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The Effects of Front-of-Pack
Nutrition Information and Product Claims on
Consumers' Product Evaluations and Choice Behaviour

A thesis presented in partial fulfilment of the requirements for the degree
of Doctor of Philosophy in Marketing
at Massey University, Palmerston North, New Zealand

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Abstract

Enabling consumers to recognise foods' nutritional profiles is important because energy overconsumption is a significant contributing factor to a worldwide obesity epidemic. Parents especially need to be able to recognise which foods are healthy options for their children to eat regularly, and which are not, as childhood weight and dietary habits instilled while young have long-term implications for adult health. Policy makers are reluctant to regulate marketing of high fat, sugar and salt foods, but collectively the global food industry has implemented a suite of educational and informational interventions intended to help consumers control their weight. Foremost among these is the introduction of new front-of-pack nutrition labels and support for product claims that link nutrients to health-related outcomes.

The objective of this research was to determine whether detailed numeric or simple graphic front-of-pack nutrition labels influence how parents evaluate and choose between products, and could therefore contribute to public health objectives. Additionally, nutrition label performance in the context of product claims was also assessed.

There were two theoretical bases for this research; the first was the Elaboration Likelihood Model (ELM) of persuasion, which offers a general explanation of consumers' attitudinal reactions to new information. It states that motivation to engage with and ability to understand information determines how people process messages. The research also incorporated behaviour modification perspective, which stresses the role of external forces in shaping behaviour.

Reflecting these two theoretical perspectives, the research used both cognitive and behavioural experimental methodologies. One formative study, two attitudinal experiments and one choice experiment investigated whether:

- new nutrition label formats enhance consumers' ability to distinguish between foods with differing nutritional values; and
- different nutrition labels formats moderate the influence of varying levels of product claims on consumers' attitudes and choices.

The formative research revealed that parents often struggle to balance a raft of goals when grocery shopping. While they may hold good nutrition as an important consideration, practical issues such as time pressure, price, convenience and preferences are more salient concerns that militate against using nutrition information.

The two cognitive studies found that parents' attitudes towards children's breakfast cereals with varying nutritional profiles were unaffected by predominantly numeric labelling formats; this result was observed in two experiments, confirming the hypothesis that numeric information is not incorporated in product evaluations. Conversely, a graphical "Traffic Light" label did affect parents' attitudes towards the two breakfast cereals; attitudes towards a less healthy option were significantly lower. The research also confirmed that the current nutrition information panel does not affect consumers' product choices, but adding nutrition information to the pack fronts did change choice behaviour. Both front-of-pack labels affected parents' choices, but the Traffic Light label had a greater impact. That is, parents were less likely to choose a less healthy cereal when presented with a Traffic Light label.

The addition of nutrition-content and health claims did not affect parents' attitudes, but these pieces of information were used when choosing between competing options. In particular, claims had significant choice utility when only numeric nutrition information was available. However, parents were less likely to be swayed by product claims on a less healthy cereal when the Traffic Light label was presented.

In summary, this research suggests that nutrition labels that display information graphically help consumers evaluate energy-dense products more accurately. Given the aim of nutrition labelling is to help consumers make healthier food choices, simple, graphical formats seem more likely to achieve this objective than highly detailed, numeric formats.

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The first study was approved by the Massey University Human Ethics Committee Southern B, Application 06/47. The subsequent quantitative research phases were evaluated by peer review and judged to be low risk, and were recorded on the Low Risk Database of the Massey University Human Ethics Committee in 2008.

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List of Abbreviations

Where relevant, the country is stated in brackets if not included in the title.

ABS	Australian Bureau of Statistics
AFGC	Australian Food and Grocery Council
AICR	American Institute for Cancer Research
AIHW	Australian Institute of Health and Welfare
ANA	Agencies for Nutrition Action (New Zealand)
ANZA	Association of New Zealand Advertisers
ANZFA	Australia New Zealand Food Authority (superseded by FSANZ)
BMI	Body Mass Index
BMP	Behaviour Modification Perspective
BNF	British Nutrition Foundation
CDC	Centers for Disease Control (United States)
CSPI	Center for Science in the Public Interest (United States)
DH	Department of Health (England)
DHA	Department of Health and Aging (Australia)
DRV	Daily Reference Value
ELM	Elaboration Likelihood Model of persuasion
FAO	Food and Agriculture Organization of the United Nations
FCQ	Food Choice Questionnaire
FIA	Food Industry Accord (New Zealand)
FIG	Food Industry Group (New Zealand)
FOE	Fight the Obesity Epidemic (New Zealand)
FOP	Front-of-pack (referring to placement of information)
FSA	Food Standards Agency (United Kingdom)
FSANZ	Food Standards Australia New Zealand
GAO	Government Accountability Office (United States)
GDA	Guideline Daily Amount
HEHA	Healthy Eating Healthy Action (New Zealand Government Policy)
HFSS	High fat, sugar and sodium (salt) foods
HRM	Hierarchical Multiple Regression
HSC	Health Select Committee

HSM	Heuristic-Systematic Model
IFIC	International Food Information Council Foundation (United States)
IOM	Institute of Medicine (United States)
kJ	Kilojoule (1 Calorie equals 4.18 kJ)
MAO	Motivation, Ability and Opportunity
MLR	Multinomial Logit Regression
MTL	Multiple Traffic Light label
MOH	Ministry of Health (New Zealand)
NCD	Non-Communicable Disease
NFP	Nutrition Facts Panel (United States NLEA mandated format)
NHF	National Heart Foundation (New Zealand)
NIP	Nutrition Information Panel (current Australian and New Zealand label format mandated by the Food Code)
NLEA	Nutrition Labeling and Education Act 1990 (United States)
ns	Not (statistically) significant
NZFGC	New Zealand Food and Grocery Council
NZNF	New Zealand Nutrition Foundation
NZTBC	New Zealand Television Broadcasters' Council
OAC	Obesity Action Coalition (New Zealand)
OECD	Organisation for Economic Co-operation and Development
PDI	Percent Daily Intake; equivalent to PDV
PDV	Percent Daily Value; equivalent to PDI
PHA	Public Health Association (New Zealand)
RAC	Responsible Advertising and Children (global industry alliance)
RDA	Recommended Daily Allowance
RDI	Recommended Dietary Intake / Reference Daily Intake
RANZ	Restaurant Association of New Zealand
SES	Socio-Economic Status
SPARC	Sport and Recreation Council (New Zealand)
SPDCM	Stated Preference Discrete Choice Modelling
TLL	Traffic Light Label
USDA	United States Department of Agriculture
USDHHS	United States Department of Health and Human Services
WCRF	World Cancer Research Fund
WHO	World Health Organization

List of Publications

Journal Articles

- Maubach, N.B., & Hoek, J.A. (2010). A qualitative study of New Zealand parents' views on front-of-pack nutrition labels. *Nutrition & Dietetics*, 67, 90-96.
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Conference Papers

- Maubach, N. B., Hoek, J. A., Gendall, P. J., & Healey, B. J. (2009, 30 November-2 December). Motivation, ability and the influence of nutrition information formats. Paper presented at the *Australian and New Zealand Marketing Academy Conference*, Melbourne, Australia.
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- Maubach, N.B., Hoek, J.A., Gendall, P.J., & Hedderley, D. (2009, 28-30 May). The effect of front-of-package nutrition information and product claims on consumers' attitudinal evaluations and choice behaviour. Paper presented at the *Marketing and Public Policy Conference*, Washington DC, USA.
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- Maubach, N. B., & Hoek, J. A. (2008, 1-3 December). Alternative nutrition information disclosure formats: Using the elaboration likelihood model to investigate consumers' attitudinal responses. Paper presented at the *Australian and New Zealand Marketing Academy Conference*, Sydney, Australia.
- Maubach, N. B., & Hoek, J. A. (2008, 15-16 July). The effect of alternative nutrition information formats on consumers' evaluations of a children's breakfast cereal. Paper presented at the *International Nonprofit and Social Marketing Conference*, Wollongong, Australia.
Received: Best Student Paper Award

Maubach, N. B., Hoek, J. A., & McCreanor, T. N. (2007, 3-5 December). Parents' views of nutrition information labels: An exploratory study. Paper presented at the *Australian and New Zealand Marketing Academy Conference*, Dunedin, New Zealand.

1 Background and Objectives

1.1 Introduction

The proportion of the population classified as overweight or obese has doubled or trebled in many developed countries over the past three decades. This has led to an increase in the incidence of many debilitating health conditions. Consequently, policy makers are keen to consider options that could reverse the trend and help citizens keep a healthy weight throughout their lives. This thesis explores one category of intervention that has received considerable attention in New Zealand, Australia and abroad: the consumer-oriented information disclosure remedy. More specifically, it considers how the presentation and formatting of nutrition information on a food product's label affects consumers' perceptions and behaviour.

Regulatory and policy managers often formulate information and education campaigns in an effort to address pressing social problems. The use of such communication based interventions assumes that consumers use new information to inform their decision making processes, and therefore effective communication will induce voluntary changes that ameliorates the social problem in question. Information interventions are especially preferred when problems involve sensitive issues where stakeholders may resent or act against more direct interventions. This is strongly characteristic of current efforts to address issues around weight gain, which tends to be viewed as a personal problem.

This chapter introduces and provides an overview of the thesis. It begins with a brief review of rising obesity rates, before introducing some of the suggested actions that could address the problem of increasing weight gain and associated diseases. The main research aim of this thesis is then outlined, and an overview of the thesis structure is provided.

1.2 Problem Statement

Over the past thirty years, the rate of obesity has doubled or trebled in many developed countries (World Health Organization [WHO], 2000). As discussed in Chapter 2, the

evidence that being overweight increases the risk of developing a myriad of chronic diseases and premature death is robust (e.g., Callee, Thun, Petrelli, Rodriguez, & Heath, 1999). The rapid, global trend towards overweight points to environmental and lifestyle factors as causal agents: Rose (1992) states that fluctuations in the incidence of modern disease patterns, including eradication of infectious diseases and increasing prevalence of non-communicable illnesses, correspond to “large and rapid changes in our life-style and environment” (p. 108). The corollary of this is that the risk posed by being overweight is modifiable, and is a suitable target for coordinated intervention and prevention activities (Australian Institute of Health and Welfare [AIHW], 2008). In particular, because childhood obesity is a strong predictor of adult obesity, actions that help children and adolescents keep a healthy body weight will help reduce future adult obesity rates and lower the incidence of many preventable diseases. However, while few question societal concern over rising obesity rates (although see, for example, Gibbs, 2005), determining the interventions required to reduce unhealthy weight gain, and where responsibility for implementation should lie, remains vigorously contested by stakeholders.

Many health researchers and advocacy groups have called for restrictions on food marketing, especially sales promotions targeted at children, as a means of helping consumers improve their diets and lower energy intake to levels that match the actual requirements (e.g., Dalmeny, Hanna, & Lobstein, 2003; Institute of Medicine, 2005; Kaiser Family Foundation, 2004; Schwartz & Puhl, 2003; Seiders & Petty, 2007; Which?, 2006a). However, proposals to constrain marketers’ promotion of food products have been met with forceful industry opposition and denounced as draconian (Irwin, 2005a, 2005b). Moreover, critics of proposals to regulate argue that existing advertising bans elsewhere have failed to curb childhood obesity (Ambler, 2004; McDonald's Corporation NZ, 2006; Responsible Advertising and Children, 2006), and that there is in fact no relationship between mass media advertising spend and obesity rates (Food Industry Group [FIG], 2006e). Food marketers claim obesity is a complex issue that cannot be solved with restrictive regulations; furthermore, they suggest consumers should take more responsibility for making appropriate ‘lifestyle choices’ from the products on offer (FIG, 2006a; World Federation of Advertisers, 2006a).

The twin themes of personal responsibility and freedom of choice are prominent in the global debate over how to reduce obesity rates (Balko, Brownell, & Nestle, 2004;

Seiders & Petty, 2004; Verduin, Agarwal, & Waltman, 2005). Consequently, many of the more widely-supported proposed interventions take the form of consumer education or information disclosure campaigns. In New Zealand, many social advertising education interventions were initiated as part of the 'Healthy Eating Healthy Action' (HEHA) strategy (Ministry of Health [MOH], 2003b), developed to achieve key population health goals of reducing obesity, improving nutrition, and increasing participation in physical activity (Minister of Health, 2000). HEHA is a collaborative strategy that recognises industry groups may have a role in designing and implementing solutions to obesity (King, 2004).

In tandem, the food industry has developed self-regulatory initiatives intended to address rising obesity rates. In New Zealand, these activities are coordinated by the Food Industry Group (FIG) under an umbrella agreement, the Food Industry Accord (FIA, Association of New Zealand Advertisers Inc, 2004). The FIG argues that consumers want to take personal responsibility for their food purchase decisions, but require more support, education and information to make better lifestyle and dietary choices (FIG, 2006d).

One form of consumer education that Australian and New Zealand food industry members are voluntarily implementing is a new front-of-pack (FOP) nutrition label, called the Percent Daily Intake (PDI) panel. This aligns with international food industry initiatives. Over the past few years, several large companies have phased in PDI labels (FIG, 2008), supported by a partnership between the Australian and New Zealand Food and Grocery Councils (AFGC & NZFGC, 2008), introduced because current labelling provisions "...are not providing useful information for consumers to understand how to select a nutritious and balanced diet" (FIG, 2005, p. 17). The PDI panel has a detailed numeric format that locates a food product in the context of consumers' overall daily dietary requirements, and the FIG argues this initiative will contribute to reducing obesity rates by helping people make more informed choices (FIG, 2006b; 2006e).

However, while many stakeholders support improvements to nutrition labelling as one measure to enhance consumers' dietary choices and reverse obesity trends, views on whether PDI labels are the best format for shifting consumption to more nutritious and less energy-dense foods vary. Some are concerned that PDI labels will confuse shoppers (e.g., Allan, 2007), and support an alternative nutrition labelling scheme developed by

the British Food Standards Authority (FSA, 2005), the Traffic Light Label (TLL) system. Those supporting TLLs include: health advocacy groups, Fight the Obesity Epidemic (FOE, 2006), Sustain (2007), the Obesity Action Coalition (OAC, 2006), and the Public Health Association (OAC & PHA, 2007); political parties, the Green Party (2005; 2008) and the Māori Party (OAC, 2008); and a range of international consumer organisations (Australian Consumers' Association, 2007; Consumer NZ, 2009; Which?, 2006c). Other formats have also been developed and implemented overseas, particularly in the United States of America. However, little is known about how these new nutrition labels are used by consumers when making purchase decisions.

Nutrition and health information disclosures at the point-of-purchase are intended to improve consumers' knowledge of food products, with the associated assumption that this will promote purchase of more nutritious foods. However, there is doubt about the likely effects of more widespread adoption of the PDI label. Day (1976) notes the "...paucity of concrete evidence that past disclosures have made significant differences in consumer or market *behavior*" (p. 42, italics in original). Similarly, and more recently, Rothschild (1999) argues that education-based interventions tend to have had limited effects on people's behaviour, as the inertia arising from the status quo is a powerful force to overcome with information alone.

The debate over food labelling has caught the attention of politicians in Australia and New Zealand, as well as internationally. Government ministers on the Australia and New Zealand Food Regulation Ministerial Council (2006; 2009) requested that the joint regulatory agency Food Standards Australia New Zealand (FSANZ) investigate front-of-pack nutrition labelling options, to enable discussion on the effects of such labels and regulatory options. A New Zealand Parliamentary Health Select Committee (HSC, 2007) concluded that government and industry officials need to work together to introduce an effective front-of-pack nutrition labelling system as one measure to help reduce the incidence of obesity and type 2 diabetes.

Similarly, the recent United States Government Accountability Office's (GAO, 2008) report into food labelling notes many stakeholders want a federally mandated, standardised front-of-pack nutrition label format. The report recommends the Food and Drug Administration (FDA) investigate options for a simplified labelling system. The

European Commission (2007) is also reviewing options for consistent nutrition labelling regulations across member states, including front-of-pack systems.

Predating the discussion of front-of-pack nutrition labels is a regulatory proposal from FSANZ to allow manufacturers to make more detailed health and nutrition claims about their products, as United States manufacturers have since the mid 1990s (FDA, 1994). Between 2005 and 2008, FSANZ undertook several rounds of consultation to develop a new policy that would allow foods to be marketed with health claims, which relate consumption of a food with physiological biomarker and disease outcomes (FSANZ, 2005a). Currently, manufacturers can print factual statements about the presence (or absence) of nutrients, such as ‘a source of fibre’ or ‘low in fat’, but are prohibited from explicitly linking consumption of their products to health outcomes. Food and media industry representatives support the proposal to amend regulations to allow health claims, arguing this would provide consumers with access to important information that would help them make better food choices (FIG, 2005; Wiggs & Irwin, 2004).

Increasing information at the point-of-purchase to improve consumer decision making and market efficiency is not a new idea, although questions have been raised about its likely effectiveness. Few studies have examined how alternative front-of-pack nutrition information formats affect consumers’ behaviour, or interact with manufacturers’ claims about products. For policy makers charged with implementing regulations that best support healthy food choices, this question requires urgent research attention. Thus, the research problem that this thesis seeks to address is that the effect of introducing new front-of-pack nutrition and health information on people’s purchase decisions is unclear. While some research has been conducted in the United States and European countries, research investigating Australian and New Zealand consumers’ reactions to this sort of information is scarce. Although providing nutritional information may assist consumers to make more informed food choices, it is not clear what such information means to them, how they interpret it, and, importantly, if or how they use it to guide their decision-making.

1.3 Research Aim

Policy makers are being encouraged to support front-of-pack nutrition labelling, but suggestions about how these new labels influence consumers in the supermarket and could ultimately affect consumption habits are built upon a relatively slim evidential base. The aim of this research is to test how differently formatted nutrition labels affect consumers' attitudes towards products and choices between options.

Each modification to the food retail environment cannot be considered in isolation. As FSANZ may gazette a new regulation for nutrition and health claims, it is necessary to understand how new nutrition labels are affect consumers in the context of these other label elements.

Weight gain in childhood is of particular concern and dietary patterns established during childhood have lifelong effects. Within youth populations, the issue of personal responsibility is largely transferred to parents and caregivers, who are positioned as gate-keepers in charge of determining children's diets and other health behaviours. Therefore, it is important to determine how on-pack nutrition and health related information influences parents' attitudes and decision making when considering children's food products, so parents and caregivers of young children were chosen as the target population for this research.

The overarching aim of this research is to determine whether prominently displayed nutrition and health related information on the front of food packaging influences the way in which parents evaluate children's food products and their choices, and could therefore be a legitimate tool to help reduce the burden of obesity. It is hoped that the research findings will inform policy decisions relating to regulations that direct the on-pack information food manufacturers must provide to consumers, and provide avenues for further research.

1.4 Research Approach and Structure

Chapter 2 provides a brief overview of the problem of unhealthy weight, with particular reference to adult and child weight trends in New Zealand and Australia, before outlining the reasons why obesity is a serious health concern that merits coordinated intervention. The first step in developing effective interventions involves understanding why people are gaining weight so causal factors can be identified as targets for intervention. Broadly, there are three types of intervention available to those wishing to modify others' behaviour; the second half of Chapter 2 explores these strategic responses, and the advantages and disadvantages of using information interventions to influence consumers' food purchase behaviour.

Chapter 3 reviews the two dominant schools of thought within the consumer behaviour literature, the cognitive and behavioural paradigms. Specifically, it presents a discussion of the Elaboration Likelihood Model (ELM) of persuasion, a theory that has been used by marketing academics to understand consumers' responses to information under different conditions. Following this, some key concepts from behavioural learning theories are outlined; these provide an alternative explanation of how consumers may respond to modified on-pack information. This discussion of alternative theoretical frameworks informs the methods used to achieve the primary research aim and the lenses used to interpret the results of this and prior research.

There has already been a great deal of research into the effectiveness of information disclosure remedies, consumer use of nutrition labels, and the effect of nutrition and health claims on consumers' cognitions. Chapter 4 summarises knowledge of why consumers do and do not use nutrition information, before examining the effectiveness of a range of on-pack nutrition and health-related information formats tested to date. The literature analysis concludes with Chapter 5, which introduces the food label elements tested in the research conducted for this thesis, describes the research hypotheses, and outlines the research design.

Four stages of research were undertaken to investigate the effect of on-pack nutrition and health information on parents' product evaluations and behaviour: Chapters 6, 7 and 8 present the methods and results of these studies. The first phase of research was a formative enquiry, detailed in Chapter 6. This guided latter stages of the project and

used a qualitative approach to gain insights into how parents shop for food for their families, their salient considerations, how current on-pack nutrition information is used, and the range of initial perceptions of some alternative front-of-pack nutrition labelling options.

Chapter 7 presents the methods and results of two related experimental surveys that investigate respondents' attitudes to products with varied nutrition and health messages, and how information formatting affects perceptions; these experiments used questionnaires whose design was informed by the ELM. The final piece of research, presented in Chapter 8, used stated preference discrete choice modelling to estimate the effect of front-of-pack nutrition information formats and product claim types on participants' choice behaviour.

Finally, conclusions drawn from all four studies about the impact of placing nutrition and health information on the front of food packages are presented in Chapter 9. Policy implications, study limitations and suggestions for further research are also delineated.

2 Finding Solutions to the Obesity Epidemic

2.1 Introduction

This chapter explains the magnitude of the obesity problem and reviews options available to policy makers seeking to reverse the trend towards rapid weight gain. The WHO (2003b) estimates that over one billion adults worldwide weigh more than considered healthy, including approximately 300 million obese¹. In many developed countries, more than half of the adult population is overweight, and increasing numbers of adults and children are classified as obese. Globally, approximately ten percent of children are overweight, with one quarter of these being obese, although the proportion of overweight children is higher in developed nations (Lobstein, Baur, & Uauy, 2004). This increase in obesity prevalence is a recent phenomenon, and has far reaching implications for the wellbeing of individuals and society. The rise in obesity rates occurred too quickly to be caused by changes to population genetics, pointing to environmental and behavioural causes (WHO, 2000). Research suggests that improving people's diets, specifically the diets of children and adolescents, will help to reduce obesity rates. Thus, the role of parents in preventing childhood obesity is also considered.

The patterns of weight gain in New Zealand and Australia clearly follow international trends, causing health professionals and politicians to express concern for the public health system, and leading to widespread debate over the interventions required to reverse the trend. The second part of this chapter explores Rothschild's (1999) taxonomy of social behaviour interventions – regulation, education, and social marketing – in the context of the obesity debate, with specific reference to New Zealand.

¹ The WHO and most government agencies use Body Mass Index (BMI) scores to track weight distributions. While some authors have documented concerns with the validity of the BMI as an accurate diagnostic tool (e.g. Daniels, Khoury, & Morrison, 1997; Malina & Katzmarzyk, 1999), it nonetheless allows quick and inexpensive monitoring of population-level weight trends over time.

2.2 New Zealand and Australian Trends in Adult and Child Weights

Only ten percent of New Zealand's adult population, aged 20-64, was obese in 1977 (Ministry of Health [MOH], 2004c). In less than three decades, this statistic doubled to 21 percent (adults aged 15-74 years, MOH, 2004b), and the most recent nationally representative data shows one in four adults are obese (adults aged 15+, MOH, 2008). The proportion of overweight (but not obese) adults remained quite steady during this time, rising slightly from 34 percent in 1977 to 36 percent in 2008 (MOH, 2004b; 2004c; 2008). Overall, however, fewer people are now within the healthy weight zone because of the upwards shift. The statistics in Australia are strikingly similar: in 2007, 25 percent of adults aged 18 years and older were obese and a further 37 percent were overweight (Australian Bureau of Statistics [ABS], 2009). The proportion of overweight and obese adult New Zealanders by age group is presented in Figure 1, and for adult Australians in Figure 2.

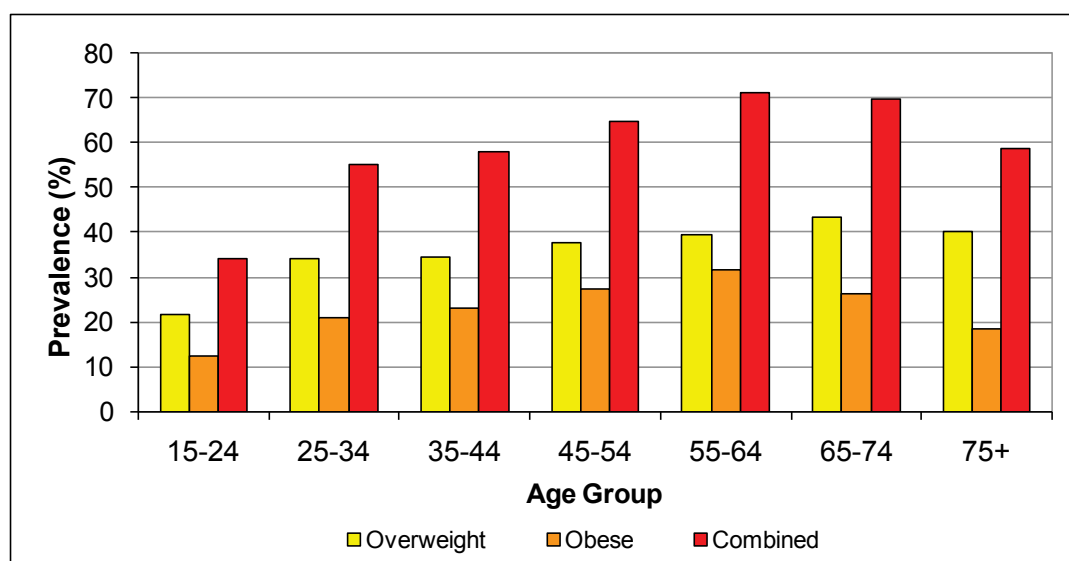


Figure 1 – New Zealand Adult Overweight (BMI > 25) and Obesity (BMI > 30) proportions by age group, 2006/07

(Data from Ministry of Health, 2008)

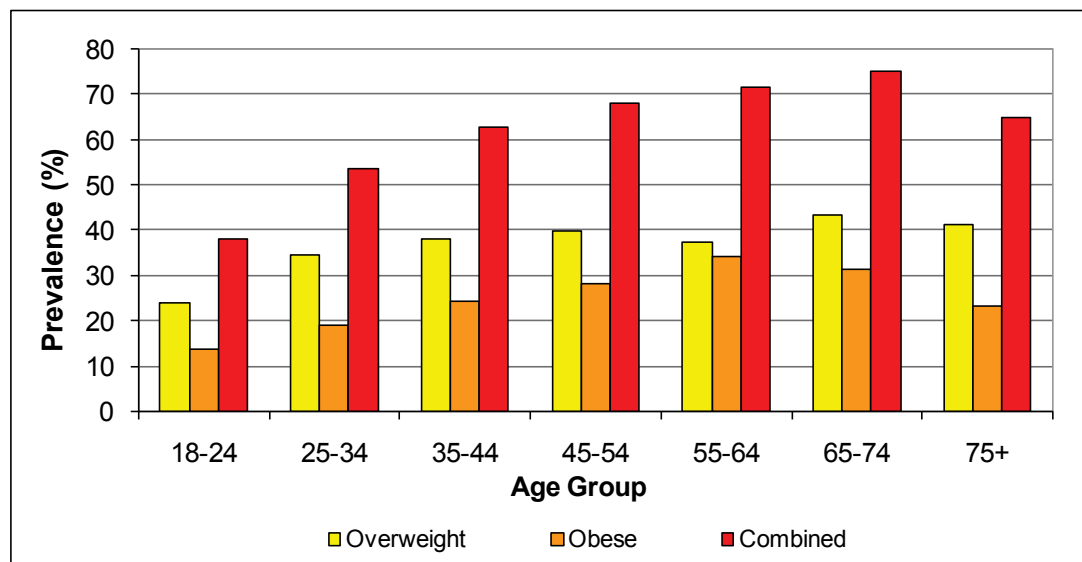


Figure 2 – Australian Adult Overweight (BMI > 25) and Obesity (BMI > 30) statistics by age group, 2007/08

(Data from Australian Bureau of Statistics, 2009)

Obesity is unevenly distributed across ethnic groups within the New Zealand and Australian populations, as it is in many countries. In New Zealand, more Māori and Pacific Islanders are obese than Europeans, Asians, and other ethnicities. Four in ten Māori adults are obese (42 percent), while two-thirds of Pacific Island adults are obese (64 percent) (MOH, 2008). Australia's indigenous Aboriginal population has higher rates of obesity than other ethnic groups (ABS, 2006).

While there were no nationally representative data on the weights of New Zealand children until relatively recently, regional surveys by Dawson *et al.* (2001) and Tyrrell *et al.* (2001) suggested a trend of increasing youth obesity levels following that observed among adults and worldwide childhood obesity trends (Ebbeling, Pawlak, & Ludwig, 2002; Wang & Lobstein, 2006). The 2002 Children's Nutrition Survey produced the first nationally representative data, which showed that 21 percent of children aged five to 14 years old were overweight and a further 10 percent were obese (MOH, 2003c). The 2006/07 New Zealand Health Survey yielded similar results, finding 21 percent of children were overweight and eight percent were obese (MOH, 2008). Figure 3 depicts the prevalence of overweight and obesity in New Zealand children aged five to 14 years (using age-standardised BMI measures) and shows the higher statistics for Māori and

Pacific Island children, as the ethnic differences observed in adults also characterise childhood statistics (Goulding, 2007; MOH, 2008).

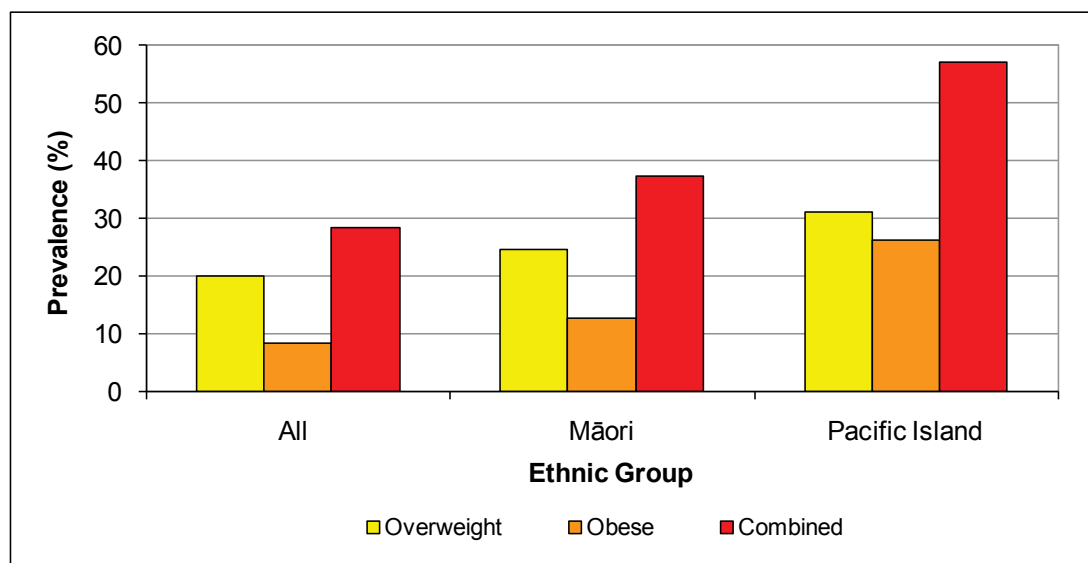


Figure 3 – Proportion of overweight and obese children by ethnicity in New Zealand 2006/07

(Data from Ministry of Health, 2008)

The number of overweight and obese children also increased in Australia during the past two decades (Magarey, Daniels, & Boulton, 2001). In 1985, 12 percent of girls and 11 percent of boys aged 7 to 15 years were overweight, while only slightly over 1 percent of girls and boys were obese. Ten years later, the proportions had increased: 16 percent of girls and 15 percent of boys aged 7 to 15 years were overweight, and obesity rates more than trebled to 6 percent for girls and 5 percent for boys. Recent data shows that approximately 30 percent of Australian children and adolescents are overweight or obese (Australian Institute of Health and Welfare [AIHW], 2008).

Overall, the pattern of rapid weight gain and proportion of overweight and obese Australian children is very similar to the trend observed in New Zealand, and both mirror international observations. These high obesity statistics place Australia and New Zealand in the ‘worst third’ of OECD countries (AIHW, 2008).

2.3 Consequences of Overweight and Obesity

Great advances were made in public health in the twentieth century; infectious diseases formerly responsible for the majority of premature deaths were nearly eradicated from industrialised nations. Today, however, chronic diseases affected by weight are the leading causes of premature death. A recent United States Surgeon General offered a stark warning to his population when he predicted that the increasing prevalence of serious diseases caused by obesity, unhealthy diets, and inactivity may result in the current generation of children having less healthy and shorter life spans than their parents (Carmona, 2004). As the rates of overweight and obesity in New Zealand and Australia are similar to those in the United States, Carmona's warning is as relevant here as it was in his own jurisdiction.

Obesity Related Morbidity and Mortality

Obesity is now known to be the tenth highest risk factor for morbidity and mortality in developed countries (WHO, 2002b). The wide range of adverse health consequences arising from excess weight are well documented (Jung, 1997) (see Table 1 for examples). As medical research further elucidates disease vectors, it is possible that more conditions will be attributed to excess weight.

Table 1 – Some physical diseases related to excess weight

Disease type	Reference
Cardiovascular disease, hypertension, stroke	Wilkinson & Marmot (1998)
Type 2 diabetes	WHO (2003a)
Cancers (of many tissues)	Callee, Rodriguez, Walker-Thurmond, & Thun (2003); Moller, Mellemegaard, Lindvig, & Olsen (1994)
Osteoarthritis of the knee	Hart & Spector (1993); Sturmer, Gunther, & Brenner (2000)
Fatty liver disease	Wanless & Lentz (1990)
Renal disease	Hall (2003)
Blindness	Royal National Institute of the Blind (2006)

Much of the data regarding obesity and its health consequences comes from research on adult populations, as the diseases caused by overweight were formerly observed in older people. However, the growing incidence of 'adult' conditions afflicting overweight

young people, such as impaired glucose tolerance and type 2 diabetes in children (Diabetes New Zealand, 2008; Fagot-Campagna, 2000) and increased rates of heart disease among young adults (Hayman, 2005), highlights the need for concern over the changing weight profile of the whole population.

Despite impressive advances in medical technology and increased access to these, premature death due to Non-Communicable Disease (NCD) is increasingly common. Globally, approximately 2.5 million people die prematurely each year from chronic diseases for which obesity is a major risk factor (WHO, 2002a). There is a near linear relationship between BMI and premature mortality (WHO, 2000), and the risk of death begins increasing with weight gain even within the healthy BMI range (van Dam, Willett, Manson, & Hu, 2006). Approximately 40 percent of all deaths in New Zealand each year are attributable to nutrition-related risk factors, particularly high saturated fat and salt intakes, being overweight and obese, or inadequate fruit and vegetable consumption (MOH, 2004a).

Being overweight or obese often has detrimental effects upon psychological and social wellbeing. Mayer (1968) noted that historical literature has left a record of "...the low regard usually held for the obese by the thinner and clearly more virtuous observer" (p. 84); a stigma that persists today (e.g., Lane, 2006). It appears that many view obesity as a personal failure to manage diet and exercise levels adequately, the consequence of a weakness of resolve and character rather than of the environment within which people live and grow (Lee & Oliver, 2002; WHO, 2000). Overweight children are often stigmatised, teased and bullied (girls more so) (Tang-Péronard & Heitmann, 2008), and are more likely to have low self-esteem (French, Story, & Perry, 1995; Strauss, 2000; Wang & Veugelers, 2008). Overweight adolescents report higher levels of social isolation and are less likely to be nominated as friends by others, including those they think of as friends, than their healthy weight peers (Strauss & Pollack, 2003).

As adults, overweight people are more likely to experience discrimination by employers (Roehling, 1999), again particularly women (Pagan & Davila, 1997), as well as discrimination in a variety of other interpersonal situations (Puhl & Brownell, 2001). Even health professionals display bias: physicians are significantly less likely to respect obese patients (Huizinga, Cooper, Bleich, Clark, & Beach, 2009). Consequently, overweight and obese people have weaker social support networks and lower social

integration (Rugulies, Aust, & Syme, 2004), and are more likely to experience major depression and suicide ideation or attempts (Carpenter, Hasin, Allison, & Faith, 2000; Eaton, Lowry, Brener, Galuska, & Crosby, 2005; van Dam *et al.*, 2006).

Economic and Societal Costs of Obesity

While modern medicine offers treatments to help manage illnesses caused by obesity, there are very high financial and social costs associated with this morbidity. The conditions stemming from obesity are often expensive and difficult to treat, lead to time away from work and a decrease in productivity (Neovius, Johansson, Kark, & Neovius, 2008), and create an economic burden borne by the whole of society (Centers for Disease Control, 2006; Finkelstein, Fiebelkorn, & Wang, 2003). In 2006, the then New Zealand Minister of Health said:

A lot of people have been looking for a crisis in health ... This is it. One in five New Zealanders are obese and we can only begin to imagine what that will mean for the future of our health system (Hodgson, 2006b, ¶ 4)².

Data from Canada shows that obese adults incur greater health care costs than healthy weight adults (Janssen, Lam, & Katzmarzyk, 2008). The health budget is a limited resource, and successive governments are unlikely to want to increase taxes, instigate spending cuts in other areas, or increase national debt to cover the increasing cost of health care required by growing numbers of overweight and obese people.

A conservative estimate for the economic burden of obesity in New Zealand in 2005 was \$303 million, based on WHO estimates of between two and five percent of the health budget (MOH, 2005), while a report on the economic impact of obesity in Australia in 2005 concluded the total cost was approximately AU\$3.8 billion (Access Economics, 2006). Nearly ten percent of the United States' health expenditure in 1998, around US\$78.5 billion, related to conditions caused by obesity (Finkelstein *et al.*, 2003). Now that the prevalence of obesity in New Zealand and Australia is similar to that of the United States, the proportion of the health budget spent on obesity related diseases may also have risen.

² The number of obese adults increased to one in four after the former Minister of Health made this comment.

There are also indirect and opportunity costs associated with obesity (WHO, 2000), but these are harder to estimate and health economists debate which variables should be included in the calculations. Indirect costs include welfare and economic benefits lost to other members of society, such as diminished production capacity due to illness-related absenteeism and premature death, and use of central funds for health care that could be diverted to other projects if it were not for obesity. Opportunity costs to the individual include fewer years living without disability, reduced longevity, limitations to social class attainment, and increased probability of discrimination.

Summary

Excess weight increases the risk of developing many detrimental physical diseases or experiencing significant emotional distress. In turn, these health outcomes are reflected in morbidity and mortality statistics, which have substantial economic implications. Disparities in the prevalence of obesity between ethnic groups is one of the contributing factors to unequal health status experienced by Aboriginals, Māori and Pacific Islanders compared to people of European and Asian decent living in New Zealand and Australia. It is clear that the current situation of increasing weight gain is unsustainable, and that the factors associated with this trend need investigation so options that would reverse it may be identified and evaluated.

2.4 Reducing Obesity Rates

Governments are considering interventions that would transform the modern obesogenic environment³ into one that facilitates maintenance of healthy body weights. Children are a primary target group worldwide (e.g., Clark, 2006; Department of Health, 2008; European Commission, 2007; Majoras, 2005). However, this task is challenging, as researchers have identified many factors that influence the ratio of energy in (through consumption of food and drink) to energy out (expenditure through physical activity), and there is vigorous debate about the role played by each. This complexity implies that regulators need to consider a wide range of potential interventions so they address

³ An 'obesogenic environment' contains stimuli and structural features that promote over-consumption of energy dense food and reduced physical exertion (Ebbeling *et al.*, 2002; Hill & Peters, 1998).

factors known to contribute to obesity, not simply those seen as politically expedient or considered more acceptable to powerful stakeholder groups (Egger & Swinburn, 1997).

2.4.1 Understanding Drivers of Weight Gain

The current scientific consensus is that excess weight gain is caused by a net positive energy balance (MOH, 2004c; WHO, 2000)⁴. Therefore, for most people, excess weight is the result of consuming more energy through food and beverages than needed to sustain a healthy body weight given their energy expenditure (USDHHS, 2001). The task facing researchers is to uncover the factors that promote increased energy consumption and reduced energy expenditure to develop an evidence base for intervention frameworks. While an extensive list of possible causes is quite easily identified, it is more difficult to determine the unique contribution that each factor makes to positive energy balance (Institute of Medicine, 2004); therefore, predicting which interventions will yield the greatest improvement in weight management is also difficult.

As the weight of young people has a significant impact upon their life-long health (Nelson, 2005; WHO, 2000), it is very important that researchers continue to investigate how the weight of children and adolescents affects health outcomes. Data shows overweight children have an increased probability of becoming obese adults (Ferraro, Thorpe, & Wilkinson, 2003; Smith, 1999), possibly because the number of fat cells created during the growth years remains constant into adulthood (Spalding *et al.*, 2008). Furthermore, researchers have noted the extreme difficulty overweight people have in first losing weight and then staying slim (Gill, 1997; Goodrick, Poston, & Foreyt, 1996); these findings suggest prevention is paramount to controlling and reducing obesity rates. The prevention of weight gain and obesity among young people is likely to have a profound influence on the future physical health and longevity of populations.

⁴ Although researchers are investigating the hypothesis that exogenous chemicals disrupt endocrine pathways and cause excess adiposity (Grün & Blumberg, 2006), more research is necessary to establish if this explanation is supported.

2.4.2 Physical Activity

Insufficient physical activity can lead to weight gain and serious health conditions such as heart disease and hypertension (USDHHS, 1996). Modern society facilitates a more sedentary lifestyle, as transport options, equipment, and labour-saving devices at work and in the home make life less arduous (WHO, 2000), while new technologies have increased sedentary recreation opportunities. Empirical data on activity levels in New Zealand has only been collected for a little over ten years using self-report measures, and there have been calls to improve the monitoring and surveillance of diet and exercise behaviour (Hohepa, Schofield, & Kolt, 2004). Data from 2000-01 showed one third of the New Zealand populace did not achieve the target of more than 150 minutes physical activity each week, although only ten percent were inactive (van Aalst, Kazakov, & McLean, 2003). However, the data collected in 2007-08 found half of New Zealand adults do not achieve the recommended weekly activity level, and 13 percent were classed as inactive (Sport and Recreation New Zealand, 2008).

International studies have arrived at conflicting conclusions regarding the relationship between physical activity levels and weight, particularly in children. A prospective study in the United States recruited children using a non-random sampling mechanism, and tracked their physical activity levels and development statistics for eight years (Moore *et al.*, 2003). The authors reported a correlation between activity levels and body fatness, which led them to conclude that exercising had a protective effect against increasing adiposity.

However, researchers in the United Kingdom conducting the prospective 'EarlyBird' project measured the activity and development of a randomly recruited sample of English children, and concluded that physical activity is unlikely to be a significant contributor to changes in obesity levels (Wilkin, Mallam, Metcalf, Jeffery, & Voss, 2006). Findings from the EarlyBird study led the researchers to propose that children have innate physical activity levels that lead to observed fluctuations in the time spent in physical activity; children with a preference for minimal activity chose sedentary activities after school when required to exercise at school, while children with preferences for higher activity levels engaged in additional exercise outside school if not sufficiently active while at school. As children thus moderate the time they spent being active, increasing compulsory exercise is likely to be matched by increased sedentary activity at other times.

Moreover, Swinburn, Jolley, Kremer, Salbe and Ravussin (2006) analysed international datasets containing information on children's energy intake, energy expenditure, and biometric measurements, and used this information to model the effects of energy imbalance on weight. Their model had very high predictive accuracy when validated against longitudinal data, and showed that increased energy intake, rather than lowered energy expenditure, was a greater causal influence on weight gain in children.

Thus, while increasing physical activity may prevent unhealthy weight gain, help people lose weight, and improve personal health, the emerging evidence suggests changes to energy intake are necessary and may have greater potential to reduce youth obesity rates than interventions focussed primarily on increasing physical activity.

2.4.3 Nutrition

The link between nutrition and health is well established (Gottlieb, 2005), and poor nutrition is the greatest risk factor for early death in New Zealand (MOH, 2006). Over-consumption of fat (particularly saturated fats), sugar and salt are closely correlated with three of the top ten risk factors for disease worldwide: high blood pressure, high cholesterol, and obesity (WHO, 2002b). As noted earlier, excess energy stored in fat cells leads to weight gain. According to long-term data tabulated by the United Nations Food and Agriculture Organization (FAO, 2002), average daily energy consumption per person has risen dramatically: in the 1960s, one third of people (34 percent) consumed more than 2,500 calories per day, but this proportion doubled to two thirds (65 percent) by the late 1990s. The WHO (2003a) estimates that people living in industrialised countries consume approximately 315 calories (1,317 kJ) more per day, on average, than people did 25 years ago; coupled with sedentary occupations and recreation, the potential for unhealthy weight gain is obvious. In New Zealand, the daily per capita energy supply from total food available for consumption increased from 12,300 kJ in the early 1960s to 13,400 kJ in 2002 (MOH, 2006).

The multi-faceted nature of food choice behaviour makes the task of elucidating causal relationships between environmental factors and consumers' dietary patterns difficult. As a result, designing and testing interventions aimed at improving population nutrition is not straight forward.

Influences on Nutritional Intake

Many factors, most of which have been brought about by technological innovations, have contributed to the change in dietary intake towards more energy-dense, highly processed foods. The scientific progress in food technology has allowed food manufacturers to develop a wide range of processed and pre-prepared foods; these packaged foods often contain a lot of refined sugars, fats, and salt, and may be more energy dense than unprocessed or fresh foods (WCRF/AICR, 2007; WHO, 2002a). Despite their unhealthy attributes, these foods are popular with many consumers because they offer convenience and satisfy innate preferences for energy-dense foods over energy-dilute foods (Birch & Fisher, 1998).

Overall, there is considerable evidence that consumers are poor judges of the energy and nutritional content of foods they eat. Clinical research has shown that people eat approximately the same quantity of food from day to day (measured by volume and weight), and do not reduce the amount eaten when more calorific foods are chosen (WCRF/AICR, 2007). Consumers cannot always accurately perceive the energy and nutrient composition of processed foods from purely visual, textual or taste sensory cues (WHO, 2000). Furthermore, people's ability to estimate accurately the calorific contribution of foods varies with portion size, as it is common for people to underestimate the energy content of larger servings (Chandon & Wansink, 2007).

Many of the factors found to correlate with over-consumption behaviours pertain to food industry marketing practices, including the types of food that are manufactured (product), the cost differential between less nutritious and more nutritious foods (price), the places these items are available (distribution), and the tactics used to encourage consumption (promotion). About the same time that obesity statistics began to increase, many restaurants embarked on a marketing strategy of offering larger portion sizes to provide greater value to customers (Young & Nestle, 2002), often supplying a large number of calories at marginal extra cost (Close & Schoeller, 2006). Posting calories counts on menu boards does not seem to mitigate the effect of discount pricing strategies on purchasing patterns (Elbel, Kersh, Brescoll, & Dixon, in press). Further examples of how marketing contributes to or reinforces unhealthy food choices and obesity are provided in Table 2. Concern over food marketing has led to a call for regulations to restrict these, particularly those directed at children (e.g., Dalmeny *et al.*, 2003; Hoek & Maubach, 2006; Institute of Medicine, 2005; Kaiser Family Foundation, 2004; Schwartz

& Puhl, 2003; Seiders & Petty, 2007; Which?, 2006a, 2006b; Zimmet & James, 2006), and research into possible regulatory interventions (Seiders & Petty, 2004).

Others question the extent of marketing's influence on consumers (e.g., Ambler, 2004; Eagle, Bulmer, De Bruin, & Kitchen, 2004; FIG, 2006a; World Federation of Advertisers, 2006b), and industry representatives argue regulations that restrict business activities are inappropriate (Irwin, 2005b). The food industry has pro-actively developed self-regulatory initiatives intended to combat rising obesity rates, while advancing themes around personal responsibility, self-care, and freedom of choice (e.g., Center for Consumer Freedom, n.d.; Robertson, 2008; Verduin *et al.*, 2005).

Table 2 – Examples of marketing influences on food choice

Marketing Element	Example
Product	Food products that are highly palatable and sweet actively promote over consumption by increasing the rate and frequency of eating, and industry has capitalised on these innate tendencies by developing foods that are highly palatable (WHO, 2000). Large pack and portion sizes normalise eating larger quantities (Wansink, 2004).
Price	Foods highest in fat, salt in sugar are often much cheaper than more nutritious, less energy dense foods (Drewnowski & Specter, 2004). Value-combo meals markedly increase calorie count for minimal extra cost (Close & Schoeller, 2006).
Place / Distribution	School tuck-shops and vending machines offer a captive market, but often only provide a limited selection of nutritious foods (Kedgley, 2006). Proliferation of fast-food and take-away outlets (Restaurant Association of New Zealand, 2006). Higher numbers of fast-food outlets in low SES neighbourhoods and near schools (Reidpath, Burns, Garrard, Mahoney, & Townsend, 2002).
Promotion	Use of food vouchers to reward sporting achievement; high profile athletes endorsing brands with predominantly energy-dense offerings (Hoek & Maubach, 2006). High sugar, low fibre children's breakfast cereals are routinely promoted with movie tie-ins, free gifts and competitions (Allan, 2006). Using new and interactive technologies to promote foods directly to children, bypassing parents (Which?, 2006a).

Proponents of a regulatory status quo, FIG argue: "Obesity and over-weight problems are a matter of lifestyle choices – the challenge of managing obesity is one of influencing lifestyle choices" (FIG, 2006b, p. 9). They report that consumers accept personal

responsibility for their decisions (FIG, 2006d; 2006e), but may find it difficult to recognise how to combine foods to construct a balanced diet (FIG, 2006b). For example, the Foundation for Advertising Research, which has questioned the effects of advertising on dietary choices (Harker & Harker, 2006), note:

...it is often difficult for consumers to identify 'healthy' food particularly with the competing claims of food manufacturers and the varying opinions of dietitians and health groups. Most foods and beverages contain nutritional information on the label but it is technical and can be difficult for consumers to interpret (FFAR, n.d.).

Therefore, industry representatives argue the most effective solution to the problem of poor dietary choices is more consumer education and information (FIG, 2006e). To this end, improving the availability of nutrition and health information at the point of purchase is one timely method of overcoming the purported knowledge gap. By providing a wide range of products with varied nutrition profiles, and printing detailed, accurate nutrition and health information on packaging, food industry representatives have suggested that consumers will be empowered to make better choices for themselves and their families, and that changed patterns will reduce the prevalence of obesity (FIG, 2005; Verduin *et al.*, 2005). Such 'information disclosure' interventions, both initiated by food manufacturers and suggested by public health advocates, are at the centre of a great deal of policy discussions worldwide at the present time. However, as the next section shows, consumer recognition of the problem of obesity is ambivalent, and this raises questions about people's willingness to change their behaviour.

Public Opinion on Obesity and Nutrition

Consumers' attitudes towards obesity and weight management appear ambivalent, although little opinion research has been conducted to investigate attitudes towards obesity, nutrition and physical activity. Polls of consumers in the United States reveal that obesity is consistently ranked as a less serious national health issue than HIV/AIDS, cancer, and heart disease (Lee & Oliver, 2002; Panagopoulos, 2006), and some polls report obesity is also viewed as less serious than tobacco smoking and diabetes (Panagopoulos, 2006). This suggests that people are not aware that obesity is a risk factor for many NCDs, including cancers, type 2 diabetes, and heart disease.

Panagopoulos (2006) reported that several polls conducted between 2004 and 2005 found only between seven and 16 percent of United States respondents selected obesity as the most urgent health problem facing their nation (Gallup, November 2004; Stony Brook University, June 2004; other research organisations reported statistics between those points). These findings indicate that many United States citizens do not recognise the health implications that come from having nearly two thirds of the population overweight (USDHHS, 2001). Similarly, fewer than half of United States citizens believe that youth obesity is a serious problem; only 41 percent agreed it was (Evans, Finkelstein, Kamberow, & Renaud, 2005). Statistics from New Zealand suggest that parents here are slightly more concerned about obesity levels; when prompted to think at the societal level, 93 percent expressed concern about the effect of the obesity epidemic “on New Zealand as a whole and the demand it could place on health resources to deal with it” (Athena Marketing Research, 2008).

2.4.4 The Role Parents Play in Preventing Obesity

The rate of obesity and overweight among children and adolescents is of particular concern, as patterns of food consumption and exercise established while young typically continue into adulthood and affect life-long weight and health (Birch & Fisher, 1998; Ferraro *et al.*, 2003). Thus, interventions that ensure children and adolescents will stay within the healthy weight range are viewed as especially important to long-term population health (Hodgson, 2006a; Ministry of Health, 2003a). Many voices in the debate over how to influence childhood weight place responsibility squarely on parents’ shoulders:

No one is in charge of what goes into kids’ mouths except their parents. It is up to parents more than anyone else to take this matter in hand...if their parents are foolish enough to feed their kids on a diet of Coca Cola and lollies well they should lift their game and lift it urgently (Tony Abbott, Australian Federal Health Minister, 2005, quoted in Baum, 2008, p. 569).

There can be little doubt that parents and family directly influence and shape children’s weight-related behaviours (Dietz, 2001; Savage, Fisher, & Birch, 2007). Parents are viewed as important socialisation agents during childhood development, although peers and media influences also contribute to the socialisation process (Hughner & Maher, 2006). Parents are in a position to act as gatekeepers when they purchase food and set

rules for the family's consumption (Savage *et al.*, 2007; White & Davis, 2006) and most do seek to control their children's diets (Brown, Ogden, Vögele, & Gibson, 2008). References to parental responsibility for managing children's diet, recreation, and weight are common, and because of this parents are nominated as the most appropriate targets for obesity interventions (e.g., Campbell, 2008; Cebrynski, 2007; Irwin, 2004). Public opinion surveys return similar views; 90 percent of United States adults believe that parents have a lot of responsibility for reducing childhood obesity (Evans *et al.*, 2005).

However, many factors may impede parents' ability to control their children's diets (Wardle, 1995). Children are not passive participants in household food selection decisions who always abide by their parents' decisions. It has long been known that children influence purchases and ask for food items even more frequently than they ask for toys. Mothers are more likely acquiesce to requests as children get older, particularly for food purchases (Ward & Wackman, 1972). Children also use specific strategies to gain access to preferred snack foods, which tend to be sweet (Marshall, O'Donohoe, & Kline, 2007). Wilson and Wood's (2004) research confirmed that children's influence on consumption decisions continues to grow, and note the increasing trend for child-specific food items and marketing.

The extent to which parents might actively try to modify their children's behaviours depends on their perceptions of the risks involved (Hughner & Maher, 2006). If parents believe that their child's weight or dietary intake poses risk to their health, they are more likely to intervene. Correspondingly, if parents do not see any risk associated with their child's weight or consumption, they will not try to modify their child's behaviours. Complicating this, however, is the fact that people are often poor judges of whether they or their children are overweight. In the EarlyBird study, researchers found only one quarter of parents correctly identified when their child was overweight, and one third of parents whose child was obese incorrectly thought their child's weight was actually 'about right' (Jeffery, Voss, Metcalf, Alba, & Wilkin, 2004).

Obesity has been framed as a consequence of insufficient knowledge, with the solution requiring more education (FIG, 2006b). However, evidence presented by the United States Department of Agriculture (USDA) shows that the relationship between children's weight and parental nutrition knowledge is actually weak: "Large percentages (around 20 in almost every case) of children whose parents have appropriate attitudes and

knowledge are overweight” (Variyam, 2001, p. 22). Therefore the fact that children are overweight is unlikely to be largely attributable to parental ignorance of the importance of good nutrition and healthy diets. However, if parents are to be responsible for the healthiness of their children’s diets, then they must know certain food choices are riskier than others and be able to evaluate which products are nutritionally better.

New Zealand parents are quite confident that their own children know which foods are healthy and which should be limited (85 percent agree, Athena Marketing Research, 2008). Furthermore, several studies report that adults and children are generally capable of identifying foods as ‘healthy’ or ‘unhealthy’ (Hill, Casswell, Maskill, Jones, & Wyllie, 1998; Kesketh, Waters, Green, Salmon, & Williams, 2005). However, the dichotomisation appears based upon simplistic category stereotypes, such as stating fresh and unprocessed produce is good while products like cakes, pizza and confectionery are bad⁵. This strategy for evaluating healthiness does not help consumers identify which products within the same category have better or worse nutritional profiles. It fails to account for the fact that consumers purchase many processed foods, which have differing nutritional values across competing brands. These variations mean parents cannot use the simple category stereotype heuristic to inform their choices.

Findings from the United States report that parents acknowledge difficulty distinguishing between healthy and less-healthy snacks (Kesketh *et al.*, 2005). While parents also routinely claim that nutritional value is a very important determinant when selecting foods (e.g., Spungin, 2004), these studies typically do not report whether respondents are actually able to assess nutritional profiles accurately. In short, there are many factors that complicate the task of ensuring that children remain a healthy weight.

2.4.5 Summary

Policy makers need to know the factors promoting weight gain in order to develop effective interventions. Current evidence suggests that most people who are overweight or obese are so because of sustained energy imbalance, with energy consumed exceeding

⁵ Often this classification scheme of discrete healthy and unhealthy types or categories is brought to the research scenario by the investigators through the stimuli they choose to present (e.g., Bullen & Benton, 2004; Noble, Stead, Jones, McDermott, & McVie, 2007).

energy expended. Dietary intake and activity levels are variables on both sides of the equation amenable to change, and the importance of each in weight-management is still disputed. However, research suggests that, on average, people are eating more energy-dense food in larger servings and consuming more energy than prior generations, and that reducing children's energy consumption will have a greater effect on long term health outcomes.

It is obvious that parents play an important role in shaping their children's behaviours, particularly when children are young and depend heavily on parental support and decision making. Thus, the notion of parental responsibility is a key theme in the public discourse for many issues related to child health. Furthermore, the occurrence of obesity is often framed as a consequence of poor decisions being made by individuals; thus it seems logical that interventions that support consumers' ability to make healthy choices will reduce obesity. However, the type of intervention most likely to achieve this goal is unclear, thus the following section outlines the three main types of behaviour change interventions that are available to policy managers wishing to modify people's food purchase and consumption behaviours.

2.5 A Strategic Intervention Framework

There are three broad categories of strategic response available to modify food choice. Rothschild (1999) labels these as 'carrots', 'sticks', and 'promises'. Like the framework proposed by Mazis, Staelin, Beales and Salop (1981), Rothschild's three categories can be ordered along a 'remedies continuum' from least to most restrictive in terms of freedom of commercial speech and consumer choice. At the lower end on the intervention scale are education and information provision programmes (*promises*) that communicate options and rationales to consumers; these are expected to foster increased knowledge and awareness, which is assumed to encourage voluntary behaviour change as people recognise the potential benefits and amend their ways to attain these. Marketing interventions (*carrots*) use a wider array of communication tactics, and seek to induce behaviour change by manipulating consumers' choice environments. Thus the consequences of competing behavioural choices vary, through the incentives and rewards attached to some purchase choices, providing further reasons to change. Finally, the law (*sticks*) is seen as the most interventionist approach, as it can be used to restrict

behaviours, enjoin environmental modifications, manipulate market variables (price, distribution, product, and promotion), and administer punishments for breaches of these. Determining which of these types of intervention is appropriate depends on the unique factors present in each situation, including the severity of externalities created, or not mitigated, at each level of intervention. The following sections analyse the implications of using marketing, legislation and education to change consumers' behaviour, and briefly review past, current and proposed interventions to curb obesity and improve nutrition in light of Rothschild's (1999) categories. Although the options mooted are addressed in separate sections, in practice many interventions involve a combination of two or even all three classes of strategic tools to create an environment most conducive to change.

2.5.1 Carrots: Marketing Behaviour Change to Consumers

Rothschild (1999) states that “*Marketing* refers to attempts to manage behavior by offering reinforcing incentives and/or consequences in an environment that invites voluntary exchange” (p. 25). Marketing intervention strategies thus retain consumers' freedom to choose from a range of competing options, but modify the consequences associated with each to encourage consumers to act in accordance with the marketer's goals. Modifying the choice environment by varying the four Ps of marketing (product, price, place, and promotion; see Table 2, page 21) can encourage consumers to select a particular option over the others available to them (Thaler & Sunstein, 2008). In appropriately-designed marketing interventions, a key objective is to provide an explicit and timely consequence that makes the ‘better’ choice more advantageous (Rothschild, 1999).

While the majority of marketing messages are produced by corporate organisations to achieve sales and profit goals, non-profit and governmental agencies also use marketing principles to modify behaviours to achieve social goals – this practice is called ‘social marketing’. Andreasen (1994) described social marketing as a distinct discipline that adapts commercial marketing technologies used in the private sector to influence social behaviours for the benefit of both individuals and society. Additionally, Andreasen (1994) stressed that behaviour change (or maintenance by those already acting as desired) is the bottom line, compared to the financial return sought by corporations.

Previously, Andreasen (1993) remarked that marketing is more than communication:

While marketers communicate information, we are not in the *education* business. While we attempt to convince people of the rightness of certain beliefs, we are also not in the *propaganda* business. Many of the health programmes I have observed or worked with around the world are, in fact, largely education and propaganda programmes (p. 2, italics in original).

Marketing and education (see §2.5.3) are sometimes mistakenly viewed as synonymous intervention strategies, perhaps because communication of information is common to both and similar channels are often used to convey messages. Often ‘social marketing’ programmes would be better categorised as education interventions, because they do not create value for consumers. Rothschild (1999) notes that “...apathy, and inertia are powerful competitive forces” (p. 28) that serve to maintain the status quo. Sometimes, consumers are unwilling or unable to change their behaviour, despite knowing the reasons why change is important and the benefits it will bring. In those situations, regulations may be necessary to enjoin behavioural change, or create an environment that facilitates healthier behaviours.

2.5.2 Sticks: Legislating Behaviour Change

The second method for modifying people’s behaviour described by Rothschild (1999) is legislation. Commonly, legislation restricts or prohibits undesirable behaviours, and uses the police and judicial system to detect and punish breaches. For example, road-user laws mandate seatbelt use, maximum speed limits, helmet use by cyclists, and maximum blood-alcohol tolerances for drivers to support the goal of enhancing road safety, with the police force monitoring compliance and prosecuting serious offences in the courts. A feature of such laws is “... the use of coercion to achieve behavior in a nonvoluntary manner ... or threaten with punishment for non-compliance or inappropriate behaviour” (Rothschild, 1999, p. 25). Jochelson (2005) argues these paternalistic policies can be viewed positively as a form of stewardship, which serves “...a protective function, where individuals are protected from harm by others and sometimes from themselves” (p. 1).

Food industry representatives believe that use of legislation to address obesity rates is draconian and undesirable because it “...diminishes the rights and responsibilities of the

individual to make choices for themselves and their families” (Irwin, 2005b, p. 1). However, others suggest that democratic governments have the dual responsibilities of protecting citizens’ freedom of choice and preventing citizens from incurring costs (financial or otherwise) created through no fault or choice of their own (Anonymous, 2008a; Hayne, Moran, & Ford, 2004; Rothschild, 1999). These costs are known as externalities and are “...present whenever the behavior of a person affects the situation of other persons without the explicit agreement of that other person or persons” (Buchanan, 1971, p.7, quoted in Dawes, 1980, p. 173). As the effects of weight gain are not solely limited to the individual, the debate over how to reduce obesity rates requires consideration of the magnitude of externalities and pressure to reduce these.

Rothschild (1999) notes that laws can also be used to facilitate marketing solutions: “Law can also be used to increase ...or decrease ...the probability of transactions that might not develop as desired through free-market mechanisms” (p. 25). Restrictions may be imposed on the way products are marketed by brand owners without limiting consumers’ ability to choose from a range of product and brand offerings. That is, governments can enact laws or regulations that set product specifications, place limits on distribution and sales, restrict or ban promotion of some products, and influence prices through taxes and subsidies.

The field of tobacco control is the most obvious example of the law being used to achieve health goals. In New Zealand, the Smoke-free Environments (SFE) Act 1990 and its amendments created a situation where adult consumers may purchase and consume tobacco, but sales have been reduced by raising the price through successive tax increases and lifting the minimum purchase age to 18 years. Furthermore, the SFE Act and its amendments bans promotion of all tobacco products (though it allows in-store displays and package design), and regulate how tobacco products may be displayed in retail environments. Similar legislation exists to restrict the sale of alcohol.

Proposals that advocate legislating to alter the market structure to improve nutrition and curb obesity have been put forward in many countries (e.g., Glanz *et al.*, 1995; Weiss, Hayne, & Smith, 2004; WHO, 2003c), including New Zealand. As price controls have proved to be a very successful measure for reducing cigarette consumption (Laugesen & Swinburn, 2000), health groups have suggested taxing energy-dense and high fat, sugar and salt foods (HFSS), or subsidising fresh produce, to reduce the price differential

between nutritionally poorer and better options (Diabetes New Zealand & Fight the Obesity Epidemic, 2004; Zimmet & James, 2006). Experimental research supports the price-elasticity assumptions underlying this proposal; a purchase simulation experiment demonstrated increases in the price of high energy-dense foods reduced purchases, and reductions in the price of low energy foods increased purchases (Epstein, Dearing, Paluch, Roemmich, & Cho, 2007).

Regulatory frameworks that set product standards are already in place to protect consumers from food-related risks such as chemical or pathogenic contamination, and these could be extended to control production standards for less nutritious, energy-dense products. Food Standards Australia New Zealand (FSANZ) is a trans-national body that administers the Food Code (FSANZ, 2006a), which, among many other things, prescribes what substances (such as pesticides or additives) may be present in foods and at what tolerances. In addition to regulating chemicals traditionally associated with food safety, some governing bodies are considering regulations to limit the presence of unhealthy ingredients in foods. For example, the New York City Health Department changed its health code to phase out trans-fats from production and cooking of food sold in restaurants and other food service outlets (New York City Department of Health and Mental Hygiene, 2006); there have been calls for similar action in New Zealand and Australia (Johnston, 2006; Ponniah, 2006).

For several years, researchers have investigated the types of food marketing communications directed at various audiences, in particular those aimed at children and adolescents (Dalmeny *et al.*, 2003; Dibb & Castell, 1995; Dibb & Gordon, 2001; Hammond, Wyllie, & Casswell, 1999; Kaiser Family Foundation, 2004; Majoras *et al.*, 2006; Morton, 1990; Taras & Gage, 1995). These studies find that sophisticated methods are used to target children directly and encourage them to request specific, often energy dense, food and beverage products – using methods such as free gifts, movie tie-ins (both themed advertisements and give-aways), celebrity endorsement, product placement in television and movies, and setting up branded interactive websites.

In addition to cataloguing the types and methods of communications and their audiences, other researchers sought to determine whether marketing communications contribute to unhealthy weight gain (Borzekowski & Robinson, 2001; Eagle *et al.*, 2004; Galst & White, 1976; Gamble & Cotugna, 1999; Halford, Gillespie, Brown, Pontin, & Dovey,

2004; Hoek & Gendall, 2006; Kotz & Story, 1994; McLellan, 2002). Some authors argue that the effects of these communications are limited to altering market share, by encouraging consumers to switch between brands but not changing the rate at which they shop within the product category. Others conclude that these marketing campaigns increase category spend as consumers are encouraged to purchase more frequently, by altering perceptions of what a normal diet looks like and using behavioural rewards to change purchase habits.

After reviewing studies that examined factors contributing to obesity, WHO (2003a) experts concluded that the balance of evidence suggested a probable causative link between heavy marketing of energy-dense and fast-foods with unhealthy weight gain. Systematic reviews have also reached the same conclusion (Hastings *et al.*, 2003; Institute of Medicine, 2005). This has fuelled calls for restrictions to be placed on the marketing of HFSS foods, including banning food advertisements directed to younger audiences (Fight the Obesity Epidemic, 2006; Powell & Longfield, 2004), and placing restrictions on the types of promotions used to encourage sales of such foods (Hoek & Gendall, 2006).

However, legislators have been reluctant to enact laws that limit food marketers' freedom to market or would modify the food supply. Instead, they have called on industry to make these changes voluntarily (Hodgson, 2006a). Many food companies are beginning to make some changes to their product ranges through reformulation and the addition of new “better-for-you” lines, and some of the larger companies have announced new policies on marketing practices to encourage responsible choices (see FIG, 2006b; 2008).

Despite denying that marketing contributes to obesity, the food industry has responded with self-regulatory initiatives that circumscribe promotional activities (CIAA, 2007; Coca-Cola Amatil NZ, 2006a; Majoras *et al.*, 2006). For example, major New Zealand beverage suppliers negotiated a timeline to remove sugared soft drinks from schools – a marketing solution. Having pre-empted regulation, the managing director of Coca Cola stated: “We now expect the debate to shift to areas which will have a much greater reduction on obesity levels – such as *education* about eating for healthy lifestyles, increased physical activity and balanced food choices” (Coca-Cola Amatil NZ, 2006b, emphasis added). Much of the policy debate in New Zealand and Australia on how to

improve consumers' food selection remains focused on education programmes and the provision of information in a minimally regulated environment.

2.5.3 Promises: Educating to Change Behaviour

The theme of reversing obesity with education has also been developed by the New Zealand Food Industry Group (FIG), which was established in 2004 to represent food manufacturers and retailers, and the marketing and media industries that work with them. The FIG argue that obesity is a complex multifaceted issue (FIG, 2006b), that food marketing has little direct influence on behaviour (FIG, 2006c), and that individuals are responsible for managing their own diet and weight (FIG, 2006d). To support consumers as they assume this responsibility, FIG members have offered to provide education and information programmes that will inform consumers' dietary choices and thus reduce the burden of obesity (FIG, 2005; 2006b; Irwin, 2005b).

Education interventions seek to impart new knowledge, but lacks the explicit exchange that is central to a marketing transaction: "...*education* refers to messages of any type that attempt to inform and/or persuade a target to behave voluntarily in a particular manner but do not provide, on their own, direct and/or immediate reward or punishment..." (Rothschild, 1999, p. 25). The logic underpinning education strategies is that consumers are self-interested, and will use new information in a rational manner to inform their decision making to attain the best outcomes for themselves and their families over the long term (Lynch & Wood, 2006). Policies designed to provide consumers with access to better information are a common type of education intervention, and Helweg-Larsen and Collins (1997) summarise the reasons why education is a popular intervention:

There are a number of philosophical and practical reasons for using information-based approaches to changing health-related behavior. The idea that people will change their behavior when they are informed about the logic of doing so is consistent with the Western worldview, which places individualism, enlightenment, and reason at the center of its value system. Knowledge-based behavior change is, in theory, internalized. Thus, the new behaviors will last longer, display a greater resistance to extinction, and generalize across more situations than will new behaviours arising from other

forms of social influences (e.g., reward, coercion, and compliance with authority figures) (p. 23).

Education programmes are arguably the easiest form of intervention to introduce and least likely to be met with resistance from key stakeholders or the general public, therefore the development of these is likely to continue (Seiders & Petty, 2004). However, education is viewed as a weak and superficial public health intervention (Rose, 1992), as it does not manipulate the consequences of various actions and often achieves disappointing results. For example, a review of government sponsored nutrition education in the United States concluded that it had no tangible effect on the eating behaviour of children, even though attitudes towards fruit and vegetable consumption improved (Mendoza, 2007).

Two high-profile diet and health-related education programmes related have existed in New Zealand for several years – ‘5+ a day’ and ‘Push Play’ – and these provide further evidence for the weak efficacy of education campaigns. The 5+ a day programme, launched in 1994, aims to promote consumption of at least two servings of fruit and three servings of vegetables every day. Push Play encourages New Zealanders to do a minimum of 30 minutes moderate activity most days. The messages in both campaigns are promoted through integrated advertising, an annual month long campaign, and online.

Both programmes have arguably had limited success in changing people’s behaviour even though cognitive measures such as attitudes, beliefs, and intentions have shown marked improvements. Knowledge of the 5+ a day message is very high (Ashfield-Watt, Stewart, & Scheffer, 2004), but even self-reported fruit and vegetable consumption (which is likely to be inflated by social desirability bias) suggests the proportion of people whose behaviour fits the recommended pattern is much lower (Mann, Parnell, Wilson, & Scragg, 2004). Similarly, between 1999 and 2002, knowledge of the Push Play exercise message doubled, recognition of the logo trebled, and the number of people stating an intention to become more active increased from 1.8 to 9.4 percent. However, there was no sustained increased in physical activity among New Zealand adults during this period (Bauman *et al.*, 2003; see also McClean & Teague, 2004). So while consumers’ knowledge of the recommended behaviour increased for both

campaigns and led to greater intentions to adopt recommended behaviours, this did not translate into actual behavioural change.

As outlined in §2.5.1, marketing initiatives deliver additional incentives to act in a timely manner, whereas education offers only a promise of potential future payback (often weakly stated), perhaps many years away. For example, educational messages in the 5+ a day campaign inform consumers that eating fresh produce *may* provide ‘health benefits’ and ‘protect against aging’, which are unquantifiable and distant prospects that are unlikely to outweigh the immediate sensory gratification or costs associated with other food choices. Furthermore, education messages often encourage people to make voluntary sacrifices by forgoing the less healthy but immediately rewarding choices without substitution or perceptible gain (Rothschild, 1999). For example, consumers often believe that foods’ tastiness and healthiness are negatively correlated, and therefore perceive healthier choices as less appealing because they will not taste as nice as other options (Raghunathan, Walker Naylor, & Hoyer, 2006). Thus, choosing healthier foods may be associated with sacrificing immediate sensory satisfaction for a somewhat vague and distant reward of reduced disease risk.

However, researchers have found a positive correlation between health knowledge and the use of nutrition information and product health claims, which ostensibly suggests that education programmes may encourage consumers to scrutinise their purchase options more carefully (Szykman, Bloom, & Levy, 1997). The food and advertising industries cite lack of adequate nutritional education as a causal factor contributing to unhealthy diets and weight in New Zealand (FIG, 2006a), and therefore strongly support increased nutrition education and consumer-friendly point-of-purchase information. This stance is somewhat supported by a recent literature review, which indicates that New Zealand and Australian consumers do not use the Nutrition Information Panel (NIP, see Figure 7 in §4.2.1) to inform food purchasing decisions, as they find it confusing and difficult to interpret (Ni Mhurchu & Gorton, 2007).

The FIG (2005; 2006b) suggests that increased consumer education and enhanced access to nutrition and health information on the front of food packaging would assist people to improve their diets and manage their weight to prevent obesity (FIG, 2005). In both New Zealand and Australia, food industry representatives support the widespread adoption of a consistent front-of-pack nutritional labelling that communicates how

products fit with recommendations for nutrient intake, the Percent Daily Intake (PDI) labelling scheme (AFGC & NZFGC, 2008; FIG, 2006b). However, stakeholders from public health and consumer groups have expressed concern that this format is too complex to serve as a useful educational tool.

As Petty, Barden and Wheeler (2002) note, many researchers have concluded that simply increasing knowledge is not enough to induce behaviour change. For example, an in-store nutrition education experiment by Jeffery, Pirie, Rosenthal, Gerber and Murray (1982) produced significant improvements in nutrition and diet-disease knowledge among consumers exposed to the intervention, but this was not reflected in their food purchase patterns. Rothschild (1999) discusses the effect that competition and choice variety have on consumers' behaviour, which may explain why, when education improves knowledge, it does not necessarily result in healthier actions:

When competition is passive, education may be sufficient; as the competition of other behavioral options, or of apathy, intensifies, a more obvious exchange will be needed, and marketing should be called on. As the power of the alternative behavior choice intensifies even more, marketing no longer will achieve the desired result, and the force of law will become appropriate (Rothschild, 1999, p. 33).

To assist policy managers contemplating which intervention to use, Rothschild (1999) integrated his framework with MacInnis, Moorman and Jaworski's (1991) work and created a prescriptive grid that linked interventions to situations. The variables that mediate behavioural action and determine the likely success of the three types of intervention are discussed in the following section.

2.5.4 Variables that Mediate Behavioural Action

As noted earlier, Rothschild's (1999) framework can be ordered along a 'remedies continuum' from least to most restrictive in terms of freedom of commercial speech and consumer choice. By using the least restrictive form of intervention according to the needs in the situation, regulators can balance freedom of choice with the responsibility of preventing harmful or unwanted externalities. Rothschild concluded the literature shows three variables mediate consumers' predisposition to change their behaviour: motivation, ability, and opportunity (MAO). To simplify categorisation, consumers are grouped

according to binary yes/no classifications, and different combinations classify people as inclined, resistant or unable to change (see Table 3). This analysis clarifies the interventions that are most appropriate, depending on the initial MAO state.

Table 3 – Typology of circumstances in which to use Education, Marketing, or Law

Motivation					
Yes			No		
Opportunity					
Yes		No	Yes	No	
Ability	Yes	① Prone to behave <i>Education</i>	② Unable to behave <i>Marketing</i>	③ Resistant <i>Law</i>	④ Resistant <i>Marketing, Law</i>
	No	⑤ Unable to behave <i>Education, Marketing</i>	⑥ Unable to behave <i>Education, Marketing</i>	⑦ Resistant <i>Education, Marketing, Law</i>	⑧ Resistant <i>Education, Marketing, Law</i>

(Rothschild, 1999, p. 31)

Motivation, Ability, and Opportunity to Act

Motivation has often been defined as goal-directed arousal, and focuses on an individual's willingness to perform a specified behaviour (Moorman & Matulich, 1993). Many psychological theories are based on the assumption that individuals are motivated to achieve consequences that serve their self-interest (Rotter, 1954), and will therefore engage freely in actions that enhance wellbeing. However, these benefits need to be visible, highly probable, and experienced soon to have a motivating effect – health benefits from preventive actions often fail to meet these criteria (Rose, 1992). Consumers are only likely to complete an action that produces desirable consequences, particularly in the short-term due to a tendency to prefer "...smaller but sooner rewards (SSRs) over larger but later rewards (LLRs)" (Foxall, 2007, p. x). Consequently, people are not commonly motivated to act in ways that require short-term sacrifices to achieve

long-term benefits (Ellen, Bone, & Wiener, 2003), a situation that characterises health behaviours such as prudent dietary choices and exercise regimes.

Motivation is a ‘hygiene factor’: necessary, but not sufficient. People typically require access to certain resources and a minimum level of skill or proficiency to complete a given action (Moorman & Matulich, 1993), thus natural or acquired abilities also mediate behaviour change attempts. That is, consumers need to have a sufficient knowledge structure in order to process and interpret information intended to affect their behaviour (MacInnis & Jaworski, 1989). Perceptions of self-efficacy also affect attempts at behaviour change (Bandura, 1977); when consumers perceive they lack ability they are deterred from trying, which manifests as reduced motivation.

However, even high motivation and ability levels are not enough to facilitate action if the environmental circumstances are not conducive to change: opportunity is another prerequisite for encouraging behaviour change (Rothschild, 1999). The facilities and resources at consumers’ disposal either provide opportunities or create barriers to action. For example, availability of and access to recreation and exercise facilities, such as cycle-ways, footpaths, gyms, and swimming pools, is correlated with physical activity levels (Gordon-Larsen, Nelson, Page, & Popkin, 2006; Humpel, Owen, & Leslie, 2002). As Goldberg and Gunasti (2007) note, interventions to improve consumers’ motivation and ability to seek out more healthy food are worthless if access to better foods is limited. Distractions and time-pressure are two variables that researchers have identified as reducing people’s opportunity to engage with information (MacInnis *et al.*, 1991); when these are present, consumers are more apt to rely on the most readily accessible or interpretable information (Petty & Cacioppo, 1984b, 1986a).

As shown in Table 3, Rothschild (1999) states that the three intervention strategies will be more or less useful according to the target audience’s mix of motivation, ability and opportunity to act. Those seeking to modify behaviour can either determine where in the table consumers fall and tailor a strategy to that cell, or seek to influence consumers’ levels of motivation and ability, thereby making them more likely to respond to education or marketing interventions. For example, Rothschild suggests that when consumers lack motivation, it may be possible for education to slightly increase motivation by making some people aware of benefits that already exist but that they had not considered. Marketing can be used to increase consumers’ motivation by creating

new reinforcing consequences that accord with consumers' self-interested outlook⁶. However, when neither education nor marketing interventions can arouse consumers' motivation, then it will be necessary for regulators to use the law to enjoin change.

Likewise, some simple abilities may be acquired by consumers via education interventions, by teaching skills or providing knowledge that allows consumers to take advantage of existing opportunities. Marketing interventions may consider product usability and seek to modify the environment so that lower ability levels are not a barrier to change. When ability to process complex information is constrained by time, one option is to use stimuli that consumers can process quickly and holistically. Advertising researchers found that consumers can process visual information holistically and simultaneously, which suggests that "...low opportunity consumers can encode fairly complex feature interactions presented by a picture in little time" (MacInnis *et al.*, 1991, p. 39). When such tactics are employed, whether via marketing or legal interventions, environmental modifications create new opportunities without requiring changes in consumers' ability.

The food and media industries have argued that consumers "...want to make their own choices about what they eat and believe in being personally responsible for those choices" (FIG, 2006d, ¶ 4). This statement suggests the FIG believes consumers are motivated to look after their health and that of their families, and that this includes buying nutritious foods and eating healthy diets. Furthermore, consumers have the opportunity to do so because foods of differing nutritional profiles exist in the market place. However, a lack of quality information at the point of purchase means that many lack the ability to recognise which foods are better or differentiate between competing offerings within product categories, matching the situation in cell 5 in Table 3 (page 36).

Rothschild (1999) suggests that opportunities to act are a structural feature of the consumption environment, which is typically beyond the immediate control of individual consumers, but that can be provided through marketing or legal interventions. Conversely, motivation and ability are latent variables attributed to consumers' personal cognitive states and skill sets, and motivation, in particular, is determined by internal constructs such as beliefs and attitudes. The view that cognitive attributes such as

⁶ See <http://www.glucoboy.com/> for an example of a marketing solution designed to improve management of juvenile type 1 diabetes mellitus.

attitudes predict and explain why people behave as they do is a fundamental assumption underpinning dominant consumer behaviour theories, and is examined in the next chapter.

2.5.5 Summary

There are three broad interventions available to policy makers wishing to influence consumers' behaviour: marketing solutions based on exchange theory to shape behaviour; education solutions that inform people of options and consequences; and regulations that define acceptable behaviours and business practices. However, the different classes of intervention vary in effectiveness according to the specific characteristics of each problem, the choice environment and the target population. The type (or combinations) of intervention required in response to a given social problem depends on consumers' personal motivation and ability to change, as well as the opportunities to engage in healthy behaviours afforded by the choice environment. Food industry representatives argue that most consumers are motivated to make healthy choices but many are presently lack the ability to do so because information available at the point of purchase does not clearly identify the attributes of competing products. Thus, they regard enhanced information disclosures as the appropriate intervention solution.

2.6 Conclusions

Being overweight increases the risk of developing many serious diseases, and the increasing prevalence of obesity is an unsustainable trend in need of urgent remedy. The harmful consequences are not limited to those who become ill as a consequence of their weight, but extend throughout society. Externalities are initially borne by friends and families, but spread to the whole of society as ill health places health systems under increasing strain and creates economic inefficiencies.

While both energy consumption and expenditure contribute to weight status, evidence suggests that improving consumers' diets is very important. As officials are concerned particularly about preventing unhealthy weight gain in children, the role of parents has

attracted widespread comment. However, parents' ability to improve their children's diets is not straightforward.

Because the causes of obesity are complex, effective solutions to the problem of rising obesity rates will need to draw on all three strategic classes of intervention that Rothschild (1999) outlines. However, regulatory and marketing solutions have not been given as much serious consideration as consumer education in the debate about how to help people maintain healthy body weights. Furthermore, the likely effects of initiatives receiving some of the most attention have not been well researched.

Specifically, there is no evidence that the Percent Daily Intake food labelling scheme is superior to other label formats, such as the Traffic Light Label system supported by public health representatives, or that it has the potential to improve consumers' food selections. Applying Rothschild's analysis of social intervention effectiveness suggests that enhanced nutrition and health information disclosure will improve consumers' opportunity to identify the nutritional value of foods. But doubts remain about consumers' motivation and ability to use new information.

Support for further education and information disclosure interventions appears based on the premise that consumers seek to discover objective information about brands before making their choices, and can weigh costs and benefits that accrue across time periods and make appropriate choices that balance these competing elements. This view is logically aligned with traditional cognitive assumptions about behaviour. However, a growing body of evidence suggests consumers' purchase patterns are based on habits developed through reinforcing experiences; thus on-pack information may not be powerful enough to change established brand choice patterns. The next chapter reviews consumers' response to information disclosure remedies, how these types of policies influence the market, and what type of information is most effective.

3 Theoretical Perspectives on Consumer Response to Information Disclosure Remedies

3.1 Introduction

Considerable resources have been devoted to measuring, understanding, modelling and predicting human behaviour. The field of psychology pre-dates consumer research, and its theories have been borrowed extensively by consumer researchers seeking to predict brand choice behaviour, and more recently, adoption of pro- social, environmental, and health behaviours. The apparent complexity of human thought and behaviour encouraged psychologists to search for cognitive variables that determine how people behave, and the causal, moderating and mediating patterns between these (Foxall, 1980). Consequently, comprehensive explanatory models have been developed that include determinative cognitive processes, states and traits (e.g., Fishbein, 2003). Thus, a great deal of consumer research is founded on the view that marketers must understand what consumers think and feel about goods and services in order to explain overt behaviour (Foxall, 2005).

However, an alternative school of thought also exists; this places less emphasis on measuring and understanding mental processes in the study of actual behaviour (Foxall, 1980). Researchers who support behavioural explanations of action question the assumption that consumers actively perceive the external environment and assess those perceptions to form conscious intentions of how to act (Grant & Evans, 1994). Rather, behaviourists suggest action is cued and shaped by the environment, often with little conscious thought (Foxall, 1986b). A key difference between these schools of thought is that the behavioural paradigm examines external, observable variables, while the cognitive paradigm is grounded on internal, latent variables.

This chapter explains and critiques these paradigms; it first examines the dominant cognitive consumer behaviour literature, and then reviews the alternative behaviour modification perspective (BMP). Because consumers' attitudes towards marketed products, services or behaviours have received a lot of academic attention, attitude-based research is thoroughly examined. This review provides a framework for analysing

information-based interventions, such as changing the format of nutrition information and providing more detailed health claims, and explores the likely effects of these on consumption decisions. The previous chapter concluded with an overview of Rothschild's behaviour change grid, which uses consumers' motivation, ability and opportunity to act to identify appropriate interventions. The present chapter extends this overview by examining the dominant theories of consumer behaviour in the marketing and psychology literatures. Thus, this chapter explores how information disclosure interventions may affect consumers' food product evaluations and choice behaviours.

3.2 Cognitive Theories of Consumer Behaviour

Cognitive models assume consumers' beliefs and attitudes inform their intentions and thus behaviour, and place attitudes as precursors of behaviour (Eagly & Chaiken, 1993; Petty, Barden *et al.*, 2002; Petty, Priester, & Briñol, 2002). This paradigm has dominated marketing theory and practice (Bitner & Obermiller, 1985; Foxall, 1986b, 2002), and assumes that "...prepurchase attitudes are determinative and that behavioural change is a function of the antecedent modification of mental attitudes" (Foxall, 1984b, p. 73).

Reliance on this approach in the debate over obesity interventions is apparent from FIG reports and press releases, which imply that obesity rates will be reduced if consumers improve their 'lifestyle choices' (FIG, 2005; 2006b; 2008). They suggest changing consumers' attitudes as the mechanism for prompting a reduction in obesity. For example, the first two FIG Annual Reports state industry interventions will enhance "...public awareness of obesity issues and [bring about] changes in public attitudes and behaviours" (FIG, 2005, p. 7; 2006b, p. 4). Furthermore, the FIG assume that consumers actively make decisions about behaviours that affect health, and thus additional, or superior, information will change beliefs and prompt better choices. With specific reference to on-pack nutrition disclosures, the FIG notes: "... easily understood nutritional information on packaging can contribute to reducing obesity by giving customers *information to make better judgements* about their lifestyles" (FIG, 2006b, p. 18, emphasis added). This reasoning assumes that by altering shoppers' beliefs and attitudes towards products, public health improvements will follow because important inputs to decision making are modified.

3.2.1 Attitudes Formation and Importance

Aaker and Myers (1987) make explicit the perceived importance of brand attitudes when they describe these as “...the pillar on which the sales and profit fortunes of a giant corporation rest” (p. 160). However, although attitudes are held to be critically important to success, researchers have struggled to define attitudes or suggest how these should be measured (Zanna & Rempel, 2008). Early definitions stated attitudes comprised emotional, cognitive and behavioural dimensions that were enduring and closely related to behaviour (Bohner & Schwarz, 2001). Over time, the definition narrowed to the evaluative concept of “likes and dislikes” (Bem, 1970, p.14, cited in Schwarz & Bohner, 2001, p. 436). A more recent and commonly accepted definition is:

...an attitude represents an evaluative integration of cognitions and affects experienced in relation to an object. Attitudes are the evaluative judgments that integrate and summarize these cognitive/affective reactions (p. 347).

In addition, attitudinal judgements are thought to vary in strength and valence (from highly positive through ambivalence to highly negative), and can be held with varying degrees of certainty (from weakly to strongly held). Together, strength, valence and certainty are theorised to determine attitudinal stability over time, resistance to persuasion from counter-attitudinal messages, and behaviour toward the attitude-object (Crano & Prislin, 2006). The belief that: “...attitudes, in some way, guide, influence, direct, shape or predict actual behavior” (Kraus, 1995, p. 58) underlies marketers’ interest in attitudes and their desire to influence these as a means of shaping behaviour.

Although attitude research dominated social psychology research in the first half of last century (Tesser & Shaffer, 1990), disagreements over the definition of ‘attitude’ (Petty, Barden *et al.*, 2002; Petty & Briñol, 2008) led some to question the validity of attitude as a construct (Chaiken & Stangor, 1987; Petty, Unnava, & Strathman, 1991). However, the 1980s saw a resurgence of interest in the structure of attitudes and process of attitude change (Chaiken & Stangor, 1987) and a common theme became apparent: persuasion occurs when exposure to information communicated by others leads to attitude change (Gass & Seiter, 2004).

Many authors proposed theories to explain how and why people change their attitudes in response to new messages, but two dual-process theories, the Elaboration Likelihood Model (ELM, Petty & Cacioppo, 1981) and the Heuristic-Systematic Model (HSM,

Chaiken, Liberman, & Eagly, 1989), gained widespread acceptance among attitude change and persuasion researchers (Chaiken & Stangor, 1987; Crano & Prislin, 2006; Olson & Zanna, 1993; Tesser & Shaffer, 1990). The ELM (Petty & Cacioppo, 1981) is widely regarded as one of the comprehensive theories for understanding persuasion and attitude change processes (e.g., Gass & Seiter, 2004; Perloff, 2003), and is being more frequently cited in marketing literature (e.g., Chitty, Barker, & Shimp, 2008; O'Guinn, Allen, & Semenik, 2009). It also shares several important features with Chaiken *et al.*'s (1989) HSM.

3.2.2 The Elaboration Likelihood Model of Attitude Change

The ELM is credited with bringing together the principles of persuasion and attitude change from decades of research findings in a single theory (Booth-Butterfield & Welbourne, 2002; Petty & Briñol, 2008; Petty & Cacioppo, 1981, 1986a, 1986b; Petty & Wegener, 1999). It surmises that 'two routes to persuasion'⁷ (termed the 'central' and 'peripheral' routes⁸) exist and that the path taken affects both attitude stability and subsequent behaviour (Petty & Cacioppo, 1986a).

The difference between the two routes relates to the depth of issue-related thinking an individual engages in (Petty, Cacioppo, Strathman, & Priester, 1994); this is mediated by the individual's motivation and ability⁹ to think about the issue at hand (Petty & Wegener, 1999). However, the labels central and peripheral are not dichotomous, but are polar anchors on a processing continuum representing "...different degrees of elaborate information-processing activity" (Petty & Wegener, 1999, p. 42), and should not be thought of as mutually exclusive types of processing (Cacioppo & Petty, 1984). As Figure 4 depicts, the actual level of message processing may fall anywhere on the continuum and depends on each individual's level of motivation and ability to process the particular message.

⁷ The theorists who developed the ELM do not draw a distinction between the terms persuasion and attitude change, arguing that the fundamental processes underlying such cognitive changes are the same (Briñol & Petty, 2006).

⁸ These align with Chaiken *et al.*'s (1989) 'systematic' and 'heuristic' processing responses, respectively.

⁹ While Rothschild (1999) listed opportunity as a separate determinant of consumer behaviour, it is subsumed as a component of ability in the ELM (Petty *et al.*, 1991).

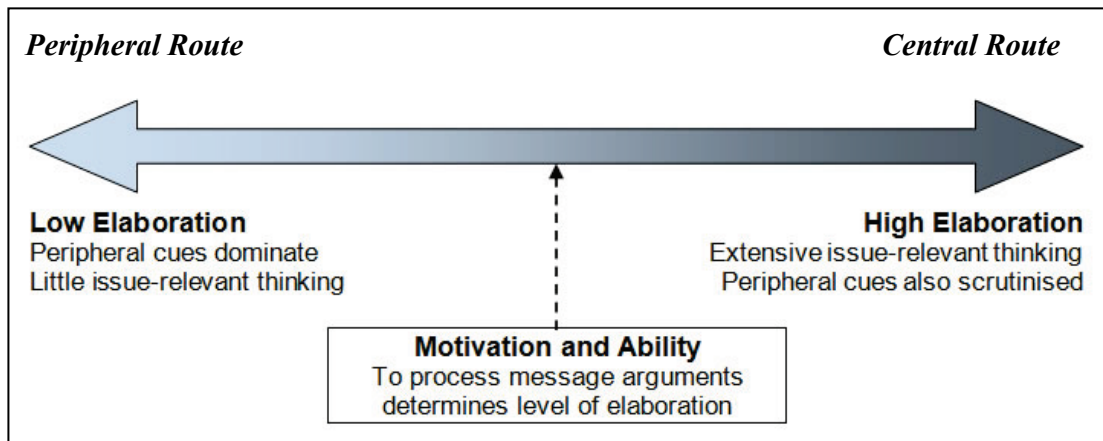


Figure 4 – Elaboration Continuum

(Petty & Cacioppo, 1986a; Petty & Wegener, 1999)

The Central Route to Attitude Change: High Elaboration

Central route processing occurs under conditions of high elaboration, when both motivation and ability to engage with the message are high (see Figure 4). Central processing entails thoughtful and careful consideration of the information presented in the message (Petty & Cacioppo, 1986b), its source and delivery, and involves personal variables such as emotions or prior beliefs (Petty, Rucker, Bizer, & Cacioppo, 2004). Elaborate thinking includes reviewing all relevant information and assessing whether messages are important, relevant and valid (Petty, 2004). Perceptions of personal relevance encourage elaborate processing; for example, Celsi and Olson (1988) found that consumers devoted more attention, applied greater cognitive effort, looked more at product relevant information, and engaged in greater elaboration when viewing advertisements for products they perceived as relevant to their needs or wants. The nature of possible consequences (i.e., favourable or not) and whether these will eventuate also affects the likelihood of central route processing strategies (Petty, 2004).

During central processing, people may generate alternative or counter-arguments that, if valid, would weaken the believability of a message (Petty & Cacioppo, 1986a). If people can generate many counter-arguments to a weakly supported message, then a boomerang effect may occur where attitude changes in the opposite direction from the intended persuasive appeal (Cacioppo, Petty, & Stoltenberg, 1985; Hamilton, Hunter, & Boster, 1993). Thus, while weak arguments may sway the attitudes of consumers

engaging in shallow processing (discussed in the next section), they have been shown to have an opposite effect among those scrutinising the messages more carefully.

There are two common misunderstandings regarding the central route. The first pertains to the objectivity or rationality of central processing. Petty and Cacioppo (1981) note the central route is often mistakenly presumed to equate with a rational decision making process, like the ‘economic man’ in classical economic theory (Simon, 1955). However, processing biases can affect message elaboration and so lead to conclusions unsupported by the message. For example, people may want to hold attitudes that seem right to them, which is not equivalent to wanting to discover an objective certainty. This bias may lead to incorrect interpretation of information, and thus may result in attitudes that are not well founded (see §*Postulates of the ELM*).

Another incorrect assumption about central processing is that consumers ignore situational cues and dismiss these as less relevant. Petty and Wegener (1999) stress that peripheral cues are often informative and may be used to infer an argument’s validity, although they may carry less weight under conditions of high elaboration (Petty, Barden *et al.*, 2002). Peripheral cues can still be important in situations where consumers engage in central processing, and could support more efficient decision making by directing consumers’ attention to specific message elements.

The Peripheral Route to Attitude Change: Low Elaboration

...it is neither adaptive nor possible for people to exert considerable mental effort in thinking about all of the messages and attitude objects to which they are exposed (Petty & Wegener, 1999, pp. 42-43).

While it may be desirable for people to think very carefully about some of the information received each day, people generally do not have the ability, inclination, or time to think critically about all decisions made or messages received (Petty *et al.*, 1994). Instead, people frequently behave as ‘cognitive misers’ and employ efficient processing strategies that enable them to respond to new information without engaging in detailed issue-relevant thought (Chaiken & Stangor, 1987; Tesser & Shaffer, 1990). This type of thinking is referred to as peripheral route processing, and occurs under conditions of low elaboration (Petty, 2004).

Under peripheral processing conditions, people evaluate just enough information to give them confidence that they can make a satisfactory decision (Wood, 2000). Therefore, some message content may be taken into account, but may be evaluated rather quickly; for example, consumers may rely on the first plausible piece of information, or the most easily understood details (Petty, 2004). Overall, less attention may be paid to the message itself and more paid to available peripheral cues.

A common family of peripheral cues are cognitive heuristics; these include the status or attractiveness of the message source (e.g., “experts can be trusted”), the number of statements supporting the argument (e.g., “length implies strength”), or perceived consensus on the issue (e.g., “trust the majority opinion”). While the HSM defines simplified processing as the use of cognitive decision heuristics, the ELM’s peripheral route includes a wider range of simplifying strategies (Chaiken & Stangor, 1987). For example, contextual cues may also permit peripheral processing through associations learned via classical or operant conditioning (Till & Priluck, 2000). People may rely on their mood or emotional responses to formulate their attitude (Petty & Cacioppo, 1986a), while perceived familiarity with the attitude-object or mere-exposure may also lead to positive inferences (Sawyer, 1981).

Peripheral processing tends to be used in situations where the consequences of a poorer decision are perceived as less important, or when resources to comprehend the information are insufficient (Petty & Cacioppo, 1986a). Consumers with low literacy skills are also more likely to rely on peripheral cues, because of the greater effort required to process more complex printed messages (Jae & Delvecchio, 2004). Although the peripheral processing route is more superficial, it is more economical and is frequently used in everyday tasks, such as shopping for fast moving consumer goods.

Motivation and Ability Determine Elaboration Level

According to the ELM, motivation and ability mediate the information evaluation process, determining whether consumers engage in higher or lower levels of elaboration. People are motivated to consider some issues but not others for reasons including personal relevance, issue involvement, accountability, subject knowledge, or ‘need for

cognition’¹⁰ (Petty, 2004). That is, people are likely to think more carefully about the merits of the message and undertake higher levels of elaboration when they perceive the message as personally relevant, know they could be held accountable for their attitudes and decisions, or if negative consequences may follow a poorly considered position. Conversely, information deemed irrelevant, or of reduced consequence, will not motivate elaborative thoughts. In short, variables that change consumers’ motivation to elaborate do so by affecting their conscious intentions regarding message processing (Petty *et al.*, 1994).

Even if consumers are motivated to engage in elaborate processing in a given situation, they may lack the ability to think carefully about the message for a number of reasons. Distractions impair consumers’ ability to devote mental resources to complex cognitions (Chaiken & Stangor, 1987; Petty, Barden *et al.*, 2002), so noisy or time-poor environments, such as supermarkets, are likely to permit only low levels of elaboration for many consumers (Rucker & Petty, 2006). A poorly conceived or incomprehensible message, limited subject knowledge, and failure to recall key information or arguments all reduce ability to elaborate (Petty, 2004; Petty *et al.*, 1994). Pre-existing knowledge enhances consumers’ ability to elaborate on new information. Highly knowledgeable consumers are able to integrate the message with existing beliefs, which augments their ability to elaborate and counter-argue; conversely, having limited knowledge makes message evaluation difficult (Petty *et al.*, 1994). In summary, ability is determined by whether a consumer has “...the necessary skills, knowledge and opportunity to evaluate the message” (Petty *et al.*, 1994, p. 120).

For obvious reasons, messages must be comprehensible. However, ability to understand a message may vary with intelligence, education and prior experience. Thus the notion of comprehension arises from an interaction between the characteristics of the message and the competencies of the audience. Message clarity influences reliance on peripheral cues; complex messages that require higher levels of ability, and possibly time, to process may push consumers towards relying on easily understood cues or heuristics (Hafer, Reynolds, & Obertynski, 1996). Hafer *et al.* (1996) confirmed what common sense suggests; people who do not understand complex elements of a message rely on peripheral cues to assess the validity of a message, but will use more thoughtful central

¹⁰ Some people demonstrate a personality trait of enjoying thinking about issues; they are described as being high in need for cognition (Cacioppo & Petty, 1982).

processing if the information is simplified and the less comprehensible elements removed. Time pressures also reduce consumers' ability to comprehend messages they may have been able to understand, if given more time. For example, Moore, Hausknecht and Thamodaran (1986) report that consumers relied on a peripheral cue (source expertise) when viewing advertisements presented at a rapid pace, while argument quality had a greater effect when presentation was slowed.

The flowchart in Figure 5 overleaf, taken from Petty and Cacioppo (1986b), summarises the attitude change process according to the ELM. It shows that level of elaboration depends on the receiver's motivation and ability to process the message; if either motivation or ability are low or absent, the level of elaboration will be correspondingly reduced and peripheral processing techniques will be employed (so long as cues are present). This is assumed to lead to peripheral attitude change, which is considered to be transient and weakly related to future behaviour. However, if receivers are both motivated and able to scrutinise the messages and contextual or situational factors, they will generate thoughts on the topic and develop stronger attitudes through central attitude change.

Postulates of the ELM

The development of the ELM was guided by seven assumptions about how people evaluate information and make decisions (see Table 4, page 51), some of which have already been discussed. The first, called the 'correctness postulate', maintains that people want to be correct in their attitudes, and therefore rarely intentionally seek to be biased. However, if motivation and ability are low, the evidential threshold for satisfying this desire reduces. This postulate does not mean that people's attitudes are always correct, but rather that they are not usually motivated to be biased.

The second postulate holds that elaboration is a continuous variable, from high to low (refer to Figure 4, page 45); variations in motivation and ability influence individuals' engagement in effortful processing. The third principle, the 'multiple roles postulate', is that different message, contextual and personal variables play many roles in persuasion. For example, an expert message source may function as a peripheral cue when the message topic is not personally relevant, or could encourage further investigation if the topic is relevant (Petty & Wegener, 1998).

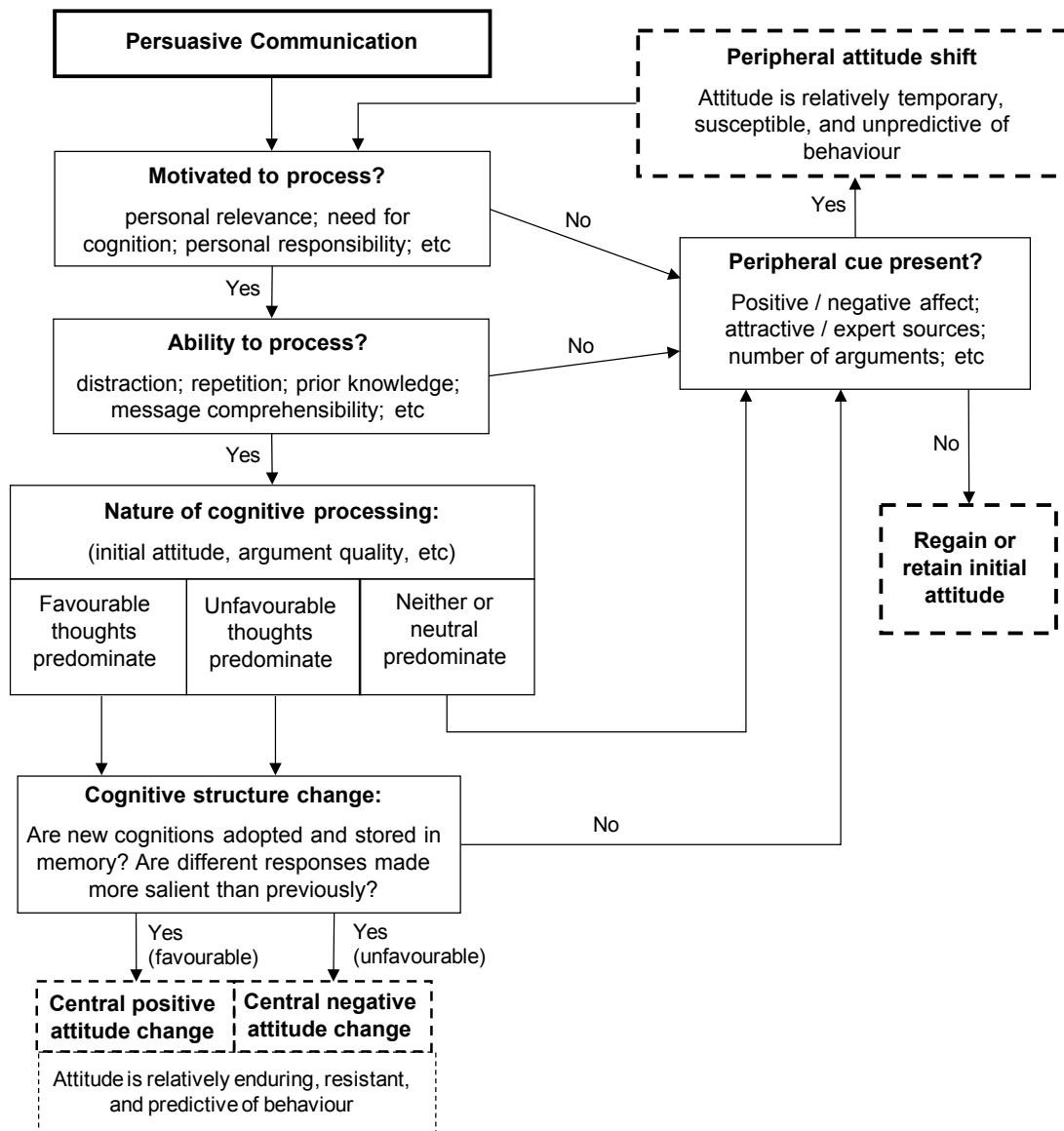


Figure 5 – Flowchart depicting ELM Persuasion Pathways
(Petty & Cacioppo, 1986b)

The fourth and fifth postulates relate to objective and biased processing, respectively. Objective processing refers to a desire to discover the truth, and use of available evidence without preconceptions or agendas (Petty *et al.*, 2004). When agendas influence processing, attitude formation is more likely to be biased and may occur when a recipient is highly involved in an issue (Tesser & Shaffer, 1990). If people have a reason or desire to hold particular attitudes, they may engage in biased processing to protect their interests. For example, people may interpret information subjectively or overlook aspects to avoid feelings of cognitive dissonance that would arise from complete and objective processing (Festinger, 1958).

Table 4 – Postulates of the Elaboration Likelihood Model of Persuasion

1	The <i>Correctness</i> postulate: People are motivated to hold correct attitudes.
2	The <i>Elaboration Continuum</i> postulate: Although people want to hold correct attitudes, the amount and nature of issue-relevant elaboration in which they are willing or able to engage to evaluate a message vary with individual and situational factors.
3	The <i>Multiple Roles</i> postulate: Variables can affect the amount and direction of attitude change by (a) serving as persuasive arguments, (b) serving as peripheral cues, and/or (c) affecting the extent or direction of issue and argument elaboration.
4	The <i>Objective-Processing</i> postulate: Variables affecting motivation and/or ability to process a message in a relatively objective manner can do so by either enhancing or reducing argument scrutiny.
5	The <i>Biased-Processing</i> postulate: Variables affecting message processing in a relatively biased manner can produce either a positive (favourable) or negative (unfavourable) motivational and/or ability bias to the issue-relevant thoughts attempted.
6	The <i>Trade-Off</i> postulate: As motivation and/or ability to process arguments decrease, peripheral cues become relatively more important determinants of persuasion. Conversely, as argument scrutiny is increased, peripheral cues become relatively less important determinants of persuasion.
7	The <i>Attitude Strength</i> postulate: Attitude changes that result mostly from processing issue-relevant arguments (central route) will show greater temporal persistence, greater prediction of behaviour, and greater resistance to counter-persuasion than attitude changes that result mostly from peripheral cues.

(Petty & Cacioppo, 1986a; Petty *et al.*, 2004)

The sixth postulate relates to the elaboration continuum, and is called the ‘trade-off postulate’. The trade-off is between central and peripheral processes. Under high elaboration conditions, central processing is more likely to dominate message evaluation, while under low elaboration the reverse is expected. This does not mean that certain variables are more or less important, but that they are processed differently according to the elaboration level. Petty *et al.* (2004) note that elaboration levels are frequently in the middle of the continuum rather than at the poles, so both central and peripheral processes are used together to varying degrees.

The final postulate is called the ‘attitude-strength postulate’. Across all persuasion attempts, some message recipients will rely more on peripheral cues and others on central processing strategies because of different elaboration levels, yet they may express similar attitudes (Petty *et al.*, 1994; Tesser & Shaffer, 1990). However, research conducted using the ELM and HSR frameworks suggests attitudes formed following central/systematic processing will exhibit four characteristics that differ from similar attitudes formed via peripheral/heuristic processing. High elaboration is thought to result in ‘stronger’ attitudes (Petty, Barden *et al.*, 2002; Petty, Haugtvedt, & Smith, 1995), which are characterised by being more stable over time, readily recalled, resistant to challenge from competing arguments and predictive of attitude-relevant behaviour (Chaiken & Stangor, 1987; Petty *et al.*, 1991; Petty & Wegener, 1999). It is not well understood why these apparent differences in attitude outcomes transpire (Petty *et al.*, 1994; Petty *et al.*, 1991), although strong attitudes are thought to be more easily retrieved from memory and so available to be drawn on in a wider range of situations (Booth-Butterfield & Welbourne, 2002). This postulate suggests that whenever possible, communication interventions intended to change behaviour should encourage consumers to use central processing. However, critics have long questioned whether central processing results in stronger attitudes that better predict behaviour (Bitner & Obermiller, 1985); these criticisms are reviewed in §3.2.3.

The ELM in Marketing Contexts

Many ELM studies conducted during theory development and refinement have used detailed verbal messages, delivered in either printed or aural formats, and administered to college students receiving course credits or remuneration for participation (Petty *et al.*, 2004). Furthermore, the research messages have typically involved themes uniquely pertinent to student populations, such as college policies requiring final-year comprehensive examinations or tuition fee increases. However, since the model was first proposed, consumer researchers have also examined the ELM’s applicability to marketing problems, particularly in advertising, which contains combinations of prose and pictorial information (see Petty *et al.*, 2004 for a citation list).

Advertisements often contain detailed brand-related messages as well as other cues amenable to peripheral processing (such as celebrity spokes-people, attractive or expert endorsers, music, colours, or imagery). In the case of marketing communications,

‘argument quality’ incorporates product attributes (Petty, Cacioppo, & Schumann, 1983), and desirable product features are seen as strong arguments for favouring a product, while less important attributes are considered weak arguments (Cole, Ettenson, Reinke, & Schrader, 1990; Petty *et al.*, 1983). Argument quality is also a measure of how well a product scores on an attribute comparison; a strong argument would be a high score on that attribute and a weak argument is a low score on the same attribute (e.g., digital cameras with resolutions of 14 megapixels versus 7 megapixels).

Less academic attention has been paid to the role of peripheral cues in decision making, despite the fact that marketers make extensive use of peripheral cues in brand promotions. The cues most often assessed in ELM marketing research are message-source manipulations (e.g., celebrity endorsers, attractive models) and the absolute number of arguments (e.g., many desirable attributes versus fewer) (Petty & Cacioppo, 1986a). The use of symbols, imagery, or other emotive contextual elements has been examined less frequently, perhaps because the ELM literature provides little direction on what other peripheral cues might influence consumers’ attitudes and behaviour. However, there has been some research into peripheral processing responses to cues contained in advertisements. Gorn (1982) demonstrated that likeability of music in advertisements affected respondents’ brand choice behaviour (measured by gift selection as a reward for participants), and he attributed this result to positive associations transferred via classical conditioning. In a second experiment, Gorn (1982) found that music in advertisements functioned as a peripheral cue under conditions of low personal relevance, but did not have a pronounced effect upon consumers with higher personal product involvement.

Pictures and graphics in advertisements can serve as either peripheral cues or arguments (the ‘multiple roles’ postulate), depending on their relevance to the promoted brand (Miniard, Bhatla, Lord, Dickson, & Unnava, 1991). For example, weight-loss product advertisements often show overweight ‘before’ photos next to slim ‘after’ photos, which serve as arguments for using the product. Conversely, advertisements featuring pictures of beautiful people who do not relate directly to any brand attributes may be processed peripherally. Miniard *et al.* (1991) reports that product-relevant images in print advertisements enhanced brand attitudes and purchase intentions while irrelevant pictures do not. However, another experiment showed that attractive pictures were used as peripheral cues when respondents had low brand involvement (Miniard *et al.*, 1991),

similar to Gorn's (1982) findings. Further research showed that attractive pictures increased respondents' brand preferences when product information suggested the choices were very similar; however, these images had no significant effect when one product stood out as superior (Miniard, Sirdeshmukh, & Innis, 1992). However, more recent research failed to find support for a hypothesis that a powerful visual peripheral cue, the Christian cross, improved attitudes towards an advertisement for consumers with low product involvement (Dotson & Hyatt, 2000).

Several social marketing and communication interventions have drawn on the ELM, as have health researchers. Briñol and Petty (2006) and Petty *et al.* (2002) listed health research questions to which the ELM has been applied. These included: AIDS prevention; improving prenatal and infant care; infection control; changing nutrition and dietary behaviours; improving cancer screening participation; and drug, tobacco, and substance abuse prevention/cessation. Rucker and Petty (2006) argue that using the ELM framework to create social marketing and public service announcements will improve the effectiveness of the communications. While Rucker and Petty (2006) note their analysis was limited to more substantive messages as they "...are most likely to benefit from an elaboration perspective" (p. 40), they also acknowledge that many consumers lack the motivation or ability to centrally process health and safety messages. As peripheral processing is common among recipients of health and safety messages, appropriate cues need to be available to consumers with low motivation or ability. However, there has been less empirical research investigating how to maximise communication effectiveness and encourage behaviour change with peripheral cues than with more complex messages.

Criticisms of the ELM

Several authors have suggested that the ELM has theoretical weaknesses that create practical difficulties when it is applied to real-world research questions. In particular, the model has low predictive power because of the 'multiple-roles postulate' and the need for *post hoc* reasoning to identify the level of elaborative processing respondents might have used when viewing a communication (Rucker & Petty, 2006). This is because the ELM theory does not give specific guidance on what message and contextual elements will serve as central or peripheral cues (Bitner & Obermiller, 1985),

only providing generic guidance about which messages will serve as convincing arguments or what peripheral cues affect attitude or influence behaviour.

Griffin (2006) and Booth-Butterfield and Welbourne (2002) note there is no *a priori* method for determining which argument will be more effective under central processing; instead, it is necessary for a range of arguments to be developed and then tested. This limits the chosen argument to the imagination of those who generated the initial list, relying on intuitions, personal judgement, and pre-testing, and may lead to a situation where the most effective argument is never considered. Petty *et al.* (2004) acknowledge that the only way to determine the final role of any given variable is to deduce it from the persuasion outcomes obtained. Therefore the model is based on a tautology: a strong argument is one that persuaded the listener, whereas one that does not achieve persuasion must, by definition, have been weak. This lack of theoretical specificity makes the model difficult to test empirically, and therefore falsify (Hamilton *et al.*, 1993; Mongeau & Stiff, 1993).

All theories of persuasion have at their heart the premise that stimuli invoke a cognitive change in consumers, and that cognitions are responsible for all observed behaviour changes. For example, Petty *et al.* (2002) state “Because attitudes are a primary determinant of behavior, attitude change can be a central focus of any health promotion campaign” (p. 84), therefore “The success of a persuasive attempt is then measured by assessing change in the attitudes targeted” (p. 72). Moreover, cognitive theories assume that consumers are aware of the change in their mental structures; otherwise they would not change their behaviour. However, Nisbett and Wilson’s (1977) critical review of the social psychology research literature cast substantial doubt on this second assumption, and consumers’ self-awareness remains questionable.

Although the ELM may be used to explain consumers’ cognitive responses to messages, social researchers need to predict how, if at all, those messages will ultimately influence behaviour. Despite this objective, most studies that use the ELM to design communications do not measure respondents’ behaviour (e.g., Garretson & Burton, 2005; Haugtvedt & Petty, 1989; Haugtvedt, Petty, & Cacioppo, 1992; Smith & Petty, 1996). For example, Lien’s (2001) review of ELM consumer advertising research was limited to drawing conclusions about “...effects on brand evaluations rather than on choice or behaviour” (p. 301), specifically because earlier research had focussed on

immediate cognitive responses rather than longer term outcomes such as behaviour outside the research setting. Rather, pre/post attitude measures are held to be reliable proxies for consumers' probable behavioural response because of the assumed causal relationship. Some studies have estimated behavioural intention in response to marketing communications (Cole *et al.*, 1990; Petty *et al.*, 1983); however, given the well-documented gap between intentions and actual behaviour, this is no substitute for attempts to estimate behaviour (Foxall, 1984a). Behavioural response remains the ultimate criterion for determining communication effectiveness, as knowledge of attitude change processes is only useful insofar as it actually predicts behaviour.

3.2.3 Do Attitudes Predict Behaviour?

“Because attitudes predict behaviour, they are considered the crown jewel of social psychology” (Crano & Prislin, 2006, p. 360).

While the predictive relationship between attitudes and behaviour is an assumption common to many social interventions, the evidence that persuasive communications affect attitudes and cause behaviour change is equivocal. Some studies support this relationship, but others do not (Lodish *et al.*, 1995), and in some cases undesired behaviour has even been observed to increase despite attitude change (e.g., Derzon & Lipsey, 2002). Forty years ago, Mischel (1968) and Wicker (1969) questioned whether attitudes cause behaviour; they conclude that attitude-behaviour correlations are typically low, rarely surpassing $r = 0.30$. More recent comprehensive meta-analyses of attitude-behaviours studies have confirmed that the relationship between attitudes and action is only moderate; Kraus (1995) reported an average correlation of $r = 0.39$ across 88 studies, while Glasman and Albarracín (1996) reported a correlation $r = 0.52$ over 41 studies. These analyses suggest that attitudes typically explain only a small proportion of variance in consumers' observed behaviour; furthermore, they do not indicate whether attitudes affect behaviour, or vice versa.

As the ELM theory outlines the process of attitude change, rather than the outcomes following attitude change, predicting and measuring behavioural consequences of persuasive attempts has not been a research priority. The assumption that attitudes may predict behaviour, particularly if they were formed in response to elaborative processing, is evident throughout the ELM literature. Thus, a lot of ELM research in marketing and

psychology has proceeded on the assumption that strong attitudes predict consumers' purchase behaviour (e.g., Haugtvedt & Priester, 1997). Most studies investigating the ELM have only measured attitude change after exposure to a persuasive message and have not attempted to measure respondents' behaviour toward the investigated attitude object (or a proxy for it) at a later time. This may be because attitudes are viewed as an appropriate behavioural proxy, in line with the fundamental assumption that attitudes are important inputs to human behaviour (Cacioppo, Harkins, & Petty, 1981).

More recently, Petty and others have begun researching the effect of metacognitive processes on attitude change, and derived the 'self-validation hypothesis' (Petty & Briñol, 2008; Rucker, 2005). Petty and Briñol (2008) argue that attitude certainty is "one of the most essential dimensions of metacognitive thought" (p. 142), which is the confidence that someone has in the correctness of their attitude. Attitudes that are held with greater certainty are said to be more predictive of future behaviour (Gross, Holtz, & Miller, 1995). Thus, attitude certainty is expected to mediate the attitude-behaviour relationship (Gross *et al.*, 1995; Holland, Verplanken, & Van Knippenberg, 2002). Cacioppo and Petty (1984) give three reasons why strong attitudes are thought to be good predictors of actual behaviour:

- (a) people relate new information about the attitude object to their prior experiences and existing knowledge; this is thought to increase their confidence in using the new attitude to guide for behaviour;
- (b) the attitude will be more stable across time and remain accessible, thus increasing the chances that it will be accessed during behavioural decision making; and because
- (c) people are assumed to have considered how to respond to the attitude object during elaborative processing and so do not need to re-evaluate the attitude when deciding how to act.

Rucker and Petty (2006) assert: "A large body of research has demonstrated that high levels of elaboration are associated with attitudes that are more persistent, resistant, and predictive of behaviour" (p. 42). However, most evidence relates to the first two consequences – attitude persistence and resistance – rather than influence on overt behaviour. The evidence that strong attitudes cause observed behaviour is limited to a small number of studies in which responses to intention scales are regarded as behaviour (e.g., Fabrigar, Petty, Smith, & Crites, 2006; Petty *et al.*, 1983), thus inevitably

overestimating the relationship between attitudes and actual behaviour (see Ji & Wood, 2007).

In one study that did measure behaviour, Cacioppo, Petty, Kao and Rodriguez (1986) investigated the relationship between attitudes, voting intentions, and self-reported voting behaviour. They found a strong correlation between voting intentions and self-reported behaviour among participants with high need for cognition¹¹ scores ($r = .86$), but a significantly weaker correlation for respondents with low need for cognition ($r = .41, p < .01$). The authors attribute this difference to varying levels of elaborative processing undertaken between the two groups, as individuals with high need for cognition are believed to engage in thoughtful central processing and thus have stronger and more accessible attitudes.

Petty, Haugtvedt and Smith (1995) cite three studies as evidence that attitudes predict behaviour in some circumstances. Firstly, Sivacek and Crano (1982) found that ‘vested interest’ moderated the attitude-behaviour relationship; college students were more likely to exhibit behaviours consistent with their attitudes toward changing the drinking age or instituting comprehensive exams if the proposed changes affected them personally. The behaviours measured were signing a protest petition and volunteering to work to prevent the proposed changes. Similarly, Petty, Cacioppo and Schumann’s (1983) investigation of students’ responses to different print advertisements found that post-exposure attitudes were better predictors of intentions to purchase the advertised products under conditions of higher relevance. Finally, Shavitt and Brock (1986) used delayed participant gift selection as a proxy for purchase behaviour after viewing an advertisement for detergent. They reported that participants who viewed an advertisement under conditions of higher self-relevance (they were instructed to relate the advertisement to their own experiences) were more likely to select a sample of that brand as a gift one week later. While the first of these three studies involved behaviours that required some effort on the behalf of participants, the latter two are proxies that may not predict actual behaviour.

¹¹ Measured using the ‘Need for Cognition Scale’ developed by Cacioppo and colleagues, consisting of 18 items such as “I find satisfaction in deliberating hard and for long hours” and “I prefer to think about small, daily projects to long-term ones”.

Overall, the influence attitudes have on consumers' decision making and behaviour remains unclear (Ajzen, 2008). The literature reports inconsistent findings and, while some studies report identifying a strong causal relationship, others document only a weak correlation. Meta-analyses have reported that attitudes need to be held with greater certainty, consistency, accessibility, and stability, and be based upon direct experience with the attitude object before they explain a large proportion of variance in behaviour (see Glasman & Albarracín, 1996 for a review).

Despite the lack of clear evidence supporting a direct attitude-behaviour relationship, many researchers continue to argue that attitude change is an important and necessary first step in behaviour change (Briñol & Petty, 2006). Others offer explanations that support a relationship, despite the lack of evidence. Thus, Schwarz and Bohner (2001) conclude there are three plausible explanations for any observed attitude-behaviour consistency:

- (a) that the behaviour serves as an input into an attitude judgement, or
- (b) that the attitude guides the individual's behavioural decisions, or
- (c) that the attitude judgment and the behavioural decision are based on the same input information (p. 450).

Others suggest the low attitude-behaviour congruence may be due to a lack of specificity in the research questions used to measure attitudes and weak congruence between the measures of attitude used and the final behaviour that the attitude is thought to inform (Glasman & Albarracín, 1996). Ajzen and Fishbein (1977) had earlier delineated conditions that would increase the likelihood of high attitude-behaviour correlations: target, action, context, and time (TACT). However, critics note this high level of measurement specificity reduces the ability to generalise findings beyond the most narrowly prescribed conditions, and is far removed from typical marketing environments (Foxall, 1984a, 1984b). Foxall (2007) cogently argues that the need for high measurement specificity demonstrates the importance of situational determinants, which he suggests are causally related to behaviour and not mediated by attitudes stored in memory.

Although still widely reported, the role of attitudes in behaviour is far from universally accepted (Kraus, 1995). The confusion created by contradictory findings has encouraged researchers to explore alternative theories from the field of behavioural psychology, such as respondent and operant conditioning (Foxall, 1986a). The behaviourist paradigm

holds that overt behaviour and other observable phenomena are the appropriate objects of study, based on the assumption that consequences either reinforce or punish different behaviours and therefore increase or decrease the likelihood of behaviours recurring in the future (Skinner, 1987).

3.3 Behaviour Modification Theories of Consumer Behaviour

An alternative explanatory view of consumer behaviour is based on principles of behaviour modification found in the learning theories of classical and operant conditioning¹². Internal mental states such as attitudes are said to be unnecessary for an analysis of behaviour (Skinner, 1953). Thus, while the ELM assumes that peripheral cues influence behaviour by first changing attitudes (Rucker & Petty, 2006), many theorists believe an alternative explanation is possible (Nord & Peter, 1980; Peter & Nord, 1982; Rothschild & Gaidis, 1981). Foxall (1984a; 1986a; 1986b) argues that consumers' choices can be explained exclusively by environmental stimuli, including antecedents and consequences following behaviour, without relying on cognitive causal pathways. Behaviourists suggest attitude changes are cognitive responses that occur simultaneously with overt behaviour, triggered by environmental stimuli. Thus, cognitions are not causative, but are parallel processes known as 'epiphenomena' (Keil & Wilson, 2001).

3.3.1 Cognitive Variables in Behavioural Research

Skinner was a founding figure in the field of 'radical behaviourism', which he described as restoring a sense of balance between 'mentalism' and 'structural behaviourism' (Skinner, 1974). Mentalists relied on introspective enquiry and ignored the environment and external events, while structural behaviourism rules out private mental events because they cannot be directly observed by a researcher. Radical behaviourism argues that cognitive responses are a class of behaviour that can be perceived by the individual and therefore can act as cues to behaviour. Like overt behaviour, cognitive behaviours also result from environmental stimuli. However, behaviourism questions whether these

¹² The terms respondent or Pavlovian conditioning are sometimes used in place of classical conditioning, and operant conditioning is also referred to as instrumental conditioning.

private sensations are always the causes of observed behaviour. Skinner considered that treating private thoughts as explanations for observable behaviours required belief in an internal agent: “The inner man wills an action, the outer executes it ... The inner has the impulse which the outer obeys” (Skinner, 1953, p. 29).

Research shows that consumers often do not have clear reasons that support their attitudes (Wilson, Dunn, Kraft, & Lisle, 1989), and may not be able to access their thoughts reliably when making decisions (Nisbett & Wilson, 1977). Nevertheless, the fact they still act confidently and generally competently questions whether cognitions are important inputs into behaviour. Furthermore, behaviourism questions whether researchers can accurately record participants’ private thoughts (e.g., Uttal, 2000). As Bogart (1967) noted, opinion¹³ research “...forces the crystallisation and expression of opinions where there were no more than chaotic swirls of thought” (p. 335). This suggests responses to attitude questions may not be accurate or useful and may be only temporary constructs generated in specific contexts rather than stable entities that can be retrieved from memory as necessary (e.g., Schwarz & Bohner, 2001). The unexplained but often observed divergence between implicit and explicit measures of attitude¹⁴ also suggests that attitude research may produce unreliable results (e.g., Payne, Burkley, & Stokes, 2008).

A substantial body of consumer research suggests situational factors and past behaviour are better predictors of future behaviour than self-reports of internal mental states such as attitudes (e.g., Ajzen & Madden, 1986; Ehrenberg, 1997; Foxall, 1984b). For example, in a study of class attendance, Ajzen and Madden (1986) found the single best predictor of future attendance was past class attendance. Attitude-behaviour correlations are much stronger when the consumers’ attitudes are based on direct product experience rather than ‘second-hand’ sources such as advertising (Alba, Hutchinson, & Lynch, 1991; Fazio & Zanna, 1978b). Fazio and Zanna (1978a) examined which attitude characteristics improved attitude-behaviour consistency by testing undergraduate

¹³ The term ‘attitude’ is easily substituted here.

¹⁴ Explicit attitude questions that ask respondents to report their attitudes on a questionnaire are the traditional method for gauging attitudes. This technique may be prone to social desirability bias or deliberate response editing. Implicit measures use performance on other tasks to measure attitudes discretely, masking the true nature of the research; examples of implicit tests can be viewed online at <https://implicit.harvard.edu/implicit/>.

students' attitudes towards participating in future psychological faculty research projects, and tracking actual behaviour. Many students sampled had the opportunity to participate during the previous year, so data on past behaviour were able to be collected. The pattern of results showed graduated levels of correlation between attitudes based on past behaviour and willingness to participate in the future; attitudes of students with the highest past participation experience correlated most strongly with future behaviour ($r = 0.42$), moderate experience levels produced a lower attitude-behaviour correlation ($r = 0.36$), while no attitude-behaviour correlation existed in the group with no previous participation experience ($r = -0.03$). The authors concluded "...the present findings are supportive of a model which hypothesizes that direct experience produces a well-defined and certain attitude. These characteristics, in turn, enhance that attitude's capacity to predict later behaviour" (Fazio & Zanna, 1978a, pp. 404-405).

Evidence has also shown that attitudes towards brands change over time, and that the change is related to past behaviour (Barwise & Ehrenberg, 1985; Castleberry & Ehrenberg, 1990). When re-interviewed, about half of consumers changed their responses to 'evaluative' attitudinal questions, such as whether a brand 'tastes nice' or is 'good value for money', so that their opinions differed from those initially expressed to the researchers (Castleberry, Barnard, Barwise, Dall'Olmo Riley, & Ehrenberg, 1994). These findings suggest that consumers' attitudes towards brands fluctuate over time, and support the epiphenomenal notion that attitudes are simply redundant re-descriptions of environmental factors (Skinner, 1953). However, this knowledge has not forestalled marketing managers' attempts to persuade consumers to view their products as desirable in order to promote brand loyalty.

These findings link logically with results from meta-analyses (e.g., Glasman & Albarracín, 1996; Kraus, 1995) and suggest the chain of causation is:

past behaviour → attitude → future behaviour

'Occam's Razor' thus suggests that the most parsimonious explanation is simply that 'past behaviour predicts future behaviour', particularly when the context is stable and opportunity to act is more frequent (Ouellette & Woods, 1998). Finally, the behaviourist paradigm can account for new behaviours that seemingly have no history of reinforcement, as truly novel behaviours are in fact very rare; most 'new' situations are

somewhat similar to previously encountered situations that have a contingency history, and therefore prior learning can be generalised to the new context. Theories of behavioural learning, particularly operant conditioning, offer simple explanations of how previous behaviour affects future behaviour.

3.3.2 Behavioural Learning Theories

A small subset of behaviour is spontaneously elicited without any conscious control or deliberate action; for example, a foreign object or puff of air (unconditioned stimulus) touching the eye's surface will elicit blinking (unconditioned response). If a specific stimulus, such as a tone (conditioned stimulus), is repeatedly and temporally paired with a puff of air to the eye, then the tone itself will come to elicit the eye-blink response (conditioned response). This process is called classical conditioning, and occurs when stimuli that an organism has no control over elicit automatic, reflexive behaviours. Flavour aversion following food poisoning, or during chemotherapy, is a common example of classical conditioning. However, although behaviour may be learned through this process, behaviourists recognise that most human behaviour is learned via an alternative process called operant conditioning.

Actions are usually undertaken purposefully to achieve specific goals or objectives (rather than being reflexive or subconscious). Therefore, the stimuli individuals encounter is often a direct consequence of their behavioural choices (Domjan, 2003). In most situations, a person can perform a range of alternative behaviours; the consequences of the chosen action determine the probability that behaviour will be repeated in a similar future context. Receiving an appetitive (pleasant) stimulus that increases the likelihood of the behaviour re-occurring is called 'positive reinforcement', while 'punishment' occurs when an aversive (unpleasant) stimulus follows and decreases the probability the behaviour will be repeated in those conditions that evoked the negative consequence. The basic premise of operant conditioning is that behaviour is controlled by its consequences (Domjan, 2003).

Stimulus Control, Discriminative Stimuli, and Rule-Governed Behaviour

According to the behaviourist paradigm, most behaviour is under stimulus control. This does not mean that consumers are compelled to behave in any way, but that certain

stimuli trigger specific responses because of a history of conditioned reinforcement (Baum, 2005). For example, people stop their cars when they approach a red traffic light, but continue through when the light is green; the coloured lights are discriminative stimuli that guide behaviour, as they trigger associative knowledge of the consequences of driving through an intersection under the different conditions. Likewise, in a retail store, brands and their associated cues (i.e., name, colour, package size, price, shelf-placement, etc.) are also discriminative stimuli with conditioned histories of reinforcement (or punishment). When consumers see brands in a store, they will habitually select one that has proved satisfactory in the past by relying on discriminating stimuli, such as logos or other trademarks.

Even serious decisions about who to vote for in an election are influenced by environmental cues (Berger, Meredith, & Wheeler, 2006). Food consumption may also be cued by environmental variables. Wansink (2004) reports that packaging and plate size influence the volume of food consumed, and that people are cued to start and stop eating according to the television programmes schedules rather than perceptions of hunger and satiety.

Much of human behaviour is rule-governed, and people tend to comply with new rules because of past reinforcement for obedience and punishment for non-compliance (Baum, 2005). In behaviourist terminology, a ‘rule’ is an instruction that expresses the relationship between the antecedent (A) stimulus conditions, the behavioural (B) response options, and the consequences (C) following those actions (Grant & Evans, 1994). Actions taken at traffic lights are governed by rules: when a road traffic light is red (A), drivers know they are to bring the vehicle to a stop and wait for the light to change to green (B), to avoid being in a crash or potentially receiving an infringement fine (C). Legal and education-based social change interventions, introduced in §2.5.2 and §2.5.3, nearly always present rules explaining contingency relationships designed to change people’s behaviour – e.g., *“if you’re caught drink-driving, you’ll lose your licence”*, or *“quit smoking to avoid lung disease”*.

When rules are associated with immediate and powerful consequences, the likelihood of compliance increases (Grant & Evans, 1994). For example, not wearing sun protection in the middle of a hot summer’s day quickly results in painful UV radiation burns, as well as a long-term consequence of damaging genetic material potentially leading to skin

cancer. However, the $A \rightarrow B \rightarrow C$ conditions specified in a rule may sometimes be distant and cumulative. For example, it may take many years before a high energy, low nutrient diet results type 2 diabetes or heart disease (Grant & Evans, 1994). Therefore, the threat of poor-health is a weak and indirect consequence, and often ineffective at inducing compliance.

For rules to effectively govern behaviour, two types of reinforcement relations are necessary (Baum, 2005). First, there is the long-term relation, which is the overarching purpose of the rule (e.g., not developing a non-communicable disease). However, there must also be a short-term proximate reinforcing relation following delivery of the rule and attempts to comply; this short-term reinforcing consequence is often praise or social approval. Baum (2005) suggested that the reason smokers may not quit smoking even after being told it may lead to lung cancer is that they lack short-term reinforcement strong enough to overcome negative consequences of quitting. For this reason, effective behaviour change interventions are often designed to create short-term contrived consequences to make rules with distant consequences more effective (Grant & Evans, 1994). Marketing strategies and tactics, discussed in §2.5.1, often prove useful in this regard.

Habitual Behaviours

People often have several choices available to them at any one time. For example, in supermarket settings, consumers first choose the type of product to buy and then the specific brands in each category. Instead of making these choices anew on each shopping expedition, many purchases made in low-involvement markets become habitual choices that are automatically repeated on subsequent occasions (East, 1997; Ehrenberg, 1972; Ji & Wood, 2007). Consumer panel data collected in several countries has shown that shoppers routinely pick from brands in their ‘purchase repertoire’, which usually consists of between two and five brands for each product category. Consumers are rarely loyal to only one brand and tend to spread their purchases across brands within their repertoire, especially for frequently bought goods (Ehrenberg, 1972).

Habitual purchase patterns release consumers from the need to make decisions; recognising a brand that has satisfied in the past and purchasing this again expedites and simplifies shopping trips. Habitual choice can develop because tasks are routine and

frequent – consumers typically shop for groceries weekly and buy the same types of products repeatedly – and the context is relatively stable across purchase occasions (Ouellette & Woods, 1998). Furthermore, the consequences of a poor choice are perceived as relatively minor, so the costs of searching for the best product outweigh the benefits (Bettman, Johnson, & Payne, 1991).

Consumers rely on environmental cues to help them complete their purchasing; they may follow the same pattern around a store each time they visit it and use cues such as packaging colours or prices to recognise brands. Interventions designed to change habitual behaviours thus need to understand the contextual variables that maintain behaviours (Ouellette & Woods, 1998). As noted earlier, many researchers prefer cognitive explanations for consumer behaviour. Although it is known that past behaviour bears a strong relationship with future behaviour, some researchers hold that the relationship is spurious because the similar behaviours are caused by a more complex set of underpinning psychological variables (Ouellette & Woods, 1998).

But changing habits that are cued by stable environmental contexts is difficult with information alone, according to Verplanken and Wood (2006). They suggest that disrupted environmental cues make habits vulnerable to change. Therefore, the task for those seeking to influence consumers' habitual behaviours is to identify how contextual cues that automatically prompt actions can be changed to promote other options. Subtle changes, such as new information that requires effort to process, may not overcome long-term behaviours, since consumers with strong habits use less information to make a choice (Verplanken & Wood, 2006).

There are some parallels between the ELM and behaviourist perspectives. The ELM absorbs elements of behavioural learning theories under the peripheral processing part of the theory. However, when viewed through the ELM perspective, these behavioural processes are still presumed to influence attitudes. When viewed from a behavioural perspective, however, both unconditioned and conditioned stimuli are environmental variables that prompt or reinforce behaviour, and that do not require mediation by cognitive variables (cf. Till & Priluck, 2000).

Measuring and Predicting Behaviour

Much consumption-related behaviour can be directly measured by an observer, such as the path a shopper takes through a store, the products they examine, and opt to buy. Conversely, cognitive measures, such as beliefs about products reviewed and bought, can almost always only be accessed through introspective self-report¹⁵. Marketers typically want to understand buyer behaviour, so observational research can provide the sought after information without relying on cognitive proxies. Additionally, actions can generally be reliably and accurately measured by researchers, although care is needed to ensure that the research participants are not modifying their behaviour as a consequence of measurement.

The choice analysis literature has developed as researchers have sought to understand how people make choices and to predict future behaviour. When researchers observe the choices that people make in the real world, or gather self-reported current or past behaviour through surveys, 'revealed preference' data are collected. However, researchers often want to predict how people will respond to a new scenario that does not exist as a real-world option at the present time, and where therefore revealed preference data cannot be collected. Thus choice experiments are carefully contrived to understand how people will respond to new offerings. In these experimental situations, respondents are given two or more options to choose between (including not selecting any option), and 'stated preference' data are collected. Analysing stated preference data allows researchers to discover the influence of each attribute on people's choices in hypothetical situations. The advantages and disadvantages for revealed preference and stated preference research are outlined in Table 5.

While it is a criticism of stated preference choice experiments that it is difficult to forecast demand accurately, it is a highly useful technique for measuring the relative utility of attributes and attribute levels (Kroes & Sheldon, 1988). Thus, while it is less certain exactly how much a certain attribute will influence consumers' behaviour, it is possible to discover the relative importance of attributes, finding that one attribute has a greater effect on choices than another. This way, researchers can still understand how consumers' behaviour will change, if not exactly 'how much'.

¹⁵ As noted previously, implicit attitudes can sometimes be measured without self-report.

Table 5 - Advantages and Disadvantages of Revealed and Stated Preference Methods

Revealed preference	Stated preference
<i>Advantages</i>	
Collects data on actual choices made by people	Hypothetical scenarios can be investigated
Observed choices are bound by real world constraints, such as income and other trade-offs	Researchers can 'untangle' correlations between variables of interest
High reliability and face validity	Possible to collect 'no choice' responses
	Able to gain multiple observations for each respondent
	Research can be conducted quickly and more cheaply
<i>Disadvantages</i>	
Limited to collecting data on options that exist in real markets, cannot investigate novel choice sets	Choices are not necessarily bound by constraints that would apply in real world situations
Often a narrow range of attributes exist in real markets	Researcher must identify the salient attributes and attribute levels in advance
Attributes are often correlated in existing offerings, such as price and quality	Difficult to predict demand accurately
Often not possible to collect data on alternatives not chosen	
High financial and time costs	

(Adapted from Hensher, Rose, & Greene, 2005)

3.4 Conclusions

The ultimate purpose of information disclosure is to enhance consumers' ability to make good decisions. The cognitive paradigm emphasises consumers' ability to access information and form attitudes that guide conscious intentions on how to act. Attitudes are considered to be key inputs into decision and the Elaboration Likelihood Model (ELM) is a theoretical framework regarded by many as providing a reliable explanation of attitude change in response to persuasive messages.

The belief that attitude change is necessary to reduce obesity is evident in the debate over how consumers should be encouraged to make healthier food choices. The FIG argues that consumers are motivated to make healthy choices, but current labelling

regulations mean many are unable to recognise the contribution of food products to a healthy diet. They suggest the Percent Daily Intake (PDI) nutrition label and health claims will help remedy this situation. Theoretically, the ELM suggests effective nutrition information formatting will enhance consumers' ability to recognise how a food contributes to a healthy diet, and this will influence their attitudes towards foods available to them. This reasoning implies that consumers will have positive attitudes towards products shown by PDI information to fit their needs, and these positive attitudes will predispose consumers to buy those products.

The provision of on-pack product information can be viewed as a form of potentially persuasive communication. Its purpose is to influence consumers' perceptions and attitudes towards food products, informing their decisions on whether to purchase those items and how frequently they can be consumed as part of a healthy diet. Thus, label information is intended to modify behaviour by altering consumers' beliefs about product features, risks and benefits, and hence their attitudes toward purchasing those products. Rucker and Petty (2006) argue that the ELM is a superior theoretical framework to employ when developing communications to consumers to improve health related behaviours, as it provides evidence on what types of messages may work with different audiences. Furthermore, they assert that the ELM is not limited to understanding persuasion, but can be applied to just about any human judgement.

However, a behaviourist perspective suggests consumers' behaviour is largely shaped by their past experiences, which have produced purchase habits. Successive reinforcement following purchase has fostered development of a brand repertoire from which consumers routinely purchase to reduce the burden of choice that would otherwise face them. According to this model, consumers are likely to reach automatically for a familiar brand, or continue to use the same set of decision cues as always, and will pay little attention to unfamiliar on-pack information. This perspective suggests that any new information that is intended to alter established purchase habits would need to overcome choice inertia. As discussed, a lot of behaviour is rule-governed, and environmental cues that activate these rule-based systems may be strong enough to interrupt habitual purchasing patterns.

In addition, grocery shopping contexts suggest consumers will have a lower ability to deal with complex nutrition and health messages as they may be distracted by children or

other shoppers, be short of time, lack knowledge about how nutrients affect health, and the numeric or literacy skills required to process detailed nutritional facts. The situational factors thus imply that easily understood messages, such as those using heuristics or visual cues, may aid information uptake.

The cognitive and behavioural paradigms discussed in this chapter suggest that the addition of novel information to the shopping context could have quite different outcomes, and policy makers need to know what the likely consequences will be. The purpose of this research is to investigate how nutrition and health related information affects consumers' purchases, using these two alternative approaches.

4 On-Pack Nutrition and Health Information

4.1 Introduction

Food labelling is a tool that could potentially enable consumers to choose healthier foods and negotiate their way through today's 'obesogenic society' more successfully (UK Health Select Committee Report on Obesity, Department of Health, 2004, p. 25).

Nutrition information disclosures are part of consumer protection laws intended to facilitate informed choice. Most industrialised nations have codified information provision policies regarding food products, although requirements vary substantially across countries, with the United States historically having been at the forefront of food labelling legislation developments. Several researchers have observed that all information disclosure regulations assume that consumers will acquire, understand, evaluate, perhaps memorise, and then act upon the disclosed information (Hadden, 1991; Jacoby, Chestnut, & Fisher, 1978; Russo, Staelin, Nolan, Russell, & Metcalf, 1986). Russo *et al.* (1986) argue that there are costs associated with each of these stages that have implications for whether consumers will search for information prior to making a purchase decision.

As shown in the quote at the start of this section, politicians and health researchers from around the world have expressed optimism that enhanced food labelling may improve consumers' diets and health (Wilkinson & Marmot, 1998). Both industry and consumer stakeholder groups also view nutrition labels on packaged foods as a useful method of delivering timely information that may improve the quality of consumers' food choices. However, opinions differ on the best format for nutrition labelling and on the importance of other decision-influencing factors in the environment. Placing objective information on packages gives consumers access to facts at the point of decision making, but provides no guarantee that consumers' behaviour will be affected. As Taylor and Wilkenning (2008) note, regulators and researchers are "...becoming increasingly aware of the widening gap between having information about foods and possessing the ability or willingness to act on that information" (p. 437).

There has been a great deal of research into nutrition labelling, and this chapter reviews the extant literature. After briefly covering the history of nutrition labelling research and the current status of nutrition and health labelling, most of the chapter examines the factors that influences consumers' use of nutrition information. In addition to the role of opportunity, motivation and ability to use information, consideration is given to how information formatting directs consumers' attention. Knowledge of barriers to more widespread use of nutrition labels has enabled regulators and researchers to consider alternative formats, and evidence of these options' effectiveness is also discussed. The chapter finishes with a review of how manufacturers claims about products' nutrient content, and the health effects of these, influence consumers' perceptions and decision making.

4.2 Nutrition Information Labels

Researchers have examined consumers' information search, acquisition, comprehension, and label use behaviour across many domains. The traditional economic model of consumer decision making posits that individuals are rational actors: they try to obtain complete information, evaluate the costs and benefits associated with different product offerings, and maximise utility by choosing the option that has the highest payback (Bettman *et al.*, 1991). However, the lack of empirical support for this decision making process led to the proposition of 'bounded rationality' (Simon, 1955), which recognises that behaviour is limited by "...the structure of task environments and the computational capabilities of the actor" (Simon, 1990, p. 7).

The quest to influence consumers' purchasing behaviours for the better is not new. Research into the effect of nutrition labelling on consumer choice increased after the United States 1969 White House Conference on Food, Nutrition, and Health, when regulators were challenged to discover how to "...better inform the public of proper food buying and food consumption habits" (President Nixon, quoted in Woolley & Peters, n.d., p. 8). Early studies investigated whether consumers in the United States wanted nutrition information at the point of purchase; these found very high levels of public support, with around 90 percent of consumers stating they would use nutrition information if available (Daly, 1976; Jacoby, Chestnut, & Silberman, 1977; Schrayner, 1978).

The United States government introduced widespread compulsory, standardised nutrition and health information in the Nutrition Labeling and Education Act 1990 (NLEA; fully enacted in 1994)¹⁶. Regulators hoped the NLEA would achieve three goals: to help eliminate confusion by defining common nutrition claims; to provide consistent, useful information to improve consumers' choices; and to encourage manufacturers to improve individual products through reformulation (Petrucelli, 1996). The NLEA specifies that a Nutrition Facts Panels (NFP) must appear on most packaged foods sold in the United States (see Figure 6). The FDA claimed that this additional information would save billions in health care costs, as the rates of heart disease, cancer and high blood pressure would decline (Andrews, Netemeyer, & Burton, 1998).

Nutrition Facts	
Serving Size 4 oz. (113g)	
Servings Per Container 4	
Amount Per Serving	
Calories 280	Calories from Fat 130
% Daily Value*	
Total Fat 14g	22%
Saturated Fat 3.5g	18%
Trans Fat 2.5g	
Cholesterol 120mg	40%
Sodium 640mg	27%
Total Carbohydrate 13g	4%
Dietary Fiber 1g	4%
Sugars 0g	
Protein 24g	
Vitamin A 2%	Vitamin C 2%
Calcium 2%	Iron 6%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories 2,000 2,500
Total Fat	Less Than 65g 80g
Saturated Fat	Less Than 20g 25g
Cholesterol	Less Than 300mg 300 mg
Sodium	Less Than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

Figure 6 – An example of a Nutrition Facts Panel (NFP) from the United States of America

The NFP provides numeric information on the quantity of nutrients per serve, energy per serve (including calories from fats), and Percent Daily Value (PDV) of several nutrients supplied in one serve of a product, based on recommendations for an average person needing a 2,000 calorie diet. The NFP also lists total Daily Recommended Values for

¹⁶ Prior to the NLEA, nutrition information was only required if a claim about nutrition was made. The 'pre-NLEA' format contained less information than the Nutrition Facts Panel.

2,000 and 2,500 calorie diets at the bottom of the panel, so consumers can see how nutrient requirements differ for people who require higher energy diets.

4.2.1 Nutrition Information Labels in Australia and New Zealand

At the time the NLEA was enacted in the United States, nutrition information was not consistently made available in Australia and New Zealand. Like pre-NLEA America, simple nutritional information tables disclosing energy, protein, fat and carbohydrate content were only required if a nutrient content claim was made, such as ‘Low in fat’ (Rumble *et al.*, 2003). Scott and Worsley (1997) surveyed New Zealand consumers during this period, and found, like US researchers in the 1970s, that over 90 percent supported compulsory nutrition information on packaged foods. Furthermore, over half of their respondents claimed to look for some nutrition information often or always, even though it was only available on some products.

In the process of regulatory harmonisation with Australia, New Zealand developed more comprehensive nutrition labelling laws in the mid-1990s (Scott & Worsley, 1997). To inform policy development, the New Zealand Ministry of Health undertook qualitative investigations to explore consumers’ perspectives on food labelling (Patten, Hodges, & Lange, 1994). Patten *et al.* (1994) report that consumers did not use nutrition information as often as Scott and Worsley’s (1997) study indicated¹⁷; their results suggested that nutrition information was not influential in establishing a food’s value or quality. Furthermore, they noted consumers had difficulties comprehending nutrition facts, particularly technical terms and numeric information.

The manufacture and sale of food in Australia and New Zealand is now regulated by a trans-national statutory agency, Food Standards Australia New Zealand (FSANZ)¹⁸, via legal requirements established in the ‘Joint Food Standards Code for Australia and New Zealand’ (here-in ‘the Food Code’) (FSANZ, 2007a). An amendment to the Food Code increased access to nutrition information at the point-of-purchase by mandating a

¹⁷ Although Scott and Worsley’s (1997) article was published after Patten *et al.*’s (1994) report, Scott and Worsley collected their data in the early 1990s.

¹⁸ Formerly the Australia New Zealand Food Authority (ANZFA).

standardised Nutrition Information Panel (NIP, see Figure 7¹⁹) on all pre-packaged food; this requirement came into effect in December 2002 (FSANZ, n.d., subject to some exclusions)²⁰. The NIP must show the average quantity per serve and per 100 grams (or millilitres) of six nutrients and energy, as well as additional information for any substance for which a product claim is made (Curran, 2002). The European Union nutrition label format contains the same information in a similar format, with an additional row for fibre content (Cowburn & Stockley, 2003).

NUTRITION INFORMATION		
servings per package - 17		
average serving size - 30g (1 metric cup†)		
	quantity per serving	quantity per 100g
ENERGY	475 kJ	1582 kJ
PROTEIN	2.3 g	7.8 g
FAT		
- TOTAL	<0.1 g	0.2 g
- SATURATED	<0.1 g	<0.1 g
CARBOHYDRATE		
- TOTAL	25.1 g	83.6 g
- SUGARS	2.4 g	7.9 g
SODIUM	216 mg	720 mg

Figure 7 – Example of current Nutrition Information Panel (NIP) format

Although Patten *et al.* (1994) had recommended that nutritional information be conveyed with symbols or nutrient banding instead of numerically, the review that recommended the NIP format focussed numeric nutrient declarations (Rumble *et al.*, 2003). Overall, NIPs were intended to promote more informed consumer choice (FSANZ, 2003c) and allow consumers to choose foods so they could manage or prevent diet-related diseases (Rumble *et al.*, 2003). FSANZ (2002a) reasoned that for nutrition information to provide consumers with adequate information for making informed choices, it should be: (1) accurate; (2) easy to use; (3) non-confusing; and (4) useful in identifying food nutrient content and enabling comparisons between foods.

¹⁹ Minimum legal requirement shown. Other nutrients must be listed under specified circumstances, such as if a claim regarding their presence is made. A manufacturer may also choose to include extra nutrients in the panel, or include Percent Daily Intake per serve in an additional column.

²⁰ Exclusions apply to single ingredient foods (e.g., fruits, vegetables, meats), foods with negligible nutritional value (e.g., coffee, tea, spices), food in packages smaller than 10cm², and foods prepared for immediate consumption (e.g., from restaurants, takeaway stores) (Curran, 2002).

During consultation prior to development of the NIP, ANZFA heard arguments against compulsory labelling, including the claim that many consumers would not understand nutrition labels well enough to use them in decision making (Rumble *et al.*, 2003). At the time of the law change, regulators were aware that although 90 percent of consumers welcomed the new labelling rules, around 80 percent acknowledged they did not fully understand the new information (FSANZ, 2002b). Several years after the introduction of NIPs, many consumers still do not find the labels easy to use and are confused by them, reducing the likelihood that they will be able to make educated dietary decisions (Ni Mhurchu & Gorton, 2007). This finding is perhaps not surprising given earlier evidence that New Zealand consumers did not easily understand numeric information formats (Scott & Worsley, 1994). Furthermore, NIPs are not visible on shelved products and, because they are typically printed in a small font, they have poor ‘shelf salience’ (Levy, Mathews, Stephenson, Tenney, & Schucker, 1985).

Research conducted after the introduction of NIPs found that the majority of respondents thought NIPs were “fairly clear” (64 percent), but less than one third agreed they were “very clear” (30 percent); reasons for lack of clarity included the presence of vague or confusing terms, or insufficient detail (FSANZ, 2003a). Results from a survey of ACNielsen’s (2005a) online New Zealand consumer panel found that 61 percent of respondents claimed to “mostly” understand food labels, a further 36 percent stated they understood nutrition labels only “in part”, while three percent stated they did not understand them “at all”. These self-reported results must be interpreted with caution as the study did not benchmark consumers’ perceived level of understanding against their actual ability to use the information accurately. Nevertheless, even taken at face value, these results reveal a substantial minority are not confident interpreting NIPs.

Voluntary Labelling Systems

In addition to the legally mandated nutrition information, the New Zealand and Australian Heart Foundations run a voluntary endorsement scheme in partnership with the food industry. The Heart Foundation registers use of the ‘Pick the Tick’ (Tick) symbol to manufacturers whose products meet certain guidelines; these manufacturers pay an ongoing fee to place the logo on the front-of-packaging (see Figure 8). The Tick indicates that the product is a healthier choice within the product category according to independently specified nutritional guidelines (National Heart Foundation, 2007).

However, the Tick system is voluntary and manufacturers must pay to participate in the programme, thus the absence of a logo does not necessarily mean a product is less healthy than one featuring the Tick. Furthermore, the assessment criteria relate to heart health, and may therefore not help people to identify the best products for other health goals.



Figure 8 – New Zealand and Australian Heart Foundation "Pick the Tick" logo

Symbolic labelling initiatives originated with non-governmental health organisations, but are now being developed by commercial companies. Globally, some food manufacturers have recently introduced their own nutrition and health related symbols, which they argue will help consumers differentiate between food items (see Figure 9a-d overleaf). For example, in the United States, both Unilever (2006) PepsiCo (2004) introduced front-of-pack (FOP) nutrition summary logos, placed on lower-calorie products in their ranges, and Kraft Foods (2007) introduced a 'Sensible Solution' flag. In Australia and New Zealand, Sanitarium Foods temporarily introduced a 'Healthy Heart' logo (Stirling, 2005).

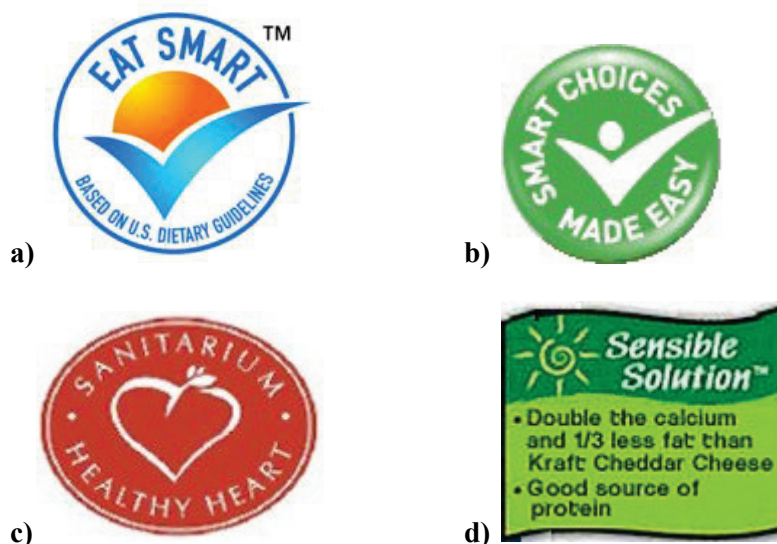


Figure 9 – Examples of Manufacturers' Summary Nutrition Logos

a) Unilever 'Eat Smart', b) PepsiCo 'Smart Choices', c) Sanitarium 'Healthy Heart', and d) Kraft 'Sensible Solution'.

Retailers in the United States have also begun identifying 'better' products with simple shelf-tags, independently of manufacturers. For example, the new 'Healthy Ideas' logo (see Figure 10a overleaf), used in United States' *Stop & Shop* and *Giant Food* grocery stores, will be shown on products that meet Federal Government sponsored nutrition guidelines (Martin, 2009). *Hannaford Supermarkets* use a proprietary algorithm that gives points for positive nutrients (micronutrients, fibre, whole-grains) and removes points for negative nutrients (saturated fats, cholesterol, added sugars, sodium) per 100 calories in their 'Guiding Stars' programme (Hannaford Brothers Company, 2009). Depending on the final score, products are allocated between zero and three stars (see Figure 10b). This system is reportedly influencing consumers' purchases, with the greatest change observed in packaged food sales (Hannaford Brothers Company, 2007). Other organisations have also developed nutritional profiling systems that will be licensed to supermarkets, including the 'NuVal' scoring system developed by researchers at Yale in conjunction with industry partners (NuVal LLC, 2009). Similar to the Guiding Stars system, NuVal scores foods from 1 to 100 points using formula takes into account 30 positive and negative nutrients (see Figure 10c).



Figure 10 – Examples of Supermarket Labelling Systems from the United States

a) Stop & Shop ‘Healthy Ideas’, b) Hannaford Brothers’ ‘Guiding Stars’, c) NuVal nutrient quotient.

Critics caution that the nutritional criteria for these diverse FOP logo systems are decided by those whose primary goal is enhancing company profits, not promoting public health. Furthermore, they note that the nutrition criteria vary substantially, and most create binary classifications that are unlikely to help consumers make truly healthy choices (Lewin, Lindstrom, & Nestle, 2006). While several studies have investigated consumers’ understanding and use of the Tick logo, much less is known about the effects of the new manufacturers’ and supermarkets’ logos (FDA, 2007a). To date, no New Zealand or Australian supermarkets have publically expressed an intention to develop their own nutrition labelling systems. However, the emergence of these schemes in the United States suggests that retailers recognise consumers are not satisfied with the more detailed, federally mandated, numeric nutrition labels.

Consumer Use of Nutrition Information Labels

Because the United States was the first to require such detailed nutrition labelling, much of the research into consumers’ reactions to this initiative and its effect on their behaviour has been conducted there.

Consumers who use nutrition labels to discover foods’ fat content are more likely to eat fewer calories from fat, and vice versa (Lin & Lee, 2004; Neuhouser, Kristal, & Patterson, 2002). This suggests nutrition labels may facilitate healthier dietary behaviours. Several international studies have reported that between 70 and 80 percent of consumers refer to nutrition labels (Cowburn & Stockley, 2003). A recent sample of shoppers across Auckland supermarkets found 82 percent claimed to read nutrition labels at least sometimes (Gorton, Ni Mhurchu, Chen, & Dixon, 2009). There is some

evidence that Australian and New Zealand consumers rely on food labels to inform their choices (ACNielsen, 2005a, 2005b; Department of Health and Aging, 2003), and a large minority claim they regularly choose healthier food alternatives (39 percent and 45 percent respectively, FSANZ, 2003a). However, these findings also reveal that a large minority of consumers do not access nutrition information at all, or do so only infrequently, and actual use of this information to inform choices may be lower (Cowburn & Stockley, 2005). For example, a qualitative study with low income, New Zealand Māori and Pacific Island peoples, suggests that few consumers in these groups use NIPs when shopping (Signal *et al.*, 2008).

Table 6 shows that only a small proportion of New Zealand and Australian consumers report reading nutrition labels either all the time or never; the majority of consumers refer to nutrition labels occasionally. The most common reason consumers in both countries give for using labels is that these assist them when they are considering purchasing an item for the first time. Approximately one third reported that they consider the nutrition profile only when purchasing certain food types (the research did not ask consumers to state these categories). These results therefore suggest that consumers do not read nutrition information for many of the products they buy regularly.

Table 6 – Self-Reported Nutrition Label Usage in New Zealand and Australia

Responses to "When you are buying packaged food, when would you check the nutritional information on the package?"

	New Zealand % agree		Australia % agree	
	2005	2008	2005	2008
Never	10	11	7	11
When I have the time	14	16	15	15
When buying certain food types	30	34	28	31
When buying products for my children	14	17	14	11
When I'm on a diet/trying to lose weight	23	20	25	24
When I'm thinking of buying a product for the first time	45	45	47	43
Always	12	11	15	16

Columns sum to more than 100 percent as multiple responses permitted

(Data from ACNielsen, 2005a, 2005b; Keli, 2008; The Nielsen Company, 2008)

By contrast, a recent survey found 63 percent of United States adults reported using nutrition labels to help choose foods (International Food Information Council Foundation, 2008). Over half of United States citizens claim to read nutrition information on food items either all of the time (27 percent) or most of the time (27 percent); only one in five rarely (11 percent) or never (9 percent) read nutrition information panels (Lee & Oliver, 2002). United States consumers have had an extra eight years to become familiar with detailed on pack nutrition information and this may explain why reported use of this information is higher.

However, rates of overweight and obesity are very high in the United States, and these continued to rise after the introduction of the NLEA (Centers for Disease Control, 2007), despite prior claims that United States consumers were beginning to choose healthier diets (Putnam, 1993). Although consumers' use of nutrition labels increased after the enactment of the NLEA (Kristal, Levy, Patterson, Li, & White, 1998), the per capita average calorie intake grew by 12 percent between 1985 and 2000, and this trend continued during and after the introduction of the NFP labels (Putnam, Allshouse, & Kantor, 2002). These observations raise questions about why the provision of more detailed nutrition information has not reversed the weight gain trend, a point acknowledged by some in the United States restaurant industry (BBC News, 2007).

Hamilton, Ni Mhurchu, and Priest (2007) analysed New Zealand supermarket sales data and found that less nutritious alternatives dominated sales in major product categories (e.g., full-fat milk, white bread, full-sugar soft drinks, butter, and sweet biscuits). This suggests that the introduction of NIPs has not shifted consumers' purchases towards healthier category alternatives. As argued in §3.3.2 this is likely to be because consumers buy habitually and mainly select products they have previously purchased, as opposed to using information on food labels to identify healthier substitutes. If so, the information currently provided is not achieving the anticipated impact (Jacoby *et al.*, 1977).

Overall, there is little direct evidence about how New Zealand and Australian consumers use and respond to on-pack nutrition and health information, or how these details inform their choices. Furthermore, the data that are available rely on self-reported behaviours, and there has been no empirical investigation into whether consumers who have

reviewed nutrition information make healthier choices, or whether alternative nutrition information formats would have stronger behavioural effects.

The United States based International Food Information Council concluded that as the NFP requires effort and higher mathematical ability to use, it creates problems for consumers, who may therefore overlook it in their decision making (IFIC, 2004). Others have also concluded the NFP format may confuse and mislead some consumers (United States Government Accountability Office, 2008), and similar critiques have been made of the NIP format (Ni Mhurchu & Gorton, 2007). The apparent ineffectiveness of current nutrition information disclosures and educational initiatives reinforces the need for research that compares the comprehensibility and user-friendliness of different communication formats, and most importantly, the likely effect of these on consumption behaviour. Such research will help establish how best to communicate nutrition information at the point of purchase to effect behaviour change.

4.2.2 Reasons for Use and Non-Use of Nutrition Information

After nutrition information became more widely available in the United States in the 1970s, investigators found that consumers referred to it much less frequently than earlier research had suggested they would (Jacoby *et al.*, 1977; Klopp & MacDonald, 1981; Murray, 1977; Schroyer, 1978). This discrepancy posed an intriguing research question and many investigators subsequently examined why consumers do or do not refer to nutrition labels, and how label usage rates may be improved. There are several reasons why only cautious optimism should be given for the likely effectiveness of nutrition information on shifting purchasing patterns. This section outlines why consumers may not want to consider nutrition information (for example, research into risk perception and appraisal demonstrates that people are often poor at assessing risk (Klein & Stefanek, 2007; Strecher & Kreuter, 2000)). Beyond this, being able to recognise and understand nutrition information does not automatically mean that consumers will use this to modify their choices (Bettman, Payne, & Staelin, 1986). This stream of research revealed that reasons for use and non-use can be grouped according to Rothschild's (1999) antecedent classification scheme, as behaviour seems to vary with consumers' opportunity, motivation and ability to access nutrition and health information.

Opportunity

For obvious reasons, opportunity to discover a product's nutritional profile is a fundamental factor influencing consumers' use of nutrition information. As noted above, nutrition information is not mandatory for food sold for immediate consumption, so consumers do not have the opportunity to accurately assess nutrition factors in these purchase situations. However, nutritional information on pre-packaged foods has been available for several years, although search for and use of nutrition labels is variable. Researchers have found that many consumers state they lack the opportunity to study on-pack information at the point of purchase because it takes more time than they have available or are willing to dedicate to the task (Grunert & Wills, 2007).

Consumers who spend more time in supermarkets are more likely to read nutrition information (Nayga, Lipinski, & Savur, 1998). However, the majority of consumers place a high value on their time, which militates against use of detailed nutrition information (Aldrich, 1999; Petrovici, Nayga, Fearn, & Drolas, 2006), and parents say that time is even more limited when shopping with their children (Signal *et al.*, 2008). FSANZ (2003a) reported that about one third of Australian and New Zealand consumers agreed they did not have enough time to read food labels when shopping, even if they wanted to. Thus, even consumers who possess both the skills and knowledge to use nutrition labels may not do so if they do not have the necessary time to undertake the task of finding, comparing and evaluating the range of offerings (Klopp & MacDonald, 1981).

Observational consumer research has shown that many people undertake very low levels of external information search when grocery shopping. Consumers make brand selection decisions within a few seconds of approaching the display, after considering only a small number of brands (Alba *et al.*, 1991). For example, Moorman's (1996) observational study found consumers spent an average of 12 seconds considering each product purchased, with two thirds of consumers spending an average of less than 10 seconds reading the entire label. Furthermore, experiments have shown that consumers do not increase the length of time spent studying labels when given additional nutrition information (Basil, Basil, & Deshpande, 2005).

Moreover, supermarkets are busy and distracting environments; they contain thousands of product categories, each of which contains many brands, which in turn have varying

attributes, quality and price. To cope with this volume of information, consumers screen out the vast majority of information to which they are exposed, via a process described as selective attention (Foxall, 1980). Thus, consumers are less likely to attend to information that is visually obscure, such as the NIP. Overall, the mere provision of information only provides the opportunity for consumers to view it (Popper & Murray, 1989; Russo & LeClerc, 1991); while it has the potential to be read, digested, and used to inform action, other factors may prevent consumers from paying any attention to the message.

Motivation

The very high reported intention to use nutrition information estimates found in the 1970s may have resulted from a common tendency for people to overestimate the likelihood of desirable behaviour (Armor & Taylor, 2002; Dunning, Heath, & Suls, 2004; Muller, 1985; Tanner & Carlson, 2009). However, the lower label usage figures may also be due to the content and format of labels (Schroyer, 1978), as early research participants may have underestimated the effort required to read the labels, especially if they did not know what these would eventually look like. As previously noted, consumers are often cognitive misers and avoid effortful processing, particularly for low involvement goods (Sherman, 2001). Thus, consumers' motivation to search for nutrition information has been suggested as an explanation for label use behaviour (Seggebruch, Brecheisen, & Jensen, 2006).

Another possible reason for non-use of nutrition information is that consumers may not perceive the nutritional value of a food as an important decision criterion, and only consumers who rate nutrition highly will direct their attention to finding and using this information (Muller, 1985). Shoppers may perceive other variables such as price, convenience, familiarity or taste as more important (e.g., Signal *et al.*, 2008), and therefore only consider nutrition information if these other variables are similar across competing products (Klopp & MacDonald, 1981). Thus, the value of nutrition information is determined in relation to other cues available to shoppers at the point of purchase.

Consumers only exhibit information seeking behaviour if they perceive a need for it (Wilson, 1997). Thus, consumers who feel in good health (or see their children in good

health) may be satisfied with their usual choice and so may not believe they need to check foods' nutritional profiles (Klopp & MacDonald, 1981). Sparks and Sheppard (1994) found that consumers exhibit 'unrealistic optimism'; respondents in their study felt they had a great deal of control over their diets, believed they had no nutritional deficiencies and did not consume excess calories, and did not perceive high-fat or high-sugar diets as hazardous to their health²¹. When people have not experienced the consequences of high risk behaviours, they tend to disregard the risks (Rose, 1992). Dunning *et al.* (2004) examined why people are prone to making flawed self-assessments and observed "... a pervasive tendency for people to perceive themselves as having significantly lower risk of a host of physical health problems than their peers" (p. 79). Therefore, consumers may not search for nutrition information if they are confident their current purchase patterns provide a healthy diet, or think they are not at risk of disease.

Alternatively, consumers may not search for information if they believe they will not be able to act on it anyway. Signal *et al.* (2008) found that many of their respondents regarded nutritionally superior foods as likely to be unaffordable "...therefore looking at nutrition labels is a waste of time" (p. 709). However, health researchers have shown that in many packaged food categories, more healthy options often cost about the same as less healthy brands (Ni Mhurchu & Ogra, 2007); which questions the assumption that nutritionally good products will be more expensive²².

Klopp and MacDonald (1981) also suggested that habitual shopping behaviour and brand preference may suppress use of nutrition information. Jacoby *et al.* (1977) observed that "attitudinally brand loyal consumers" seem to purchase via a brand name and do not reference nutrition information at all: "...*the vast majority of consumers neither use nor comprehend nutrition information in arriving at food purchase decisions*" (p. 126, italics in original). Habitual brand purchase portfolios "...tend to result in brand inertia" (Muller, 1985, p. 145), as evidenced by consumers' shopping behaviour. Cole and Balasubramanian (1992; 1993) watched United States consumers selecting products in

²¹ Consumers tend to perceive pathogenic or chemical contamination, improper handling and hygiene, and food irradiation as greater health hazards than HFSS diets (Sparks & Sheppard, 1994; Worsley & Scott, 2000).

²² Although healthier between-category substitutions may cost more; for example, it may be more expensive to buy fresh fruit as a snack food than potato chips.

supermarket cereal aisles, and reported that the majority bought the first box they picked up, while very few read nutritional information on any cereal boxes. In New Zealand, Signal *et al.* (2008) found that product familiarity was a more important consideration than nutritional value. These studies suggest that when brands are already in consumers' purchase repertoires, it may be difficult to dislodge them (Ehrenberg, 1972). If brand repertoires are to be reconstituted, this will require easily accessible and readily comprehensible nutrition information before consumers re-evaluate the brands they currently use, and have found to be satisfactory, on other important dimensions.

Information format can also influence motivation, as people are less motivated to process numeric information (Anderson & Jolson, 1980). This effect was clearly demonstrated by Witt (1976), who produced two documents that contained the same overall information and were equally readable; one was a quantitative version that used numbers while the second substituted verbal descriptors in place of numbers. Respondents who read the quantitative article were less willing to solve problems based on the article than those who saw the purely verbal description. A replication with extension showed that providing consumers with percentages, instead of verbal descriptions, increased reliance upon an unrelated peripheral cue (Yalch & Elmore-Yalch, 1984).

Arguably, the problems facing conscientious shoppers who wish to make a fully informed choice are the same as those identified by Russo, Staelin, Nolan, Russell, and Metcalf (1986) over two decades ago:

The costs facing shoppers who want to base their brand choice on nutrition information are not small. Currently they must collect the nutrition information from many different product labels, comprehend it, and then determine how to aggregate the different nutrients to identify the most nutritious brand. If taken at all seriously, this task requires considerable effort (p. 49).

Ability

The supermarket environment contains an enormous amount of information and it would take great dedication and energy to review all options within each product category using central processing (Rucker & Petty, 2006). The capacity of human working memory is small, which places "...severe limitations on the amount of information that we are able

to receive, process, and remember” (Miller, 1956, p. 95). Once the volume of information available goes beyond the limits of what a person can perceive and process, they are said to be ‘overloaded’ (Jacoby, 1977; Malhotra, Jain, & Lagakos, 1982). However, Jacoby (1984) found that “...consumers stop far short of overloading themselves” (p. 435, italics in original) by examining only a small proportion of the available product information. Even if consumers are motivated to review the nutrition profiles of foods they buy, certain cognitive abilities are required to evaluate and understand the information. The information contained in numeric nutrition labels, such as the NIP, cannot readily be understood with a cursory glance.

Research conducted for FSANZ (2003a) found consumers rely on a few nutrients to assess products, with the most commonly mentioned nutrients being fat and sugar (see also Bhaskaran & Hardley, 2002). FSANZ (2003b) researchers also tested consumers’ ability to identify the healthiest of two products, across three categories. Selection patterns suggest that most respondents primarily examined fat and sugar per serving, information that led many to choose the less healthy option for some pairs. Recent research confirms that New Zealand consumers are most interested in fat and sugar content, and pay much less attention to other nutrients (The Nielsen Company, 2008). New Zealand and Australian consumers are not atypical in this regard; British researchers also report that consumers commonly used one nutrient, typically fat, as the basis for product comparisons (Black & Rayner, 1992; Higginson, Rayner, Draper, & Kirk, 2002). This pattern of decision making fits with the notion of ‘fast and frugal’ heuristics, where consumers search for products that satisfy requirements for a few key attributes (Scheibehenne, Miesler, & Todd, 2007). Overall, it seems that many consumers do not understand what the common macro- and micronutrients are, and therefore are not able to take these into account in decision making.

In addition to understanding what the nutritional terms mean, consumers have to know what appropriate levels are for each of the nutrients listed in the NIP to use the information for health and weight maintenance goals (Klopp & MacDonald, 1981). However, whether consumers are aware of nutrition science recommendations is not known (Ni Mhurchu & Gorton, 2007). Research undertaken in 1990 showed that New Zealand consumers understood important nutrition messages to reduce fat, cholesterol, salt, and sugar intake, and eat more fibre, but were confused about appropriate consumption of energy, protein, carbohydrate, sodium, vitamins and minerals (Scott &

Worsley, 1997). Gilbey and Fifield (2006) tested New Zealand consumers' knowledge of recommended maximum salt intake and found only ten percent were aware of the six gram recommended daily limit, even though two thirds reported they cared about salt intake.

Consumers require a moderate to high degree of mathematical ability to manipulate the numbers provided in conventional nutrition panels, but several studies have concluded that many have trouble performing basic computations using these (Byrd-Bredbenner, Alfieri, Wong, & Cottee, 2001; Byrd-Bredbenner, Wong, & Cottee, 2000; 1976; Jacoby *et al.*, 1977; Klopp & MacDonald, 1981; Levy & Fein, 1998; Rothman *et al.*, 2006). While consumers can readily compare products and accurately determine which has higher or lower levels of specific nutrients using the NFP, most do not or cannot use this information to “draw appropriate dietary implications” (Levy & Fein, 1998, p. 215), such as determining which nutrients they should seek to increase or cut back on in other foods, if they consumed a particular product. Computational ability has been linked to educational attainment (Byrd-Bredbenner *et al.*, 2001; Byrd-Bredbenner *et al.*, 2000), with Rothman *et al.* (2006) reporting a linear relationship between scores on a standardised numeracy test and ability to use nutrition labels.

Despite increasing upper-secondary education completion rates in New Zealand (OECD, 2006; Satherly, Lawes, & Sok, 2008a), many adults have low literacy and numeracy levels (see Figure 11 overleaf). The 1996 International Adult Literacy Survey revealed that around half of New Zealand adults were functionally illiterate and innumerate (categorised as Level 1 or 2), as their reading and mathematical skills were lower than those considered necessary to meet the “complex demands of everyday life and work” (Walker, Udy, & Pole, 1996, p. 2). The proportion of adults with Level 1 or 2 numeracy was unchanged (51 percent) in Adult Literacy and Life Skills Survey in 2006 (Satherly *et al.*, 2008a). Like the inequalities in health status, literacy and numeracy levels are not distributed evenly across ethnic groups within the New Zealand population. The functional literacy of the majority of Māori, Pacific Islanders and other ethnic minorities is below the level required to effectively meet the demands of everyday life. These facts suggest that a substantial proportion of the population are likely to find the current NIP inaccessible.

Overall, Daly's (1976) conclusion "... that consumers possess the motivation to use the labels but lack the ability to do so" (p. 177) seems accurate today, despite changes in the label format and attempts to educate consumers to use nutrition facts.

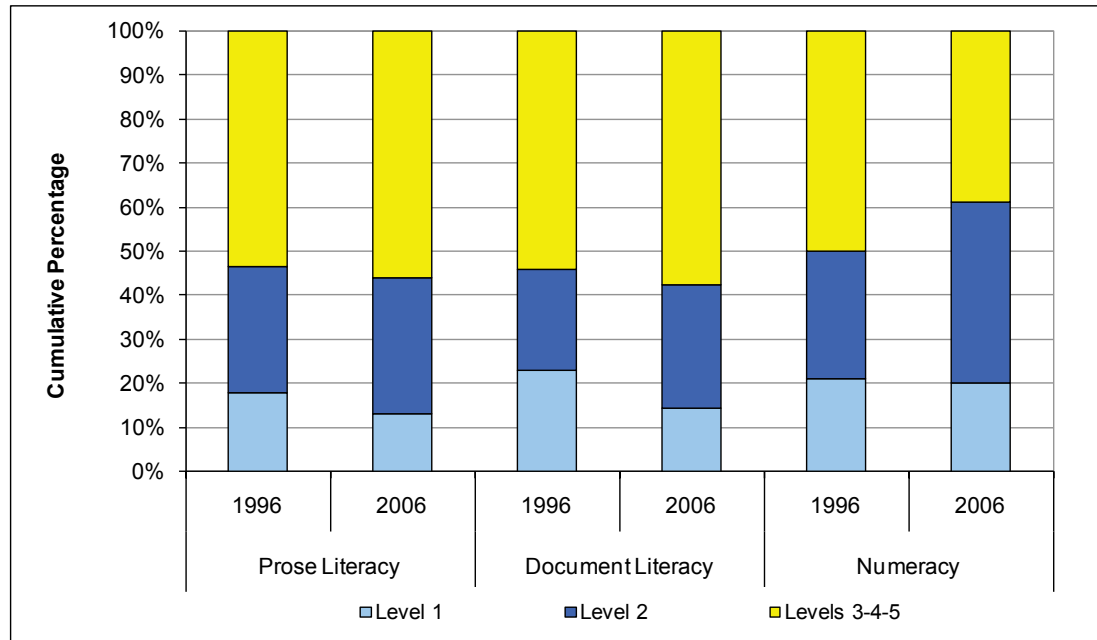


Figure 11 – Literacy and Numeracy Levels in New Zealand Adults in 1996 and 2006

The blue bars parts (levels 1 and 2) show the percentage of the population with 'low' literacy and numeracy skills.

(Data from Satherly, Lawes, & Sok, 2008b).

Amount of Information

Conventional wisdom suggests that consumers will be able to make better decisions as the amount of information they have access to increases. However, information load research tends to reveal a curvilinear pattern, where consumers are less likely to make good choices when they have too little or too much information (e.g., Jacoby, Speller, & Berning, 1974; Jacoby, Speller, & Kohn, 1974; Keller & Staelin, 1987; Malhotra, 1982; Wright, 1975). However, consumers like increasing information loads; they report higher levels of certainty about their decisions when given a lot of information, even though their decisions were actually poorer in these conditions (Friedman, 1977; Jacoby,

Speller, & Berning, 1974; Jacoby, Speller, & Kohn, 1974; Keller & Staelin, 1987)²³.

Thus, consumers appear unaware of the inverse relationship between quantity of information and decision quality. Further research has revealed that increasing the number of product attributes described makes choice tasks more difficult than increasing the number of products to choose between (Malhotra *et al.*, 1982). Overall, there seems to be a paradoxical relationship between consumers' preference for detailed information and the volume of information that they can actually effectively process.

Subsequent evidence suggests that when consumers face more complex decisions they spend less time processing information, use different search and decision strategies, and reduce the number of attributes they attend to (Payne, Bettman, & Johnson, 1992). Consumers also tend to limit the attributes they consider when they are under time pressure or experience distractions (Hahn, Lawson, & Lee, 1992; Wright, 1974, 1975). Whether reducing the number of attributes considered improves or worsens the final choice depends on the actual attributes that consumers review.

Several factors affect the attribute set considered. Firstly, consumers often have conflicting purchase goals that are difficult to reconcile, and this conflict may direct attention to some attributes at the exclusion of others (Payne *et al.*, 1992). Secondly, the way that information is formatted affects what consumers attend to, thus package design influences information acquisition (Payne *et al.*, 1992). Prominently displayed information is most likely to shape decisions, and may override other considerations during decision making. If attributes are correlated (i.e., products are either good, average, or poor across all important attributes) consumers can make good choices without reviewing all information; however, choices may be less successful if the quality of attributes are only weakly related (Fasolo, McClelland, & Todd, 2007).

Overall, the evidence suggests that information overload does occur and depends on the type of information presented, but may be mitigated by good formatting (Owen, 1992). Limitations on human processing capacity explain why increasing the volume of information available may sometimes lead to dysfunctional rather than improved

²³ Prior to the experimental task, Jacoby, Speller and Kohn (1974) and Jacob, Speller and Berning (1974) asked respondents to rate the importance of a range of attributes. Respondents' brand choices were then compared against these ratings to determine whether they had selected the 'best buy' according to their needs.

decision making (Day, 1976). As consumers typically face several pieces of information about brands under consideration, research suggests that many will limit the amount of information they consider. This implies that improving information quality is more important than increasing quantity (Keller & Staelin, 1987), and consumers' decisions can be improved by modifications to the information environment.

Format and Label Design

One important information quality dimension is termed 'processability' – the ease with which consumers can understand and act upon information. This can be enhanced by creating "...congruence between (a) the format and organization of information and (b) the type of processing (judgement) to be done" (Payne *et al.*, 1992, p. 418).

Furthermore, fewer pieces of information are easier to process, and too much information creates clutter that can actually obscure available information (Buckley & Shepherd, 1993). Information is clearer when only a small number of important attributes are highlighted on the front-of-packages, and interested consumers will access additional information printed elsewhere on packages (Fasolo *et al.*, 2007).

Many product attributes can typically be described numerically or verbally. For example, a car manufacturer could promote fuel economy numerically ("4.8L/100km") or use an adjectival description ("very fuel efficient"). Often, packaged products display a combination of numerical and verbal claims for consumers to reconcile. Research shows that consumers make quicker product comparisons with numeric information than with combinations of verbal and numeric details or with purely verbal descriptors; this suggests they find numeric comparisons easier to undertake (Viswanathan & Narayanan, 1994). However, while consumers find it easier to identify which product has a higher or lower score on a numeric attribute, they place more weight on verbal descriptors when evaluating products (Viswanathan, 1996), perhaps because numbers lack inherent meaning and require contextual knowledge to interpret (Viswanathan & Childers, 1996).

Warning labels are critical for helping consumers use products safely, and ergonomics researchers have investigated how formatting affects label reading. In addition to large font size, prominent placement, low clutter, and high contrast with other information (e.g., Silver & Braun, 1993), researchers have found that appropriate use of colour and easily recognised pictorial symbols improve label communication effectiveness

(Laughery, 2006; Laughery, Young, Vaubel, & Brelsford, 1993). Research with Western populations has consistently shown that certain colours imply different levels of hazard; the colour red suggests high hazard or to stop, orange and yellow are associated with moderate hazard levels or to be cautious, while green and blue represent low risk or safety (Braun & Silver, 1995; Chapanis, 1994; Derefeldt, Swartling, Berggrund, & Bodrogi, 2004; Edworthy & Adams). It is because of these consistent colour interpretations that internationally agreed conventions on traffic control state that red should be the dominant colour in signs prohibiting actions (Eliot, 1960, cited in Edworthy & Adams, 1996).

Colour also appears to affect consumer behaviour. Coloured warning labels are attended to more than achromatic labels (Adams & Edworthy, 1995), and red hazard warnings increase behavioural compliance over the same messages printed in green or black (Braun & Silver, 1995). Coloured labels are judged as more readable, and can be interpreted quickly and accurately (Braun, Mine, & Silver, 1995; Hellier, Edworthy, Derbyshire, & Costello, 2006; Williams & Noyes, 2007). Similarly, consumers spend more time viewing and are better able to recall advertisements printed in colour (MacInnis *et al.*, 1991). Overall, coloured labels appear to require less cognitive processing capacity (Hellier *et al.*, 2006; Treisman, 1986; Williams & Noyes, 2007).

Summary

Although many consumers use nutrition labels to inform their purchasing decisions, a sizeable group do not. The reasons for non-use can be grouped according to the Opportunity-Motivation-Ability behavioural change framework (see §2.5.4, page 35) proposed by Rothschild (1999). Although NIPs are printed on most packaged foods sold in New Zealand and Australia, many consumers report the time required for locating, reading, and interpreting the facts these contain reduces their opportunities to use the information.

Consumers may not be motivated to use available nutrition facts, particularly if they feel there is no need to use this information since they feel well or use other more salient decision criteria. Some researchers suggest interventions to increase consumers' motivation levels (Kemp, Burton, Creyer, & Suter, 2005). However, high motivation does not guarantee that nutrition information will be referenced during decision making.

Even if consumers want to include nutritional factors in their decisions they may lack the knowledge and ability to understand the numeric information panels, or simply feel too pressured in store to spend the time required to evaluate nutrition information across the dozens of product categories they purchase from.

Overall, the research to date suggests label design factors may influence consumers' motivation and ability to use information (Bettman & Kakkar, 1977; Goldberg, Probart, & Zak, 1999; Levy *et al.*, 1985; Muller, 1985). The purpose of providing nutrition information at the point of purchase is to promote educated food choices. However, consumers who already use nutrition labels tend to prefer detailed information, whereas non-users prefer brevity (Klopp & MacDonald, 1981; Levy, Fein, & Schucker, 1992). The task for policy makers, therefore, is to determine what method of communication will most effectively convey information and facilitate informed decision making that promotes public health (McCullough & Best, 1980; Rumble *et al.*, 2003). Given concerns of health researchers about the NIP, and industry initiatives to introduce new labels, Ministerial representatives from Australia and New Zealand decided that FSANZ should investigate front-of-pack nutrition labelling options (Australia and New Zealand Food Regulation Ministerial Council, 2006). Researchers, policy experts and manufacturers have devised many methods of displaying information intended to be more easily processed; the following section examines some of the options reviewed.

It is apparent that information formatting may influence consumers' purchase behaviour, and the formatting of nutrition information is a topic that has received a lot of research attention. However, the question of which nutrition label format helps consumers to process nutrient information most effectively and thus encourage healthy choices has not been answered.

4.2.3 The Effectiveness of Different Nutrition Label Formats

Given the importance of the "task environment" in directing information acquisition (search) behavior, an emerging trend has been to suggest redesigning the consumer's environment so as to optimize the ease and quality of information acquisition (Jacoby, Chestnut, Weigl, & Fisher, 1976, p. 308).

It is obvious that nutrition information needs to be presented “...in a manner that makes sense and will be used by the average consumer” (Jacoby *et al.*, 1977, p. 127). While many researchers have tested different labelling formats, the best format for communicating information effectively to the widest audience has not been established. Much research conducted to date has used non-representative samples that do not yield generalisable results, and employed disparate outcomes measures to evaluate format effectiveness. These have included self-reports of current label use behaviour, consumer preferences, tests of comprehension, ability to select healthier products or accurately rate healthiness, information recall, time taken to use labels, influence on purchase intent, and effect on actual sales. Furthermore, a variety of research methods have been employed, including consumer surveys using both random selection methods and consumer panels, and laboratory and field experiments formats.

Many studies have included multiple measures. These have shown that consumer liking or preference is a poor predictor of how well they will be able to perform product comparisons or answer dietary management questions (Levy, Fein, & Schucker, 1991, 1996; Scott & Worsley, 1994). For example, Burton *et al.* (1994) reported that consumers were most accurate at answering dietary management questions when given a format that many believed to be the least understandable.

One characteristic of successful product information disclosures is reduced processing effort (Russo & LeClerc, 1991), as consumers’ mental processing capacity should be viewed as a scarce resource (Bettman *et al.*, 1986). For example, financial costs are an important decision factor for many, yet evidence demonstrates that consumers often fail to economise in-store by calculating price per volume for products. Putting prominent unit-pricing on shelf-tags decreases the amount consumers spend, because consumers select products that are cheaper per unit when given this information (Miyazaki, Sprott, & Manning, 2000; Russo, 1977). Consumers could use available product weight or size and price information to calculate unit prices for themselves, but the fact that adding unit-price information changes spending patterns reveals they do not. Thus, it appears that consumers utilise information that is not a burden to process, but few will devote mental resources to determining which options are most economic.

After reviewing such evidence, Goldberg and Gunasti (2007) criticised the NFP format for not aligning with “...consumers’ penchant for processing information using

simplifying heuristics” (p. 165). Recent qualitative research in New Zealand supports this view, as participants in Signal *et al.*’s (2008) research identified several qualities consumers would appreciate in nutrition labels: simple, pictorial, bright colours, or well known symbols. Goldberg and Gunasti (2007) argued that labels based on simplifying heuristics would be more attractive to consumers, but needed to be rigorously tested to examine the potential for improving public health.

Numeric Reference Information Formats

The NIP label provides numeric information about the amount of each nutrient in one serve and per 100 grams (or mLs) of product (refer to Figure 7, page 75). Consumers can compare brands to determine relative amounts of different nutrients, but they must understand nutritional recommendations to interpret nutrient content information and make informed judgements about product healthiness. Reference information formats are designed to help the majority of consumers who do not have this knowledge (Guthrie, Derby, & Levy, 1999); these provide additional information that locates nutrition-content facts within a broader context of scientific advice about daily nutritive requirements (Dietary Reference Intakes, DRI).

The United States NFP contains reference information in a Percent Daily Value (PDV) column on the right side of the panel (see Figure 6, page 73). Legislators required PDVs as research evidence suggested this information would enable consumers to determine whether a food contains a high or low quantity of key nutrients, relative to government nutrition recommendations (Levy *et al.*, 1991). Furthermore, the PDV standardises the absolute numeric information through conversion to percentages, which may reduce processing burden and possible confusion from different units of measurement (e.g., grams, milligrams, calories) across nutrients. Manufacturers of products sold in Australia and New Zealand can voluntarily include reference information in an additional optional column in the NIP²⁴, referred to in this jurisdiction as Percent Daily Intake (PDI) information (FSANZ, 2003c).

Several researchers have considered how reference information may facilitate consumers’ comprehension of nutrition labels, often in direct comparison with other

²⁴ No audit has been completed to determine how many product NIPs also list PDI information.

proposed labelling formats (Barone, Rose, Manning, & Miniard, 1996; Burton *et al.*, 1994; Levy *et al.*, 1991, 1992, 1996; Scammon, 1977; Viswanathan, 1994; Viswanathan & Hastak, 2002). Evidence as to whether PDV labels facilitate improved product evaluations is equivocal. In one of the earliest studies, Levy *et al.* (1991) tested a range of new labels presenting information in a variety of formats, including PDVs. They found that consumers' performance on various label-use tasks was worse than the control (pre-NLEA format) for all formats tested, including when given PDV information. However, in a later study, Levy, Fein and Schucker (1996) reported that consumers' ability to answer questions about dietary management was consistently enhanced by the addition of PDV information to nutrition labels. Other have also reported that PDV labels enabled consumers to draw more appropriate inferences about product healthiness (Burton *et al.*, 1994; Viswanathan & Childers, 1996).

However, Barone *et al.* (1996) found conflicting results; their between-groups design asked respondents to rate the fibre, calorie and sodium content, as well as overall healthiness, of breakfast cereals with different nutritional compositions. In the control condition (i.e., without reference information) respondents' perceptions of product healthiness were insensitive to changes in nutritional profile. Equally, however, there were no significant differences in overall healthiness ratings for the better and worse products when PDV labels were used.

The Institute for Grocery Distribution (IGD, United Kingdom) commissioned research to investigate consumers' preferences for a range of Guideline Daily Amount (GDA) labels (Bailey & Macnab, 2005). The GDA format can be described as the precursor to PDV information, as this tells consumers the total amount of each nutrient that an 'average' person should consume. Therefore, consumers could divide the per serve information by the GDA amount to calculate PDV. The IGD found consumers stated a preference for more comprehensive formats, which showed GDA information for both males and females (as recommendations differ for men and women), and were further supplemented by PDV information. However, consumers were rarely able to answer dietary management questions correctly with preferred formats, which casts doubt on the practical utility of GDA information (Bailey & Macnab, 2005).

Percent daily value information appears more useful to consumers who have higher levels of nutrition knowledge (Li, Miniard, & Barone, 2000; Suter & Burton, 1996).

Highly knowledgeable consumers' product evaluations are more accurate with PDV information than without, but this information does not enhance product evaluations among consumers with lower nutrition knowledge. Moorman also (1990) reported that more highly educated consumers benefited most from the addition of PDV information to labels, suggesting PDV formats still require a reasonable degree of mathematical ability to use effectively (see also Burton *et al.*, 1994). Levy and Fein (1998) also found that consumers performed poorly on numeric tasks, and concluded:

These findings strongly suggest that consumer nutrition guidance will be more effective if it instructs people how to balance their diets in ways that do not require quantitative tasks (p. 216).

Summary Information Formats

Summary information formats typically interpret absolute numeric information, with the intention of overcoming difficulties associated with quantitative labels. Adjectival descriptors are the most common type of summary information that researchers have tested; these classify nutritional amounts using qualitative terms such as 'none', 'fair', 'good' and 'excellent', or 'low', 'medium', and 'high'. Alternative formats that summarise variation in nutritional composition across the product category have also been researched (Viswanathan, 1994). As summary formats offer explicit interpretation, they should require less effort for consumers to comprehend and use.

This supposition is supported by research. Scammon (1977) was one of the first to investigate the effect of adjectival descriptors in nutrition labelling. Her experiment compared the effect of including either summary adjectival descriptors or PDV information in television advertisements for peanut butter products (one fictitious brand and one real brand). The majority of respondents across both conditions erroneously concluded that the familiar brand was more nutritious; however, twice as many consumers in the summary information groups correctly identified the 'new' brand as more nutritious than respondents who saw PDV information (25 percent *cf.* 12 percent). Respondents were better able to recall nutrient levels in the summary information conditions. However, despite the adjectival format appearing to communicate nutrition information more effectively, there was no statistically significant difference in brand preference or purchase intention by label format.

Viswanathan (1994) suggested two summary formats that situate a product's nutritional profile within the entire product category. The first format reports the average amount of each nutrient across all brands (e.g., average total fat content of all ice-creams), and the second provides minimum and maximum nutrient content values (e.g., lowest and highest total fat content in the ice-cream category). Viswanathan (1994) compared the performance of the category average and range summary statistics formats against both absolute numeric content information and adjectival summary descriptors (very low, low, high, very high). The category average summary information format appears to enable consumers to distinguish between two brands on nutritional grounds (Barone *et al.*, 1996; Viswanathan, 1994). However, this effect diminished when respondents were required to engage in the more complex task of comparing four brands (Viswanathan & Hastak, 2002). The practical utility of the category range format also appears to be higher than PDV information (Viswanathan & Hastak, 2002), but adjectival descriptors consistently enhanced respondents' ability to identify healthier products (Viswanathan, 1994).

However, as with PDV information, it is unclear whether summary information will assist consumers to manage their dietary intake. For example, Burton *et al.* (1994) found that consumers' responses to dietary management questions were more accurate when given adjectival summary information, and least accurate with PDV labels. However, Levy *et al.* (1992; 1996) report conflicting results: consumers shown a format with adjectival descriptors in capitalised bold font, alongside absolute nutrient content per serve, were least able to identify all differences in nutritional profile between two products. Furthermore, respondents overlooked differences in absolute content described by the same adjective, and took significantly more time to use this format than more conventional labels. However, the adjectival format performed as well as many others for dietary management tasks and evaluation of the veracity of product claims, and respondents believed the format was helpful.

Viswanathan (1996) tested whether consumers paid equal attention to verbal descriptors and numbers, by creating nutrition labels that contained a mixture of numeric and verbal information across nutrients. Across products in the experimental design, the numbers and adjectives were fixed to give conflicting impressions; that is, if the numeric information was 'healthy' then the adjectival information was 'unhealthy', and vice

versa. His research showed that adjectival information had a greater influence on consumers' product evaluations than numeric information.

A series of in-store longitudinal studies in the United States tracked the sales effect of shelf-tags bearing adjectival descriptors identifying products that were low in sodium, fat, calories or cholesterol (Levy *et al.*, 1985; Schucker, Levy, Tenney, & Mathews, 1992). The adjectival tags appeared to influence consumers' purchase behaviour; items with healthier tags generally increased their market share (or slowed loss of market share for some). However, more recent research found that shelf-tags may sometimes depress sales of healthier brands in some product categories (Teisl, Bockstael, & Levy, 2001). The authors propose that this may be because consumers often believe that low-fat products do not taste as good as the full-fat original, for example (see also Raghunathan *et al.*, 2006).

Although research has shown that many consumers do not have sufficient knowledge or skills to use and understand numeric nutrition labels (Jacoby, Speller, & Berning, 1974; Jacoby, Speller, & Kohn, 1974; Scammon, 1977), most prefer numeric information to verbal descriptors. However, consumers' preferences correlate only weakly with their information use, and consumers given their preferred level of information often make poorer decisions (Burton *et al.*, 1994; Levy *et al.*, 1992). These findings provide further grounds for investigating whether the format in which information is presented can mitigate the effects of low individual numeracy (Ancker & Kaufman, 2007).

Graphic Labels: Symbols, Logos and Colour Coding

Well-designed nutrition information panels may function as warning labels by alerting consumers to risks associated with different products (Rucker & Petty, 2006). Although it is unlikely that many people regard readily available foods as posing serious risks, knowledge of effective warning label design may inform the design of good nutrition labels. Warning label research has shown that cautions must be conspicuous to achieve salience, capture consumers' attention and increase the likelihood the information will be read.

Furthermore, research shows that labels with coloured and pictorial elements attract more attention than text only labels (Wogalter, Conzola, & Smith-Jackson, 2002), and

adding colours and graphic images can have strong effects on product beliefs and purchase behaviour (Bone & France, 2001). Pictorial elements may be crucial for low literate consumers, as they rely on visual cues when selecting products (Corus, Saatcioglu, & Ozanne, 2006). Qualitative consumer research suggests that graphic labelling elements also help less educated or low literate consumers to understand abstract concepts more readily and therefore appear to enhance label understanding (Viswanathan, Hastak, & Gau, 2006). Health researchers suggest colour-coding may help low-numeracy consumers to interpret numeric information; however, this suggestion requires further research (Rothman, Montori, Cherrington, & Pignone, 2008).

As noted in §4.2.1, graphic logos that convey nutrition information are already in use. National Heart Foundations or Associations operating in many countries run nutritional endorsement programmes. The American Heart Association issues the ‘Heart-Check’ Mark, while Australia and New Zealand’s National Heart Foundations license a ‘Pick the Tick’ symbol (see Figure 8, page 77, and Figure 12a). The Keystone Center (2008), a non-profit in the United States, recently developed a new endorsement system called the ‘Smart Choices Program’, in partnership with industry representatives and researchers (see Figure 12b)²⁵. Like the Heart symbol, this system has benchmark qualifying criteria for product categories, and manufacturers will pay to carry the symbol.

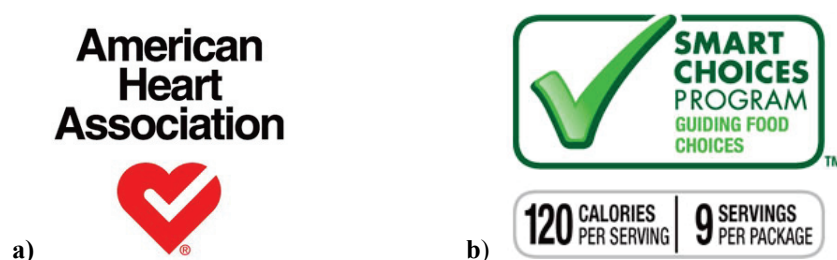


Figure 12 – Examples of third-party Front-of-Pack logos from the United States

a) American Heart Association ‘Heart Check’ symbol, and b) Keystone Center ‘Smart Choices’ symbol

However, several authors have noted a lack of empirical investigation into the utility of highly simplified labelling schemes, such as logos and other graphics (e.g., Cowburn &

²⁵ After launching, the Smart Choices Program was been placed on hold while the FDA investigates front-of-pack labelling (Smart Choices Program, 2009).

Stockley, 2003; Goldberg & Gunasti, 2007). Because such logos are appearing on more products every year, the Center for Science in the Public Interest (CSPI, 2006) requested that the United States Food and Drug Administration to mandate a standardised front-of-pack nutrition symbols to help consumers make healthier choices. In response, the FDA (2007a) convened a public hearing where manufacturers explained their schemes, to help the FDA determine research requirements.

Research undertaken by the Australia New Zealand Food Authority (ANZFA) in Australia in the mid 1990s found over half of the consumers interviewed wanted reliable symbols that summarised label information, rather than numeric or verbal information (cited in Scott & Worsley, 1997). As noted earlier, Patten *et al.* (1994) also concluded that symbolic formats would be more effective methods of communicating nutrition information to New Zealand consumers. In the United States, Soriano and Dozier (1978) had reached a similar conclusion 15 years earlier. They argued that as consumers do not evaluate the nutritional profile of all choices in a food category, they would benefit from an easily recognised graphic format that identified healthier offerings. Since then, many researchers have devised and tested a variety of graphic nutrition labelling concepts intended to reduce processing effort.

Russo *et al.* (1986) developed a single numeric summary called the ‘nutrient quotient’, calculated from the amount of protein and seven vitamins and minerals provided per unit of energy. The nutrient quotient scores were broken into five bands, each band represented by a different numbers of stars (0-4 range), where a higher number of stars denoted a more nutritious product. The nutrient quotient was tested in a seven month field experiment, with large posters in selected supermarkets displaying nutrient quotients for all available brands in selected categories. Sales data showed this summary labelling system did not influence purchasing behaviour, and surveys revealed consumers actually had negative attitudes towards the system. Baltas (2000) criticised the nutrient quotient as being “...too prescriptive and ignor[ing] consumer heterogeneity in the importance of individual nutrients” (p. 713), as a possible reason why consumers did not use the system.

The first on-pack nutrition label using graphic elements was devised and tested by Mohr, Wyse and Hansen (1980), which they called the ‘nutrient density graphic’. This label used a horizontal bar chart to depict the PDV for major nutrient groups and included a

vertical line at the end of the calorie bar to draw consumers' attention to the proportion of energy contained in relation to the supply of other nutrients. Mohr *et al.* (1980) compared this to the old United States 'pre-NLEA' nutrition label, and found that the graphic format seemed to benefit low income respondents in particular, who may have lower educational attainment, as they were significantly more likely to answer dietary management questions correctly when viewing this label (there was no statistical difference between labels for high income participants). The nutrient density graphic also decreased the time respondents needed to complete the three experimental tasks by half a minute (3:02 *cf.* 2:33 minutes).

Nutrient density graphic labels, and close derivatives, were tested in several separate studies (Geiger, Wyse, Parent, & Hansen, 1991; Levy *et al.*, 1991; Rudd, 1986; Suter & Burton, 1996), although as with other research, the results do not provide a clear view of this format's effectiveness. For example, a replication by Rudd (1986) found that this graphic format significantly improved consumers' responses to only one of three dietary management questions. Furthermore, this format was associated with the lowest performance scores when consumers were asked to select the more nutritious of two options. In an FDA study, consumers' ability to accurately answer dietary management questions was significantly lower with the bar graphs, and consumers were also slower to respond (Levy *et al.*, 1991). When probed, however, roughly equal proportions of respondents believed that the graphical representation of PDV was both the least (35 percent) and most (31 percent) helpful format tested. Geiger *et al.* (1991) used conjoint analysis to determine what label characteristics consumers perceived as most useful for making purchase decisions, and found the PDV bar chart had high utility. However, as previously noted, consumers' preference can be an unreliable indicator of a label's effectiveness, and on balance, the results of studies testing consumers' ability to use this format suggest it is not very useful.

A small number of studies have examined consumers' understanding of graphic logos that signify healthiness ratings. In New Zealand, Scott and Worsley (1994) compared consumers' interpretation of three alternative National Heart Foundation endorsement schemes against the simple numeric nutrition information panel mandated at the time. These alternative labels were the Heart Tick (tick), a small Heart Tick pointing to a section of the Healthy Food Pyramid (pyramid), and the Heart Foundation's logo with the message 'Low Fat Low Salt' (claim). Respondents disliked the numeric nutrition

label the most, which suggests that consumers prefer heuristics. However, many consumers misinterpreted the tick and claim logos, even though they favoured these. As the researchers did not measure whether these logos enabled consumers to make healthy product selections, no conclusions could be drawn about the effect of these labels on purchase behaviour.

In 2004, the British Government instructed the Food Standards Agency (FSA) to investigate options for front-of-pack nutrition labelling systems that consumers would find easier to use (FDA, 2007b). The FSA developed and tested five alternative concepts. Three of these were a novel nutritional signposting system, called Traffic Light Labelling (TLL) that uses the colours red, amber and green to communicate information about nutrition profiles. Simple Traffic Lights (STL) label a food with one colour: green broadly means eat often, amber indicates eat in moderation, and red suggests eat infrequently. The FSA also developed an extended STL with five bands.

The third concept signposts the nutrient density of negative nutrients in the product, and is called the Multiple Traffic Light (MTL) label. The MTL lists the four nutrients of most concern as determined by the WHO (2004) World Health Assembly – total fat, saturated fat, sodium, and sugar – and gives each a separate coloured rating. In the MTL concept, the colour red indicates that the food or drink has a high amount of the nutrient, per 100g/mL. Green lights indicate the opposite, and amber lights show that the food has a moderate amount. Examples of the STL and MTL concepts are shown in Figure 13.

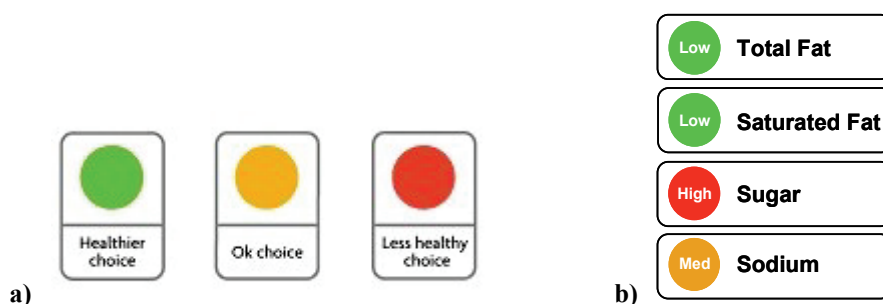


Figure 13 – Examples of Traffic Light Label formats

a) FSA Single Traffic Lights; b) FSA Multiple Traffic Light label

The final two formats tested by the FSA were a ‘Healthy Choice’ logo that would indicate a product was deemed ‘healthy’ (analogous to a Heart Tick), and another

nutrient signposting system that printed Guideline Daily Amounts (GDA) alongside the nutrient content per serve, so consumers could calculate PDV for themselves. The GDA format was included in testing as many manufacturers were voluntarily supplying this information already, arguing it serves consumers' information requirements well.

The FSA conducted focus group interviews to explore consumers' responses to the five schemes and concluded that the STL and MTL formats "...had significantly more promise than the others" (Navigator Research & COI Communications, 2004, p. 3). Unpublished research by Tesco's supermarkets reportedly found that STL labels help consumers evaluate product healthiness at a glance (cited in Lobstein, Landon, & Lincoln, 2007). However, Tesco's also reported that many consumers believed products with a red STL should never be eaten, even though these foods can still feature in a balanced diet. Although MTLs only list four nutrients, research conducted in Canada, Australia and New Zealand suggests that consumers are primarily interested in this subset of nutrients (Russo *et al.*, 1986; Scott & Worsley, 1997).

After consumer research and community consultations found support for the scheme, the FSA recommended that food manufacturers place TLLs on the front of packaged foods (FSA, 2007). Several British supermarkets and food manufacturers have subsequently created their own labels based on the traffic light colour concept, but the actual presentation formats vary quite considerably²⁶ (Fletcher, 2007).

Jones and Richardson (2007) researched the effect of supplementing the standard European nutrition information label with MTL information, measuring British consumers' product evaluations and comparing these to an objective measure of each food's nutrition value. Using a convenience sample of university staff and students, Jones and Richardson (2007) found that participants' evaluations were significantly more accurate (closer to objective calculation) when the traffic lights were added to the numeric label.

The utility of TLLs for communicating information about health care quality for competing hospitals was recently examined. Using a sample of consumers with varied

²⁶ Examples of how different manufacturers have implemented the traffic light labelling concept are available on the Food Standards Agency's (2009) website. See, for example, the Sainsbury's and ASDA labels in Figure 15a and b.

numeracy levels, Peters, Dieckmann, Dixon, Hibbard, and Mertz (2007) tested combinations of traffic light symbols or black-and-white symbols and numeric information to communicate information about hospital quality. The traffic light colours were used to present death-rate statistics (green for below average, amber for average, and red for above average). Peters *et al.* (2007) found that highly-numerate consumers' judgements improved with the traffic light symbols, while low-numerate consumers generally performed poorly and did not make significantly better decisions with the traffic light label. However, the traffic lights were only provided for one important dimension (death rate), but not for two other dimensions (price and patient satisfaction). The researchers ruled that a good choice was made when either of the two hospitals with the lowest death rate was selected; however, these were among the more expensive options, and it is possible that low numerate consumers tried to factor cost into their decision.

Summary

...consumers may use simplifying heuristics to limit processing. Thus, merely making information available may not be sufficient. Instead one must distinguish between the availability and the processability of information ... In general, information must be both available and easily processable to be utilized (Bettman *et al.*, 1986, p. 14).

The alternative nutrition label formats proposed and tested since the early 1980s generally provide information in three different ways: numeric reference information, summary information, or graphical representation. However, some label formats contain elements from two or three groups, making it difficult to draw firm conclusions about the effects of the unique formatting elements.

The principal reference information format tells consumers the Percent of Daily Value (PDV), for selected nutrients, supplied per serving. There is evidence that percentage information improves consumers' ability to use nutrition labels over formats that only contain absolute numeric information. However, researchers have not concluded that it is the optimal format (Burton *et al.*, 1994). While consumers tend to prefer more detailed formats, particularly PDVs, it is not clear that increasing detail leads to consistently better product evaluations across population subgroups. In particular, PDV

information seems most useful to highly educated, mathematically able consumers who have greater nutritional knowledge.

Researchers have suggested summary formats that use adjectival descriptors to categorise nutritional values as low, medium or high may be more effective. These align with the proposition that 'Less is more in presenting quality information to consumers' (Peters *et al.*, 2007). This is supported by the observation that research participants tend to make more accurate product evaluations with summary labels than numeric labels, including those providing PDV information. Longitudinal field studies also suggest that adjectival descriptors may have positive effects on the sales of healthier products. However, summary labels also have limitations; when competing products have different values for a particular nutrient, yet these values fall into the same summary group, consumers often fail to detect that there is a difference in nutritional content.

Overall, there is some evidence that consumers will find utility in labels with graphic and coloured elements, particularly as these may require less knowledge and ability to use. But further research is necessary to determine whether such formats improve consumers' food choices (Drichoutis, Lazaridis, & Nayga, 2006).

4.3 Nutrition-content and Health Claims

4.3.1 Introduction

Nutrition information panels are not the only sources of nutrition and health related information on food packages. Manufacturers frequently include claims about nutrition-content, and in some countries, are permitted to link consumption to health biomarkers or disease outcomes (Hawkes, 2004). For example, about six in ten packaged goods sold in the United States in 2001 had nutrition-content (49.7 percent), structure/function (6.2 percent), or health claims (4.4 percent) (LeGault, Bender Brandt, McCabe, Adler, & Brecher, 2004).

As public health advocates have called for the introduction of simplified nutrition information in New Zealand, industry groups have argued for permission to use “health claims” that link disease prevention to consumption (FIG, 2005; Wiggs & Irwin, 2004).

Manufacturers argue that the current legislation is an impediment to innovation, as they cannot effectively market new products with functional benefits to consumers and recoup research and development expenses (FSANZ, 2006b). Both FSANZ (2008b) and the FDA (Gottlieb, 2005) acknowledge this as a legitimate concern. Furthermore, health claims have been promoted as a way to improve public awareness of diet-disease relationships to better inform decision making and improve health (Leathwood, Richardson, Sträter, Todd, & van Trijp, 2007; van Trijp & van der Lans, 2007), and are said to be more effective than government sponsored public education initiatives (Ippolito & Mathios, 1991). However, the concern has been voiced that the introduction of more detailed and sophisticated health claims raises the possibility that these will take precedence over the factual nutrition information (Williams, 2005).

Between 2005 to 2008, FSANZ conducted three rounds of public consultation on a proposed 'Nutrition, Health and Related Claims Standard' (P293, FSANZ, 2005a), which would permit general and high level health claims for products that meet regulatory requirements (see §4.3.2 for explanation). The final recommendations may be gazetted into the Food Code in the near future if approved by the FSANZ Board (FSANZ, 2008b). The next section provides an overview of the current regulatory situation in Australia and New Zealand, and is followed by a review of international evidence regarding the effect of nutrient and health claims on consumers' product perceptions and food related behaviour.

4.3.2 Product Claims and the Food Code

The Food Code currently permits food manufacturers to make truthful 'nutrition-content claims' on packaging (e.g., "a good source of iron", "reduced fat") and use of these is regulated. Statements that link nutrients to generalised physiological outcomes, called 'nutrient-function claims', are unregulated but not prohibited (e.g., "high in calcium for strong teeth and bones", "good for your heart"). Only one 'health claim' is legal at present for the link between folate consumption prior and during pregnancy and prevention of foetal neural tube defects²⁷ (FSANZ, 2005a).

²⁷ http://www.foodstandards.gov.au/_srcfiles/Standard_1_1A_2_Health_Claims_v101.pdf

In most recent amendments to P293, FSANZ (2008b) recommends classifying nutrient and health related product claims into three groups: nutrition-content claims, general level health claims, and high level health claims (see Table 7 for definitions and examples). The proposal states that all health claims must be substantiated by scientific evidence that demonstrates a link between nutrient consumption and accrual of health benefits, and high level health claims must be pre-approved before use (FSANZ, 2007b). Under the proposed guidelines, only products with an acceptable nutrient profile will be eligible to display a health claim²⁸ (FSANZ, 2007b). The criteria for use of nutrition-content claims are more relaxed; these must be truthful, but beyond this there are no generic restrictions²⁹ against products for their use (FSANZ, 2008b).

Table 7 – Example nutrition-content, general and high level health claims

Claim Type	Description	Example
Nutrition-content Claims	These describe or indicate the presence or absence of a component in food	“This food is high in calcium”
General Level Health Claims	Refer to the presence of a nutrient or substance in a food and to its effect on a health function. They may not refer to a serious disease or condition or to an indicator of a serious disease	“Yoghurt high in active probiotic cultures may help keep your immune system healthy, when consumed as part of a healthy diet with a variety of foods”
High Level Health Claims	Refer to the presence of a nutrient or substance in a food and its relationship to a serious disease or condition or to an indicator (i.e. a biomarker) of a serious disease	“This food is high in calcium. Diets high in calcium from a variety of foods may increase bone mineral density”

(Food Standards Australia New Zealand, 2008d)

²⁸ Similar to the United States “Jelly Bean” Rule, which specifies upper levels of negative nutrients and minimum levels of beneficial nutrients per serve (Roe, Levy, & Derby, 1999). See <http://www.foodstandards.gov.au/foodmatters/healthnutritionandrelatedclaims/nutrientprofilingcal3499.cfm>

²⁹ A few specific nutrition-content claims will be submitted to restrictions, e.g., low cholesterol claims have a disqualifying rule regarding saturated fat content.

4.3.3 Effects of Product Claims on Buyer Beliefs and Behaviour

In the United States, the NLEA formalised the legal status of product claims by specifying rules for nutrition-content, structure-function and health claims³⁰, and researchers there have investigated how consumers use such claims on packaging when appraising products.

Advocates argue that health claims allow the private sector to contribute to public nutrition education and increase consumers' knowledge of the role of diet in health (Ippolito & Mathios, 1991). Health claims became part of the food landscape in the United States after the Kellogg's Company[®] advertised that consumption of high fibre foods, such as its All Bran cereal, was associated with reduced cancer risk (Ippolito & Mathios, 1991). This campaign was credited with enhancing consumers' knowledge of the fibre-cancer relationship, encouraging greater average fibre consumption, and improving the nutritional composition of cereals on the market (Ippolito & Mathios, 1991).

These changes were only correlated with Kellogg's[®] advertising, and the effects cannot be separated from news stories and consumer education programmes that also occurred around the same time (Silverglade, 1996). In fact, FDA researchers have concluded that the educational benefits of health claims may be limited, as consumers tend to recall the nutrient but not the health benefit (Levy, Derby, & Roe, 1997). This effect is particularly pronounced when the health benefit is limited to a subgroup rather than the whole population (Levy *et al.*, 1997). Similarly, research conducted in Australia found that while many consumers could recall the nutrients featured in health claims, only a small proportion could state the claimed health benefits (Singer, Williams, Ridges, Murray, & McMahon, 2006).

Moreover, in Singer *et al.*'s (2006) study, a significant minority of consumers generalised a specific nutrition-content claim about added vitamin C and calcium to believe the juice was 'high in vitamins' and 'high in minerals', as well as other assorted attributions. Thus, while consumers sometimes fail to recall the consumption benefits touted in product claims, a tendency to generalise benefits beyond health claims has also

³⁰ The three levels of claims used in the United States are similar to the categories suggested by FSANZ.

been observed (Andrews *et al.*, 1998; Roe *et al.*, 1999). When viewing advertisements with product claims, where nutrition information is not available, consumers were also found to make inferences about unmentioned nutrients (Andrews *et al.*, 1998). Although nutrition information is available on most packaged products, this finding suggests that consumers may generalise claims if they choose not to read nutrition information. For example, Roe *et al.* (1999) reported that nutrition and health claims encouraged consumers to rate products highly on nutrients not mentioned in the claim (a ‘halo effect’) or overstate the health effects (the ‘magic bullet effect’).

Some nutritional experts are concerned that nutrition, structure-function and health claims are employed mainly as marketing tactics to encourage consumers to believe a product is better for them and increase the purchase likelihood. They suggest these claims discourage consumers from carefully assessing nutritional values (Mangan, 2006), and may result in less healthy choices where nutrition information and claims are at variance (Fasolo *et al.*, 2007). As noted in §4.2.2, consumers tend to base their conclusions on verbal descriptors when evaluating a brand’s healthiness, and may fail to incorporate numeric facts that provide conflicting information (Viswanathan, 1996). Redmond (2009) argues that the United States labelling laws have led to distorted communications and may cause a market failure, as marketers draw consumers’ attention to healthful elements while minimising less healthy attributes. The specific type of failure, he argues, is of information asymmetry as the seller knows more about the product than the buyer.

However, advocates of nutrition and health claims argue that consumers are not misled by product claims (Calfee & Pappalardo, 1991), because consumers search for other information to determine if the product is good quality. Furthermore, Ippolito and Mathios (1991; Mathios & Ippolito, 1999) argue that because manufacturers compete using claims that focus on a range of nutrients, consumers will be aware of the many dimensions on which to evaluate foods.

The empirical evidence as to whether nutrition and health claims bias consumers’ product evaluations is equivocal. For example, Garretson and Burton (2000) report that claims ranging from single and double nutrition-content claims to diet-disease health claims, had no discernable effect on consumers’ purchase intentions or attitudes towards products. Research conducted with consumers from several European countries also

found that product claims have little effect on product perceptions (van Trijp & van der Lans, 2007). Other authors report that while consumers rate products more highly when given only nutrition or health claims, their evaluations are based on overall product composition when nutrition information is also provided (Ford, Hastak, Mitra, & Ringold, 1996; Keller *et al.*, 1997; Mazis & Raymond, 1997; Mitra, Hastak, Ford, & Ringold, 1999).

Experimental research has demonstrated that consumers can still correctly read and interpret nutrition information in the presence of a health claim, and are capable of using nutrition information panels to evaluate the veracity of front panel claims (Burton, Andrews, & Netemeyer, 2000; Ford *et al.*, 1996; Keller *et al.*, 1997). In fact, Teratanavat (2005) concluded that health claims encouraged respondents to evaluate the NFP more carefully; the difference in participants' attitudes towards the healthy and unhealthy versions³¹ of the product was greater in the presence of a health claim, while there was no significant difference in attitudes across nutrition profiles when no health claim appeared on pack.

However, Roe *et al.* (1999) found that consumers viewed products as healthier when health or nutrition-content claims were added. Their findings suggest that consumers may not always compare front-of-pack claims to nutrition facts. Exploratory research conducted with Australian consumers revealed that while consumers were often sceptical about nutrient function claims, particularly younger adults, many admitted they still chose to buy such products in the hope that the claimed benefit would eventuate (Bhaskaran & Hardley, 2002).

Roe *et al.* (1999) reported that when claims are present, some consumers limit label search behaviour to viewing the front of the package. Thus, even if consumers can use nutrition information in the presence of claims (Ford *et al.*, 1996), this does not logically preclude them from being influenced by claims when in store. Younger consumers may be more likely to use claims to inform their decision making; McCullum and Achterberg (1997) reported that adolescent consumers preferred to use claims on the front of pack rather than full nutrition profile information.

³¹ Teratanavat's (2005) 'unhealthy' experimental product labels contained an inaccuracy that may have confounded the results: the nutrition facts panel reported the product contained 26g of Total Carbohydrates, yet listed 150g of Sugars.

Thus, while consumers express scepticism about claims (Keller *et al.*, 1997), it seems that under some conditions product claims may affect product evaluations and purchase decisions. For example, research shows that consumers' motivation to read the full nutritional profile moderates the effect of product claims on their product evaluations and purchase intentions (Kemp, Burton, Creyer, & Suter, 2007). Several years of sales data from the United States shows consumers have responded positively to nutrient content claims; for example, chocolate confectionery products bearing health claims sell in larger volumes (Lempert, 2006), and products fortified with calcium have experienced very high sales growth (Lempert, 2007). The General Mills company stated that the addition of a health claim linking fibre consumption and reduced risk of heart disease to Cheerios® cereal increased sales by five percent in one year (Marquart, Weimer, & Jacob, 2001).

Experimental studies have shown the potential for ostensibly 'better for you' products to lead to weight gain is real (Miller, Castellanos, Shide, Peters, & Rolls, 1998; Shide & Rolls, 1995; Wansink & Chandon, 2006). One study found that participants consumed more calories in a meal after first being given a starter labelled 'low fat' than when the starter was labelled 'high fat' (the energy content of the two starters was the same) (Shide & Rolls, 1995). Likewise, Wansink and Chandon (2006) found that overweight consumers were likely to ingest more calories when given a 'low fat' product to eat, and concluded that low fat nutrition claims encourage people to eat more because these inflate consumers' perceptions of an appropriate serving size and assuage consumption guilt. Products bearing nutrition-content claims such as 'low fat' may still have high energy contents. An audit of Australian products with reduced fat claims found many were energy dense and could contribute to unhealthy weight gain (La Fontaine, Crowe, Swinburn, & Gibbons, 2004).

In the course of developing P293, FSANZ undertook or commissioned several studies to determine how nutrition-content claims shape consumers' choices. Participants in a qualitative research study reported that claims do not influence their purchase behaviour (FSANZ, 2005b). In a more recent experimental study, respondents were asked to evaluate fictitious product packages either with or without nutrition-content claims. Adding nutrition claims did not lead to a significant increase in purchase intentions or product evaluations (FSANZ, 2008c).

However, another FSANZ study found conflicting results. This study explored possible effects of health claims, and found that consumers do look for and rely on claims. The research also yielded another surprising piece of information: many consumers reported they were already aware of and relied on high level health claims, despite this being impossible (FSANZ, 2005b; 2006c). Although FSANZ attributed this finding to confusion over the question or possible exposure to illegal claims (see for example Williams *et al.*, 2006), psychological research also suggests a plausible alternative explanation. It is normal for people to recall prior knowledge and associations to draw inferences while reading (called “top down” processing), and thereby infer conclusions that are not explicitly contained in the text being read (Leahey & Harris, 2001; Matlin, 2003). Therefore, consumers may recall reports of scientific findings in the media or claims made in advertisements (Williams, Tapsell, Jones, & McConville, 2007), leading them to assume that a product may help them achieve specific health benefits. Furthermore, marketers are aware that consumers have a tendency to make attributions beyond manufacturers’ claims (Preston, 2002). Additionally, consumers do not always draw distinctions between different levels of claims (Williams, 2005). Despite ambiguous research findings, FSANZ (2007c) concluded there is no reliable evidence that nutrition claims mislead consumers or encourage unhealthy consumption behaviours.

Overall, the effects these types of information have on consumers’ knowledge, beliefs and behaviour are unclear, and the interaction between health claims and current or simplified versions of nutrition information has not yet been tested. While health claims are put forward as a way to “remove ambiguity and uncertainty in the marketplace” (FSANZ, 2005c, p. 2), they have the potential to create confusion as consumers receive more information and opt for more efficient ways of processing this. Thus, health claims may assist consumers to make more informed food choices, but empirical clarification of the role this information could play, how consumers interpret it, and its interaction with other information, will extend knowledge of how consumers process conflicting information (Baltas, 2000).

4.4 Conclusions

Western societies place a high value on the right of individual freedom of choice, and this is particularly so for food, which is a key reason why information disclosure policies are preferred by policy makers. It is very important that people eat well as diet affects health, but the optimal nutrition and health information disclosure policies remain unknown. Furthermore, consumers can only receive direct benefit from information disclosure if they understand it and alter their decision making accordingly (Mazis *et al.*, 1981); high obesity and chronic disease rates cast some doubt on the efficacy of current labelling provisions.

The effect of nutrition information formatting and product claims has been the subject of many consumer surveys, as well as lab and field experiments, particularly in the United States. The collective findings often present conflicting results, although some themes have begun to emerge. It is quite clear, for example, that while many consumers want their families to eat nutritious foods and remain healthy, there are other factors that militate against using available information to achieve this goal. Consumers have reported that they only have limited time available to peruse options and read nutrition labels, and a significant proportion of the population has difficulty understanding and working with numeric information.

The fact that opportunity, motivation and ability affect consumers' use and understanding of information has prompted both researchers and regulators to design and test alternative communication formats. Reference formats such as Percent Daily Value (or Percent Daily Intake) have been shown to be effective in some studies but not others. The difference seems to result from ability; consumers with greater nutrition knowledge and education perform well at label reading tasks using PDV information.

Summary labels were developed to reduce knowledge and ability burdens, and it seems these do help less able consumers. However, research on the communication effectiveness of summary formats is ambiguous, and many consumers do not like simple formats. However, manufacturers and supermarket chains have quite recently begun to embrace the use of prominent, simplified decision cues – in the form of 'healthy choice' logos. Evidence from the field of label ergonomics suggests that graphic, colourful, and easily recognised labels are seen and used by consumers.

It seems that consumers can be partitioned according to the volume of information they would prefer in nutrition labels: ‘the simpler the better’ versus ‘give us all the information’. However, the studies reported above also show that consumers’ preferences frequently fail to align with their ability to use alternative formats: “...formats which perform well are not necessarily popular, and formats which are popular do not necessarily perform well” (Levy *et al.*, 1991, p. 120).

Consumers tend to base product evaluations on verbal descriptions rather than numeric information, which has raised concerns among nutritionists and health advocates about the potential for product claims to bias food selection decisions. While consumers can use nutrition information to establish the validity of product claims, evidence points to claims being used as quick heuristics. As claims are often prominent, typically using easy to read fonts and accompanied by graphics, it is important that nutrition labels are visually strong enough to compete with nutrient and health claims.

Overall, the effect of nutrient and health related claims on consumers’ behaviour is unclear (Williams *et al.*, 2003). Since the majority of studies have measured perceptions and evaluations rather than impact on behaviour, questions remain about whether reported findings generalise to in-store settings and purchase decisions (Geiger, 1998). Few studies have been conducted in field settings, and it is reasonable to expect that consumers’ use of nutrition labelling could decline in realistic settings.

Policy makers also need information on the amount and type of information that consumers can realistically use in-store (Scott & Worsley, 1994). In developing regulations around information disclosure, policy makers need to reconcile the disparity between consumers’ desire for more information and their ability to process it. As Bettman *et al.* (1986) noted, label designers need to ensure that sufficient information is present for informed choices, while not providing so much information that consumers selectively process and make sub-optimal choices. A balance must be struck, as overly simplified labels may also result in misleading impressions. Thus, researchers need to test formats that minimise information load to determine if these simple formats enable adequate decisions.

5 Research Hypotheses and Design

5.1 Introduction

Increasing obesity rates are unsustainable because they contribute directly to the growing prevalence of chronic disease and early mortality. While both physical activity and dietary intake directly affect weight, current evidence suggests increased energy consumption is primarily responsible for unhealthy weight gain (Swinburn *et al.*, 2006). However, there is considerable debate both over the factors that have led consumers to eat more energy dense diets and the interventions that could promote more healthful diets to reverse obesity trends.

Policy makers have been reluctant to restrict marketers' activities and instead prefer to educate consumers to be responsible for their own and their families' wellbeing. This position assumes that if consumers are informed about the need to eat balanced diets, and have access to a wide range of products with appropriate health and nutrition information, they will make good choices. Since people in Australia and New Zealand purchase most of their food from supermarkets, the New Zealand Food Industry Group and both the Australian and New Zealand Food and Grocery Councils have encouraged food manufacturers to place Percent Daily Intake nutrition labels on their products. However, public health groups have encouraged regulators to mandate the use of Traffic Lights Labels, which they argue are more accessible and thus more likely to influence behaviour.

As outlined in Chapter 4, food labelling research has not produced consistent findings. Some studies have found that consumers make better judgements when provided with simpler labels, while others report consumers effectively use more detailed information. Intuitively, providing more information should enhance consumers' ability to make more accurate assessments when evaluating products. However, it is equally plausible to suspect that many consumers do not have the time, desire or capacity to undertake extensive information searches when making many choices in distracting retail environments. Furthermore, little is known about whether moving information to the front of packages enhances its effectiveness or increases the likelihood consumers will access and use it.

Thus, while different groups have proposed alternative information labels, little is known about how consumers use and respond to existing on-pack nutrition information, and even less is known about the likely effects of complementary FOP labels. In a systematic review of 103 articles that investigated consumers' understanding and use of nutrition labelling published to June 2002, Cowburn and Stockley (2005) conclude there is insufficient evidence to predict how consumers would use alternative nutrition information in real world settings. The authors further note that most studies rely on self-reported data that are not validated with objective measures, and use methodologies and tasks that do not necessarily align with supermarket shopping behaviours.

Furthermore, few researchers have examined whether and how parents use food information labels to inform their purchase decisions. This is an important omission, since the best hope for preventing obesity may lie with improving children's diets (Wadden & Clark, 2005).

This thesis addresses these knowledge gaps by drawing on two theoretical frameworks to consider how formatting of nutrition and health related information on packaged foods may influence consumers' attitudes and purchase behaviour. This chapter further discusses the alternative front-of-pack labelling formats most frequently cited in labelling discussions in New Zealand, and proposes hypotheses about how these may affect consumers' decisions. The final section outlines the mixed methods research design used to test the hypotheses. Methodological information specific to each study is provided in Chapters 6, 7 and 8.

5.2 Front-of-Pack Labels Formats under Consideration in Australia and New Zealand

The technical content and formatting of NIPs have led to concerns that many consumers may not comprehend the information featured; this has prompted calls to simplify the information and increase the label's utility. Recently, FSANZ was asked to review regulatory options for front-of-pack (FOP) nutrition labels (Australia and New Zealand Food Regulation Ministerial Council, 2008), not long after the New Zealand Health Select Committee (2007) report recommended that options for new nutrition labels should be investigated. Similarly, the United States Government Accountability Office's

(GAO, 2008) report into food labelling noted many stakeholders want a federally mandated, standardised FOP nutrition label format, and recommended the FDA investigate options for a simplified labelling system.

Several recent studies suggest that consumers want front-of-pack nutrition labels (Gorton *et al.*, 2009; Grunert & Wills, 2007; Kelly *et al.*, 2009; Signal *et al.*, 2008; van Kleef, van Trijp, Paeps, & Fernández-Celemín, 2008). Globally, most food manufacturers are opposed to mandatory FOP labelling, preferring the status quo that allows companies to voluntarily adopt FOP systems of their choice (GAO, 2008). Internationally, there has been a proliferation of industry-developed nutrition labels and summary symbols (Majoras *et al.*, 2006). In the United Kingdom, there are more than 30 different front-of-pack nutrition labelling systems (FSA, 2009). As noted in the previous chapter, examples From the United States include PepsiCo's (2004) Smart Spot® and Unilever's (2006) Choices™ stamp, and the Smart Choices Program™ (Keystone Center, 2008). Products carrying these logos reportedly experience sales growth. Industry leaders state their research shows consumers appreciate and "...want simple messages with out too much information or detail" (Majoras *et al.*, 2006, p. 18), and are confident their current labels fulfil this need.

The nutritional criteria for current FOP logo systems are decided by those whose primary goal is enhancing company profits, argue critics (Lewin *et al.*, 2006). The criteria vary substantially between schemes and often draft all products into only two categories – either qualifying for a 'healthy choice' label or not. Overall, many health, nutrition and consumer advocates are concerned that industry labels are less effective than other FOP labelling schemes at helping consumers identify healthy options. Two alternative nutrition information formats, the first providing reference information and the other a visual summary format, are favoured by industry and public health stakeholder groups in New Zealand.

5.2.1 Percent Daily Intake Nutrition Labels

Percent Daily Intake (PDI) labels state, in percentage terms, how much one serving of a food contributes to the daily recommended intake of selected nutrients and energy. The recommended intake is calculated from the reference values provided in Standard 1.2.8 of the Food Code (FSANZ, n.d.), reproduced in Table 8. The FIG (2006b) supports the

introduction of Percent Daily Intake labels (PDI, see Figure 14) and energy-only information ‘thumbnails’ for small packages (not shown).

Table 8 – Daily nutrition reference values for adult New Zealanders

Nutrient	Reference Value
Energy	8,700 kJ (≈2080 kCal)
Protein	50 g
Fat	70 g
Saturated Fat	24 g
Carbohydrate	310 g
Sugar	90 g
Dietary Fibre (if included)	30 g
Sodium	2,300 mg

(Food Standards Australia New Zealand, n.d.)



Figure 14 – Example of a Percent Daily Intake label

(from www.mydailyintake.net)

Many companies now voluntarily print PDI labels on product packages³². Research commissioned by the Australian Food and Grocery Council (AFGC, 2008b) found that three quarters of Australian consumers are aware of PDI labels, two thirds believe these are easy to read and understand, but only one third state they have used the labels to inform purchase decisions. As yet, there has been no published evidence on whether consumers’ purchasing behaviours have changed following the introduction of PDI labels.

Some research conducted to date poses questions about the likely effectiveness of PDI labels. Qualitative research conducted for FSANZ suggests consumers who currently do

³² An audit of Australian grocery items in February 2008 found about 450 products with PDI labels or thumbnails on the front of packaging (AFGC, 2008a). As many products are sold in both countries, the number may be similar in New Zealand.

not use the NIP will not use PDI labels either (TNS Social Research, 2007). This finding reflects concerns held by some food manufacturers. For example, on their website, Sanitarium (n.d.) questioned the user-friendliness of PDI labels, and whether consumers would use all the information in these panels to monitor their daily intake. To do so, consumers would have to simultaneously monitor their intake of many nutrients and sum this across the day, which Sanitarium suggested was unlikely. Moreover, people often eat more than recommended serving sizes, usually unknowingly (Bryant & Dundes, 2005), making it difficult to track energy consumption over the day with any degree of accuracy.

Fasolo *et al.* (2007) explain that consumers find it more difficult to compare a few products with many attributes than to choose between many products with few attributes. Some manufacturers who have adopted the PDI scheme seem to be aware that the volume of information contained in this label is high and requires effort to comprehend. For example, McDonald's New Zealand ran a print advertisement explaining the PDI labelling scheme in their 'Take a Closer Look' campaign, which stated: "Sorry for the information overload, but it's important to us that you can make informed choices" (Anonymous, 2008b, p. 25).

Furthermore, it may not be possible for consumers to undertake straight comparisons of PDI labels on competing products. FSANZ does not regulate product serving sizes (unlike the FDA in the United States); instead, manufacturers determine serving sizes for their products. The outcome of this policy is that substitutable products often have different serving sizes, which will make it difficult for consumers to compare products using PDI labels (House standing committee on health and ageing, 2009; Lobstein *et al.*, 2007).

5.2.2 Traffic Light Nutrition Labels

The British Foods Standards Agency (FSA, 2006) developed a colour-coded nutritional signposting system called "Traffic Light" labelling (TLL). The agency recommended that Multiple Traffic Light (MTL) labels be adopted (see Figure 13b, page 103), and a range of MTL formats have been implemented by manufacturers in Great Britain (FSA, 2009). One popular implementation is typified by ASDA Supermarket's label (Figure 15a), which presents 'traffic light' ratings, GDA, and actual nutrients per serve

information. Other manufacturers have used the ‘Wheel’ format designed by Sainsbury’s Supermarkets (Figure 15b).



Figure 15 – Examples of other Traffic Light Label formats

a) ASDA Supermarket's Traffic Light and Guideline Daily Amount label; b) Sainsbury's 'Wheel of Health' Traffic Light with nutrient amounts.

As the colours used in TLLs have inherent meaning and are related to a nearly universal rule-governed behaviour, it is thought that consumers will require little instruction to understand and interpret these labels. Most TLLs present less information than the PDI label, as they feature fewer nutrients and summarise the levels of these as low, medium or high. These features are thought to increase consumers' ability to understand the information communicated in the label. Additionally, studies suggest nutrition labels that emphasise negatively perceived nutrients, such as fat, cholesterol, sugar, or calories that people generally need to consume less of, are more likely to affect buying behaviour (e.g., Russo et al., 1986).

However, while this concept has attracted considerable support from nutrition and consumer groups, there is little empirical research that tests the effectiveness of this labelling approach. Some researchers have described TLLs as too simplistic and therefore less helpful (e.g., Bussell, 2005), and point to research that indicates consumers prefer labels to list information on more nutrients rather than fewer (Geiger *et al.*, 1991).

5.2.3 Nutrition-content and Health Claims

Nutrition facts labels are not the only source of information consumers can use to make inferences about a product's nutritional profile. Manufacturers may also use nutrition-

content or nutrient function claims to communicate information about their products, and may soon be able to make specific health claims on products sold in Australia and New Zealand (see §4.3.2, page 107). Collectively, these are referred to as ‘product claims’ in this thesis.

The results of research exploring how product claims affect consumers’ product evaluations and purchase behaviours are equivocal. Some findings suggest consumers preferentially rely on written product claims when given numeric nutrition information (Roe *et al.*, 1999; TNS Social Research, 2007; Viswanathan, 1996), while other studies conclude consumers use numeric nutrition facts to assess the accuracy of product claims to evaluate a product’s healthiness (Ford *et al.*, 1996; Keller *et al.*, 1997). To test whether consumers can reconcile product claims and nutrition information when evaluating foods, researchers create experimental conditions where the product claims and nutrition information are incongruous. However, in many studies, the product claims tested were factually incorrect in the incongruous conditions (Ford *et al.*, 1996; Garretson & Burton, 2000; Keller *et al.*, 1997; Mitra *et al.*, 1999), a situation which consumers are protected from by truth-in-labelling laws. For example, Ford *et al.* used the claim “*Does your heart good*” on product with a high fat and sodium content. Thus, research is necessary to test how consumers assess truthful claims on products with less healthy nutrition profiles.

5.2.4 Summary

Increasing or improving information at the point of purchase to assist consumer decision making and enhance market efficiency is not a new idea (Day, 1976), although questions remain about how these measures affect consumers’ behaviour (Rothschild, 1999). Providing nutrition information at the point-of-purchase aims to improve consumers’ knowledge of food products and assumes this will translate into healthier purchase behaviours. However, as Seiders and Petty (2004) note: “Little is known about how consumers apply general nutrition information to weight-control goals or what formats or particular information would be most useful to consumers and serve to overcome dietary confusion” (p. 164). Even putting to one side the argument that obesity is not a “knowledge-deficit problem” (Swinburn, cited in Fight the Obesity Epidemic, 2007), few studies have examined how alternative FOP nutrition information formats affect consumers’ attitudes and behaviour. For policy makers charged with implementing

regulations that best support healthy food choices to achieve social goals, this question requires urgent research attention.

5.3 Hypotheses

Rucker and Petty (2006) argue that the Elaboration Likelihood Model (ELM) is an appropriate conceptual framework for creating effective social marketing and public service communications. The model is used here to make predictions about the effect of different nutrition labels on consumers' attitudes. The ELM states that when people receive new information, the level of evaluation they undertake falls on a continuum from high to low elaboration ('central' to 'peripheral' processing, refer Figure 4, page 45), determined by their motivation and ability to think about the message. As outlined in §5.3.1 below, Rucker and Petty (2006) propose a method for research informed by the ELM, which guides the development of hypotheses.

However, given the generally weak evidence for the causal relationship between attitudes and behaviour, the question of how front-of-pack nutrition labels and product claims may affect consumers' choices is investigated using a behaviour modification perspective. This has a different set of assumptions to the ELM framework. In particular, the BMP emphasises the role of environmental cues and consequences over attitudes and beliefs, and acknowledges the tendency towards status quo driven by habitual behaviour established through histories of reinforcement. Additionally, because overt action is the variable of interest in behavioural studies, a different experimental method is required to investigate the effects of food labelling from this perspective.

5.3.1 The ELM and Message Effectiveness

As the research reported here was being conceptualised, Rucker and Petty (2006) published an article encouraging use of the ELM "... to effectively communicate the risks associated with products and services to consumers" (p. 39). Nutrition labels are intended to alert consumers to a food's composition, so they can determine whether it would be appropriate for them to eat. Given that there are health risks associated with high energy, fat, sugar and salt diets, effective communication of nutrition information should enable consumers to manage the risk of poor nutritional intake on health.

In their article, Rucker and Petty (2006) outline six steps to determine whether messages adequately communicate the risks products and services may pose to consumers (see Table 9). The first four steps encourage systematic evaluation of audience and message characteristics, the communicator's objectives, and the fit between these three elements; the research hypotheses are generated via this process. The final two stages represent testing and evaluating the message, and will be discussed in §5.4.

Table 9 – Recommended steps in developing risk communications for consumers using the ELM

Step	Process
1	<i>Consider audience elaboration level</i> Is the audience motivated and able to scrutinise the message carefully?
2	<i>Design and evaluate message characteristics</i> Does the message contain information that can serve as cues, arguments, or both?
3	<i>Determine the message objectives</i> Is immediate or enduring attitude change desired?
4	<i>Evaluate fit between steps 1-3</i> Is there congruency between the audience's likely elaboration level, the message characteristics, and the message objectives?
5	<i>Test message effectiveness</i> Experimentally examine whether the message is more effective under high or low elaboration levels.
6	<i>Evaluate message effectiveness</i> Was the message effective at the elaboration level specified? How was certainty of the attitude influenced?

(adapted from Rucker & Petty, 2006, p. 41)

The first step is to consider the audience's likely level of elaboration and whether consumers are more likely to process a message carefully or use mental shortcuts. The ELM states that consumers' level of elaboration is determined by their motivation and ability to engage with the message; they will undertake higher elaboration (following the 'central route') when motivated and able to process the message content, but lower levels of elaboration (the 'peripheral route') result when motivation or ability are low. In these latter situations, contextual cues (such as visual stimuli) are used instead of arguments in the message (Petty & Wegener, 1999).

The research reviewed in Chapter 4 suggests many consumers are unlikely to expend much time and effort to read and comprehend food labels while grocery shopping.

Consumers spend very little time choosing products and use fewer pieces of information when hurried or distracted; thus the likelihood that more complex nutritional information will be overlooked seems high. As noted earlier, research suggests consumers are generally optimistic about their vulnerability in many domains, which may explain why they generally do not read or process risk information carefully (Rucker & Petty, 2006). Thus, consumers will probably be more likely to undertake peripheral processing, by relying on salient criteria and prominent, easily accessed on pack information that requires little thought to evaluate.

The second step is to evaluate characteristics of the alternative messages and assess whether these correspond to the audience's likely elaboration level. The PDI and TLL nutrition label formats place different processing demands on consumers. The warning label literature suggests the TLL will be more amenable to peripheral-route processing as the colours used have inherent meaning and require minimal ability or effort to interpret. Nutritional labelling research has shown that more educated or knowledgeable consumers perform better with numeric nutrition formats, suggesting central processing is required to evaluate these types of labels.

Simple product claims are often able to be processed peripherally, using rules-of-thumb such as 'foods with vitamins and minerals are good for you'. However, as claims are written statements on packs, they may also be centrally processed, as consumers may compare the claims to their existing knowledge and to other on-pack information. Furthermore, health claims may constitute strong arguments for viewing a product positively, and may therefore lead to more favourable attitudes when processed centrally.

While summary nutrition information consistent with the NIP may enhance knowledge of the product's overall nutritional profile, nutrition-content claims could be inconsistent with this knowledge. Consumers with high motivation may process and evaluate all information sources provided before forming an evaluative attitude toward the brand. However, consumers with lower motivation levels may be more influenced by the simplified information sources and less likely to search for inconsistent information. Thus, elaborative processing would be required to detect inconsistencies between overall nutritional composition and specific claims.

The third step requires a consideration of the type of attitude change that is required.

The ELM posits that central processing leads to stronger, more resilient attitudes, while attitudes formed through peripheral processing are not strongly held. However, as the related behaviour (deciding to purchase or not) would be performed within seconds of message exposure, short term attitude change is all that is required in this situation.

In order for a message to be effective, there needs to be a high degree of congruence between the audience's elaboration level, the message's characteristics and type of attitude change required. Thus, the fourth step is to determine the fit between the three elements evaluated in the prior steps to predict whether the message will be effective at producing the type of attitude change required.

Given the proposition that motivation and ability moderate elaboration processes, only consumers with higher levels of motivation and ability would be expected to consider complex numeric information and use this to inform their attitudes about a product. That is, consumers with high motivation to access nutrition information, coupled with an ability to evaluate this information, should be more likely to use more complex nutrition formats and be better able to evaluate foods accurately. Conversely, consumers with low motivation or ability should be less able to evaluate complex information accurately, and thus more likely to rely on contextual information to form product attitudes. In short, when nutrition information is more accessible, it will require less processing to understand and therefore incorporate in attitude formation. Therefore, the TLL format should better suit consumers with lower motivation or ability, although it will remain useful to those with high motivation who will be capable of evaluating information from all sources. If these assumptions are correct, then including a TLL on the front-of-pack of a nutritionally superior product will result in higher average attitude scores than when a PDI label is presented, and vice versa for a nutritionally inferior product. As NIPs are the least accessible information format, consumers' attitudes will be least differentiated with these labels, on average.

Furthermore, if motivation and ability moderate elaborative processing, then attitude strength and valence will be directly proportional to consumers' motivation and ability to use nutrition information. This would show in the results as an interaction between these variables and the message format variables. Thus, the first pair of hypotheses predicts that:

- H1a Respondents' attitudes will become increasingly differentiated for the two nutrition profiles as the nutrition information becomes more accessible, and will increase from NIP to PDI to TLL.
- H1b Respondents' ability and motivation to use nutrition information will mediate attitude scores across the nutrition label conditions; those with high motivation and ability will have differentiated attitudes when nutrition information labels are less accessible.

Health claims that promote mineral or vitamin fortification, for example, may lead consumers to overlook other, less healthful, attributes of a product when nutrition information is not very accessible. Thus, a nutrient fortification claim may detract from information about a product's sugar or fibre content, for example, or may reduce the salience or significance of this information. This reasoning suggests that when a product features a nutrition-content or health claim, consumers will have a more positive attitude to the product when nutrition information is presented in a Percent Daily Intake label than when nutrition information is presented in a Traffic Light Label. If this is the case, introducing more information may mislead or overwhelm consumers.

- H2a Consumers' responses to product claims in attitude formation will be mediated by front-of-pack nutrition label format, and will be inversely proportional to label accessibility, so will decrease from PDI to TLL.
- H2b Consumers with higher motivation and ability to use nutrition information will not be as influenced by product claims when evaluating the product.

5.3.2 The Effect of Information on Behaviour

In addition to assessing the likely effectiveness of alternative nutrition label formats and product claims on consumers' attitudes, the research presented here seeks to measure the effect of this information on choice behaviour. As previously described, there is evidence that changing consumers' attitudes will not necessarily result in a change to behaviour. The final experiment was designed to examine the effect of nutrition and health related information on consumers' stated choice preferences.

Because Traffic Light Labels convey information using a well-known set of rules that have a long history of conditioned reinforcement ('green means go', 'amber means slow down', 'red means stop'), consumers will easily understand the label. Conversely, the Percent Daily Intake label does not convey information using heuristics, and in fact presents the information in a format that requires a moderate level of numeracy to process, and deliberate consideration.

Placing nutrition information on front-of-packages overcomes problems related to lack of access for consumers who typically do not search for this information. Additionally, as the TLL requires minimal interpretation, it will have a more pronounced effect on preferences than the PDI label. Therefore, it is hypothesised that:

- H3a When nutrition information is presented on the front-of-pack, consumers' preference for a nutritionally superior product will increase, and their preference for a nutritionally inferior product will decrease, relative to when a Nutrition Information Panel only is available.
- H3b The change in stated preference will be greatest when a TLL is presented.

Written product claims are relatively easy for most people to read and interpret. Furthermore, because claims by their very nature suggest a desirable consequence (even if only implicitly), they will positively influence consumers' choices. Additionally, because claims are reasonably easy to understand, whereas the NIP and PDI nutrition label formats are not, then product claims will have the greatest effect on choice when nutrition information is presented numerically. Thus, it is hypothesised that:

- H4a The addition of nutrition-content and health claims will increase stated preference for all products.
- H4b The increased in stated preference for a product bearing a product claim will be greatest when the nutrition information is less accessible.

As research suggests that a significant proportion of New Zealand consumers report they use the NIP when grocery shopping, it is further hypothesised that this prior behaviour will affect consumers' stated preferences. Respondents who regularly

use the NIP will have different stated preference patterns from those who do not, and they will be more likely to select the superior product with any nutrition label format. Front-of-pack labels will affect the stated preferences of consumers who are not regular NIP readers. It is hypothesised that:

- H5a Respondents who view the side panel image showing the NIP more frequently during the experiment will have significantly higher stated preferences for the nutritionally superior option over the inferior option with all three label formats.
- H5b Respondents who do not view the side panel image showing the NIP frequently will not differentiate between the nutritionally superior and inferior options in the absence of front-of-pack labels. Their stated preferences will be most differentiated when TLLs are available.

Finally, people who already frequently refer to the NIP will have greater confidence in their ability to use nutrition information when choosing products, and respondents' confidence levels will mediate their choices when the products carry a numeric label. However, because the TLL uses graphic elements based on a known set of rules, confidence to use nutrition labels will not affect choices made.

- H6 The Traffic Light Label will reduce the effect of differences in self-reported confidence and enable better differentiation between healthy and less healthy products than labels featuring numeric details.

5.4 Research design

Since medical researchers have argued that addressing youth obesity will have the greatest impact on long-term societal health, this research examined the views and choices of New Zealand parents with children up to 15 years of age.

Breakfast cereal provides an appropriate context for the study of on-pack health and nutrition information for several reasons. Firstly, packaged breakfast cereal is a high

penetration product category,³³ making it highly likely that respondents would be familiar with purchasing from this category. Secondly, many cereals have been described as nutritionally ambiguous (Allan, 2006), and products targeted at children often have lower protein and higher sugar, sodium, and energy content than cereals targeted at adult consumers (Elliott, 2008; Woods & Walker, 2007). Thirdly, with particular relevance for latter experiments, a range of nutrition-content claims are common on breakfast cereals (Williams *et al.*, 2003), especially children's cereals (Woods & Walker, 2007)³⁴. Finally, high proportions of consumers have reported examining NIPs and nutrient claims when selecting breakfast cereals, with 65 percent claiming to use NIP labels when purchasing from this category (FSANZ, 2003a).

The research involved three data collection phases. Before the hypotheses were tested in experimental settings, a series of in-depth interviews was conducted to explore the factors consumers perceived as influencing their food purchases, consumers' understanding of nutrition information panels, their concerns about food content, their ability to address those concerns, and the means they used to do so.

The second phase consisted of two experiments, designed using the ELM principles to measure consumers' attitudinal responses to front-of-pack nutrition labels and product claims. The first used a face-to-face method and the second was conducted online. The third and final research phase tested whether changing information available influences respondents' choices, using a stated preference discrete choice modelling experiment conducted online.

5.4.1 Phase One: Study One

This phase aimed to uncover breadth of experience rather than elucidate a deep understanding of the phenomenon of food choice (Patton, 2002). This research also gauged parents' cognitive reactions to four front-of-pack nutrition labelling schemes and helped ensure that the questions used in subsequent experiments reflected consumers' decision process. The topics discussed in the depth interviews were broader than the

³³ The 2007 Household Economic Survey found that 45.3% of New Zealand households purchased breakfast cereals during the survey week (Statistics New Zealand, 2007a).

³⁴ Regulatory provisions in the Food Code specifically permit cereal products to be fortified with 12 micronutrients (Standard 1.3.2, FSANZ, 2006a).

scope of the following three experiments, and included decision making in grocery stores and when purchasing food in take-away or restaurant settings. Study One is presented in Chapter 6.

5.4.2 Phase Two: Studies Two and Three

The fifth step in applying the ELM research method, as advised by Rucker and Petty (2006), is experimentally testing the communication to see whether it is more effective under conditions of high or low elaboration compared to control or alternative messages (see Table 9, page 124). The final step is evaluating the results. Three variables should be measured to gauge message effectiveness: attitudes; attitude certainty; and thoughts generated while viewing the message. Thoughts are examined to determine reasons underlying respondents' attitudes.

To manipulate consumers' level of elaboration, ELM researchers often modify participants' issue involvement by making the message either very relevant or not very relevant to their personal circumstances, asking respondents to process the message carefully in one condition but not another, or introducing distractions to prevent central processing (e.g., Celsi & Olson, 1988; Cole *et al.*, 1990; MacKenzie & Spreng, 1992; Miniard *et al.*, 1991; Miniard *et al.*, 1992; Petty & Cacioppo, 1984a; Petty *et al.*, 1983). For example, Petty, Cacioppo and Goldman (1981) manipulated participants' motivation to engage with the experimental message by making it more or less personally relevant: they informed participants, who were university students, that they were to review a proposed new campus policy that would either come into effect the following year (high relevance assumed to increase motivation) or in ten years (low relevance, lower motivation) (cited in Petty, Barden *et al.*, 2002).

However, given the evidence that some consumers are inherently more motivated and able to use nutrition information than others, the decision was made to try to measure respondents' actual motivation and ability levels to see if these influenced message processing. This will increase external validity and allow a more thorough assessment of how nutrition and claim formatting affects attitudes (Ford *et al.*, 1996).

The first experiment (Study Two) tested the first pair of hypotheses (H1a-b) by examining the effect of front-of-pack nutrition formats on respondents' cognitions. A

full-factorial two by three between groups experiment was developed (nutritional profile: more-healthy, less-healthy; nutrition label: NIP, PDI, TLL). The second experiment (Study Three) was a replication with extension that explored the effects of nutrition-content and health claims on respondents' product evaluations, testing hypotheses H2a-b. This experiment used a between-groups, partial-factorial two by two by three design (nutritional profile: more-healthy, less-healthy; nutrition label: PDI, TLL; product claim: no claim, nutrition-content, health claim). In each experiment, respondents' attitudes, attitude certainty, beliefs, purchase intentions, motivation, and ability were measured. Studies Two and Three are presented in Chapter 7.

5.4.3 Phase Three: Study Four

As Balasubramanian and Cole (2002) note, research that employs multiple methodologies balances the strengths and weaknesses of specific methods, while multiple outcome variables enables identification of convergent findings that may increase confidence in the results. Most nutrition labelling studies have measured only cognitive outcomes, and assumed that these are related to behaviour. This is a widely disputed assumption (Baltas, 2000). Keller *et al.* (1997) recommended using a choice modelling methodology to assess how different product package elements shape consumers' food choices.

This study used a stated preference discrete choice experiment to analyse consumers' choice behaviours to quantify preferences for different options (Gerard, Shanahan, & Louviere, 2003). Thirty pairs of products with different nutritional composition (more and less healthy), nutrition labels (NIP, PDI, TLL), and product claims (no claim, nutrition-content, health claim) were presented in this study. Additionally, two cereal product variants were used to enhance the realism of the experiment. The remaining hypotheses, H3a-b, H4a-b, H5a-b, and H6, were tested in this experiment. Study Four is presented in Chapter 8.

6 Study One: Exploring Consumers' Food Purchase Decisions and Reactions to Nutrition Labels

6.1 Introduction

There is very little published evidence from New Zealand and Australia regarding parents' attitudes towards and use of information on food labels. This chapter presents the findings from a series of in-depth interviews conducted with a diverse group of parents living in the Manawatu region of New Zealand. Parents are nutritional gatekeepers regarded as responsible for their children's diets, so their views and experiences are important when determining how to reduce the incidence of obesity among children (Brown *et al.*, 2008).

The results are presented in two parts, corresponding to two articles (Maubach & Hoek, 2010; Maubach, Hoek, & McCreanor, 2009). First, parents' perceptions of the factors that influence their food purchase are explored, particularly their experiences and use of on-pack information, including the mandatory NIP. More specifically, the research aimed to identify factors that encouraged or limited use of the NIP, and beliefs about the need for nutrition information when buying meals away from home. The second section reports their views on four alternative front-of-pack nutrition labelling schemes and explores how participants use nutrition information to evaluate products and the formats they believed would be most useful.

6.2 Study One Method

Following approval by the Massey University Human Ethics Committee³⁵, 15 face-to-face, semi-structured interviews were conducted with parents who had at least one child between five and 12 years old in their care. As a primary goal of this research was to uncover the breadth of parents' experience, a diverse sample was sought to build a rich database. Four community organisations in Palmerston North helped recruit

³⁵ The project was approved by the Massey University Human Ethics Committee Southern B, Application 06/47.

participants: a netball club, a kōhanga reo (Māori immersion preschool), an organisation supporting solo parents, and a church-run adult education service. Contacts within the organisations distributed invitations to potential participants (see Appendix A1.1.1). Snowball sampling was used to invite participants and recruitment ceased when no new insights were forthcoming from successive interviews (Daly *et al.*, 2007).

The interviews were conducted in April and May 2007 and lasted between 25 and 55 minutes each; respondents were offered \$20 as a token of thanks. The first two interviews were used as pilots to test the discussion format and show cards; following these, minor refinements were made to the question wording and stimuli presentation. A structured protocol was used (see Appendix A1.1.2); the first section prompted respondents to describe how they shopped for their families and began with a non-directive question (McCracken, 1988). Respondents described a regular supermarket trip, including what they perceived as most important and influential when making food choices. Planned prompts were used to ensure all respondents commented on the different factors that may influence their choice.

Respondents also examined a series of show cards featuring the five nutrition formats: the current NIP, Percent Daily Intake (PDI), Multiple Traffic Light (MTL), Wheel Traffic Light (Wheel), and a Combined Traffic Light with Percent Daily Intake (Combined) (see Appendix A1.1.3). Each label was presented first as a blank example, then in context on a packet of Kellogg's® Cornflakes, and finally with the nutrition profile of four unidentified³⁶ children's breakfast cereals of differing nutritional value, side-by-side to demonstrate how the labels would vary. The stimuli used were drawn from formats developed by the food industry or regulatory bodies (see Figure 13, page 103; Figure 14, page 119; Figure 15, page 121). Respondents also discussed consumption of food away from home and the general absence of nutrition information in those settings.

All interviews were audio recorded (with permission) and subsequently transcribed verbatim by the interviewer and two assistants, and checked by the interviewer for

³⁶ The nutritional composition data came from four breakfast cereal products targeted to children - Kellogg's® Cornflakes®, Kellogg's® Coco Pops®, Hubbard's® Sling Shots®, and Kellogg's® Froot Loops® - as marketed in New Zealand in early 2007.

accuracy. Participants were given the opportunity to review and edit their transcript, but none opted to do so.

Each transcript was coded using thematic analysis. Although some researchers claim thematic analysis is a generic tool used across varying methodologies (see, for example, Boyatzis, 1998; Ryan & Bernard, 2000), others argue it is “...a method in its own right” (Braun & Clarke, 2006, p. 78). Following Braun and Clarke (2006), thematic analysis is used “...as a method for identifying, analysing and reporting patterns (themes) within data” (p. 79). As Braun and Clarke (2006) argue, thematic analysis enables researchers “...both to reflect reality and to unpick or unravel the surface of ‘reality’” (p. 81). This thematic analysis was undertaken within a realist framework, exploring participants’ accounts of their experiences, focussing on overt rather than latent themes, and using an inductive approach that was not driven by previous findings or theoretical considerations. This approach was used because the work was exploratory.

Each transcript was analysed and quotes illustrating unique categories within the interview protocol were coded. An iterative approach of re-reading the transcripts, refining codes, and re-coding was undertaken, following Green *et al.* (2007). During this process, the order in which themes were identified was also recorded to register the salience of the different factors affecting food purchase. The analysis is descriptive in nature, and is intended to inform future quantitative research rather than attempt to explain results with links to existing literature (Green *et al.*, 2007).

6.2.1 Demographic Profile of Participants and their Families

Four men and 11 women were interviewed. Table 10 describes the demographic profile of interview participants. Four were solo parents (all female) while the remainder lived with a partner; 11 were of European descent (NZE or British), and four were New Zealand Māori (NZM, all female); six respondents were aged between 25 and 34, and the remainder were aged between 35 and 44 years. There was a mix of family sizes and children’s ages. Respondents’ education levels also varied, as did their annual household incomes. Concern for choosing healthier alternatives was assessed by asking participants to identify which of five statements best represented their behaviour; all stated they sometimes or regularly chose healthier or more nutritious alternatives.

Table 10 – Participants’ Demographic Information, Study One

Name *	Age	Gender	Ethnicity	Education †	Partner at home	H’hold income ‡	Nutrition attitude ‡	Total children	Age 0-3	Age 4-6	Age 7-9	Age 10-12	Age 13+
Ann	35	Female	NZE	D	Yes	c	--	2			1	1	
Beth	36	Female	NZE	--	Yes	--	--	2			1	1	
Craig	35	Male	NZE	E	Yes	e	3	2	1	1			
Diane	35	Female	NZE	D	Yes	c	4	2		1		1	
Erin	29	Female	NZM	D	Yes	d	4	2	1	1			
Frank	34	Male	British	D	Yes	d	4	2	1		1		
Gary	37	Male	NZE	E	Yes	d	4	2	1	1			
Heath	25	Male	NZE	C	Yes	d	3	1	1				
Isabel	30	Female	NZM	D	No	c	4	1		1			
Jane	26	Female	NZM	E	Yes	d	3	1	1				
Kate	36	Female	NZE	B	No	b	4	2		1		1	
Lily	39	Female	NZM	A	Yes	a	3	4	1	1	2		
Nikki	38	Female	NZE	D	No	a	4	1			1		
Olive	30	Female	NZE	A	No	b	4	2			1	1	
Pam	44	Female	NZE	D	Yes	b	4	3			1		2

* Pseudonyms used

NZE = New Zealand European

-- Unanswered

NZM = New Zealand Māori

† ≤ 3 years secondary school | B 4-5 years secondary school | C Trade qualification | D Certificate or Diploma | E Bachelor's Degree | F Postgraduate Degree

‡ a < \$20,000 | b \$20,001-\$40,000 | c \$40,001- \$60,000 | d \$60,001-\$80,000 | e \$80,001-\$100,000 | f >\$100,000

‡ 1. I’m not at all concerned about the health or nutritional value of foods I choose | 2. I’m not usually concerned about the health or nutritional value of foods I choose | 3. I sometimes like to choose healthy or nutritious foods | 4. I regularly choose the healthy or nutritious alternative | 5. I always choose the healthy or nutritious alternative.

Participants were asked to indicate their highest level of education and annual household income before tax; both from a selection of six categories on the last show card (see Appendix A1.1.3). Educational attainment ranged from three years or less of secondary school, through trade qualifications to postgraduate degrees, and annual household pre-tax incomes ranged from less than \$20,000 to between \$80,000 and \$100,000. Participants used five behavioural statements to indicate their concern for choosing nutritious foods, adapted from earlier research for FSANZ (2003a, Appendix B).

6.3 Study One Results

The following sections outline and discuss themes arising from the data set; respondents have been given pseudonyms of the correct gender, and their age is also reported with quotes. Although the information available to consumers at the point of purchase is standard, consumers may perceive it differently because of their knowledge, beliefs, past behaviour, or because of other environmental influences. This phase of the research aimed to uncover common beliefs or attitudes toward nutrition panels and how these affected use of them.

6.3.1 Influences on Behaviour while Grocery Shopping³⁷

Practical themes were ‘top of mind’ for respondents when they described the factors they believed influenced their choices when shopping in a supermarket. The most salient factor was price, which was typically one of the first three issues discussed. Those on lower incomes noted their limited budget restricted their choices and ability to buy healthier or better quality foods:

“...if we had the money, definitely we’d go for the higher priced, better quality food” (Heath, 25).

Although participants wished to feed their children well and encouraged them to try new foods, food neophobia was sometimes problematic. Many parents noted that their children’s taste preferences affected the options they considered.

³⁷ This section was published in: Maubach, N. B., Hoek, J. A., & McCreanor, T. N. (2009). An exploration of parents' food purchasing behaviours. *Appetite*, 53(3), 297-302.

“...and with two kids who are quite fussy, I tend to cook the things I know they’re going to like” (Ann, 35).

Only one parent stated explicitly that he and his wife persevered with foods their children resisted, because those foods were seen as vital for a healthy diet:

“Yeah, it is hard sometimes for the girls because there are some foods they don’t like eating...we just try and keep pushing those upon them” (Gary, 37).

Accommodating taste preferences was closely linked to a more general desire to avoid conflict with children. As well as purchasing favoured foods, parents reduced in-store conflict by shopping without their children where possible, making sure children were not hungry if they were present, by avoiding certain aisles in the store, and moving through the store swiftly. These strategies helped them complete their shopping trip as quickly as possible, but inevitably meant they had less time available to consider their purchases or information that might assist these.

Given the desire to limit the time spent shopping with children, few participants reported referring to information on food packaging to inform their choices. Instead, they preferred to rely on recommendations from friends and family, the media, or on their own prior knowledge. Even respondents who stated that good nutrition was very important commented that they rarely read information printed on product packaging. However, participants did make use of heuristics. Some reported using the Heart Foundation Tick to identify healthier choices, although they noted that tick-bearing products were often more expensive. Others relied on nutrient-content claims to support their choices, particularly when these promoted products’ vitamin and mineral content and when they felt their children did not eat enough fruit and vegetables. However, other participants were sceptical of health-related claims, which they saw as marketing tactics designed to increase sales.

Overall, although participants said they often or sometimes chose healthy options, they found it difficult to articulate how they identified ‘healthy’ products. One respondent’s reliance on personal ‘nutrition intuition’, a vaguely specified belief that she ‘just knew’ what was suitable for her daughter to eat, typified these reactions:

“I don’t really get it [information about foods] from anywhere, I just sort of decide that it’s not good ... or whatever my partner and I decided that was going to be good for her” (Jane, 26).

As this quotation suggests, participants stereotyped food categories as healthy or unhealthy as part of a ‘common sense’ strategy that helped them classify their food choices. For example, fresh fruits and vegetables, unrefined grains, and fresh meat were frequently cited healthy choices, while carbonated drinks, biscuits, chippies, and highly coloured foods were viewed as unhealthy, though still desirable.

“The main things that I’ve learnt is, yeah, that we should be eating healthy foods like heaps of vegetables and fruit and stuff and stay away from things that I know that I like [laughing]” (Nikki, 38).

These simple heuristics may be useful guiding principles as they are often correct; however, they may also discourage comparison of competing packaged foods, which often have different nutritional profiles.

While nutrition was the most frequently occurring theme, it was not usually a highly salient factor and was often mentioned after more immediate concerns had been raised, or after participants had been prompted to list additional factors that influenced their choices. Although some participants had developed rules, these did not always guide their choices and their technical knowledge was limited. For example, those who considered nutrition did so in relation to only one or two macronutrients, primarily sugar and fat, and although participants were aware that nutritious food was important, few explicitly linked diet with health outcomes.

Instead, grocery shopping choices were typically habitual and relied on set routines of where to go and what to buy, and repeat purchases of familiar brands. As one respondent noted:

“I’ve got a routine of where I go all the time... I get the same things each week pretty much” (Beth, 36).

Years of consumption and purchase experience leads to habitual patterns and reduces the burden of making new decisions on each shopping occasion. Past experiences also contributed to participants’ sense that they instinctively knew which foods were better than others and thus more appropriate for their families.

Use of the Nutrition Information Panel

Respondents who reported using the Nutrition Information Panel (NIP) did so only when buying from specific product categories (e.g., muesli bars) or purchasing foods for particular family members (often themselves, and in relation to personal weight management goals). Participants with a family member who had special dietary requirements (such as a food allergy) were more likely to use product labels, although their focus was on allergens and the ingredients list rather than general nutritional value. Respondents used labels to identify the presence of additives, which appeared more important than products' overall nutritional profile. They avoided products they felt were too processed, and viewed these as unhealthy; minimal processing indicated a healthier choice, even though processing may not always result in a poorer nutritional profile. Overall, although participants had stated that good nutrition influenced their grocery choices, most did not use NIPs to gain information about a product's nutritional value.

Those who did use NIPs to gain nutritional information used this to compare brands, particularly new products or items their children had requested. However, they referred primarily to sugar and total fat levels and did not review other nutrients as they did not understand what these were or why they might be important. Terms such as energy, saturated fat, sodium and protein were seen as confusing by those who had no framework for interpreting the information provided.

“...if you don't know the information then you're pretty much going 'oh yeah, that's nice, but what does that mean?' Yeah so you've got really no clue unless you've got something or a gauge to go off, or you've learnt it previously through studies or whatever” (Erin, 29).

Others were discouraged from evaluating nutrition information because they thought nutritional advice often changed, as the popularity of different diets waxed and waned:

“I find it really hard because it seems, it feels like it changes all the time... you know too much salt is bad, and saturated fat is worse than other fats, and um, we apparently do need a certain amount of fat. But, I mean, at the moment the big phase is to lower your carbohydrates as well. Um, you know, that's always a tricky one because we sort of brought up thinking you know just have no fat and you just eat carbohydrates till you're absolutely

full, and now they've found that's wrong, so it's all a bit up in the air"
(Diane, 35).

Participants who referred to NIPs generally selected the product with the lowest values on selected 'important' nutrients and few used nutrient thresholds to assess a product's overall acceptability. While they could assess whether one brand had less fat than another, they were not sure whether either met criteria required of low-fat products. Difficulties in using NIPs to make absolute judgments about a product reflect wider problems participants experienced, and many found NIPs difficult to read and interpret:

"...unless somebody had an understanding of nutrition and what each of those values represent and what each of the elements represent, people don't understand it" (Gary, 37).

Problems interpreting NIPs were also evident in inconsistencies between reported use of these and subsequent food choices. While one respondent stated she used the NIP to help her avoid high-sugar foods for her son, she also reported buying her son Kellogg's Coco Pops[®], which contain more than 35g of sugar per 100g. Discrepancies between what participants said and did also raise questions about the role of NIPs in communicating information about product attributes.

6.3.2 Food away from home

Because families are eating outside the home more frequently, many food purchases are made in the absence of nutrition information; this may explain the positive correlation between frequency of food consumption away from home and body fat (Burns, Jackson, Gibbons, & Stoney, 2002; McCrory *et al.*, 1999). To examine whether consumers want or would use nutrition information when choosing food away from home, the study also explored parents' out-of-home food purchases.

Most participants reported buying meals away from home twice a week, largely because they wanted a break from cooking, lacked the time, energy, or the ingredients to prepare a meal, hoped to provide a treat for their family, or wanted to celebrate an occasion. The main factors influencing their meal choices were price and convenience, particularly speed of purchase and proximity to home.

Participants used very different criteria to assess the meals they prepared themselves and those they bought. Several acknowledged that they knew bought meals were nutritionally unbalanced, but felt this did not matter because it was not the main reason prompting their purchase. When asked if nutrition information should be provided in takeaway stores and restaurants, some reacted strongly against this proposal as they regarded bought meals as treats not subject to normal dietary considerations.

“I just really personally feel it takes away kind of the reason why I’ve gone to a restaurant...when I’m going to a restaurant I’m going for a night out, I’m not going to be guilty because I’m meant to be on a diet and I’m having this for tea ... it’s almost an invasion of having a night out or relaxing”
(Ann, 35).

Others rationalised their view that nutrition information was unnecessary by arguing that eating takeaway food once or twice a week was not harmful if the remaining meals were healthy:

“I think my girls eat really well during the week, as far as we hardly ever have treats, so one treat night is really good” (Diane, 35).

Even though others would welcome nutrition information in takeaway outlets and restaurants, they were not sure how this would influence their choices. Instead, they thought it an important principle that consumers should have access to information that could remind them of their wider responsibilities:

“I totally agree. People place such a high importance upon what they buy within a supermarket and what they feed their children, but as soon as they take them out of their home environment and they are buying something from a fast-food industry or an outlet in town, they are effectively um forgoing that responsibility or giving that responsibility away” (Gary, 37).

As nutrition information is not available in takeaway outlets or restaurants, participants were not able to reflect on their actual behaviour. This may explain the ambivalence evident in their responses and suggests their use of nutrition information in other food venues may parallel their limited use of NIPs.

6.3.3 Reactions to Front-of-Pack Nutrition Labels³⁸

Percentage Daily Intake Labels: Information versus Complexity

Participants were first asked to examine and comment on Percent Daily Intake (PDI) labels. Some thought the percentage information would help them (and other consumers) evaluate each food's contribution to their overall diet more easily; they also thought that the format would reduce the need for consumers to have their own detailed knowledge of food composition:

"...it tells you how much you're supposed to have in your diet full stop"

(Jane, 26).

This theme suggests PDIs could simplify evaluations consumers currently make by reducing the prior knowledge they require. As such, PDIs represented an advance over the NIP, which does not locate information in a broader dietary context.

However, others disliked the PDI format and the daily intake details, which they thought did not reflect true patterns of shopping and consumption behaviour:

"When you go shopping, you don't go there to work out what you're going to be eating ... throughout the day that's going to average the 8,700kJ's. You don't know that, you just buy what you need, you know, you need to eat"

(Beth, 36).

This comment highlights a strong competing theme, namely the difficulty of interpreting and combining nutrition information from several products.

"It would need a lot of working out really, wouldn't it, I think so anyway.

Um, yeah you could spend all day deciphering all that" (Frank, 34);

"I think it needs to be a little, a bit more basic than what it is, a bit more user-friendly" (Erin, 29).

These comments highlight the time participants thought would be required to interpret PDIs, as the information these contain is not intuitive or easy to understand. Because of this, PDIs appeared inconsistent with consumers' shopping routines, which did not allow for detailed interpretations or comparisons. When prompted to consider how they would use PDI labels in store if these became widely used, participants indicated that they

³⁸ This section is from: Maubach, N.B. & Hoek, J.A. (2010). A qualitative study of New Zealand parents' views on front-of-pack nutrition labels. *Nutrition and Dietetics*, 67, 90-96

would probably compare a few brands so they could select one with lower levels of fat, sugar, or energy. However, as food items often do not have consistent nutrient profiles (for example, they may be high in fat but low in sugar and sodium, or low in sugar, but high in fat and sodium) these comparisons require background knowledge of nutrient benchmarks and an ability to trade off different profiles.

PDI labels use the phrase ‘Moderate your intake’ for some nutrients, such as fat and sodium. Some participants thought this advice was potentially misleading, since some targets were minimum amounts required for good health (e.g., protein) whereas others were upper limits that should not be exceeded (e.g., sodium).

“...if it’s a percentage of your daily intake surely you are aiming for a hundred percent on everything, if that’s what your daily intake should be ... but then to turn around and say ‘moderate your intake’: well, surely then you’re not aiming for a hundred percent” (Ann, 35).

These comments add an extra dimension to the complexity theme and suggest consumers may find additional written advice contradictory or, at best, difficult to reconcile with the label information.

Multiple Traffic Light Labels: Visual Simplicity

After viewing the PDI, respondents viewed examples of the Multiple Traffic Light label (MTL); key themes that emerged in participants’ comments related to simplicity and ease of use.

“Simple, isn’t it? Simple’s good! ... you don’t have to think about it” (Beth, 36).

This comment reflects the widely held perception that this label was straightforward to interpret and directly contrasts with comments about the PDI. Whereas the MTL did not require thought, the PDI could “*take all day to decipher*”. Furthermore, the MTL seemed more congruent with the reality of participants’ shopping experiences:

“...especially with the speed that I go through the supermarket, um that I have to go through, I think that would be really good” (Diane, 35).

The fact that many shopped quickly, felt under time pressure, and were often distracted by other stimuli, meant their ability to read, interpret and use complex information was limited. Labels they could comprehend easily gained stronger support because their format supported and simplified participants’ shopping expeditions.

However, there were also similarities in participants' responses to the two formats. Like the PDI label, the MTL was thought to assist interpretation of the numeric information in the NIP:

"Yeah, that would be a simpler solution because they're telling you, they're actually telling you rather than you having to work it out" (Frank, 34).

Like the earlier comment, this quotation also highlights the intuitive appeal of the MTL, which both participants thought "told" them what they needed to know and did not require them to "think" or "work it out". A corollary of the simplicity theme was that the MTL would be easy to explain to children because it did not require high numeracy levels:

"I think kids would understand that better ... that would be good because you are teaching your kid that without having to go into numbers" (Kate, 36);

This comment suggests MTLs could help promote healthier eating habits among young people, a development that is critical to reducing current obesity levels.

More generally, participants indicated they would use MTLs to screen foods; the heuristic would help them focus on nutrients in which they had a particular interest, and would simplify the process of choosing between competing brands.

"I would probably use it um as an initial sort of assessment of what it is ...Process of elimination for me if I look at it and think 'oh yeah no that's got more of something that I don't want' so I'd see if I could move on to the next one" (Jane, 26).

However, participants were not unanimously positive about the MTL; while they understood how the label worked and found it easy to understand, some preferred a front-of-pack label that provided more information.

"The traffic light on its own is good, but I don't think it's sufficient information" (Gary, 37).

Combined Format Labels: Balancing Information and Interpretation?

Developed by the British supermarket Sainsbury's, the Wheel Traffic Light (WTL) balances the visual characteristics of the MTL with elements of the numeric per serve information provided by the current NIP label. Participants who found MTL

insufficiently informative regarded the WTL as an improvement, although some thought percentage information would have been more useful than amount of nutrient/energy per serving.

However, although participants recognised the WTL provided more detailed information, several found the circular layout confusing and reported finding it difficult to compare the same nutrient across different foods. Others found the pie graph image distracting and thought the segment size was sometimes inconsistent with the numeric information.

“I’m finding it quite hard to say to myself that those sections aren’t proportions ... So it’s like, it’s hard to see the numerical representation as the indicator not the chunk” (Pam, 44).

Comments such as this indicate the additional cognitive demands the WTL placed on participants as the format requires separate interpretation of the visual and numeric elements. Because the colours in the WTL appear as part of the background, its visual correspondence with a traffic light was less obvious than the MTL format, where each colour appears in a separate circle. Participants did not view the WTL as a compound traffic light that they could assess holistically and use to examine whether a product had predominantly green, amber, or red nutrient ratings. The difficulties participants reported and their overall lack of support for the WTL format may be due to its novelty. Most participants are likely to have seen PDI labelling, since some food companies have already adopted it, and would recognise the MTL, even if they had not seen it used in food labels. However, they would not previously have seen a format like the WTL and greater familiarity with this format may have elicited more positive responses.

Participants’ ambivalent reactions to the WTL also emerged when they were shown the final nutrition label format, which combined elements of the MTL and PDI formats. Those who had initially liked the PDI label and been less enthusiastic about the MTL tended to favour the combined format as this provided numeric information in addition to the traffic light colour coding.

“For me that would be absolutely ideal ... that would give me an easy glance, concise amount of information as opposed to the information that’s currently contained on packaging. I really like it” (Gary, 37).

However, those who endorsed the simplicity of the MTL found the additional information off-putting and likely to be a deterrent to their use of the label:

“I think the more information that is there, the less likely I would be to read it, to be honest. Probably would still look at this, the traffic light, but then I’d probably tend to start ignoring all of this (numerical information)” (Ann, 35).

These contrasting views highlight the difficulty of developing a label that is both accessible and informative. Overall, while all formats received some support from participants, the greater the label simplicity, the more likely participants were to respond positively to it.

6.4 Discussion

This research explored the factors that a group of parents consider when shopping for their families, and gauged perceptions of alternative nutrition labels in order to inform research designed to identify effective point of purchase nutrition labels. This research provides a deeper understanding of the challenges that parents report they face when selecting foods for their families, and this context should encourage policy makers to think broadly about the wider system and the confluence of factors that affect family life.

Although the parents interviewed said they sometimes or often chose healthy foods, their reported experiences of food purchasing revealed they faced pressures likely to influence their choices. Irrespective of gender, maintaining harmony with their children, completing their shopping quickly, selecting familiar brands, and reliance on routines all reduced the time available to interpret food labelling, including nutrition information panels. While most parents in this study acknowledged that nutrition values should determine food choice, pragmatic themes – price, marketing and pressure from children – undermined this ideal.

Respondents regarded ‘processed’ foods as unhealthy, but used different approaches to evaluate what they should avoid. Some searched for ‘whole’ or unrefined foods, while others avoided products with artificial colours, flavours, or preservatives. These heuristics may reduce purchase of high calorie, low nutrient foods, but further research is required to test how reported concerns translate into behaviour.

Participants' reasons for purchasing fast-food were consistent with those recently reported by Dunn, Mohr, Wilson and Wittert (2008), and suggested a common tendency to suspend health and nutrition goals when eating out or buying takeaway food. While this theme implies that different meals may meet different objectives, many meals eaten out of home cannot currently be selected using nutritional information. Although this suggests a need for nutrition information in restaurants and takeaway outlets, further research is required to test the optimal format for this, given the view of bought meals as treats and the limited attention paid to long-term health consequences (Dunn *et al.*, 2008; Navigator Research & COI Communications, 2004).

Although participants frequently mentioned that they read labels, they did so to find information about the ingredients and few spontaneously mentioned looking at the mandated nutrition information panel. The pattern of label use found in this study aligns well with quantitative research conducted at the same time for FSANZ, which found consumers are primarily interested in fat and sugar content, and like to check for artificial ingredients that review the nutrition profile (FSANZ, 2008a). Searches for specific information, such as details of ingredients likely to prompt allergic reactions, may explain why the objective information contained in the NIP appeared to have low salience and little reported influence on food purchases. Lay consumers' lack of technical knowledge meant even those who did refer to NIPs made limited use of the information provided. This finding suggests the mere provision of information will not be sufficient to influence food choices and is consistent with Ni Mhurchu and Gordon (2007), whose work also questioned the impact of NIPs.

The parents interviewed all faced pressures that reduced the time they could spend interpreting food label information, including nutrition information panels, while shopping. Many were distracted by their children and aimed to complete their shopping as quickly as possible. Both these factors militated against the use of detailed or complex information at the point of purchase and may explain why no participants spontaneously mentioned the mandatory Nutrition Information Panel as an influence on their food purchasing decisions.

Despite their lack of reliance on NIPs, all participants thought front-of-pack information would improve their ability to identify nutritious products and make brand comparisons. While several positive themes emerged in response to colour coded traffic light labels,

labels that included numeric information did not elicit a similar range of positive comments. Numeric information was seen as more difficult to interpret and more time consuming to use, and thus more difficult to draw on as part of a normal shopping routine. Furthermore, the availability of detailed numeric information in the standard NIP may also have reduced support for front-of-pack labels that participants thought duplicated information available elsewhere on the package.

Although the PDI label was associated with some positive attributes, in the end it did not compare favourably to the other labelling options tested. Participants' comments are consistent with research recently reported by FSANZ, which found that if consumers do not currently use the numeric NIP labels, they are unlikely to read PDI labels (TNS Social Research, 2007). Even if PDI labels were more widely adopted, the FSANZ research found consumers who did not possess the mathematical ability to use NIPs would find PDIs too difficult to interpret. The Australian and New Zealand Food and Grocery Councils have strongly supported the introduction of PDIs and believe this format provides consumers with the details they require to make informed choices. However, these findings suggest the information in these PDIs is more difficult to interpret than labels proposed by consumer advocates. Furthermore, PDIs require a level of attention and concentration that is incompatible with consumers' normal shopping behaviour.

Findings from ergonomic studies investigating effective label design suggest traffic light colours have inherent meaning and so require minimal conscious processing effort, even in distracting environments such as supermarkets (Braun *et al.*, 1995; Chapanis, 1994; Edworthy & Adams, 1996). This conclusion may explain participants' overall support for the traffic light concept, which draws on a simple heuristic to guide consumers' choices. Versions of the TLL that incorporated more numeric information elicited less support, primarily because the labels were considered more demanding and difficult to interpret. However, empirical research is required to test whether consumers' preference for TLLs is supported by their ability to use the information and translates into behavioural effects.

7 Measuring Consumers' Product Evaluations using the ELM: Studies Two and Three

7.1 Introduction

Participants in Study One believed that nutrition information on the front of packages would be more useful than the Nutrition Information Panel (NIP). While some expressed a desire for detailed numeric information, others appreciated the visual simplicity of the Multiple Traffic Light (MTL) format. However, previous research has shown consumers are not very good at judging the utility of new label formats, thus the effectiveness of any proposed front-of-pack (FOP) label system must be tested empirically.

Food industry representatives support the widespread introduction PDI labels, but few participants in Study One preferred the Percent Daily Intake (PDI) label once they had reviewed other labelling options. However, because of the food industry's strong support for this option and the fact many producers are already using it, it was deemed necessary to include this format in the research. The decision as to which TLL format to test was driven by the observation that many participants in Study One preferred the MTL, and public health advocates do not tend to talk of traffic light labels supplemented by numeric information.

Two experiments were designed: the first measured how each nutrition information format affected consumers' product evaluations when the nutritional value of a food changed; the second examined whether introducing product claims moderated the effect of nutrition label format on consumers' product evaluations. Several studies conducted in the United States informed development of the experiments reported in this chapter. In particular, studies by Ford *et al.* (1996), Keller *et al.* (1997), Roe *et al.* (1999), and Garretson and Burton (2000), which all investigated the effects of nutrition labelling and product claims, were carefully reviewed for methodological strengths and suggestions for future research. However, none of these projects investigated FOP nutrition label formats, the effect of elevating a nutrition-content claim to a health claim, or parents'

choices of children's products. Furthermore, some product claims tested in these studies were factually untrue (e.g., a 'low fat' claim on a high fat product).

The first experiment allowed the effect of the two FOP formats to be compared to the currently mandated NIP, and used face-to-face intercept interviews to collect data. A six-cell, between-groups experiment estimated consumers' attitudes towards a fictional cereal product, their beliefs about its attributes, as well as their perceptions of nutrient content. Respondents were recruited using a mall-intercept method. The second experiment was a replication with extension and investigated how the addition of nutrition-content or health claims affected consumers' attitudes in the presence of FOP nutrition labels. This second study was a ten-cell, between groups experiment conducted via the internet, with respondents randomly selected from a nationwide online panel. Both studies also collected information on consumers' perceptions and use of the NIP.

The choice of product and package design for the experimental stimulus reflected the fact that parents were the target population. Both surveys used the same questionnaire, with minor variations, which was developed according to principles of the Elaboration Likelihood Model (ELM). The remainder of this chapter is divided into three main sections. In the next two sections, the methods and results of the two experiments are explained sequentially; the questionnaire development is detailed in the Methods for Study Two (see §7.2.1). As these two attitude studies used very similar approaches, the final section of the chapter concludes with a joint discussion of the results of both experiments.

7.2 Study Two: Front of Pack Nutrition Information

The first experiment examined whether the formatting of nutrition information on the front of food packages altered consumers' perceptions of a food product, and secondly whether the ELM helped explain differences in respondents' attitudes. Researchers in the United States report that consumers' motivation to use nutrition information moderates the effect of product nutritional value on their evaluations (Keller *et al.*, 1997); however, this relationship may not hold with simpler FOP nutrition labelling systems. The study therefore addressed the first pair of hypotheses:

- H1a Respondents' attitudes will become increasingly differentiated for the two nutrition profiles as the nutrition information becomes more accessible, and will increase from NIP to PDI to TLL.
- H1b Respondents' ability and motivation to use nutrition information will mediate attitude scores across the nutrition label conditions; those with high motivation and ability will have differentiated attitudes when nutrition information labels are less accessible.

7.2.1 Study Two Method

To test these hypotheses, a three-by-two, between-groups experimental survey was developed, using a post-test only with control group design (Malhotra, Hall, Shaw, & Oppenheim, 2006). As shown in Table 11, the design had two levels of nutrition profile (better, worse) and three levels of nutrition label format (NIP (control), MTL, PDI). Each participant was shown only one of six product images, designed according to the six experimental conditions. Details of how the experimental stimuli and survey instrument were developed, and an explanation of research mode and pilot testing, are provided in the following subsections. Following this, the data collection method, sample demographics, and statistical analyses used to report the results are described.

Table 11 – Experimental Treatment Conditions for Study Two

Nutrition Profile	Nutrition Label Format		
	Control (NIP only)	Multiple Traffic Light Label	Percent Daily Intake Label
Better	1	3	5
Worse	2	4	6

Developing Visual Stimuli

As parents' food choices were to be examined, a relevant product category needed to be selected. Health and consumer lobbyists often refer to breakfast cereals as nutritionally ambiguous product categories because of the wide variation in nutritional quality across offerings that are often not immediately apparent. Breakfast cereals already employ nutrition-content claims and were thought likely to develop more specific claims, if these are permitted, based on the types of claims used by United States manufacturers. As brands are powerful cues that often encompass a larger set of attributes (Carson *et al.*,

1994; Jacoby, Speller, & Berning, 1974), a fictitious children’s cereal package was created by a graphic designer. This was given the novel name ‘Hooplas’ and depicted an extruded hoop-shaped, grain-based, uncoloured cereal.

An image showed the front and one side panel of the packet of Hooplas, printed to A4 size (see example in Figure 16, see also Appendix A1.2.1). The side panel displayed the legally required NIP, ingredients list, and allergen information statement. The ingredients list was copied from a popular extruded cereal, Kellogg’s Nutrigrain®, and was kept consistent across all conditions. In the FOP label conditions, the formatting for the PDI label was based on that used by Kellogg’s® at the time of the experiment, as this company was the first to adopt PDI labelling in New Zealand. The MTL format was based on the design developed by the British Food Standards Authority (using nutrient thresholds presented in Appendix A2.1). All package design elements were consistent across the six experimental conditions, with the only changes being the experimental manipulations.

The better and worse nutrition profiles, shown in Table 12, were derived from actual breakfast cereals sold in Australia and New Zealand: Sanitarium Weet-Bix® (better) and Nestlé Milo® cereal (worse). The serving sizes were adjusted slightly for the purposes of the experiment, without changing the per 100 grams information, as it is relatively common for competing products to recommend different serving sizes.

Table 12 – ‘Better’ and ‘Worse’ Nutrition Profiles used in Studies Two to Four

Nutrient	Cereal Profile 1 (Better) Serving Size: 40g		Cereal Profile 2 (Worse) Serving Size: 30g	
	Per Serve	Per 100g	Per Serve	Per 100g
Energy	589kJ (141cal)	1480kJ (354cal)	506kJ (121cal)	1685kJ (403cal)
Protein	3.6g	12.0g	3.1g	10.3g
Total Fat	0.4g	1.3g	1.7g	5.8g
Saturated Fat	0.1g	0.3g	0.8g	2.8g
Carbohydrate	20.0g	67.0g	22.8g	76.1g
Sugar	0.8g	2.8g	9.4g	31.3g
Fibre	2.9g	7.3g	1.5g	5.0g
Sodium	84mg	280mg	58mg	194mg

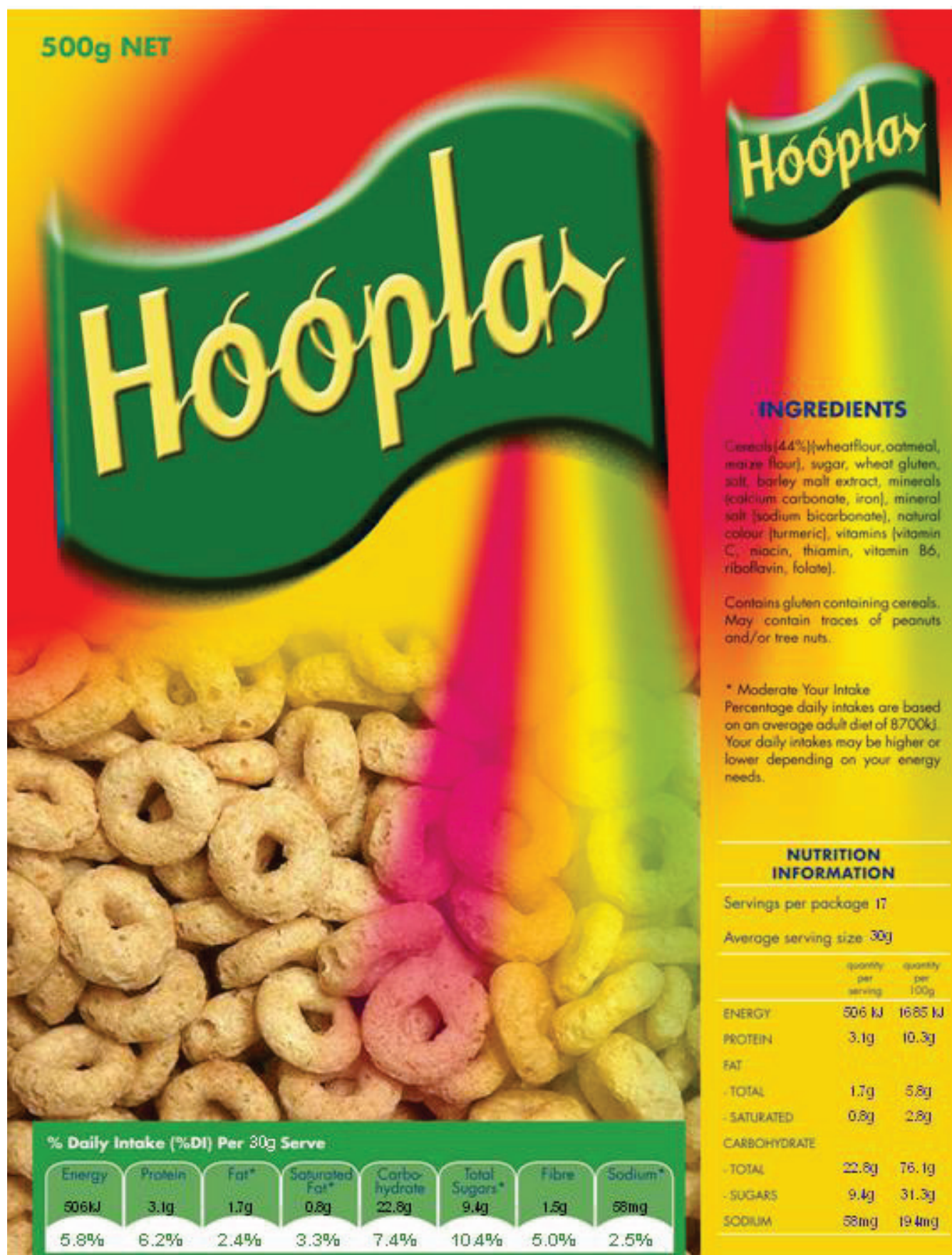


Figure 16 – Example Hooplas Packet with Percent Daily Intake Label
(reproduced smaller than experimental show card)

The Survey Instrument

The questionnaire was primarily designed to test whether consumers' attitudes varied according to the nutrition labelling format they saw, and to provide supplementary information to interpret the attitudinal results. In addition, methodological concerns informed the questionnaire's development and items were designed to measure the variables advised by Rucker and Petty (2006). Recent ELM research was reviewed to discover how attitudes, attitude certainty, and elaboration are measured by experts. In particular, Rucker's (2005) Doctoral thesis, supervised by Petty, was reviewed as this contained experiments using designs similar to these two studies. Although Rucker's dissertation examined the relationship between attitudes, attitude certainty, and behavioural intentions, his experiments measured consumers' attitudes towards several fictional consumer products, and therefore used questions that were suitable for this research. The following paragraphs outline how the questionnaire for experiment one was developed, which is available in Appendix A1.2.2. A draft version of the questionnaire, with explanatory cover note, was sent to Dr. Rucker for peer review. His feedback was incorporated into the final questionnaire design (Rucker, 2008).

To measure respondents' attitudes towards a fictional aspirin product, Rucker used four nine-point semantic differential items anchored with 'good–bad', 'favorable–unfavorable', 'positive–negative', and 'support–oppose'. The Cronbach's alpha for these four items was very high ($\alpha = .97$). The high correlations infer item redundancy (Boyle, 1991; Streiner & Norman, 1989), suggesting that using only two items would reduce repetition and respondent burden but still capture global attitudes accurately. Incorporating recommendations from Rucker (personal communication, 21 March 2008), the first semantic differential pair was 'positive to negative' and gauged respondents' overall attitude after studying the packet image (Q2). The second question used the 'good to bad' differential, and was phrased to measure attitude towards purchasing the cereal for children (Q4).

Rucker and Petty (2006) strongly recommend measuring attitude certainty, as more certain attitudes are thought to be more persistent, resistant, and predictive of behaviour. In his aspirin study, Rucker (2005) measured attitude certainty with a composite of two items ($\alpha = .93$); participants were asked, "How certain are you of your feelings toward

Brand?” and “How convinced are you of your attitude toward *Brand?*”, based on past research (Fazio & Zanna, 1978a; Tormala & Petty, 2002). These two items were adopted (Q3 and Q5), with one asked after each of the attitude questions.

Many ELM studies also ask respondents to indicate their intention to purchase or use the product as a proxy for behaviour (Petty *et al.*, 1983; Petty, Priester *et al.*, 2002; Rucker, 2005). Rucker assessed behavioural intentions with two questions: “Will you use *Brand?*” and “Will you purchase *Brand?*” Both questions were answered on nine-point scales and had a very high Cronbach’s alpha ($\alpha = .98$). Again, only one item was adopted to reduce respondent burden (Q6).

In order to further understand respondents’ attitudes, four semantic differential questions explored their beliefs about four product attributes (Q7a-d): quality (low quality to high quality); nutritional content (not nutritious to nutritious); taste (tastes bad to tastes good); and the extent to which it appeared processed (artificial to natural). These belief statements were derived from key selection criteria expressed by participants in Study One, and do not represent an exhaustive list of factors.

To assess whether people elaborated upon messages and used central processing, measures such as reading time, message recall, thought listing, and attitude certainty have been used (Chaiken & Stangor, 1987; Petty, Barden *et al.*, 2002; Tesser & Shaffer, 1990). Rucker and Petty (2006) recommend inclusion of a ‘thought listing’ task that asks participants to write any thoughts they have about the product. By analysing respondents’ thoughts, insights into the level of elaboration underpinning their attitudes can be obtained. However, the decision to conduct the research by mall-intercept interviews raised concerns about the viability of a thought listing task (refer to *Research Mode and Sampling Strategy*). Asking respondents to verbalise their thoughts while an interviewer writes these down would be time consuming, and respondents may reduce the number of thoughts articulated so they complete the survey more quickly. Collecting thoughts was thus likely to increase respondent burden, extend the survey duration, and possibly compromise data quality while not yielding particularly informative data.

Instead, a message recall task was used as a proxy for message elaboration. This could be completed more quickly and also allowed some insight into consumers’ ability to interpret and remember nutrition information. Three questions asked respondents to use

a five-point scale to indicate how much sugar, sodium, and total fat the cereal had (Q8-10). They completed this task from memory after the product image was removed from sight. Respondents were given the option of stating ‘Don’t know’, as it was anticipated that those who did not process the information would not attempt to answer these questions.

As noted in §5.4, the majority of ELM studies manipulate rather than measure respondents’ motivation and ability to process a message (Petty & Wegener, 1998). However, it was decided to follow other nutrition researchers and measure respondents’ inherent motivation and ability (e.g., Frewer, Howard, Hedderley, & Shepard, 1997; Moorman, 1990; Verplanken, 1991). To measure consumers’ motivation to use nutritional information, Moorman (1990) developed a set of three seven-point Likert scale questions, which other researchers subsequently adapted (see Table 13). The second question in each of these sets explored consumers’ interest in reading nutrition information, while the first and third questions measured current behaviour as a proxy for motivation.

Table 13 – Motivation measures from prior nutrition labelling studies

	Moorman (1990)	Suter & Burton (1996); Keller <i>et al.</i> (1997)	Kemp, Burton, Creyer, & Suter (2007)
1	How often do you read nutrition labels? (not often – very often)	How often do you read nutritional labels? (not often – very often)	How often do you read the nutrition information panel that reports nutrient information on food product packages? (very often – not often)
2	How interested are you in reading nutrition and health-related information at the grocery store? (not interested – very interested)	How interested are you in reading nutrition and health-related information in the grocery store? (not interested – very interested)	How interested are you in reading nutrition and health-related information at the grocery store? (very interested – not interested)
3	How often do you read nutrition labels at the grocery store? (not often – very often)	How frequently do you read nutritional information on packaged food products? (not frequently at all – very frequently)	When you buy a product for the first time, how often do you read the nutrition information panel that reports nutrient information on food product packages? (very often – not often)

However, these questions appear to confound motivation with ability, as they jointly determine behaviour (Rothschild, 1999). For example, consumers with low mathematical ability may not read the current NIPs, and would therefore be classed as having low motivation by these questions; however, this does not necessarily mean they do not believe nutrition is important and would not use alternative, non-numeric formats if these were available. As a result, past use of numeric nutrition information may be a weak predictor of motivation to use of graphic label formats.

Furthermore, Study One revealed that several factors motivate parents' supermarket shopping behaviour, with concern about nutrition a common though not highly salient motivation. Questions that focussed exclusively on motivation to use nutrition information could highlight the purpose of the research and introduce the biasing effect of experimenter demand.

The 'Food Choice Questionnaire' (FCQ) (Steptoe, Pollard, & Wardle, 1995) was identified as an alternative way of measuring consumers' motivation to use nutrition information. This is a 36-item instrument that has nine subscales measuring motivations underlying food selection: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, and ethical concern. However, as the full scale was too long and would provide unnecessary information, nine items from the weight control, health, convenience, natural content, price and sensory appeal scales were used to measure a range of motivation dimensions identified in Study One. As the FCQ did not measure some factors such as sugar content or taste preferences that Study One suggested were important, two items were added to reflect these issues. Additionally, Coveney (2005) reported that some Australian parents were more concerned with foods' satiating qualities than nutritional benefits, so an item was also added to cover this motivation.

The 12 motivation questions (Q1a-l) were placed at the start of the survey to reduce the likelihood of biased responses as respondents were naïve to the research purpose; encourage respondents to consider a range of factors when viewing experimental stimuli presented in the following section; and complete the most demanding questions while respondents were 'fresh'.

To measure respondents' ability to understand nutrition labels, they were shown the nutrition profiles of three unnamed cereals and asked to identify which had the highest sugar, lowest total fat, and lowest energy content (Q11-13). The nutrition information formats shown matched the experimental conditions, so those in control conditions were shown NIPs only, whereas other respondents saw the MTL or PDI format as well as the NIP also (see MTL example in Figure 17 overleaf, see also Appendix A1.2.3).

The final two sections of the questionnaire measured respondents' perceptions of the current NIP format and their usage of it, before collecting demographic data.

Respondents were shown an example of an NIP to ensure they understood the information referred to in five questions about NIPs (Q14-18). Respondents were also asked to indicate their perceived knowledge of nutrition, as Rucker and Petty (2006) noted that this may be one dimension of ability. Two questions (Q16-17) were similar in nature to those used as measures of motivation in prior studies (see Table 13, page 157). The questionnaire concluded with demographic questions (Q19-23)³⁹.

³⁹ Not all questions have been used in the Results reported in this thesis as they do not directly address the research hypotheses, but were included for future analyses.

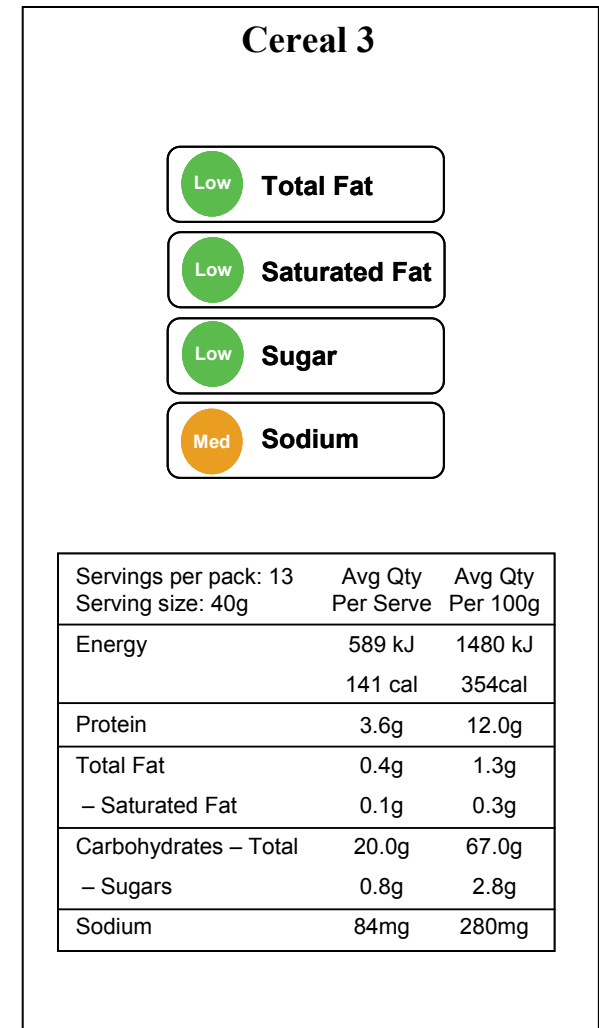
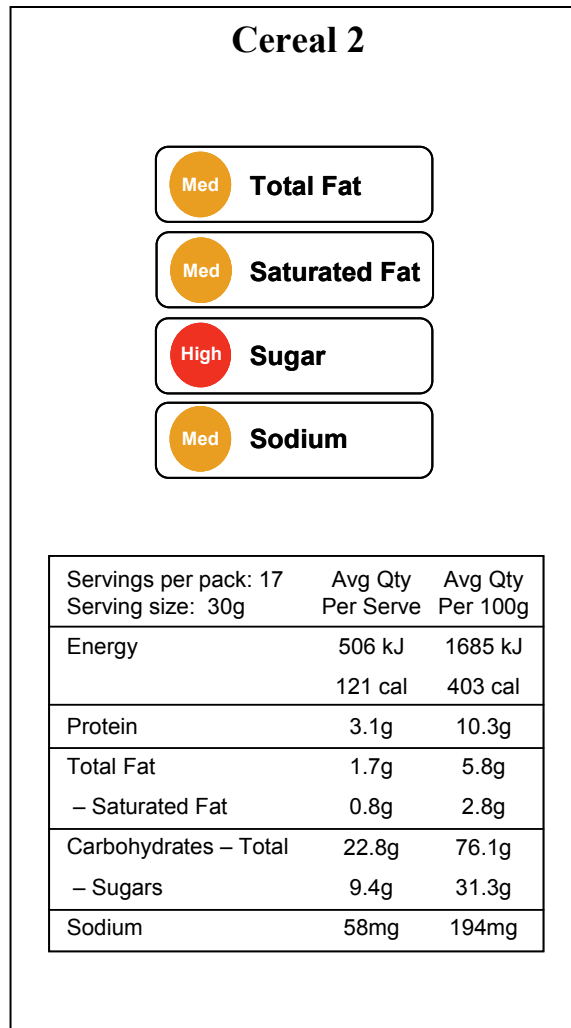
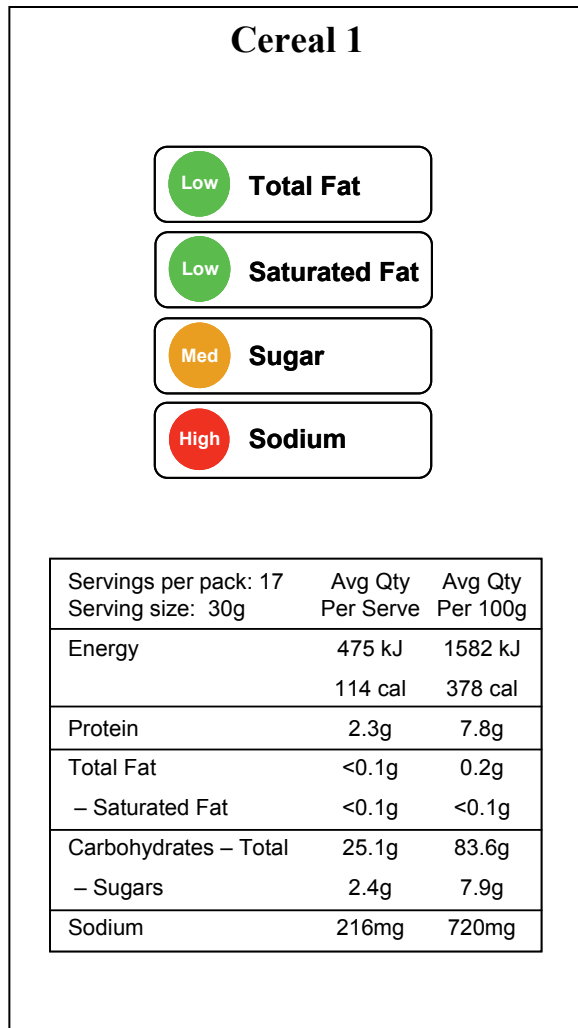


Figure 17 – MTL Version of the Ability Show Card

Research Mode and Sampling Strategy

The four dominant survey research modes are: telephone surveys, including computer assisted surveys; self-completion pen-and-paper surveys, either distributed by mail or in person to respondents; interviewer administer surveys conducted in respondents' homes or in central locations such as shopping centres; and online self-completion surveys (Hair, Lukas, Miller, Bush, & Ortinau, 2008). Both sampling and administration issues meant that some of these research modes would not be practical.

There was no nationally representative sampling frame for the target population – parents or caregivers of young children who have some household shopping responsibility – in any survey mode. Thus drawing a simple random sample from a population list was not possible with the resources available for the study. While the electoral roll could have been used as a sampling frame and potential parents or caregivers of younger children inferred from their year of birth, this approach would include many ineligible people at considerable additional cost. Using affinity groups to recruit participants was considered as an alternative sampling strategy. Parents and caregivers are affiliated with organisations such as schools; recruiting volunteers through school affinity groups would have permitted deliberate sampling of high and low socioeconomic status (SES) communities, as New Zealand schools are categorised into deciles based on SES indicators of communities where the pupils live (Ministry of Education, 2006). This is an important consideration, as the SES gradient for obesity highlights the need for the research providing insights into how nutrition information can affect low income households' decisions (Marmot & Wilkinson, 2006). However, using affinity groups requires the cooperation of multiple third-parties, who may not be able or willing to invest the effort required to secure participants, despite being offered financial incentives for their assistance. Furthermore, it is possible that parents or caregivers who volunteer to take part from within affinity groups may be different from those who would not, resulting in bias or range restriction on key variables such as motivation and ability.

Three questionnaire administration issues also affected the practical viability of different survey modes: the need to provide respondents with images, the use a variety of quite complex response scales, and the need to control order of question completion. The

visual elements and complex response scales meant telephone interviews would be impractical.

Self-completion pen-and-paper surveys were also ruled out. As prior research shows many consumers do not use nutrition information while shopping, the order of question completion must be controlled to ensure respondents remained naïve to the true research purpose (Shimp, Hyatt, & Snyder, 1991). Questions about use of nutrition information could alert respondents to the research aim and encourage them to respond differently. As the presentation of visual stimuli cannot be controlled in self-completion surveys, responses to the nutrient recall questions could be affected. Therefore, a self-completion survey mode that allowed respondents to return to prior sections and modify their responses was ruled unsuitable (Hair *et al.*, 2008).

Online surveys overcome these problems, as they permit the controlled presentation of visual stimuli and questions (i.e. whether prior responses can be revisited), and also can require question completion. Likewise, face-to-face surveys also have these benefits. Additionally, in-person research permits trained interviewers to observe and record how respondents interact with the questionnaire and stimuli, encourage completion of all questions, and record comments respondents spontaneously offer during the survey.

The two main forms of personal interviewing are in-home and central location (e.g., mall-intercept) interviews (Malhotra *et al.*, 2006). Central location surveys are cheaper than in-home interviews, as respondents come to the interviewer. Choosing the central location for the intercept interviews is very important, as members of the population of interest must be likely to visit the venue quite frequently. ‘The Plaza’ is the largest shopping mall in Palmerston North, with varied stores that would attract a good cross-section of shoppers and this was selected as the central location. This location is also adjacent to the city centre park, ‘The Square’, which is a popular place for people to relax during the day, including workers taking their breaks. It was expected that using intercept interviews in these locations would ensure that people from across the SES range would be invited to take part.

Pilot Testing

The survey was pilot tested using draft stimuli over a two day period. Ten parents visiting a children's playground agreed to take part in survey testing. As estimated, the survey took about seven to eight minutes to complete. Using post-hoc probing, all pilot participants were asked how easy or difficult the questions were for them to answer, and no problems were detected.

To test whether participants perceived differences in the nutrition profiles used in the experiment, a manipulation check was then undertaken. A further nine people viewed the three nutrition profiles used for the ability questions (which were the 'better' and 'worse' profiles, plus an 'in between'), and were asked to identify which of the three had the: highest sugar, lowest energy, lowest total fat, highest saturated fat, best overall nutrition profile, and worst overall nutrition profile. Across all participants in the manipulation check, 87 percent of questions were answered correctly. Approximately 80 percent also agreed that the 'better' and 'worse' cereals had the best and worst overall nutrition profiles, respectively, of the three presented.

Data Collection

Mall-intercept interviews were conducted over two week days and two weekend days (Thursday 27th to Sunday 30th March 2008), from early in the morning to late afternoon, to ensure that a good cross section of respondents was attained. A team of trained interviewers was instructed to approach every third person passing them who appeared to be between 20 and 50 years; during quiet periods with few shoppers, the interviewers approached each passing person who appeared to be between 20 and 50 years old.

Interviewers were assigned to one experimental condition for blocks of between three to four hours, and were rotated across the six conditions to balance any interviewer effects. The questionnaires were colour coded to ensure interviewers presented the correct stimuli according to the condition to which they were assigned. To begin, two screening questions were used to ensure that respondents were either a parent or caregiver of at least one child aged between two and 15 years, and had some degree of responsibility for household grocery shopping (see Appendix A1.2.4). Qualifying respondents were informed of their rights as a participant according to Human Ethics Committee protocols and told they could read an information sheet explaining the survey purpose.

Respondents were given an A5 sized, spiral-bound booklet of cards that contained response scales used for all questions in the survey (see Appendix A1.2.5). The interviewers directed participants' attention to the relevant scale before reading each question. Respondents were also provided with an A4 sized card featuring the experimental stimuli at two points during the interview. The first show card displayed one of the six breakfast cereal images, and respondents were asked to look at it as if in a store and considering buying it. Respondents were able to view this card while answering the attitude and belief questions. The cereal image was then removed from sight, and respondents were asked to recall nutrient content details. A second show card was provided for the ability questions (see Figure 17).

Response Rate and Sample Demographics

In total, 1,763 people were approached to take part in this research over the four days, and 604 people agreed to be surveyed (cooperation rate of 34 percent). However, 304 of these people (50 percent) were ineligible because they answered 'no' to either screening question, had already completed the survey on a prior day, or could not speak English. Overall, 290 interviews were completed, giving a final response rate of 21 percent.⁴⁰

Respondents' ages ranged from 19 to 62 years, with the average age being 39 years ($SD = 8$) (detailed demographic information is presented in Appendix A3.1). The sample contained more women (72 percent) than men, and there was a wide spread of educational attainment within the sample. Chi-square tests revealed no significant differences in the distribution of any demographic variable across the six experimental conditions.

Statistical Analyses

The Results section (§7.2.2) contains six sub-sections. Across these subsections, several different statistical analyses are reported. First, to provide some context for the hypothesis testing, the distribution of respondents' attitudes towards and use of the Nutrition Information Panel, and their perceptions of their nutritional knowledge, are described. Following this, results of tests for H1a are presented, to detect differences in

⁴⁰ If it is assumed that the same proportion of people who refused were ineligible as among those who agreed to answer the screening questions, then the response rate would be estimated at 34 percent.

attitudes towards products across the conditions. As the independent variables are categorical, Analysis of Variance and Independent Samples *t* Tests are used to test for significant relationships with the dependent variable, attitude toward the product. The purpose of measuring consumers' attitudes is to predict the likely impact of labelling changes on purchase behaviour; the third subsection explores this further outlines these findings. ANOVA was used to examine whether respondents' intentions to purchase the product varied by labelling format, and multivariate ANOVA was used to test whether respondents' attitude certainty varied according to the label format.

To assess the degree of elaborative processing undertaken by respondents when reviewing the product, a MANOVA and Independent Samples *t* tests were used to determine if message recall differed across the nutrition label conditions. This also provides some insight into whether information formatting affected respondents' perceptions of the quantities of selected 'negative' nutrients. As cognitions are another correlate of attitudes (i.e., people's thoughts and beliefs about the attitude object can be both antecedents and consequences of attitudes (Olson & Zanna, 1993)), a MANOVA was run to examine how the manipulated independent variables affected respondents' beliefs about four important food characteristics.

Finally, the relationship between motivation and ability to use nutrition information and consumers' product evaluations was tested. The posited relationship is predicted by the ELM theory of persuasion and hypothesised in H1b. A measure of motivation was created using selected items from the first block of questions following an inter-item reliability analysis. Three questions that required the use of nutrition information to answer correctly were used to create a measure of ability; this scale was constructed by summing the number of total correct responses, yielding a possible score of zero to three. Traditionally, ANOVA is used to examine the effect of motivation and ability when these are manipulated by the experimenter (Mongeau & Stiff, 1993). While others have used grouping techniques such as median-splits to classify respondents into dichotomous groups for ANOVA (e.g., Keller *et al.*, 1997), there are strong statistical arguments against this practice, most notably that it reduces power to detect effects (Irwin & McClelland, 2003; MacCallum, Zhang, Preacher, & Rucker, 2002). Therefore, a hierarchical multiple regression (HRM), following the method prescribed by Aiken and West (1991), was used to estimate the relationship between respondents' motivation and ability to use nutrition information and their attitudes across the six conditions.

7.2.2 Study Two Results

The Nutrition Information Panel: Attitudes and Current Label Behaviour

Respondents used nine-point Likert scales to answer five questions that measured their attitudes towards the NIP, their use of it, and self-reported perceptions of nutrition knowledge. The purpose of these questions is to provide some basic descriptive statistics, so to simplify interpretation of this information, responses were divided into three groups; those who selected responses from one to three were identified as disagreeing with the statement, responses four to six as ambivalent, and seven to nine as agreeing (see Table 14). Respondents were most likely to agree that they often generally read the NIP when shopping (60 percent) or when their children request a food purchase (62 percent). There was a moderate Pearson's correlation between responses to these behavioural questions ($r = 0.65$; see Appendix A3.2).

However, these high rates of self-reported label usage are slightly at odds with the observation that respondents were less sanguine about their own knowledge of nutritional issues and the NIP. About half of respondents agreed or strongly agreed that they feel knowledgeable about nutrition (48 percent). Just under half (47 percent) agreed that NIPs are easy to understand, but an equally large proportion were either ambivalent (35 percent) or disagreed that NIPs are easy to understand (18 percent). About the same number of respondents agreed that NIPs tell them what they need to know about foods (42 percent), while nearly one in four disagreed (23 percent).

Table 14 – Beliefs about NIPs and self-reported usage, Study Two

Statement	Mean response on 9-point scale	Percent of Respondents		
		Strongly Disagree – Disagree (1-3)	Slightly Disagree – Slightly Agree (4-6)	Agree – Strongly Agree (7-9)
I always read NIPs when child asks for food	6.54	15	22	62
I often read NIPs when shopping	6.34	18	22	60
I feel knowledgeable about nutrition	5.88	13	40	48
NIPs are easy to understand	5.83	18	35	47
NIPs are informative	5.53	23	35	42

Effect of Label Format on Respondents' Attitudes⁴¹

It was predicted in H1a that the nutrition label format will affect consumers' attitudes towards products with different nutritional profiles. Responses to two questions that measured overall opinion of the cereal and attitude towards purchasing it were averaged to form an attitude scale ($r = 0.61$), used as the dependent variable in subsequent analyses. A two-way ANOVA was run to examine main and interaction effects between the two manipulated variables, nutrition profile and nutrition label format, and attitudes. A significant main effect of nutrition profile on attitudes was found, $F(1, 293) = 22.84, p < 0.001$. That is, the mean attitude score was significantly higher among respondents shown the nutritionally superior cereal ($M = 5.1, SD = 1.8$) than among those who viewed the nutritionally inferior product ($M = 4.1, SD = 1.7$). This result also serves as a manipulation check and shows that respondents evaluated the 'better' and 'worse' product profiles as expected.

The main effect of nutrition label format was also significant, $F(2, 293) = 3.21, p < 0.05$; this shows that respondents' attitudes were affected by the way information is formatted. There was also a significant interaction effect between product nutrition profile and label format according to the ANOVA results, $F(2, 293) = 5.85, p > 0.01$. That is, large differences were observed between nutrition label format group means across the three nutrition profiles in the worse cereal conditions; however there was little difference between group means for the better nutrition profile conditions.

To further explore the ANOVA results, a series of independent samples *t*-tests were run. Comparison of attitude scores between the two control group conditions (NIP only) reveals that there was no significant difference in respondents' attitudes towards the better and worse cereals ($M = 5.0$ *cf.* $M = 4.8, t(97) = 0.89, p = 0.39$). This suggests that most consumers do not, or cannot, use the NIP to evaluate products with different nutritional compositions. However, the attitudes of respondents who saw either the MTL or PDI labels were significantly different across the two nutrition profiles. The difference in attitude scores was greatest between respondents who viewed images featuring MTL labels ($M = 5.3$ *cf.* $M = 3.4, t(92) = 5.48, p < 0.001$). Respondents in the MTL label condition with the poorer nutrition profile reported the lowest attitude scores

⁴¹ This section is based on a paper presented at the 2008 International Nonprofit and Social Marketing Conference in Australia (Maubach & Hoek, 2008b).

of any group. Those who viewed PDI labels also had a more negative attitude towards the less healthy cereal, although the difference between the two group means was not statistically significant ($M = 5.1$ cf. $M = 4.4$, $t(87) = 1.96$, $p = 0.06$).

Behavioural Intentions and Attitude Certainty

Respondents also indicated their intention to purchase the cereal, if it were available, using a nine point scale from ‘definitely would not buy’ to ‘definitely would buy’. This measure of behavioural intention was moderately correlated with overall opinion of the cereal ($r = 0.62$) and attitude towards buying cereal for their children ($r = 0.66$). Across all three nutrition label formats, respondents’ intention to purchase the nutritionally worse cereal was lower than intention to purchase the better cereal ($M = 3.3$ cf. $M = 4.4$, $t(293) = 3.75$, $p < 0.001$).

There was an interaction between nutritional profile and nutrition label format, as the difference in intention varied across the three formats. As with the measure of attitude, there was no statistically significant difference in intention to purchase the nutritionally better or worse cereals when only the NIP was available, although the observed difference was in the expected direction ($M = 4.0$ cf. $M = 4.4$, $t(99) = 0.82$, $p = 0.42$). The same pattern was observed in the PDI conditions, and although the difference between means was greater, it was not statistically significant either ($M = 3.7$ cf. $M = 4.6$, $t(87) = 1.78$, $p = 0.08$). However, respondents who evaluated products bearing a MTL label had significantly lower intentions to purchase the worse cereal ($M = 2.5$ cf. $M = 4.3$, $t(103) = 4.11$, $p < 0.001$).

As Rucker and Petty (2006) argue that ‘attitude certainty’ mediates the attitude–behaviour relationship, respondents were asked to how certain they were of their responses to the two attitude questions. A two-way MANOVA was run to determine whether nutrition label format and nutrition profile affected respondents’ attitude certainty. Analysis shows that the nutrition label format did have a significant effect on attitude certainty (Roy’s largest root = 0.02, $F(2, 287) = 3.25$, $p < 0.05$). In particular, respondents who viewed a MTL were significantly more certain of their attitude towards whether the cereal was good or bad to buy than respondents in the control condition (MTL $M = 6.4$ cf. NIP $M = 5.7$). Attitude certainty for respondents viewing a PDI ($M = 6.3$) was not significantly different from the NIP conditions.

According to postulates of the ELM, the observation that respondents are more certain of their attitudes towards a product when viewing an MTL suggests that respondents would be less likely to buy products that they had a more negative attitude towards.

Conversely, because more people are less certain of attitudes formed after studying numeric labels, this analysis suggests their attitudes would be weaker predictors of behaviour.

Respondents' Perceptions of Nutrient Levels

Further analyses were undertaken to determine whether the nutrition label format affected respondents' perceptions of the levels of three nutrients: sugar, sodium, and total fat. Perceptions of nutrient content were measured on a 5-point scale, anchored by 1 = very low and 5 = very high. Mean scores and the number of respondents who stated 'don't know' (DK) are reported in Table 15; although more people selected 'don't know' responses in some conditions than others, a Chi-square test showed this distribution was not significantly different from expected values.

Respondents' perceptions of sugar and total fat content did vary across the three nutrition label formats. The cereal with the better nutrition profile contained 2.8g sugar per 100g, while that with the worse profile contained more than ten times this amount, 31.3g per 100g (see Table 12, page 153). Respondents' mean sugar level ratings differed significantly between the better and worse profile conditions across all three nutrition label formats; the largest differences emerged in the groups exposed to a MTL.

The better cereal contained 1.3g total fat per 100g, while the worse had 5.8g per 100g. Those respondents shown the control and MTL versions were significantly more likely to state that the lower fat cereal had a low fat content. However, respondents' perceptions of fat content did not differ significantly across the two nutrition profiles in the control and PDI label conditions.

The sodium content of the better cereal was actually slightly higher; 280mg *cf.* 194mg, which are moderate amounts according to the thresholds developed by the British Food Standards Agency for the Traffic Light scheme (see Appendix A2.1). Thus, the fact that respondents gave ratings around the scale midpoint in all conditions is accurate and no differences were expected. However, more people gave 'don't know' responses when

asked how much sodium the cereal had, and several made unprompted comments to the effect that they did not look at sodium levels. Therefore, it is possible that some respondents may have made ‘safe’ guesses around the scale midpoint, and were in fact unsure of sodium content.

Table 15 – Nutrient content evaluation by nutrition profile and nutrition format, Study Two

Nutrient, by Format	Better Nutrition Profile		Worse Nutrition Profile		Sig.
	<i>M</i> [§]	DK (n)	<i>M</i> [§]	DK (n)	
Sugar					
NIP	2.7	9	3.5	3	$t(87) = -3.53^{**}$
PDI	2.7	3	3.7	3	$t(82) = -4.21^{***}$
MTL	2.2	4	4.4	4	$t(94) = -11.89^{***}$
Sodium					
NIP	3.0	25	3.0	11	$t(63) = 0.00$
PDI	3.5	16	3.1	11	$t(61) = 1.34$
MTL	3.0	6	3.2	13	$t(65) = -1.35$
Total Fat					
NIP	2.0	15	2.6	4	$t(80) = -3.06^{**}$
PDI	2.4	6	2.4	5	$t(77) = -0.20$
MTL	2.0	8	3.1	9	$t(85) = -5.01^{***}$

[§] Mean calculated excluding “DK” responses; ** $p < 0.01$, *** $p < 0.001$

These recall questions also served as proxies for cognitive processing. ELM theorists posit that people will only recall information that they have processed, or elaborated upon, to some extent. As responses to these three nutrient recall questions tended to be more closely aligned to the nutritional composition of the product in the MTL conditions, this suggests that consumers are able to process information in this format better than either of the two numeric formats.

Respondents’ Beliefs

As Study One revealed that parents consider and trade-off many factors when evaluating foods, a set of semantic differential questions was included to measure respondents’ beliefs about the product on four important dimensions: artificial to natural, low quality to high quality, not nutritious to nutritious, tastes bad to tastes good. In addition to the manipulated nutrition-content information, and ease of access to this across the label formats, consumers’ beliefs could have been informed by other elements of the total

package design, such as the look of cereal, packaging colours, ingredients list, or product name.

These four belief questions were entered as dependent variables in a MANOVA and nutritional profile and nutrition label format were the independent variables. Using Roy's largest root to assess significance, the combined belief measures were shown to be affected by nutrition profile, $F(4,254) = 3.62, p < 0.01$, and label format, $F(4,255) = 3.55, p < 0.01$, and by an interaction between these variables, $F(4,255) = 2.80, p < 0.05$. The between-subjects effects output showed that the nutrition label format had a significant effect on all four beliefs, while nutrition profile had a significant effect on respondents' beliefs about product quality and nutritiousness, but not naturalness or taste. The interaction between nutrition profile and label format was significant only for respondents' beliefs about nutritiousness. This interaction was explored using independent samples t tests, which showed that respondents who viewed a MTL label believed there was a difference in the nutritiousness of the two cereal profiles ($t(93) = 4.11, p < 0.001$) (see Table 16). Overall, perceptions of whether the product was nutritious were weakly correlated with the nutrition profile ($\rho = 0.16$), which indicates that consumers are probably using a variety of packaging cues to infer nutritional value. Although the 'branding' elements remained the same across all conditions, people have different purchase histories, experiences and knowledge – this means that packaging cues will be interpreted in different ways, and explains why beliefs about the same product can vary.

Table 16 – Respondents' Beliefs across Nutrition Label Formats by Nutrition Profile

Belief Statement	Nutrition Label Format	Product Nutrition Profile	
		Better	Worse
Artificial (1) to Natural (9)	NIP	5.3	5.5
	PDI	5.0	5.0
	MTL	4.8	3.9
Low Quality (1) to High Quality (9)	NIP	4.9	4.9
	PDI	5.3	4.5
	MTL	4.9	3.7 *
Not Nutritious (1) to Nutritious (9)	NIP	5.6	5.3
	PDI	5.3	4.9
	MTL	5.4	3.8 *
Tastes Bad (1) to Tastes Good (9)	NIP	4.9	4.8
	PDI	5.5	4.9
	MTL	4.3	4.4

* Significant difference at 95% Confidence Interval level

There was no significant difference in nutritiousness ratings across the two profiles in either the NIP ($t(99) = 0.17$, ns) or PDI ($t(87) = 1.04$, ns) conditions. Thus, the total-sample correlation between nutrition profile and beliefs about nutritiousness would have been reduced by responses in these latter two conditions. Additionally, participants also believed there was a difference in the quality of the two product profiles when they had access to a MTL, but not in the other two labelling conditions either. Interestingly, although respondents in the MTL conditions believed the two products were of different quality and nutritiousness, and recall from the prior section had very different sugar and fat content, they did not believe the two products would taste different. This is interesting as research suggests consumers sometimes state that healthier products taste worse (Raghunathan et al., 2006), yet this perception was not evident here.

The Effect of Respondents' Motivation and Ability on Attitude⁴²

In addition to hypothesising that respondents' attitudes would differ across the nutrition label conditions, H1b hypothesised that motivation and ability to use nutrition information would explain differences in attitudes. Motivation to discover information about foods' nutritional composition was measured by seven items at the start of the experiment. Respondents were asked how important it is that food they buy for their children is: free of artificial additives (1b), low in energy (1c), high in protein (1d), low in fat (1f), nutritious (1h), high in vitamins and minerals (1j), low in sugar (1l). A reliability analysis was conducted on these items to determine if a summated 'motivation to read nutrition information' scale could be created. The Cronbach's alpha score for all seven items was moderate ($\alpha = 0.60$). According to the item total statistics, the item relating to energy should be removed from the scale. This was not surprising, as interviewers noted during data collection that some respondents were confused by the term 'energy' or stated they deliberately sought high energy foods for their children. This item was removed, and the item-total statistics for the motivation scale created from the remaining six items were improved ($\alpha = 0.73$; $M = 19.6$, $SD = 3.2$, range 8-28). Removing any other items from the scale would have lowered the alpha coefficient.

⁴² This section is based on a paper presented at the 2008 Australian and New Zealand Marketing Academy Conference (Maubach & Hoek, 2008a).

The ability questions required respondents to use available nutrition information to identify which of three products had the highest sugar, lowest energy, and lowest total fat content. Correct responses were summed, yielding potential scores from 0 (none correct) to 3 (all correct). The proportion of one, two or three correct responses was not evenly distributed across the nutrition label groups (no respondents answered all questions incorrectly), showing that respondents' ability to find information varied across the label formats (see Appendix A3.3). A higher proportion of respondents in the MTL condition answered all three questions correctly (31 percent) and the control condition (26 percent) than the PDI condition (8 percent). Fewer respondents in the MTL and control conditions also only answered one question correctly (6 percent and 4 percent, respectively), but one in ten people in the PDI condition answered only one question correctly. Chi square analysis confirmed the relationship between information format and respondent ability to use the nutrition information was significant ($\chi^2(4) = 17.82, p < 0.01$). It is possible this pattern may have resulted from respondents in the PDI condition failing to notice the different serving sizes used across the three nutrition profiles, which may have created conflicting impressions of nutrient density and per serve information.

As outlined in the *Statistical Analyses* section, a hierarchical multiple regression (HRM) analysis was used to investigate whether differences in motivation and ability could explain differences in respondents' attitudes. As motivation and ability were continuous variables, these were centred by subtracting the mean from each score prior to inclusion in regression models, to minimise multicollinearity between single independent variables and higher-order interaction terms (Aiken & West, 1991). The categorical independent variables (nutrition format and nutrition profile) were recoded using unweighted effect coding (Cohen, Cohen, West, & Aiken, 2003; Pedhazur, 1997). As shown in Table 17, this procedure generated two effect vectors to represent the three levels of nutrition format: with the control level (NIP) set as the contrast, the MTL identified in Format Effect 1 (FE1), and PDI identified in Format Effect 2 (FE2). One effect vector was created to represent the two levels of nutrition profile, with the better profile set as the contrast level (based on earlier results) and the worse nutrition level as the Profile Effect (PE) vector. To test for significant interactions between variables, cross-products were created by multiplying variables into single composite variables (Cohen *et al.*, 2003).

Table 17 – Effect Vectors created for Discrete Variables, Study Two

Independent Variable	Level	Effect Vector
Nutrition Label Format	Nutrition Information Panel (Control)	Contrast level
	Multiple Traffic Light label	FE1
	Percent Daily Intake label	FE2
Nutrition Profile	Better	Contrast level
	Worse	PE

All variables and interactions were entered in the HRM (the “full model”); the effect coded and centred predictor variables were entered in Step 1; all two-way interactions of these variables were entered in Step 2; all three-way interactions in Step 3; and four-way interactions in Step 4. Cognitive theories state that beliefs are precursors to attitudes (Fishbein & Ajzen, 1975), therefore the four semantic differential items measuring respondents’ beliefs were entered into the regression analysis in Step 5, to explore whether these explained remaining attitudinal variance. Table 18 contains the “full model” summary statistics.

The main effects of the manipulated and measured variables entered in Step 1 explained 14.5 percent of the variance in respondents’ attitudes, which was significant (see Table 18). The increase in explanatory power resulting from the addition of interaction terms in Steps 2, 3, and 4 was not significant. Step 5 of the “full model”, where respondents’ beliefs about the product were entered, explained the largest proportion of variance in consumers’ attitudes (39.5 percent), bringing total variance explained by the model to 61.5 percent.

Table 18 – Full Model HRM Summary Statistics, Study Two

Step	R	R²	R² Change	F Change
1	.381	.145	.145	8.331 ***
2	.440	.193	.048	1.582
3	.458	.210	.016	0.683
4	.470	.220	.011	1.579
5	.784	.615	.395	57.391 ***

*** $p < 0.001$

Reviewing the “full model” β coefficients and associated t tests (see Appendix A3.4) showed that only one two-way interaction was significant: between the MTL effect vector and respondents’ motivation (FE1 x Mot). Additionally, one four-way interaction

was also significant, between FE1 x PE x Mot x Ab. Aiken and West (1991) explain that removing non-significant higher-order terms from the regression equation simplifies the model, while typically providing an equally good fit of the data. While the purpose of this analysis is to determine whether consumers' motivation and ability affected their attitudes, rather than to identify a model that explains attitudinal variance, including extraneous variables can have a marked effect on beta coefficients and thus changing the interpretation of independent variables (Garson, 2009).

Therefore, all interactions between predictors that were not significant in the full model analysis were removed and the HRM was re-run to produce a "reduced model". The same pattern of entry was used: all single independent variables were entered in Step 1, significant cross-products in Step 2, and beliefs in Step 3 (see Table 19). The resulting estimates show that the combined effect of the single independent variables explained 14.5 percent of the variance in respondents' attitudes; however, nutrition label format and respondents' motivation and ability were not significant predictors on their own. The interaction terms added in Step 2 did not explain a significant amount of variance. The final variables entered in Step 3 explained the greatest proportion of variance, an additional 42.7 percent, and took total attitudinal variance explained to 58.4 percent.

Table 19 – Reduced Model HRM Summary Statistics and Coefficient Output Study Two

Step	R	R ²	R ² Change	F Change
1	0.381	0.145	0.145	8.33 ***
2	0.396	0.157	0.012	1.77
3	0.764	0.584	0.427	61.48 ***
Variable Name (Step 3)		Unstandardised B Coefficient		t
Constant		4.38		54.98 ***
Profile (PE)		-0.30		-3.71 ***
Motivation (Mot)		0.04		1.63
Ability (Ab)		-0.14		-0.84
Format (FE1)		-0.08		-0.68
Format (FE2)		0.01		0.08
FE1 x Mot		-0.05		1.48
FE1 x PE x Mot x Ab		-0.08		1.67
Belief (Nutritious)		0.37		5.31 ***
Belief (Quality)		0.26		3.50 **
Belief (Taste)		0.10		2.27 *
Belief (Naturalness)		0.03		0.56

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

If motivation and ability affect consumers' use of information when this is presented in different communication formats, the interaction variables created between the Format Effect variables (FE1 and FE2) and either Motivation (Mot) or Ability (Ab) would have been significant. Thus, the hypothesis that consumers' motivation and ability moderate their evaluation of the cereals when these were associated with alternative nutrition information formats was not supported by this analysis. The large proportion of attitudinal variance explained by respondents' beliefs suggests they draw widely on different contextual information sources to develop opinions of a product; these may not relate to the actual nutritional merits of the product but rather the skill of the marketer at designing cues that denote desirable attributes.

7.3 Study Three: Front of Pack Nutrition Labels and Product Claims

7.3.1 Introduction

This study is a replication with extension of Study Two, and, as outlined below, used a nationwide sample and an online survey design. The purpose of Study Three was to test whether an alternative source of nutrition and health related product information, in the form of claims made by the manufacturer, affect consumers' use of nutrition information during product evaluation. Food manufacturers are permitted to state factual claims about the presence or absence of nutrients when marketing their products in Australia and New Zealand, and the Food Code may soon be amended to permit general and high level health claims linking nutrients to specific physiological and health outcomes. Therefore, if different types of nutrition-related information on packages interact to influence consumers' perceptions and choice behaviour, regulators need to understand the size and nature of this interaction.

As Study Two demonstrated that consumers' product evaluations were not affected by nutrition information when it was presented in the currently mandated NIP, this format was excluded from Study Three to keep the number of experimental cells down to a manageable size. Therefore, this experiment tested the effect of adding nutrition-content and health claims to products featuring either a MTL or PDI nutrition label on the front

of the package. In addition to the hypotheses addressed in Study Two, this research also addressed the following hypotheses:

- H2a Consumers' responses to product claims in attitude formation will be mediated by front-of-pack nutrition label format, and will be inversely proportional to label accessibility, so will decrease from PDI to TLL.
- H2b Consumers with higher motivation and ability to use nutrition information will not be as influenced by product claims when evaluating the product.

This section of the chapter follows the structure of the previous, because of the high degree of overlap between the study designs. First the method is outlined, but only the differences in design and content between Study Two and Three are expanded upon. The results are presented in much the same format, including repetition of analyses conducted on the data in Study Two plus additional analyses to discover the affect of product claims on consumers' evaluations.

7.3.2 Study Three Method

A two by three by two, partial-factorial experiment was designed to test the effect of product claims on consumers' product evaluations, in the context of FOP nutrition labels. As shown in Table 20 (overleaf), there were two levels of nutrition information (PDI, MTL), three levels of product claims (no claim (control), nutrition-content claim, health claim), and two nutrition profiles (better, worse). The proposed regulations for Australia and New Zealand require that foods must meet minimum nutritional criteria to carry a health claim (FSANZ, 2008d). Therefore, the nutritional values of both the better and worse nutrition profiles were entered separately into the FSANZ online Nutrient Profiling Calculator, which evaluates the nutritional value of foods to determine whether they are eligible to carry a health claim (products must score fewer than 4 points to be eligible for a health claim). The first product (better) received a score of -3 and was eligible to carry health claims, but the second (worse) cereal's score of 11 was well above the threshold and could not legally use high level health claims. Because a high level health claim is prohibited from being added to the product with the worse profile, this combination of variables was excluded from the study; this reduced the design to ten cells (rather than 12) and made the experiment a partial-factorial design.

Table 20 – Experimental Treatment Conditions for Study Three

Product Claim	Nutritional Profile	Nutrition Label Format	
		Multiple Traffic Light	Percent Daily Intake
No Claim (control)	Better	1	6
	Worse	2	7
Nutrition-content Claim	Better	3	8
	Worse	4	9
High Level Health Claim	Better	5	10
	Worse	Not permitted	Not permitted

Selection of the Product Claims Variable

The research was conducted in the months after the release of the final assessment report for P293 Nutrition, Health and Related Claims. In this report, FSANZ (2008d, p. 16) specified eight high level health claim diet-disease relationships will be preapproved:

1. Calcium, vitamin D status and osteoporosis
2. Calcium and enhanced bone mineral density
3. Folic acid and foetal neural tube defects
4. Saturated fatty acids and LDL-cholesterol
5. Saturated and *trans* fatty acids and LDL-cholesterol
6. Sodium and blood pressure
7. Increased intake of vegetables and fruit and coronary heart disease
8. A high intake of vegetables and fruit and coronary heart disease

As this research evaluates the effect of claims on parents' food purchases for their children, the high level health claim used in the experiment needed to appeal to this audience and be relevant to child health. Over the last decade, a series of reports has shown New Zealand children do not achieve recommended intakes of calcium (MOH, 1998; 2003c; 2006), and calcium intake during childhood and adolescence is important for healthy bone development (DHA & MOH, 2006; MOH, 2003a). Thus, given the health needs of children and the general nutritional profiles of breakfast cereals, the second preapproved claim (calcium and enhanced bone mineral density) was deemed most suitable to the research context. Additionally, vitamin and mineral nutrition claims are quite common on breakfast cereal products (Williams *et al.*, 2003), so consumers should not find a claim about mineral fortification unusual.

The guidelines available when the research was conducted stated that in order to carry the claim, foods must contain at least 200mg calcium per serve, which equates to 25

percent RDI. Furthermore, the claim must also reference that benefits will accrue when the product is eaten as part of a "...healthy diet with a high intake of calcium from a variety of foods" (FSANZ, 2008b, p. 82). Therefore, to satisfy proposed legal requirements, an asterisk on the FOP health claim linked it to a statement on the side of the pack that read: *"This cereal is high in Calcium. A healthy diet high in calcium from a variety of foods may enhance bone mineral density and create strong bones and teeth"*. Additionally, it is common practice for cereal manufacturers to reiterate and further explain product claims on the side of packaging above the NIP, so the phrase *"A delicious combination of grains with calcium to build strong bones & teeth"* was also added to the side panel.

To ensure consistency across treatments to allow the difference between levels of claims to be assessed, the nutrition-content claim condition also referred to calcium. The proposed regulations do not require any specific nutritional profile in order for a product to be promoted with a nutrition-content claim for vitamin or mineral content. If a single serving product provides at least ten percent RDI for a vitamin or mineral, then it is able to be promoted as being a 'source' of that micronutrient. A product must provide at least 25 percent RDI to be described as a 'good source' (FSANZ, 2008c). To eliminate a potential confound, the amount of calcium per serve remained consistent, and so the 'good source' nutrition-content claim was used. Similar to the health claim conditions, the phrase *"A delicious combination of grains with calcium"* was printed above the NIP on the side pack image.

The nutrition-content claim stated "a good source of Calcium - 25% RDI per serve", and the health claim read "High in Calcium for increased Bone mineral density - 25% RDI per serve" (see Figure 18).



Figure 18 – Images of the a) High Level Health and b) Nutrient-Content Product Claims

When claims are used, the nutrient must also appear in the NIP (FSANZ, n.d.), so calcium was added to the bottom of the NIP table in all product claim conditions. The full set of images is available Appendix A1.3.1.

Research Mode

It was planned that this experiment would employ the same data collection method as Study Two. However, the task of recruiting respondents using the central location intercept surveys was much more difficult than anticipated as fewer people were visiting the city centre (retailers were also voicing concerns about declining shopper numbers at this time due to the global economic recession). As this experiment also introduced another variable, a larger sample of respondents was required to ensure that the study would have sufficient power to detect any effects.

As outlined above (§7.2.1 *Research Mode and Sampling Strategy*), internet surveys had many of the same benefits as face-to-face research, so participants were recruited from an online research panel. Although one third of New Zealand households did not have internet access in 2006 (Statistics New Zealand, 2007b), there was no reason to believe that internet access was related to nutrition label use and could systematically bias results. However, one potential problem is that approximately half of household internet connections are dial-up (Statistics New Zealand, 2007b), so the survey website needed to function on slow download speeds.

An advantage of online research is that it allows participants' behaviours while completing the survey to be unobtrusively recorded (the information collected is technically referred to as "client-side paradata") (Heerwegh, 2003). As well as standard HTML forms, the online questionnaire employed two JavaScript functions to provide for dynamic data presentation and collection in each respondent's web browser. Thus, this code worked with respondents' personal computers to capture information about their behaviour, such as clicks made and time taken between click events, to send this to the survey database when a page is submitted.

Shifting to an online mode also permitted a nationwide sample to be obtained. Three New Zealand online consumer panel owners allow researchers to sample their members without additional design or analytic services: SmileCity (owned by PermissionCorp),

Valued Opinions (Research Now), and Consumer Link (Colmar Brunton). SmileCity was selected because it had the largest panel (over 125,000 people at the time of the research), consisting of members with diverse demographic backgrounds. SmileCity panel members receive reward points for completing surveys⁴³, which can be redeemed for cash or as discounts on purchases made through online retailers, or donated to charities.

Changes to the Survey Instrument and Presentation of Visual Stimuli

The questionnaire was modified slightly for this experiment (see Appendix A1.3.2). Firstly, the questionnaire was redesigned for presentation on screen. Again, the survey began with the screening questions to ensure only parents with some responsibility for household grocery shopping took part. A third screening question was added in response to comments received in Study Two, which indicated that some parents do not buy packaged cereals. This third question presented a list of products, which included breakfast cereal, and asked panel members to select those they had bought at least once in the past six months. Respondents who did not select breakfast cereal were screened out at this point.

Changes were also made to the visual stimuli to take advantage of the ability to collect client-side paradata during the survey. Specifically, the Hooplas cereal image showed only the front panel of the box, but respondents could see the side panel if they wished. This amendment reflected the fact that consumers in a supermarket setting usually only see pack fronts on store shelves, and must pick these up and turn them over to find the NIP and ingredient information. By using web functions from the LightBox2 JavaScript library (Dhakar, 2007), respondents were able to view the side of each cereal packet ‘on demand’ as an overlay on the web page. This side panel image showed the ingredients list, NIP, allergen statement and also any additional statements associated with product claims. A mouse click on the front-of-package image initiated presentation of the overlay, while a mouse click outside of the overlay or on a ‘close’ link in the overlay itself returned focus to the underlying questionnaire page. Additionally, a modified version of Heerwegh’s (n.d.) client-side paradata JavaScript function automatically collected user input paradata for key items throughout the questionnaire (see Couper, 2000a;

⁴³ SmileCity members also earn rewards points on purchases made through online partners and by participating in the community in other ways (<http://smilecity.co.nz/earn/>).

Heerwegh, 2003). This enabled analysis of specific behavioural metrics, including whether or not the package side overlay was viewed and the number of times it was opened and closed.

Between the first set of questions (Q1a-11) and the page displaying the cereal image and associated attitude questions, respondents read an instruction screen that informed them they could click their computer mouse anywhere on the image to read the ingredients list, nutrition information and allergy statement on the side panel (if respondents tried to move off this page quickly, a message encouraged them to read the instructions carefully before moving on).

Pilot Testing

A sample of 1,334 people was randomly drawn from the SmileCity panel⁴⁴. As this research sought to solicit responses from parents, the following parameters were applied during sampling: respondents had to have at least one child between the ages of 2 and 12 years living at home, and have shared or full responsibility for household shopping. Using Microsoft Excel, the database of all sample members were randomly pre-assigned to one of the ten experimental conditions.

To pilot test the web survey, email invitations were sent to 100 people in the sample on Wednesday 27th August 2008. Within 24 hours, 45 people had clicked the survey link in the invitation email, and 35 completed the survey (six were screened out and four qualified but did not finish). Men and women responded equally to the invitation, and their average age was 38 years ($SD = 4.5$). Participants completed the survey in around eight to ten minutes and none reported problems with the site, so the remaining 1,234 invitations were then sent out.

Data Collection and Sample Demographics

The online survey was live from Wednesday 27th August to Monday 1st September 2008. In total, 428 valid responses were obtained, including the pilot, and the final cell sizes were between 41 and 45 respondents. The final sample was 53 percent women and 47 percent men, with respondents' ages ranging from 27 to 53 years ($M = 37.7$, $SD = 4.3$)

⁴⁴ SmileCity selected the sample size based on the desired final sample of 420 responses.

(see Appendix A4.1). Chi square revealed no significant difference in the distribution of any demographic variables across the experimental conditions.

Statistical Analyses

The analyses conducted for Study Two are repeated here in the same order, and the effect of adding product claims is accounted for using three-way ANOVA. There are additional subsections of analysis, using some client-side paradata collected during the process of filling in the web survey (Heerwegh, 2003). Firstly, Chi Square analysis was used to test whether the proportion of respondents viewing the side panel image, containing the NIP, differed across the label format conditions. Secondly, independent samples *t* tests were used to determine whether the varying levels of information presented on the front of packs affected the time respondents took to answer the questionnaire.

7.3.3 Study Three Results

The Nutrition Information Panel: Attitudes and Current Label Behaviour

Overall, the general pattern of responses to questions about the NIP was similar to that observed in Study Two (see Table 14, page 166); however, some differences were evident. As shown in Table 21, slightly fewer than half of respondents (47 percent) strongly agreed or agreed that NIPs are easy to understand, and a little over one third (35 percent) agreed that NIPs tell consumers what they need to know about foods. The proportion of people who claim to use NIPs often when shopping, or when checking foods their children request, was lower than Study Two; fewer than half of respondents agreed or strongly agreed with either of these statements, and the correlation between responses to these items was high ($r = 0.79$, see Appendix A4.2). One explanation for the difference in response distributions to these questions between Studies Two and Three is that social desirability bias is less of a problem in online surveys than personal interviews, so the responses obtained in this study may provide better estimates of actual behaviour (Couper, 2000b; Duffy, Smith, Terhanian, & Bremer, 2005).

Respondents in this Study also rated their knowledge of nutritional issues lower; half (50 percent) selected a response option around the middle of the scale, while less than one in

three (28 percent) agreed or strongly agreed they feel quite knowledgeable about nutrition. There was a moderate correlation between self-reported nutrition knowledge and general label reading behaviour ($r = 0.64$).

Table 21 – Beliefs about NIPs and self-reported usage, Study Three

Statement	Mean response on 9-point scale	Percent of Respondents		
		Strongly Disagree – Disagree (1-3)	Slightly Disagree – Slightly Agree (4-6)	Agree – Strongly Agree (7-9)
I always read NIPs when child asks for food	6.04	19	31	50
NIPs are easy to understand	5.91	16	37	47
I often read NIPs when shopping	5.81	21	34	45
NIPs are informative	5.64	16	49	35
I feel knowledgeable about nutrition	5.24	22	50	28

Respondents' Viewing of Side Panel Image

As the survey dataset recorded whether respondents clicked to view the side panel image showing the NIP, the effect of front-of-pack information on consumers' use of the side panel could be estimated. Specifically, the PDI contains information on more nutrients than the MTL, and also in a numeric form, so could conceivably reduce consumers' desire to view the NIP. The converse of this argument is that consumers may be dissatisfied with the reduced level of information in the MTL, and seek the more detailed NIP to fulfil their information requirements. Additionally, Roe *et al.* (1999) reported that product claims were associated with lower use of the nutrition facts panel. To test whether respondents were more or less likely to click to see the side panel image across the ten conditions, a Chi Square analysis was conducted.

Table 22 shows the proportion of respondents in each experimental group who opted to view the side panel image. Although there are differences between some conditions (most notably between the MTL and PDI conditions for the 'better' cereal with no product claim), the overall pattern is not significant, $\chi^2(9) = 14.50, p = 0.11$. This suggests that consumers are not dissatisfied with the reduced amount of information in the MTL, and does not support Roe *et al.*'s (1999) finding that consumers are less likely

to look for nutrition facts. However, in Roe *et al.*'s research there was no nutrition information on the front-of-packs, so the studies are not directly comparable.

Table 22 – Proportion of respondents viewing the side panel image

Nutrition Profile	Product Claim	Percent Viewed Side Panel	
		PDI	MTL
Better	Control	31	63
	Nutrition	34	40
	Health	48	52
Worse	Control	41	40
	Nutrition	53	51
	Health	--	--

These results show that less than half of respondents searched for detailed nutrition information on a completely novel product, although shifting nutrition information to the front of the package may have reduced consumers' inclinations to search for the NIP.

Effect of Label Format and Product Claims on Attitudinal Responses⁴⁵

A three-way ANOVA was run to test for the main effects of each manipulated variable (nutrition profile, label format, and label claim), and any interactions between these, on attitudes. As with the study reported above, there were significant main effects for nutrition profile, $F(1, 427) = 28.17, p < 0.001$, and nutrition label format, $F(1, 427) = 4.28, p < 0.05$. However, the addition of nutrition-content or health claims did not have a significant main effect on respondents' attitudes, $F(2, 427) = 1.72, p = 0.18$, thus Hypothesis 2a was not supported.

As with Study Two, the ANOVA showed a significant interaction between nutrition label format and nutritional profile, $F(1, 427) = 15.60, p < 0.001$. That is, respondents who viewed an MTL on the cereal with the worse nutrition profile had a significantly lower attitude than those viewing PDI labels. Although the product claim variable did not have a main effect on attitudes, it did interact with nutritional profile, $F(1, 427) = 5.96, p < 0.05$; this finding is explored further below. Neither the two-way interaction

⁴⁵ This section was included in a paper presented at the 2009 Marketing and Public Policy Conference (Maubach, Hoek, Gendall, & Hedderley, 2009).

between product claim and nutrition format ($F(2, 427) = 0.30, p = 0.74$) nor the three-way interaction between format, profile and claims were significant ($F(1, 427) = 0.01, p = 0.85$).

Table 23 reports a series of independent samples t tests run to explore these main effects further. The table reports the average attitudes of respondents across the ten experimental conditions. Overall, the pattern of results is similar to those observed in Study Two. The top two rows in Table 23 show there was no statistically significant difference between the attitudes of those who saw the better and worse cereals with the PDI labels, across both the no claim and nutrition-content claim conditions (there is no comparison in the health claim condition as the worse cereal profile was not eligible to carry a health claim). While respondents shown the worse cereal in the control (no claim) condition had a slightly lower attitude score (4.4 *cf.* 5.1), this difference was not statistically significant. When a nutrition-content claim was added to the cereal images, the difference in respondents' attitudes was further reduced.

Table 23 – Mean attitude by nutrition label format, product claim, and nutrition profile

FOP Label Format	Product Claim	Better Profile (M)	Worse Profile (M)	95% CI M difference	Sig.
PDI	Control	5.1	4.4	-0.1 – 1.6	$t(87) = 1.80$
	Nutrient	4.9	5.1	-1.0 – 0.5	$t(85) = -0.62$
	Health	5.4	--	--	--
MTL	Control	5.6	3.4	1.5 – 2.8	$t(81) = 6.77^{***}$
	Nutrient	5.0	3.7	0.6 – 2.0	$t(83) = 3.76^{***}$
	Health	5.4	--	--	--

*** $p < .001$

The bottom of Table 23 shows consumers' mean attitudes when they were shown images with a MTL label; differences in attitudes between the groups who saw the better and worse products in these conditions were statistically significant. The effect was greatest in the absence of a product claim ($M = 5.6$ *cf.* $M = 3.4$), and supports the hypothesis that easily processed nutrition labels have a greater affect on attitude formation.

Finally, respondents' attitude towards the cereal carrying a health claim was the same in both the MTL and PDI conditions ($M = 5.4$), and was no greater than attitudes towards

the better cereal profile in the two other product claim conditions. Thus, health claims do not appear to cause attitudes to increase for products with a healthy nutritional composition.

According to the ANOVA results there was an interaction between the product claim and nutritional profile variables, which is evident in the 'Better' and 'Worse' profile columns in Table 23. This was probed with independent samples *t* tests. When a nutrition-content claim was added to the nutritionally inferior cereal, mean attitude scores were not significantly different across both the PDI (4.4 *cf.* 5.1, $t(85) = -1.50$, ns) and MTL (3.4 *cf.* 3.7, $t(82) = -0.90$, ns) conditions. Similarly, mean attitude scores were not significantly changed when a nutrition claim was added to product with a better nutritional profile: PDI (5.1 *cf.* 4.9, $t(87) = 0.61$, ns); MTL (5.6 *cf.* 5.0, $t(82) = 1.49$, ns). Although the scores for consumers' attitudes towards products with health claims were higher than when they were presented with a nutrition-content claim, these did not reach statistical significance either: PDI (4.9 *cf.* 5.4, $t(84) = -1.47$, ns); MTL (5.0 *cf.* 5.4, $t(83) = -1.01$, ns). While the interaction effect was significant across the total sample, it was not within the nutrition label format conditions; the interaction effect was too weak to reach significance in the reduced subgroup sample sizes.

Behavioural Intentions and Attitude Certainty

As previously observed in Study Two, the difference in attitude toward the two nutrition profiles translated into a difference in intention to purchase ($M = 4.1$ *cf.* $M = 5.0$, $t(426) = 3.93$, $p < 0.001$). Again, a three-way ANOVA was run to determine how the manipulated variables affected respondents' intentions to purchase; the pattern of results is very similar to the ANOVA reported in the preceding paragraphs. Both nutrition profile ($F(1, 427) = 10.61$, $p < 0.01$) and nutrition label format ($F(1, 427) = 4.75$, $p < 0.05$) had a significant main effect on purchase intentions, but product claims did not ($F(2, 427) = 1.48$, $p = 0.23$).

The only significant interaction was between nutrition profile and label format ($F(1, 427) = 7.83$, $p < 0.01$); this interaction was probed with independent samples *t* tests. These showed that the nutrition label format only had a significant between groups effect in the worse cereal nutrition profile conditions; MTL $M = 3.5$ *cf.* PDI $M = 4.8$, $t(169) = -3.94$, p

< 0.001 . Label format did not significantly affect intentions to purchase the cereal when the nutritional profile was better; MTL $M = 5.1$ *cf.* PDI $M = 5.0$, $t(255) = 0.13$, $p = 0.89$.

To determine whether any of the manipulated variables affected respondents' attitude certainty, as another measure of likely impact on behaviour, a MANOVA was run.

Roy's largest root was used to assess significance; the results revealed that none of the predictor variables influenced respondents' attitude certainty. While the nutrition label format variable was found to have a significant effect in Study Two (see §7.2.2 *Behavioural Intentions and Attitude Certainty*), removing the control level (i.e. NIP only) appears to have eliminated this effect. There was no significant difference between attitude certainty across the MTL and PDI groups regarding overall opinion (MTL $M = 6.6$, PDI $M = 6.3$, $t(424) = 1.56$ ns) or certainty of attitude regarding whether the cereal was good or bad to buy for children (MTL $M = 6.5$, PDI $M = 6.5$, $t(419) = 0.20$ ns).

Time Taken to Review Pack Image

As the research was conducted using computers, it was possible to unobtrusively record the amount of time that respondents took to select their responses. It was hypothesised that the ease with which respondents could process the two FOP nutrition label formats would be unequal; specifically, it was thought that consumers would take longer to respond to questions in the PDI label conditions as they would need more time to process the information in the nutrition label. To test if respondents did need more time in the PDI label conditions, the time between respondents accessing the page containing the Hooplas cereal image and answering the first attitude question was analysed. The analysis assumes that the distributions of times taken to actually read the first attitude question was equal across the groups.

Before analysing the time data it was necessary to exclude outliers; some respondents may have recorded long viewing times because they were distracted while completing the survey. Heerwegh (2003) recommended classifying respondents with response times greater than two standard deviations above the mean as outliers. However, the range of times taken to complete this question was very large, from 2 seconds to 40 minutes ($M = 33$ seconds), with a positively skewed distribution. Because of this distribution shape, Heerwegh's (2003) recommendation resulted in no respondents being classified as

outliers. Instead, the distribution of response times was reviewed manually; the vast majority of respondents took less than 90 seconds to answer the first attitude question. It is likely that respondents who took longer than this were not attending to the survey; using this threshold, three percent of respondents were excluded as outliers for this particular analysis.

Independent samples *t* test results show that nutrition label format appeared to affect the time respondents took to answer the first attitude question. Respondents who viewed an image with a PDI label took an average of 24.2 seconds to answer, while those who saw a MTL took 18.8 seconds to answer, $t(394) = -3.33, p < 0.01$. The time taken to answer the remaining attitude and intention questions was not significantly different across the two format conditions, suggesting that the assumption of equal question reading and answering time distributions was valid.

This same type of analysis was possible from another point in the survey, when respondents answered the three ability questions. Again, the results show an effect by nutrition label format (see Table 24). When the target nutrient was listed in both the MTL and PDI labels (i.e., sugar, total fat), respondents exposed to an MTL label answered significantly more quickly. However, when the target nutrient was energy, respondents provided more rapid responses in the PDI conditions. Energy is listed first in the PDI panel but is not included in the MTL, meaning respondents had to read the NIP if they were to answer this question without guessing.

Table 24 – Time to Answer Ability Questions, by FOP format

Nutrient	MTL <i>M</i> (seconds)	PDI <i>M</i> (seconds)	95% CI <i>M</i> difference	Sig.
Sugar	35.7	42.9	-11.6 – -2.7	$t(405) = -3.14$ **
Total Fat	15.4	18.8	-6.8 – -0.2	$t(413) = -2.07$ *
Energy	17.3	13.2	1.9 – 6.1	$t(375) = 3.87$ ***

* $p < .05$, ** $p < .01$, *** $p < .001$

Respondents' Perceptions of Nutrient Levels

As with the previous study, respondents were asked recall questions that explored their impression of the cereal's content of four nutrients (see Table 25). Perceptions of fibre content was added to this set of questions, to test whether consumers' use all available

information in the PDI label. Fibre was selected as cereal is generally known as a good source of dietary fibre, and nutritionists recommend this as an important criterion when selecting a cereal. Respondents were given the option of stating “don’t know”, and the number of people who stated this is reported in columns three and five of the table.

Sugar content ratings for the better and worse cereals were significantly different across both the MTL and PDI label formats, but the difference was much greater between respondents who saw the MTL formats (2.0 *cf.* 4.2) than between those who saw the PDI label (2.4 *cf.* 3.4). The same pattern of response is evident for total fat evaluations, with the difference in average nutrient recall scores between respondents in the MTL conditions being much greater (1.7 *cf.* 3.0) than between respondents in the PDI conditions (2.0 *cf.* 2.6).

Unlike Study Two, this time the difference between respondents’ perceptions of sodium content in the MTL conditions was significant (2.8 *cf.* 3.1), but it was not in the PDI conditions (2.5 *cf.* 2.6). However, the significant difference in the MTL conditions was actually in the wrong direction, as the worse cereal had slightly lower sodium content. The sodium content was rated ‘amber’ for both profiles, but it appears that respondents’ interpreted the amber light differently across the two conditions.

Table 25 – Nutrient content evaluation by nutrition format and nutrient profile

	Better Nutrition Profile		Worse Nutrition Profile		
	(M) §	“Don’t know” (n)	(M) §	“Don’t know” (n)	Sig.
Sugar					
PDI	2.4	32	3.4	19	$t(160) = -5.73$ ***
MTL	2.0	23	4.2	16	$t(166) = -13.62$ ***
Sodium					
PDI	2.5	51	2.6	36	$t(124) = -0.39$
MTL	2.8	32	3.1	22	$t(150) = -2.62$ **
Total Fat					
PDI	2.0	25	2.6	21	$t(153) = -3.41$ **
MTL	1.7	27	3.0	20	$t(157) = -9.80$ ***
Fibre					
PDI	3.6	45	3.4	64	$t(136) = 1.79$
MTL	3.2	54	3.0	44	$t(116) = 1.29$

§ Mean calculated excluding “Don’t know” responses; ** $p < .01$, *** $p < .001$

The fibre content of the better cereal was 7.3g per 100g, and 5.0g per 100g for the worse cereal. In order for respondents in the MTL conditions to read about fibre content, they had to look at the NIP on the side pack image. However, fibre content per serve was stated on the front-of-pack in the PDI panel conditions. Many respondents selected ‘don’t know’ in both FOP label conditions, and those who did answer appeared to respond around the scale midpoint. Respondents’ perceptions of fibre content was in the expected direction, but the differences were not statistically significant for either nutrition label format.

Respondents’ Beliefs

The four belief variables were entered as dependent variables in a MANOVA, with nutritional profile, nutrition label format, and product claims as the independent variables. Using Roy’s largest root to assess predictive significance, the model showed that the combined belief measures were affected by the cereal’s nutrition profile, $F(4,414) = 3.81, p < 0.01$, and FOP label format used, $F(4,414) = 3.99, p < 0.01$, but not by the addition of product claims, $F(4,415) = 1.09, p = 0.36$. Overall, none of the interactions were significant. The between-subjects effects again showed that respondents’ beliefs about product nutritiousness were affected by nutrition label format and nutritional profile, and the interaction between these. Thus, respondents’ beliefs about the product’s nutritional values were mediated by the nutrition label format; respondents were more likely to agree that the product with the better nutritional profile was nutritious when a MTL label was present.

However, as also seen in Study Two, the correlation between nutrition profile and rating of nutritiousness was weak. As this study was conducted online, respondents were given the opportunity to leave comments about the survey, and many took the opportunity to comment about their perceptions of the experimental stimuli (see Table 26, overleaf). These comments reveal that many respondents had negative perceptions towards the product because of the packaging elements. These quotes demonstrate that consumers use branding elements as heuristics for making judgements about product attributes.

Table 26 – Selected Comments from Study Three

“The packaging and front cover alone indicated that the food was not nutritious.”
“The name of the cereal, shape of the cereal, and the box colour are immediate turnoffs. The name is cheap, and the cereal shape and box colour is similar to other low end cereals.”
“On the package we were asked to look at, the colours made me feel the product was artificial although there was no other evidence of this.”
“Most children’s cereals are not healthy, anything like this one I totally ignore and keep to what I know is good for my children with the occasional treat.”
“The packaging put me off.”
“It looks like it has fibre but with the colours that ray over the cereal, it looks like they are adding additives and additives are usually not good.”
These comments have been corrected for major typographical errors to improve readability.

The Effect of Respondents’ Motivation and Ability on Attitude

Again, a reliability analysis was conducted on the seven motivation items that related to nutritional concerns, and the statistics showed that the same six items discussed previously (§7.2.2 *The Effect of Respondents’ Motivation and Ability on Attitude*) created a scale with the highest alpha ($\alpha=0.81$; $M=17.5$, $SD=3.2$, range 6-24). Like Study Two, a higher proportion of respondents using the MTL label answered all three ability questions correctly (14 percent) than those using the PDI label (five percent) (see Appendix A4.3). Chi square analysis confirms the relationship between information format and respondents’ ability to use the nutrition information was significant, $\chi^2(3) = 22.10$, $p < 0.001$.

Following the same process outlined earlier in the chapter, unweighted effect variables were created to dummy code the categorical variables (see Table 27), and all continuous variables were centred around their means. Cross-product variables were created for all possible two-way, three-way and four-way interactions.

The variable main effects, shown by the results for Step 1 in Table 27, explained 9.8 percent of the variance in respondents’ attitudes. The increase in explanatory power resulting from the addition of interaction terms in Steps 2 and 3 was significant, increasing the variance explained to 19.4 percent. None of the four-way interactions

were significant. Adding respondents' beliefs about the product increased the proportion of attitudinal variance explained to 54.6 percent.

Table 27 – Effect Vectors created for Discrete Variables, Study Three

Variable	Level	Effect Vector
Nutrition Label Format	Multiple Traffic Light label	Contrast
	Percent Daily Intake label	FE
Nutrition Profile	Better	Contrast
	Worse	PE
Product Claim	No Claim	Contrast
	Nutrition-content Claim	HE1
	Health Claim	HE2

Table 28 – Full Model HRM Summary Statistics, Study Three

Step	R	R ²	R ² Change	F Change
1	.313	.098	.098	7.434 ***
2	.395	.156	.058	2.267 **
3	.440	.194	.038	2.304 *
4	.456	.208	.014	1.139
5	.739	.546	.338	70.731 ***

* $p < .05$, ** $p < .01$, *** $p < .001$

Reviewing the model β coefficients and associated t tests (see Appendix A4.4) showed that two of the two-way interactions entered in Step 2 were significant: between the MTL and nutrition profile effect vectors (FE1 x PE), and between the nutrition profile and nutrition claim effect vectors (PE x HE1). Two of the three-way interactions were also significant, one including motivation and the other including ability: format x profile x motivation (FE x PE x Mot), and profile x nutrition claim vector x ability (PE x HE1 x Ab).

Non-significant interactions between predictors were removed and the HRM was re-run to produce a 'reduced model' (see Table 29 overleaf). The single IV terms were again entered in Step 1, significant two-way cross-products in Step 2, significant three-way cross-products in Step 3, and beliefs in Step 4.

The resulting estimates show that the independent variables explained about ten percent of the variance in respondents' attitudes; only the beta coefficients for nutrition profile

and nutrition label format registered significant effects in the equation (respondents' motivation and ability were not significant predictor variables). The two-way interaction terms added in Step 2 explained an additional 3.8 percent of attitude variation and the three-way interaction terms in Step 3 explained 2.8 percent. The final variables entered in Step 4 explained the greatest proportion of variance, an additional 36.1 percent, and took total attitudinal variance explained to 52.5 percent.

In the reduced model, the three way interaction between product profile, the nutrition claim vector and respondents' ability was not significant. However, the *t* test results revealed three significant higher order effects: label format x nutrition profile (FE x PE); nutrition profile x nutrition-content claim (PE x HE1); and label format x nutrition profile x motivation (FE x PE x Mot). Therefore, unlike Study Two, this survey found some support for H1b, in the three way interaction between nutrition label format, nutrition profile, and motivation. However, the results do not support H2b, as there was no interaction between the product claim variable and either motivation or ability.

Table 29 – Reduced Model HRM Summary Statistics and Coefficient Output Study Three

Step	R	R ²	R ² Change	F Change
1	0.313	0.098	0.098	7.434 ***
2	0.369	0.136	0.038	8.957 ***
3	0.405	0.164	0.028	6.880 **
4	0.725	0.525	0.361	76.158 ***
Variable Name (Step 4)		Unstandardised B Coefficient		<i>t</i>
<i>Constant</i>		4.72		62.46 ***
Profile (PE)		-0.26		-3.35 **
Motivation (Mot)		0.02		0.78
Ability (Ab)		0.10		0.92
Format (FE)		-0.17		-2.32 *
Nutrition Claim (HE1)		-0.09		-.089
Health Claim (HE2)		0.14		1.11
FE x PE		-0.22		-3.21 **
PE x HE1		0.15		1.99 *
FE x PE x Mot		-0.06		-2.88 **
PE x HE1 x Ab		0.15		1.27
Belief (Nutritious)		0.28		5.69 ***
Belief (Quality)		-0.15		-3.73 ***
Belief (Naturalness)		0.25		5.25 ***
Belief (Taste)		-0.04		-1.00

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

7.4 Discussion

Two attitudinal experiments, referred to as Studies Two and Three, measured the effect of nutrition profile, nutrition information format and product claims on respondents' product evaluations of a fictitious children's breakfast cereal. These experiments provide important new evidence for how nutrition and health related information affects consumers' product perceptions.

The results of these experiments provide partial support for hypothesis H1a; consumers do evaluate a children's breakfast cereal differently when shown front-of-pack nutrition information labels, with their attitudes being most greatly modified when information is presented in a simpler visual format. The patterns of response are very similar in both studies and convergent across survey modes, suggesting the results are robust.

The combined results of these two studies suggest that consumers will incorporate a product's nutritional profile into their evaluations if the information is reformatted; these studies show consumers' attitudes towards cereals with differing nutritional profiles are influenced by the FOP label format. Specifically, in the studies reported, consumers' attitudes towards both cereals were very similar when nutrition information was in the PDI label format, despite the large difference in nutritional values between the two product versions, suggesting the PDI label has limited influence during attitude formation. Conversely, consumers' attitudes to the two cereals were significantly different in the MTL conditions, suggesting they were better able to differentiate products on nutritional merits when presented with a MTL label. In addition, the measures of time taken suggest that respondents require less time to use MTL labels, which suggests that this format will be more useful in the time-pressured store environment.

Interestingly, there was no difference in consumers' attitudes towards the better cereal by nutrition label format – hence the conclusion of only partial support for H1a. Although participants in the MTL conditions had significantly more negative attitudes towards the less healthy cereal than participants viewing a NIP or PDI label, they did not have significantly more positive attitudes to the more healthy cereal. Instead, respondents' attitudes towards the nutritionally better cereal were the same across all nutrition labelling conditions. There is no obvious reason revealed by the data as to why attitudes

to the nutritionally better cereal were consistent across formats while those towards the less healthy differed. However, it is possible that the product type or other package design elements influenced respondents' attitudes; further research is necessary to test whether consumers' attitudes vary towards other healthy products.

Overall, the significant interaction effect between nutrition label format and product profile suggests MTL labels are more likely to help consumers identify products with poorer nutritional profiles. This conclusion is supported by results of other studies conducted in New Zealand (Gorton *et al.*, 2009) and Australia (Kelly *et al.*, 2009) released after this research was conducted. Both studies reported that consumers were significantly more likely to correctly identify healthier options with traffic light labels than when using PDI panels. Furthermore, intentions to purchase the cereal, if it were to be sold, mirrored these results. Across both studies, consumers who viewed the nutritionally inferior cereal with a MTL label had the lowest behavioural intention scores. This is a very important finding, given the need for information that enables consumers to identify high fat, sugar, and salt foods, and thus manage or reduce their energy consumption.

New Zealand consumers have had over five years to become familiar with the current nutrition labelling system, the NIP, yet the results from Study Two show this information does not help them differentiate between products with different nutrition profiles. This suggests that consumers either do not look at NIPs when evaluating products or they lack the knowledge or ability to incorporate this information in their decision making.

Answers to the questions about respondents' use of NIPs offer some insights into why this format appears not to inform evaluations. Across both studies, around 40 to 50 percent of consumers reported that they read NIPs only infrequently and fewer than half agreed or strongly agreed that NIPs are easy to understand and tell them what they need to know. The findings suggest many consumers are not well practised at using the current nutrition label format to evaluate products, and would benefit from formatting changes that make this task easier.

While many respondents could accurately compare three nutrition profiles and judge relative differences in nutrient content, they were less sure what the values reported in

those profiles indicated about a product overall. This interpretation is consistent with findings from Study Two, where respondents who saw only the NIP were less certain of their attitudes than those who viewed the MTL label. In addition, these results are consistent with responses indicating that many respondents lacked confidence in their knowledge of nutrition issues.

The MTL label contains less information than the PDI panel, but does not appear to be less useful as a result. Approximately two thirds of consumers claim to check nutrition information when buying breakfast cereals (FSANZ, 2003a); the reported high level of nutrition information use in this category suggests that if consumers were dissatisfied with the level of information provided on front of pack labels, more would have opted to view the side panel image which contained the NIP. However, the rate of clicking to view the side panel was evenly distributed across the experimental conditions. This implies that participants found sufficient information was provided in the MTL. Given that earlier research has shown consumers are most interested in knowing total fat, sugar, and saturated fat content, which are available in both the PDI and MTL formats, this finding is also consistent with earlier work (Russo *et al.*, 1986; Scott & Worsley, 1997).

As well as promoting the greatest divergences in respondents' attitudes, the results suggests that the MTL label also stimulated better information processing and elaboration, as evidenced by the nutrient recall results. This fits with findings from labelling ergonomics research, that consumers find it easier to both comprehend and recall messages on labels that use symbols (Wogalter *et al.*, 2002).

Previous research suggests that information formatting affects consumers' ability to evaluate the presence of important nutrients; for example, Ford *et al.* (1996) reported an interaction between nutrition label format and respondents' beliefs about fat and sodium content. Participants in these two studies seemed to pay most attention to sugar and total fat content. Study Three found minimal differences in recall of fibre content across the nutrition profiles for both the MTL and PDI label formats, despite the better cereal containing more fibre both per serve and per 100 grams. As there was no significant difference in respondents' recall of fibre in the PDI condition, this shows that most consumers do not process information simply because it is made available. Garretson and Burton (2000) found that fibre was not an important consideration for Americans, and this may be because consumers do not understand why fibre is an important nutrient

and therefore overlook it when evaluating products, or they do not know how much fibre they should be eating and cannot judge the amount per serve.

The addition of a nutrition-content claim advertising high calcium content did not have a significant main effect on consumers' evaluations over a no-claim control, nor did a high-level health claim that linked consumption to improved bone health. This finding does not support the research hypotheses. However, recent research conducted in Belgium concluded that health claims have a stronger effect than nutrition-content claims across a range of nutrients and food types (Verbeke, Scholdere, & Lähtenmäki, 2009). One possible, but speculative, reason for the non-significant result may be that calcium fortification was not considered to be important for a cereal normally consumed with milk, despite it being a common claim on children's cereals⁴⁶. Alternatively, product claims may be less important when a single product is reviewed in isolation.

Although the ELM predicts that consumers' intrinsic motivation and ability moderate the level of information processing undertaken, the measures of motivation and ability used in this research did not explain any of the variance in consumers' attitudes. According to the postulates of the ELM, consumers with high motivation and ability to use the PDI and NIP labels should have had significantly different attitudes to the two breakfast cereal profiles, but this was not borne out by the results. The results of this analysis across the two studies told slightly different stories, however. Study Two found no significant interactions between motivation or ability and the alternative nutrition communication formats, despite the differences in message accessibility between the three nutrition label formats tested. There were significant interactions in Study Three, though. Therefore, there was limited support for H2b, and no support for H1b. Overall, however, the weak results suggest that motivation and ability are not practically significant variables for when consumers' evaluate food products. The pattern of results suggests that label designers are best to assume that consumers have low motivation and ability, and thus supply labels that can be easily and quickly processed by all.

This conclusion is at odds with prior research conducted in the United States, but may be due to the different measures used. For example, Keller *et al.* (1997) reported a

⁴⁶ See for example Kellogg's NutriGrain™ or CocoPops™ nutrition profiles

<http://www.kelloggs.com.au/Home/Products/Cereal/tabid/316/Default.aspx>, and Nestle Milo Duo™
http://www.nestle.com.au/Products/CerealSnack/Milo_Duo_Cereal/Milo_Duo_Cereal.htm

significant interaction between intrinsic motivation and product nutritional value, with more highly motivated consumers having significantly lower opinions of a product with a 'poor' nutritional profile (there was no difference between consumers with high and low motivation when the nutritional profile was rated 'medium' or 'good'). However, as shown in Table 13 (page 157) Keller *et al.*'s measured motivation by asking respondents to report how often they used the NFP. These questions are based on a tautology: consumers who refer to nutrition facts are more motivated to use nutrition information than those who do not. It is not surprising that respondents who state they use the NFP frequently are better able to use nutrition information to distinguish between products of differing nutritional quality.

The large proportion of attitudinal variance explained by respondents' beliefs, which correlated only weakly with modifications to experimental stimuli, suggests consumers draw widely on different contextual information sources to develop opinions of a product. However, their beliefs may not relate to the actual nutritional merits of the product. Much of this variance will be based on respondents' personal purchase history, their past experiences with children's cereals, and their subjective perceptions of the brand's imagery. Given consumers' propensity to base product evaluations on a wide variety of cues, nutrition labels need to be visually salient and easily interpreted if they are to influence and inform these evaluations.

This chapter has presented evidence collected from research designed under a cognitive theoretical framework; the next chapter presents the results of an experiment designed using a behavioural methodology developed to estimate how these labelling elements affect consumers' actual choices. While the information collected in Studies Two and Three provides strong evidence that simple graphic labels have more impact, examining the research questions through an alternative theoretical framework will provide more robust evidence for those charged with writing food labelling policy. A stated preference discrete choice experiment tested how the nutrition label formats and product claims examined in this chapter influence parents' behaviour when they are choosing between products for their children.

8 Study Four: The Effect of Nutrition and Health Related Information on Choice Behaviour

8.1 Introduction

The argument in favour of providing more information at the point-of-purchase assumes that enhancing consumers' knowledge will promote behaviour change. However as discussed in Chapter 3, there is surprisingly little evidence to support this proposition and some that directly challenges it. Over three decades ago Day (1976) noted there was growing demand for increased information disclosure despite a "...paucity of concrete evidence that past disclosures have made significant differences in consumer or market *behavior*" (p. 42, italics in original). Day cautioned against the tendency for researchers to assess the effect of disclosure on 'intermediate' variables alone (i.e., awareness, beliefs, attitudes), without investigating behavioural consequences. While Studies Two and Three suggest consumers' attitudes towards food products can change in response to modified nutrition information, it is also critical to investigate whether labelling changes are likely to affect consumption behaviour.

Considering the likely effects of information disclosures on consumers' behaviour patterns from a behaviour modification perspective leads to a less sanguine analysis of the potential for information to change consumption behaviours, even when people have the skills to understand and use the information to make decisions. Information-disclosures are only one of many environmental stimuli within the decision making context; as people are typically 'cognitive misers' who selectively attend to only a limited number of stimuli, this information may not even be noticed, let alone studied. Although labels may inform readers of the consequences of behaviour, they are antecedent stimuli that can only cue behaviour, rather than provide feedback that reinforces or punishes actions. However, when information is designed to capture consumers' divided attention and links into established rule-governed behaviour, then the chances of reshaping behaviour are increased.

This chapter presents the results of an experiment designed to predict behavioural responses to labelling changes. A stated preference discrete choice modelling (SPDCM)

experiment measured consumers' responses to the attributes examined in the two prior studies. SPDCM is a technique developed in economics to predict consumers' choice behaviour in hypothetical but realistic situations, and enables an assessment of the relative weight they attach to different product attributes. Thus, SPDCM can quantify the influence different nutrition and health information formats have on consumers' choices (Gerard *et al.*, 2003). This technique extends earlier research by examining behavioural responses to nutrition information when this is presented in a choice context.

As introduced in Chapter 5, the hypotheses developed for this experiment were derived following an analysis of the literature from the behaviour modification perspective; they are:

- H3a When nutrition information is presented on the front-of-pack, consumers' preference for a nutritionally superior product will increase, and their preference for a nutritionally inferior product will decrease, relative to when a Nutrition Information Panel only is available.
- H3b The change in stated preference will be greatest when a TLL is presented.
- H4a The addition of nutrition-content and health claims will increase stated preference for all products.
- H4b The increased in stated preference for a product bearing a product claim will be greatest when the nutrition information is less accessible.
- H5a Respondents who view the side panel image showing the NIP more frequently during the experiment will have significantly higher stated preferences for the nutritionally superior option over the inferior option with all three label formats.
- H5b Respondents who do not view the side panel image showing the NIP frequently will not differentiate between the nutritionally superior and inferior options in the absence of front-of-pack labels. Their stated preferences will be most differentiated when TLLs are available.
- H6 The Traffic Light Label will reduce the effect of differences in self-reported confidence and enable better differentiation between healthy and less healthy products than labels featuring numeric details.

After outlining the experimental design and data collection method, the results of a Multinomial Logit Regression used to test these hypotheses are presented. In particular, the effect of nutrition label format and product claims on consumers' product choices are explored to test H3a-b and H4a-b. The results conclude with two additional sets of analyses that investigate how respondents' information search behaviour and confidence in using the Nutrition Information Panel affected their choices, to test H5a-b and H6.

8.2 Study Four Method

8.2.1 Experimental Design

This experiment aims to investigate how changes to nutrition and health information affect consumers' choices, so the results can be compared to those generated from a cognitive framework. The study used the same variable manipulations but included an additional cereal variant to enhance the realism of the choice task. The new variant was carefully chosen to be perceptually similar to the original to avoid introducing confounding nutritional connotations (such as flavour or product type). Although flavour variations can be introduced with chemical compounds that have no nutritive value, it was thought that participants could use flavour as a heuristic to evaluate nutrition status, which would bias results. However, an alternative extruded shape was thought to provide enough visual differentiation for participants without implicitly suggesting a nutritional change. The new variant was extruded star shapes; this variant used the same package design, but was called "Hooplas Stars" (see Figure 19). Of the four variables tested in the choice experiment, two had three levels and two had two levels, as shown in Table 30 (p. 204).

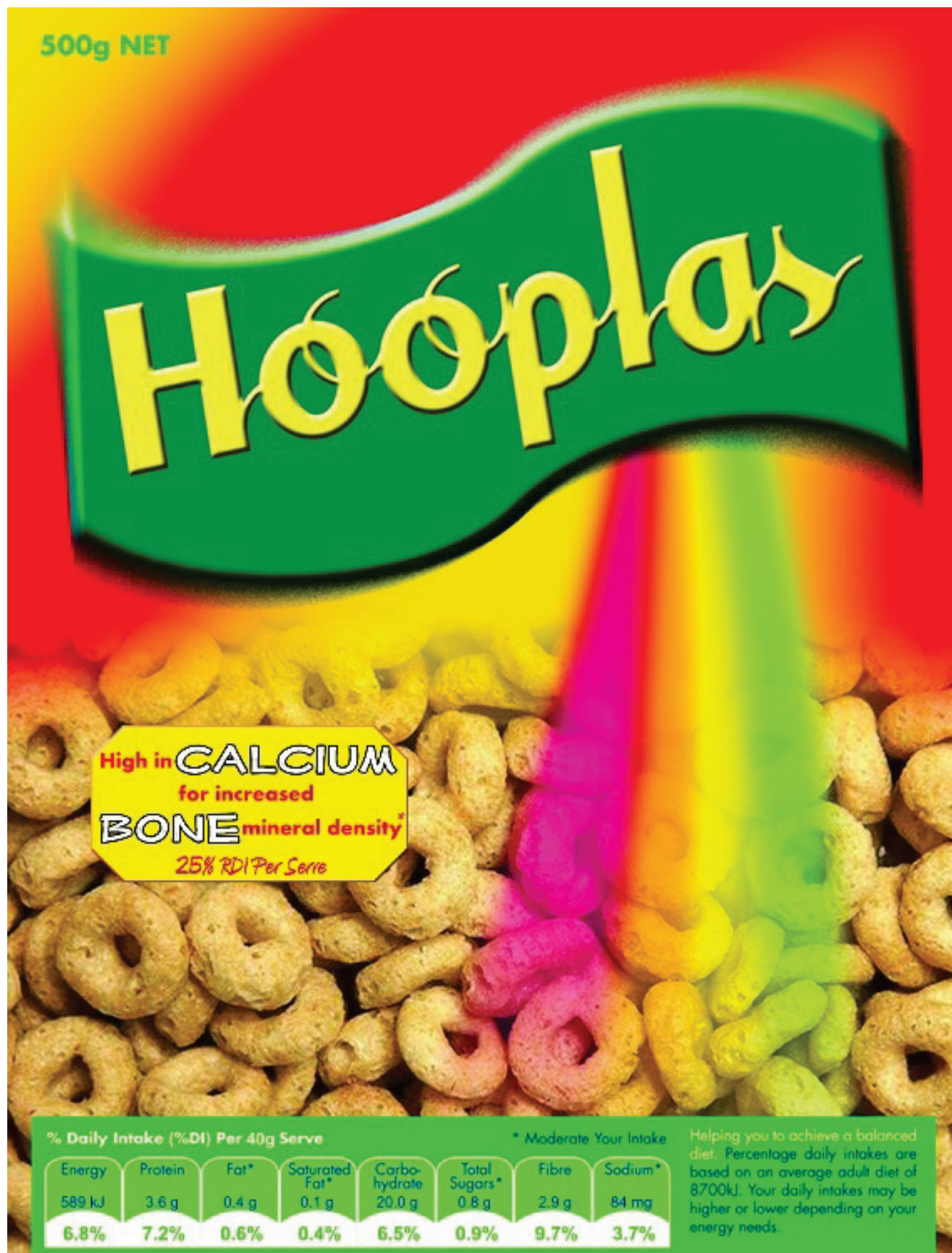


Figure 19 – Example “Hooplas Stars” with PDI label and Health Claim

(side panel not shown)

Table 30 – Enumeration of Attributes and Levels in Choice Experiment

Attribute	Attribute Levels [number of level]
Nutrition Information Format	Nutrition Information Panel [0] Percent Daily Intake Label [1] Multiple Traffic Light Label [2]
Product Claim	No Product Claim [0] Nutrition-content Claim [1] High Level Health Claim [2]
Nutritional Profile	Better [0] Worse [1]
Cereal Type	Hoop Shape [0] Star Shape [1]

A complete factorial design with all attribute levels would yield 36 unique combinations⁴⁷. However, as covered in §7.3.2, high level health claims cannot appear on the poorer nutrition profile cereal, so this combination was excluded from the design. Furthermore, the ‘cereal type’ variable is not of primary interest, so did not need to be built into the design, and was instead evenly split within each choice pair. Therefore, the actual experimental combinations came from an incomplete factorial arrangement, displayed in Table 31. Each of the 15 combinations was presented on both cereal types (i.e., Hoops and Stars), giving a total of 30 cereal product images.

Table 31 – Variable Combinations Used in Choice Experiment

Product Claim	Nutrition Profile	Nutrition Label Format		
		NIP	MTL	PDI
No Claim (Control)	Better	1	3	5
	Worse	2	4	6
Nutrition-content Claim	Better	7	9	11
	Worse	8	10	12
High Level Health Claim	Better	13	14	15
	Worse	--	--	--

Presentation of Stimuli

Only two cereal packet images could be displayed side-by-side at a reasonable size on a standard computer monitor, so a paired choice task was developed. All possible two-way combinations of these 15 stimuli (excluding cereal type) yielded 210 pairs, which was impractical for this study, thus pairs were constructed following an efficient row-

⁴⁷ Two variables with two levels and two variables with three levels: $2^2 \times 3^2 = 36$

column design proposed by Bailey (2007)⁴⁸. This design enabled the impact of all variables and interactions of interest to be measured using only thirty pairs. However, this was considered likely to be too demanding on respondents, and to avoid respondent fatigue the thirty pairs were randomly split into three subsets of ten pairs, and each respondent saw one subset (see Appendix A5.1). Each pair always contained one Hoop variant and one Star variant, with their order randomly switched between left and right on-screen positions across the pairs.

Randomising Treatments and Order of Presentation

A thorough randomisation process was used to ensure that subjects in the initial sample set were randomly allocated to each of the three subset conditions, and the image presentation order was randomised to eliminate presentation order effects across the pairs (Hensher *et al.*, 2005). The random number function in Excel was used to achieve this. Firstly, sample members were assigned a random number, which was sorted from lowest to highest; the sample was then split into thirds, and each third was allocated to a subset.

The order of presentation was randomized using a balanced Latin square design (MacFie, Bratchell, Greenhoff, & Vallis, 1989), thus respondents in each subset did not see the pairs in the same order. To achieve this, each pair was rotated through the ten presentation slot positions (i.e., from presented first to last) across each block of ten respondents (see Figure 20, showing non-randomised balanced Latin square design). Random numbers were then used to distribute these allocations across all respondents in the sample dataset. This process ensured that the presentation order of all subsets and pairs was completely randomised, but each image was allocated across presentation slots an equal number of times in the original sample.

⁴⁸ Combinations of nutrition information were classified as the ‘treatments’ and cereal type as the ‘colours’ according to Bailey’s (2007) design recommendations.

Person	Subset	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5	Pair 6	Pair 7	Pair 8	Pair 9	Pair 10
1	1	1	10	9	8	7	6	5	4	3	2
2	2	2	1	10	9	8	7	6	5	4	3
3	3	3	2	1	10	9	8	7	6	5	4
4	1	4	3	2	1	10	9	8	7	6	5
5	2	5	4	3	2	1	10	9	8	7	6
6	3	6	5	4	3	2	1	10	9	8	7
7	1	7	6	5	4	3	2	1	10	9	8
8	2	8	7	6	5	4	3	2	1	10	9
9	3	9	8	7	6	5	4	3	2	1	10
10	1	10	9	8	7	6	5	4	3	2	1

Randomise Horizontally

Randomise Vertically

Figure 20 – Schematic of Randomisation Process used in Study Four

Step 1. randomise subsets across participants; step 2. randomise Latin square horizontally; step 3. randomise Latin square vertically.

8.2.2 Survey Design

The screening questions used in Study Three were presented at the start of the survey (see Appendix A1.4.1). Participants screened into the experiment were next shown an instructional page outlining the research task (see Figure 21). Respondents were reminded to read the instruction page carefully if they clicked on the ‘next’ button within 20 seconds of landing on the instruction page. The images in each pair were given the generic labels ‘Cereal A’ and ‘Cereal B’, and respondents were asked to select the cereal they would rather buy. They were allowed to select ‘Neither’ as a third option to make the task more realistic and improve data quality (Dhar & Simonson, 2003), as some choice pairs contained options that may both have been unacceptable to respondents.

As with Study Three, client-side paradata was again collected with JavaScript coding. This enabled analysis of specific behavioural metrics, including whether or not the package side overlay (containing the NIP) was viewed and the number of times it was opened and closed. The number of respondents who opted to view the side image was counted across all ten conditions, as a behavioural measure of respondents’ motivation to search for detailed nutrition information. As the purpose of the experiment was to collect behavioural data, the only questions asked after the choice task measured respondents’ current use of NIPs and their confidence in using this information, and collected demographic details.

On the next page, you will see a pair of images showing the front of two packets of a new brand of children's breakfast cereal. You can click anywhere on these images to view the packet side panels, which show the ingredients, allergy and nutrition facts. You will be able to return to the pack front image by clicking on the ☐ in the lower right corner of the side panel.

- Please imagine you are in a supermarket where you see a sales display featuring these two new cereals; this makes you think about buying one of the cereals for your child or children.
- You can assume the cereals are the same price, and that this is a price you are prepared to pay.
- Please take a moment to look at the cereal packets, as if you were considering buying one.

If you were to choose one of these two cereals, which one would you pick? Or, would you not choose one at all? Please select a button for 'Cereal A' or 'Cereal B', or 'Neither' if you really would not buy either A or B.

Nine similar choice tasks will then be shown; these instructions apply to each choice task.

Figure 21 – Instructions for Choice Experiment

As a significant minority of New Zealanders still access the internet using dial-up connections, special care was taken in developing the survey website to account for slow download speeds. For example, the website was designed so that the cereal images began downloading to respondents' computers as soon as they started the survey screening questions. This meant that the first few choice pairs would already be downloaded when respondents started the choice task, with the remainder continuing to download in advance of respondents reaching those pages.

Pilot Testing

A sample of 2,400 respondents was drawn by the online panel provider, and email invitations were sent to 300 people to pilot test the survey. The pilot period lasted four full days; during this time 156 people responded to the email invitation (52 percent), of which 99 completed the survey, 46 were screened out, and 11 started but dropped out. The average completion time was under 12 minutes, suggesting that the survey website was operating correctly. There was no evidence that participants were having trouble viewing the images, and about half of respondents in the pilot opted to view one or more of the side panel images.

As well as checking technical matters, the pilot was used to review choice patterns. In particular, there was a concern that respondents may frequently select ‘Neither’ rather than opt for Cereal A or B, or that the prevalence of ‘Neither’ responses would vary across the three subgroups (this would have serious implications for the analysis). However, these concerns were not justified according to the pilot data; the majority of respondents did choose either Cereal A or B for most pairs, and the number of ‘Neither’ responses were similar across the three subgroups.

Data Collection and Sample Demographics

The remaining survey invitations were issued on 9 October 2008 and the survey website closed five days later when 801 people had completed the experiment (achieving between 266 and 269 responses per set). Over half of respondents were female (56 percent), and respondents ages ranged from 18 to 63 years ($M = 37.9$, $SD = 8.9$). There was a wide range of educational attainment and household income across participants; full respondent demographics are presented in Appendix A5.2.

8.2.3 Analytic Procedure

The data were analysed using multinomial logit regression (MLR), which is a generalised case of logistic regression for designs with two or more discrete outcomes (Garson, 2008). MLR enables estimates of the main and interaction effects of manipulated factors on consumers’ choices (Hensher *et al.*, 2005), although, as noted above, the main and interaction effects that could be assessed were limited by the efficient design developed for the experiment. In situations where respondents said they would not choose either of the options, both the options were coded as ‘not chosen’.

The model specified main effects for Cereal Type (Hoop vs. Star shapes), Nutritional Label Format, Nutritional Profile, and Product Claim, and the two- and three-way interactions between Nutritional Information, Nutritional Profile and Product Claim. The MLR model also included random effects for the interactions between Respondent and Pair of Images, Cereal Type, Nutritional Information, Nutritional Profile, Product Claim and their interactions (Chen & Kuo, 2001).

8.3 Study Four Results

Before the analysis was conducted, the response pattern was examined (see Appendix A5.3). Over half of respondents selected either Cereal A or Cereal B in all ten choice tasks ($n = 441$), while a further 20 percent selected ‘neither’ for only one or two of the ten pairs ($n = 159$). Slightly over 10 percent selected ‘neither’ cereal every time, and these respondents were excluded from the analysis (see Appendix A5.4). The response distribution showed there was a clear preference for one cereal over the other in many pairings. The multinomial logit regression (MLR) results show which variables had the strongest influence on respondents’ choices.

8.3.1 Multinomial Logit Regression Results ⁴⁹

Table 32 shows the choice MLR model’s fixed effects, ordered by magnitude of effect. With one exception, all main effects and interaction terms explained significant amounts of variation in respondents’ stated preferences; the exception, the interaction between label claims and nutrition profile, is discussed further below. As shown by the high F statistics, nutrition-content and health claims (‘Product Claim’) and the nutritional profile had the strongest effect on respondents’ preferences. Interestingly, the shape of the cereal had a moderately strong effect on respondents’ preferences (Cereal Type), with the star shape being more popular overall than the hoop shape. All the main effects were highly significant predictors of stated preference.

Table 32 – Model of Fixed Effects

Fixed term	d.f.	F statistic	Sig.
Product Claim	1,1221	620.0	<0.001
Nutrition Profile	2,9650	570.6	<0.001
Cereal Type	2,2748	199.9	<0.001
FOP Format	1,4647	175.5	<0.001
FOP x Profile	4,7112	59.0	<0.001
FOP x Claim	2,9354	15.8	<0.001
Claim x Profile	1,3818	3.8	0.051
FOP x Claim x Profile	2,10647	8.2	<0.001

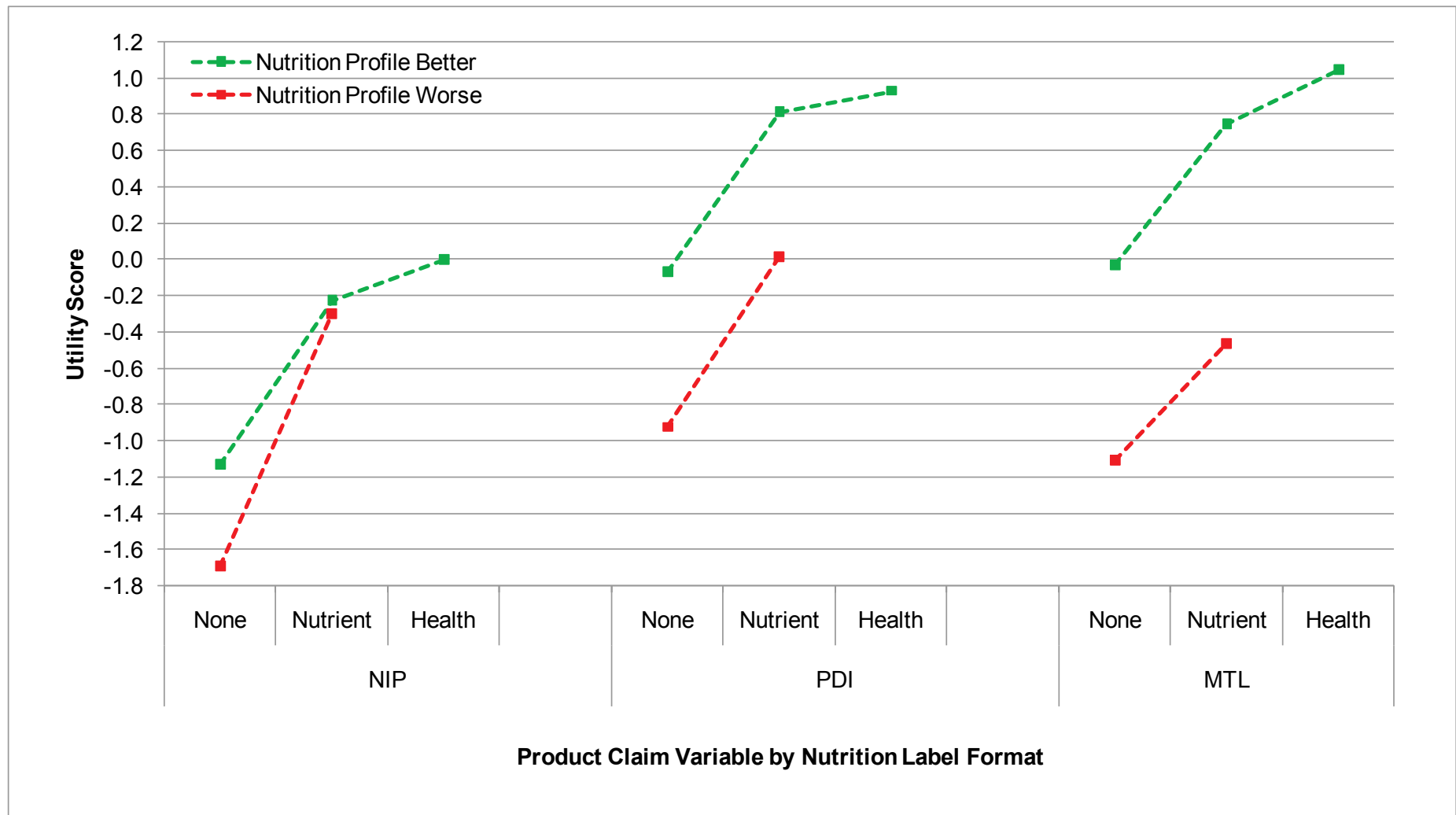
⁴⁹ This section is based on a paper presented at the 2009 Marketing and Public Policy Conference in the United States (Maubach, Hoek, Gendall, & Hedderley, 2009).

While the results presented in Table 32 show that the main and interaction effects examined were highly significant (bar one), the actual change in ‘utility’ scores provides a more comprehensive explanation of these effects. These scores provide information on how changes to the variable levels affected stated preferences, and are shown graphically in Figure 22 (overleaf). The utility scores have no real meaning in their own right, but the differences across variable combinations illustrate the relative importance of the variables tested.

The two coloured lines in Figure 22 show the utility scores for cereal options, with the better nutritional profile shown in green and the poorer profile in red. Combinations of nutrition information format and product claims are shown across the X axis (cereal type is excluded, as this does not relate to any hypotheses), with utility scores on the Y axis. The combination of a health claim on a better cereal with the NIP only is set as the reference, with change in utility benchmarked to this option (this was an arbitrary decision, with no bearing on the overall analysis). Studying this chart enables a preliminary assessment of whether the experimental results suggest the hypotheses should be rejected or are supported.

Across all conditions, respondents were more likely to opt for the cereal with the better nutritional profile. As hypothesised (H3a), consumers’ stated preferences for the better cereal were higher when a front-of-pack nutrition label was available; however, the utility scores were virtually identical for the PDI and MTL formats, so this result does not support H3b. Stated preference for the worse cereal was higher with front-of-pack labels than when only an NIP was available. Thus, consumers were more likely to choose products with a front-of-pack nutrition label than one with the NIP only, rather than being less likely to choose the less healthy cereal with more accessible nutrition information as predicted.

Figure 22 – Utility Scores for Variable Combinations in Study Four



There was strong support for H4a: Utility scores increase as product claims are added to the cereals, shown by the positive gradient of all lines in Figure 22. Hypothesis H4b predicted that claims would have the greatest impact on choice when nutrition information was presented in the NIP and PDI formats, and a smaller effect when a Traffic Light Label was present. The pattern of results differed across the nutrition profile conditions. When claims were added to the nutritionally superior cereal profile, the effect on stated preferences was very similar across all three nutrition labels. However, the addition of a nutrition-content claim had less impact on stated preferences when an MTL label was presented on the worse cereal than in the NIP and PDI conditions.

These patterns are examined more closely in tables that show the change in utility when FOP nutrition label formats, product claims, and nutritional profile are varied. Firstly, Table 33 (overleaf) shows the increase in consumers' preference in response to a product with a superior nutritional profile. Secondly, Table 34 (overleaf) illustrates how the addition of a PDI or MTL affected consumers' preference behaviour and reports the increase in utility relative to the NIP only condition for that row (i.e., the control). Finally, Table 35 (page 214) documents the effect of adding a nutrition-content or health claim when compared to the no claim control condition. In order to make these comparisons, all variables not included in the comparison are held constant across each row within the tables. All differences between utility scores reported in these tables are statistically significant unless 'ns' (not significant) is specified.

Table 33 shows the increase in consumers' preference when they were presented with a product that had a superior nutritional profile. The top half of the table shows change in preference when no product claims were present, while the bottom half shows how preference changed with nutrition profile in the presence of a nutrition-content claim. The increase in utility score was significant in five of the six claim and label combinations. The largest increase in consumers' preference for the better product occurred when a MTL was on the front-of-pack, while the increase in preference was smallest when nutrition information was presented in the NIP only. The PDI label also had a positive but smaller effect on preference.

Table 33 – Change in Utility Associated with Changing Nutrition Profile from Worse to Better

Product Claim	Nutrition Label Format	Effect of Better Profile
No Claim	NIP	0.56
	PDI	0.86
	MTL	1.86
	MEAN	1.09
Nutrition-content Claim	NIP	0.07 ns
	PDI	0.80
	MTL	1.21
	MEAN	0.69

There is no information for the Health Claim condition as this was not shown on the worse cereal.

Note: For all tables in this chapter, all change scores are statistically significant, unless followed by the notation “ns”.

It is evident that the utility scores differ across the three nutrition label formats. While the red lines in Figure 22 showing stated preference scores for the less healthy cereals are similar in range, the green lines showing preference for the better cereals are much higher when PDI or MTL labels are introduced. When considering the ‘worse’ cereal options: in the absence of product claims, a PDI label increased the utility score by 0.77 and a MTL increased utility by 0.59, when compared to the worse cereal with a NIP label (see the first row of Table 34). As noted above, H3a predicted that consumers’ preference for less nutritious options would decline relative to the NIP when FOP labels were introduced, but these results mean H3a should be rejected.

Table 34 – Change in Utility Associated with Adding FOP Nutrition Labels Relative to the NIP-only

Profile	Product Claim	Effect of adding PDI ^a	Effect of adding MTL ^a	Difference
Worse Nutrition Profile	No claim	0.77	0.59	-0.19 ns
	Nutrition claim	0.32	-0.16 ns	-0.48
	MEAN	0.55	0.22	-0.34
Better Nutrition Profile	No claim	1.06	1.10	0.04 ns
	Nutrition claim	1.04	0.98	-0.07 ns
	Health claim	0.93	1.05	0.12 ns
	MEAN	1.01	1.04	0.03 ns

^a The change in utility is relative to the NIP-only control condition for each row.

Guide to interpreting the table: A positive change score indicates that stated preference increased relative to the control (respondents were more likely to choose a product with those attributes), and a negative change score means that stated preference declined.

The size of the increase in utility for the less healthy cereal is slightly dampened when a nutrition-content claim is present; however, the utility score still increases significantly for the PDI label, but the change is not statistically significant for the MTL conditions. It is not possible to explain this observation from the data collected in this experiment. The bottom three rows of Table 34 show utility scores increased markedly when PDI and MTL labels are added to a cereal with a better nutrition profile. Across the three product claim conditions, the average increase in utility when a PDI label was added was 1.01, while the average increase in utility in the MTL conditions was 1.04; these results do not support H3b, which predicted that preference would increase most when an MTL was presented.

Table 35 shows the effect of adding nutrition-content or health claims to a product compared to the no claim control condition, with all other variables again held constant across each row (this information is also represented graphically in Figure 22). The results show that adding nutrition-content claims increases consumers' preference for products considerably, as predicted by H4a. Adding a nutrition claim enhances the utility score across all nutrition information format and profile conditions; however, there is a pronounced gradient within the worse nutrition profile group in the top half of the table. This shows that adding a nutrition claim increased consumers' preferences markedly when the only nutrition information was on the side of the pack in the NIP (+1.40).

Table 35 – Change in Utility Associated with Adding Nutrition-content and Health Claims Relative to No Claim Condition

Profile	Nutrition Format	Effect of adding Nutrition Claim ^a	Effect of adding Health Claim ^a	Difference
Worse Nutrition Profile	NIP	1.40	---	---
	PDI	0.95	---	---
	MTL	0.65	---	---
	MEAN	1.00	---	---
Better Nutrition Profile	NIP	0.91	1.13	0.23
	PDI	0.88	1.00	0.12 ns
	MTL	0.78	1.08	0.30
	MEAN	0.86	1.07	0.22

^a The change in utility is relative to the 'no claim' control condition for each row. A health claim was not added to the worse nutrition profile in accordance with proposed regulations.

Preferences also increased for the poorer product when FOP nutrition information was available, but the effect was significantly less pronounced. Specifically, adding a nutrition claim to the worse cereal profile with a PDI label increased the preference score by 0.95, while a claim added to a product bearing an MTL increased utility by 0.65; this result supports H4b. Referring back to Table 33, it is apparent that the nutrition-content claim equalised respondents' preference for better and worse cereals when only the NIP was available, showing that claims greatly affect choice behaviour when nutrition information is least accessible.

While the effect of adding a nutrition-content claim to the cereal with a better nutrition profile is also slightly different across the three nutrition label formats, the change in preference is quite uniform. Adding health claims slightly increased consumers' preference over the effect of a nutrition-content claim, and was significant in the NIP and MTL conditions, but not when a PDI label was present.

8.3.2 The Effect of Motivation and Ability on Choice ⁵⁰

The final set of analyses examined how confidence to use nutrition information and use of the NIP through the experiment influenced results. It was hypothesised that some respondents would opt to view the side panel containing the NIP more frequently through the experiment, and these people would select the nutritionally better options more consistently irrespective of the nutrition label format provided (H5a). Conversely, the choices patterns among respondents who did not view the side panel image, and therefore could not have reviewed the NIP, would only differ when a FOP label was presented (H5b). Finally, it was predicted that respondents with less confidence in their ability to use nutrition information would show the greatest difference in choice behaviour when a TLL was available (H6).

After the choice tasks, three questions examined respondents' use of the NIP while shopping. On a nine-point scale, from strongly disagree (1) to strongly agree (9), respondents' mean score in response to the statement "I often read the nutrition information panels on packaged foods when shopping" was 4.7 ($SD = 2.5$). When asked

⁵⁰ This section is based on a conference paper presented at the Australia New Zealand Marketing Academy Conference (Maubach, Hoek, Gendall, Healey, & Hedderley, 2009).

about the case of their child asking for a new product, self reported use of the NIP increased slightly ($M = 5.0$, $SD = 2.5$). The distribution of responses to two statements about using NIP labels while shopping (see Table 36) was very similar to that observed in Study Three (refer Table 21, page 184), and the proportion of respondents who agreed or strongly agreed with these statements was identical across the two studies.

Table 36 – Self-Reported use of NIP, Study Four

Statement	Percent of Respondents		
	Strongly Disagree – Disagree (1-3)	Slightly Disagree – Slightly Agree (4-6)	Agree – Strongly Agree (7-9)
I often read NIPs when shopping	24	31	45
I always read NIPs when child asks for food	20	30	50

As a more robust alternative to drawing upon self-reported use of the NIP to assess respondents' information search behaviour, the client-side paradata collected during the experiment enabled respondents' actual behaviour to be observed. Across all subsets, 56 percent of respondents viewed the side panel image for the first choice pair they saw. The proportion viewing the side panel image declined over subsequent pairs; 39 percent viewed the image for pair two, 34 percent for pair three, stabilising at a little over one quarter (27 to 29 percent) across the remaining seven pairs. In total, 219 respondents did not view the side panel image for any choice pair, 187 viewed it only once, and 395 viewed it two or more times across the experiment (see Appendix A5.6). The majority of those who viewed the side panel only once opened the image for the first choice pair (64 percent), and it is possible they were simply curious about the functionality of the survey website rather than keen to find and read the NIPs.

The MLR procedure was repeated using side panel viewing behaviour as a grouping variable (never; once; for two or more pairs). As shown in Figure 23, respondents who did not view the side panel or who viewed it only once through the whole experiment had equal preferences for the better and worse cereals when there was no front-of-pack information, as predicted by H5b. Conversely, as hypothesised in H5a, those people who viewed the side panel two or more times through the experiment strongly preferred the cereal with the better nutritional profile even when nutrition information was only presented in the NIP.

Figure 23 – Choice Patterns Across Groups of Respondents who Viewed Side Panel Zero, One or Two-Plus Times

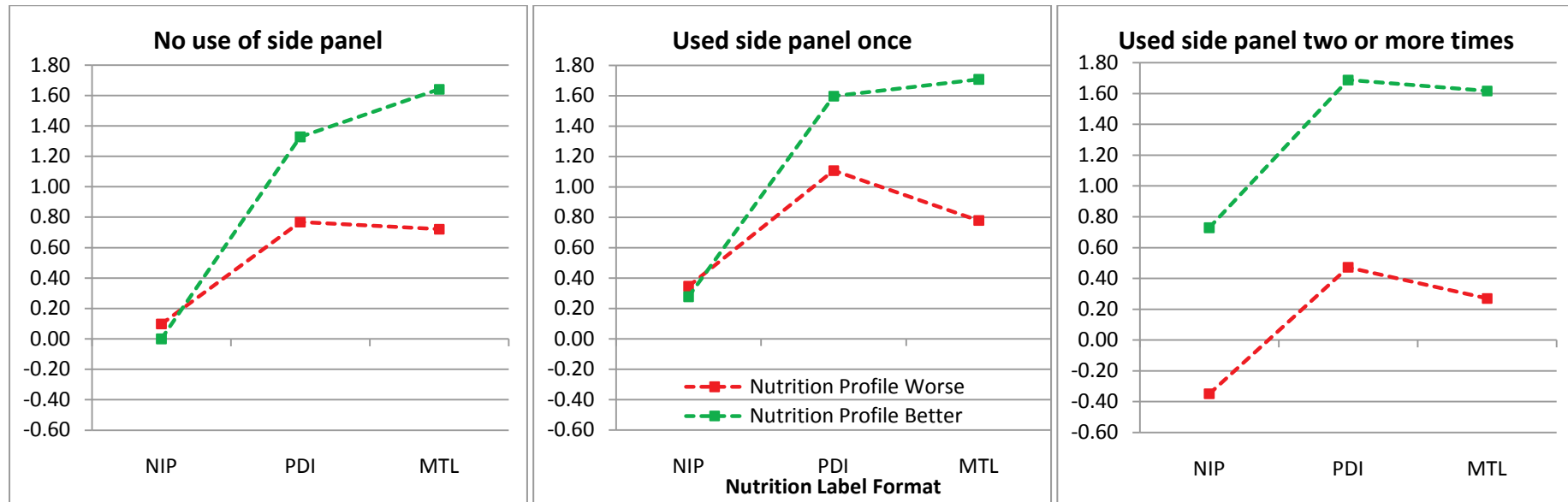


Figure 23 shows that respondents' choice of the nutritionally better cereal was very consistent with front-of-pack labels available, irrespective of whether they accessed the side panel image during the experiment. As consumers with low motivation to search for information were as likely to choose the nutritionally better cereal as more proficient nutrition information users, this suggests they benefit from front-of-pack nutrition labelling when choosing between products. The largest difference in preference scores between better and worse nutrition profiles was observed with the MTL format. These results strongly support the hypotheses, and demonstrate that consumers who do not search for the NIP label could benefit greatly from nutrition information being placed in plain sight on the front of food packaging.

Finally, with an example of a NIP on screen, respondents were asked to consider the statement "I feel confident that I can use nutrition information panels to work out how healthy a food is" (anchored by 'not at all confident' and 'completely confident'); on average, respondents were somewhat confident in their ability ($M = 5.1$, $SD = 2.1$, 9-point scale). To test whether consumers' confidence in their ability to use the NIP affected their choice behaviour, the MLR was repeated with confidence used as a grouping variable. H6 predicted that the TLL will be most useful for consumers with low self-reported confidence to use the NIP, enabling them to better distinguish between the more and less healthy cereal profiles.

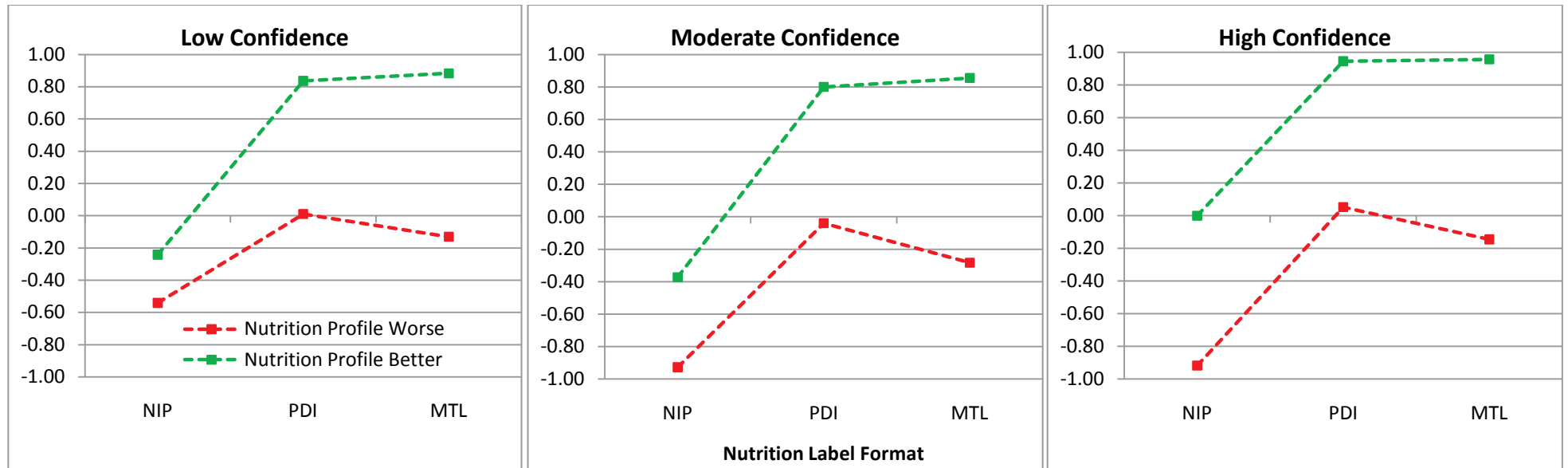
Half the participants (50 percent) in Study Four selected a response option between seven and nine, and were identified as being confident in their ability to use the NIP to determine how healthy a food is. Just over one third (37 percent) of participants selected an answer around the middle of the scale, and were labelled as having moderate confidence. The remaining 13 percent responded by selecting between one and three, suggesting they had low confidence in their ability to use the NIP label.

Comparison of the 'better' and 'worse' nutrition profile lines in Figure 24 reveals differences in the product by information format utilities across the three confidence groups. As respondents' confidence in using nutrition information increased, they were better able to differentiate between good and poor cereal profiles when given access to the NIP only. When the PDI was introduced, all consumers' ability to discriminate increased, but this change was similar across all three confidence groups. The MTL further enhanced consumers' ability to discriminate between the two profiles,

particularly among the low and moderate confidence groups when compared to the ‘NIP-only’ condition.

Figure 24 illustrates that, while the attractiveness of the good product was relatively consistent across the groups, respondents’ ability to differentiate between products with different nutrition profiles increased sharply when PDIs and MTLs were provided. Again, the largest differences between the profiles were observed with the MTLs, which elicited very similar results from all three confidence groupings, supporting the prediction made in H6. The implications of these findings for low confidence consumers are particularly important, since this group showed the weakest discrimination when provided with access to the NIP only, but exhibited very similar choice patterns to the high confidence group when provided with a MTL.

Figure 24 – Choice pattern across groups with low, moderate and high confidence when using the NIP



8.4 Discussion

Study Four examined the changes in parents' product choice behaviour caused by modifying nutrition profile, product claims and nutrition label format on a children's breakfast cereal. The use of a stated preference discrete choice experiment is novel for research investigating the effect of nutrition and health information formatting on consumers' choice, and provides robust evidence for the magnitude of effect of different information formats.

Overall, the experimental results provide support for the hypotheses tested, although some results departed from predictions. The results of this experiment suggest that many people want to select healthier options: when consumers were able to detect a difference between two similar products with different nutritional profiles, they chose the product with the better nutritional profile. However, this research also showed that some consumers' choices can be manipulated by variables unrelated to food's nutritional qualities, in this case the extruded shape of the cereal – with respondents being more likely to select the novel 'star' shape over the 'hoops'.

Across the three nutrition label formats tested, the increase in preference for a nutritionally superior product over a nutritionally inferior product varied. Respondents' preferences for the better cereal were most pronounced when the MTL was on the front of the package, while stated preferences for the two cereal profiles were almost identical with the NIP label only. The results offer only partial support for H3a: the utility scores for the better cereals increased markedly when nutrition information was added to the front of packs, compared to the NIP. However, preference for the worse cereal profiles also increased slightly, rather than being lower than preference for the worse cereal with an NIP only. This finding conflicts with the observations of Study Two, which saw significantly lower attitudes and purchase preferences for the worse cereal product when an MTL was available. Ostensibly, this seems to indicate that consumers' may be more likely to purchase unhealthy products if FOP labels are introduced – however, the important difference to note is between purchase utilities for the better and worse cereal options.

Across all but one condition, consumers' preference for both nutrition profiles increased when nutrition information was on the front of pack, as evidenced by the increases in utility scores associated with the both FOP formats presented in Table 34. Preference was expected to decline for nutritionally inferior cereals when compared to the NIP condition, as the FOP labels should help consumers evaluate the nutritional composition more accurately and discourage choice of less healthy options. Although the utility decreased when both the MTL format and a nutrition-content claim were present, overall this result implies that consumers prefer products with FOP nutrition labels over products without these, even if there is no actual difference in the nutritional value of the products. However, the magnitude of this effect differed across the two nutritional profiles tested; it was more pronounced in the conditions where a PDI appeared on the nutritionally worse cereal, indicating the presence of this label led consumers to prefer it more than its nutritional profile may have merited.

A second important way in which the findings from this choice experiment seem to differ from the results obtained in the ELM based studies relates to the effect of product claims. This experiment found that nutrition-content and health claims had the largest effect on choice behaviour, indicated by the high F statistic in Table 32, and the increase in consumers' stated preferences in Table 35. H4a predicted that the addition of claims would increase stated preference, and the magnitude of this effect is substantial. Although no choice experiments had been reported when this research was undertaken, a recent German study reached similar conclusions, reporting that the addition of product claims significantly increased the probability consumers would select the product (Aschemann & Hamm, 2009). Conversely, in Study Three, product claims did not have a significant effect on respondents' attitudes; the results of this study reinforce the evidence that there is a disconnect between consumers' attitudes and the way in which they behave.

Adding a product claim that focussed on one micronutrient had a greater effect on consumers' product choices than the complete nutrition profile. It is possible that this effect may be due to respondents searching for points of difference between the cereals in each pair; however, respondents' preferences for products with claims depended on the nutrition label format. The pattern of results suggests that numeric information is less readily relied upon by consumers when making product selections, and easily accessible product claims will have an effect in such circumstances. That is, the change

in utility score when claims were added was greater when the numeric nutrition information formats were used (NIP and PDI), and smaller when the graphic MTL was present.

This experiment suggests that product claims do influence consumers' preferences when they are choosing between competing products, particularly when nutrition information is presented in numeric formats. The implication of this result is that consumers may be more likely to choose less healthy foods promoted with claims if the nutrition information is not equally accessible. The fact that participants in Study Three were only required to evaluate a single product may explain the different findings, although further research is needed to test this possible explanation.

Consumers who opted to view the side panel image frequently throughout the experiment displayed different preferences to those who did not, in line with H5a and H5b. In particular, consumers who did not view the NIP labels for cereal options without front-of-pack nutrition labels had virtually identical preferences for the better and worse cereals without FOP labels. Adding nutrition information to the front-of-packs, especially MTL labels, enabled these less motivated consumers to differentiate between the products – this generated choice patterns similar to those of consumers who did use the NIP more regularly. Finally, as predicted in H6, even consumers who self-identified as having low confidence in their ability to use the NIP demonstrated different product selection patterns when front-of-packs labels were added. The utility scores across the cereal profiles among consumers with low confidence were most differentiated when a MTL was available, and the difference in utility between the better and worse options was the same as observed among highly confident consumers. Thus these final two sets of analyses suggest that FOP nutrition labels will be useful for consumers who do not presently rely on numeric nutrition information labels when shopping, helping them to make decisions that more closely match more knowledgeable consumers.

9 Conclusions, Implications and Future Research

9.1 Introduction

Competition continues to intensify in the food industry, and consumers are faced with a wide array of options every time they enter a supermarket or food store. The choices on offer vary widely in nutritional value and composition, and a product's contribution to a healthy diet may not be immediately obvious. Despite growing recognition by consumers of the importance of eating well, exercising, and maintaining a healthy weight, at the population level, the proportion of overweight people continues to increase and this has serious implications for the sustainability of our public health system.

Many prominent voices in the debate over how to reduce the levels of overweight and obesity argue that this is a problem of personal responsibility, and consumers need to be given more information to enable better decisions. The role of on-pack nutrition and health information in reducing rates of unhealthy weight gain has received political attention in New Zealand and Australia in recent years. Educational remedies are a popular policy response to problems in consumer markets because they preserve consumers' free choice as well as manufacturers' ability to market their products without restriction. In particular, information disclosures represent light-handed government intervention that supports consumers' ability to make informed decisions, and many in the food industry are voluntarily adding more information to packaging. Nutrition information disclosures are believed to empower consumers and are thought likely to influence their decisions and elicit healthier eating behaviours (House of Commons, 2005). However, the current Australian and New Zealand nutrition labelling regulations may not have resulted in these outcomes, as obesity rates have continued to increase since labels became mandatory, a pattern that has promoted debate over how nutrition information ought to be conveyed.

Researchers have identified many reasons why nutrition information can have a minimal impact on consumption behaviours. Broadly, these reasons align with three individual-level characteristics – motivation, ability and opportunity (MAO). These states mediate consumers' reactions to educational interventions by rendering them more or less likely

to change their behaviour. Rothschild (1999) argues education-only interventions will be ineffective if consumers are not motivated to change, or lack either the ability or opportunity to act in accordance with the educational message. Other interventions will be more effective with low levels of motivation, ability and/or opportunity.

The Elaboration Likelihood Model (ELM) of persuasion explicitly recognises the role MAOs play in mediating attitudinal responses to information, and provided the theoretical basis for two studies reported here. However, as the ELM focuses on attitudes, knowledge from behavioural psychology and behavioural economics was used to extend the research framework so it could provide a more thorough understanding of how information could shape consumers' choices. The behaviour modification perspective, particularly discriminative stimuli theory and knowledge of rule-governed behaviour, informed the final experiment.

Relatively little is known about how placing nutrition information on the front-of-packs will influence consumers' behaviour. The Food Industry Group (FIG, 2008) and others (e.g., AFGC, 2009) have argued that providing information on the percentage of an average adult's nutritional requirements per serving – in a Percent Daily Intake (PDI) label – will encourage consumers to manage their nutrient and energy intake more effectively. However, health researchers contend that consumers' behaviour will not be affected by these complex, numeric labels, and instead favour formats that predominately use graphic elements to present information and require little conscious effort to interpret (e.g., FOE, 2006; OAC & PHA, 2007).

Although modifications to numeric nutritional labels have been tested over the past two decades, there has been limited research into the range of recently developed front-of-pack formats. The formative qualitative study and three experiments reported in this thesis compared the relative effectiveness of a PDI label and a Multiple Traffic Light (MTL) label in communicating nutrition information, to discover if either of these formats facilitated healthier food choices. As the regulatory body in charge of the Food Code may soon allow 'health claims', these nutrition label formats were tested in the context of different product claims.

To begin, a series of depth interviews were conducted with 15 parents who had at least one child of pre- or primary-school age. The purpose of these interviews was to

discover the breadth of experience that parents' report when shopping for their families, and to find out how nutritional concerns feature in decision making, and identify what other factors influence shopping decisions. Additionally, their reactions to four novel front-of-pack labels were recorded, to find out how the information in these labels may be used to support decision making.

The first two experiments examined how nutrition labels and claims affected consumers' attitudes towards products, and were based on principles of the ELM. The first of the attitude experiments investigated how the FOP nutrition label formats affected consumers' product evaluations and purchase intentions relative to the currently mandated nutrition label format. Product claims were added as a third variable in the second attitude study, which compared the performance of the two FOP labels only. Additionally, these two attitude studies assessed whether consumers' inherent motivation and ability to use information affected their product assessments.

The final study was a choice experiment that estimated the effect of all variables (nutrition label format, nutritional profile, and product claims) on consumers' behaviours. This experiment used a behaviourally-focussed method that allows the magnitude of effect of each variable, and interaction effect, on choice to be determined. Furthermore, this experiment was informed by behavioural learning theories that explain the relationship between environmental effects and observable actions.

The insights provided by the formative depth interviews provide some context for the findings, and, together with the experimental results, suggest avenues for further research. As with all studies, this research has limitations, which are also discussed before recommendations for further research.

9.2 Conclusions

Food industry and public health representatives hold differing views on the effectiveness of alternative nutrition labelling formats. Comments made by members of the general public who participated in the depth interviews reflected these differences: while some parents preferred labels with detailed numeric information, others believed simple, graphic nutrition labels would be more useful. The three experiments conducted enabled

the validity of claims made about alternative front-of-pack nutrition label formats to be tested.

Nutrition Label Formatting Affects Consumers' Attitudes

The attitudinal studies provide partial support for the prediction that a graphic traffic light nutrition label would have a greater effect on consumers' product evaluations than either of the numeric label formats tested. Specifically, it was predicted that consumers who viewed a product with a front-of-pack Multiple Traffic Light (MTL) label would have more positive attitudes towards a nutritionally superior product and more negative attitudes towards a less nutritious offering, than consumers who saw the same products with either a Percent Daily Intake (PDI) label or Nutrition Information Panel (NIP). Although the two experiments used different survey modes with respondents drawn from different samples, the results were very similar and suggest the observed effects are robust.

Respondents' average attitudes and purchase intentions towards the better cereal were very similar across the control (NIP), PDI and MTL label conditions in the first attitude study, and in the second study the average attitude scores were again not statistically different between the PDI and MTL label groups. While the first hypothesis posited that evaluation scores for the better cereal would be higher in the MTL conditions than the PDI and NIP conditions, this was not observed. However, the hypothesised results were observed for the worse cereal; respondents had significantly more negative attitudes and lower purchase intentions toward the nutritionally inferior, high-energy cereal choice when nutrition information was presented in a MTL, rather than in either of the numeric formats.

Furthermore, there was no statistically significant difference between respondents' mean attitudes towards both cereal profiles in either the NIP conditions in the first experiment or the PDI conditions in both experiments. This suggests that the PDI format is not easier for consumers to use than the NIP. As changing the nutrition information presented in the NIP and PDI formats did not influence respondents' attitudes to the two cereal profiles, this indicates that nutritional profiles are not factored in during attitude formation when information is presented numerically. However, the MTL format was associated with attitudinal differences between the groups – respondents had

significantly more negative attitudes toward the worse cereal product bearing a MTL label. These results suggest that consumers are better able to use visual information than numeric information when evaluating the nutritional value of products.

Additional evidence regarding consumers' ability to understand the nutrition information presented in the three formats comes from questions that asked respondents to indicate how much total fat, sugar, sodium, and fibre (in Study Three only) was in the product they saw. The results show that perceptions of nutrient levels differed across the label formats in both studies. The perceived differences in nutrient density between the better and worse profile conditions tended to be greatest (and in line with actual composition) when respondents had seen an MTL label, particularly when they recalled the sugar and total fat content.

Respondents' perceptions of the better cereal's nutrient content were quite similar across the three labelling formats. However, there were marked differences across the worse cereal conditions: respondents exposed to the MTL label stated that the worse cereal had significantly higher sugar content than respondents in the PDI and NIP conditions. There was little difference between the two products in terms of sodium content, and while fibre content differed, respondents' perceptions were the same for the two profiles with both the MTL and PDI labels. Fibre was only available in the NIP for consumers in the MTL conditions, while consumers in the PDI conditions did have access to this on the front-of-pack. These results are similar to Scammon's (1977) findings, and again suggest that consumers benefit when nutrition information is interpreted and summarised for them.

Although respondents exposed to an MTL on the better cereal were expected to hold more positive attitudes and higher purchase intentions, this pattern was not evident. Instead, the nutrition label format appeared to affect only respondents' perceptions of the high fat, high sugar cereal. Responses to the belief statements show that participants' beliefs about the product's nutritiousness were only weakly correlated with its nutrition profile. These findings suggest that consumers draw on many packaging cues, such as the look of the food and branding elements, to form an overall assessment. If this reasoning is correct, it could explain why the expected responses to the better cereal were not apparent.

Overall, these results indicate that consumers do not readily draw upon, or cannot accurately interpret, numeric information contained in NIP or PDI panels when evaluating products. Conversely, information presented graphically does appear to influence the inferences that consumers draw about products.

Product Claims Do Not Affect Consumers' Attitudes

As prior research found consumers are more likely to be influenced by verbal written statements than numeric information, it was hypothesised that respondents' attitudes would be mediated by product claims. Specifically, it was anticipated that adding a product claim would exert a stronger influence on consumers' attitudes when the product carried a PDI label than a MTL label.

However, adding nutrition-content and health claims did not have a significant main effect on respondents' attitudes, assessed in Study Three. Research from the United States suggested that consumers evaluated products more closely, which led to increased attitudinal variance, when claims were added (Teratanavat, 2005), but this result was not observed here. Although the interaction between product claims and nutrition label format was not significant, product claims did interact with nutrition profile (i.e., better / worse) and the predicted pattern *was* observed in the worse cereal profile conditions. That is, respondents' held more positive attitudes towards the worse cereal when it bore a nutrition-content claim with a PDI label, but adding a nutrition-content claim in the presence of a MTL did not lead to improved attitudes. In the better nutrition profile conditions, which were legally allowed to carry a health claim, there was no significant difference between respondents' attitudes in the nutrition-content and health claims conditions. Overall, some weak effects were observed with the addition of nutrition-content claims, but these findings suggest that product claims do not play a significant role in attitude formation when consumers review one product in isolation. This finding aligns with research conducted by Garretson and Burton (2000), that also found a range of product claims had no discernable effect on purchase intentions or attitudes.

As the research tested the effect of claims about only one mineral, replication is required to test if the observed results generalise to claims about other nutrients or situations where more than one product is being assessed. Work investigating the latter question is important as the results of the choice experiment, summarised at the end of this section,

suggest product claims have a strong effect when consumers are choosing between competing product options.

Motivation and Ability do not Mediate Attitude Formation

In considering explanations for the apparent lack of effect for nutrition labelling, Ford *et al.* (1996) suggests that consumers either cannot understand the numeric nutrition information presented in nutrition information panels (low ability), or they choose not to use it when evaluating products (low motivation) (see also Roe *et al.*, 1999). It was hypothesised that consumers' motivation and ability to use nutrition information would mediate the attitude formation process, in line with the primary postulate of the Elaboration Likelihood Model (ELM). Specifically, it was predicted that consumers with low motivation and/or ability to use nutrition information would have significantly different attitudes from those with high motivation and ability. Furthermore, it was also predicted that product claims would have a more pronounced effect on attitudes among consumers with lower motivation and ability. Overall, the data from the two attitude studies do not support the hypothesis that motivation and ability mediate consumers' attitudinal responses to nutrition and health information on the front of packages.

Though participants in the two attitude experiments exhibited differing levels of motivation and ability with regards to nutrition information, these differences explained only a small amount of the variance in attitudes across the different information conditions. Thus, the results of the studies reported here suggest that when faced with decisions about low involvement goods, most consumers typically use peripheral processing strategies and rely on easily-accessed information. It seems even consumers' with high motivation and ability to use nutrition facts do not take full advantage of this information. Most of the variance in attitudes was explained by respondents' beliefs about the products' quality, taste, naturalness and nutritiousness; the variance of these beliefs were only weakly correlated with the experimental manipulations. The fact that the measures of belief contained a great deal of random variance suggests that consumers' beliefs were based upon their unique perceptions of the cereal images.

Nutrition Label Formatting and Product Claims Affect Consumers' Choice Behaviour

The two attitude studies, like the majority of labelling research conducted to date, measured attitudes and intentions as proxies for behaviour. Few studies have estimated how changes to nutrition labels will affect purchase behaviour, which is the ultimate research question that policy makers need answered. The final study used a stated preference discrete choice experiment to estimate how front-of-pack nutrition and health information affects respondents' choice behaviour when it is presented in different formats.

This experiment was informed by a behaviour modification perspective, which led to slightly different hypotheses than generated from the cognitive perspective that informed the two attitude studies. The fundamental difference between the two perspectives is shown by the increased emphasis on past behaviour, discriminative stimuli, and rule-governed behaviour as predictors of consumers' behavioural responses.

It was expected that improving the physical accessibility of nutrition information with FOP labels would affect consumers' choices: stated preference was expected to increase for options with a better nutritional profile, and conversely to decrease for the nutritionally inferior product, relative to when nutrition information was only available in the NIP on the side panel. Moreover, this effect would be greater for the MTL than the PDI, as the MTL presents information using the well-known, rule-governed behaviour associated with the highly discriminative traffic light system. As product claims also activate rule-governed behaviour by implying positive consequences from consumption (e.g., eating enough micronutrients leads to good health), it was further hypothesised that product claims would make consumers more likely to choose a product. It was also predicted that product claims would interact with the accessibility of nutrition information, having the greatest effect when nutrition information was presented in either numeric format (NIP or PDI).

As hypothesised, adding nutrition information to the front-of-pack greatly increased the attractiveness of the nutritionally superior cereal. This finding aligns with in-store research conducted in the United States, that found consumers' were more likely to purchase products that were identified as being low in sodium, fat, calories or cholesterol (Levy *et al.*, 1985; Schucker *et al.*, 1992). The utility scores for the better

cereals with both front-of-back labels were very similar, which was not predicted: it was anticipated that stated preference would be highest in the presence of an MTL label. However, unlike the two attitude studies, the addition of front-of-pack nutrition labelling (particularly in the absence of a product claim) did not depress stated preference for the less nutritious cereal. If attitudes predict behaviour, then according to the results of Studies Two and Three, selection of the worse cereal with the MTL label would have been significantly reduced. Although respondents were significantly more likely to choose the poorer cereal when it had a PDI label and a nutrition-content claim, it is not clear why their preference for the poorer cereal did not decline when either a PDI or MTL label was introduced.

Although the second attitude study found that product claims did not affect respondents' attitudes, claims had the largest effect on consumers' choices in the final experiment. The attractiveness of cereal options increased markedly when these featured a nutrition-content claim, and increased slightly more again when a health claim was added to the better cereal. Products that featured numeric nutrition information labels showed larger increases in attractiveness when a nutrition-content claim was added, as hypothesised. This suggests claims outlining positive consequences influence consumers' behaviour, and that this effect is strongest when the nutrition label format is more numeric and less accessible. This finding appears to contradict assertions made by Calfee and Pappalardo (1991) that consumers will use all available information to determine whether a product is good quality.

Consumers' propensity to choose the better and worse cereals when only the NIP was available was very similar, particularly when a nutrition-content claim was present. This result did vary with respondents' information search behaviour, as predicted. Respondents who searched for the NIP two or more times during the experiment had consistently differentiated stated preferences for the two nutritional profiles with all three nutrition label formats. Conversely, participants who did not refer to the NIP showed the greatest differentiation between the better and worse cereals when an MTL label was provided, and less discriminating choice patterns with the numeric labels.

Finally, respondents' confidence in their ability to use numeric nutrition information also affected their choice patterns with the three nutrition label formats. The final hypothesis predicted that MTL labels would enable low-confidence consumers to select

between the options in a similar manner to those consumers with high-confidence, and this was supported by the results. This analysis showed that the MTL label had a greater effect on stated preference choice behaviour than the PDI format, which offers only a moderate improvement on the NIP.

Drawing Together Cognitive and Behavioural Conclusions

The previous subsections described the results and conclusions drawn from the three experiments. This section briefly summarises and compares the key findings observed across the two theoretical approaches.

The first attitude study and the choice experiment provide insights into consumers' ability to integrate information in the NIP into cognitive and behavioural decisions. Overall, both suggest that the NIP does not effectively communicate nutrition information to many consumers, thus providing evidence to substantiate the widespread belief, based largely on anecdotal experiences, that the design of the NIP label is inadequate for achieving nutrition labelling goals.

Earlier research studies, mainly from the United States, reported varying results for the effectiveness of Percent Daily Value (PDV) information, which is a similar format to the PDI. While some authors report that consumers were better able to draw appropriate inferences about a product's healthiness using PDV information (e.g. Burton *et al.*, 1994; Viswanathan & Childers, 1996), others found that participants performed worse with this format (Levy *et al.*, 1991). Whether or not a significant result was found did seem to depend on the type of outcome measure used, and that is true of the experiments conducted with New Zealand parents. The two attitude studies reported here suggest PDI labels are not significantly more effective at communicating nutrition information to consumers than the current NIP format, while MTL labels are. However in the choice experiment, many consumers' stated preferences differed across the better and worse profiles when they had access to PDI labels, meaning consumers can and do use this information to choose between products with different nutritional profiles. Although the choice experiment provides more robust evidence for the positive impact of PDI labels on behaviour, consumers' ability to differentiate was greater with MTL labels, a finding consistent with the attitude studies. Consumers' ability to use the MTL label is all the

more impressive when it is considered this was the only completely new format tested. With a little education, the effectiveness of this format may be even greater.

The stated preference utility scores for the worse cereal products increased when both types of FOP label were added, which was not expected. However, this does not mean that consumers would be more likely to choose unhealthy options if all products bore FOP labels; the significant difference in utility across the better and worse profiles within the labelling conditions shows that the healthier options were much more likely to be selected.

As already noted, the most substantial difference in results occurred when nutrition-content and health claims were introduced. These had almost no effect on consumers' attitudes, yet were the most important explanatory variable in the choice study. When evaluating a single product in isolation, and thus with no other sources of information for comparison, it seems that consumers do not fully integrate available information during attitude formation. This result replicates the findings of prior research with New Zealand and Australian consumers, which found adding nutrition claims to products did not lead to a significant increase in purchase intentions or attitudes (FSANZ, 2008c). However, the difference between the attitude and choice experiments demonstrate the weak link between attitudes or intentions and behaviour, and the necessity of collecting behavioural information to understand the effects of proposed interventions. When participants were tasked with choosing between similar products, claims did have a significant influence on selection decisions, perhaps because they further enable consumers to distinguish between competing options.

While motivation and ability to use nutrition information explained only a small amount of variance in consumers' attitudes towards the different products, the choice experiment found that information search behaviour and self-reported confidence to use NIPs did affect consumers' choices. Thus it seems that consumers with a history of using nutrition information are better able to make decisions with numeric information when they have at least one product to use as a point of comparison. However, less confident consumers still need nutrition information presented graphically if they are to make greater use of it.

9.3 Public Policy Implications

The front-of-pack nutrition labelling formats promoted by different stakeholders vary substantially in both design and content, but all parties agree that adoption of a uniform labelling system would have clear benefits for consumers. In choosing which label to implement, policy makers must appreciate how consumers make food choices so their recommendations recognise the low-involvement nature of grocery shopping. Research conducted with key stakeholders found lack of evidence about the effectiveness of various formats is a major barrier to regulating front-of-pack nutrition labelling in New Zealand (Signal & Lanumata, 2008). The research presented here helps address this gap and suggests the industry-favoured Percent Daily Intake labelling scheme does not communicate nutrition information very effectively.

The qualitative study found consumers did not routinely use NIPs because of their perceived complexity. While many consumers occasionally review nutrition panels, they do so to make limited comparisons between a small number of products. Though some consumers may reject products if their ingredients exceed an upper threshold, the qualitative work indicates that NIPs do not help consumers to make more comprehensive evaluations of products' nutritional composition. NIPs thus appear to perform a narrow role and exert less influence than 'common sense' heuristics or participants' accumulated experiences. Overall, the qualitative research suggests simplified information formats, rather than more complex or detailed devices, will be pivotal if point-of-purchase nutrition details are to play any role in supporting healthy food choices.

When considering which format will best communicate important nutrition information to most consumers, policy makers must also recognise that purchase habits are shaped by competing forces and brand inertia following years of habitual shopping. The assumption that improved access to nutritional profiles will facilitate healthier food choices appears to be widely held, yet Study One revealed parents' lived experiences of food purchasing is less straightforward than this rational model of choice. Consumers seek to make shopping easier and quicker by using simplifying strategies (Furst, Connors, Bisogni, Sobal, & Falk, 1996), thus food shopping is marked by habitual purchases and routine behaviour patterns to satisfy competing demands of convenience, price and taste.

Consumers who use these shortcuts may make the act of shopping more tolerable, but they may also be less likely to consider individual product choices in detail. Thus, even consumers who recognise that good nutrition is important may base their purchase decisions on other factors if these are more salient or urgent. For example, the effect of price and convenience on purchase is well documented, as is the nudging influence of packaging and in-store promotions. Additional information is therefore unlikely to change behaviours that are driven by more basic demands, and even receptive consumers require information they can understand and use easily if established preferences for familiar, but less healthy, brands are to be changed. Thus, nutrition information must be in an accessible format if it is to have any chance of changing habitual preferences for familiar, energy-dense brands.

Recent research suggests that consumers want front-of-pack nutrition labels (Gorton *et al.*, 2009; Grunert & Wills, 2007; Kelly *et al.*, 2009; Signal *et al.*, 2008; van Kleef *et al.*, 2008). However, policy makers face the challenge of determining which format will help the most at-risk consumers to recognise foods' nutrition values and shift choices towards healthier options. It is worth recalling Russo *et al.*'s (1986) warning, issued over two decades ago, that it is unrealistic to believe any nutrition information format will help consumers choose an ideal diet. At best, a new label format will help consumers move closer to that ideal. Additionally, the aggregate or population level response to the packaging stimuli is an important consideration when formulating policy responses. While individual consumers' responses may vary markedly due to personal attributes, a shift in the population mean can have major implications for the health system: a small reduction in risk for a large number of people may result in a large reduction in incidence of disease across an entire population (Rose, 1992).

As manufacturers do not want their products to be perceived negatively, effective nutrition labelling could also encourage manufacturers to reformulate their products to reduce energy density (Bettman *et al.*, 1986), rather than simply market high fat, sugar and salt foods with a reduced serving size as is the current practice (Warner, 2005). As a result, the actions of those more inclined to switch brands following more effective nutrition disclosure may indirectly benefit all consumers.

As already highlighted, nutrition information must be simple enough to remain salient in the presence of nutrition-content and health claims. The choice experiment suggests that

product claims increase the attractiveness of products, although MTLs dampened this effect. When deciding whether to amend product claim regulations, policy makers thus need to consider whether the additional information would increase consumers' knowledge in an unbiased manner. As nutrition-content claims are now widespread, it is even more important that consumers have access to easily understood nutrition information formats.

Although PDI labels are becoming more widespread, surveys of the general population suggest only a minority of consumers currently look at these labels (FSANZ, 2008a). Graphic MTLs seem more likely to help consumers select foods that assist weight control. Because neither motivation nor ability explained a significant proportion of the variance in consumers' product evaluations, and did not interact with nutrition label format, labelling policies that assume central processing are likely to be ineffective. Instead, labels that are intuitive to use and affect perceptions by activating pre-existing associations will gain consumers' attention more effectively and have a greater likelihood of influencing both their beliefs and choices.

According to the motivation, ability and opportunity (MAO) typology presented in Table 3 (see page 36), when consumers have low motivation and ability but have the opportunity to modify their behaviour, a combination of education, marketing and legal strategies are needed to induce and support healthy behaviours. Educational and information interventions are known as weak agents for behaviour change; even though they may increase people's knowledge and understanding of issues this often fails to translate into action. Therefore, in order to reverse the growing rates of childhood and adult obesity, policy makers must consider the multifaceted nature of purchase and consumption environments and use a range of tools to create a healthier food environment.

While food companies are a significant stakeholder in the problem of obesity, a primary aim of business must be to ensure ongoing profitability; this is evident within the mission statement of the Food Industry Accord:

To do all that is possible to encourage all sectors of the food industry to create *commercially successful* product and services that will make a positive contribution to the health of New Zealanders (emphasis added).

As discussed in Study One, low cost foods are very attractive to consumers as they look for ways to extract maximum value from their household budgets. The most profitable food and beverage products often use cheaper, less nutritious ingredients, as they can still be sold at a relatively low price with a wide margin. This leads to a tension between the twin aims of producing socially-responsible offerings and achieving bottom-line success. Companies that opt to increase the nutritional value of their product range may put themselves at a competitive disadvantage, and government must be prepared to enact policies that eliminate the advantage of using cheaper, HFSS ingredients, for example.

9.4 Limitations

Like all experimental consumer studies, this research has some limitations that should be borne in mind when interpreting the conclusions and considering their generalisability. Knowing that experiments undertaken in artificial environments are vulnerable to a range of limitations that can reduce external validity, steps were undertaken to quality assure the studies' procedures.

Foremost among these was recruiting participants using diverse means to ensure that a wide range of personal demographic characteristics were represented in the final samples. However, it is likely that consumers with low literacy skills were under-represented as this is common to consumer research (Adkins & Ozanne, 2005), and it is this group that may benefit most from improved nutrition labelling. Although participants were not randomly selected from the population of parents in New Zealand, this limitation does not undermine the conclusions drawn from the pattern of results as the aim of the research was to compare parents' reactions to different labelling and claim formats, rather than predict the impact these changes would have if introduced. Additionally, the experiments were carefully designed to keep respondents blind to the hypotheses, to facilitate them interacting with the stimuli in a realistic manner.

As with all experiments, the number of variables manipulated and examined was constrained. The findings from this research are restricted to parents' perceptions and choices regarding products for their children, which may limit the generalisability of findings to the general population. However, there is no evidence that parents behave in fundamentally different ways when choosing foods for themselves compared to their

children, so it is unlikely that a significantly different pattern of results would have been obtained if the task asked respondents to evaluate or choose between food products for themselves. Like most research that manipulates product attributes, this research was not conducted in real environments. The experimental context may have meant that respondents acted differently when evaluating the products; for example, by giving these more consideration than would normally be the case when they were shopping. Furthermore, this research focussed specifically on the effects of labelling changes, and therefore the research design did not include marketing variables known to affect consumers' decisions, such as price or sales promotions.

9.5 Further Research

There were limits to the scope of the research conducted for this thesis that warrant further investigation through replication and extension.

Although participants with a range of educational levels participated in this research, low-literate and low-numerate people were not specifically targeted with the sampling strategies used. Research is needed to explore how low-literate and low-numerate consumers access information on food labels, as without this research consumer protection and information provision policies may fail to account for the needs of more vulnerable consumer groups (Day, 1976; Hadden, 1991). Given low-literate consumers' reliance on pictorial information when shopping (Jae & Delvecchio, 2004; Viswanathan, Rosa, & Harris, 2005), a visual heuristic, such as the traffic light system, may have the greatest potential for ensuring all consumers have access to essential nutrition information at the point-of-purchase.

The range of stimuli that could be tested was limited, and future research could therefore test consumers' behavioural responses to different variables. For example, research could explore how consumers use nutrition labels to choose between a larger product array featuring more diverse nutrition profiles. Such work could examine how different labels influence both beliefs and behaviour when differences between nutritional profiles are less pronounced and the profiles themselves are more ambiguous. With regards to TLLs, for example, consumers may not detect differences between two products' nutritional profiles if these feature the same traffic light colours (e.g., both green), even

if the nutrient content is near the thresholds at either end of the range (e.g., Levy *et al.*, 1996). An extension of the choice experiment with more nutrition profile combinations and a larger sample could examine whether consumers use PDI and MTL label formats to choose between products with more closely matched nutritional compositions.

The nutrient recall results in the two attitude studies suggest that consumers' interpretation of amber traffic lights requires further research. For both cereal profiles used in this research, the sodium content was rated amber. Respondents who viewed the less healthy cereal profile recalled sodium content as being higher even though that profile contained slightly less sodium (refer to Table 15, p. 170 and Table 25, p.190). It is possible that the direction of the difference is due to a biasing halo effect (or rather reverse halo in this instance), where the colours of the other traffic lights in the panel influenced perceptions of amber ratings. That is, an amber light in the context of red ratings may be perceived as worse than when shown alongside green ratings. Although these two studies were not designed to address this hypothesis, future research could examine whether the overall traffic light appearance influenced how consumers perceived individual nutrient summary ratings.

Practical constraints meant that other alternative front-of-pack nutrition labelling schemes could not be investigated in this research. As noted previously, the PDI and TLL formats were examined because these have received the most attention from industry and public health representatives. However, the qualitative research revealed that people who liked the detailed PDI format also liked a combined format that mixed elements of both schemes; future work could examine the effects of the format presented in Figure 25, which combines information from the MTL and PDI formats.

		Per 30g serve	% DI
Low	Total Fat	0.5g	0.6%
Low	Saturated Fat	0.2g	0.6%
High	Sugar	12.5g	13.8%
Med	Sodium	141mg	6.1%
Percentage daily intakes are based on an average adult diet of 8700 kJ. Your daily intakes may be higher or lower depending upon your energy needs.			

Figure 25 - Combined Multiple Traffic Light with Percent Daily Intake format

Repeating this experiment with a range of package designs, or alternative types of product, may shed light on the finding that respondents did not have even more positive attitudes towards a healthier product when a MTL was used. For example, a package design that included wholesome, attractive imagery of fruit and whole grains, featuring an MTL label with a good nutritional profile, might produce higher attitude scores than observed in this research.

Additionally, research is required to estimate the effect of label information under conditions that more closely match a realistic setting. A choice modelling experiment that included a price variable could test whether and how consumers trade off nutritional concerns against price. Now that there is evidence that graphic labels have a stronger effect on choice than numeric labels, more research is needed to determine if these graphic labels are ‘strong’ enough to shift brands in consumers’ purchase repertoires. The effect of nutrition labels on real brands may be weaker, as prior research has shown consumers are less likely to look for numeric nutrition information on familiar brands (Balasubramanian & Cole, 2002). While more complex and expensive to conduct, this could be examined in a laboratory setting designed to imitate a real shopping environment, or through a computer or virtual-reality simulation, where participants are asked to ‘shop’ for products from a range of categories. By conducting research in environments that mimic real world settings, researchers will be able to discover the magnitude of effect that nutrition labels and product claims in the retail environment.

The nutrient and health claims tested in the research reported here referred to the presence of calcium in the product. While this is an important micronutrient that is deficient in some New Zealand children’s diets, it is possible that nutrition-content and health claims featuring other nutrients may have a different effect on parents’ evaluations and choice behaviours. The depth interviews revealed that while some parents do consider micronutrient intake when buying food for their children, the macronutrients fat and sugar dominated their nutritional concerns. Therefore, further research should examine the effect of front-of-pack nutrition labels in the presence of alternative nutrient and health claims, such as claims about low levels of ‘negative’ nutrients.

While all people benefit from eating a balanced, nutritious diet, there are certain groups of people whose wellbeing depends on managing their diet more carefully. In addition

to testing how consumers from the general population make choices for themselves with front-of-pack labels, future research could also investigate how reformatting nutrition information affects the choices of those living with chronic conditions such as diabetes or heart disease. Relevant product claims should also be tested with these population subgroups, to discover if they are more readily influenced by claims that relate to pre-existing medical conditions.

9.6 Summary

This research suggests that graphic nutrition labels help consumers evaluate energy-dense products more accurately. Consumers' attitudes towards a less healthy children's cereal product were significantly lower when a Multiple Traffic Light label summarised the nutrition profile than when the more detailed Percent Daily Intake label preferred by industry groups was provided. Furthermore, respondents formulated their attitudes towards the test product and were able to evaluate products' nutritional profiles in a shorter time, and more accurately, with an MTL label; this observation is important given how little time consumers devote to considering products in store.

While nutrition-content and health claims about calcium content did not have a significant effect on the way consumers evaluated a product in isolation, product claims had a large effect on the pattern of selections made in a choice experiment. Consumers were more likely to choose a product when a claim was added, irrespective of its nutrition status. However, when the product had a high fat and sugar content, the MTL label dampened the effect of nutrition-content claims. Given the already ubiquitous nature of nutrition claims, which appear to divert attention away from products' overall nutritional values, the importance of easily understood information formats that balance claim effects is clear. The MTL label was more likely to achieve this balance and it also increased consumers' preferences for nutritionally superior products substantially more than when the same information was presented in a numeric format.

As the stakeholders who participated in Signal and Lanumata's (2008) study stated, the main criterion for implementing any new system has to be that it will have the most beneficial effect on public health. Overall, this research suggests that the industry-favoured PDI nutrition label format is not optimal, and that consumers would make

healthier choices if food products used labels that incorporated graphic elements. Graphic front-of-pack nutrition labels simplify the complicated task of evaluating the nutritional value of different food products, and are more likely to make it easier for consumers in distracting shopping environments to make healthier food choices.

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Appendix One:

Information on Thesis Supplementary CD

A1.1 Study One Appendices

A1.1.1 Recruitment Letter

Information sheet distributed to potential respondents by affinity organisations

A1.1.2 Interview Protocol

Semi-structure interview protocol

A1.1.3 Show Card Booklet

Show cards used in interviews

A1.2 Study Two Appendices

A1.2.1 Experimental Stimuli

Image Number	Nutrition Label	Nutrition Profile
Image 1	NIP (control)	Better
Image 2	NIP (control)	Worse
Image 3	MTL	Better
Image 4	MTL	Worse
Image 5	PDI	Better
Image 6	PDI	Worse

A1.2.2 Questionnaire

The same questionnaire was used for each experimental condition, though interviewers were provided with colour-coded versions to ensure the conditions could be correctly distinguished at data entry (these versions only differed in their instructions to interviewers regarding which stimuli show cards to present across the conditions).

A1.2.3 Stimuli used in measure of Ability to use Nutrition Information

Contains three show cards for each of the three nutrition label format conditions.

A1.2.4 Screening Form

All participants who were approached and agreed to take part were first read their rights as a research participant and then asked two screening questions to determine eligibility.

A1.2.5 Response scale show card booklet used

As an aid for when answering questions, respondents were given an A5, spiral bound booklet of laminated show cards that contained all response scales.

A1.3 Study Three Appendices

A1.3.1 Experimental Stimuli

Image Number	Nutrition Label	Nutrition Profile	Product Claim
Image 1	MTL	Better	Control
Image 2	MTL	Worse	Control
Image 3	MTL	Better	Nutrition-Content
Image 4	MTL	Worse	Nutrition-Content
Image 5	MTL	Better	Health Claim
Image 6	PDI	Better	Control
Image 7	PDI	Worse	Control
Image 8	PDI	Better	Nutrition-Content
Image 9	PDI	Worse	Nutrition-Content
Image 10	PDI	Better	Health Claim

A1.3.2 Screen Captures of Online Survey

Images of each page of the online survey.

A1.4 Study Four Appendices

A1.4.1 Screen Captures of Online Survey




Example images of each page of the online survey (experimental variable combinations described in Appendix 5.1 Description of Experimental Stimuli)




Appendix Two:

Traffic Light System Nutrient Thresholds

A2.1 Nutrient content thresholds

Set by UK Food Standards Agency (reproduced from 2007).

Foods	Green 	Amber 	Red 
Amount per 100g			
Total Fat	<3.0g	3.0 - 20.0g	>20.0g
Saturated Fat	<1.5g	1.5 - 5.0g	>5.0g
Sugar	<5.0g	5.0 - 15.0g	>15.0g
Sodium	<118mg	118 - 590mg	>590mg

Liquids	Green 	Amber 	Red 
Amount per 100mL			
Total Fat	<1.5g	1.5 - 10.0g	>10.0g
Saturated Fat	<0.75g	0.75 - 2.5g	>2.5g
Sugar	<2.5g	2.5 - 7.5g	>7.5g
Sodium	<118mg	118 - 590mg	>590mg

Appendix Three:

Additional Data Tables for Study Two (§7.2)

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A3.4 Full Model Hierarchical Multiple Regression Coefficient Output	283

A3.1 Respondent Demographics

Demographic Variable		Percent
Gender	Female	72
	Male	22
	Not recorded	6
Age range (years)	19-25	3
	26-30	10
	31-35	20
	36-40	20
	41-45	21
	46-50	16
	51-55	6
	56+	4
Relationship status	Living with partner	78
	Solo parent	22
Educational attainment	No formal qualification	7
	School qualification	21
	Trade qualification	11
	Tertiary Certificate or Diploma	23
	Bachelor's Degree	18
	Postgraduate Degree	19
Dieting	Yes	50
	No	50

A3.2 Correlation matrix for Nutrition Information Panel Beliefs, Behaviour, and Nutrition Knowledge

	NIP is easy to understand	NIP is informative	Often read NIP when shopping	Read NIP on foods kids request
NIP is informative	.51**			
Often read NIP when shopping	.25**	.17**		
Read NIP on foods kids request	.21**	.12*	.65**	
Feel knowledgeable about nutrition	.32**	.24**	.56**	.49**

* p < 0.05, ** p < 0.01

A3.3 Ability Scores by Experimental Condition

Nutrition Format	Ability Score (no. Correct)		
	One (%)	Two (%)	Three (%)
NIP	4	70	26
PDI	10	82	8
MTL	6	63	31

A3.4 Full Model Hierarchical Multiple Regression Coefficient Output

Variable Name (Step 3)	Unstandardised B Coefficient	<i>t</i>
<i>Constant</i>	4.40	50.31 ***
Profile (PE)	-0.34	-3.75 ***
Motivation (Mot)	0.05	1.63
Ability (Ab)	0.00	0.01
MTL Format (FE1)	-1.43	-1.18
PDI Format (FE2)	0.07	0.47
FE1 x PE	-0.22	-1.81
FE2 x PE	0.02	0.17
FE1 x Mot	0.08	2.10 *
FE2 x Mot	-0.06	-1.52
FE1 x Ab	-1.17	-0.70
FE2 x Ab	0.30	0.84
PE x Mot	-0.03	-1.28
PE x Ab	-0.17	-0.81
Mot x Ab	-0.03	-0.54
FE1 x PE x Mot	-0.06	-1.49
FE2 x PE x Mot	0.05	1.19
FE1 x PE x Ab	-0.02	-0.09
FE2 x PE x Ab	-0.30	-0.83
FE1 x Mot x Ab	-0.14	-1.87
FE2 x Mot x Ab	0.09	0.85
PE x Mot x Ab	-0.03	-0.43
FE1 x PE x Mot x Ab	0.16	2.04 *
FE2 x PE x Mot x Ab	-0.12	-1.14
Belief (Nutritious)	0.35	4.80 ***
Belief (Quality)	0.24	3.07 **
Belief (Taste)	0.12	2.62 **
Belief (Naturalness)	0.06	1.08

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix Four:

Additional Data Tables for Study Three (§7.3)

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A4.4 Full Model Hierarchical Multiple Regression Coefficient Output	286

A4.1 Respondent Demographics

Demographic Variable		Percent
Gender	Female	53
	Male	47
Age range (years)	19-25	0
	26-30	23
	31-35	101
	36-40	195
	41-45	77
	46-50	19
	51-55	1
	56+	0
Relationship status	Living with partner	79
	Solo parent	18
	Not stated	3
Educational attainment	No formal qualification	9
	School qualification	33
	Trade qualification	12
	Tertiary Certificate or Diploma	23
	Bachelor's Degree	13
	Postgraduate Degree	7
	Not stated	2
Dieting	Yes	46
	No	54

A4.2 Correlation matrix for Nutrition Information Panel Beliefs and Behaviour, and Nutrition Knowledge

	NIP is easy to understand	NIP is informative	Often read NIP when shopping	Read NIP on foods kids request
NIP is informative	.66**			
Often read NIP when shopping	.39**	.28**		
Read NIP on foods kids request	.33**	.23**	.79**	
Feel knowledgeable about nutrition	.44**	.31**	.64**	.59**

** p < 0.01

A4.3 Ability Scores by Experimental Condition

Nutrition Format	Ability Score (no. correct)			
	Zero (%)	One (%)	Two (%)	Three (%)
PDI	1.2	9.3	35.2	5.0
MTL	0.5	7.2	28.0	13.6

A4.4 Full Model HRM Coefficient Output

Variable Name (Step 3)	Unstandardised B Coefficient	<i>t</i>
<i>Constant</i>	4.73	50.45***
Profile (PE)	-0.27	-3.36*
Motivation (Mot)	0.00	0.16
Ability (Ab)	-0.08	-0.47
Format (FE)	-0.18	-2.22*
Nutrition Claim (HE1)	-0.08	-0.89
Health Claim (HE2)	0.14	1.09
FE x PE	-0.23	-2.90**
FE x HE1	-0.01	-0.08
FE x HE2	0.01	0.06
FE x Mot	0.00	0.00
FE x Ab	-0.18	-1.37
PE x HE1	0.18	2.24*
PE x Mot	-0.04	-1.69
PE x Ab	-0.19	-1.02
HE1 x Mot	0.01	0.39
HE2 x Mot	-0.01	-0.32
HE2 x Ab	-0.25	-0.97
Mot x Ab	-0.03	-0.55
FE x PE x HE1	0.03	0.33
FE x PE x Mot	-0.06	-2.19*
FE x PE x Ab	-0.08	-0.60
PE x HE1 x Mot	0.01	0.50
PE x HE1 x Ab	0.40	2.13*
PE x HE2 x Ab	-0.55	-1.71
HE1 x Mot x Ab	0.05	0.70
HE2 x Mot x Ab	-0.08	-0.91
FE x PE x HE1 x Mot	-0.04	-1.18
FE x PE x HE2 x Ab	-0.28	-1.76
FE x PE x HE2 x Mot	0.01	0.20
FE x PE x HE1 x Ab	0.05	0.25
PE x HE1 x Mot x Ab	0.11	1.73
PE x HE2 x Mot x Ab	-0.06	-0.75
Belief (Nutritious)	0.28	5.70***
Belief (Quality)	-0.15	-3.64***
Belief (Naturalness)	0.23	4.82***
Belief (Taste)	-0.04	-0.95

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix Five:

Additional Data Tables for Study Four

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A5.1 Description of Experimental Stimuli

SET ONE						
Choice Pair	Stimulus #	Option	Label Format	Nutrition Profile	Product Claim	Cereal Variant
1	1	A	NIP	Better	Control	Hoops
	2	B	NIP	Better	Nutrition	Stars
2	4	A	NIP	Worse	Control	Hoops
	5	B	NIP	Worse	Nutrition	Stars
3	7	A	MTL	Better	Nutrition	Hoops
	8	B	MTL	Better	Health	Stars
4	10	A	MTL	Worse	Nutrition	Hoops
	11	B	PDI	Better	Control	Stars
5	13	A	PDI	Better	Health	Hoops
	14	B	PDI	Worse	Control	Stars
6	1	A	NIP	Better	Control	Stars
	5	B	NIP	Worse	Nutrition	Hoops
7	13	A	PDI	Better	Health	Stars
	2	B	NIP	Better	Nutrition	Hoops
8	10	A	MTL	Worse	Nutrition	Stars
	14	B	PDI	Worse	Control	Hoops
9	7	A	MTL	Better	Nutrition	Stars
	11	B	PDI	Better	Control	Hoops
10	4	A	NIP	Worse	Control	Stars
	8	B	MTL	Better	Health	Hoops

SET TWO

Choice Pair	Stimulus #	Option	Label Format	Nutrition Profile	Product Claim	Cereal Variant
11	2	A	NIP	Better	Nutrition	Hoops
	3	B	NIP	Better	Health	Stars
12	5	A	NIP	Worse	Nutrition	Hoops
	6	B	MTL	Better	Control	Stars
13	8	A	MTL	Better	Health	Hoops
	9	B	MTL	Worse	Control	Stars
14	11	A	PDI	Better	Control	Hoops
	12	B	PDI	Better	Nutrition	Stars
15	14	A	PDI	Worse	Control	Hoops
	15	B	PDI	Worse	Nutrition	Stars
16	5	A	NIP	Worse	Nutrition	Stars
	9	B	MTL	Worse	Control	Hoops
17	2	A	NIP	Better	Nutrition	Stars
	6	B	MTL	Better	Control	Hoops
18	14	A	PDI	Worse	Control	Stars
	3	B	NIP	Better	Health	Hoops
19	11	A	PDI	Better	Control	Stars
	15	B	PDI	Worse	Nutrition	Hoops
20	8	A	MTL	Better	Health	Stars
	12	B	PDI	Better	Nutrition	Hoops

SET THREE

Choice Pair	Stimulus #	Option	Label Format	Nutrition Profile	Product Claim	Cereal Variant
21	3	A	NIP	Better	Health	Hoops
	4	B	NIP	Worse	Control	Stars
22	6	A	MTL	Better	Control	Hoops
	7	B	MTL	Better	Nutrition	Stars
23	9	A	MTL	Worse	Control	Hoops
	10	B	MTL	Worse	Nutrition	Stars
24	12	A	PDI	Better	Nutrition	Hoops
	13	B	PDI	Better	Health	Stars
25	15	A	PDI	Worse	Nutrition	Hoops
	1	B	NIP	Better	Control	Stars
26	9	A	MTL	Worse	Control	Stars
	13	B	PDI	Better	Health	Hoops
27	6	A	MTL	Better	Control	Stars
	10	B	MTL	Worse	Nutrition	Hoops
28	3	A	NIP	Better	Health	Stars
	7	B	MTL	Better	Nutrition	Hoops
29	15	A	PDI	Worse	Nutrition	Stars
	4	B	NIP	Worse	Control	Hoops
30	12	A	PDI	Better	Nutrition	Stars
	1	B	NIP	Better	Control	Hoops

A5.2 Respondent Demographics

Demographic Variable		Percent
Gender	Female	56
	Male	44
Age range (years)	18-25	12
	26-30	10
	31-35	18
	36-40	20
	41-45	15
	46-50	20
	51-55	5
	56+	<1
	Missing	<1
Relationship status	Living with partner	78
	Solo parent	22
Educational attainment	No formal qualification	15
	School qualification	30
	Trade qualification	9
	Tertiary Certificate or Diploma	24
	Bachelor's Degree	14
	Postgraduate Degree	8
Household Income	Less than \$20,000	7
	\$20,000 – \$39,999	22
	\$40,000 – \$59,999	24
	\$60,000 – \$79,999	20
	\$80,000 – \$99,999	12
	Over \$100,000	14
Dieting	Yes	38
	No	62

A5.3 Choice Response Pattern

Subset 1	Pair 1	Pair 2	Pair 3	Pair 4	Pair 5	Pair 6	Pair 7	Pair 8	Pair 9	Pair 10
Cereal A	77	31	82	62	117	84	149	96	159	125
Cereal B	136	177	110	151	88	116	72	112	55	94
Neither	56	61	76	56	64	69	47	60	55	50
Missing	0	0	1	0	0	0	1	1	0	0
Subset 2										
Cereal A	87	54	92	76	126	99	149	99	152	115
Cereal B	129	165	107	141	91	112	70	114	66	102
Neither	50	48	68	49	50	56	47	54	49	50
Missing	1	0	0	1	0	0	1	0	0	0
Subset 3										
Cereal A	91	42	93	52	116	90	150	89	146	124
Cereal B	114	161	94	157	85	109	62	111	62	93
Neither	61	63	79	57	65	67	53	66	58	49
Missing	0	0	0	0	0	0	1	0	0	0

A5.4 Distribution of Total ‘Neither’ Selections per Respondent across Subsets

‘Neither’ responses per participant	Subset 1		Subset 2		Subset 3	
	n	%	n	%	n	%
10	32	12	33	12	29	11
9	4	1	4	2	7	3
8	3	1	5	2	1	0
7	2	1	5	2	2	1
6	4	1	6	2	2	1
5	7	3	4	2	7	3
4	5	2	10	4	5	2
3	7	3	7	3	10	4
2	16	6	15	6	19	7
1	34	13	22	8	53	20
0	155	58	155	58	131	49
Total n	269		266		266	

A5.5 Number of Pairs for which Respondents Opted to View the Side Panel Image

	Total number of pairs for which side panel was viewed										
	0	1	2	3	4	5	6	7	8	9	10
n	219	187	75	37	34	32	23	27	33	45	89