

## **Supporting document 4**

### Literature review on nutrition content claims research published since 2007

#### P293 – Nutrition, Health & Related Claims

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##### **Executive summary**

This literature review provides an update on the findings of the research on nutrition content claims which has been published since 2007. The review examines whether consumers may be misled by nutrition content claims, and whether their behaviour may be influenced by them.

The literature search used online literature databases and found articles using a wide range of research methodologies. Articles were grouped by methodology for the purposes of this review, with the findings of similar research studies being compared and contrasted. Consequently, the review is structured by research methodology with particular emphasis placed on analysing the findings of studies which are able to test whether there is a causal link between nutrition content claims and outcomes such as consumers' preferences, purchase intentions, actual purchases, nutrition perceptions and health perceptions.

The available literature had a number of shortcomings, including design problems in many of the experiments, meaning that their results need to be interpreted with caution. However, the literature when viewed as a whole does enable some conclusions to be made about the effects of nutrition content claims.

##### **Are consumers' nutrition perceptions of products influenced by nutrition content claims?**

The findings of the studies examining consumers' nutrition perceptions generally did not find an effect from nutrition content claims on perceptions of the overall nutritional value of food products, except where nutrition information was not available to participants. This supports the findings of previous FSANZ research, and suggests that nutrition content claims do not mislead consumers about the nutritional value of food products.

##### **Are consumers' health perceptions of products influenced by nutrition content claims?**

Similarly, the experiments examining whether nutrition content claims influenced consumers' perceptions of the health benefits of food products generally found not significant effects, except where nutrition information was not available.

### **Do nutrition content claims influence consumers' purchase intentions or choices?**

The literature review found divergent results in the studies which examined consumers' purchase intentions, using rating studies, and those which used choice modelling to examine consumers' preferences.

The ratings studies, in which participants evaluated one product at a time on a range of attributes, tended to find no effect from nutrition content claims on participants' purchase intentions.

In contrast the choice experiments, in which participants choose their preferred product out of a choice set, found statistically significant effects from nutrition content claims on participants' choices. The size of the effects found varied widely, with some product/claim combinations resulting in no change in participants' preferences, and other resulting in moderate increases.

Only two experiments examined whether a nutrition content claim could increase participants' selection of a less healthy product over a healthier version. Both of these found that, although participants overall preferred the healthier product, a higher proportion of participants selected the less healthy option when it carried a nutrition content claim. One of the two studies found that this effect only occurred for participants who did not view the nutrition information for the products.

### **Do nutrition content claims influence consumers' food purchases or consumption?**

Only two studies examined the relationship between nutrition content claims and actual purchases of food products. Of the two studies, only one was able to test whether a causal relationship existed between the presence of nutrition content claims and sales for a product (microwave popcorn). The study had a number of factors which made the research environment different to that which consumers would experience in-store. However, it was able to demonstrate that the nutrition content claims used in the study (shown in-store on shelf tags) influenced sales of particular microwave popcorn products. Some nutrition content claims led to increased sales, while others led to decreases in sales.

Overall, the evidence from this literature review suggests that nutrition content claims may influence consumers' behaviour through sales of food products. However, they do not appear to mislead consumers about the nutrition or health properties of food products. Where nutrition content claims do influence food purchases and choices, the direction (positive or negative) and size of the effect would be difficult to predict and will depend upon the product/claim combination. The size of effects in real life environments are likely to be smaller than those found in the research included in this review, due to factors such as taste, price and habit competing with nutrition content claims.

# Table of Contents

EXECUTIVE SUMMARY.....	1
1 INTRODUCTION.....	1
1.1 Objectives.....	1
1.2 Search strategy.....	2
1.3 Structure of the literature review.....	2
2 HOW THE QUALITY OF RESEARCH WAS ASSESSED.....	3
2.1 Theories behind consumers' food purchasing behaviour.....	3
2.2 General design features.....	4
2.3 Research methods.....	7
3 RESULTS.....	11
3.1 Choice experiments.....	11
3.2 Sales data studies.....	19
3.3 Rating experiments.....	21
3.4 Self-reports of nutrition content claim use.....	30
3.5 Qualitative studies.....	34
3.6 Literature reviews.....	38
3.7 Miscellaneous studies.....	38
4 DISCUSSION.....	39
4.1 Are consumers' nutrition perceptions of products influenced by nutrition content claims? 40	
4.2 Are consumers' health perceptions of products influenced by nutrition content claims?..	40
4.3 Do nutrition content claims influence consumers' purchase intentions or choices?.....	41
4.4 Do nutrition content claims influence consumers' food purchases or consumption?.....	43
4.5 Shortcomings of the literature.....	43
4.6 How might consumers' purchases or consumption be influenced by nutrition content claims?.....	45
4.7 What the literature review adds to FSANZ's research findings.....	48
5 CONCLUSIONS.....	49
6 REFERENCES.....	51
APPENDIX A. HOW THE LITERATURE SEARCH WAS CONDUCTED.....	59
APPENDIX B. ARTICLES ELIMINATED FROM THE LITERATURE REVIEW.....	62

# 1 Introduction

## 1.1 Objectives

When FSANZ last reviewed the literature on nutrition content claims<sup>1</sup> in late 2007, the published research available at the time and the findings of FSANZ research suggested that nutrition content claims were unlikely to mislead consumers about the nutritional value of food products and did not appear to increase consumer purchase intention<sup>2</sup>. For this literature review, a search was undertaken for studies which examined the effects of nutrition content claims on consumers and which were published from 2007 onwards. This includes studies using a range of methodologies and which vary in their quality and ability to demonstrate a causal relationship between the presence of nutrition content claims and changes in consumers' perceptions or behaviours.

The main questions which this literature review seeks to answer are:

- Are consumers' nutrition perceptions of food products influenced by nutrition content claims?
- Are consumers' health perceptions of food products influenced by nutrition content claims?
- Are consumers' purchases or consumption of food products influenced by nutrition content claims? And if so, to what extent?

### ***1.1.1 Are consumers' nutrition perceptions of food products influenced by nutrition content claims?***

Concerns have previously been raised that consumers may make inappropriate assumptions based on the presence of a nutrition content claim. These could include assumptions about the overall nutritiousness of the food, or of other nutrients not mentioned in the nutrition content claim. An example would be a consumer seeing a 'no added sugar' claim on a muesli product and assuming that the product with the claim had lower levels of sugar than other mueslis.

### ***1.1.2 Are consumers' health perceptions of food products influenced by nutrition content claims?***

Another concern is that consumers may make inappropriate assumptions about the health benefits of a food when it carries a nutrition content claim, for example, that consuming a food labelled as 'low in fat' will help them lose weight.

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<sup>1</sup> Nutrition content claims are voluntary statements made by manufacturers on labels and in advertising about the nutrient content of a food. Nutrition content claims are claims such as 'low in fat' or 'source of calcium'. From the Food Standards Australia New Zealand website:  
<http://www.foodstandards.gov.au/consumerinformation/nutritionhealthandrelatedclaims/>

<sup>2</sup> The discussion of the literature on nutrition content claims up to 2007 is available in Attachment 10 of the P293 Nutrition, Health and Related Claims Final Assessment Report on the Food Standards Australia New Zealand website:  
<http://www.foodstandards.gov.au/foodstandards/proposals/proposalp293nutritionhealthandrelatedclaims/>

### **1.1.3 Are consumers' purchases or consumption of food productions influenced by nutrition content claims? And if so, to what extent?**

The potential for nutrition content claims to influence either purchase or consumption decisions, to the detriment of the person's diet, has also been raised. Changes in purchases or consumption may or may not lead to changes in the intake of energy or other nutrients in the consumer's diet. For example, if a nutrition content claim led a consumer to purchase a different brand of product than they otherwise would have, but the nutritional profile is the same then there would be no negative effect on the consumer. It is also possible that some nutrition content claims could reduce the likelihood of consumers purchasing particular foods. For example, a consumer may infer from a 'low salt' claim that a particular product will be less tasty than a conventional version with no claim about the salt content and choose not to buy it. If a nutrition content claim led the consumer to purchase and consume a product with a worse nutritional profile (or to eat a larger serving of the product) then this would have a negative effect on the consumer. Depending on the degree of difference in the nutritional profiles of the two products and whether purchasing of the product is a one-time event or becomes a habitual purchase for the consumer, the difference may be negligible, or it may be large enough to be of nutritional significance.

In determining whether a change in purchase or consumption is of nutritional significance, the frequency and quantity of the product consumed would need to be considered.

## **1.2 Search strategy**

The following sources were used to find relevant articles:

- online literature databases: Medline, EconLit, JSTOR, Food Science and Technology Abstracts, and Nutrition Abstracts and Reviews
- the reference lists of relevant articles
- the Journal of Public Policy & Marketing was also searched via the journal's website as it frequently includes articles relating to food labelling and is not indexed in any of the databases searched
- a bibliographic database of consumer food research maintained by FSANZ
- a researcher in the area of nutrition content claims and two peer reviewers were asked to suggest any articles which may have been overlooked by the literature search
- cited reference searching was used for particularly relevant articles to find articles in which they had been cited.

Further detail on the search strategy is available in Appendix A.

In searching and compiling articles, only articles on research which examined the effects of nutrition content claims on consumers' behaviour towards or perceptions of foods were included. Research examining only health claims, or which reported on the prevalence of nutrition content claims rather than their effects was excluded from the literature review. Details on papers which were excluded from the review are available in Appendix B.

## **1.3 Structure of the literature review**

The next section describes how the quality of the research was assessed in the literature review, and the justification for using particular criteria. This is followed by the results of the literature review, which are organised by research method used. More robust methods are discussed first, while also considering that no research methodology is able to answer all of the research questions in this review. This is followed by the discussion, which is organised

by the main research questions, described above. Finally, the conclusion summarises the main points of the review.

## **2 How the quality of research was assessed**

When evaluating the studies included in this literature search, the appropriateness of the study design has been considered. A wide variety of research methodologies were found in the studies revealed by the literature search. These were generally appropriate for the particular research question that the article's authors were trying to answer but were often less than ideal for determining whether nutrition content claims influence consumers' behaviour. Appropriateness was determined by the ability of the study to answer the research questions posed by this review, this includes how closely the stimuli in the studies replicated the products and choice sets shoppers face when grocery shopping.

Particular features which differ among the experiments are described below, including how decisions on the relative quality of different research methods were made. The literature review found that the research method used had a strong influence on the findings of the study. Therefore, more weight is given to studies with stronger research methods when considering the overall findings from the literature. The results of the review are organised by the research method used, with methods that are better able to address the research questions discussed first.

The literature on consumer decision making informed how the quality of research was assessed for this review. A brief summary of literature relevant to consumer decision making in food purchasing is given below.

### **2.1 Theories behind consumers' food purchasing behaviour**

Researchers in food buying behaviour have generally assumed that food purchasing elicits a low level of cognitive response from consumers (Beharrell and Denison 1995). This is based on observational research which has found typical grocery product choices are made very quickly, using only a small proportion of the information available to consumers on the product packaging and shelf tags (Moorman 1996; Balasubramanian and Cole 2002; Food Standards Australia New Zealand 2007a; Grunert et al. 2010). This will particularly be the case where consumers are making repeat, habitual food purchases which make up the majority of food decisions (Enright et al. 2010). Psychological and marketing research has shown that decisions using low levels of cognitive involvement are made with the assistance of short cuts, called heuristics, that consumers use as 'rules of thumb' to make quick decisions using little thought (Hoyer 1984).

This is in contrast to decisions using high levels of cognitive involvement, such as the purchase of a car, in which consumers would generally make the decision more carefully; systematically considering a range of attributes. This dichotomy, between high and low involvement decisions has been proposed by numerous psychological researchers, with various theories referred to as Dual Process Theories (Chaiken and Trope 1999). These include the Elaboration Likelihood Model (Petty et al. 2004) and Stanovich and West's (2000) System 1 and System 2, which was further developed by Kahneman (2003).

Other competing theories relating to purchasing decisions with low levels of cognitive involvement have been proposed. For example, Hamlin's (2010) cue-based decision making. Despite proposing different mechanisms by which consumers make low cognitive involvement decision, all of these theories would suggest that consumers could potentially be swayed by relatively trivial product attributes, often unknowingly (Visschers and Brunner 2011). For example, low cognitive involvement (or System 1) decisions are subject to cognitive biases. One example is the framing effect which could lead shoppers to perceive a

product labelled '75 % lean' more positively than the same products labelled '25 % fat' (Levin and Gaeth 1988; Kahneman 2011).

Similarly, according to Hamlin's theory, shoppers' unconscious positive attitudes towards attributes such as the presence of terms like 'natural', 'sale' or 'lean' may lead to shoppers developing a more positive evaluation of a product. Trivial attributes may also sway consumers' decisions where the products within a choice set are difficult to choose between and an extra attribute, such as the phrase 'all natural' on the packaging, is available on one product to differentiate and act as a 'tie breaker' (Carpenter et al. 1994; Brown and Carpenter 2000; Miljkovic et al. 2009; Kahneman 2011).

Beharrell and Denison (1995) have challenged the view that all or most grocery purchases use low levels of cognitive involvement. Participants in their research reported high levels of involvement with products in a range of categories, and many of them claimed they would go elsewhere to buy their preferred brand if it wasn't available in a particular store. However, these self-reports by research participants belie shoppers actual behaviours in store. Most clearly this is demonstrated by the readiness of shoppers to swap brands when product attributes such as price promotions or displays are altered (Kumar and Leone 1988; Kiesel and Villas-Boas 2009; Anders and Moser 2010). This readiness to switch brands can also be seen in the dramatic shift from manufacturer brands to supermarket 'own brand' or 'private label' brands which has occurred in Australia and New Zealand over the last ten years (Burch and Lawrence 2005). With a few exceptions, such as wine (Hamlin 2010) and particularly dominant brands (such as Coca Cola), observational research still demonstrate that most food purchasing decisions are made quickly and with low levels of information use. Jacoby and Kyner (1973) have also noted that what may appear to be brand loyalty may simply be repeat purchasing behaviour where the shopper is using the brand as a heuristic.

Shoppers may consider food purchases more carefully where they are purchasing a product for the first time. Surveys on food label use have tended to ask respondents how often they use food labels or nutrition labels when purchasing a product for the first time. For example, a Food Standards Australia New Zealand survey (Food Standards Australia New Zealand 2008a) found that approximately half of Australians and New Zealanders refer to food labelling information when purchasing a food product for the first time. Although, interestingly the United Kingdom Food Standards Agency found almost no change in self-reported food label use when the question in their tracking survey changed from "Thinking just about products that you purchase, how frequently, if at all, do you refer to the labelling information?" to "Thinking just about products that you purchase *for the first time*, how frequently, if at all, do you refer to the labelling information?" (2007). Nutrition information on food labels is most likely to be consulted while shopping, rather than while preparing food at home (Nayga et al. 1998), so buyers are unlikely to consult the nutrition information again once the food has been purchased once. As these findings are from shoppers reporting on their own before, the frequency of label use is likely to have been over stated (Grunert et al. 2010).

However, even in first time purchases, consumers still tend to use techniques to simplify the choice process. These include only considering a subset of the available products, referred to by marketers as an 'evoked set' (Turley and LeBlanc 1995) and giving preference to familiar brands (Hoyer and Brown 1990).

## **2.2 General design features**

Shoppers' food purchasing decisions are difficult to replicate in an experimental situation. The main reasons for this are:

- Participants' motives in their selections or evaluations within an experiment differ from those in real life. Participants in an experiment may be motivated to appear responsible to the researcher, perhaps by carefully processing the available information to select the healthiest option.
- Grocery shoppers tend to be shopping under a range of circumstances. For example, some will be trying to purchase the few items they need as quickly as possible, some will be shopping with children, some will be carefully following a shopping list, and others will be keeping an eye out for specials. This creates great diversity in shoppers' behaviours. In contrast, participants in experiments will generally be told to consider a specific set of circumstances, such as imagining they're selecting a product for their child and that they can assume all of the products they'll be shown will be the same price.
- Experimental studies tend to use mock up products that don't exist in real life. Researchers may do this to test the effect of specific labelling elements separately from the brand, or for legal reasons. However, brands do significantly influence consumers' choices and their absence in experiments may magnify the apparent influence of the remaining attributes in the experiment. Additionally, consumers may make assumptions about the nutritional value of well-known brand names. For example, some consumers may be less likely to check the nutrition information on a product from a brand they're familiar with.
- Participants' responses to packaging stimuli may also vary depending on the amount of clutter on the packaging. For example, Visschers et al. (2010) found in an eye tracking experiment that participants examined nutrition information fewer times, and for shorter amounts of time on packaging which had more non-nutrition labelling elements cluttering the packaging and distracting participants. Therefore studies which use stimuli that provide only basic information with few distractions may lead to different responses by making the remaining elements more salient to participants.

### **2.2.1 Provision of nutrition labelling in the research**

The studies in this review which included food product stimuli differed in whether they included nutrition information<sup>3</sup> and how this was presented to participants. It is mandatory in Australia and New Zealand for manufacturers to provide a nutrition information panel on most food packages, and most manufacturers choose to place this on the back of the pack (BOP). In many of the other countries in which labelling research is conducted, such as European Union countries, this type of information is either not mandatory or has only recently been mandated (European Food Information Council 2011). However, some European Union countries, such as the United Kingdom, have a very high prevalence of manufacturers providing nutrition information (Storcksdieck genannt Bonsmann et al. 2010). Observations of grocery shoppers in store demonstrate that most of the time shoppers do not turn over products to examine all of the information available (Food Standards Australia New Zealand 2007a; Grunert and Wills 2008) and that when they do examine the back of the package they do so very quickly (Balasubramanian and Cole 2002). Researchers have acknowledged this and tried to recreate this in research situations on nutrition content claims in the following ways:

- not providing information typically on the back of the package (BOP) to participants

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<sup>3</sup> For the purposes of this review 'nutrition information' will refer to the detailed nutrition information available to consumers as a table, usually located on the back or the side of food packaging. In Australia and New Zealand this is called the Nutrition Information Panel. In the United States and Canada it is called the Nutrition Facts Panel.

- splitting the participants into two groups – one of which does not have any BOP information available and another which does
- making BOP information available via an on-screen click (in online experiments)
- using realistic 3 dimensional mock ups of whole packages with nutrition information, etc on the BOP.

In countries where nutrition information is mandatory on food products, not providing the same information in an experiment may make it less realistic. Despite evidence suggesting consumers don't use nutrition information for most of their purchases, they may be more likely to use it when confronted with an unfamiliar product (Koenigstorfer and Groeppel-Klein 2010), which would generally be the case in an experiment. A study by Moorman (1996) found that shoppers spent more time examining nutrition information in stores after Nutrition Facts Panels were mandated in the United States. This would suggest that results from experiments conducted in countries where nutrition information is not mandatory or high in prevalence are less relevant to Australian and New Zealand consumers and that, ideally nutrition information should be available to research participants in some form.

However, no matter how the nutrition information is presented to participants, their responses to the labelling are likely to differ from their responses in a real life shopping situation because they are aware that they're participating in an experiment. Generally the participants in the studies included in this review involve placing participants in an environment or situation that's less distracting than a real life supermarket and presenting them with unfamiliar products. Participants will also generally be aware that the researchers have created the products and that they're interested in how participants respond to the packaging. All of these factors are likely to lead research participants to use System 2 (high cognitive involvement) processing to evaluate and rate the hypothetical products, rather than using System 1 (low cognitive involvement) processing, which would be more typical of food purchases. Consequently, this may lead to results that differ from how consumers would behave in a real life situation. For example, the research methods may result in higher estimates of purchase intention, or stronger beliefs that there is a causal relationship between the presence of a nutrition content claim on a product and purchase of the product (Gregory et al. 1982; Dougherty et al. 1997).

### **2.2.2 Time taken by participants to evaluate stimuli**

Different research designs may also influence the time taken by participants to evaluate products or information. No studies in the literature search limited the amount of time participants could use to evaluate or choose between products. Only one researcher, Maubach (2010), reported on the amount of time taken by participants in one of her studies to answer particular questions.

### **2.2.3 Mode of experiment or survey**

The mode in which an experiment or survey is administered (by telephone, face to face, mail or online) could potentially also have an effect. Participants completing the study either face to face or by mail may consider their answers more thoroughly and take longer to answer questions than the same study conducted by telephone or online. Unfortunately there were few examples of either mixed mode studies or separate studies with similar designs but administered via different modes in the literature search.

Researchers, particularly when using online methodologies, have found many participants satisfice when providing their responses (Krosnick 1991). Weak satisficing, where participants simply make less effort to understand a question and form an answer which conforms to their attitude towards a product may not be an issue. However, strong satisficing, which can include always selecting the same response (e.g. 'Product A, or 'agree' on an agree/disagree Likert scale) would not create realistic responses. Strong satisficing is more likely to be exhibited in long or repetitive studies, and may be more likely in particular modes. For example, Savage and Waldman (2008) found that participants' responses to a mail choice experiment different to those participating in the same experiment online.

## **2.3 Research methods**

### **2.3.1 Choice experiments**

Choice experiments, in which participants are asked to choose their preferred option from a choice set, are relatively new to the nutrition content claims literature, and are a type of stated preference study design<sup>4</sup>. The previous review of literature by FSANZ did not include any choice studies; the predominant methodology by researchers in the area at the time was testing the effects of claims on consumers' evaluations using rating studies.

Participants in choice experiments are presented with 'choice sets' consisting of two or more options or products side by side. Most choice experiments in this review used two choices in each choice set. Within an experiment, each participant is generally presented with a number of choice sets, presented sequentially. Participants simply indicate their preferred option from each choice set, or select 'no choice' (where this option is available).

Each choice set is designed to include products or choices that vary on a range of attributes, for example brand, price, and nutrition information. Within each attribute there are different levels. For example, there may be four different price points. An example would be ready made meals that varied on flavour (chicken or vegetables), brand, nutritional content (one healthier nutrition information panel and one less healthy) and price (high or low). To create the choice sets, the factors are varied to create products with all possible combinations. By analysing participants' choices, researchers can determine how much each of the attributes (such as brand) impacts on participants' selections.

Choice experiments would most closely simulate a situation in which a shopper is comparing two or more products within a category. As product categories within supermarkets tend to contain a large number of products, it is unlikely that shoppers would include every possible product within the category. Rather, they would create their own choice set (an evoked set), for example by only comparing brands they have purchased before (Macdonald and Sharp 2003). Within that choice set they may simply select the cheapest product, or the first product they examine which meets a particular criterion (such as 'chocolate-flavoured').

Choice experiments are also useful because they force participants to 'trade off' attributes. In other words the choice sets will include cases where each choice has a favourable attribute that is missing in the other. For example, the participant may be faced with choosing between two chocolate bars where one contains a higher level of cocoa solids (something this particular participant considers desirable), while the other product has Fair Trade certification (also desirable). The participant's choice will indicate which of the two attributes they prioritise.

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<sup>4</sup> An example of a choice experiment can be found at the following website:  
<http://www.Insclab.org/FoodChoice/474385.html?subjectID=758>

A significant strength of choice experiments is that participants are able to base their decision on only those attributes within the experiment which they consider are important to them. However, the obvious caveat is that participants are only able to base their decision on attributes the researcher has included in the design. If, for example, shoppers in real life are very price sensitive in a particular product category, but price is not included as an attribute in a choice experiment, the attributes which are included will appear to strongly influence participants' decisions but this will not follow through to real life sales of the product if shoppers' are not satisfied with the price at which it is offered.

The outcome variables for choice experiments include measures of participants' preferences, such as utility scores. Where price is included the products in the choice sets are displayed at a range of prices. Researchers then use participants' selections to determine how they trade off price against other attributes. For example, if a particular attribute (such as a healthier nutrition information panel) was included in a product at a higher price point, did participants still choose the product and thereby demonstrate they were willing to pay the higher price for the more nutritious ready-made meal? The data from participants is used to calculate how much the average participant was willing to pay for that particular attribute.

Also of use when interpreting results is the variance for each attribute in a choice experiment. This indicates the level of heterogeneity (or variation) between participants in their preferences. A high variance indicates that while some participants highly value that particular attribute, others don't consider it important. For example, an organic label may be the main influencer for some participants in their choices, while others prioritise a healthier nutrition profile. If most participants responded similarly to an attribute, for example by preferring products with lower prices, this would reduce the variance for that particular attribute.

Choice experiments don't examine whether participants' perceptions of the nutritiousness of food products or their perceptions of the health benefits they provide are influenced by the presence of nutrition content claims (two of the questions the literature review is designed to answer). Instead, by their design, choice experiments focus on how participants chose between products.

When examining the results of choice experiments it is important to consider not just whether participants have shown a preference for an attribute, but also the size of the preference. This is because it is possible to have a measure of preference (such as utility or WTP) which is significantly different from zero, but which is too small to be of practical significance. For example, a choice experiment with a large sample size may find that participants were willing to pay A\$0.02 extra for a product with an organic label. Even though the result may be statistically significantly different from zero, for the manufacturer the WTP would be too small to be worth altering their ingredients or production processes.

Previous research examining consumers' responses to choice sets has demonstrated that participants may make their choice based on an attribute which they consider irrelevant or trivial where the products in the choice set are otherwise similar (Carpenter et al. 1994). This effect may carry through to choice experiments when participants are faced with choice sets in which both products or options are otherwise equally desirable. For example, the two products in the choice set may be of similar nutritional value and price, and so the participant may make their choice based on the presence of the nutrition content claim on one of the products. This may not actually indicate that the participant believes the food will be more nutritious, just that it acted as a 'tie breaker' in the choice of product.

### **2.3.2 Sales data studies**

In contrast to choice experiments, which are stated preference experiments, studies using sales data examine shoppers' 'revealed preferences'. These provide a picture of what happens in the real world. However, many sales data studies are not experiments, which means the reason for a relationship (a correlation) between two factors, such as sales and the presence of a nutrition content claim, cannot be determined. That is, a study of sales figures may reveal that products with a nutrition content claim have higher levels of sales than a similar product without a claim. However it would not be possible to determine from sales data alone whether the presence of the claim influenced or caused the decision to buy that product.

One particular study was found in the literature search which did include an experiment and sales data, and therefore was able to examine whether causal relationships existed. For this reason, this section contains relatively strong evidence and is included directly after choice experiments.

### **2.3.3 Rating experiments**

Experiments in which participants rate products with and without nutrition content claims on a range of attributes dominate the nutrition content claims literature. Either the responses from participants exposed to a food product carrying a nutrition content claim are compared to other participants' responses to the same product without a claim (between-group comparisons). Or, each participant is exposed to products with and without nutrition content claims, and within-group comparisons are made.

The outcome measures used in the studies in this literature review include purchase intention, preferred product (from a choice of two or more), nutrition perceptions, health perceptions and willingness to pay (WTP). It is important to note that WTP in rating experiments is very different to WTP to pay in choice experiments. In rating experiments, participants are explicitly asked to provide their WTP for a particular product or feature, or they provide this information by participating in an experimental auction. In contrast, WTP in choice experiments is derived by participants trading off attributes, including price, and determining how much of the variation in responses is due to the price.

In terms of the applicability to real life shopping situations, rating experiments would most closely simulate a consumer evaluating one product at a time, for example where a shopper's attention is drawn to a particular product due to a price discount. The shopper may then examine information on the package, such as nutrition information, and decide whether it meets one or more criteria, such as 'needs to have less than 5 grams of fat per 100 grams'. However, in rating experiments participants are often asked to evaluate a range of attributes for each product. For example, how nutritious the product is, or whether they believe it would have any health benefits. In real life, particular participants may not base their purchasing decisions for this product category on those criteria. By including these questions, participants may feel that the researchers expect them to make their decisions based on these criteria, and this could potentially influence their overall evaluations of the products (Lorenz et al. 2001; Podsakoff et al. 2003).

The advantage of including additional attributes, however, is that the effect of nutrition content claims on participants' perceptions of the nutritiousness or health benefits of products can be measured. These are aspects that choice experiments are not able to examine.

Participants' evaluation of each product in a ratings experiments tend to take longer than in choice experiments as they are generally asked a series of questions on each product, rather than simply being asked to choose their preferred product. This may increase the likelihood of participants making their evaluation using System 2 (high cognitive involvement) processing which is more analytical than System 1 (low cognitive involvement) processing and thereby make them less representative of consumers' real life evaluations.

#### **2.3.4 Self-reports of nutrition content claim use**

Surveys capturing participants' self-reports of whether they use nutrition content claims in purchasing decisions are relatively weak evidence for this review. This is because the studies rely on participants being able to recall their nutrition content claim use, interpret the behavioural influences of their use, and then accurately relay this to researchers, so the results are likely to be subject to a number of cognitive biases. In particular, studies in which participants answer numerous questions on a particular nutrient, such as sodium, and their knowledge of its connection with health outcomes (for example, high blood pressure) are likely to over-report their use of nutrition content claims to researchers. This can either be due to social desirability bias (answering questions in a way that they feel will reflect well on them in the eyes of others), or due to a wish to help the researcher. Also, previous research has shown that many of the research participants that report using nutrition information to select food products rarely use any nutrition information when being observed by a researcher while actually shopping (Higginson et al. 2002a).

Grunert and Wills (2007) have previously noted that the self-report studies may be useful for comparing groups. For example, a self-report study might be used to examine whether participants who have been diagnosed with high blood pressure are more likely to report using sodium content claims than other participants. They may also be useful for determining which nutrition content claims consumers are most interested in, for example whether they find a 'low fat' claim more compelling than a 'low sugar' claim.

#### **2.3.5 Qualitative studies**

Qualitative studies can be useful for understanding how consumers understand nutrition content claims, and how they might influence consumers' choices in the context of other labelling elements. However, they also involve consumers thinking about their own behaviour in-depth. This is a different type of thinking process to the low cognitive involvement decision-making that shoppers make in stores, and may result in them providing explanations for their behaviour which do not accurately reflect the causes of that behaviour (Fowler 1995).

Although they are not able to demonstrate whether nutrition content claims influence consumers' behaviour, qualitative studies can be useful for interpreting the findings of the stronger research designs mentioned above. For example, findings from qualitative studies may be able to explain why a particular nutrition content claim increases sales of some products but not others.

Therefore they are still useful to this literature review, but interpretation of the findings needs to consider the research context and how this may have influenced responses.

#### **2.3.6 Literature reviews**

Literature reviews provide compilations of research on a particular topic. However, their usefulness depends on how current they are and the extent to which they actually review rather than summarise the studies they include.

The literature reviews didn't provide any references that weren't found in the literature search for this review.

### **3 Results**

#### **3.1 Choice experiments**

Eight studies which used choice experiments were found in the literature search (Bond et al. 2008; Gao and Schroeder 2009; Gracia et al. 2009; Mueller et al. 2009; Berning et al. 2010; Maubach 2010; Barreiro-Hurlé et al. 2010a; Dixon et al. 2011) One of these, (Berning et al. 2010), examined participants preferences for nutrition content claims on supermarket shelf tags. The seven other studies examined the effects of nutrition content claims on participants' preferences for products with a range of attributes (Bond et al. 2008; Gao and Schroeder 2009; Gracia et al. 2009; Mueller et al. 2009; Maubach 2010; Barreiro-Hurlé et al. 2010a; Dixon et al. 2011).

In some experiments the effect of the nutrition content claim is expressed as willingness to pay (WTP) (Bond et al. 2008; Gao and Schroeder 2009; Gracia et al. 2009; Mueller et al. 2009; Barreiro-Hurlé et al. 2010a) by including price as an attribute with a range of levels (e.g. A\$2.00, A\$2.50 and A\$3.00). WTP is the valuation placed by an individual on a good or service in terms of money. Studies which include WTP are useful in that the measure of WTP is easy to relate to, and it indicates whether participants are willing to pay extra for the particular attribute. WTP enhances interpretation of choice experiment findings by enabling researchers, and readers of the research, to make a judgement as to whether a statistically significant effect from an attribute has any practical significance. For example, a study with a large number of participants may be able to determine that the WTP of participants for an organic certification logo is approximately A\$0.10 for a fruit juice, with 95 per cent certainty that the average WTP is between A\$0.05 and A\$0.15. This result would be statistically significant, but the very small size of the WTP would have no practical significance, except perhaps to dissuade a fruit juice manufacturer from investing large sums of money in obtaining organic certification.

In contrast, utility (used by Maubach, 2010) as an outcome variable is useful for comparing products or attributes within an experiment to consider their relative importance, but it is difficult to determine what the real world significance of the value is. This is because utility can be difficult to quantify as money does not (entirely) capture it. Utility is a measure of satisfaction underlying most economic theories. Whilst people want as much utility as they can get, the more of an item or service you have the less additional utility you achieve. Therefore, someone can be made richer in a monetary sense with no additional utility.

In all choice experiments, the attributes which the researchers have chosen to include will influence the significant differences and effect sizes found. Due to the design of choice experiments, in which respondents are exposed to all possible combinations of attributes, researchers tend to only vary a limited number of attributes. However, where important attributes are excluded from the research design, this has the potential to inflate the apparent size of the effects remaining attributes have on respondents' preferences.

The study by Berning et al. (2010) examined participants' preferences for information, including nutrition content claims, on supermarket shelf tags in the United States. Participants were shown a choice set with four examples of shelf tags which varied in the display of price information (low prominence, high prominence), unit price information (low and high prominence) and nutrition information (not present, low prominence, high prominence). Lower prominence information was shown in a smaller sized standard (not bold) font. The nutrition information was the following three nutrition content claims: 'Fat Free', 'Saturated Fat Free', and 'Cholesterol Free'. Participants were presented with 16 choice sets and asked to indicate which of the four shelf tags they most preferred. The researchers found that participants had positive preferences for the high prominence nutrition information (nutrition content claims). The majority of participants preferred high prominence nutrition information, with only 19 per cent of participants having negative preferences towards it. Participants with negative preferences for the high prominence nutrition information appeared to prioritise high prominence price information (Berning et al. 2010). These results indicate that supermarket shoppers may have positive attitudes towards the presence of standardised nutrition content claims on supermarket shelf tags. However, it's not clear whether shoppers would have the same attitudes towards manufacturers' nutrition content claims on packaging (the focus of this review). Nutrition content claims would be less useful to shoppers in their current form on food packaging as they are used in an ad hoc way by manufacturers who choose not to display them on many of the foods which are eligible.

One study by Barreiro-Hurlé et al. (2010a), described below, raised the possibility that consumers may find some utility in the provision of nutrition content claim information even where the claim does not suggest the product is more nutritious than other products. This may support the finding of Berning et al.'s research.

### **3.1.1 Studies which did not include brand as an attribute**

Four choice experiments did not include the product brand as an attribute which was varied (Bond et al. 2008; Gao and Schroeder 2009; Mueller et al. 2009; Barreiro-Hurlé et al. 2010a). This is a serious shortcoming, as it is not clear whether participants in these studies, by selecting products carrying nutrition content claims, are indicating that the information in the claim ('low in fat') is important to them or whether it is the feature of the product (that the product is low in fat) that is valuable. Because participants in these studies were presented with two products of the same brand, with just a few labelling elements and price varied, some participants may have assumed that the nutritional value of the two products was identical. In other words, the preference for the product with the nutrition content claim may have indicated a preference for the information per se, or it may have indicated a preference for a product with a lower amount of fat. Nutrition information (either a Nutrition Facts panel or a Nutrition Information Panel) was not provided in three of the four studies (Bond et al. 2008; Gao and Schroeder 2009; Mueller et al. 2009), and in the fourth study the nutritional values in the panel were not varied (Barreiro-Hurlé et al. 2010a). This means that participants would, with the exception of the Barreiro-Hurlé et al. study, not have been able to verify whether the nutritional value of the two products being compared was the same.

These studies all used WTP as the outcome variable, and they tended to find that the presence of the nutrition content claim had a statistically significant effect. The size of the effects ranged widely between experiments. In a study on red oak lettuces, participants were willing to pay US\$0.22 for an 'Excellent source of vitamin C, an antioxidant nutrient' claim (Bond et al., 2008). WTP for steaks with 'Enhanced Omega-3 Fatty Acids' ranged from US\$0.12 to US\$0.98 per pound in a study by Gao and Schroeder (2009), compared to US\$0.94-3.42 for 'Guaranteed Lean'. Mueller et al. (Mueller et al. 2009) found that the claims 'rich in omega-3' and 'low in fat' accounted for only 0.3 per cent of importance in a choice experiment using prawns. This translated to a price premium of A\$3.28 per kilogram for the 'low in fat' claim and A\$0.20 per kilogram for the 'rich in omega-3' claim.

The presence of nutrition content claims did not have a statistically significant effect for all of the food and claim combinations tested. Barreiro-Hurlé et al. (2010a) found no impact of a '0 % fat content' claim on a yoghurt product, but found participants were willing to pay €0.35 for a 'low fat content' claim on frankfurters. WTP for particular attributes, such as nutrition content claims, was also affected by the number of attributes included in the study (Gao and Schroeder, 2009), and they were found to interact with other attributes in a way that lead to unexpected WTP estimates. For example, Bond et al. (2008) found that a vitamin C nutrition content claim shown with an organic claim led to a WTP of US\$0.55. But the vitamin C claim on its own only had a WTP of US\$0.22 and the organic claim only US\$0.11.

The lack of an effect in Barreiro-Hurlé et al. (2010a) study on the yoghurt product may be due to the way nutrition information was presented. In this experiment, nutrition information was presented on the front of the package in the product images shown to participants. As noted by the authors, it would have been very easy for participants to deduce that the yoghurt contained no fat by reading the nutrition table. Therefore the nutrition content claim would not have added much value. In contrast, the 'low fat content' claim on the frankfurters did add additional information, as although participants were able to view the nutrition information they may have been unable to interpret whether the amount of fat was low, moderate or high. The 'low fat content' claim made a judgement about the level of fat in the frankfurters, whereas the '0 % fat content' claim just replayed information from the nutrition panel.

As the other three studies in this section did not make nutrition information available to participants we can't determine whether the effects found from nutrition content claims are based on a feature intrinsic to the product or whether they are simply valuing the information that has been provided.

Another consequence of these studies not varying the brand or nutritional value of the food products included is that they weren't able to test whether the presence of a nutrition content claim would make participants more likely to choose a less healthy product.

### **3.1.2 Studies which did include brand as an attribute**

Three studies included brand as an attribute that was varied (Gracia et al., 2009; Maubach et al., 2010; Dixon et al., 2011).

Gracia et al.'s (2009) study, conducted in Spain, examined the effect of a 'light' nutrition content claim on consumers' preferences for two breakfast cookie products. Participants were presented with four of the eight choice sets used in the experiment (out of a possible 16 choice sets). For each choice set, participants were shown a table comparing the attributes of two breakfast cookie products. The products varied on brand (well-known, not well-known), 'light' claim (present or absent), nutrition label (present or absent) and price (€2 or €3 per kilogram of cookies). The actual nutrition label and packaging were not available to participants. Participants were asked to either choose one of the two cereals or to select neither of them. The 'light' claim was not significant in the multinomial logit model, but was significant at the 5 per cent level in a random parameters logit model, indicating that participants perceived a higher utility from the product with the 'light' claim than without. Using the price, Gracia et al. (2009) were able to calculate participants' willingness to pay for the other attributes of the products. The well-known brand attracted the highest WTP (€0.84); followed by the presence of a nutrition label (€0.42), and then the 'light' claim (€0.26).

Although Gracia et al. (2009) included 'well-known brand' and 'not well-known' brand as attributes in their study, participants were not provided with actual brand names or packaging. Also, participants did not see the nutrition table that was available on some of the products, it was just noted that it was there in the table comparing the attributes of the two products in each choice set. As with the choice experiments described above which did not vary the brand, it's not clear from this study whether participants are placing a value on the information provided by the 'light claim' or whether they believed that one of the products in the choice set was 'light' and the other was not. As with the choice experiments described above, this experiment was not able to test whether a nutrition content claim would make participants more likely to choose a less healthy product.

Maubach's (2010) study included two different products in each choice set, with one less healthy and one more healthy. The graphic design of the breakfast cereal packages suggested that one product (Hooplas Stars) was a variation of the other (Hooplas). Both products were extruded breakfast cereals with colourful packaging. The study initially had a 2 x 3 x 2 x 3 factorial design. The variables were nutritional profile (less healthy, healthy), cereal type (Hooplas, Hooplas Stars), front of pack nutrition labelling (none, per cent daily intake, multiple traffic lights) and claim (no claim, nutrition content claim and health claim). As the less healthy product would not be eligible to carry a health claim under the proposed Nutrition, Health and Related Claims Standard, Maubach did not pair the health claim with the less healthy product. This yielded 210 possible pairs of products, of which 30 were used in the study with each participant viewing a subset of 10 pairs. Maubach used an incomplete Latin square design for randomising presentation order, but although each product image was featured in each place an even number of times, the use of this design instead of a counterbalanced factorial design meant that ordering effects would have remained.

For each pair, participants could choose either cereal, or 'Neither'. Participants were able to access nutrition information as well as the ingredient list for the products by clicking on the screen. The study was conducted online using a research panel and resulted in 801 completions. The data, analysed using multinomial logit regression, found higher utility scores for package combinations which included the nutrition content claim compared to the control. This effect was found in all front of pack labelling conditions, and was particularly strong for the less healthy cereal.

Participants across all conditions were more likely to select the breakfast cereal with the healthier profile than they were to select the less healthy product (Maubach 2010). However, the gap in preference between the products with the two nutritional profiles narrowed when no front of pack nutrition labelling was available to participants. This was because in the presence of the nutrition content claim, the healthier profile product's utility was no different to that for the less healthy product. In contrast, where no nutrition content claim was present, the utility for the healthier product was 0.56. This effect from the nutrition content claim indicates its presence led to a higher proportion of respondents selecting the product with the less healthy nutrition profile than would occur in the absence of a nutrition content claim. This effect was somewhat attenuated when multiple traffic lights were also shown on the less healthy breakfast cereal.

Maubach found that 219 respondents (approximately 27 per cent) did not access the nutrition information in the experiment by clicking on the screen even once, despite clear instructions on how to do this. Of those who did view the nutrition information during the experiment, 32 per cent only accessed this for one of the ten choice sets they saw. Only 249 participants (31 per cent of the total sample) viewed the nutrition information five or more times during the experiment. Participants were more likely to access nutrition in the first choice sets they saw. Some of the participants who only accessed the nutrition information once or twice during the experiment may have assumed that the nutritional value of each cereal type did not vary throughout the experiment, i.e. they may have assumed that the Hooplas Stars cereal was always the healthier product. Nutrition information was available in front of pack labelling (per cent daily intake labelling and multiple traffic light labelling) on many of the images, but generally the two images shown would have had different types of labelling, making comparison difficult.

As noted above, Maubach's study used two related products from the same brand, with only the cereal shape and name differing. This may have led participants to assume they would be of similar nutritional value. If this were the case, participants may have been less likely to examine nutrition information. This would be a similar problem to that noted above for the experiments which did not include brand as an attribute that was varied. Participants in the study had an opportunity to provide feedback on the study at the end if they wished, however they weren't specifically asked any questions on what they believed the hypothesis might be or which factors they considered important in their decisions.

A study by Dixon (Dixon et al. 2011) also tested how participants' selections were affected by the presence of nutrition content claims using a variety of brands, but was not a true choice experiment as the nutrition content claims only appeared on one brand within each product type. The study included products with two levels of nutritional value (high and low), and real life examples of packaging (from an overseas country) to increase realism. The nutrition content claims tested were for fibre, calcium, reduced fat, trans fat free and vitamin D. A variety of products aimed at children were used, and the participants were parents of children aged 5-12 years (N=1551). The products used were breakfast cereals, cheese dip snacks, ice cream bars, frozen chicken nuggets and flavoured milk drinks. Participants were asked to choose between pairs of matched product types, with one product in each pair being an energy-dense nutrient-poor (EDNP) product, and the other being healthier. The EDNP products were manipulated so that some participants saw a version of the EDNP with no claims, some with a nutrition content claim, and others with a sports celebrity endorsement that included a nutrition content claim. The healthier brand within each product type was never shown with claims. Participants were able to view nutrition information for the products by clicking on the product image.

The study found preferences for the EDNP product over the healthier product increased from 29 per cent in the control group to 36 per cent for those who saw the nutrition content claim. This effect was found for participants with a high level of education (OR=1.75, 95% CI 1.14, 2.70,  $p=0.010$ ), but not for those with low levels of education. Participants who clicked to view the nutrition information were not influenced by the presence of the nutrition content claim. In the sample, 56 per cent of participants did not click to see the nutrition information for either of the products; this proportion did not vary between the conditions, suggesting that the presence of the nutrition content claim did not encourage participants to truncate their information search. As well as the selection task, participants rated the products on a range of Likert scales. The results of the ratings are summarised in the results section on rating experiments

The Dixon study did include brand as an attribute and had nutrition information available to participants that varied between brands, increasing the realism of the experiment compared to some of the earlier choice studies described in this section. However, the packaging variable was not manipulated. That is, the EDNP products always had the same packaging, as did the healthier products. The researchers did a manipulation check on the data using a series of paired t tests and found the packs in the control condition (no claims) were comparable for ratings of quality, taste, value for money and inferiority to other brands. However, the researchers did not test, prior to the experiment, whether participants would behave differently toward the two packages in a selection task. This manipulation check is not able to be carried out on the collected data, as the EDNP control product had a different nutritional profile to the healthier product. If participants consistently found some of the brands more appealing than others, then this could potentially have biased the results.

All of the choice experiments on nutrition content claims have one or more problems in their design which limit either their relevance to this review or the robustness of their results. Many of the studies did not vary the brand and did not provide nutrition information. Maubach and Dixon's studies are the most useful for the review as nutrition information was made available to participants and the brand of products was included as an attribute that varied across products (although less so in Maubach's study which used a variation on a product). However, they both have design issues that could potentially have biased the results. While these design issues are acknowledged, they are not so significant that the findings of the choice experiments should be discarded, particularly as their findings are quite different to those of the rating experiments which are discussed in a later section of this review.

Both Maubach and Dixon et al.'s studies were conducted with parents, and used a task in which participants were asked to imagine they were purchasing foods for their child or children. This may have increased participants' motivation to select 'healthier' products, and hence their likelihood of using nutrition content claims to assist their selections.

One possible interpretation of the findings, of Dixon et al. and Maubach's studies is that participants valued the interpretation of the nutrition information that the nutrition content claim provides. For example, although participants were able to see nutrition information panels for products in both of the studies, this only provides absolute numbers which consumers may have difficulty in interpreting. Would participants feel comfortable in interpreting whether 10 grams of fat in 100 grams of breakfast cereal was a high or low level of fat? Rather than interpreting the presence of the nutrition content claim on the product as indicating that it was healthier than the other product in the choice set, participants may have valued the interpretation of the nutrition information provided by the nutrition content claim. For example, without the 'Source of fibre' nutrition content claim on the breakfast cereal, participants may have been unsure whether the cereal contained a useful amount of fibre.

Both the Maubach and Dixon studies involved adding additional information to the front of food packages and examining the effect of this on participants' preferences. However, Maubach's findings seem to suggest that the addition of any extra information to a package that has relatively little text or logos (compared to other breakfast cereals on the market) leads to increased preference. This can be seen in the results from adding front of pack information (either per cent daily intake or multiple traffic lights) to the packaging. Maubach found that this led to increased preferences for the products, even when the product was of lower nutritional value. This is an unexpected finding considering the multiple traffic lights on the product of lower nutritional value showed three amber lights (for total fat, saturated fat and sodium) and one red light (for sugar).

All of the choice experiments found statistically significant effects from the presence of nutrition content claims for at least some products, although some effects were small, and Barreiro-Hurlé et al. (2010a) found that a '0 % fat content' claim on a yoghurt product had no significant effect on research participants' preferences. Both Maubach's and Dixon et al.'s studies suggest that the study design has a strong impact on whether nutrition content claims are found to have an effect. Previous FSANZ research on nutrition content claims has used between-subjects rating tasks to determine whether the presence of a nutrition content claim on a particular product results in different ratings from participants compared to the same product without the nutrition content claim. Both Dixon and Maubach included ratings tasks in their research and tended to find no effect from the nutrition content claims in these.

A summary of the findings from the choice experiments is in shown in Table 1.

**Table 1: Summary of choice experiments**

Author	Country	Product	Claims	Outcome measure	Effect size
Bond et al. (2008)	United States of America	Red oak lettuce	"Excellent source of vitamin C, an antioxidant nutrient"	Willingness to pay per package	US\$0.22
Gao and Schroeder (2009)	United States of America	Beef steak	"Guaranteed Lean" "Enhanced Omega-3 Fatty Acids"	Willingness to pay per pound	"Guaranteed Lean" - US\$0.94-3.42 "Enhanced Omega-3 Fatty Acids" - US\$0.12-0.98
Gracia et al. (2009)	Spain	Breakfast cookies	"light"	Willingness to pay per kilogram	€0.26
Mueller et al. (2009)	Australia	Prawns	"Rich in Omega-3" "Low in fat"	Willingness to pay per kilogram	Claims accounted 0.3 % of importance "Rich in Omega-3" - A\$0.20 "Low in fat" - A\$3.28
Barreiro-Hurlé et al. (2010a)	Spain	Frankfurters Yoghurt	"Low fat content" "0 % fat"	Willingness to pay per package	Frankfurters - €0.35 Yoghurt – no effect
Berning et al. (2010)	United States of America	Supermarket shelf-tags	"Fat Free" "Saturated Fat Free" "Cholesterol Free"	Parameter estimates	Combined high prominence claims – mean of 2.52 (base model), -1.79 (full model)
Maubach et al. (2010)	New Zealand	Breakfast cereal	"A good source of calcium 25 % RDI per serve"	Change in utility from the presence of the nutrition content claim	The presence of a nutrition content claim reduced the utility for the healthier cereal (compared to the less healthy cereal) from 0.56 to 0.
Dixon et al. (2011) NB: not a true choice experiment	Australia	Breakfast cereal, cheese dip snacks, ice cream bars, frozen chicken nuggets and flavoured milk drinks marketed towards children	"Source of fibre" "Source of calcium" "Reduced fat" "Trans fat free" "Good source of vitamin D"	Preference for the energy-dense nutrient poor product over the healthier product	Preference for the EDNP product increased from 29 per cent in the control group (no claim) to 36 per cent for participants shown an EDNP with a claim

### 3.2 Sales data studies

Two studies which examined the relationship between nutrition content claims, retail prices and sales were found (Kiesel and Villas-Boas 2009; Anders and Moser 2010; Kiesel and Villas-Boas 2010; Berning et al. 2011). One of these studies was reported in three publications (Kiesel and Villas-Boas 2009; Kiesel and Villas-Boas 2010; Berning et al. 2011). Both of these studies found relationships (positive and negative) between the presence of nutrition content claims and sales, however, one of these (Anders and Moser 2010) did not include an intervention and therefore wasn't able to demonstrate a causal relationship, just a correlation. The other study, reported on by Kiesel and Villas-Boas (2009, 2010) and Berning et al. (2011) was an experiment where shelf tags carrying nutrition content claims were placed in supermarkets. Due to the experimental design, this study was able to suggest a causal relationship between the provision of nutrition content claim type information and sales.

Anders and Moser (2010) used retail scanner data from Canadian supermarkets to examine the relationship between meat origin (e.g. beef, chicken), brand (compared to generic), and labelled fat content (regular compared to extra lean) on sales of minced meat. The researchers found that extra lean beef (as well as extra lean chicken and pork) had a retail demand that was inelastic to price, suggesting consumers were prepared to regularly pay higher prices for products labelled as extra lean, a nutrition content claim. However, it seems unlikely that consumers would be misled by a nutrition content claim on a fairly standardised product that is non-processed, such as meat. Whereas processed products carrying nutrition content claims may include higher levels of negative nutrients not mentioned in the nutrition content claim, meat producers are only able to vary the level of fat in the product, and in a number of situations the fat content is to some degree visible after the meat is packaged.

Kiesel and Villas-Boas (2009, 2010) and Berning et al. (2011) conducted an experiment using shelf tags displayed with microwave popcorn products to test whether providing standardised nutrition content claims would have an impact on sales. Shelf tags were placed on all products that would be eligible to carry 'no trans fats', 'low calorie', and 'low fat' nutrition content claims. The categories for the claims were developed by grouping products into low, medium and high levels for particular nutrients, such as fat (Kiesel and Villas-Boas 2009). The 25 per cent of products with the lowest levels, for example of fat, would then be assigned a 'low fat' claim. As the categorisation of 'low fat', as well as the other claims, was specific to the microwave product category, the proportions of similar products in the Australian and New Zealand markets eligible to carry these claims would differ. This is because manufacturers generally follow the Code of Practice on Nutrient Claims in Food Labels and in Advertisements<sup>5</sup> which specifies that foods should not carry a 'low fat' claim unless they contain less than a specific number of grams of fat per 100 grams of food or per 100 ml of liquid. This specification is standard across all food categories. Many, but not all, of the popcorn products in the study already carried nutrition content claims on their packaging. The shelf tag treatment was carried out in 5 supermarkets, with 27 supermarkets from the same supermarket chain acting as controls.

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<sup>5</sup> Available from the Food Standards Australia New Zealand website:  
[http://www.foodstandards.gov.au/\\_srcfiles/Code\\_of\\_Practice\\_jan1995.pdf](http://www.foodstandards.gov.au/_srcfiles/Code_of_Practice_jan1995.pdf)

'No trans fats' and 'low calorie' labels were associated with increases in sales. In contrast, 'low fat' labels were associated with reductions in sales (Kiesel and Villas-Boas 2010). This may have been due to perceptions amongst shoppers that products carrying a low fat claim would be less tasty, an effect which has been found previously for sodium claims (Miremedi 2011). Examining the sales of 'low fat' claim products with unlabelled products revealed that their sales had reduced by 42.8 per cent during the treatment period relative to unlabelled products. This suggests that at least some of the reduced sales are due to a deterrence factor, rather than all of these lost buyers being drawn toward the more attractive 'no trans fats' and 'low calorie' claims. When shelf tags were introduced that carried multiple nutrition content claims, these tended to reduce sales, although only a small percentage of products were eligible to carry two or more claims. The treatment stores experienced a 3.7 per cent drop in microwave popcorn stores in comparison with the control stores during the experiment. The authors suggest that some shoppers may have been dissuaded from buying microwave popcorn by the additional information as it may increase the cognitive effort required to make a purchase decision.

Further analysis of the results was conducted by Berning et al. (2011) to examine whether the overall shifts in popcorn purchases led to increased purchases of healthier popcorn products. Berning et al. (2011) found that sales of healthier popcorns (defined as those which were able to carry a shelf tag in the experiment) experienced a statistically significant reduction in sales over the period of the experiment ( $p < 0.01$ ), but there was no statistically significant change in the sales of the unhealthy popcorns. It would appear, based on Kiesel and Villas-Boas' (2010) article, that this would largely be due to the 'low fat' shelf tags reducing sales of eligible products as the 'low calorie' and 'no trans fats' labels were found to increase sales in their analysis.

These results are in line with previous findings from shelf tag research conducted by the United States Food and Drug Administration (Levy et al. 1985; Teisl et al. 2001) which have also found changes in purchasing patterns in supermarkets in which shelf tags were introduced. Levy et al. (1985) and Teisl et al.'s (2001) studies found wide variation in the effect of the shelf tags across the different food categories they included, both positive and negative effect. This suggests that the size of the effects found in the microwave popcorn study may be greater or smaller than what would be found in real life should such a program be introduced in all food categories in supermarkets. For example, microwave popcorn buyers may be more or less concerned about nutrition than other supermarket shoppers. The studies by Levy et al. (1985) and Teisl et al. (2001) were conducted over much longer time periods (two years or longer compared to 4 weeks in this experiment) and tended to find smaller overall effects on sales than the study reported on by Kiesel and Villas-Boas and Berning et al., which suggests the effect of the shelf tags may decrease somewhat over time.

Unlike the study by Anders and Moser (2010), the supermarket shelf tag experiment is able to demonstrate a causal relationship between the provision of the information and sales. However, unlike manufacturer claims, the claims used in this experiment were standardised with all eligible products carrying them. This may have led to shoppers believing they were more credible, as they were placed there by the retailer rather than the manufacturer. The standardisation may have also reduced information search costs for shoppers as the information was always available in the same place in the same format, and shoppers were able to infer from the absence of a shelf tag that a product was not eligible to carry a claim. This theory is supported by the finding that including multiple nutrition content claims on shelf tags reduced sales of the tagged products. The authors suggest that the increase in information from shelf tags carrying multiple nutrition content claims increased information search costs, putting off shoppers wishing to make a quick decision (Kiesel and Villas-Boas 2009).

Another difference between the shelf tags compared to manufacturer nutrition content claims is that they would have been much more prominent because they were positioned next to pricing information on shelves rather than on packaging, and this may have contributed to their effect on sales.

The studies examining sales of products with and without nutrition content claims suggest that any relationships that exist in real life are likely to vary between products and claims and that particular pairings of food products and claims can result in reductions in sales. This may go some way to explaining why studies with similar methodologies that are discussed in other parts of this review appear to have contradictory findings, as the choice of claim and product combinations will affect whether or not a relationship is found.

### **3.3 Rating experiments**

This section includes studies which examine the effect of nutrition content claims on participants' evaluations of food products via ratings of attributes such as purchase intention and nutrition attitudes. Some of these studies test for effects from nutrition content claims using an experimental design that includes a control treatment in which participants are not exposed to nutrition content claims. These are similar in design to the FSANZ research conducted in 2007, and are testing the absolute effects of claims. However, some other studies do not include this type of control group, as the researchers are testing the relative effects of nutrition content claims compared to other nutrition content claims or to health claims.

In terms of the applicability to real life shopping situations, rating experiments would most closely simulate a consumer evaluating one product at a time, for example where a shopper's attention is drawn to a particular product due to a price discount. Participants are asked to rate the products on scales which relate to attributes of interest to the researchers. Many of the studies also ask participants to rate how likely they would be to purchase the product in a real life situation.

This section is split into studies which included a control product with no nutrition content claims, and those that did not.

#### **3.3.1 *Studies which included a control***

Thirteen articles reported on studies which included rating tasks for products or advertisements and included controls (Behrens et al. 2007; Haddad et al. 2007; Kemp et al. 2007; Baixauli et al. 2008; Howlett et al. 2008; Lin 2008; Andrews et al. 2009; Ginon et al. 2009; Labiner-Wolfe et al. 2010; Maubach 2010; Saba et al. 2010; Dixon et al. 2011; Dean et al. 2012). Outcome variables used in these studies include purchase intent, perceived healthfulness, belief that the product will help with a particular health condition, and willingness to pay.

These studies can be further broken down into those that make additional nutrition information (a Nutrition Information Panel or a Nutrition Facts Panel) available to participants and those that do not. Studies which include nutrition information (Kemp et al. 2007; Howlett et al. 2008; Lin 2008; Maubach 2010; Dixon et al. 2011) simulate more closely the amount of information that is available to consumers in most shopping environments. However, as noted earlier in this review, some studies (Behrens et al. 2007; Haddad et al. 2007; Baixauli et al. 2008; Andrews et al. 2009; Ginon et al. 2009; Saba et al. 2010; Dean et al. 2012) do not include nutrition information perhaps to mimic the effect of shoppers not choosing to access nutrition information when purchasing food<sup>6</sup>. However, not making nutrition information available in an experiment may not create the same effect as nutrition information being available but shoppers choosing not to use it. The lack of nutrition information is particularly a problem where participants are being asked about their nutrition or health perceptions of a product and are forced to make their judgement based on a few clues on the packaging such as a 'low in fat' claim..

Howlett's (2008) study examined the effect of a 'low trans fat' nutrition content claim on participants' perceptions of the nutritiousness of a snack cracker product and their disease risk perceptions. The researchers also manipulated the level of trans fats that was listed in the Nutrition Facts Panel, displayed on screen next to the image of the front of the package. Half of the images had 1 gram of trans fat per serving, and the other had 4 grams of fat. The design was fully factorial, which meant some participants would view a package that had a 'low trans fat' claim and a Nutrition Facts Panel with 4 grams of fat per serving. Participants shown a package with the 'low trans fat' claim had higher ratings of the nutrition level of the snack cracker product ( $p < .01$ ), but their disease risk perceptions were not influenced. This effect was not influenced by the level of trans fat (low or high) shown in the Nutrition Facts Panel.

However, the nutrition profile used for the food in Howlett et al.'s (2008) experiment is quite unrealistic for a food labelled as 'low trans fat'. The Code of Practice on Nutrient Claims in Food Labels and in Advertisements suggests that manufacturers only use the claim 'low fat' for foods with 3 grams or less of fat per 100 grams of food. Given that crackers tend to have quite small servings sizes (the product the researchers based the nutrition information on a cracker product which has a serving size of around 14 grams), the amount of trans fat in this product measured per 100 grams would be large even for the product with the 'low' level of 1 gram per serving. A manufacturer following the Code of Practice would therefore not put even a 'low fat' claim on the food, let alone a 'low trans fat' claim. The information provided in the Nutrition Facts Panel for this food therefore makes the products used in this experiment unrealistic in the context of the Australian or New Zealand markets.

Lin's (2008) study included nutrition information and compared participants' purchase intentions for yoghurt, orange juice and pasta products with health claims, nutrition content claims and a control (with no claims). The study was conducted online, with participants viewing two labels for different food products and answering a range of questions on them. The nutrition content claims included were 'a good source of calcium', 'a good source of potassium' and 'a good source of lysoton'. Lysoton was a fictional nutrient included in the experiment so that participants' responses to an unfamiliar nutrient could be compared with responses to familiar nutrients. Lin (2008) reported that products with nutrition content claims or no claim resulted in the lowest purchase intentions from participants compared to health claims. However the article does not report on whether there was any difference in participants' response to nutrition content claims compared to no claim.

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<sup>6</sup> Observational studies find that, although participants in surveys report using nutrition information on food packages frequently, their in store behaviour is quite different. Most purchases are made without referring to nutrition information (Grunert et al. 2010).

Andrews et al. (2009) found no statistically significant effect from a nutrition content claim on purchase intention for a snack bar in the absence of nutrition information. However, they did find an effect on perceived weight gain risks, and the proportion of participants making health inferences for both a fat and a calorie claim. The presence of either claim increased the proportion of participants making 'health halo' inferences about the advertised product. For example, "It's healthy and not many calories", "That it would help you lose weight". The claims also reduced participants' perceived risk of weight gain from consuming the product. This effect was attenuated where a US Food and Drug Administration disclosure was included in the advertisement.

The study underpinning Saba et al.'s (2010) and Dean et al.'s (2012) articles did not include nutrition information and found a positive effect from claims. Saba et al. and Dean et al. report on different aspects of the same study. They found, using conjoint analysis that the 'contains wholegrain' claim positively influenced participants' perceptions of the healthiness of products, but only had a small influence on their purchase intentions. However, the stimuli in this study were fairly rudimentary show cards with black and white sketches of foods combined with various claims. It's likely this would have made participants focus on the claims more than they would if they were examining realistic branded food packaging.

Behrens et al.'s (2007) Haddad et al.'s (2007), Baixauli et al.'s (2008) and Ginon et al.'s (2009) studies included a taste testing component and tested the effects of providing nutrition content claims on these evaluations. Baixauli et al. (2008) and Ginon et al. (2008) found positive effects from nutrition content claims in the absence of additional nutrition information. In Baixauli et al.'s study the nutrition content claim resulted in small increases in ratings of intention to purchase wholemeal muffins on a nine point scale from 4 to 5, and an increase of nutritious ratings from 6.0 to 6.5 and, for fibre-enriched muffins, 5.4 to 6.4. Ginon et al. observed a 12 per cent increase in participants' willingness to pay for high fibre baguettes when they were displayed with a 'source of fibre' claim compared to the same baguettes without the claim.

Behrens et al. (2007) measured the effect of a health message which contained a nutrition content claim ("lower calorie") on both participants' expected liking of a soy milk product, and actual liking following a taste test. The study was conducted in Brazil. Participants first tasted the flavoured soy milk product blind (with no health message) and rated their liking of the product on a 9 point scale. They were then exposed to the health message/nutrition content claim and rated how much they expected to like the same soy milk product on a 9 point scale. Finally, they then tasted and rated the product again on a 9 point scale for liking. The results found participants' expected liking (following information provision) was significantly higher than their liking after the first taste test (6.8 on the scale, compared to 5.5 on the first taste test,  $p < 0.05$ ). However, this difference disappeared when participants tasted the product for the second time, with ratings of liking dropping back to an average of 5.6 on the scale (no significant difference from the original rating of 5.5 for the first taste test,  $p > 0.05$ ). The nutrition content claim in this study ("lower calorie") was always presented in the context of a health message, which means any effect of a nutrition content claim on expected liking of the soy milk product cannot be separated out from that caused by the health message.

Haddad et al.'s (2007) study, conducted in Lebanon, found a preference among participants for labneh products (concentrated yoghurt) with higher levels of fat, participants preferred the full-fat product compared to labneh labelled as 'reduced fat' or 'fat free'. Participants tasted four labneh products with three different levels of fat and rated their purchase intent of a 9 point scale. The samples of labneh were presented with information on the fat content, price, method of processing and presence or absence of preservatives in the products. As a conjoint valuation method was used, product profiles had been generated to balance which labneh were shown with which information. In other words, it would appear from the study that a high fat labneh product may be presented as a low fat product to participants. The main determinant of purchase intention in the experiment was the sensory properties of the yoghurt itself, with a relative importance of 38.42 per cent, followed by the labelled fat content with 27.04 per cent. Participants preferred labneh labelled as full-fat over labneh labelled either reduced-fat or fat-free. No nutrition information was provided to participants. As this study was conducted in Lebanon, the results may be less relevant for the Australian and New Zealand markets.

In three of the four taste testing studies, participants tasted the products: muffins (Baixauli et al. 2008), baguettes (Ginon et al. 2009), and soy milk (Behrens et al. 2007) before rating them or indicating their willingness to pay. Baixauli et al. and Behrens et al.'s studies used within-subjects designs to compare participants' responses before and after being provided with the nutrition content claim. Because these study designs were not counter-balanced; the baseline tasting could have potentially resulted in an anchoring effect which may have biased the relative ratings. Ginon et al. used a between-subjects design to determine how a fibre content claim would influence participants' responses.

The shortcoming of studies which do not include nutrition information for participants is that they are not able to examine whether nutrition content claims lead people to disregard nutrition information and purchase or consume less healthy versions of products than they otherwise would. Studies where nutrition information is not available tend to find a significant effect from nutrition content claims on purchase intention (with the exception of Andrews et al. 2009) and other measures, such as perceptions of healthiness. Generally, where an effect is found it is positive, however Haddad et al. (2007) found a negative effect from 'reduced fat' and 'fat free' claims on preferences for labneh.

Two studies have examined the effects of nutrition information in combination with nutrition content claims by including a control condition with no nutrition information (Kemp et al. 2007; Labiner-Wolfe et al. 2010), but have had mixed findings. Kemp et al. (2007) found no effect on purchase intention or nutrition perceptions of a frozen dinner product carrying low carbohydrate and low fat content claims, either with or without a nutrition facts panel available. Kemp et al. did find a statistically significant interaction between the claims and the level of motivation of participants to process nutrition information for both risk perceptions for heart disease and stroke, but not for weight gain. Participants with low motivation to read nutrition information perceived a lower likelihood of weight gain from consuming the product labelled 'low carb' than high motivation participants. The study results are reported in such a way that they do not enable the size of the effect for content claims to be identified. In contrast, Labiner-Wolfe et al. (Labiner-Wolfe et al. 2010) found the 'low carb' nutrition content claim had a positive effect on participants' perceptions of how helpful the product would be for weight management and their perceptions of how high or low the product was in calories. On the bread product (but not the frozen dinner product) the 'low carb' claim also increased participants' perceptions of healthfulness. These effects occurred where the nutrition facts panel was absent, but disappeared when it was available. Labiner-Wolfe et al. did not include purchase intentions as an outcome measure in the study.

It is not clear why Kemp et al. and Labiner-Wolfe et al. had different findings, although the most likely explanation is the difference in sample size. Kemp et al. had a relatively small sample size (N=186), with only 19 to 24 participants in each treatment. In contrast, Labiner-Wolfe et al. had 180 participants in each treatment and a total sample size of 4320. With a much larger number of participants in each condition, Labiner-Wolfe et al.'s study would have had a substantially higher chance of finding significant differences between treatments than Kemp et al. for similar effect sizes.

Another explanation could be participants responding differently to stimuli received in the mail (as in Kemp et al.'s study) compared to online stimuli (Labiner-Wolfe et al.'s study). The participants in Kemp et al.'s study would have had substantially more time to examine the packaging than those in Labiner-Wolfe et al.'s study. This may have encouraged them to make a more considered decision using System 2 (high cognitive involvement) processing instead of System 1 information processing. This may have, for example, led them to use more of the available information than the participants in the online experiment. If this were the case, then the online experiment may more closely reflect the decisions that shoppers make in supermarket environments, the latter tending to have a low level of cognitive involvement (System 1 processing) and to be made quickly.

The different products tested in the experiments may also be a factor, as the effect of content claims may not be consistent across food products. Kemp et al.'s study only used one product, a frozen meal. Labiner-Wolfe et al. used a bread product and a frozen dinner product, and found a higher number of significant effects from the 'low carb' content claim on the bread product.

A more nuanced simulation of shopping conditions is found in Maubach's (2010) rating study. Participants in the online experiment were able to view nutrition information for the breakfast cereal products by clicking on the on screen image. This more closely replicates the small but additional effort involved in turning over a product package in-store to read back of pack nutrition information. Maubach's rating study found no effect from the presence of a nutrition content claim on participants' attitudes toward the product and their purchase intentions. The study also examined whether the nutrition content claim or other front of pack nutrition information had any impact on the proportion of participants clicking to view nutrition information and found no statistically significant effect. The findings of Maubach's choice experiment are reported earlier in this review.

Similarly to Maubach, Dixon et al.'s (2011) study made nutrition information available through a click and included a rating component (Dixon's selection task is reported on later in this paper). The study used products marketed to children from five categories: sweetened breakfast cereal, cheese dip snacks, ice cream bars, frozen chicken nuggets and flavoured milk drinks. The participants were parents of children aged 5-12 years who were also main grocery buyers. The nutrition content claims had a statistically significant effect on participants' ratings of the levels of the nutrients referenced in the claims. Mean ratings on a seven point scale increased from 3.77 to 4.69 when a nutrition content claim was added to the energy-dense and nutrient-poor product. This may simply demonstrate that participants were replaying information that they saw on the front of the packaging, as the other findings did not suggest that their overall impressions of the products were affected. Ratings of other attributes, including healthiness and purchase intentions were not affected by the presence of the nutrition content claims.

The findings of the ratings studies which used controls are summarised in Tables 2 and 3, below.

**Table 2: Summary of rating studies including a control with nutrition information**

NB: Only effects significant at the  $p < .05$  level or below are reported as significant

Study	Country	Sample size	Claims tested	Outcome measures	Relevant findings
Howlett et al. (2008)	United States of America	N=153	'Low trans fat'	perceived nutrition level	increase in perceived nutrition, coefficient = .19
				disease risk perception	no effect
Kemp et al. (2007) <sup>7</sup>	United States of America	N=186 19-24 participants in each treatment	Low carbohydrate Low fat	purchase intention	no effect
				perception of carbohydrate level	significant effect
				perception of fat level	no effect
				nutrition perceptions	no effect
				heart disease risk perception	significant interaction with participant motivation
				stroke risk perception	significant interaction with participant motivation
				weight gain perception	no effect
Lin (2008)	United States of America	N=1077	A good source of calcium A good source of potassium A good source of lysoton	purchase intention	effect of nutrition content claim compared to control not reported on by authors

<sup>7</sup> Control with no nutrition information also included. Presence of nutrition information did not influence whether an effect was found.

**Table 2 continued**

<b>Study</b>	<b>Country</b>	<b>Sample size</b>	<b>Claims tested</b>	<b>Outcome measures</b>	<b>Relevant findings</b>
Labiner-Wolfe et al. (2010) <sup>8</sup>	United States of America	N=4320 180 participants in each treatment	'Low Carb'	healthfulness	Without nutrition info: Bread - rating increased from 3.69 to 4.86 on a 7-pt scale Frozen dinner - no effect
				helpfulness in weight management	Without nutrition info: Bread – rating increased from 2.92 to 4.27 on a 7-pt scale Frozen dinner – rating increased from 4.10 to 4.71 on a 7-pt scale
				calorie content	Without nutrition info: Bread – rating decreased from 4.86 to 4.03 on a 7-pt scale Frozen dinner – rating decreased from 4.83 to 4.31 on a 7-pt scale
Maubach (2010) rating study <sup>9</sup>	New Zealand	N=801	A good source of calcium. 25 % RDI per serve.	Purchase intention	No effect
				Attitude toward product	No effect
Dixon (2011) <sup>10</sup>	Australia	N=1551	Source of fibre Source of calcium Reduced fat Trans fat free Good source of vitamin D	Purchase intention	No effect
				Level of target nutrient (nutrient referenced in the claim) in product	Ratings increased from 3.77 to 4.69 on a 7-pt scale
				Healthiness	No effect

<sup>8</sup> Control with no nutrition information also included. Significant effects disappeared when nutrition information was present.

<sup>9</sup> Nutrition information accessed by participants clicking on screen

<sup>10</sup> Nutrition information accessed by participants clicking on screen

**Table 3: Summary of rating studies including a control and no nutrition information**

NB: Only effects significant at the  $p < .05$  level or below are reported as significant

Study	Country	Sample size	Claims tested	Outcome measures	Relevant findings
Andrews et al. (2009)	United States of America	N=480	'half the fat of the leading candy bar' 'half the calories of the leading candy bar'	Purchase intention	No effect
				Whether participants made 'health halo' inferences	Proportion of participants making 'health halo' inferences increased from 9 to 22 %
Behrens et al. (2007)	Brazil	N=56	Lower calorie	expected liking	significantly increased
				actual liking	no effect
Haddad et al. (2007)	Lebanon	N=300	full-fat reduced-fat zero-fat	Purchase intent	The reduced-fat and fat-free labels reduced participants purchase intentions
Ginon et al. (2009)	France	N=123	source of fibre	Willingness to pay	Presence of the fibre claimed resulted in a 12 % increase in willingness to pay
Saba et al. (2010) and Dean et al. (2012). Same study, report in two papers.	Finland, Germany, Italy, United Kingdom	N=2392	Contains wholegrain	Purchase intention	Part-worth utility of 0.06 using conjoint analysis
				Healthiness	Part-worth utility of 0.22 using conjoint analysis
Baixauli et al. (2008)	Spain	N=102	grams of fibre per 100g	Purchase intention	Wholemeal muffin – rating increased from 4 to 5 on a 9-pt scale Fibre-enriched muffin – no effect
				Nutritiousness	Wholemeal muffin – rating increased from 6.0 to 6.5 on a 9-pt scale Fibre-enriched muffin – rating increased from 5.4 to 6.4 on a 9-pt scale
				Healthiness	Wholemeal muffin – rating increased from 6.0 to 6.5 on a 9-pt scale Fibre-enriched muffin – rating increased from 5.4 to 6.1 on a 9-pt scale

### **3.3.2 Studies which did not include a control**

Drewnowski et al. (2010), Geyskens et al. (2007), Harris et al. (2011), Kapsak et al. (2008), Kim et al. (2009), Lynam et al. (2011), Paek et al. (2011), van Trijp and van der Lans (2007), and Verbeke et al. (2009) also conducted rating studies but did not include control stimuli with no nutrition content claims in their designs. This means any effects reported in the studies are measured relative to other nutrition content claims (van Trijp and van der Lans 2007; Drewnowski et al. 2010; Harris et al. 2011; Paek et al. 2011), to health claims (van Trijp and van der Lans 2007; Kapsak et al. 2008; Verbeke et al. 2009; Harris et al. 2011; Lynam et al. 2011) or to taste claims (Kim et al. 2009). In addition to not including a control, participants in these studies did not have access to any nutrition information (such as an NIP or a nutrition facts panel) to inform their rating of products or claims.

These studies are not able to examine the effect of a nutrition content claim, because they are not compared to a product with no claim, so they are not discussed further in this review.

However one of these studies (Kim et al. 2009), used claims about the taste of foods which, although not a control, compare nutrition content claims to a totally different form of information on the package which is neither health nor nutrition oriented. This is still of some use as the use of these claims by food manufacturers is generally accepted by the public and not the subject of controversy. Also, as noted later in this review, it is possible that consumers developing favourable attitudes towards products which carry nutrition content claims may be reacting to the presence of additional information rather than the nutrition content claim specifically.

The Kim et al. (2009) study used print advertisements already in existence, and so was a quasi-experiment rather than a true one in which the independent variables were manipulated by the experimenter. The study was conducted in the United States. Participants were each shown five print advertisements for food products, four of which were dummy advertisements of no interest to the researcher. The remaining advertisement (presented to participants as the third of the five advertisements), included either a 'functional food' (defined by the author as a food that is generally consumed for non-hedonic reasons, such as health) or a 'hedonic food' (eaten primarily for its sensory characteristics, rather than health or other reasons). The food was paired with either a 'functional claim' (a claim promoting the nutritional qualities of the food product) or a 'hedonic claim' (promoting the sensory characteristics), to test whether participants would have more positive attitudes towards foods with a more traditional claim pairing (i.e. a functional food with a functional claim) or a more novel claim pairing (i.e. a functional food with a hedonic claim). All but one of the ten functional claims included in the advertisements was a nutrition content claim, although another advertisement also included a health claim. Participants had significantly more favourable attitudes towards products in the advertisements when they were paired with more novel claims than when they were paired with traditional ones. For hedonic products, functional (i.e. nutrition) claims led to an average product attitude of 5.23 on a 9 point scale (with 9 being most favourable), compared to 4.79 for a hedonic claim ( $p < 0.05$ ). Similarly, the purchase intention was also significantly higher at 4.78 for the functional claim on a 9 point scale, compared to 4.17 for the functional claim ( $p < 0.01$ ). The more novel pairing worked similarly for the functional product with both product attitude ( $p < 0.05$ ) and purchase intention ( $p < 0.05$ ) more favourable for the taste claim. Product attitude was 5.13 for the taste claim, compared to 4.67 for the functional claim. Purchase intention was 4.6 for the taste claim and 4.09 for the functional claim. The researchers noted that this finding was in contrast to the practices of food marketers in print advertisements, as a content analysis conducted as part of the same project had revealed that in the majority of print advertisements in the United States functional foods were paired with functional claims, and hedonic claims with hedonic products.

The researchers suggested that unexpected pairings of products and claims may be more interesting to consumers and lead to more favourable attitudes in line with schema congruity theory (Kim et al. 2009). The hedonic foods included in this study: wine, chocolate, pizza snacks, jelly, potato chips, crackers, fruity snacks and salted peanuts are generally less healthy foods and are consumed for their hedonic properties rather than their health properties. If, as the results of this study suggest, the presence of nutrition content claims on these foods would improve consumers' attitudes towards the products and their purchase intention it is not clear what behaviour this would translate to in the real world. If this resulted in shoppers purchasing Chocolate Product A instead of their usual Chocolate Product B then this would not be of concern as the overall nutritional value of their shop would be approximately the same. However, if these more favourable attitudes led to an increase in purchases of hedonic/less healthy products this would be problematic, as it may decrease the overall nutritional value of consumers' diets. As the study used print advertisements, rather than food packages, no nutrition information was available to study participants to verify the overall nutritiousness of the food products. The qualitative research reported earlier suggested that consumers may be more sceptical of hedonic foods paired with nutrition content claims, which may make them more likely to consult nutrition information compared to a more congruent pairing of a functional food with a nutrition content claim.

Another weakness in the study is the use of real life print advertisements instead of advertisements in which the researchers manipulated the claim present. Manufacturers would not have randomly assigned taste claims and nutrition content claims to their food advertisements. Rather, they would have been chosen based on market research or on a feature of the product. Three of the five nutrition content claims on the hedonic products indicated that the product had been reformulated to contain lower amounts of a negative nutrient, such as sodium or fat. The remaining two appeared to be products portioned into 100 calorie packets for consumers interested in controlling their calorie intake. This would suggest that these products would be somewhat healthier than many of the other products in the same food category. For a shopper wishing to buy a hedonic food, these products may be a healthier choice than the conventional full fat/sodium/trans fat/saturated fat version of the product.

Previous FSANZ research has used rating experiments to test the effects of nutrition content claims on participants' nutrition and health perceptions as well as their purchase intentions for products and hasn't found any positive effects from nutrition content claims on these outcome variables. The ratings experiments in this review which use a control and which made nutrition information available to participants tended to have similar findings (with the exception of Howlett et al., 2008). Two experiments (Kemp et al., 2007; Dixon et al. 2011) did find that participants' perceptions of the level of a nutrient in a food were sometimes influenced when a claim about the nutrient was on the product.

Experiments in which nutrition is not available do tend to find that nutrition content claims influence participants' purchase intention, willingness to pay, and nutrition perceptions. These experiments are less realistic, as participants are not able to access relevant information which would usually be available in store.

### **3.4 Self-reports of nutrition content claim use**

Eight studies were found in the literature search in which participants were surveyed about their use of nutrition content claims (Food Safety Authority of Ireland 2009; Grimes et al. 2009; Choinière and Lando 2010; Ellis and Glanville 2010; Stranieri et al. 2010; Webster et al. 2010; Barreiro-Hurlé et al. 2010b; International Food Information Council 2011).

### **3.4.1 General influence of nutrition content claims**

In a survey by Barreiro-Hurlé et al. (2010b) 21 per cent of respondents reported often 'using nutrition or health claim labels while shopping', and 9 per cent reported always using them. Unfortunately participants were asked about their use of both nutrition and health claims in the same question, so it's not possible to tease out usage that relates only to nutrition content claims.

The latest version of the United States Food and Drug Administration's tracking survey, the Health and Diet Survey (Choinière and Lando 2010), found a high level of self-reported use of nutrition content claims. Participants were provided with examples of 'statements on the front of the package that described the amount of nutrients in the product' and asked how often they used these statements, when they were available, to make food purchasing decisions. Thirty-eight per cent reported using them often to make purchasing decisions, and a further 34 per cent reported using them sometimes.

Participants in a survey of food label use in Ireland reported that nutrition content claims would make them more inclined to purchase food products (Food Safety Authority of Ireland 2009). Sixty-six to 76 per cent of respondents reported that they would be 'inclined to buy a food product' with the claims 'low salt', 'low sugars', 'high fibre' and 'fat free'.

### **3.4.2 Use of specific nutrition content claims**

Participants in surveys described in this section were asked about their use of specific nutrition content claims, such as 'low in sodium'. Three studies in particular, by Ellis and Glanville (2010) (2010), Grimes et al. (2009) and Webster et al. (2010) were surveys focused on single nutrients. Participants in these surveys would have been somewhat primed to be concerned about the nutrient in question due to the focus in the questionnaires on their knowledge of the nutrients and their links to diseases. It is likely that this would lead participants to over-report their use of these claims to researchers.

When asked directly what strategies they were using to reduce their trans fat intake, Ellis and Glanville (2010) found 51 per cent of participants reported purchasing foods labelled as '0 trans fats'.

Grimes et al. (2009), Webster et al. (2010) and the International Food Information Council (IFIC) (2011) have conducted research in which participants are asked to report on their use of sodium or salt content claims. Grimes et al. (2009), in a survey of shoppers in Melbourne, Australia, found 70 per cent of those sampled reported previously purchasing a food product labelled as reduced salt. Furthermore, 60 per cent of respondents indicated that, where price remained constant, they would be more likely to purchase a product labelled as reduced salt (Grimes et al. 2009). Webster et al. (2010), in an online study, found 30 to 33 per cent of respondents claimed to purchase low salt foods, or to choose food from food groups they considered to be lower in salt. The research conducted by IFIC examined Americans' awareness and attitudes towards salt and sodium in 2009 and 2011 and their self-reported use of nutrition content claims. Thirteen to 14 per cent of respondents reported using 'low sodium' nutrition content claims.

IFIC also included self-reported use of other nutrition content claims in their survey. The proportion of respondents in the online research who reported using nutrition content claims to select food products ranged from 11-12 per cent for 'low cholesterol' to 19-20 per cent for 'low calories'. Other claims included as response categories were 'low fat' (19 per cent), and 'low sugar' (14-15 per cent). Only 18 to 20 per cent of respondents reported using 'none of the above' nutrition content claims in their purchasing decisions. The proportion of participants self-reporting using nutrition content claims did not change between 2009 and 2011.

Stranieri et al. (2010) asked participants how important a range of nutrition content claims were in their purchasing decisions. These included low energy, low fat/fat free, lower sugar, low sodium, and high fibre and vitamin claims. Participants' ratings on a 5 point scale, from 1 'strongly disagree' to 5 'strongly agree' ranged from a mean of 2.22 (low energy) to 3.85 (high fibre and high vitamins claims). Sixty-six per cent of interviewees indicated that high fibre/vitamin claims were important in their purchasing decisions, compared to 58 per cent for low fat, 50 per cent for low sugar, 44 per cent for low energy and 47 per cent for low sodium or salt.

A summary of the self-report studies is provided in Table 4.

Participants tend to rate the importance of particular nutrition content claims on their purchasing decisions highly and say that they use them frequently. However, these studies are not very useful for determining whether nutrition content claims have an impact on behaviour as the behaviour is self-reported. Participants are likely to be inaccurate when reporting on their own use of nutrition content claims for a number of reasons. These include demand effects which may lead to participants reporting that they engage in a behaviour of interest to the researcher (Shimp et al. 1991), social desirability bias (which may lead them to over-report due to believing the behaviour is perceived favourably by society), and poor memory of how often the behaviour occurs. Grunert et al. (2010) found that grocery shoppers tend to over-report their use of nutrition information. Observations of their behaviour in supermarket aisles while interacting with product packaging found that a significant proportion of those later reporting having used nutrition information had not actually done so. Participants in surveys may similarly over estimate their actual use of nutrition content claims when shopping.

The questions on nutrition content claim used in these surveys also tend to lack the context in which the decision is being made. For example, is it the researchers' intention that participants think about buying a new product with the claim? Should they assume that in this hypothetical choice the products they are considering are similar on all other attributes? Would the presence of a nutrition content claim affect choices across food categories (i.e., could a nutrition content claim lead to a consumer purchasing a chocolate bar instead of an apple)? In a real life shopping situation consumers will be comparing products on a range of salient attributes rather than just the presence of a nutrition content claim.

**Table 4: Summary of self-report studies**

<b>Author</b>	<b>Country</b>	<b>Survey administration</b>	<b>Sample</b>	<b>Findings</b>
Food Safety Authority of Ireland (2009)	Ireland	face to face	1,021 consumers aged 16+ across Ireland	Participants reported that a range of nutrition content claims would make them more inclined to purchase products.
Grimes et al. (2009)	Australia	face to face	493 participants recruited from shopping centres in metropolitan Melbourne aged 18+	60 per cent said they would be more likely to purchase a product labelled as reduced salt.
Choinière and Lando (2010)	United States of America	telephone	2,584 adults aged 18+. Obtained by random digit dialling from households in a nationally representative sample of telephone number.	High level of self-reported use of claims.
Ellis and Glanville (2010)	Canada	face to face	244 participants aged 19+, obtained by approaching shoppers at grocery stores in Halifax.	51 per cent of respondents reported purchasing foods labelled as '0 trans fats'
Stranieri et al. (2010)	Italy	telephone	1,025 participants aged 18+, resident in Lombardy, stratified by gender, age, town, and province.	Participants rated the importance of a range of nutrition content claims from 2.22 to 3.85 on a 5 point scale.
Webster et al. (2010)	Australia	online	1,084 participants aged 14+. Sampled from an online panel.	30-33 per cent of respondents claimed to purchase 'low salt' or 'no added salt' foods.
Barreiro-Hurlé et al. (2010b)	Spain	face to face	800 main grocery buyers sampled from two Spanish cities. Sample stratified by district and age.	21 per cent reported often using nutrition or health claims.
International Food Information Council (2011)	United States of America	online	1,003 participants aged 18+	Self-reported use of specific claims ranged from 11-20 per cent. Only 18-20 per cent reported using none of them. Use didn't change between 2009 and 2011.

### 3.5 Qualitative studies

Four qualitative studies were found in the literature search, conducted in New Zealand (Maubach et al. 2009a), Australia (McMahon et al. 2010), Germany (Koenigstorfer and Groeppel-Klein 2010) and Sweden (Svederberg and Wendin 2011). These examined participants general food purchasing and consumption behaviours and motivations (Maubach et al. 2009a; Koenigstorfer and Groeppel-Klein 2010) participants' responses to packaging stimuli (Svederberg and Wendin 2011) and print advertisements (McMahon et al. 2010) which included nutrition content claims.

Maubach et al. (2009a) conducted 15 individual face to face interviews with parents who had at least one child aged 5-12 years of age living with them. Participants noted the importance of healthy eating, although this came after other factors such as time constraints and price in influencing purchasing and consumption behaviours. When judging the nutritiousness of a particular food, participants reported basing their evaluation on a wide range of product attributes including the food category (for example, biscuits would generally be considered unhealthy), how 'processed' the food was, the presence of food additives, nutrition content claims and nutrition information from the nutrition information panel. Some participants believed that better quality and more nutritious foods were generally more expensive. Participants felt confident in using values from the nutrition information panel to compare two or more food products on a particular nutrient. However they reported being unsure what absolute levels of nutrients would be appropriate. For example, deciding whether 10 grams of fat per 100 grams of crackers would be a high or low level of fat. According to Maubach et al., some participants reported using nutrition content claims to support their decisions (although it is unlikely participants would have used this exact terminology). Those who reported using these claims seemed particularly interested in claims about the vitamin or mineral content of foods, particularly if they felt their child did not eat enough fruit and vegetables. Other participants were sceptical about 'health-related' claims and perceived these as marketing. Maubach's sample size was relatively small, however she did note that sampling finished when the interviews stopped revealing new insights which is common practice in qualitative research (Daly et al. 2007).

McMahon et al. (2010) conducted focus groups with 25 adult Australian women to examine their responses to scientific and lay person terms used in food advertisements. The stimuli categorised as scientific terms by the researchers were the following nutrition content claims: 'rich in antioxidants', 'low glycaemic index', 'less kilojoules', and 'low in saturated fat'. The authors found that participants perceived scientific terms as credible when used in conjunction with foods seen as healthy, but were sceptical when they appeared on foods of lower nutritional quality (such as jam). However, when discussing the persuasiveness of the advertisements, participants tended to focus on visual clues, branding and how often they had seen terms used before. Lay person terms such as 'light' were seen as vague and due to their ubiquity they were seen as meaningless. Some of the scientific terms, in contrast, were more likely to be seen as novel and some participants believed that their purchase intentions could potentially be influenced by these claims, despite not having a good understanding of what the terms mean. Participants noted that they tended to find advertisements for well-known brands more persuasive, and they were put off by dense text in advertisements.

Photo elicitation was used by Koenigstorfer and Groeppel-Klein's (2010) in their interviews with main grocery buyers in 10 households in Germany. The researchers took photos during participants' weekly shops and at family meal times. Participants were a mixture of parents and couples without children. The photos were then used in interviews to encourage participants to discuss first their general purchasing and consumption behaviours, and then more specific behaviours (such as food label use). The researchers focused on front of pack nutrition information (including nutrition content claims) and how it was used by participants, taking photos of the front of food packages selected by participants in their shop but not the back of the packages. Participants anticipated foods carrying claims such as 'low fat' or 'light' would have a flavour trade-off, being more nutritious but less tasty than the standard versions of the same products. However some respondents were prepared to trial these products to assess whether the trade-off between flavour and healthiness would be worthwhile. Participants felt that they were much more likely to use nutrition information at the point of sale, but less likely when consuming the product at home. One exception was a participant who believed that a fat claim on a cheese product may make her more likely to take an extra slice. Koenigstorfer and Groeppel-Klein (2010) noted that participants in this German study appeared to be less sceptical of nutrition information on food packaging than United Kingdom participants in the United Kingdom Food Standard Agency's qualitative research (2009).

Svederberg and Wendin (2011) conducted interviews with 30 Swedish consumers who were shown two food packages, a margarine and a bread, with nutrition content and health claims. Both food packages carried nutrition and health claims relating to Omega 3 fatty acids. Because of the way the article is written it is difficult to determine which aspects of participants' reactions to the products were due to which claim (nutrition or health), as this was not the intention of the study. Svederberg and Wendin found that participants expressed positive attitudes towards the claims, with the exception of those participants who did not find them credible. The study did not examine purchase intention or perceptions of products without nutrition content claims.

The four qualitative studies have findings which are difficult to extrapolate for the purposes of this literature review. The two studies only included nutrition content claims that were less ubiquitous. For example, they did not include fat or fibre claims (such as 'reduced fat', 'high in fibre') which previous FSANZ research has found make up a high proportion of nutrition content claims on the market (2007b). Therefore participants in the studies would have been reacting to nutrition content claims with which they're less familiar. As noted in the Svederberg and Wendin (2011) study, participants may be more sceptical of less familiar claims, although McMahon et al.'s (2010) work suggests they may be attracted by their novelty.

Cross-country consumer research has found that consumers in different countries differ in their responses to food claims (van Trijp and van der Lans 2007; Williams et al. 2008; Saba et al. 2010). For example, research conducted by Williams et al. (2008) found that Australian research participants were more influenced by the product in a product and health claim combination than Dutch consumers were. Even with this review, one author (Koenigstorfer and Groeppel-Klein 2010) suggest that German consumers appeared to differ from British consumers in their reactions to label claims. Because of these differences, caution should be used in interpreting the results of the qualitative studies Sweden and Germany.

Participants in some of the qualitative studies make judgements about what they believe are the causes of their behaviour (e.g. using nutrition content claims to identify healthy foods). However, it is important to recognise that consumers' ideas of the reasons for their food purchases are often inaccurate, particularly as they tend to underestimate the importance of less salient features of the situation in which they make their decisions (Visschers and Brunner 2011). Therefore, the findings from the experiments discussed earlier in this review are more reliable in demonstrating whether a causal relationship exists between consumers' behaviours and perceptions and the presence of nutrition content claims.

The findings of the qualitative studies are, however, still useful for examining why particular relationships are or are not found in the other studies. The qualitative research findings are summarised in Table 5.

**Table 5: Summary of qualitative studies**

<b>Author</b>	<b>Country</b>	<b>Sample</b>	<b>Method</b>	<b>Findings</b>
Maubach 2009	New Zealand	15 parents of young children	Individual in-depth interviews	Many different factors considered when assessing the healthiness of a food product (not just nutrition information) Nutrition information panel useful for comparing products side-by-side but not enough knowledge to evaluate a food on its own. Some parents attracted by vitamin and mineral claims for foods for their children, others were sceptical.
Koenigstorfer & Groeppel-Klein 2010	Germany	Ten German middle-class families. Eight families with children (aged 3 to 26), two without children. Main grocery buyers (all women) were the main research participants.	Photos were taken during a family meal at home and on a main, weekly shopping trip. A selection of these was used in the photoelicitation interviews.	Participants felt that many foods with nutrition content claims, such as 'low fat' or 'light' had a flavour trade-off. But some participants were prepared to trial these. Generally, participants felt nutrition labelling (including claims) were more likely to influence them at the point of sale. However, one participant mentioned that a fat claim on cheese may encourage her to eat more cheese.
McMahon et al. 2010	Australia	25 women aged 25-63 drawn from non-professional staff at the University of Wollongong, and community members who had previously expressed interest in participating in food and nutrition studies.	Four focus groups (4-8 participants in each), using print advertisements featuring nutrition content claims and more general food claims (e.g. 'healthy') as stimuli.	Participants perceived the nutrition content claims as credible when used in conjunction with foods perceived as healthy, but were sceptical when they were featured on less healthy products. Vague, ubiquitous claims (such as 'light') were seen as unconvincing. Novel claims were seen as interesting.
Svederberg and Wendin 2011	Sweden	30 consumers aged 25 to 64, selected from participants in a survey on use of food package labels. 16 men, 14 women.	Individual semi-structured interviews, using two food packages as stimuli. Interview data analysed using contextual analysis.	Participants expressed positive attitudes towards the claims, although some did not find them credible.

### 3.6 Literature reviews

Three literature reviews published since 2007 were found (Leathwood et al. 2007; Ni Mhurchu and Gorton 2007; Campos et al. 2011). Unfortunately none of them included new research that had not already been reviewed by FSANZ in Attachment 10 to the Final Assessment Report for Proposal P293.

Campos et al. (2011) did not examine nutrition content claims in the body of her review. References from Campos et al. were examined for articles on nutrition content claims, but none were found that were published since 2007.

The review by Ni Mhurchu and Gorton (2007) included a section on claims, however the articles and reports cited were published before 2007 and have already been reviewed by FSANZ in Attachment 10 to the Final Assessment Report for Proposal P293.

Leathwood et al.'s review (2007) was useful for laying out the main avenues by which nutrition content claims could have effects on consumers' purchases and consumption of food.

The review outlines Roe et al.'s (1999) four effects which nutrition content claims could potentially have on consumers and which could alter their behaviour in negative ways:

- A 'positivity bias'<sup>11</sup> whereby the mere presence of the claim leads to a positive inference. This effect, if present, would not be limited to nutrition content claims, but could be caused by the presence of almost any label claim.
- Creating a 'halo effect' whereby consumers extrapolate the benefits suggested in the claim (such as a low level of fat) to other attributes not mentioned in the claim. An example would be a 'low fat' claim leading consumers to believe a food would also be low in kilojoules.
- Creating a 'magic bullet effect'. This would involve consumers inferring inappropriate health benefits from the presence of a claim. For example, a low fat claim leading consumers to believe consuming the food will reduce the risk of heart disease.
- Creating an 'interactive effect' where the claim interferes with consumers' processing of nutrition information on the packaging. This may lead to consumers processing the nutrition information in a less critical way.

In addition to Roe et al.'s four processes, Leathwood et al. describe how consumers' could use nutrition content claims as heuristics in their food choices, potentially leading to less healthy food choices. For example, consumers may decide that where a nutrition content claim is present on only one of two products, the claim can be used as the deciding characteristic. Alternatively, consumers searching for nutrition information may use the presence of a nutrition content claim as a signal to stop their search for nutrition information on the product, and thus evaluate only the nutrition information represented in the claim.

### 3.7 Miscellaneous studies

This section includes articles with methodologies that do not fit within any of the other categories. Two articles were found that fitted this description.

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<sup>11</sup> NB: 'Positivity bias' is used to describe a range of concepts in social research. This definition of the term appears to have been created specifically for nutrition content claims.

Gorton et al. (2010) tested shoppers' understanding of two common nutrition content claims, '97 % fat free' and 'no added sugar'. Participants were recruited using shopping mall intercepts in Auckland, New Zealand. Researchers asked participants how many grams of fat were in 100 grams of a product labelled '97 % fat free'. Seventy-two per cent of participants were able to correctly answer that the food would contain 3 grams of fat. When asked "does the claim mean it is definitely a healthy food?" 46 per cent of participants believed it would. Results were similar for the 'no added sugar' claim. Seventy-two per cent of participants were able to correctly answer that a food labelled 'no added sugar' could still have some sugar in it, and 36 per cent believed it would mean it was definitely a healthy food. These results suggest that, although most participants understand the intended meaning of the nutrition content claims, many of them still infer that they are used on healthier foods. One limitation of this study was the unrealistic packaging used to demonstrate the nutrition content claims to research participants. The example packaging used was highly simplified (missing many of the elements that would be present on normal breakfast cereal packaging) and carried three nutrition content claims rather than just the one which the participant was being asked about. This makes it possible that research participants were not making their inference about the overall healthiness of the product solely on the nutrition content claim they were specifically being asked about. Gorton et al.'s study was designed to include a diverse range of Aucklanders; the sample was split almost equally between Maori, Pacific, Asian and New Zealand European shoppers, one third of who reported having a household income of NZ\$40,000 or less.

A study by Visschers et al. (2010) used eye tracking equipment to gather data on the labelling elements consumers looked in high and low motivation conditions. They included 'nutrition claims' as a category of labelling elements, although it's not clear how well this term would correspond with the definition of nutrition content claims in Australia/New Zealand. The research found that the nutrition claims category had relatively low means for median gaze duration and median gaze count compared to elements such as nutrition information panels, design and product name. However, compared to label elements such as the nutrition information panel, nutrition content claims are generally short and easy to understand and so they may not need a great deal of attention from shoppers in order to influence them in their purchases. The researchers noted that the overall design of the packaging tended to influence participants' gaze – packages with cluttered designs were less likely to attract attention to the nutrition information displayed than packages with simple designs. Products that displayed mostly nutrition information were more likely to attract consumers' attention to this than products cluttered with other information.

## **4 Discussion**

Overall, the findings of the literature review suggest that the design of experiments on nutrition content claims has a strong role in influencing whether participants' nutrition perceptions, health perceptions, and stated intentions to purchase food products are influenced.

The research examining the relationship between nutrition content claims and sales of food products suggests they may have an effect on sales, both positive and negative. However, due to the study design it is not possible to determine what the effect size of nutrition content claims would be on real life sales of food products.

This discussion will examine the evidence for each of the main questions, the shortcomings of the available evidence and, if nutrition content claims were to influence consumers, how this might work.

#### **4.1 Are consumers' nutrition perceptions of products influenced by nutrition content claims?**

Whether nutrition content claims influence consumers' nutrition perceptions was examined in the rating experiments, and was touched on in the qualitative studies as well as a survey conducted in New Zealand. The findings of these studies suggest that, in the absence of nutrition information, nutrition content claims may influence consumers' nutrition perceptions. However, this effect tended to disappear when nutrition information was made available.

The qualitative research suggested that participants felt ambivalent about nutrition content claims. The overall nutritiousness of food products was not judged solely on a nutrition content claim, or the information in the Nutrition Information Panel. Participants also believed that the ingredients, the presence or absence of food additives, and the food category were considered when deciding on the nutritional value of a food. Some participants, particularly in Australia, claimed to be sceptical about nutrition content claims when they were featured on products perceived as less healthy.

A survey conducted in New Zealand (Gorton et al. 2010) found that most participants understood the meaning of '97 % fat free' and 'no added sugar' claims, but that around 40 per cent still believed that only healthy products would carry these claims.

The findings from the ratings studies varied depending on the particular design. Those which included a control and made nutrition information available generally found that the presence of a nutrition content claim did not alter participants' perceptions of the overall nutritional value of the food product. This was also the case for the two experiments in which participants were able to access nutrition information by clicking on the products. However, two experiments did find that participants' perceptions of the level of the nutrient in the claim were affected by its presence. For example, participants who saw a 'low carbohydrate' claim perceived that the product had lower levels of carbohydrate than participants who saw the same product, with the same nutrition information and no claim (Kemp et al. 2007). In the absence of nutrition information a number of the ratings studies found that nutrition content claims did increase participants' nutrition perceptions. However, the absence of nutrition information makes these experiments less realistic.

The effect of nutrition content claims on the perceived level of the nutrient referred to in the claim is unlikely to cause real world problems. This is because requirements in the Food Standards Code and the guidelines in the Code of Practice on Nutrient Claims in Food Labels and in Advertisements regarding the level of particular nutrients (minimums or maximums) that must be present in a food to carry a nutrition content claim mean that they are unlikely to mislead consumers about the specific nutrient. For example, foods carrying vitamin and mineral nutrition content claims are required to contain a minimum level of the recommended daily intake (RDI) for the nutrient. The effect may be due to research participants replaying the information from the nutrition content claim, and it did not influence their overall perceptions of the nutritional value of the products.

Additionally, the nutrition content claim may be useful for shoppers looking for a product with a high or low level of that nutrient, for example, a 'no added salt' peanut butter. Where this is the case, nutrition content claims may assist shoppers in identifying products that meet their criterion, as they have already made a decision to purchase a product meeting that criterion within that product category.

#### **4.2 Are consumers' health perceptions of products influenced by nutrition content**

## claims?

Researchers have previously raised concerns that nutrition content claims may lead to consumers inferring inappropriate health benefits from food products. Roe et al. (1999) referred to this as nutrition content claims potentially having a 'magic bullet effect'. The effect of nutrition content claims on consumers' health perceptions was examined in some of the rating experiments. Similarly to the findings on nutrition perceptions, the rating studies only tended to find effects from nutrition content claims where nutrition information was not available. The lack of an effect on health perceptions supports the findings of FSANZ's previous nutrition content claims research (2008b) which found the presence of a claim on packaging did not lead participants to believe the products had inappropriate health benefits, such as a reduced risk of heart disease, when eaten regularly.

### **4.3 Do nutrition content claims influence consumers' purchase intentions or choices?**

Although research participants' reported purchase intentions or choices in experiments are not direct measures of what they would choose in a real life situation, many studies examined these proxy measures due to the difficulty of studying the effects of nutrition content claims on actual consumer behaviour. Whether nutrition content claims influence consumers' self-reported purchase intentions or choices was touched on in the choice experiments, rating experiments, self-report surveys and the qualitative studies. Again, methodology strongly influenced the outcomes of studies with rating studies generally finding no effect from nutrition content claims on purchase intentions (where nutrition information was available) and choice studies finding effects of varying sizes, including one nutrition content claim having no effect on participants' preferences. When asked about the effect of nutrition content claims on their purchases, some participants in qualitative studies and self-report surveys reported using nutrition content claims and being influenced by them. However, consumers are generally poor at contemplating their reasons and motivations for selecting low involvement products (Olshavsky and Granbois 1979).

The qualitative studies found that many factors were considered by participants when deciding on food purchases, particularly price, taste and perceived healthiness. Responses regarding the effect of claims on purchases were ambivalent, with some participants indicating that they looked out for the claims, while others were more sceptical. As noted earlier in this report, research participants tend to over-report their use of labelling information, such as nutrition information, on food products so this is less reliable than the other research methods.

Participants in the self-report surveys tended to report using both general and specific nutrition content claims frequently. However, these findings are likely to be somewhat biased due to research participants' social desirability bias and their tendencies to report behaviours of interest to researchers. Previous mixed mode research has revealed that research participants tend to over report how often they use back of pack and front of pack nutrition information when compared with their observed use in stores (Higginson et al. 2002b; Food Standards Agency 2009; Grunert et al. 2010).

The ratings experiments which included nutrition information and a control tended to find no effect from nutrition content claims on participants' purchase intentions. Even many of those which did not include nutrition information found no effect. This is in keeping with FSANZ's previous research on nutrition content claims which has used a similar methodology.

In contrast, the choice experiments in this review did, in most instances, find that nutrition content claims influenced participants' choices when they were asked to choose out of a set of products. The effect was not consistent among all product and claim combinations, with one product and claim combination finding no effect (yoghurt and a '0 % fat' claim). Nutrition content claims generally were not the most important factor in influencing participants' decisions as attributes such as price and brand tended to be more important. The two studies by Maubach (2010) and Dixon et al. (2011) did not include price as an attribute. Many of the choice experiments had issues related to the design, such as not including brand as an attribute and not making nutrition information available to participants.

Maubach and Dixon et al.'s studies were able to examine whether the presence of a nutrition content claim on a less healthy product would increase the proportion of participants selecting that product over a healthier version. While both studies found that products with healthier nutritional profiles were more likely to be selected than less healthy products (even in the presence of a nutrition content claim), the proportion of participants selecting the less healthy product did increase in the presence of a nutrition content claim. For example, Maubach's study found that the change in utility from a product with a healthier profile in the absence of front of pack nutrition information was 0.56. But, this increase in utility disappeared when a nutrition content claim was present on the product, thereby nullifying the positive effect from the healthier nutrition profile (Maubach 2010).

Two of the choice experiments, by Maubach (2010) and Dixon et al. (2011), also included rating components, which were included in the section on rating experiments in this review. Interestingly, although they both found significant effects from the presence of nutrition content claims on the choice tasks, neither of them found any impacts from nutrition content claims on participants' purchase intentions or their overall nutrition perceptions. This supports the conclusion that the experiment design has a significant impact on whether or not an effect is found.

The rating and choice experiments give participants very different tasks to perform. In the rating tasks, participants are presented with one product at a time and asked to evaluate the product on a range of attributes, such as how nutritious the product is and their intention to purchase the product. In contrast, choice experiments present participants with two products at a time which they are asked to compare and then indicate a preference for one of them. Participants in the choice experiments generally go through numerous choice sets for the same products (same brands and category of food) with a few changes in the attributes of the products in each choice set. Participants in rating studies are generally either presented with just one product to evaluate, or they evaluate a handful of products from different food categories. These differences in the tasks given to participants are the most likely explanation for the difference in results. Some previous research has suggested that consumers' real life purchases are more accurately predicted by eliciting their preferences through comparisons (such as choice experiments) rather than individual evaluations (rating experiments) (Morwitz et al. 2007).

Of the studies described in this section, none of the above examined consumers' actual purchases or consumption of food products. Instead, they reported on participants' self-reports of their behaviour, and on their choices in choice experiments. These may or may not follow through to actual behaviours in food shopping or consumption situations.

#### **4.4 Do nutrition content claims influence consumers' food purchases or consumption?**

The studies examining sales data found that nutrition content claims were associated with product sales. One of the two sales studies used an experiment to test whether there was a causal relationship between the presence of nutrition content claims and microwave popcorn sales. This was the only study in the review which was able to demonstrate that nutrition content claims may influence consumers' real life food purchases within a particular food category. There were a number of differences between the study and real life, however. In particular, the nutrition content claims were displayed as shelf tags on all eligible products, which is very different to the ad hoc way in which food manufacturers choose to display nutrition content claims on their products. This may have given the nutrition content claims more credibility with shoppers, as their presence on all eligible products would suggest that they were placed there either by the retailer or due to a government intervention rather than by manufacturers. Previous research has suggested that consumers are sceptical of manufacturer claims, which many consumers perceive as marketing, rather than useful information (Garretson and Burton 2000). Due to these differences, it is likely that the real life effect sizes from nutrition content claims would be smaller.

#### **4.5 Shortcomings of the literature**

While a number of studies have been conducted since the previous FSANZ review of literature in 2007, and these have used a range of methodologies, there are some shortcomings in the literature that limit the generalisability of findings to real life. Nutrition content claims studies have tended to examine whether nutrition content claims lead consumers to make less healthy purchases within a particular food category, for example breakfast cereals. None of the studies examined in this literature review tested whether nutrition content claims would lead shoppers to buy foods from product categories that they otherwise wouldn't. For example, no studies examined whether a shopper who doesn't generally buy confectionery would be encouraged to do so by a '97 % fat free' claim.

Only two studies examined consumers' actual behaviours in stores, using sales data. The others dealt with participants' self-reports of their behaviour, their attitudes towards and perceptions of products, and what they stated their preferences were. Of the two sales data studies, one was able to demonstrate a causal relationship between nutrition content claims and consumers' actual behaviours (their revealed preferences) in stores. This study, which was designed to test a shelf tag nutrition program, presented the information differently to how it would appear to consumers in real life. It also only tested the effects on one product, microwave popcorn. For these reasons it is difficult to determine the nature and size of effects, if any, nutrition content claims would have on product sales in general.

With a few exceptions, most of the nutrition content claim research examines consumer ratings or choices for two products or fewer. Generally, shoppers would have more than two products to choose between when making purchases in a supermarket. Research on trivial attributes has previously suggested that attributes which research participants openly acknowledge to be of little importance, can still be important where there are more than two products to choose between and other attributes do not suggest a clear favourite. Also, as noted earlier in this review, consumers in real life shopping situations would create their own evoked sets which may differ compared to those of researchers. It is likely that these personal choice sets would be based on the position of products on the shelf<sup>12</sup>, taste, and brand awareness<sup>13</sup>, none of which were included in the choice experiments. Where study participants are forced to make decisions based on trivial (to them) attributes, the findings are unlikely to accurately translate into the real world.

Where nutrition information has been made available to study participants, this has either been kept constant between products, or has been manipulated to clearly differentiate the products, creating one product which is clearly healthier than the other (for participants who choose to look at the nutrition information). Previous consumer research, particularly the research on trivial attributes (Carpenter et al. 1994), would suggest that a nutrition content claim is most likely to significantly influence consumers' purchase decisions or nutrition perceptions where the available information (including nutrition information) is ambiguous. In a real life shopping environment this would not be important where a nutrition content claim makes consumers slightly more likely to purchase one healthy product than another equivalent product. However, where a nutrition content claim has an influence and there is a small difference in nutrition, this effect may be nutritionally significant across a population even if it is not significant at the individual level.

Additionally, the products which participants choose between tend to be very similar in the studies included in this literature review, for example two extruded breakfast cereals marketed towards children. In real life, shoppers may be choosing between less similar products, such as wheat biscuits and corn flakes. A study that only examined wheat biscuits, for example, would not be able to determine the factors associated with choosing corn flakes instead of wheat biscuits, and vice versa.

Consumers tend to form habits in their grocery purchases, buying the same products repeatedly (Grunert 2005). Most of these decisions are made using System 1 processing, relying on habit and heuristics to simplify purchasing decisions (Leong 1993). Whether a particular consumer is making a repeat purchase because they have developed a loyalty to that brand, or just because it is easier to grab the same product off the shelf every time, nutrition content claims are unlikely to alter this purchasing pattern. However, even shoppers who exhibit very habitual shopping patterns still make occasional first time purchases. Nutrition content claims will be more likely to have an influence where a consumer is open to purchasing a new product. Most of the research found in the search conducted in this review did not take purchasing habits into account. One exception was the supermarket shelf tag study reported on by Kiesel and Villas-Boas (2009, 2010) and Berning et al. (2011). This found a significant change in purchases in the microwave popcorn category over the 4 week study period, suggesting that shoppers may be prepared to rethink their purchases when nutrition information becomes more accessible.

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<sup>12</sup> Eye tracking research has shown that the position of a product on a store shelf has a significant impact on whether that product is noticed and considered by shoppers (Chandon et al. 2009).

<sup>13</sup> Some of the choice experiments varied the brand of the product in the experiment, but none of them used brand names that were currently on the market in the same country as the study was conducted in. Therefore, none of the participants would be aware of, or have a set of beliefs about any of the brands in the experiments prior to being exposed to the stimuli.

Where a nutrition content claim is able to have an influence on a shopper's purchases, this has the potential to have a long term effect as the product may become a repeat purchase for that shopper, or it may reinforce their existing behaviour.

Many of the package designs included in studies in this review have been relatively simple with areas of free space, which may not reflect the generally cluttered nature of food packaging. This may have increased the salience of nutrition content claims in these studies, by reducing or removing the other labelling elements, such as brand names or front of pack nutrition logos, which also compete for shoppers' attention in real life shopping environments.

While recognising the significant shortcomings of the literature, it is important to note that researchers in food research often need to trade off internal validity for external validity, or vice versa (Winer 1999; Livingstone 2005). For example, research based on scanner data has very good external validity, as it is based on consumers' revealed preferences (rather than what they say they would choose). However, because it does not include a manipulation to test for causation (with the exception of the study conducted by Kiesel and Villas-Boas), the internal validity is sacrificed (Winer 1999). A well conducted experiment, on the other hand, may have very good internal validity by varying only one attribute at a time and using a control, but will have little external validity as it is not conducted in the usual environment in which food choices take place.

#### **4.6 How might consumers' purchases or consumption be influenced by nutrition content claims?**

If nutrition content claims were to influence consumers' purchases and consumption of foods in real life, there are a number of potential mechanisms that could explain this effect. This section examines these potential effects and discusses the evidence from the literature that does and doesn't support them. They are:

- truncation of information search
- confirmation bias
- a trivial attribute effect
- distracting consumers from nutrition information
- positive associations

##### **4.6.1 *Truncation of information search***

Previous research conducted by Roe et al. (1999) found that research participants presented with mock up products were less likely to examine the Nutrition Facts Panel when a nutrition content claim was present on the front of the package. Roe et al.'s study did not find the information truncation caused by the presence of a nutrition content claim influenced purchase intention, although there was an effect on how important participants thought the product would be as part of a healthy diet. However, the studies in this literature review did not find similar effects. Dixon et al. (2011) found that the presence of a nutrition content claim on a package did not influence the likelihood of participants clicking on screen to access nutrition information. Similarly, Maubach (2009b) found that the likelihood of a participant choosing to access nutrition information on screen was not influenced by the information on the front of the package, including the nutrition content claim.

#### **4.6.2 Confirmation bias**

Another potential theory is that shoppers examining a food product may scrutinise the nutrition information less critically when a nutrition content claim is present. In other words, the nutrition content claim may not reduce the likelihood of a shopper turning over the package to check nutrition information. But it may lead to a confirmatory bias, whereby the shopper forms a positive initial impression of the product, and this initial impression then alters the way in which they process the nutrition information, by making information that supports their initial impression stand out, and making other information less salient (Russo et al. 1998). However, participants in Dixon et al.'s study who chose to access the nutrition information using an on screen click were not influenced by the presence of a nutrition content claim on the front of the product. In contrast, the same study did find that the presence of a nutrition content claim increased participants' perception of the level of the nutrient referred to in the claim (Dixon et al. 2011). However, this did not cause a confirmation bias for the overall nutritional value of the food products, and may simply reflect that research participants were replaying the information from the nutrition content claim. Similarly, Kemp et al. (2007) found that a low carbohydrate claim influenced participants' perceptions of the level of carbohydrate in the product even when the nutrition facts panel was available (although they did not find an equivalent effect for a low fat claim). The results suggest that nutrition content claims may create a confirmation bias for the nutrient referred to in the claim, but not for perceptions of the overall nutritiousness of the food product. Within a product category, nutrition content claims may assist the shopper in easy identification of the foods containing suitable levels of their nutrients of interest.

#### **4.6.3 Trivial attribute effect**

Previous research in marketing has suggested that the addition of a trivial attribute to a choice set can have a significant effect on participants' preferences (Carpenter et al. 1994; Brown and Carpenter 2000; Miljkovic et al. 2009). This is particularly the case when there is no clear preferred option in the choice set, until an extra attribute is added to just one of the products in the choice set (Brown and Carpenter 2000). These effects occur even when research participants are informed that the attribute has no effect on the quality of the product and is therefore irrelevant (Carpenter et al. 1994). Van Trijp and van der Lans (2007) and Leathwood et al. (2007) have previously noted that the research into how trivial attributes influence consumers' choices may be relevant to nutrition content claims and could explain some of the effects found. If this were the case, nutrition content claims may have effects on consumers' purchases where they differentiate a product from others in the set being considered by the grocery shopper. For example where a consumer is considering several breakfast cereals, and comparing them on price, taste and other variables salient to the shopper, does not result in a clear preference, the shopper may look to a less important variable to act as a tie breaker. This could be a nutrition content claim or a term, such as 'natural' that the consumer would not otherwise consider in their selection. Because the shopper is not necessarily inferring anything from the claim, another experimental design such as a rating task where a tie breaker is not needed may show no effect from the same claim.

The results of Maubach's (2010) study would support this, as the addition of any extra nutrition information to the packages (per cent daily intake labelling, multiple traffic light labels, a nutrition or a health claim) was found to increase preferences. This was even the case where the additional information was multiple traffic light labelling revealing three amber lights and one red light, indicating that the food was of lower nutritional quality.

The results of the other choice experiments (Barreiro et al., Bond et al., and Gao & Schroeder) also suggest this may be the case, as they tended to find that participants were willing to pay at least a small amount for almost all of the labelling elements included. The small size of these effects in some of these experiments, in comparison to other attributes such as price and brand, may also support the trivial attributes hypothesis as the use of a nutrition content claim only in tie breaker situations would lead to small effect sizes.

However, Kim et al.'s (2009) study which compared the effects of nutrition content claims and taste claims on participants' attitudes towards foods depicted in advertisements does not support this. The study found that taste claims and nutrition content claims had quite different effects on research participants' ratings of the food products, suggesting that the effects of nutrition content claims may be much greater than those of generic flavour claims on particular food products.

Also, the findings of Kiesel and Villas-Boas (2009, 2011) and Berning et al.'s (2011) studies found that a 'low fat' claim on microwave popcorn product reduced sales. This finding does not support the theory that addition of an extra attribute, such as a nutrition content claim, will generally lead to increased preference.

#### **4.6.4 *Distraction***

The eye tracking study conducted by Visschers et al. (2010) found that food products with more clutter on them tended to distract research participants from the nutrition information carried on them. Nutrition content claims could lure consumers' attention away from nutrition information by cluttering the front of the food package, and thereby influence what information is seen and processed by the consumer. However the study did not examine whether the additional clutter would influence consumers' food purchases or consumption. Given that the rating studies which include nutrition information generally find no effects from nutrition content claims on participants' purchase intentions, it would appear that distraction may not have an overall impact on consumers' choices. However, many of the packaging examples used in the experiments discussed in this review used packages that, compared to products on the market, were relatively uncluttered which may have reduced the likelihood of finding an effect. Also, nutrition content claims are only one of many elements which may contribute to clutter on the front of food packages. Graphic designs and logos would be just as likely to have the same distracting effect as nutrition content claims.

Dixon et al.'s (2011) study examining participants' choices did find that some participants were more likely to select an energy-dense nutrient-poor product in the presence of a nutrition content claim. However, this may or may not have been due to distraction, or other factors such as product familiarity, as they did not control for packaging in their study and they used actual products.

#### **4.6.5 *Positive associations***

Roe et al. (1999) suggested that nutrition content claims may lead to consumers having more positive attitudes towards products carrying them, and referred to this potential effect as a 'positivity bias'. Hamlin's (2010) theory of Cue-Based Decision Making suggests that such an effect could be created by prior, unconscious, positive attitudes that consumers have towards cues (such as the phrase 'low fat'). For example some consumers may, due to articles they've read discussing low fat diets, unconsciously experience positive attitudes towards cues that mention this.

The findings from the rating studies generally do not support the existence of positive attitudes towards the concepts in nutrition content claims influencing participants' overall perceptions of products. However, the choice experiments do somewhat support this, particularly as the effects of claims tend to differ between different product and claim combinations. This would fit Hamlin's theory as consumers may hold negative attitudes towards some claims, such as 'low salt', if they unconsciously associate the claim with a negative attribute (such as less flavour). The sales data and choice experiments did suggest that not all nutrition content claim and product combinations would have a positive effect.

#### **4.7 What the literature review adds to FSANZ's research findings**

The studies included in this literature review used a wide range of methodologies, some of which were similar to FSANZ's previous research and some which were very different.

The studies which were most similar to FSANZ's experimental studies on nutrition content claims were the components of Dixon et al.'s and Maubach's studies in which participants rated the food products on attributes such as purchase intention and healthiness. Nutrition information was made available to participants by clicking on screen. These two studies had very similar findings to FSANZ's research, confirming that this type of study generally (with one or two exceptions, such as Howlett et al.'s 2008 study) finds no effect from nutrition content claims on purchase intention, nutrition perceptions and health perceptions.

In a real life shopping environment, FSANZ's methodology would most closely resemble a shopper examining one food product at a time. This may be the case where a product attracts their attention because it is on sale, or is displayed prominently. In contrast to the rating experiments, the choice studies mimic more closely situations where shoppers are trying to choose between two or more products.

In contrast, the choice experiments fairly consistently (with the exception of yoghurt with a '0 % fat' claim) found positive effects from nutrition content claims, although these effects varied in size. The choice experiments did have a number of design issues which mean they need to be interpreted with caution. It's not clear how much impact these design issues would have on the size or significance of the effects found. Two of the choice experiments found that the presence of a nutrition content claim may increase preference for a less healthy product in a choice task. This would suggest that where consumers are comparing two or more products in store, a nutrition content claim could make them more likely to choose a less healthy product where it is present on a less healthy option but absent on a healthier option. One of the two studies (Dixon et al. 2011) found that the effect of the nutrition content claim disappeared for research participants who chose to access the nutrition information available for the product.

The shelf tag supermarket experiment supports the findings of the choice experiments with real life data. Due to the saliency of shelf tags carrying nutrition content claims, the possible increase of credibility in the claims due to their source (i.e. they were not marketing from manufacturers) and the ease of comparability with other products, the size of the effects found in this study are probably larger than what real life manufacturer nutrition content claims would be.

As noted above in the discussion of the shortcomings of the nutrition content claims literature, none of the studies in this review examined whether the presence of a nutrition content claims could lead consumers to purchase foods from a different food category. A study by Williams et al. (2008), on health claims, found that Australian participants were heavily influenced by the base product carrying a claim in their evaluations of a product. Also, the qualitative research suggested that some participants were sceptical about the use of nutrition content claims on foods from less healthy food categories. Therefore there is currently no evidence to suggest that the occasional effects found for nutrition content claims within a food product category would extend to effects between categories.

Overall, the findings of the studies discussed in this literature review suggest that the research methodology used has a significant impact on whether nutrition content claims are found to affect consumers' perceptions and behaviours. The limitations of the literature on nutrition content claims make it impossible to determine what size of effect nutrition content claims would be likely to have in a real life environment. The findings suggest that any effects from nutrition content claims would occur in both positive and negative directions, in other words that some nutrition content claims would reduce consumers' preferences for or purchases of particular products. They would also be heterogeneous between food products, as the research found that nutrition content claims interacted with the food product and other labelling elements in the minds of research participants, leading to unexpected effects on purchase intentions. Their effects are also likely to differ between consumers, depending on their motivations in store (Inman and Winer 1998).

## **5 Conclusions**

Overall, the research on nutrition content claims published since 2007 suggests that nutrition content claims on food packages may have effects on consumers' preferences and purchases of very similar foods within a food product category. The research suggests that preferences for and purchases of foods within a particular subset of a food category (such as breakfast cereals) may be increased or decreased in the presence of a nutrition content claim. Only two of the studies examined whether nutrition content claims could increase consumer preferences for foods of lower nutritional value.

The size of the effect of nutrition content claims would be difficult to predict for any particular claim and product combination based on the available research. This is because the effects of nutrition content claims tend to be heterogeneous, sometimes resulting in reduced rates of purchase, sometimes having no effect on preference or purchase, and sometimes increasing preference or purchase. The size of the effects in real life are also likely to be somewhat smaller than those found in the experiments included in this literature review, as various factors would make them less salient to consumers in real life situations than in the research environments in which they were tested. In real life shopping environments, food labels compete with other elements, such as price, taste, habit and attitudes to healthy eating (Panel for the Review of Food Labelling Law and Policy 2011), which are likely to water down the effects from nutrition content claims detected in the studies included in this review.

No studies found in this literature review examined whether nutrition content claims could lead to shoppers purchasing from categories they otherwise would not have, or even changing their selection across subsets of product categories (e.g. purchasing a sweetened, coloured, puffed extruded cereal instead of muesli). This is because the studies included in this literature review only examined how nutrition content claims may influence choice of products within a particular food category subset.

Two studies found that, where participants were choosing between a healthier and less healthy version of a product, that the presence of a nutrition content claim influenced this decision. A nutrition content claim increased the proportion of respondents selecting the less healthy product; however one study found that this effect only occurred for those participants who chose not to access the nutrition information.

The evidence also generally did not suggest that consumers' nutrition or health perceptions were influenced by nutrition content claims. This would suggest that, while consumers' purchases and preferences may be subtly influenced by nutrition content claims, they are not actually misled by them.

Several mechanisms by which nutrition content claims may influence consumers' purchases and preferences were examined. These include consumers having positive attitudes towards concepts mentioned in nutrition content claims, or using the nutrition content claim as a deciding attribute when choosing among similar alternatives. Evidence for these was mixed. No evidence was found in the literature published since 2007 that nutrition content claims reduce the likelihood of consumers using the nutrition information panel. It is likely that, where nutrition content claims have an influence, a range of factors such as price, taste, and convenience may moderate this effect.

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## Appendix A. How the literature search was conducted

All searches were for publications from January 2007 onwards. Searching was conducted in September and October of 2011. Articles were exported from online bibliographic databases after titles and abstracts were reviewed to check for relevance.

The total number of relevant articles found, once duplicates and irrelevant articles were removed, was 43.

NB: where search terms use capital letters, this indicates a subject term. Where lower case letters are used, this indicates a keyword. 'Number of hits' indicates the number of results returned by the bibliographic database for the search term combinations. 'Kept' indicates how many results from that particular search were unique (i.e. not already found in the searches above conducted in the same database) and were exported to bibliographic databases.

### **MEDLINE**

<b>Search combination</b>	<b>Number of hits</b>	<b>Kept</b>
Food Labeling AND claim	98	21
Food Labeling AND Eating	9	1
Food Labeling AND perception	28	11
Food Labeling AND purchase	32	4
"nutrition content claim"	0	0
"nutrient content claim"	3	3
"content claim" AND (fat OR sugar OR salt OR fibre OR antioxidant OR sodium)	1	0
Food Labeling AND consumption	56	4
Food Labeling AND sales	8	0
	Total kept	43

### **EconLit**

<b>Search combinations</b>	<b>Number of hits</b>	<b>Kept</b>
"food labeling" AND claim	0	0
Food Consumption AND claim	547	164
"food labeling"	22	0
eating AND labeling	186	4
perception AND label#ing	614	5
purchas* AND label#ing	753	0
label#ing AND sale* AND food	454	0
"nutrition content claim"	1	1
"nutrient content claim"	2	0
"content claim"	3	0
label#ing AND consumption AND food	521	0
	Total kept	174

### **Food Science and Technology Abstracts**

<b>Search combinations</b>	<b>Number of hits</b>	<b>Kept</b>
"nutrition content claim"	0	0
"nutrient content claim"	2	1
"content claim" AND (fat OR sugar OR salt OR fibre OR antioxidant OR sodium)	3	2
Labels OR Nutritional Labelling and consumption	29	3
purchase OR perception OR sales AND (Labels OR Nutritional Labelling)	72	4
eating AND (Labels OR Nutritional Labelling)	27	1
claim AND (Labels or Nutritional Labelling)	12	7
	Total kept	18

### **Nutrition Abstracts & Reviews**

<b>Search combinations</b>	<b>Number of hits</b>	<b>Kept</b>
Food AND Labelling	425	37
"food labelling" OR "food labeling" AND claim	37	8
"food labelling" OR "food labeling" and Food Beliefs	2	0
"nutrition content claim"	1	1
"nutrient content claim"	13	3
"content claim"	17	5
"food consumption" AND claim	12	0
labelling OR labeling AND sale	44	0
perception AND labelling OR labeling	89	1
Purchasing AND labelling or labeling	47	1
Food Beliefs AND claim	7	1
"food beliefs" AND claim	6	1
Eating AND labelling OR labeling	66	0
	Total kept	58

### **JSTOR**

NB: Searching conducted within Marketing, Health Sciences, Psychology, and Health Policy areas.

<b>Search combinations</b>	<b>Number of hits</b>	<b>Kept</b>
"nutrition content claims" [abstract was used as the field searched]	0	0
"food" AND "claim" [item title was used as the field searched]	0	0
	Total kept	0

***Journal of Public Policy and Marketing site***

<b>Search combinations</b>	<b>Number of hits</b>	<b>Kept</b>
food claim	4	0
food labelling	5	0
food	25	0
claim	4	0
label	0	0
eating	5	0
	Total kept	58

## **Appendix B. Articles eliminated from the literature review**

The following references were retrieved in the literature search and exported to bibliographic software. However, on closer inspection they were found to not be relevant to the search.

### ***Not related to nutrition content claims:***

Berman M, Lavizzo-Mourey R (2008) Obesity prevention in the information age: caloric information at the point of purchase. *JAMA: The Journal Of The American Medical Association* 300(4):433–435

Dodson HJ, Whelan WJ (2007) The wars of the carbohydrates. 5. Calorie counting. *IUBMB Life* 59(3):193–194

Garg N, Wansink B, Inman JJ (2007) The influence of incidental affect on consumers' food intake. *Journal of Marketing* 71(1):194–206

Gray JP, Karnon J, Blackwell L (2011) Sugar consumption from beverages and the potential effects of a text-based information label. *Australian And New Zealand Journal Of Public Health* 35(1):88–89

Hoefkens C, Verbeke W, Van Camp J (2011) Consumer perception and behaviour related to food labelling. *Communications In Agricultural And Applied Biological Sciences* 76(1):89–92

Jasti S, Kovacs S (2010) Use of trans fat information on food labels and its determinants in a multiethnic college student population. *Journal Of Nutrition Education And Behavior* 42(5):307–314

Jones G, Richardson M (2007) An objective examination of consumer perception of nutrition information based on healthiness ratings and eye movements. *Public Health Nutrition* 10(3):238–244

Mackison D, Wrieden WL, Anderson AS (2010) Validity and reliability testing of a short questionnaire developed to assess consumers' use, understanding and perception of food labels. *European Journal Of Clinical Nutrition* 64(2):210–217

Maubach N, Hoek J (2008) The Effect of Alternative Nutrition Information Formats on Consumers' Evaluations of a Children's Breakfast Cereal. In: 15 July 2008, Wollongong, p. 1–8

Signal L, Lanumata T, Robinson JA, Tavila A, Wilton J, Ni Mhurchu C (2008) Perceptions of New Zealand nutrition labels by Maori, Pacific and low-income shoppers. *Public Health Nutrition* 11(7):706–713

Steenhuis IHM, Kroeze W, Vyth EL, Valk S, Verbauwen R, Seidell JC (2010) The effects of using a nutrition logo on consumption and product evaluation of a sweet pastry. *Appetite* 55(3):707–709

Tangari AH, Burton S, Howlett E, Cho YN, Thyroff A (2010) Weighing In on Fast Food Consumption: The Effects of Meal and Calorie Disclosures on Consumer Fast Food Evaluations. *Journal of Consumer Affairs* 44(3):431–462

Temple JL, Johnson K, Recupero K, Suders H (2010) Nutrition labels decrease energy intake in adults consuming lunch in the laboratory. *Journal Of The American Dietetic Association* 110(7):1094–1097

Visschers VHM, Siegrist M (2009) Applying the evaluability principle to nutrition table information. How reference information changes people's perception of food products. *Appetite* 52(2):505–512

### ***Survey of nutrition content claim prevalence on food labels***

Abbatangelo-Gray J, Byrd-Bredbenner C, Austin SB (2008) Health and nutrient content claims in food advertisements on Hispanic and mainstream prime-time television. *Journal Of Nutrition Education And Behavior* 40(6):348–354

Brandt M, Moss J, Ferguson M (2009) The 2006-2007 Food Label and Package Survey (FLAPS): Nutrition labeling, trans fat labeling. *Journal of Food Composition and Analysis* 22(Suppl.):S74–S77

Lalor F, Kennedy J, Flynn MAT, Wall PG (2010) A study of nutrition and health claims--a snapshot of what's on the Irish market. *Public Health Nutrition* 13(5):704–711

Schwartz MB, Vartanian LR, Wharton CM, Brownell KD (2008) Examining the nutritional quality of breakfast cereals marketed to children. *Journal Of The American Dietetic Association* 108(4):702–705

Williams P, Yeatman H, Ridges L, Houston A, Rafferty J, Ridges A, Roesler L, Sobierajski M, Spratt B (2006) Nutrition function, health and related claims on packaged Australian food products--prevalence and compliance with regulations. *Asia Pacific Journal Of Clinical Nutrition* 15(1):10–20

### ***Focused on nutrition content claim legislation, not consumer research***

Buttriss JL, Benelam B (2010) Nutrition and health claims: the role of food composition data. *European Journal Of Clinical Nutrition* 64 Suppl 3:S8–S13

Lupton JR (2009) Scientific substantiation of claims in the USA: focus on functional foods. *European Journal Of Nutrition* 48 Suppl 1:S27–S31

Tarabella A, Burchi B (2009) Legislative factors and product specifications in the marketing of "light" foodstuffs. *Journal of Commodity Science, Technology and Quality* 48(3):227–247

USFDA (2007) Food labeling: nutrient content claims, expansion of the nutrient content claim "lean". Final rule. *Federal Register* 72(8):1455–1459

### ***Food industry articles***

NB: These articles very briefly report on trends in the food industry, measured via consumer surveys and label surveys. Generally, the terminology used is not specific enough to be able to tell whether a nutrition content claim is being discussed. For example, health claims or structure/function claims may be referred to as 'nutrition claims'. This means that the findings and/or conclusions may not be relevant to nutrition content claims. Not enough detail is provided on the studies included in these articles to determine their quality.

Adams M (2009) By the label. *International Food Ingredients*(No. 2):34–35

Brandt MB, Moss J, Ellwood K, Ferguson M, Asefa A (2010) Tracking label claims. Food Technology (Chicago) 64(1):34–40

Sloan AE (2011) Navigating the natural marketplace. Food Technology 65(7):24–33

***Same research already reported in another reference included in the review:***

Baixauli, R., Salvador, A., Hough, G., Fiszman, S. M. (2007) How information about fibre (traditional and resistant starch) influences consumer acceptance of muffins. Correspondence address, S. M. Fiszman, Instituto de Agroquímica y Tecnología de Alimentos (CSIC), Quality and Preservation, Physical and Sensory Properties Lab, Apartado de Correos 73, 46100 Burjassot, Valencia, Spain. Tel. +34 963900022. Fax +34 963636301. E-mail sfiszman@iata.csic.es.

<http://search.ebscohost.com/login.aspx?direct=true&db=ffh&AN=2008-10-Mq2892&site=ehost-live>.

Maubach N, Hoek J (2008) The Effect of Alternative Nutrition Information Formats on Consumers' Evaluations of a Children's Breakfast Cereal. In: Proceedings of Partnerships, Proof and Practice - International Nonprofit and Social Marketing Conference 2008, 15 July 2008, University of Wollongong, accessed from [http://ro.uow.edu.au/do/search/?q=Maubach&fq=virtual\\_ancestor\\_link%3A%22http%3A%2F%2Fro.uow.edu.au%22](http://ro.uow.edu.au/do/search/?q=Maubach&fq=virtual_ancestor_link%3A%22http%3A%2F%2Fro.uow.edu.au%22), p. 1–8

***Examines retail prices, not consumer behaviour***

Muth MK, Zhen C, Taylor J, Cates S, Kosa K, Zorn D, Choiniere C (2010) The value to consumers of health labeling statements on breakfast foods and cereals. In: Proceedings of the International Association of Agricultural Economists Conference, Beijing, China, August 16-22 2009, This study was conducted under Contract 223-01-2466, Task Order 6 with the U.S. Food and Drug Administration (USDA), Center for Food Safety and Applied Nutrition Accessed on 7 December 2011

[http://ageconsearch.umn.edu/bitstream/50333/2/Manuscript\\_Value\\_of\\_Labeling\\_Statements\\_IAAE%20174.pdf](http://ageconsearch.umn.edu/bitstream/50333/2/Manuscript_Value_of_Labeling_Statements_IAAE%20174.pdf), p. 1–29

***Did not examine effect of nutrition content claims on consumers' nutrition perceptions, health perceptions, purchase or consumption***

Ng J, Stice E, Yokum S, Bohon C (2011) An fMRI study of obesity, food reward, and perceived caloric density. Does a low-fat label make food less appealing? Appetite 57(1):65–72

***Too little information provided on the information participants were exposed to:***

Toontom N, Meenune M, Posri W (2010) Influence of antioxidant information on consumer preference for a Thai chilli paste product. British Food Journal 112(11):1252–1265

***Not clear which label elements are being discussed by participants***

Kempen E, Bosman M, Bouwer C, Klein R, van der Merwe D (2011) An exploration of the influence of food labels on South African consumers' purchasing behaviour. International Journal of Consumer Studies 35(1):69–78

***Not able to be obtained***

Banterle A, Baldi L, Stranieri S (2007) Nutrition claims and consumer attitude: an empirical analysis in Italy. In: 103rd Seminar of the European Association of Agricultural Economists 'adding value to the agro-food supply chain in the future Euroomediterranean space', 23-25 April 2007, Barcelona, Spain,