that fat is an essential nutrient (Webb and Dear 1996).<sup>13</sup> An Australian study examined people's understanding of the relative fat content of various foods (Hawkes and Nowak 1998). While most of the subgroup sizes were too small to produce robust estimates of understanding at the subgroup level, the cardiac patient subgroup was the largest (73% of the sample), and the results for this group were sufficiently robust to be reported here.<sup>14</sup> The study found that 66% of cardiac patients knew that it was more important to eat less saturated fat, than it was to eat less cholesterol, in order to reduce their cholesterol level. A later Australian qualitative study suggests that there is a mixed understanding about fats (Chan et al. 2005). Participants viewed vegetable oils, fish oils and unsaturated fats as "good fats", and saw saturated and animal fats as "bad fats". There appeared to be a view that fat in the diet should be reduced, without taking the nuances of the different types of fat into account.

A more recent Australian survey conducted in 2011 found mixed understanding with respect to fats (Worsley et al. 2012). When asked to select which fat was the most important to cut down on, only 45% of respondents correctly choose saturated fat, with 33% selecting trans fat even though this latter type is not present in many foods in Australia. Seventeen percent were not sure, 3% thought it was polyunsaturated fat, and 3% selected monounsaturated fat. When asked about the link between various nutrients and prevention of heart disease, 87% knew to eat less saturated fat, however 36% either didn't know about omega-3 fatty acids or did not realise that this type of fat helps protect against heart disease.

In New Zealand, a survey conducted over 1988/89 found that 91% of respondents knew cholesterol was a type of fat, with 6% indicating they didn't know, and 3% thinking it was a type of sugar (Worsley et al. 2012). A 1990 survey examined adults' understanding of the dietary guidelines. The results showed that 93% of respondents knew that fat should be reduced, 87% knew that cholesterol should be reduced, and 82% knew that saturated fat intake should be reduced (Scott and Worsley 1997). However, only 14% knew that polyunsaturated fat intake should be increased. The qualitative research by Maubach et al. (2009), based on 15 New Zealand parents, found that the total fat information in the Nutrition Information Panel (NIP) was relatively well understood. However, the study also, found that terms such as saturated fat were confusing. The study did not examine the ingredient list.

### **2.2.2 Understanding of sugar**

The 1990 New Zealand survey found that 82% of adults knew that sugar intake should be reduced (Scott and Worsley 1997). The qualitative research by Maubach et al. (2009) found that the sugar information in the Nutrition Information Panel (NIP) was relatively well understood.

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<sup>13</sup> 27% thought fat was not an essential nutrient, and 8% did not know.

<sup>14</sup> The results for all subgroups could be combined, but the relatively large size of the cardiac subgroup will swamp the results for the other subgroups.

## 2.3 Do consumers understand which foods are higher in sugar, fats, and oils?

### 2.3.1 Australian and New Zealand studies

An Australian study examined people's understanding of the relative fat content of various foods (Hawkes and Nowak 1998). Again only the results for the cardiac patient subgroup are reported. Just under one-third of cardiac patients knew that butter and margarine have the same amount of fat, and that olive oil and vegetable oil have the same amount of fat. Only 28% knew that cholesterol was found solely in animal products. When asked which – out of a list of nine foods<sup>15</sup> – should be consumed less in order to reduce their cholesterol level, the median percentage of correct responses was 56%. When asked which of eight foods<sup>16</sup> were low in fat, the median percentage of correct responses was 63%. An Australian qualitative study found that butter was viewed as a preferred spread due to a perception that butter is more “natural” (Chan et al. 2005).

A small qualitative study of rural New South Wales couples, conducted around the same time, found a general understanding of which foods were fatty (Lupton 2000). For home-cooked meals, participants tried to choose less fatty cuts of meat, physically removed the fat during meat preparation for cooking, and tried to grill rather than fry. One participant mentioned that the addition of butter to mashed potatoes or the use of fat in the frying pan meant that meals were possibly less healthy than they could be. There was a focus on fat being unhealthy, with less mention of sugary foods being worse for one's health. Regarding takeaway meals, these tended to be viewed as having too much oil, fats, and sugars.

A recent Australian qualitative study of 37 adults with cardiovascular disease found that some barriers exist to consumer understanding of dietary advice (Meyer et al. 2014). Specifically, these consumers believed they were given too much dietary advice, and believed some of it was contradictory in nature. For example, participants felt they had been given conflicting advice with respect to egg and avocado consumption.

Some Australian research has identified that context appears to place an important role in the consumer understanding of sugars, fats, and oils. More specifically, the way the individual food item is viewed appears to moderate consumer beliefs of these nutrients. A qualitative study of Aboriginal people in the Northern Territories found that traditional sources of these nutrients, such as the fat of traditionally hunted species and the honey of wild bees, were viewed as good for health (Colles et al. 2014). Conversely, high-sugar and high-fat foods purchased from stores were viewed as having a negative impact on health. A qualitative study of consumers living in Bathurst and Sydney found that dietary fat was the most common association with bad food, with body fat and weight being the main concerns for those participants trying to control their weight (Lupton 2005). Almost all participants talked about fat in negative terms, and there was little distinction between good and bad fats. Sweet or sugary foods were only mentioned in the context of limiting children's intake.

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<sup>15</sup> The foods were: cakes and biscuits; skim milk; ice cream; fat on meat; sugar; bread; peanuts; coconut; avocados.

<sup>16</sup> The foods were: toasted muesli; spaghetti; rice; bread; nuts; margarine; olive oil; carob bar.

A qualitative study of Victorian adults had similar findings for fat (Timperio et al. 2003). Whether or not a food was fattening depended mainly on the fat content alone of that food. Some participants mentioned there were two types of fat, however the language used was inconsistent<sup>17</sup> and there was no consensus on whether both types were equally fattening. Sugar content was also commonly mentioned as a factor in deciding if a food was fattening, and both fat and sugar were seen as fattening if consumed in excess. However, some participants believed that sugar from fruit was not fattening. This belief was reflected in the finding that – except for avocado and nuts – fresh and natural foods were not fattening as they were viewed as unadulterated (e.g. no added oils). The subsequent quantitative survey of Victorian voters provided insights into the popularity of these food and nutrient beliefs. Only 24% of respondents disagreed that “[f]resh natural foods are not ‘fattening’”, with 60% agreeing with the statement. Seventy-nine percent of respondents agreed that “[i]t is foods with a high fat content that are ‘fattening’” and only 30% agreed that “[a]s long as I watch my fat intake I can eat as much as I like”. Fifty-five percent agreed with the statement “[s]aturated fat is more fattening than unsaturated fat” and 56% agreed that “[y]our body can burn sugar quicker than it can burn fat”.

An Australian study of children aged 5-6 years showed that the ability to distinguish whether a food was more or less healthy differed by product (Zarnowiecki et al. 2011). While over 90% of the children identified apples, corn-on-the-cob, broccoli, carrot, watermelon, and/or milk as healthy, only 57% thought legumes were healthy and 47% thought nuts were healthy. For non-core foods, over 90% identified doughnuts, chocolate, and/or lollies as less healthy, and almost 90% identified potato chips and/or ice cream as less healthy. Conversely, around half believed that meat pie, fried chicken, coco pops, and/or muesli bar were less healthy and 62% thought that a hot dog was less healthy. The study did not examine the reasons underpinning the children’s beliefs.

The issue with the depth of nutritional understanding in children was also examined in a New Zealand study of teenagers aged 13 to 16 years (Hill et al. 1998). While the children had been taught home economics in school years 7 and 8, and some had been taught nutrition in science classes, specifics (e.g. the effects of nutrients on the different parts of the body) had apparently been largely forgotten. Another issue is that the children focussed on negatives, for example that fat leads to people putting on weight or having heart attacks, and that sugar is bad for teeth. There were some gender differences. The association between dietary fat and clogged arteries, heart disease, or stroke was mainly mentioned by boys. Girls had more of a focus on excess weight and slimming through dieting. There appeared to be little understanding of why vegetables and fruits were “good for you”. These two studies of children suggest that some rote learning of “good” versus “bad” foods may be occurring, without a deeper understanding of the role of nutrients such as saturated fat and sugar in distinguishing foods on a relative healthiness spectrum.

Three studies were located that looked at consumer understanding of the sugar content of various beverages. The studies examined slightly different questions, so it is not possible to pool their findings. One study is of Australian and New Zealand consumers, and is reported in this subsection. The other two studies are reported in the next subsection.

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<sup>17</sup> Good vs bad fat; healthy kind of fat vs unhealthy kind of fat; natural fat vs processed fat; not concentrated fat vs concentrated fat; saturated fat vs unsaturated fat.

A 2006 study of Australians and New Zealanders found that people were relatively accurate at gauging the relative levels of sugar in formulated beverages and other non-alcoholic drinks (FSANZ 2006). Around 80% of consumers correctly reported that formulated beverages contained more sugar than water (bottled or tap). Around 60% correctly thought that formulated beverages contained more sugar than milk, and about the same proportion believed that sugar sweetened soft drinks contained more sugar than formulated beverages. However, the results showed the consumers were uncertain about the relative sugar content of formulated beverages and fruit juices, and only around 40% correctly thought that diet/no sugar soft drinks contained less sugar.

### **2.3.2 International studies**

A recent USA study of beverages examined absolute perceptions of sugar levels in beverages (Rampersaud et al. 2014).<sup>18</sup> Respondents were asked to indicate how sugary particular types of beverages were (with water given as a priming drink). The results showed a mixture of understanding with respect to sugary drinks: while 96% replied that sugar sweetened soft drinks were sugary, 45% also thought diet soft drinks were sugary. Only 39% felt that 100% fruit juice was sugary, and this decreased to 24% for a combined fruit/vegetable juice drink. A Swiss study of children and one of their parents found that, in a sort task of 20 non-alcoholic beverages, a high sugar content (g/L) was the strongest predictor of perceived unhealthiness (Bucher and Siegrist 2015). The second best predictor was the presence of artificial sweeteners, followed by presence of caffeine. The fruit content (%) was the fourth significant predictor, and was the only one that contributed to perceived healthiness. The sort order of the child and parent dyads was highly correlated.

The study by Rampersaud et al. (2014) also showed that respondents did not have a good general understanding of the types of sugars present in commonly-consumed beverages. Respondents were also asked to indicate, for each beverage type, which of four sweeteners was contained in the product.<sup>19</sup> While 97% of respondents knew that water did not contain sugar, for all three fruit juices tested<sup>20</sup> around 11% believed that they did not contain sugar. While 80% of respondents correctly believed that orange juice contains natural sugar, this dropped to 74% for apple juice and 73% for grape juice. These numbers reversed for perceptions of added sugar: 8% incorrectly believed orange juice contained added sugar, increasing to 12% for apple juice and 13% for grape juice. Another USA study found that only 39% of adolescents and 52% of their parents knew that 100% fruit juice did not contain added sugar (Nelson et al. 2009), and a Brazil study found that grocery shoppers did not appear to differentiate between nectars – which can contain added sugar – and juice (Ferrarezi et al. 2013).

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<sup>18</sup> No confidence intervals have been provided, so the study does not indicate which proportions are statistically significantly different.

<sup>19</sup> Options for all beverages were: Does not contain sugar; Contains natural sugar; Contains added sugar (including HFCS); Contains artificial sweetener (such as Splenda or Aspartame). Respondents could select more than one response option for each beverage.

<sup>20</sup> 100% orange, 100% grape, and 100% apple juice.

The findings also suggest that people may not realise the sugar content of vegetables or milk. While just over half of respondents correctly believed that pure vegetable juice contains natural sugar, 19% incorrectly believed that it does not contain sugar, and 7% incorrectly thought that type of beverage contains added sugar (Rampersaud et al. 2014). Respondent understanding of the sugar content of fruit-vegetable juice blends was worse: only 49% of respondents realised these beverages contained natural sugar, with 33% incorrectly thinking they contain added sugar and 5% thinking they do not contain any sugar. Regarding milk, 35% incorrectly thought that reduced-fat (2%) milk did not contain sugar and 39% thought that fat-free milk did not contain sugar, and these proportions were larger than the respondents who correctly thought that the milks contained natural sugar (24% and 23%, respectively).

### **2.3.3 Summary of consumer understanding of foods higher in sugar, fat, oil**

Overall, the results outlined in this section suggest that the type of product may influence perceptions about the expected ingredients. There is some evidence that the product itself may influence consumer beliefs about the healthiness of ingredients. The Nelson et al. (2009) study also found that the type of drink may affect how positively a sweetener is viewed. Forty-three per cent of adolescents surveyed, and 69% of their parents, knew that the sweetener used in sports drinks is not healthier than the sweetener used in soft drinks. The 2011 Australian study on food knowledge assessed consumer understanding of some foods with respect to added sugar and saturated fat (Worsley et al. 2012). Again, knowledge depended on food product. While 78% of respondents knew that bananas are low in added sugar, 78% knew that orange juice drink (35% juice) is high in added sugar, and 72% knew that a muesli bar is high in added sugar, only 55% knew that strawberry yoghurt is high in added sugar. The results for saturated fat are worse: while 73% knew that lean red meat is low in saturated fat, only 58% knew that whole milk is high in saturated fat and 39% knew that vegetarian pastry is high in saturated fat. Sixty percent knew that avocado is low in saturated fat.

As well as the type of product, the presence of other ingredients that are mistrusted by consumers may affect overall evaluations of food healthiness. A survey conducted over 1988/89 found that, when asked which ingredient most concerned them, food additives had the most mentions (36%), followed by fat (27%), salt (18%), and then sugar (13%) (Worsley et al. 1991). However, 55% of respondents identified reducing fat intake as the single change that would make their diet healthier, and 7% would consume less sugar. In comparison, 20% would avoid chemical additives.

## **2.4 How well is the concept of “natural sugar” understood?**

A FSANZ-commissioned on-line study examined the impact of sugar claims on Australian and New Zealand adults' perceptions of the level of sugar in six mock food products<sup>21</sup> (Bessey et al. 2006). Half the respondents saw the labels with a “contains natural sugar” disclaimer and half saw the labels without the disclaimer. All respondents could access a NIP and ingredient list on the products, but they had to manipulate the stimuli to access this information. There was a statistically significant effect of disclaimer; the presence of the disclaimer was associated with fewer respondents rating the products as containing no sugar.

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<sup>21</sup> The stimuli were mock labels only, rather than mocked up packaging. There were two products in each sugar-level category: vegetable juice and vanilla yoghurt (low sugar), fruit/nut bar and muesli (medium sugar), and apple juice and tinned peaches in juice (high sugar).

### 3 Who uses information in the ingredient list?

Key points:

- 23 relevant studies were identified, of which only one was conducted in Australia/New Zealand
- Up to 52% of consumers report using the ingredient list, and some of the lower rates are likely explained by differences in question wording (use when first purchasing a food versus asking generally)
- Grocery shoppers who are more likely to use the ingredient list have one or more of the following attributes: female; higher formal education; greater nutrition knowledge; higher income
- The ingredient list is used by consumers who are wishing to avoid particular ingredients, so their dietary requirements (e.g. allergen, religious) are met
- Little information on the use of the ingredient list to obtain information on specific sugars, fats, and oils was located
  - The one series of studies that examined this issue found that a reasonably large proportion of consumers used the ingredient list to obtain information on these nutrients in order to identify products to avoid
  - However, consumers also have beliefs about the sorts of products that are, for example, high in fat, and may rely on these beliefs instead of checking the ingredient list.
- Consumers appear to value the ingredient list highly, even though relatively few appear to use this label element

#### 3.1 Who uses the ingredient list?

Up to 52% consumers report routinely using the ingredient list; this finding is consistent in literature from across a wide range of countries. The FSANZ-commissioned consumer attitude survey found that around half of Australian and New Zealand people<sup>22</sup> aged 14 years and older reported using the ingredient list when purchasing a food product for the first time (Stafford et al. 2008). About a third<sup>23</sup> reported they looked for information on the “quantity of the main ingredients (% Labelling)”, in the ingredient list, when purchasing for the first time.

While not directly comparable because it wasn't limited to the ingredient list, 46% of English people<sup>24</sup> aged 16 years and older volunteered that they looked for ingredient information when purchasing a food product for the first time (TNS 2007). This category included answers relating to factors such as whether the food contained GMO ingredients, or was organic, so is not strictly limited to information contained in the ingredient list. More specifically, 8% reported they looked for the quantity of the main ingredients, 8% for checking ingredients for dietary reasons, and 10% looked at the list of ingredients for other reasons (e.g. not for allergy purposes).

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<sup>22</sup> 52.7% of Australians, 48.3% of New Zealanders, no statistically significant difference.

<sup>23</sup> 36.1% of Australians, 33.3% of New Zealanders, no statistically significant difference.

<sup>24</sup> Sample was not limited to grocery shoppers.

A study of consumers in five European countries<sup>25</sup> found that only 38% self-reported reading the ingredient list in the shop, and 25% reported they never read it (BEUC 2005). These results are interesting in light of two facts. First, at the time the study was conducted, a food product was only required to include a Nutrition Information Panel equivalent if a nutrition claim was made, so the ingredient list would be the only source of standard information about the contents of a product. Second, when given a food package and asked to identify sources of nutritional information, only 32% identified the ingredient list, so the ingredient list may not be commonly viewed as a source of nutritional information. A later cross-European<sup>26</sup> study found that the ingredient list is used much less frequently than the nutrition table as the place where consumers first look for nutrition information (EUFIC 2008). Self-reported “first look” use ranged from a low of about 7% (Germany) to a high of around 26% (Hungary). In the UK, France, and Germany, the Guideline Daily Amount information was also more commonly used as a first look source of nutrition information than the ingredient list.

A study of Greek grocery shoppers found that 17.5% self-reported using the ingredient list as a source of information (Drichoutis et al. 2005). In slight contrast to the characteristics of self-reported ingredient list users in the USA, described below, Greek users were more likely to be male and younger however, as in the USA research, users were also more likely to be more educated and more nutritionally knowledgeable.<sup>27</sup> A Polish study of Warsaw consumers found that only 4.5% self-reported always checking the ingredient list, and 21.5% reported that they often checked, with 34% reporting they “never” checked (Rejman and Kasperska 2011). Women, people with higher education levels, and higher income consumers were more likely to self-report using the ingredient list.

There is some USA literature on use of the ingredient list. A series of 1980s FDA Health and Diet Surveys<sup>28</sup> found that being female, having higher levels of formal education, having a low-sodium diet, and having a low-cholesterol diet were each independently associated with a higher probability of reading the ingredient list (Bender and Derby 1992). However, these surveys were conducted before the introduction of the Nutrition Facts label in 1994. Based on self-reported data collected in a 1991 USA population survey of meal planners/ preparers, ingredient list users were more likely to be female, live outside a metropolitan area, have a higher education (college or graduate), gave more importance to nutrition when shopping but less important to taste, and were more likely to perceive their diet as healthy (Nayga 1996). Due to the method of analysis, these are all independent main effects that take into account the other variables in the model.<sup>29</sup> USA self-reported use data from 1994/6 showed that being female, having a higher income, being employed, being Hispanic, living in a metropolitan area, having at least some college education, having an awareness that diet can affect health, having the time to read food labels, being the main grocery shopper, and not participating in the food stamps program were all associated with a significant increase in the use of the ingredient list (Kim et al. 2001).

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<sup>25</sup> Denmark, Germany, Hungary, Poland, and Spain.

<sup>26</sup> France, Germany, Hungary, Poland, Sweden, UK.

<sup>27</sup> Variables not statistically significant as predictors of ingredient list use were: income; whether price, taste, nutrition, ease of preparation, or brand were viewed as important (5 binary variables); whether the respondent smoked, was on a special diet, was the major grocery shopper, was the major meal planner, or agreed that diet affects disease risk (5 binary variables); household size; importance of following dietary guidelines; average time spent grocery shopping; nutrition knowledge score.

<sup>28</sup> Surveys were reported for 1978, 1982, 1984, 1986, and 1988.

<sup>29</sup> Variables not statistically significant were: household size; ethnicity; employment status; city dweller; age; income; compass-based geographical location.

Regarding frequency of use of the ingredient list, a comparison of USA self-reported data from 1995/6 and 2005/6 found that – while the percentage reporting they always/often use the information remained the same (27%) – in the later survey significantly fewer Americans reported using the ingredient list “sometimes” and significantly more “never” used the information (Todd et al. 2008).<sup>30</sup> None of the demographics assessed were associated with these changes in use.<sup>31</sup> Comparable USA survey results from 2008 and 2010 found that around 50% of respondents reported frequent use of the ingredient list for unfamiliar packaged food (Deloitte 2010).<sup>32</sup>

Since 2006, the annual International Food Information Council Foundation (IFIC) consumer survey has retained a question on the information used when purchasing or eating a food or beverage. For each year of the survey (2006 to 2013), about half of USA adults aged 18 years and older have reported they use the ingredient list in purchasing and/or consumption decisions<sup>33</sup> (IFIC 2013). An analysis of the USA 2005-2006 NHANES data found that being female, having higher levels of formal education, being aged 35 years and older, and living alone were all associated with a higher self-reported use of the ingredient list (Ollberding et al. 2010).

A study of USA adolescents found that only 9.0% self-reported that they always used the ingredient list on the food label, and 16.1% reported they sometimes used it (Wojcicki and Heyman 2012).<sup>34</sup> More adolescents reported looking for total fat, trans fat, saturated fat, cholesterol, and sugars than reported using the ingredient list, however the parts of the food label used to locate this information was not measured. Another USA study found that Latina women with higher nutrition knowledge were more likely to pay attention to ingredients (28% compared to 17% of those with lower nutrition knowledge) (Fitzgerald et al. 2008).

Use of the ingredient list may differ depending on the type of product. An Irish qualitative consumer study found that consumers did not look at the labels on some food products, with everyday products such as milk and pasta, juices, and “junk food”, specifically mentioned (FSAI 2009). The quote published to illustrate this point was “*I don’t need a label to tell me what to eat, I know about my five portions of veg./fruit a day! And I know that if I buy biscuits it is junk food anyway*”. One study of Brazilian grocery shoppers found that 32% self-reported reading the ingredient list every time they purchased ready-to-drink orange juice and nectar<sup>35</sup> (Ferrarezi et al. 2013).

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<sup>30</sup> “Never” increased from 21% in 1995/6 to 32% in 2005/6. “Rarely” stayed at 16%. “Sometimes” decreased from 35% to 25%.

<sup>31</sup> Probit regression which examined age, gender, maximum educational attainment, race, and survey language (English vs. Spanish).

<sup>32</sup> 50% in 2008, 53% in 2010, no significance testing.

<sup>33</sup> Range: 59% in 2007 to 47% in 2010, results are weighted so the differences may reflect sampling error.

<sup>34</sup> There were ethnic differences in use, but these are not relevant to Australia or New Zealand.

<sup>35</sup> Nectar appears to be equivalent to fruit drink.

For some foods, consumers may not read the ingredient list because they believe they already know the ingredients. A Danish experiment, using consumers, gave participants varying amounts of information (Smith et al. 2013). Participants were allocated to one of three groups: one group was given an ingredients list and nutrition information; one group was given that information plus a written definition of the food they were assessing; and the third group was provided with no information. For each of three food products,<sup>36</sup> participants were given three samples<sup>37</sup> of the food to rate, so participants had a total of nine samples to rate. Each sample was rated on a 9-point typicality scale,<sup>38</sup> that ranged from “not at all a real [product]” to “a perfect [product]” In this experiment, all three groups gave the lowest typicality scores to the three samples that were not typical of the food. The authors concluded that, at least for the foods tested, the consumers may have had their own expectations about how a product will look and taste, and therefore don’t require information to assist them in their decisions.

Finally, there may be other contextual factors that influence use of the ingredient list. A UK study found that the proportion of grocery shoppers who reported looking at the ingredient list for each of six food products differed by the supermarket used (Grunert et al. 2010.<sup>39</sup> For example, at one supermarket 29% of customers reported checking the ingredient list on confectionery, compared to 10% and 6% at the other two supermarkets. However, across all three supermarkets, and the six food product categories examined, shoppers were least likely to check the ingredient list of breakfast cereals (range of 0% to 8% reported checking).

### **3.2 Who uses the ingredient list for sugars, fats, and/or oils information?**

An Irish qualitative consumer study found that ingredient information was helpful in allowing consumers to avoid foods that contain ingredients to which they are allergic or intolerant, and to enable consumers to abide by their dietary restrictions (e.g. vegetarian) (FSAI 2009). The associated quantitative study asked about consumer use of the Quantitative Ingredient Declaration, or QUID<sup>40</sup> (FSAI 2009). The QUID, which is the percentage of the ingredient in the food, must be declared under certain circumstances and therefore is not a mandatory label element in Ireland. Only 47% of respondents reported having seen a QUID and, of these, 31% hadn’t used the information. Again, of this 47%, some said they had used the information to calculate calories/fat intake (13%), and/or salt/sugar intake (6%), and/or nutritional ingredients (2%). However, it is not possible to use the QUID information to produce accurate estimates of these attributes. An important consideration in interpreting these results is that packaged food in Ireland does not currently require nutrition information unless a nutrition claim is made, although this will change when the Food Information Regulations come into effect on 13 December 2016. For some foods, the QUID (if present) may be the only source of numerical information available to Irish consumers.

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<sup>36</sup> Macaroons, fruit smoothie, and a traditional Danish spiced meat roll (rullepølse).

<sup>37</sup> The samples differed on the basis of ingredients. For all three foods, participants were given an ideal product, an alternative version, and a version that was different to the products normally marketed under those terms (e.g. the macaroon “different” sample was a pastry that contained no egg white or almonds/almond flavouring). Each participant tried all three samples and all three products.

<sup>38</sup> Is this a real macaroon? Is this a real smoothie? Is this a real rullepølse?

<sup>39</sup> The differences could be due to supermarket specifically, or to the differences in the demographics of the customers at each supermarket. The reasons for the differences are not given.

<sup>40</sup> The QUID has a slightly wider scope so that it captures more ingredients compared to characterising ingredients as defined in Standard 1.2.10 of the Australia New Zealand Food Standards Code.

An USA study that predated the introduction and mandating of the Nutrition Facts label found that the ingredient list was used by some consumers to avoid particular ingredients (Bender and Derby 1992). Across the five FDA Health and Diet Surveys,<sup>41</sup> between 20% and 32% used to the ingredient list to avoid sugars, between 5% and 15% to avoid fats/oils, and between 2% and 14% to avoid cholesterol. There was a significant trend over time of increasing percentages of consumers using the ingredient list to avoid fats/oils and cholesterol. The study did not explain how consumers were using the ingredient list to avoid cholesterol, however it is reasonable to expect they were using the ingredient list to avoid ingredients they associated with cholesterol.

In the IFIC 2010 and 2011 surveys, USA consumers were asked to select all the reasons they used the ingredient list.<sup>42</sup> The proportion of consumers reporting particular uses of the ingredient list relevant to this review are summarised in Table 2 below (IFIC 2010; IFIC 2011). A dash indicates that the response option was not given in that year.

**Table 2. Proportion of consumers using the ingredient list for review-related information. Consumers are specifically looking for:**

Use	2010 survey (%)	2011 survey (%)
Type of oil/fat	62	64
Sugars	-	60
Order of ingredients on list	47	36**
Length of ingredient list	22	24
Ability to pronounce ingredient names <sup>43</sup>	14	18**

\*\* Statistically significant difference between the two years.

### 3.3 Importance of the ingredient list to consumers

While few consumers appear to use the ingredient list, more view this packaging information as important. On a ten-point rating scale, 44% of Irish consumers thought the ingredient list was very important (ratings 10 and 9) and another 28% thought the list was moderately important (ratings 8 and 7) (FSAI 2009). Overall, the ingredient list was rated second in importance after the date of minimum durability. A South African study found that the importance with which the ingredient list is viewed depends on the self-reported level of food label reading (Jacobs et al. 2011).<sup>44</sup> All grocery shoppers who reported they “always” read the information on food labels viewed the list of ingredients as very or moderately important, compared to 84.5% of consumers who “sometimes” read the information.<sup>45</sup>

<sup>41</sup> Surveys were reported for 1978, 1982, 1984, 1986, and 1988.

<sup>42</sup> The question may have been asked in other years, but these were the only years for which the data was reported.

<sup>43</sup> Respondents were asked “What, specifically, are you looking for when it comes to using the ingredients portion of food and beverage packages?” and they were instructed to select all that applied. This was one of the response options for the question.

<sup>44</sup> A new food labelling regime was effective in South Africa from 1 March 2012

(<http://www.ift.org/Public-Policy-and-Regulations/Recent-News/2012/April/New-food-labeling-rules-take-effect-in-South-Africa.aspx>). While ingredient lists were present on food products prior to this date, when the study was undertaken the ingredient list was not mandated and the information was not listed in order of descending mass (<http://www.industrial-newsroom.com/news-detail/t/south-africa-introduces-new-regulation-for-food-labeling/>).

<sup>45</sup> The result for shoppers who self-reported “never” reading the information was not reported. It is not clear whether this group were asked the question.

USA consumers similarly self-report being highly interested in ingredients. Two IFIC surveys (IFIC 2012; IFIC 2013) found that at least 90% of USA consumers reported giving “a little” or “a lot” of thought to the ingredients in their food and beverages. While the respondents do not appear to have been asked how important they find the ingredient list, the fact that so many respondents were interested in food ingredients suggests that they view the ingredient list as important.

## **4 How well do consumers understand the ingredient list?**

Key points:

- 2 relevant studies were identified
- no Australia/New Zealand studies were found
- relatively few studies were located that addressed consumer understanding
- the few international studies suggest that there is consumer confusion about:
  - the comprehensiveness of the ingredient list
  - some of the ingredient terms used

A quantitative survey of Norwegian consumers and found that, with respect to the inclusiveness of the ingredient list, 61% believed that all ingredients were listed, 24% assumed that the list was incomplete, and 10% were not sure about the inclusiveness (Wandel and Bugge 1996).

A more recent study examined the level of understanding of Israeli adults (Sharf et al. 2012). Using four questions related specifically to the ingredient list on four Israeli food products (one question per product), respondents averaged 1.7 correct items.<sup>46</sup> The best answered item was one asking about the major component of an orange drink (water, 63% answered correctly). Only 46% were able to correctly identify the smallest ingredient in 5% white cheese<sup>47</sup> (calcium). Possibly of greater concern is that only 51% correctly responded that a sweet relish did not contain salt, with 39% responding that the product contained salt even though salt was not listed as an ingredient.

## **5 How are sugar, fats, and oils information in the ingredient list used in purchase and consumption decisions?**

Key points:

- 17 relevant studies were identified, of which six were conducted in Australia/New Zealand
- There appears to be little impact of the ingredient list on purchase decisions
- Three USA studies examined the impact of ingredient list use on consumption, giving mixed findings

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<sup>46</sup> Maximum possible score was 4.

<sup>47</sup> The study did not specify the type of cheese any further, but it may be g vina levana, or quark.

## 5.1 Purchase decisions

One Australian study found that some people report using the ingredient list to assist in making food purchase decisions (Population Research Laboratory 2009). The most common use was to check the order of ingredients (28% of respondents), followed by identifying allergens (16%) and ensuring the food met dietary restrictions (13%). In a qualitative study of 15 New Zealand parents, few reported using any packaging information to make food choices in the supermarket (Maubach et al. 2009). Few parents stated that they used food packaging when making food choices, as the choices tended to be habitual such as repeat buying of familiar brands. Some parents indicated they thought about nutrition while purchasing food, and the nutrition information most often sought related to sugar and fat.

The ingredient list, generally, may not be a major factor in helping make purchase decisions. Rejman and Kasperska (2011) found that female Polish consumers gave a significantly higher rating to the importance of the ingredient list when making purchase decisions compared to male consumers, but the scores suggested that the ingredient list was only somewhat important for both (mean of 3.09 compared to 2.47).<sup>48</sup> A South African study found that only 48.7% of self-reported food label readers read the ingredient list specifically to avoid purchasing a food product that contained particular ingredients, such as additives, preservatives, colours, or monosodium glutamate (Jacobs et al. 2011). The authors concluded on the basis of this, and unreported results, that consumers were generally unconcerned about the ingredients in the food they buy, or did not understand the terms used.

The use of sugar, fat, and oil information may not translate into expected behavioural outcomes. While the New Zealand qualitative study by Maubach et al. (2009) study was about the NIP and not the ingredient list, it found that some people will buy less healthy products even when they report reading nutrient information. In the example described in the study, one parent reported that they used the NIP to avoid purchasing high sugar products for their child, but still purchased a high-sugar breakfast cereal for them. A quantitative New Zealand study which compared the effect of providing price discounts and/or tailored nutrition education on food purchases found no effect of education on healthier purchases (Ni Mhurchu et al. 2010). The relatively extensive analysis included an examination of the effects of each intervention on the amounts of saturated fat, total fat, and sugars purchased. Education had no significant effect at either the 6-month or the 12-month follow-up, compared to baseline.

Some of this lack of influence on purchasing decisions may be due to taste. An Australian study found an association between disliking the taste of healthy foods and a reduced probability of purchasing the healthy food instead of a less healthy variant (Turrell 1998). For example, 55% of respondents on welfare reported disliking the taste of low-fat yoghurt, and only 24% reported exclusively buying low-fat yoghurt. High-income respondents were significantly less likely to report disliking low-fat yoghurt (30%) and significantly more likely to report buying it exclusively (49%). For unsweetened fruit juice, 49% of welfare respondents disliked the taste and only 25% exclusively purchased it, whereas only 9% of high-income respondents disliked the taste and 59% purchased it instead of a sweetened version.

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<sup>48</sup> The scale was 5-point, anchored at 1 (“not important”) and 5 (“very important”).

There may be little overall impact of sub-types of sweeteners on the purchase decisions of consumers. One study of female students at an USA university found that students without nutrition training formed more positive product evaluations in the presence of an “all natural” claim on food packaging, irrespective of whether “HIGH FRUCTOSE CORN SYRUP” or “HONEY” was identified in the ingredient list (Walters and Long 2012). When the “all natural” claim was absent, students without nutrition training gave higher quality and purchase intention ratings to products with “HIGH FRUCTOSE CORN SYRUP” in the ingredient list. However, two USA population surveys found that 49% of consumers in 2012 and 56% of consumers in 2013 self-reported that the inclusion of high-fructose corn syrup in a food affected their purchasing decisions (IFIC 2012; IFIC 2013). The IFIC results were replicated by a 2010 USA survey that found 27% of respondents were concerned about the use of high fructose corn syrup in foods, the fifth highest food concern (Deloitte 2010). The fourth largest concern, identified by 29% of respondents, was the “possible use of chemical ingredients that are detrimental to long-term health”.<sup>49</sup>

One USA study suggests that, even when a particular sweetener is viewed positively by main grocery shoppers, the effect of the sweetener on purchase intent differs depending on the type of food product (Cypress Research Associates 2011). In a study conducted for the National Honey Board, 96% of shoppers agreed that honey was a “natural sweetener option”<sup>50</sup> and 64% agreed that “[f]oods sweetened with honey taste better than foods made with other sweeteners.” When asked about purchase intent for foods sweetened with honey, across 26 products,<sup>51</sup> 28% said they buy/would buy milk sweetened with honey, 33% buy/would buy soda, and 39% buy/would buy potato chips. However, 91% said they buy/ would buy breakfast cereal sweetened with honey and 89% buy/would buy Graham crackers.<sup>52</sup>

Other studies suggest that the ingredient list has an impact on the purchase decisions of some consumers. A quantitative survey of Norwegian consumers found that, of the consumers who read labels at least sometimes,<sup>53</sup> about a quarter were interested in the specific type of fat/oil in the product<sup>54</sup> (Wandel and Bugge 1996). For some, this was whether the fat/oil was saturated or unsaturated, but for others it was whether the fat/oil source was animal or vegetable. There was no analysis of whether vegetable sources were preferred by consumers with dietary restrictions (e.g. vegetarians/vegans) or whether the preference was due to perceptions of the relative healthiness of fats/oils based on whether the source is animal or vegetable. An Irish quantitative consumer study found that, of the 74% of consumers that found food labelling informative, 34% said they used food labels to check for specific ingredients (FSAI 2009).<sup>55</sup>

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<sup>49</sup> The report does not contain information on the types of ingredients considered detrimental in this regard. The other food concerns, in descending order of frequency, were: healthiness (49%); safety (36%); over-processed food (31%).

<sup>50</sup> Although 95% agreed with this statement when it was included in a different question, with different response categories.

<sup>51</sup> The percentage who said they never buy that product have been deleted, so the percentages reported here are slightly higher than those shown in the report where the “never buy” responses are included.

<sup>52</sup> Graham crackers are a sweet baked good similar to a plain sweet biscuit, the closest Australia/New Zealand equivalent is a digestive biscuit.

<sup>53</sup> This looks to be approximately 65% of the respondents, based on the results reported in Figure 2, but the actual result is not reported nor is sufficient information reported to accurately estimate this result.

<sup>54</sup> This is about a quarter of about two-thirds of respondents, so about 1/6 of respondents.

<sup>55</sup> This question was only asked of that large subset of respondents, so it is not appropriate to calculate a proportion based on the total sample size.

An Australian study used cross-sectional data to examine the effectiveness of the *Don't Palm Us Off* campaign launched by Melbourne Zoo in 2009 (Pearson et al. 2014). Prior to the start of the campaign, 70% of zoo visitors supported mandatory palm oil labelling, and this increased to 90% at the 6-month point of the campaign. This increase in support was sustained after the campaign ended. Prior to the start, 66% of visitors responded that palm oil labelling would influence their purchases, and this increased to 87% at the 6-month point. Again, this increase was sustained after the end of the campaign. A 2015 survey found that 60% of Australians indicated it was important, very important, or crucial for them to correctly identify whether a product contains palm oil (CHOICE 2015).

## 5.2 Consumption amounts

An analysis of the 2005-2006 NHANES data found an effect of self-reported ingredient list use on the intakes of some nutrients, but not others (Ollberding et al. 2010). Self-reported use of the ingredient list was associated with statistically significantly reduced daily intakes of total fat (-4.41 g), saturated fat (-2.04 g), sodium (-162.02 mg) and significantly increased daily fibre intake (1.24 g). However, there was no statistically significant influence on the daily intakes for energy, cholesterol, or sugar. A previously outlined USA study on a limited sample (Fitzgerald et al. 2008) found that use of the ingredient list was associated with a statistically significant increase in the consumption of fruits and vegetables<sup>56</sup> and a significant decrease in the intake of regular soft drinks.<sup>57</sup> There was no effect for meat, sugar-sweetened sweets and desserts, or salty snacks consumption. Due to the very limited nature of the sample<sup>58</sup> the results do not appear to be influenced by confounding due to consumer demographic characteristics.

The interest level of consumers in sugar appears to influence beverage consumption (Rampersaud et al. 2014).<sup>59</sup> In this USA study, compared to respondents who did not have this as a primary concern, respondents who were concerned about total sugar reported significantly lower daily sugar-sweetened beverage consumption<sup>60</sup> (260 ml versus 390 ml), significantly higher daily water consumption (1088 ml versus 988 ml), significantly lower daily fruit juice/blends consumption (139 ml versus 166 ml), and significantly higher daily other beverage<sup>61</sup> consumption (594 ml versus 571 ml), with no significant differences between the two groups for milk or diet beverage consumption. For those who indicated added sugar was a primary concern, the result patterns were similar for water consumption (1065ml versus 1023ml for those without added sugar as a primary concern), sugar-sweetened beverages consumption (263ml versus 361ml), and other beverages consumption (600ml versus 571ml), except there was no difference in consumption levels of fruit juice/blends. Finally, there were no significant consumption differences between those who had a primary concern for natural sugar and those who did not.

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<sup>56</sup> 71% of ingredient list users had consumption above the median intake, compared to 44% of non-users.

<sup>57</sup> 36% of ingredient list users had consumption above the median intake, compared to 53% of non-users.

<sup>58</sup> 201 (100 cases with diagnosed type 2 diabetes, 101 controls without diagnosed diabetes) nonpregnant, nonbreastfeeding Latinas without severe health conditions, aged 35 to 60 years.

<sup>59</sup> The proportions with a primary concern about each type of sugar were: 51% for total sugar, 39% for added sugar, and 7% for natural sugar. Each analysis included every respondent, they were simply recategorised on the basis of their answers.

<sup>60</sup> Consumptions shown are mean daily values, and have been converted to the nearest whole ml from the oz data provided in the article.

<sup>61</sup> Includes tea, coffee, vegetable juices.

### **5.3 What is the likely impact of grouping added sugars, fats, and oils in the ingredient list?**

No research was located that addressed this question. The likely impact cannot be estimated.

## **6 What are the consumer preferences for how added sugars, fats, and oils are expressed in the ingredient list?**

Key points:

- 5 relevant studies were identified
- No Australia/New Zealand studies were found
- Based on the international literature, sizeable proportions of consumers find ingredient lists to be difficult to understand
- No study examined the outcome of grouping added sugars, fats, and oils in the ingredient list.

There appears to be general agreement in the literature that ingredient lists could be improved to make them more comprehensible to consumers. The types of terms used in the ingredient list influence the understanding of at least some consumers.. An English study found that somewhere between 4% and 8% of respondents wanted more or better information on ingredients<sup>62</sup> (TNS 2007). An Irish qualitative study found that the use of scientific terms for ingredients was confusing to some consumers and the related quantitative study found that 55% of consumers wanted labelling to be in ordinary language (FSAI 2009).

One European cross-country study found that “a large proportion” of respondents wanted ingredient lists to include terms that are more commonly understood. However, no further information was provided on this issue (BEUC 2005).

An USA population survey asked consumers what extra information they would like on food packaging, using an open-ended question. While 48% could not suggest anything extra, 6% wanted more specific ingredient information (not further elaborated) and 2% wanted easier terms to understand (IFIC 2013). The latter statistic may be an underestimate, as 93% of consumers agreed that they would prefer ingredient lists to use the common name for ingredients rather than the scientific name (e.g. salt instead of sodium chloride).

A South African study found that 42.1% of self-reported food label users agreed that the “terms used in the ingredient list are confusing”, although about as many (41.2%) disagreed (Jacobs et al. 2011). Of the consumers who reported they did not read food labels, 50.9% agreed that the terms used in the ingredient list were confusing, although a sizeable proportion (29.8%) disagreed. While inaccessibility of language is clearly not the sole reason consumers didn’t read food labels such as the ingredient list, some respondents suggested that nutrients and associated terms should be more generally understandable.

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<sup>62</sup> The results are difficult to interpret as this was an open-ended question and there are two results shown that both contain “ingredients” as part of the result. Four percent of respondents wanted more or better information on “content/ingredients/sugar/fat/salt” and 4% wanted this for “food contents/ingredients”. These figures suggest a bottom threshold of 4% and an upper threshold of 8% for wanting better information on ingredients.

## 7 Limitations in the literature

There are relatively few studies on the ingredient list. Noticeably absent are more recent studies that take current Australia/New Zealand food labelling into account. The literature review findings are therefore heavily influenced by overseas research that may not be directly transferable to Australia and New Zealand. In particular, differences in mandatory label elements between countries, the relative implementation timing of mandatory label elements, and different cultural/ethnic histories limit the applicability of findings.

The ingredient list is one of a number of mandatory label elements present in Australia and New Zealand (e.g. advisory statements, Nutrition Information Panel, allergen declaration). Voluntary label elements may also be present, such as front-of-pack labelling, nutrition content claims, health claims. There is little understanding in how consumers choose one or more label elements over others, and how these choices influence their behaviour. Amendments to one label element may influence how the other label elements are used, and this could result in unintended consequences. The lack of literature in this area means that both the estimated impact on behaviour, and unintended consequences, are unknown.

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## Appendix 1 Summary of studies used

Table A1.1 Overview of key features of studies

Authors	Country	Study type	Products	Stimuli used	Relevant outcome measure(s)
Bender & Derby (1992)	United States	Telephone surveys	NA	NA	Demographic characteristics of ingredient list users % reporting use of ingredient list for avoiding or limiting sugars, % reporting use of ingredient list for avoiding or limiting fats/oils, % reporting use of ingredient list for avoiding or limiting cholesterol
Bessey et al. (2006)	Australia, New Zealand	Online experiment (6 products x 2 disclaimers)	Vegetable juice, Yoghurt, Muesli bar, Muesli, Apple juice, Tinned peaches	Mock front of package, mock label with NIP and ingredient list	Reanalysis of data using adjacent categories logit model
BEUC (2005)	Denmark, Germany, Hungary, Poland, Spain	Survey, face-to-face	NA	Product examples, not further described	% reporting reading the ingredient list, terms in the ingredient list, % understanding carbohydrates, unsaturated fatty acids, saturated fatty acids, trans fatty acids
Bucher and Siegrist (2015)	Switzerland	Experiment	22 non-alcoholic beverages (e.g. tap water, apple juice, iced tea, diet cola)	Original beverage bottles, tap water presented in a neutral transparent 0.5-litre PET bottle	Distance of each beverage from the unhealthy point on a 3m line anchored at 'healthy' and 'unhealthy', and criteria mentioned as relevant for sorting (analysed separately for children and parents)
Chan et al. (2005)	Australia	Focus groups	10 provided, but not identified in article	Fat-related claims present on the products	Comments relating to "good fats", "bad fats", Preferred spread and reasons for choice, General comments on fat in the diet
CHOICE (2015)	Australia	Online survey	NA	NA	% indicating it was important, very important, or crucial for them to correctly identify whether a product contains palm oil
Colles et al. (2014)	Australia	Face-to-face semi-structured interviews	NA	NA	All participants were first asked to share a story about 'food', then asked 'where did you learn this?'. As required, enquires continued for 'good food', 'store foods', 'meat', 'fruit', 'vegetables', 'fat' and 'sugar'. Within discussions, other prompts related to 'where store foods come from', health, overweight, how adults and children learn and what they may like to learn
Cypress Research Associates (2011)	United States	Survey, method not provided	NA	NA	% agree foods sweetened with honey taste better than foods made with other sweeteners % who would not buy each of 26 food products sweetened with honey
Deloitte (2010)	United States	Online survey	NA	NA	% report frequently/always read ingredient list on unfamiliar products, % report understand half or less ingredients, % report understand 75% or more ingredients, % concerned about the use of high fructose corn syrup
Diekman & Malcolm (2009)	Belgium, Czech Republic, Germany, France, The Netherlands, Poland, Spain, Sweden, UK, United States	Wave 1: telephone survey (2007)  Wave 2: internet survey (2008)	NA  NA	NA  NA	% familiar with different types of fats, % understand omega-3 fat, % understand saturated fat, % misunderstand trans fat, % misunderstand polyunsaturated fat, % misunderstand monounsaturated fat  % confused about fats, % agree government etc give conflicting messages, % indicate lack of knowledge about fat health benefits
Drichoutis et al. (2005)	Greece	Face-to-face survey	NA	NA	% reporting use of ingredient list, statistically significant maximum likelihood estimates for variables in the Ingredients binary logit analyses
Eckel et al (2009)	United States	Survey	NA	NA	% correctly answering the effect of each of these on risk of heart disease: animal fats; saturated fats; trans fats; partially hydrogenated oils; tropical oils; n-3 fatty acids; polyunsaturated fats; monounsaturated fats; vegetable oils, % correctly answering which of the following typically contain saturated fats, trans fats: French fries; lard; butter; fatty beef; doughnuts; pastries; hard margarine; vegetable shortening; cookies; dairy products; soft tub margarine; whole milk; crackers; chicken
EUFIC (2008)	France, Germany, Hungary, Poland, Sweden, UK	In-store interviews  Take-home questionnaire	NA  NA	NA	% reporting ingredient list as first source of information on packaging  % correctly understanding health recommendations with respect to fat, polyunsaturated fat, saturated fat, and trans fat intakes

Authors	Country	Study type	Products	Stimuli used	Relevant outcome measure(s)
Ferrarezi et al (2013)	Brazil	Face-to-face survey	10 common brands of ready to drink orange juice and nectar (4 orange juice, 6 orange nectar)	NA	% reporting reading the ingredient list of orange juice/ nectar every time they purchase, lack of consumer differentiation between nectar and juice
Fitzgerald et al. (2008)	United States	Face-to-face interviews	NA	NA	% pay attention to ingredient list, % of ingredient list user vs. ingredient list non-user over median food group intake
FSAI (2009)	Ireland	Face-to-face interviews plus simulated shopping exercise  Face-to-face survey	Prepackaged food products including: Cheese, Yoghurt, Breakfast cereal, Bread, Ready meals, Orange juice, Fruit and vegetables  NA	Product examples, not further described  NA	Types of products where food labels not read, Reasons for using ingredient list, Factors that create confusion with respect to ingredients  % respondents who find labels informative, who use them to look for specific ingredients % respondents rating list of ingredients as important (10-point scale) % respondents wanting food label information to be easier to understand
FSANZ (2006)	Australia, New Zealand	Survey	Beverage types: Tap water, Bottled still water, Sugar sweetened soft drink, Fruit juice, Milk, Diet/no sugar soft drink	NA, although examples of some drink names were given in the questionnaire to assist respondent accuracy in answering	Percentages of amount of sugar in other beverages compared to formulated beverages
Grunert et al. (2010)	United Kingdom	In-store interview	Ready meals, Soft drinks, Yoghurts, Breakfast cereals, Confectionary, Salty snacks	NA	% who looked for one of four key nutrients in the ingredient list
Hawkes & Nowak (1998)	Australia	Survey	NA	NA	Median % correct responses to eating less of 9 foods to reduce cholesterol; %correctly answering whether cholesterol is only found in animal products; % correctly answering that saturated fat increases blood cholesterol more than cholesterol; % correctly answering butter and margarine have equal quantities of fat, % correctly answering olive oil and vegetable oil have equal quantities of fat; Median % correct responses to which of 8 foods are low in fat
Hill et al. (1998)	New Zealand	Interviews	NA	NA	Comments on fat and sugar knowledge
IFIC (2010)	United States	Web-based survey	NA	NA	% looking for type of oil/fat in ingredient list, % looking for order of ingredients in ingredient list, % looking at length of ingredient list, % looking at ability to pronounce ingredient names in ingredient list
IFIC (2011)	United States	Web-based survey	NA	NA	% looking for type of oil/fat in ingredient list, % looking for sugars in ingredient list, % looking for order of ingredients in ingredient list, % looking at length of ingredient list, % looking at ability to pronounce ingredient names in ingredient list
IFIC (2012)	United States	Web-based survey	NA	NA	% giving a little or a lot of thought to ingredients in food, % reporting that the inclusion of high-fructose corn syrup in a food affected their purchasing decisions
IFIC (2013)	United States	Web-based survey	NA	NA	% reporting use of the ingredient list in purchasing and/or consumption decisions (time series), % giving a little or a lot of thought to ingredients in food, % reporting that the inclusion of high-fructose corn syrup in a food affected their purchasing decisions, % wanting more specific ingredient information, % wanting easier terms to understand
Jacobs et al. (2011)	South Africa	Face-to-face survey	NA	NA	% reporting ingredient list as important, % using ingredient list to avoid purchasing products with particular ingredients, % agreeing that the terms used in the ingredient list are confusing, Qualitative responses to making information easier to understand
Kim et al. (2001)	United States	Survey	NA	NA	Statistically significant maximum likelihood estimates for variables in the Ingredients probit analysis

Authors	Country	Study type	Products	Stimuli used	Relevant outcome measure(s)
Lin & Yen (2010)	United States	Survey	NA	NA	% aware of fats: saturated fat; trans fat; partially hydrogenated oil; n-3 fatty acids; polyunsaturated fat; monounsaturated fat, Characteristics of people with greater awareness, % (subset) who understand the effect of the fat on heart disease risk, Characteristics of people with higher knowledge
Lupton (2000)	Australia	Interview plus survey	NA	NA	Comments on fat and sugar in meals
Lupton (2005)	Australia	Semi-structured interviews	NA	NA	Comments on 'good' and 'bad' foods
Maubach et al. (2009)	New Zealand	Face-to-face semi-structured interviews	NA	NA	Interview responses, no quantitative information
Meyer et al. (2014)	Australia	Face-to-face interview	NA	NA	Relevant comments and findings associated with fats
Naygar (1996)	United States	Survey	NA	NA	Statistically significant maximum likelihood estimates for variables in the Ingredients logit analysis
Nelson et al. (2009)	United States	Longitudinal study (3 years)	NA	NA	% knowing that the sweetener used in sports drinks is as healthy as the sweetener used in soft drinks, % knowing that 100% fruit juice does not contain added sugar
Ni Mhurchu et al. (2010)	New Zealand	15-month randomised controlled trial	NA	Education groups received education material	Effects of education on the amounts of saturated fat, total fat, and sugars purchased at 6-month and 12-month follow-up, compared to baseline
Ollberding et al. (2010)	United States	Survey	NA	NA	% reporting use of ingredient list, demographics of respondents using ingredient list, regression coefficients for impact of use of ingredient list on nutrient intake
Pearson et al. (2014)	Australia	4 cross-sectional surveys	NA	NA	% supporting mandatory palm oil labelling % indicating that palm oil labelling would influence their purchases
Population Research Laboratory (2009)	Australia	Online survey	NA	NA	% reporting use of ingredient list to check order of ingredients, % reporting use of ingredient list to check for allergens, % reporting use of ingredient list to meet dietary restrictions
Rampersaud et al. (2014)	United States	Survey	22 non-alcoholic beverages (e.g. water, sugar sweetened soft drink, diet soft drink, 100% juice)	NA	% consuming each general beverage category, % identifying a beverage type as "sugary", % accurately identifying sweeteners in beverages, % expressing concern about sugar (total, added, natural)
Rejman & Kasperska (2011)	Poland	Survey	NA	NA	% using list of ingredients, Rating given to ingredient list influence on purchase decisions (5-point scale), % understanding sugar, % understanding fat, % understanding cholesterol, % understanding trans fat
Scott & Worsley (1997)	New Zealand	Postal survey	NA	NA	% accurately responding on dietary intake recommendations for: fat; cholesterol; saturated fat; polyunsaturated fat; sugar
Sharf et al. (2012)	Israel	Survey	Orange drink, Bamba (corn/peanut snack), 5% white cheese, Sweet relish	Relevant portions of food labels (unclear as to whether these are mock products)	Mean % correct responses for the four ingredient questions, % correctly identifying major component of orange drink, % correctly identifying Bamba contains food colouring, % correctly identifying calcium as the smallest ingredient in 5% white cheese, % correctly identifying that the sweet relish does not contain salt
Smith et al. (2013)	Denmark	Partially counterbalanced experiment	Macaroons, Fruit smoothie, Traditional Danish spiced meat roll (rullepølse)	Group 1: product samples Group 2: As for Group 1, plus ingredient list and nutrition information Group 3: As for Group 2, plus written definition for each product type from a Danish consumer organisation	Rating on how typical the sample is for the product (9-point scale) Rating on how much the participant liked the product sample (9-point scale)
Stafford et al. (2008)	Australia, New Zealand	Survey	NA	NA	% using the ingredient list when purchasing a product for the first time, % using ingredient list to get quantity of quantity of the main ingredients when purchasing a product for the first time
Tarancón et al. (2014)	Spain	2 (fat content, 10% vs 15%) x 3 (shortening, sunflower oil, olive oil) experiment	Sweet biscuit	Product label including Nutrition Facts label	Rating given to perceived healthiness (7-point scale)
Timperio et al. (2003)	Australia	Focus groups  Survey	NA  NA	NA  NA	Comments on the kinds of factors that are considered when deciding whether a food or food group is 'fattening'  % agree/disagree fresh foods are not fattening % agree foods with a high fat content are fattening % agree as long as I watch my fat intake I can eat what I like % agree saturated fat more fattening than unsaturated fat % agree your body can burn sugar quicker than it can burn fat

Authors	Country	Study type	Products	Stimuli used	Relevant outcome measure(s)
TNS 2007	England	Survey	NA	NA	% usually looking for ingredient information when purchasing a product for the first time, % looking for ingredient-related information when purchasing a product for the first time, % wanting more/better information on ingredients
Todd & Variyam (2008)	United States	Survey	NA	NA	% reporting frequency of use of ingredient list (4-point scale), Probit results for influence of demographics on ingredient list use over time
Turrell (1998)	Australia	Survey	Yoghurt, Milk, Cheese, Minced meat, Bread, Rice, Pasta, Fruit juice, Canned fruit, Spreads, Fats and oils	NA	% disliking the taste of a low-fat yoghurt or low-sugar food product, % exclusively purchasing the healthier fat or sugar variant of a product
Walters & Long (2012)	United States	4x4 Greco Latin square x 2 (subject type) design	Granola bars, Lemonade, Vanilla yoghurt, Salad dressing	Simulated labels not attached to products. Labels contained mock brand name, mock product name, ingredient list, net weight.	Perceived quality (15 x 7-point Likert scale items), Purchase intent (4 x 7-point Likert scale items), Product liking (1 x 7-point Likert scale item)
Wandel & Bugge (1996)	Norway	Pilot study: face-to-face interviews	Coca cola, Margarine, Yoghurt, Salad dressing, Apricot jam	Food label from the real product, e.g. ingredient list, nutrition panel, weight, storage instructions, use instructions	Comments on fats
		Survey	NA	NA	% interested in the specific type of fat/oil in the product
Webb and Dear (1996)	Australia	Survey	NA	NA	% that knew that fat is an essential nutrient
Wojcicki & Heyman (2012)	United States	Survey	NA	NA	% using ingredient list % looking for information on specific nutrients (total fat, trans fat, saturated fat, cholesterol, sugars)
Worsley et al. (1991)	New Zealand	Survey	NA	NA	% responses to question about cholesterol, % responses to ingredient of most concern, % responses to which would be the most important thing to do to make your diet healthier
Worsley et al. (2012)	Australia	Survey	NA	NA to extracts used in this report	% responses to which fat was the most important to cut down on, % responses to nutrient intake question related to the prevention of heart disease, % responses to four foods under added sugar question, % responses to four foods, saturated fat question
Zarnowiecki et al. 2011	Australia	Standardised interview	14 non core foods (doughnut, meat pie, hot dog, potato chips, chocolate, lollies, ice cream, fried chicken, cheese burger, coco pops, hot chips, chocolate chip cookies, soft drink, muesli bar), 16 core foods (apple, corn-on-the-cob, broccoli, carrot, orange juice, watermelon, fish, eggs, nuts, legumes, brown rice, bread, cereal, yoghurt, cheese, milk)	Colour digital photographs of all the foods and drinks were taken, printed on photo paper and laminated for durability	% correctly answer unhealthy/eat sometimes for the non-core foods, % correctly answer healthy/eat often for the core foods

**Table A1.2 Overview of study quality**

Authors	Country	Study type	Achieved sample size	Sampling technique	Internal validity	External validity to Australia/New Zealand
Bender & Derby (1992)	United States	Telephone surveys	1982, 1984, 1986 = 1000, 1988 = 400	Random digit dial of telephone numbers to obtain national probability samples	Medium (general use of nutrition information on packaging indirectly measured)	Low (overseas study so different food labelling, study data is from the 1980s and predates Nutrition Facts panel)
Bessey et al. (2006)	Australia, New Zealand	Online experiment (6 products x 2 disclaimers)	1007, response rate = 34%	Used members of the TNS Social Research Online Panel	Medium (mock packaging provided to participants, however study examined the impact of “no added sugar” claims rather than the construct “added sugar”)	High (local study, conducted in past 15 years)
BEUC (2005)	Denmark, Germany, Hungary, Poland, Spain	Survey, face-to-face	3000, 600 in each country	No detail provided. 98% of respondents aged 20 years and older	Medium ( respondents were asked about their food packaging information use, and use of the ingredient list was indirectly measured )	Low (while national statistical agencies were involved in the sampling design and the country strata were large, the European equivalent to the NIP was not required at the time unless a nutrition content claim was made on the product)
Bucher and Siegrist (2015)	Switzerland	Experiment	100 children matched to 100 parents	Mail invitation to parents of children aged 7 to 10 years, using an address database maintained by the Schober Information Group	Medium (subjects were given the beverages to sort, beverages were sorted from ‘unhealthy’ to ‘healthy’, sort criteria was subject-driven and sugar content (not added sugar) was the most salient sort criterion)	Medium (overseas study so different food labelling, included products not on Australian or New Zealand markets)
Chan et al. (2005)	Australia	Focus groups	36, using 6 focus groups	Newspaper advertisements in the Illawarra region, south of Sydney	Medium (small sample size, sampling method introduced bias, one geographic area, participants talked about fat in relation to food)	High (local study)
CHOICE (2015)	Australia	Online survey	1061	No detail provided. Respondents were aged 18 to 75 years	Low (only examined palm oil, questions were answered generally)	Medium (local study, participants were primed, i.e. “How important is it for you to have palm oil labelled separately on the ingredients list?” and palm oil was a response option to “How important is it for you to correctly identify whether a product contains the following ingredients?”)
Colles et al. (2014)	Australia	Face-to-face semi-structured interviews	30	Purposive sampling method using senior community members in Aboriginal communities in the Northern Territory.	Low (added sugar addressed indirectly, restricted and purposive sample, small sample size)	Medium (local study but on a specific aboriginal community)
Cypress Research Associates (2011)	United States	Survey, method not provided	423	No detail provided, but respondents limited to main grocery shoppers	Medium (sampling methods not specified, no ability to estimate sampling bias, topic was honey – which consumers may view as a form of added sugar)	Medium (overseas recent study on consumer perceptions of food sweeteners, all of which exist in products on the Australian and New Zealand markets)
Deloitte (2010)	United States	Online survey	2010 = 1102	No detail provided	Low (sampling methods not specified, no ability to estimate sampling bias, only generic use of the ingredient list and Nutrition Facts panel measured)	Medium (overseas study, asked generic labelling questions so results should be similar to those from a comparable Australian and/or New Zealand sample)
Diekman & Malcolm (2009)	Belgium, Czech Republic, Germany, France, The Netherlands, Poland, Spain, Sweden, UK, United States	Wave 1: telephone survey (2007)  Wave 2: internet survey (2008)	2204  2201	No detail provided, but respondents limited to grocery shoppers	Medium (sampling methods not specified, no ability to estimate sampling bias, participants were tested on fats knowledge)	Medium (overseas research conducted in 16 countries over two waves, would expect Australian and New Zealand data to be similar given range of countries involved)
Drichoutis et al. (2005)	Greece	Face-to-face survey	320	Grocery shoppers randomly selected from one of fifteen supermarkets in Athens	Medium (sample selection based on supermarket shoppers, use of labels based on self-report, participants were tested on nutrient knowledge)	Medium (overseas research that uses relatively international demographic measures in the estimations)
Eckel et al (2009)	United States	Survey	2006 = 1000 2007 = 2000 (3% response rate)	Participants in Survey Sampling International’s multi-sourced online panels were invited to participate via banner ads and permission-based online recruitment. In 2007, the survey invitation was e-mailed to approximately 37,000 panelists, and this was used as the basis for the response rate estimate for that year.	Medium (biased sampling method, no ability to estimate sampling bias, the 2007 response rate was 3%, participants were tested on their knowledge of fats, and their knowledge of how the various fats affect heart disease)	Medium (overseas research not based on packaging examples, and results would be expected to be similar in Australia and New Zealand)
EUFIC (2008)	France, Germany, Hungary, Poland, Sweden, UK	In-store interviews  Take-home questionnaire	>11,600  5,700	At least 1800 in-store interviews conducted in each country, limited to a subset of supermarkets, no further details  People who were interviewed in-store appear to have been provided with an incentivized take-home questionnaire	Medium (sample selection based on supermarket shoppers, in-store observation of shoppers, participants were tested on fats knowledge)	Medium (overseas research not based on packaging examples, and results would be expected to be similar in Australia and New Zealand)
Ferrarezi et al (2013)	Brazil	Face-to-face survey	167	Adult grocery shoppers recruited from one of nine supermarkets in Araraquara, Brazil	Low (relatively small sample size, selected from only one supermarket, participants were tested on the meaning of related words such as “nectar”, “natural”, “reconstituted juice” and were questioned on their ingredient list use)	Low (overseas research using actual labels of products, product range and knowledge may differ to Australia and New Zealand)

Authors	Country	Study type	Achieved sample size	Sampling technique	Internal validity	External validity to Australia/New Zealand
Fitzgerald et al. (2008)	United States	Face-to-face interviews	201	Convenience sample of a mixture of Latinas with and without type 2 diabetes mellitus, split 100 (with) and 101 (without)	Low (sample selection may have introduced bias, only included one ethnic group from one area of the US, results may not entirely transfer to Australia/ New Zealand, and outcome measures are only indirectly related to the REA topic)	Medium (While Latinas are not a large ethnic group in either Australia or New Zealand, the outcome measures are general and have a logical link between knowledge and behaviour)
FSAI (2009)	Ireland	Face-to-face interviews plus simulated shopping exercise	50	No detail provided, respondents were aged 15 years and older and lived in a central Dublin location	Low (sampling methods not specified, no ability to estimate sampling bias, and outcome measures are only indirectly related to the REA topic)	Medium (While the set of studies was conducted in Ireland, under different food packaging regulations, general interest in food label elements appears to transfer between countries)
		Face-to-face survey	1,021	No detail provided, respondents were aged 16 years and older and were sampled across Ireland		
FSANZ (2006)	Australia, New Zealand	Survey	2,091	Online national survey panels created by a market research company, respondents limited to those aged 14 years and older	Medium (online panel with no sampling bias information, showed participants pictures of beverages on the market, findings are only relative to formulated beverages, only looked at total sugar)	Medium (while the study is local, the findings only relate to total sugar in beverages)
Grunert et al. (2010)	United Kingdom	In-store interview	454	Observed shoppers who had put at least one product into their trolley were approached and asked whether they were willing to participate in a short interview	Low (only looked at ingredient list use generally)	Medium (While the study was conducted in the UK, general interest in food label elements appears to transfer between countries)
Hawkes & Nowak (1998)	Australia	Survey	344 overall, 252 cardiac patients	Subjects were all based in Townsville. Convenience sampling for dietitians, GPs, and nurses, random selection of general public from Townsville electoral roll, cardiac patients were all those undergoing one of two procedures between October 1994 and October 1995	Medium (only cardiac sample large enough for use, biased sample)	Medium (an Australian survey that is almost 20 years old and knowledge may have changed since the study was conducted)
Hill et al. (1998)	New Zealand	Interviews	20 teenagers, 20 parent-shoppers	Networking within Auckland	Medium (children's general knowledge of sugar and fat)	Medium (a New Zealand study hat is almost 20 years old and knowledge may have changed since the study was conducted)
IFIC (2010)	United States	Web-based survey	1,024	Subject recruitment e-mail list was constructed to be reflective of the U.S. adult (18 years and up) population on key Census characteristics, adjusting for groups with historically lower response rates.	Medium (use of ingredient list for sugars, oils/fats)	Medium (while the study was conducted in the USA, use of ingredient list for sugars, oils/fats appears to transfer between countries)
IFIC (2011)	United States	Web-based survey	1,000	Representative sample of U.S. adult population (18+) on age, socioeconomic profile, race/ethnicity, region, and gender, no further details given.	Medium (use of ingredient list for sugars, oils/fats)	Medium (while the study was conducted in the USA, use of ingredient list for sugars, oils/fats appears to transfer between countries)
IFIC (2012)	United States	Web-based survey	1,057	Sample from Research Now's consumer panel	Low (most of relevant results relate to high fructose corn syrup, which is only a very small subset of sugars in food)	Low (USA consumers appears to be particularly interested in high fructose corn syrup)
IFIC (2013)	United States	Web-based survey	1,006	Sample from Research Now's consumer panel	Medium (some results relate to high fructose corn syrup, which is only a very small subset of sugars in food, general comments provided on ingredient list)	Medium (USA consumers appears to be particularly interested in high fructose corn syrup, however interest in ingredient list appears to transfer between countries)
Jacobs et al. (2011)	South Africa	Face-to-face survey	174	Approaching consumers who had purchased household food products with a sample stratified by city, and the supermarkets used restricted to three chains (80% of supermarket sector in South Africa)	Low (only looked at ingredient list use generally, outcome measures are only indirectly related to the REA topic)	Low (The study was conducted in South Africa, and a the time of the study the label-related food regulations were quite different to Australia and New Zealand)
Kim et al. (2001)	United States	Survey	5343	1994/6 Diet and Health Knowledge Survey (USDA)	Low (demographics/characteristics associated with general use of food label elements such as the ingredient list, Nutrition Facts panel)	Medium (While the study was conducted in the USA, characteristics associated with ingredient list use – such as higher education – appear to transfer between countries)
Lin & Yen. (2010)	United States	Survey	1,798 (34% response rate)	US Food and Drug Administration Health and Diet Survey 2004 Supplement. The random-digit-dialling telephone survey, targeted non-institutionalized English- or Spanish-speaking adults, aged 18 years and older, from households in the 50 states and the District of Columbia. Households were selected from a nationally representative single-stage sample of telephone numbers. The eligible respondent in a multiple-adult household was selected using the most recent birthday method.	High (random selection of adults, awareness of different types of dietary fats)	Medium (It is not clear how USA results on fat knowledge transfer to Australia and New Zealand)
Lupton (2000)	Australia	Interview plus survey	68 (34 couples)	Convenience and snowball sampling of people in rural central west New South Wales	Low (small sample, general understanding of fatty foods only, outcome measures are only indirectly related to the REA topic)	Low (Australian study that is almost 20 years old, small sample size)
Lupton (2005)	Australia	Semi-structured interviews	70	Networking in Sydney and Bathurst, followed by snowball sampling	Low (small sample, general understanding of fatty foods only, outcome measures are only indirectly related to the REA topic)	Medium (Australian study, small sample size)

Authors	Country	Study type	Achieved sample size	Sampling technique	Internal validity	External validity to Australia/New Zealand
Maubach et al. (2009)	New Zealand	Face-to-face semi-structured interviews	15	Snowball sampling of Palmerston North parents with at least one child aged between 5 and 12 years old in their care	Medium (small sample size restricted to parents, ingredient list not asked about specifically, examined NIP)	Medium (New Zealand study, small sample size)
Meyer et al. (2014)	Australia	Face-to-face interview	37	Recruitment via South Australian cardiac rehabilitation programs and South Australian General Practitioner (GP) surgeries, restricted to cardiovascular disease patients	Low (small sample size, only one location, outcome measures are only indirectly related to the REA topic)	Medium (Australian study, small sample size)
Naygar (1996)	United States	Survey	1448, from 1925 respondents	1991 Diet and Health Knowledge Survey (USDA)	Medium (demographics/characteristics associated with general and specific use of food label elements)	Low (USA study based on 1991 data, between-country and between-time changes in labelling mean the results are unlikely to be reflective of Australian and New Zealand consumers)
Nelson et al. (2009)	United States	Longitudinal study (3 years)	Adolescents: 349 Parents: 348	Survey of participants in the 3-year Identifying Determinants of Eating and Activity (IDEA) study	High (objective test of knowledge used)	Medium (While the interpretation of the questions is likely to be the same in Australia and New Zealand, the sample was based on one geographic area and the estimates may not be robust)
Ni Mhurchu et al. (2010)	New Zealand	15-month randomised controlled trial	1104	Mail-out to main grocery shopper, who shopped at one of eight supermarket sites in New Zealand, who either used or were prepared to use the supermarket barcode reader for shoppers	High (controlled experiment, large sample, outcome measures assessed through objective means)	High (New Zealand study that examined actual food purchasing)
Ollberding et al. (2010)	United States	Survey	5502, 4454 for nutrient intake effects	2005 – 2006 NHANES data	Medium (mean intake of specific nutrients, demographics associated with use of the ingredient list, but not related to specific nutrients examined)	Medium (a similar analysis should provide similar results for Australian and New Zealand consumers)
Pearson et al. (2014)	Australia	4 cross-sectional surveys	403 overall, 92 – 108 for each survey	Visitors to Melbourne Zoo at any data collection time, who were above 18 years of age and had “adequate English proficiency”	Low (only looked at palm oil, not in the context of food)	High (recent Australian study)
Population Research Laboratory (2009)	Australia	Online survey	1435	Australian Health and Social Science (AHSS) online panel. No detail on age coverage provided.	Low (only looked at ingredient list use generally, outcome measures are only indirectly related to the REA topic)	High (relatively recent Australian study)
Rampersaud et al. (2014)	United States	Survey	3,361 (61% completion rate)	Online national survey panel created by a market research company, respondents limited to those aged 18 years and older	High (objective measures of sugar knowledge relating to beverages)	Medium (online panel in the US with no sampling bias information, findings may not entirely translate to Australia/New Zealand)
Rejman & Kasperska (2011)	Poland	Survey	200	Snowball sampling of Warsaw consumers, with sample selected to be 50% male	Low (general look only, self-reported checks for nutrients not linked to the particular elements used to check)	Low (snowball sampling, Polish sample)
Scott & Worsley (1997)	New Zealand	Postal survey	300 (55% response rate)	Random selection from New Zealand electoral roll	High (objective testing of sugar and fat knowledge)	Medium (survey was over 15 years ago)
Sharf et al. (2012)	Israel	Survey	120	Random sample of Israeli adults aged 18 – 40 years intending to travel overseas who were attending an immunization clinic for this purpose	High (objective testing of ingredient list understanding)	Medium (Israeli intending travellers not representative, findings may not entirely translate to Australia/New Zealand)
Smith et al. (2013)	Denmark	Partially counterbalanced experiment	154	Random telephone dialling of phone numbers in the geographic area in which the study was being conducted, with the person answering being invited to the study (150 participants) supplemented with 4 participants recruited at the university campus where the study was conducted. All participants were aged between 20 and 70 years old, ate pork, did not have allergies, and did not work in the food sector.	Low (no results specifically for REA objectives, relevance relies on the authors’ conclusions from the pattern of results)	Low (only 3 products tested, one is not a common food in Australia or New Zealand)
Stafford et al. (2008)	Australia, New Zealand	Survey	1200 Aust 800 NZ	Market research company online panel sample, respondents limited to those aged 14 years and older	Medium (use of ingredient list measured indirectly)	High (Australian & New Zealand study conducted inside past 10 years)
Tarancón et al. (2014)	Spain	2 (fat content, 10% vs 15%) x 3 (shortening, sunflower oil, olive oil) experiment	100	Sweet biscuit consumers were recruited, no further details provided	Medium (fat knowledge objectively tested, design linked knowledge to perceptions of biscuit healthiness, but no ingredient list provided to subjects)	Medium (only one food tested)
Timperio et al. (2003)	Australia	Focus groups  Survey	62  681	Convenience sample recruited from workplaces, community groups, sporting facilities, and community organisations. Study was publicised through posters, emails, newspaper ads, emails, newsletters  Random sample of electoral role for Victoria, Australia	Medium (tested knowledge around fat, ambiguity in some statement wording)	Medium (Australian & New Zealand study conducted inside past 15 years)
TNS 2007	England	Survey	1393	TNS sampling frame based on census small area statistics and the Post Office Address File, then quota sampling within geographical regions	Medium (self-reported use of ingredient lists)	Medium (It is not clear how UK results on ingredient use transfer to Australia and New Zealand)

Authors	Country	Study type	Achieved sample size	Sampling technique	Internal validity	External validity to Australia/New Zealand
Todd & Variyam (2008)	United States	Survey	1995/6: 3851 2005/6: 4917	1995/6 data was from the USDA's 1994-96 Diet and Health Knowledge Survey (DHKS). 2005/6 data was from the Diet Behavior and Nutrition module of the 2005-2006 National Health and Nutrition Examination Survey (NHANES). Both were national US surveys.	Medium (Self-reported use of ingredient list assessed against demographics)	Low (results of probit regression not completely applicable to Australia or New Zealand, using different variables in a regression adjusts the coefficient values so impact on direction and magnitude of coefficients is not clear)
Turrell (1998)	Australia	Survey	383 (67% response rate)	500 were systematically selected from the Australian Commonwealth electoral roll, limited to males and females aged 18 years or more living in the city of Brisbane, plus 70 self-selected clients from three Salvation Army welfare centres in low income areas of Brisbane and its surrounding shires.	Low (looked at food purchasing in the context of low-fat, and low-sugar, taste preferences)	Low (survey was over 15 years ago, welfare sample selection used convenience sampling)
Walters & Long (2012)	United States	4x4 Greco Latin square x 2 (subject type) design	106 (61 nutrition students, 45 journalism students)	Recruitment inside classes, participation was voluntary and apparently not for credit	Medium (simulated labels used were not attached to fake food products, and did not incorporate all labelling elements in design, experiment was otherwise well designed)	Low (sample not generalizable, focus on high fructose corn syrup which may not attract the same attention in Australia and New Zealand)
Wandel & Bugge (1996)	Norway	Pilot study: face-to-face interviews  Survey	31  1,050	25 urban households selected to provide a spread of social backgrounds, no further details  Sample selected to be representative of the Norwegian population aged over 15 years, no further details	Medium for qualitative (cannot generalise findings), Medium for quantitative (self-reported used and test of ingredient list comprehensiveness)	Low (study was conducted about 20 years ago, food labels are different, results may not generalise culturally)
Webb and Dear (1996)	Australia	Survey	262 (44%)	Diet groups from 3 areas contacted via Yellow Pages, surveys provided to coordinators who agreed to distribute them. Response rate calculated from number of surveys sent out	High (objective measures of fat knowledge)	Low (survey was 20 years ago, and labels and health messages have changed since the study was conducted)
Wojcicki & Heyman (2012)	United States	Survey	1,160 for ingredient list use, 742 for use of specific nutrient data	NHANES data, from 2005-2006, which is a continuous national survey that represents a stratified multistage probability sample of the non-institutionalized US population, analysis restricted to adolescents	Medium (self-reported use of ingredient list but label element/s used to look for information on specific nutrients not collected)	Low (US study using adolescents as the sample, not clear how results would generalise to Australian and New Zealand)
Worsley et al. (1991)	New Zealand	Survey	1,011 (68% mean response rate)	Random selection of 50 shoppers in each of 20 supermarkets, from seven New Zealand cities	Medium (objective understanding of cholesterol measured, also collected information on the nutrient of most concern)	Low (study was conducted over 20 years ago)
Worsley et al. (2012)	Australia	Survey	2,208	Population survey	High (nutrient knowledge tested objectively)	High (recent survey, conducted across Australia, large sample size)
Zarnowiecki et al. 2011	Australia	Standardised interview	192	Random selection of schools from the Adelaide metropolitan area, based on SES status, sample limited to children aged 5-6 years where parental consent was obtained	High (objective measures of food healthiness used, included high sugar and high fat foods, as well as core foods – e.g. dairy, fruits vegetables – in the questions)	Low overall (only had urban children aged 5-6 years surveyed, however external validity would be high for that demographic in Australia)

## Appendix 2 REA method

### Inclusion criteria for research

The review was limited to primary research on sugars, fats, and oils information in the ingredient list of packaged food. The review included studies that examined:

- consumer understanding of sugars, fats, and oils generally, in the context of food.
- consumer understanding and use of ingredient list information generally.
- consumer search for sugars, fats, and oils information in the ingredient list.
- consumer use of sugars, fats, and oils information in the ingredient list
- consumer preferences for how sugars, fats, and oils information is expressed in the ingredient list, excluding format and presentation.
- the effect of sugars, fats, and oils ingredient list information on the amount and/or type of food purchased.
- the effect of sugars, fats, and oils ingredient list information on the amount and/or type of food consumed.

No criteria were set with respect to study type (e.g. experiment, survey, or type of subject (e.g. main grocery buyer. Unless otherwise explicitly stated, searches were unconstrained with respect to publication date and country.

### Search strategy

Five online database separate searches were undertaken, in order to use simpler Boolean search term combinations. Grey literature was also searched

### Online database searches

All used EBSCO Discovery Service (EconLit with Full Text, Food Science Source, FSTA - Food Science and Technology Abstracts, MEDLINE with Full Text, SocINDEX with Full Text), available through the FSANZ library. Unless otherwise stated, all searches had Initial searches were conducted in October 2014 and updated in August 2015 unless otherwise stated. The searches were:

- consumer AND knowledge AND (fat OR sugar). Search was limited to peer reviewed articles published in English. Two variants of this search were used, one had the geography restricted to Australia, and the other had the geography limited to New Zealand.<sup>63</sup> Search was conducted in October 2014.
- ("ingredient list" OR "ingredients list" OR "list of ingredient") AND consumer AND (fat OR oil OR sugar)
- ("ingredient list" OR "ingredients list" OR "list of ingredient") AND consumer AND ("understand" OR "comprehend" OR "know") AND "food"
- consumer AND (knowledge OR understand) AND (fat OR oil OR sugar) AND food. Search was limited to peer reviewed articles published in English. Two variants of this search were used, one had the geography restricted to Australia, and the other had the geography limited to New Zealand.
- (oil OR fat OR sugar) AND consumer AND food AND (preference OR value OR attitud\* OR purchas\* OR utility OR belie\* OR feeling) NOT sensory. Search was limited to peer reviewed articles published in English.

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<sup>63</sup> Country was initially specified as a search term, but this returned articles written by people based in Australia or New Zealand but where the subjects were not in either country.

## **Other sources**

To ensure that the REA incorporated a suitably broad range of references, the following additional searches were performed:

- FSANZ consumer research reports
- The FSANZ Behaviour and Regulatory Analysis section Reference Manager database
- the International Food Information Council Foundation website
- direct request to the International Social Research Liaison Group
- research cited by others, e.g. in summary articles or professional magazines
- CHOICE provided FSANZ with a copy of the results of their 2015 palm oil survey.

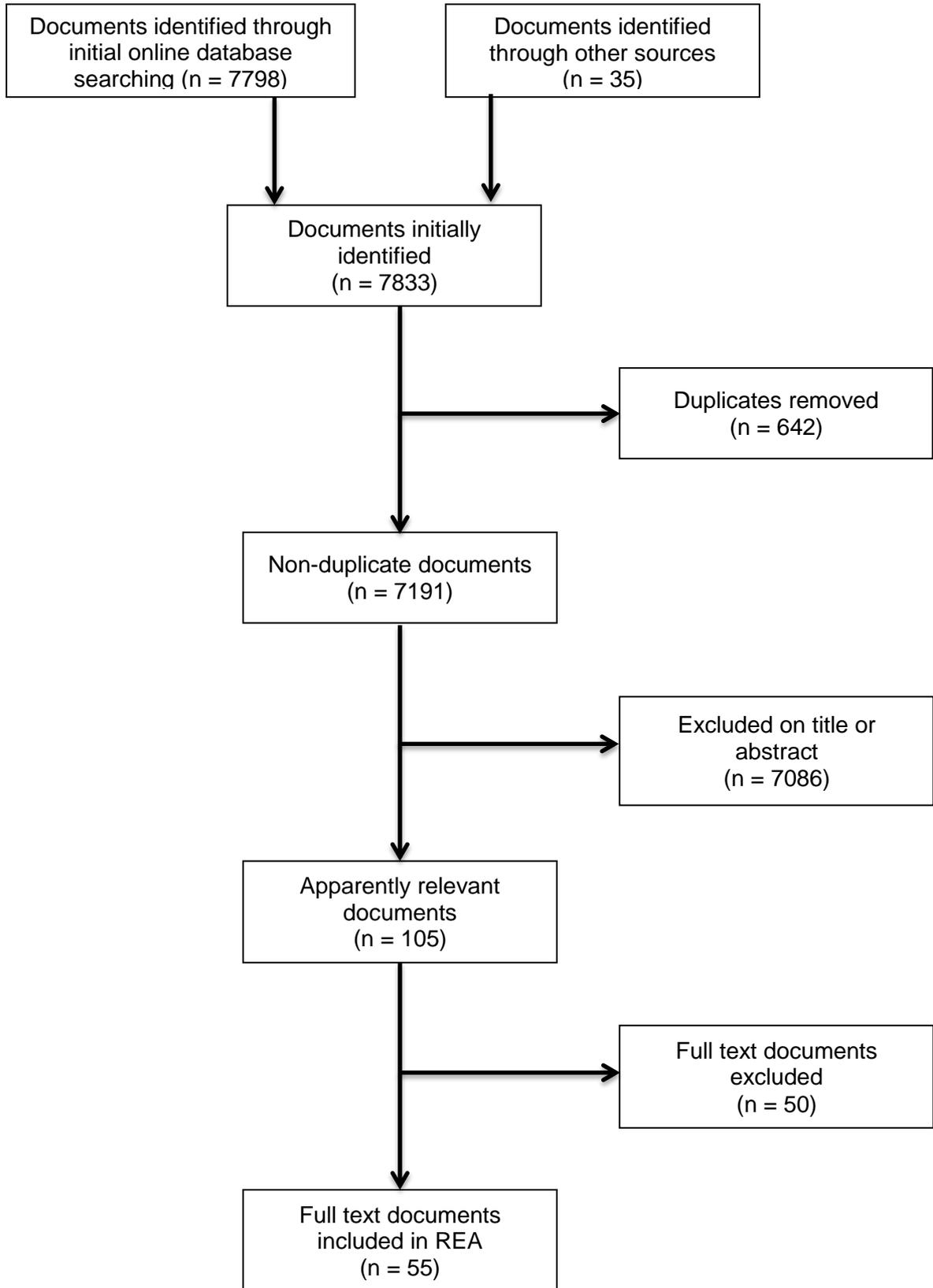
## **Research review process**

The review process is outlined in Figure A2.1 on the following page. The search process initially identified 7833 potentially relevant research documents. Duplicates and out-of-scope papers (based on abstract and/or title) were excluded. Finally, documents identified as out of scope on the basis of full-text review were excluded. This resulted in 55 research documents included in the REA, and which are described in Table A1.1 in Appendix 1.

Each included research document has been assessed for quality, and was scored using the three categories of low, medium, and high (Table A1.2, Appendix 1). The assessments related to internal validity and external validity. Internal validity addressed the study design and the external validity assessments were based on sampling, and whether the results could reasonably be expected to apply to Australia and New Zealand.

## **REA drafting process**

The REA report structure is based on the primary objectives stated in the Introduction. The REA was peer reviewed by the section manager of the Behaviour and Regulatory Analysis Section and by the FSANZ project manager for Recommendation 12 of the Labelling Review. Two external peer reviewers provided comments on an earlier draft of the REA.



**Figure A2.1. Number of documents retrieved at various stages of the review process.**