



Rapid review of evidence

The supermarket as an environment for facilitating dietary behaviour change

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Commissioned by the National Heart Foundation of Australia.

1300 36 27 87

www.heartfoundation.org.au

June 2012

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ISBN 978-1-74345-019-2

PRO-136

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Advocacy statements

The National Heart Foundation of Australia is a non-profit, non-government health organisation that undertakes activities including health promotion and educational activities, support of research and the Heart Foundation Tick Program. The Tick Program aims to influence the food industry to produce, promote and signpost foods that are healthier choices among foods of their type. Food manufacturers use the Tick program's nutritional benchmarks to formulate and reformulate foods – with resulting reductions in sodium and saturated fat, and increases in fibre, in the food supply.

The Heart Foundation's nutrition information for patients, families, consumers and health professionals is based on independent evidence-based reviews, policies and position statements. The Heart Foundation believes that the food industry (producers, manufacturers, retailers and food service companies) has an enormous role in the promotion of healthy eating and dietary patterns: through the innovation and reformulation of healthy and nutritious choices for consumers; limiting the levels of saturated fat and trans fat, salt/sodium and sugar; and practising responsible marketing promotions of these choices. The Heart Foundation supports a spectrum of approaches – voluntary and regulatory – that help the food industry produce and market products that assist people to achieve healthier eating patterns, with due consideration given to safety.

Introduction

In both developed and developing countries, the burden of chronic disease is growing decade by decade. Rapid changes in diets and lifestyles that have occurred with urbanisation, economic development and market globalisation are having a significant impact on the health and nutritional status of populations.¹ Food availability and variety have increased, with negative consequences in terms of inappropriate dietary patterns and a corresponding increase in diet-related chronic diseases, especially among socio-economically disadvantaged groups.¹

From being a local commodity food has become essentially a global one. Changes in the world's food economy have resulted in cheaper and more energy-dense foods becoming widely available and affordable. Combined with a reduction in people's energy expenditure, obesity and its co-morbidities have become national problems in many developed countries.¹ In Australia, almost 60% of adults and one quarter of all Australian children between seven and fifteen years of age are overweight or obese.² Given current trends in obesity incidence it has been estimated that in 2025 almost three-quarters of the Australian adult population will be overweight or obese.³ This has introduced a complex generational challenge for Australians that requires a multidisciplinary solution to changing population dietary behaviours.

Lowering population food intake requires individual-level changes in behaviour together with a supportive environment at the community level. The simple message to 'eat less and move more' has certainly underestimated the influence of the environment. Since nutrition interventions aimed at the individual are not likely to change eating behaviours generally, environmental and policy interventions may be more effective.⁴⁻⁶

Environmental strategies to improve food choices can be defined as those that decrease barriers to – and increase opportunities for – healthy choices, as well as policies that require that healthy choices are available or limit access to unhealthy choices.⁷ Consequently, the food retail environment (supermarkets, corner stores, delicatessens, convenience stores, markets, restaurants and takeaway outlets) is being investigated for intervention opportunities.

Environmental strategies that affect consumer behaviour directly or indirectly within the supermarket setting may have particular value as strategies for influencing food choices at the population level. This paper describes the recent literature examining the effectiveness of nutrition interventions in the supermarket setting for promoting and enabling healthier food choices.

Scope of the review

This rapid review aims to determine if nutrition interventions conducted in the supermarket setting facilitate positive changes in dietary behaviour. It builds on a summary paper *Supermarkets and dietary behaviour change* prepared for the National Heart Foundation in 2008. The previous review summarised the literature pertaining to the supermarket environment and concluded that the heterogeneity of the literature made it difficult to draw conclusions as to the effectiveness of nutrition interventions in the supermarket setting. It is hoped that this review of the literature undertaken in 2010 will provide further knowledge of this area of investigation.

The 2010 review is different in scope from the 2008 review and the literature will be examined in two parts.

Part 1 describes the influence of the supermarket on dietary behaviour.

Part 2 examines the effectiveness of supermarket nutrition interventions for changing dietary behaviour in a rapid review.

Specifically, this rapid review aims to:

1) Determine the strength of the evidence regarding supermarket interventions that:

- a) ensure or encourage availability and promotion of healthier food choices
- b) change consumer purchasing behaviour/sales of healthier choices

And to use this evidence to establish:

- a) whether these practices (could) represent 'best practice guidelines'
- b) whether, if implemented by Australian supermarkets retailers, such practices would assist in improving food supply and food choices at point of purchase.

2) Identify which, if any, interventions undertaken by supermarkets are successful in assisting consumers of lower socio-economic position to improve food purchases.

Methodology

A previous review *Supermarkets and dietary behaviour change* was developed in September 2008. Studies found in the search from the 2008 summary paper were sourced by the National Heart Foundation and re-examined for the current review.

The 2010 review searches were conducted in PubMed, Medline and CINAHL databases using MeSH search term 'diet' and free text term 'supermarket'. Studies were limited to 'human' and those published in English between January 2000 and August 2010. Grey literature sources were also searched in the Informit Health database using free text terms like 'supermarket' and 'consumer preferences'/'consumer behaviour' or 'shelf space' or 'healthfulness index'. Grey literature was also sourced via Google and media sources such as *Health News* or *Choice* magazine. Studies identified as important from reference lists were also included.

After reading the abstracts the studies were grouped into those that contributed to Part 1 or Part 2 of the rapid review. Literature examining the supermarket nutrition environment was used for Part 1 and literature identified as having undertaken a nutrition intervention within the supermarket setting was assigned to Part 2.

It was decided to favour peer-reviewed intervention studies for Part 2; however reports that were not peer-reviewed have been included based on the quality of their reviews. Studies using both objective (sales data) and subjective (self report) measurement outcomes were included. Supermarket sales data has proven to be a valid objective measure of household dietary behaviour, but not of individual consumption.^{8,9} Studies measuring individual dietary intake with validated tools as well as studies calculating dietary intake from supermarket receipts were also included. Interventions conducted in restaurants, fast food outlets, canteens, worksites and education facilities were not included in this review.

We addressed the quality of the studies using the Critical Appraisals Skills Program¹⁰ classifying studies as 'good quality', 'moderate quality' and 'poor quality' based on the sets of questions relevant to each study design. We also assessed the strength of the evidence using a system designed by the Victorian Government Department of Health for assessing health promotion interventions¹¹, which are different from controlled clinical trials. Given the nature of the question, and the likely field of studies available for the review, the National Health and Medical Research Council's evidence strength classifications were not suitable.

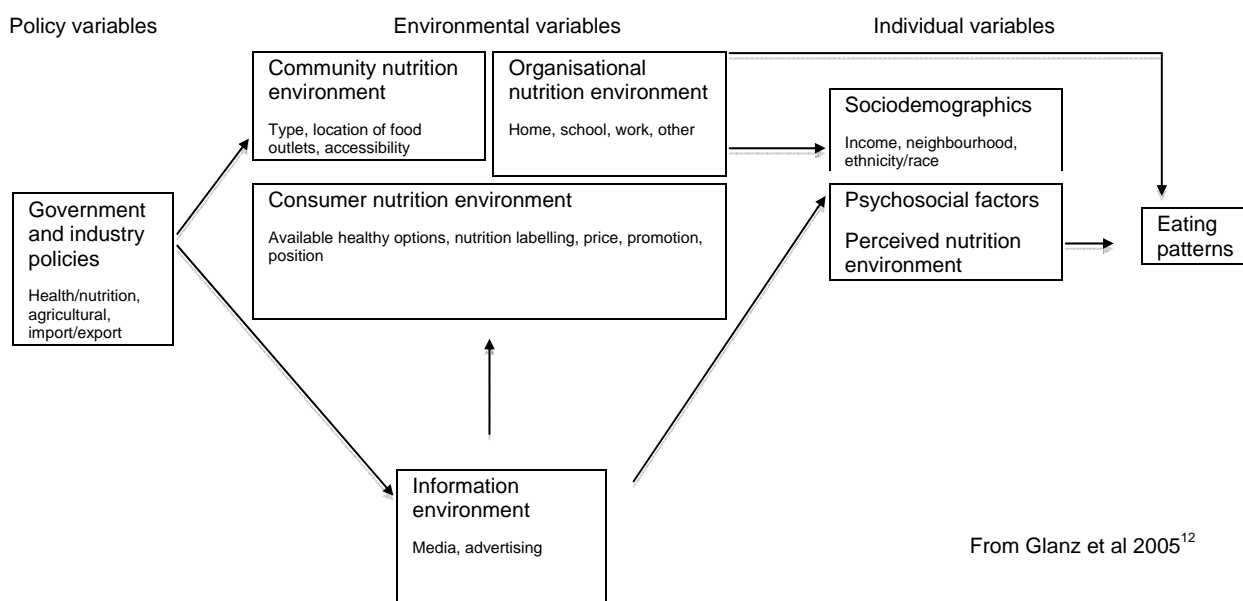
Part 1.0: The influence of supermarkets on dietary behaviour

1.1 Supermarkets are part of our nutrition environment

In recent years, the role of the environment in regulating eating behaviour has been widely studied to try to explain why obesity incidence is increasing, despite health organisations' and governments' best efforts to educate consumers about energy intake and physical activity.⁵ Changing eating behaviour is a complex and multifactorial process. Food choices and eating behaviour are dependent on environmental, political, economic and psychosocial variables. In order to influence behaviour, we have to understand the role that each variable plays in individual choices, and the mechanisms by which they act on these. A model for understanding the interplay between variables that affect eating behaviour can be seen in Figure 1.¹² According to Glanz et al., there are three key variables influencing eating behaviour: policy, environment and individual factors. The model distinguishes between the nutrition environment and the information environment, with the latter taking into account psychological influences through advertising and media that affect our perception of foods.

The nutrition environment is a more complex set of variables that affects variables that involve access to foods; price; availability; and the context in which food is consumed. Factors such as the geographical layout of areas and communities, supermarket accessibility (including distance and opening hours), and location of food outlets (including fast food outlets and fresh produce stores) play a role in the foods we purchase and ultimately consume. There are also factors influencing the individual at home, such as food availability, frequency of shopping, food preparation skills, the attitudes of the main grocery buyer and the socio-economic status of the family unit.¹³ Parental influence may then filter down as a primary influence on children's' food choices.¹⁴ Other factors such as nutrition labelling, price, promotion, portion size, taste, and convenience are more ubiquitous and may directly or indirectly influence choices, whether at the point of purchase or at the moment of consumption.¹²

Figure 1. Model of community nutrition environments



It can also be argued that, in addition to the model in Figure 1, economic influences such as supply and demand and the relative cost of food affect the type and nutritional value of the foods purchased.¹³ Nevertheless, the environment affects eating behaviour in two ways, both *directly*, for example where we choose to shop, where we choose to eat and the availability of healthy options; and *indirectly*, for example by moderating individual variables such as psychosocial factors and changing our perception of foods. This multi-faceted web of interconnected influences on eating behaviour makes the work of public health advocates aiming to improve eating practices extremely complex. Understanding the different nutrition environments and their influence is central for initiatives that are designed to promote healthy eating.¹⁵

The theory that humans are automatically inclined to eat what they are surrounded by¹⁶ may explain why interventions working only at the individual level to change eating behaviour do not always work. Instead, theorists propose that we also have to change the food environment so that if humans are naturally sensitive to food-based stimuli, then they may respond positively at a subconscious level if these stimuli are adjusted,¹⁶ for example by reducing portion sizes or increasing healthy options at the supermarket.

1.2 Supermarkets and the food supply

There are five core decisions made by supermarket operators that have important implications for nutrition and diet: the location and format of outlets, the food they sell, the prices they charge, their promotional strategies and their nutrition-related activities.¹⁷ Supermarkets are for-profit businesses and as such their business is primarily concerned with generating revenue and

prompting the consumer to buy more. Supermarkets are designed in such a way as to manipulate consumers' purchasing patterns;¹⁸ and their 'one-stop shopping' approach has reduced consumers' reliance on small stores and markets for their food purchases.^{17,19} This means that their influence on what we buy is growing.

Supermarkets are increasingly becoming the gatekeepers of the food supply. The top 30 supermarket grocery chains in the world control an estimated thirty-three per cent of all global food sales.²¹ This means that the modern retail sector wields significant power and influence in terms of both production and consumption of foodstuffs. In the United Kingdom (UK), the five major retailers account for 61% of food retail and in Germany and France that figure reaches 80%.²⁰ In Australia, the full service supermarket channel dominates sales of most food and beverage categories, with Woolworths and Coles holding approximately 78% of the Australian market share of the grocery channel, excluding liquor sales.²² This represents one of the most concentrated retail markets in the world, together with that of Finland.²⁰ The power of the retail giants extends far beyond what products they sell, to their purchasing, pricing and buying policies.²⁰ The combined effects on food prices, availability, supply chain sustainability, food choice and quality are likely to have implications for public health.²³

It has been suggested that the growth of supermarkets and the processed food they sell encourages diets high in calories with little nutrient value.²⁴ However there is little evidence to show that people who use supermarkets more often purchase more processed food.¹⁷ It is also undeniable that supermarkets increase food variety and diversity, which can be positive for diet quality.²⁵ One of the largest geographical studies involving more than 10,000 individuals in the United States examined the relationship between obesity incidence and the presence of different food stores in neighbourhoods. Results showed that the presence of a supermarket in an area or neighbourhood was associated with a lower prevalence of obesity. In contrast, neighbourhoods without supermarkets had the highest prevalence of obesity.²⁶ This being said, the relatively low cost of processed nutrient-poor foods in supermarkets has been linked (although anecdotally) to the rise in obesity.²⁷

It has been reported that the average large supermarket contains approximately 11,700 food and beverage products and that this is increasing year by year.²⁸ Regardless of the type of foods they are selling, supermarket operators aim to encourage greater purchasing – especially bulk purchasing – for greater movement of stock and greater profit.¹⁷ Healthy foods have lower profit margins than 'unhealthy' foods, making selling healthier options a more profitable exercise for the retailer.²⁹ In addition, approximately 70% of decisions to purchase a product are made in the store at point of purchase.³⁰ This provides a key behavioural intervention point for motivating healthier food selection in the supermarket setting.³¹

1.3 Supermarket location and accessibility

Areas with supermarkets have greater access to healthier foods.³² Studies have also shown that the availability of healthy food correlates with the healthfulness of the community – communities with healthier stores have healthier diets.³³⁻³⁵ Studies in the United States have shown that healthy foods are less available in stores in lower income communities^{26,34,36,37} and less shelf space is devoted to healthy foods in their stores.³⁷ More notably, healthy foods did not cost more in lower income neighbourhoods – there was just less choice and price was dependent on store size, with smaller stores being more expensive.³⁷ In rural areas in the United States, food prices for healthier options were higher simply because consumers relied more on smaller convenience stores for their food purchases as there were fewer major supermarkets.³⁸

Supermarkets focus much of their strategic direction in their choice of the locations of their stores. Building large supermarkets in areas where populations are more affluent is common as residents have more money to spend in the store.¹⁷ Certainly in the United States, this has left lower income neighbourhoods with less access to larger food stores; studies have suggested that there are fewer supermarkets in deprived neighbourhoods²⁵ and in neighbourhoods with a greater percentage of African Americans.^{25,39} These types of neighbourhoods have been called ‘food deserts’; while the existence of such ‘deserts’ is still contentious amongst food environmentalists⁴⁰⁻⁴⁴ it is theorised that they have three key elements: higher fruit and vegetables prices, socio-economic deprivation and a lack of local supermarkets.⁴⁵ At the same time, differences in access to supermarkets between lower income and more affluent neighbourhoods have been associated with some measure of diet inequality between their residents.^{25,39}

Certainly in the Australian context, advantaged neighbourhoods in Melbourne were shown to have a greater number of supermarkets and fruit and vegetable stores within a two kilometre radius of homes. The density of fruit and vegetable stores per 10,000 residents was also found to be higher in advantaged neighbourhoods.⁴⁶ It was shown that residents of lower socio-economic status (SES) communities had to travel further distances to access supermarkets or fruit and vegetable stores compared to those from more advantaged neighbourhoods. In addition, the ability to access transport and to travel to and from the store carrying parcels was reduced in lower SES areas and these people were also less likely to have private modes of transport.

In cities which are geographically large and designed with auto mobility in mind, lack of private transport can make access to healthy foods very difficult, especially for the disadvantaged and the disabled.⁴⁰ Even living within 2.5km of a supermarket is still an issue when private transport is lacking.^{40,47} A recent study found that providing a supermarket-owned shuttle bus to transport vulnerable customers to the store would be self supporting if just 10% of households without a car were able to then shop at the store due to transport access.⁴⁷ Certainly, by these calculations

supermarket profits would increase should more households make use of the service. However, it is not known from the results of the study whether the diets of individuals improved as a result of the service: that is, whether access to the store resulted in more healthful food choices.

The distance one has to travel to the supermarket has been associated with the healthfulness of the diet, particularly in urban centres. A large study of 918 pregnant women in North Carolina found that women living more than six kilometres from a supermarket were more than twice as likely to have a lower diet score than women living within two miles of a supermarket.⁴⁸ A recent study of 919 Americans found that the presence of a supermarket in a neighbourhood was associated with greater fruit and vegetable intakes amongst residents.⁴⁹ This was later supported by one of the largest geographical food environment studies in the United States, which showed that fruit and vegetable consumption in urban centres increased as distance from a supermarket decreased.⁵⁰ Correspondingly, the odds of obesity decreased as distance from the supermarket decreased, a finding supported by Morland et al.²⁶ However, in Morland's study, this finding was not replicated in rural areas, where there was no association between obesity and distance from a supermarket. This may indicate that other physical, cultural or social factors affect eating behaviours in rural areas, such as greater automobile ownership; familiarity with travelling long distances for medical services and groceries; and less issue with travelling long distances, as traffic congestion is not as common in rural areas.⁵⁰

1.4 Supermarket prices and promotion

Whilst store location and accessibility of healthy options have strong implications for nutrition, food prices are likely to be just as, if not more, influential. Food costs have been reported as the second most important factor in food decisions, behind taste.^{32,51,52} Food prices have increased over the last decade⁵³ and in 2007, the international price index rose by 40%. After a small drop in 2009, it is set to increase even further.¹³

Healthier foods are often more expensive than less healthy foods^{32,37,54} and for many the higher cost of healthier options is a key barrier to making healthy food choices^{12,13} especially for fruit and vegetable purchases.^{55,56} More disturbingly, the higher cost of healthier food usually affects the most vulnerable groups¹³ resulting in less healthful diets in disadvantaged^{27,31} and in rural, more remote communities.^{40,54,57} In fact, research has shown that fresh and unprocessed foods are the first foods to be omitted when food security is threatened.⁵¹ This is often a direct response to the high cost of fresh, unprocessed foods when compared to more energy-dense, low-nutrient options. A study of 372 foods and beverages in Seattle found that the monetary cost of foods with the lowest energy density was \$18.16/1000kcal compared to \$1.76/1000kcal for foods with the highest energy density. They also found that foods with higher energy density were more resistant to

inflation, with only a 1.8% increase in price over two years compared to an almost 20% increase in price for lower energy density foods.⁵⁸ This is of great concern to public health advocates, and calls for taxes on unhealthy foods to bridge the price gap have become prolific over the years.²⁹ Since supermarkets often offer processed foods at lower prices than convenience stores and corner stores, this reinforces value for money for the consumer and increases purchase intent for processed foods within the supermarket setting.¹⁷

There is some evidence that monetary incentives like coupons, price promotions or discounting of healthier options may provide one way to reduce the economic barrier to healthy choices.^{36,59} In general, consumers do not have a good understanding of pricing and they tend to use similar products in the store for reference, thus allowing the supermarkets the ability to govern perception about the value of a product.¹⁷ This means that supermarkets' pricing policies can have grave implications for public health when consumers perceive healthier options to be more expensive.

Australians spend almost 18% of their total household budget on food and this figure can reach up to 32% in lower SES groups.²³ A key indicator that price is important to Australian consumers is the rapid growth in private label products in the major supermarkets as well in the competitor chain, Aldi. Private label in Australia now accounts for almost a quarter of grocery sales, as it provides a cheaper option with often comparable nutrition and taste characteristics.⁶⁰ In fact, it is such big business that Coles' future strategy will focus on increasing private label share over the next few years.⁶¹

1.5 Supermarket layout and shelf space allocation

It is undeniable that supermarkets have more space than other food stores. One would assume that they have greater amounts of floor space for fresh produce and shelf space for healthier options. However, a recent study examining the proportion of shelf space devoted to fresh produce and snacks in 419 stores in Louisiana and Los Angeles counties, found that, although supermarkets devoted more space to fresh produce than other stores, they also devoted the greatest amount of space to unhealthy snack items.⁶² Furthermore, shelf space allocation influences food purchases. Marketing studies identified the importance of the amount of shelf space devoted to a product and its influence on sales almost 40 years ago. If the amount of shelf space for a particular item was doubled, sales of that item increased by about 40%.¹⁶

Shelf space allocation has also been shown to correlate with community diet. Studies in the United States that have examined the proportion of shelf space devoted to healthier items (for example the *Shelf Space Healthfulness Index*) showed that there was a correlation between stores with higher healthfulness scores and healthier community diets.^{33,34,63} In addition, more healthful stores with greater shelf space devoted to healthier options were found to provide more health education

materials for customers³³; however these stores were found to be predominantly established in advantaged neighbourhoods³⁷ and in communities with higher education levels.⁶³

A recent Australian study compared shelf space allocation of unhealthy foods in nine Sydney supermarkets in low and high SES areas.⁶⁴ They also analysed shoppers' dockets for purchases of confectionery; sugar-sweetened, carbonated beverages and cordials; sweet biscuits and cakes; and crisps and popcorn. The study showed no difference between low and high SES areas in the amount of shelf space dedicated to healthier foods. There was also no correlation between shelf space and sales of non-core foods in any of the supermarkets. Despite no difference in shelf space allocation between low and high SES stores, low SES shoppers purchased significantly more non-core foods than high SES shoppers, especially chips and sugar-sweetened, carbonated beverages and cordials. This is an interesting finding, which indicates that food purchases are governed by influential factors such as price, taste, promotion and perception rather than shelf space.

Supermarkets are also well aware of studies that showed sales increased when special displays and end-aisle displays were used and when items were placed at eye level.^{18,65} Grocery chains aware of this principle maximise their revenues by arranging large, prominent displays of high profit items in these ways.¹⁶ Supermarkets are also more likely to place staple foods such as milk, bread and eggs in separate locations around the supermarket to encourage consumers to look for them amongst the aisles. This makes impulse buying more likely as well the purchase of packaged goods within the aisles.⁶⁵ Certainly, placing confectionery at checkouts is designed to maximise spontaneous purchases in adults, but is also associated with visibility for children who are likely to 'pester' the adult shopper into purchasing unhealthy items.¹⁴ This has become a contentious issue for public health advocates aiming to reduce children's exposure to unhealthy food items.

1.6 Supermarkets and nutrition education

Together with the fast food chains, supermarkets have been viewed as environments that promote 'obesogenic' diets, as a consequence of being the main source of readily available and accessible food and of clever promotion.²¹ Thus, supermarkets have played a part in the dramatic growth in Western health-related problems such as heart disease and diabetes.²¹ A large survey conducted in five countries (US, UK, Germany, Argentina and China) found that 45% of consumers think food companies should play a role in addressing obesity. The study also revealed that 45% of consumers believe that food companies should be responsible for their health and wellbeing into the future.⁶⁶

Supermarkets are very adept at allying themselves with the next big food trend because they play a leading role in creating the major preceding socio-cultural and economic trends.⁶⁷ Key consumer trends that are currently shaping the food retail industry are convenience, premiumisation and

choice⁵³ as well as freshness.⁶⁸ Many researchers believe consumers are increasingly becoming more interested in health and that this is driving the nutrition agendas of food retailers as part of their social agenda.^{19,53,68} There is also a shift towards organic foods – which may be more for health reasons rather than environmental ones.¹⁹ In fact, consumers clearly identify the supermarket as influential in helping them to meet their health and lifestyle choices. In one Finnish study of 299 customers who were asked if it was a good idea that the supermarket promoted health, 92% answered absolutely in favour.⁶⁹ Only eight per cent had some doubts or were clearly negative to this idea. Women appeared to be slightly more supportive of this concept than men, and men were less likely to perceive nutrition as important when shopping than women.³¹

The food industry now finds itself at a crossroads, where it must meet the financial demands of shareholders and owners, but also of various stakeholders including the consumer. Consumers are becoming increasingly demanding when it comes to transparency of information and are recognising that food companies have a role to play in educating the consumer about the foods they sell. Recently there has been increasing interest in the role of corporate social responsibility (CSR) by industry in general, and Corporate Nutrition Responsibility (CNR) by the food industry, in improving brand image. Studies have shown that retailer brands can indeed be distinctly positioned through aspects such as through brand image and ethical company practices, as well as price.⁷⁰ This can then affect which outlets consumers buy from and what they choose to buy.⁵³ Some ‘early adopters’ are beginning to consider their new role in responsible and ethical practices, including aligning their products with nutrition and healthy eating principles, simply because it is unavoidable. CNR strategies can include promoting healthy diets, improving the nutritional quality of their products, providing better nutrition information and practising responsible marketing of foods.

Certainly, one key strategic move by supermarkets to increase their visibility in the health sector is through developing alliances with key stakeholders and health professional organisations.⁶⁷ Supermarkets are increasingly trying to assert their nutrition credentials by providing more information to consumers through labelling schemes, salt reduction schemes and fruit and vegetable promotions¹⁷ – a clandestine approach to image-building, but nevertheless an effective CNR strategy. Supermarket managers in Sweden reported that when the supermarket was shown to be promoting nutrition on the premises, this gave consumers a more positive image of the store.⁷¹ Relationships with celebrity chefs, who promote various products within the store through recipe cards, create the perception that the food sold is restaurant-quality.⁷² Recipes that target particular health conditions have also become increasingly popular as the supermarkets battle to capture a greater share of the health food market.⁷³ In addition, maintaining a dialogue with customers about fresh produce quality and availability – for example the Woolworths Fresh Market Update – may control expectations about produce quality, price and freshness.⁷⁴ In other words, these are strategic manipulations of the information environment to control the perception of foods

and food prices. One study conducted in supermarkets in Australia⁷⁵ did show that retailers and public health advocates could work together effectively, but the paper failed to show results for health outcomes. In Australia there has been some work conducted by the Dietitians' Association of Australia and the Coles chain of supermarkets as part of a large health promotion project. The *7-a-day* program, launched in 1999, was designed to increase consumption of fruits and vegetables.⁷⁶ The program promoted the key messages that Australians need to eat five servings of vegetables and two servings of fruit every day to reduce the risk of disease, and the objective was to increase consumption of fruit and vegetables by 0.25 servings each year. The educational component was multi-strategy and included brochures, in-store demonstrations, competitions and loyalty card bonuses. A website was set up and there were ongoing promotions in women's and lifestyle magazines. The program evaluation showed that between 1998 and 2000 reported consumption of fruits and vegetables increased by 0.4 servings per day. This was a promising result, although actual consumption increases did lag behind increases in awareness of the program message – suggesting that interventions may require some length of time to allow the message to permeate. Nevertheless, this was a program with a 'win-win' situation for both parties involved.

It is important to remember that supermarket social responsibility policy may not always lead to action. A report by the Centre for Food Policy, City University in London examined the CSR commitments made by 25 of the largest food manufacturers and retailers in the world.⁷⁷ Out of the 25 companies, there were ten retail chains: Ahold (Netherlands), Aldi (Germany), Carrefour (France), Ito-Yokado (Japan), Kroger (USA), Metro (Germany), Rewe (Germany), Schwarz (Germany), Tesco (UK), Wal-Mart (USA). Whilst most of them mentioned nutrition as part of their CSR commitments, only Tesco had measurable performance indicators and a policy commitment to having a healthier range of products. Retailers also ranked poorly when it came to responsible communications and engagement with stakeholders. These findings highlight the need for supermarkets to be accountable for their policies and commitments.

1.7 Supermarkets and nutrition policy

There is potential for policy that regulates the nutrition environment to facilitate prevention of chronic diseases such as obesity.⁷⁸ This could include policies that directly affect and involve supermarkets, such as governing management of land use by local government (for example retail tenancy lease agreements and planning and zoning laws); nutrition labelling and health claims; incentive systems for welfare recipients to buy healthy food; food taxes/subsidies; and perhaps, product placement in stores.⁶ Policy may also include a regulatory framework for food pricing, the imposition of taxes on food, as well as subsidies for farmers and growers.²⁰ Contributing to such challenges are the complexity of the food industry, the feasibility and sustainability of a funding

mechanism to lower prices of healthier foods, and the need for substantial commitment to policy from central governments and the food industry.⁷⁹

There have been calls recently for a system that taxes unhealthy food items in a bid to make them less attractive to the consumer. There is very little evidence in Australia to show that the introduction of taxes will have an effect on actual dietary behaviour; however in modelling exercises the introduction of a 10% tax on unhealthy non-core food items has been shown to improve health outcomes.⁸⁰ At present there are no such taxes aimed at deterring poor eating habits, but rather food taxes more likely designed to raise revenue, such as GST.²⁹ In other nations, there is some evidence that taxes have an impact. In 18 states in the United States there is a tax on soft drinks and certain snacks, which has been estimated to raise \$1 billion annually.²⁹ In Maryland the introduction of a tax on snack foods led to a \$US500,000 reduction in sales of Frito-Lay. In California, a tax on certain snack foods resulted in an estimated 10% drop in sales of snack foods. Sensitivity analyses suggested that demand is very sensitive to even small rises in prices of snack foods²⁹. Consumers seem to respond to a change in price as they did with tobacco and cigarettes.⁷⁹ In this case, although even small taxes may get public support, it is important to recognise that the most vulnerable groups are likely to be the most affected by taxes.²⁹ In addition, introduction of a tax doesn't guarantee that the price of healthy foods will decrease – which could result in high prices for food across the board. In addition, the food industry is likely to oppose *any* idea of taxes, and in the past taxes have been withdrawn after short periods of time due to industry lobbying.²⁹

Part 1 of the review has highlighted the complex influences of the nutrition environment on our ability to access and choose healthier foods. Part 2 summarises the research within the supermarket setting that examines the effectiveness of interventions designed to facilitate making healthier choices.

Part 2.0: Can supermarket nutrition interventions positively affect dietary behaviour?

The literature search conducted in 2010, together with intervention studies listed in the 2008 rapid review, yielded 20 intervention studies in the supermarket setting (see *Appendix 1*). These studies were published between 1991 and 2010.

Of the 20 papers, two papers presented different aspects of the 'Eat for Health' trial in Washington and Baltimore, USA^{81,82} and two papers presented different aspects of a trial in one supermarket in Mikelli, Finland.^{69,83} There were therefore a total of 18 intervention trials reported on.

Of the 18 different intervention trials, ten were conducted in the USA, two in Australia, two in New Zealand, one in Canada, one in Scotland, one in the Netherlands and one in Finland. Studies ranged from just a few weeks^{84,85} to up to two years^{81,82,86} in duration. There were five randomised control trials (RCTs)^{85,87–90} differing in length from eight weeks⁸⁵ to 12 months.⁸⁹ There was one non-randomised control trial in which supermarkets in three cities were matched based on demographics and assigned to intervention and control conditions⁹¹; there were five matched control comparative trials^{43,81,82,92–94} and seven impact evaluations.^{39,69,75,83,84,86,95,96} In addition to the eighteen intervention trials, there were four systematic reviews, two peer-reviewed^{97,98} and two non-peer reviewed^{99,100} and each examined an individual intervention method and its effectiveness.

2.1 The effect of point of purchase information (POPI) interventions

Ten intervention trials^{75,81–84,86,88,90,93–95} examined the effectiveness of point of purchase information (POPI) in the supermarket setting. POPI interventions included shelf labelling,^{81,82,84,86,90,93,95} brochures and leaflets,^{75,81,82,84,86,88,90,93} signage and posters.^{75,81–83,86,88,90}

Six good quality studies were reported, of which three used sales data as an outcome measure,^{81,86,93} two used self-reported purchasing behaviour^{82,88} and one used self-reported fat intake from food frequency questionnaire (FFQ).⁹⁰ One other study used a FFQ to measure fruit and vegetable intake during the intervention, but this was in conjunction with self-reported purchasing behaviour.⁸⁸

The latter study was a randomised control trial and was conducted over a six month period to increase fruit and vegetable intake by supermarket consumers. The intervention was a multi-strategy trial combining POPI – using leaflets, recipe cards and signage – with a linked 50c coupon redeemable on each fruit or vegetable item. This study also measured actual consumption by the 955 participants with a validated FFQ. They found no differences between control and intervention for fruit and vegetable purchases or for consumption. The other randomised control trial examining POPI was conducted using 2203 customers from thirteen supermarkets in the Netherlands.⁹⁰ The trial examined the effect of nutrition education (recipe cards, healthy eating brochures and a self help manual) and shelf labelling (low fat labels in nine food categories) on fat intake measured by a FFQ. They found no difference in self-reported fat intake between the control group, those exposed to shelf labelling and education and those only exposed to education. They also found no significant difference between the intervention groups for awareness of or intention to use information to reduce total fat intake.

The other good quality studies were matched control comparative trials examining the effect of shelf labelling to indicate ‘recommended’ and ‘other than recommended’ foods in 40

supermarkets;^{81,82} labels with simple messages such as 'low fat', 'low energy', 'low cholesterol' and 'low sodium' in 40 supermarkets;⁹³ and a system called *Guiding Stars*, which placed one, two or three stars on products according to their healthfulness in 168 stores of a supermarket chain.⁸⁶ All of these shelf-labelling schemes showed modest positive intervention effects on sales in certain food categories. In general, in these good quality studies, POPI showed modest effects on actual sales and on self-reported purchasing behaviour.

There were three moderate quality POPI interventions. One involved 600 customers from one supermarket in Finland for one year and measured sales in designated food categories that were selected for saturated fat, fibre and salt levels based on a 'heart healthy' theme, for example milk, sausages and bread.⁸³ Products were grouped on the shelf under 'Healthy Choices' and local newspapers used advertising to raise awareness. The study showed no shifts in proportional sales of healthier items, but rather spikes in sales when food companies chose to promote their items during the eight weeks of the intervention. The weakness of this study was that it failed to determine if consumers understood what role saturated fat and salt play in heart health and if therefore the message failed to resonate with consumers. The other moderate quality interventions^{94,95} both relied on self-reported behaviour as an outcome measure and found that although awareness was good, this failed to translate to purchasing behaviour. In addition there was no objective measure of effect in these studies; therefore translating these measures to actual purchasing behaviour was not possible.

There was one peer-reviewed systematic review published in 2004, which examined the effectiveness of POPI in the supermarket setting.⁹⁷ Out of the 10 studies included in the review (all of which were published prior to 1997), five showed no effect on purchases^{88,101–104} and five showed shifts in sales consistent with a positive intervention effect.^{82,93,105–108} The other report examining POPI was published in 1997 by the Division of Public Health and Primary Health Care, Oxford University and was not peer-reviewed.¹⁰⁰ The report reviewed eight interventions using POPI in the supermarket setting. Only studies using objective measurement outcomes (sales data) were included. Out of the eight interventions, four were good quality.^{81,93,102,109} Three out of the four interventions showed positive intervention effects. Two of those were conducted over a two-year period and showed small increases in market share (1–2%) for selected food products – such as fresh produce, baked goods, meat, canned vegetables, cereal and frozen vegetables – that were part of a shelf-labelling scheme.^{81,93} The other study was a randomised control trial over eight weeks using in-store videos to assist customers with making healthier choices.¹⁰⁹ Customers in the intervention supermarket were exposed to a series of short videos, and then based on their intended purchases, were educated on healthier choices. The study showed that the intervention group reduced their total fat purchases from 38% to 34% of energy over the intervention, compared with no change in the control group. However, this reduction was not sustained four

weeks post-cessation of the intervention. The final study showed no effect on sales of 246 food items over a one year period following a shelf labelling scheme.¹⁰²

It seems that most studies measuring sales in food categories showed positive effects in selected categories and these studies were usually ones of longer duration. Studies relying on self-reported purchasing behaviour seemed to show little or no effect. This may suggest that consumers respond differently to POPI based on the type of food being sold or promoted, which in turn showed positive intervention effects for certain food categories. Certainly it was shown in some of the longer intervention trials that there were peaks in sales of items that were actively promoted by the supermarket.^{81,83}

With most of the studies there was no examination of actual consumption so it is difficult to postulate whether these interventions in fact affected eating behaviour. It also seems that studies using shelf-labelling schemes in conjunction with leaflets or brochures were more likely to show a positive effect over the long term.

There is some evidence of the effectiveness of POPI for increasing sales of selected foods but no evidence of effectiveness for changing consumption of any foods.

Key findings from POPI interventions:

- Studies of longer duration showed greater effect. High quality studies over one to two years were able to show shifts in sales despite individual category promotions within the intervention period.
- Studies using objective measures of effect such as sales data were more likely to show effect.
- Studies focussing on specific food categories rather than general nutrition information showed greater effect.
- POPI needs be tailored according to the segmentation of shoppers visiting the store. Messages that work well with low-income shoppers may be different to those that work well with shoppers with fewer disadvantages.
- Multi-strategy studies – such as shelf labels plus recipes and leaflets, combined with coupons or advertising campaigns – were more likely to show moderate effects.
- Simple guidance systems such as the star ratings of the *Guiding Stars* program are more likely to be accepted by a wider audience and are easier to interpret rather than nutrient focused messages. Star rating systems indicating healthier choices eliminate the need for knowledge of nutrient-disease relationships.

- There is a need to examine food consumption post-purchase to determine if POPI affects actual consumption of foods.
- There was little POPI research in low-income groups. There is a need to identify the messages that work best in low-income and vulnerable groups.
- POPI may need endorsement from a health agency to maintain credibility and independence from the food industry.
- In order for POPI campaigns to work in-store, there needs to be a good relationship with the retailer. Involving them early in the campaign and training their staff to implement the program is fundamental. Each store needs someone to coordinate the campaign and to be responsible for its implementation.

2.2 The effect of monetary incentive interventions

Six studies examined monetary incentives as an intervention method. Six issued coupons for price discounts^{75,85,87–89,96,110} and one offered discounted prices at the point of purchase.⁷⁵

Out of the six, four were randomised control trials.^{85,87–89} Two of the four trials offered coupons specific to fruit and vegetables. One trial was good quality and involved 955 customers from eight rural supermarkets, but showed no effect on fruit and vegetable purchases as a result of the coupon scheme, although coupon usage was high.⁸⁸ An explanation may be that the sample group already had high intakes of fruit and vegetables – so they may have used the vouchers to purchase what they normally would in a single shopping trip, resulting in no change in consumption. The other study was moderate quality and failed to measure change in purchases due to the coupon scheme,⁸⁷ but the researchers did find the vouchers were effective for motivating people of low socioeconomic status to buy fresh fruit and vegetables.

Another randomised control trial examined the effectiveness of a video booth that showed short educational videos and then offered discount coupons on healthier items. Researchers measured customer purchases from dockets and calculated the total fat and fibre purchased as a surrogate for consumption data.⁸⁵ They found that the best results were seen in those who watched the video and then used the coupons to make healthier choices. People who redeemed the coupons decreased their calories from fat and increased their dietary fibre intake to the greatest extent and were more likely to reach the minimum servings of fruit and vegetables. Previous work by this group also showed that without the use of coupons to stimulate purchasing, the intervention effects were smaller.¹⁰⁹

The most recent randomised control trial was conducted in New Zealand and examined the effect of tailored nutrition education (based on baseline purchases) and price discounts on food purchases by 1104 customers.⁸⁹ The study used a hand-held scanner that allowed individual shopping practices to be examined and followed for one year. This was a very good quality study with robust outcome measures, six-month intervention and a large sample size. Intervention groups were randomised to either education only; price discounts only or price discounts and education. The control group received no intervention. Discount coupons could be redeemed for a 12.5% price reduction on healthier food items. The study showed that there was no effect of any of the interventions on nutrient purchases (calculated from nutrients in foods purchased); however, groups receiving discounts purchased a greater number of healthy items at six months and this was sustained six months after the intervention. Interestingly, the price discounting groups were not buying fewer unhealthy items, therefore there was no change in nutrient purchases or in final monetary expenditure. The authors concluded that pricing interventions might be more effective in changing food purchases than nutrition education interventions, as discounting removes the 'personal responsibility' aspect associated with changing behaviour based on knowledge. However, the finding showing customers were still spending the same amount of money at each shop suggests that there were other variables than price affecting their choices.

There was one good quality impact evaluation that examined the use of coupons together with prompting/tasting by demonstrators to encourage shoppers to change to reduced fat food items (milk, desserts and salad dressing).⁹⁶ The study showed that although coupons did not encourage people who would not normally buy the reduced fat item to buy it, they did encourage consumers who would normally purchase the higher fat items to switch to the reduced fat items. The intervention worked particularly well for frozen desserts, but not as well for milk or salad dressing. Researchers concluded that milk may be a food item that is very specific for taste and may be resistant to change based simply on fat content. Nevertheless, the study did show that taste was one of the most important factors governing purchase and that the taste testing aspect of the trial was key in encouraging consumers to change their purchases. The other impact evaluation study failed to report the results of their price discounting intervention.⁷⁵

There was one systematic review examining monetary incentives and the effect on dietary behaviour.⁹⁸ Although the studies examined in the review were not conducted in the supermarket setting, they were all randomised control trials examining the effect of monetary incentives on food-related behaviour. The relevant studies showed that offering monetary incentives on healthier items did lead to positive intervention effects.^{111,112}

The evidence seems to indicate that price has influence on food purchases and that monetary incentives in the form of discounts and coupons can assist with encouraging individuals to

purchase healthier food items. However more research is needed to determine the effect of monetary incentives on changing actual consumption behaviours, and whether these incentives need to be delivered in conjunction with other nutritional strategies like POPI or demonstrations to improve outcomes. There is also a need for more research in low socio-economic groups, especially since the high price of healthier food items is a likely barrier to making healthy choices.

There is some evidence of the effectiveness of price discounts for encouraging purchase of healthier food items, but not necessarily for a reduction in purchase of unhealthy items.

There is no evidence to show that price discounts encourage consumption of healthier items.

There is some evidence to show the effectiveness of coupon schemes for encouraging purchases of fruits and vegetables in low socio-economic groups.

Key findings from monetary incentive interventions

- Coupons were effective in encouraging people to purchase healthier items and in one case this was evident in low-income people.
- Coupons seem to provide incentive for people to choose discounted items; however, it is not known whether people will continue to purchase the item once it is no longer discounted.
- More research is needed to establish whether discounting of healthier foods encourages consumption of such foods post-purchase.
- The use of monetary incentives may need to be accompanied by nutrition education or POPI to prevent consumers from purchasing more unhealthy items as a result of the savings.

2.3 The effect of increasing healthier food availability

There were three intervention studies that assessed the effect of increasing the availability of healthier food items on self-reported purchasing behaviour.^{39,43,110} All three were conducted in low socio-economic neighbourhoods. There was one good quality prospective cohort control study conducted in Glasgow, Scotland where a large supermarket stocking fresh produce opened in a deprived neighbourhood.⁴³ Postal surveys assessed the effect in the surrounding neighbourhoods (n = 412), using a smaller store in a similar location as a control. There was no difference in fruit and vegetable consumption between groups living around the large supermarket and groups living

near the smaller store. However, self-reported fruit and vegetable intake was high in all groups, which may mean that they were resistant to further changes. Despite not having access to a large supermarket, 37% of participants indicated that they ate five or more portions of fruit and vegetables a day. This led the authors to conclude that living in a 'food desert' did not necessarily impact diet quality in Glasgow. However, it is important to recognise that self-reported fruit and vegetable consumption is prone to social desirability bias, by which participants report the answer they think is desirable to the researcher – in this case, a high intake of fruit and vegetables. This may have affected baseline results and therefore failure to show effect.

Another cohort control study of moderate quality was a multi-component intervention, which aimed to increase availability of healthy foods in 20 supermarkets and convenience stores in East Baltimore.¹¹⁰ Together with POPI, stores were required to stock the healthier items specified at each stage of the intervention. Twenty similar stores in West Baltimore with no intervention were used as a control. The study showed higher awareness of POPI in intervention groups and intervention groups were more likely to have healthy eating intentions; however, the study failed to examine if the increased availability of healthier options impacted on sales, diet quality or consumption in the intervention neighbourhoods.

The final study was a moderate quality 'before and after impact' evaluation. It examined the effect of a new fresh produce case in a convenience store in a low-income neighbourhood on sales of fresh produce.³⁹ Sales data were collected for six months. The produce case was also observed by researchers for two to three hours each week to examine usage. Sales data revealed that the fresh produce case was sufficiently profitable to justify its presence and that the demand for fresh produce was enough to keep it profitable in a low-income neighbourhood. Managers and staff reported that barriers to having the case were the high fixed costs associated with initial setup and that if they received assistance with these costs, they would be more likely to install fresh produce cases. The study did not examine whether the produce case had an effect on individual purchases or consumption of fruit and vegetables.

None of the studies measured changes in actual purchasing behaviour or consumption following increased access to fresh produce. While it was shown that low-income consumers do purchase fruit and vegetables, it is not known whether this was supplemental or if consumers now chose to buy their fresh produce from the intervention store. In addition, there was no research examining increased availability of different food groups and the effect on purchasing and consumption behaviour. Research in this area is warranted – given that increasing availability of healthy food for people in low-income and also, perhaps, in more remote areas in Australia may assist with improving diet quality in these vulnerable groups.

There is no evidence of the effectiveness of increasing healthy food availability for changing consumer purchasing or consumption behaviour in low-income neighbourhoods.

Key findings from food availability interventions:

- Fruits and vegetables are consumed in low socio-economic neighbourhoods, and having them available makes them more appealing.
- Fresh produce cases are important in convenience stores in neighbourhoods where there is no supermarket or if the supermarket is less accessible; and these cases can be profitable.
- Smaller convenience stores in low-income neighbourhoods may require monetary assistance for setting up a fresh produce case or some form of incentive to do so – for example, tax breaks.

2.4 The effect of supermarket nutrition education interventions

There were seven studies examining nutrition education in the supermarket setting.^{81,82,85,89,90,92,93} However, only six interventions have been reported as two papers discussed different aspects of the same trial.^{81,82} The latter intervention (Rogers et al.) and another matched control cohort,⁹³ were multi-component trials and nutrition education was one intervention strategy, together with POPI, examined by researchers. These two interventions used monthly bulletins and a food guide to educate customers on healthy eating. Both interventions showed positive effects on sales of measured food categories following the intervention; however, it was not possible to separate the effects of POPI from the nutrition education aspects of the trial.

Another study in 105 shoppers examined nutrition education delivered via a video booth installed in two supermarkets.⁸⁵ Participants in the intervention group were exposed to a series of short informative sessions on lowering fat and increasing fibre intake. They then entered into the computer information about their regular purchases and the computer was able to suggest healthier options. Participants were given coupons to redeem on these healthier items. Sales receipts were then collected at the till or mailed to researchers. Control groups returned receipts for cash incentive. The study showed that those exposed to the nutrition education inside the booth purchased less fat from dairy, oils and prepared foods than the control group, but there was no effect on meat or snacks. They also purchased more fibre from fruit and vegetables and cereals, but not bread. This was a positive finding, but it was not possible to separate the effects of the education from the coupons in changing behaviour. Previous work by the same group showed that the intervention effect following video nutrition education was much smaller when coupons were

not used¹⁰⁹ suggesting that the price discounts were a critical factor in changing purchasing behaviour.

One of the more interesting studies was an intervention that placed a dietitian in a manned booth in a supermarket.⁹² The booth contained pamphlets and recipe cards, the dietitian ran cooking demonstrations, and customers could talk to the dietitian and ask questions. The booth improved the image of the store, and customers reported that they also found the booth to be extremely useful and were satisfied with the information supplied. However, it would have been more relevant to this review if researchers had investigated whether the dietitian's presence helped to change purchasing behaviour.

A Dutch study, discussed earlier in this review (n=2203), examined whether nutrition education led to a reduction in fat intake if it was combined with shelf labelling.⁹⁰ Education consisted of posters, healthy eating brochures and a self help manual for intervention participants. The study showed no effect of nutrition education with or without shelf labelling on fat intake in the intervention groups, but it did find that intention to eat less fat was highest in the group receiving only nutrition education. Similar results were shown in New Zealand (n=1104) when nutrient purchases were examined following exposure to tailored nutrition education with or without price discounting.⁸⁹ They showed no effect of nutrition education with or without price discounting on nutrient purchases, but those receiving the price discounts did purchase more healthy food items. The lack of effect on nutrient purchases was due to participants still purchasing more unhealthy items as well as healthy ones. The interesting aspect of this trial was the nature of the education delivered. Education was tailored to each intervention participant based on their regular shopping habits assessed by a hand held scanner at baseline. This was a very effective method for assessing individual purchasing behaviour and allowed for reproducible follow-up at six month intervals. Despite the very specific nature of the education provided to participants, there was still no change in purchasing behaviour.

The evidence for nutrition education appears to be inconclusive, with some studies showing an effect and others no effect. Nutrition education delivered through a video booth appeared to be most effective for changing purchasing behaviours, but the feasibility of such a concept for changing population behaviour is questionable. In addition, the results were very dependent on price discounts on healthier items and effect was not as large when discounts were not offered. More notably, the two good quality randomised control trials with large samples showed no effect.

There is some evidence for the effectiveness of nutrition education when combined with other strategies such as POPI and price discounting for changing purchasing or consumption behaviour.

There is some evidence of the ineffectiveness of nutrition education for changing purchasing behaviour when used as a sole strategy.

Key findings from nutrition education interventions:

- Nutrition education on its own may be too removed from the actual shopping experience to be effective and may need to be combined with POPI to deliver information at point of purchase.
- Nutrition education actually delivered in the supermarket appeared to be more effective than that delivered at home through a tailored program or self help manuals. Nutrition education combined with price discounts or coupons appeared to be effective in encouraging purchases of healthier items, but did not discourage purchases of unhealthy items.

2.5 The effect of promotional interventions

Many of the supermarket-based interventions reported in the literature include some form of promotional component. Two of the better quality POPI studies examined earlier in the review used an advertising campaign (advertisements in the local paper and on radio and television) to introduce the intervention to customers.^{81,82,93} Both studies showed good awareness of the intervention, and both showed modest increases in sales of promoted products over a two-year period. However, the latter study showed that the advertising campaign had no effect on initial sales data despite heavy use of advertising in the initial stages. A study in Finland did look at the effect of advertising (paid advertisement in local paper and news story in the paper about the campaign) on self-reported purchasing behaviour. The study found that after two phases of promotion through advertising, awareness of the program was about 50% – but this did not translate to changes in purchases. Very few participants reported that they purchased a healthier item because of the campaign. In contrast, another good quality intervention, which aimed to increase the consumption of low fat milk, compared paid advertising slots encouraging individuals to switch to low fat milk and a PR campaign with nutrition education activities. The PR campaign consisted of a number of press conferences by physicians from two major hospitals together with a radio campaign. Nutrition education consisted of a number of activities run through worksites, schools, churches and supermarkets including taste tests and signage encouraging switching from high fat to low fat milk. The study found that low fat milk consumption increased in the cities exposed to the two promotional interventions (public relations together with nutrition education activities or paid advertising alone) when compared to a matched control city.⁹¹ In addition, the city that was exposed to both public relations and nutrition education showed greater effects than the

city exposed to paid advertising alone. The success of the study may have been due to the message being simple and targeted, and the PR campaign being credible with the involvement of health professionals as delivery tools.

Some studies have used cooking demonstrations and product tasting or sampling as a means of promoting healthier choices.^{75,96} Again these activities and interventions have had mixed success in changing purchasing behaviours or actual dietary behaviour change. The latter study by Paine-Andrews et al. showed that demonstrators and taste testing were crucial in assisting people with identifying and purchasing healthier products, but having discounts of up to 40% on those healthy items may have been the final influencing factor in purchasing. The study also worked very well for frozen dairy, but not as well for milk or salad dressings – indicating that the success of a promotional campaign may be food-specific and that it is important to identify which strategies work best for particular food categories.

There is inconclusive evidence for the effectiveness of promotional interventions for changing purchasing or consumption behaviour, but it appears they work best when combined with other strategies such as nutrition education and POPI.

Key findings from promotional interventions:

- Paid advertising works well by raising awareness of nutrition campaigns but does not necessarily translate to changes in purchases.
- A multi-strategy approach with advertising linked in with a PR or education campaign may be more effective than using any one of the strategies on its own.
- Promotional campaigns involving demonstrations and taste testing are effective in changing purchasing behaviour, but may be more effective if linked with a monetary incentive like a coupon scheme.

Summary of findings

This review aimed to determine if supermarket nutrition interventions are effective in changing consumer dietary behaviour. Despite a large body of evidence examining various aspects of this food environment we found only 18 intervention studies from the past 20 years that have been peer reviewed. Furthermore, many of these studies had methodological shortcomings, which meant the results had to be viewed in context. Nevertheless, there were a number of very good quality studies that have provided valuable information for best practice implementation of nutrition promotion in supermarkets (see Appendix 1).

From our examination of the 18 intervention studies, we found no evidence that increasing availability of healthier choices affected food purchases or consumption, especially for fruits and vegetables. Much of this research was undertaken in food deserts where, interestingly, consumption of fresh produce was reported to be high and there may have been a consequent failure to show effect. Promotion of healthier food choices through POPI or nutrition education appeared to show modest effects and coupon schemes worked well when combined with these strategies. In addition, using advertising to raise awareness was effective, but needed to be in conjunction with a promotional/educational campaign to fully translate to changing purchasing behaviour.

We also found that multi-strategy interventions were more effective – that is, where multiple strategies such as shelf labels, promotion or price reductions were combined. No single strategy was effective on its own. The research also showed that lengthier trials (over one to two years) were able to show trends in sales more effectively than short term interventions and cross sectional measurements.

Overall this review had the following findings.

- There is some evidence of the effectiveness of POPI for increasing sales of selected foods but no evidence of effectiveness for changing consumption of any foods.
- There is some evidence of the effectiveness of price discounts for encouraging purchase of healthier food items, but not necessarily a reduction in purchase of unhealthy items. There is no evidence to show that price discounts encourage actual consumption of healthier items. There is some evidence to show the effectiveness of coupon schemes for encouraging purchases of fruits and vegetables in low socioeconomic groups
- There is no evidence of the effectiveness of increasing healthy food availability for changing consumer purchasing or consumption behaviour in low-income neighbourhoods

- There is some evidence for the effectiveness of nutrition education when combined with other strategies such as POPI and price discounting for changing purchasing or consumption behaviour. There is some evidence of the ineffectiveness of nutrition education for changing purchasing behaviour when used as a sole strategy
- There is inconclusive evidence for the effectiveness of promotional interventions for changing purchasing or consumption behaviour, but it appears these work best when combined with other strategies such as nutrition education and POPI.

We must acknowledge the limitations of this review. Firstly, time constraints meant that a more comprehensive literature review was not performed, which may have covered research conducted prior to 1991. The literature showed substantial heterogeneity in study populations, settings, interventions, store sizes, sample sizes and outcome measures. This meant that a traditional pooling of data for systematic review was not possible and therefore we have taken a narrative approach to this work. Much of the research is skewed towards the main grocery buyer of the household – which in many cases is a woman – so there may be some gender biases in results.

It was also decided that having a large number of exclusion criteria would apply too many restrictions on the scope and would fail to address the objective. Therefore studies were included with outcome measures that were not objective, such as self-reported purchasing behaviour. These studies can be prone to biases such as social desirability and over and under reporting, which may affect outcomes. In general, there was limited good quality research, which is often expected of studies in environments such as the supermarket. However, even moderate quality research can make an important contribution to our understanding of the question and as such was included. To minimise these limitations we addressed the quality of the studies using the *Critical Appraisals Skills Program*¹⁰ and assessed the strength of the evidence using a system designed by the Victorian Government Department of Health for assessing health promotion interventions.¹¹

Many other factors governing purchase of food were beyond the scope of the review: for example, understanding the psychosocial aspects of food purchase and therefore, the most effective way to manipulate these variables to deliver the outcome most positive for population health. These may be topics for future reviews.

Recommendations for research

Use of sales data and new technologies

Sales data appears to be more effective than self-report at showing real trends in purchasing behaviour, and can be used effectively to estimate community dietary behaviour.^{9,117,118} There was little, if any research, using sales data in Australia to track trends in dietary behaviour, apart from one study in beverages.¹¹⁹ These data are potentially good surrogates for population dietary data, giving us clues into the purchasing habits of Australians, and may provide valuable information about community diets in certain areas. Despite their value, sales data cannot determine individual-level practices; devices such as hand held scanners might be more effective for this purpose. New technologies such as applications on smart phones may also assist with tracking purchases and consumption in individual consumers through purchase tracking and mobile food diaries. Whilst there were innovative technologies used in some of the studies, for example video booths and hand held scanners, there are many more technologies being launched that have not had their potential examined. New technologies can be leveraged to deliver targeted nutrition information to consumers as they shop in the supermarket. For example, in the US there are smart phone applications that allow one to assess the nutrition content of foods by scanning the product barcode.¹²⁰ These applications are also able to inform the consumer if they are making a healthy choice at the point of purchase. Technology such as this has a place in health promotion and can be used to deliver accurate credible nutrition information such as serving sizes, nutrition information and allergen information to consumers at the point of purchase.¹²¹ New global positioning satellite (GPS) technology installed into shopping carts is already being trialled. These carts are able to track consumer location in the supermarket and deliver advertising based on their position within the aisles.¹²² Such carts could be used to deliver nutrition messages to the consumer as they browse the aisles. An example may be that a consumer is educated about healthy oils as they reach the aisle where oils are sold, or reminded of the benefits of low fat dairy as they reach the dairy case. However there was generally a lack of research into the post-purchase period to consider the consumption and preparation of the foods at the individual level, and the technologies mentioned above may be useful for measuring such information at this level.

Assessing the 'healthfulness' of supermarkets

Research into the role of product displays and the effect on food purchasing or consumption was lacking in this review. There were no studies examining the differences between stores with more healthy items on the shelf and those without, and whether that resulted in different purchasing patterns between stores for the same products. The concept of a *Shelf Space Index* has potential

and deserves further investigation as a tool for assessing the healthfulness of a store. There were a number of studies that used this tool to measure the healthfulness of grocery stores in the United States by examining the proportion of shelf space dedicated to healthy items.^{33,63,105} Another validated tool that may be adapted for Australian use is the *Nutrition Environment Measures Survey* developed in the United States.¹²³ This tool asks a number of questions of the researcher to assist with assigning a healthfulness score to a particular supermarket. This can then assist with mapping the healthfulness of food retailers in an area or neighbourhood to identify food deserts and areas of deprivation.

Research in low-income communities

There was a lack of research in low-income communities. More research is needed in these communities and in more vulnerable remote groups, to determine which intervention, if any, is more likely to facilitate change. Whilst it was shown that low-income groups have a need for healthier choices, increasing the availability of those choices didn't necessarily result in a positive effect on purchasing. This suggests that price may be a more important factor to these groups, and more research into the feasibility of monetary incentives is warranted – since poor diet quality and deprivation are commonly associated. In Australia's more remote locations, which often house vulnerable groups, price and availability of healthy fresh foods are certainly likely to affect community healthfulness and threaten food security.

Recommendations for best practice nutrition promotions in supermarkets are summarised in Appendix 2.

Conclusion

The evidence provides valuable information for undertaking best practice nutrition promotion in supermarkets. Working with retailers to deliver nutrition promotion campaigns, segmented to the demographic, that have sound methodologies and are cost effective will be crucial to succeeding in this food environment.

This review has provided an overview of the literature examining nutrition interventions in the supermarket setting. Whilst it is difficult to draw definitive conclusions as to the most effective methods for intervention, a number of points became clear from the research. Long-term interventions with a multi-strategy approach and simple messages for the consumer were most effective in changing purchasing behaviour. Monetary incentives in the form of coupon schemes worked well, especially in low-income groups, but were more likely to be effective when combined with POPI or nutrition education within the supermarket setting. There is very little research on

actual consumption in the post-purchase period and this may be an area where more research is warranted.

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Appendix 1: Nutrition interventions in the supermarket setting

Author	Study type	Duration	Location	Sample	Objective	Type of intervention	Method	Results	Comment	Effect (Positive, negative or none)
POINT OF PURCHASE INTERVENTIONS										
Scott et al. 1991(84)	Impact evaluation, before and after	12 weeks	Bunbury, Western Australia	Six supermarkets in Bunbury, 310 shoppers aged 25–45, mostly women	To examine the effectiveness of a supermarket nutrition education program in changing eating behaviour in the direction of the <i>Dietary Guidelines for Australians</i> , particularly reducing fat in dairy foods, increasing fruit, vegetables and cereals	POPI, shelf labels, leaflets, taste testing, advertising	Shelf labelling, decorative canopies in dairy section, hanging mobiles in fresh produce area and decorative produce bins. Featured logo and 'Flavour without Fat' slogan. Low fat dairy foods and reduced fat cheese located in one section to avoid individual food labelling. Leaflets with tips and recipes in fridges and next to produce. 60-second advertising campaign accompanied intervention, radio spots and weekly newspaper advertisements. Shoppers surveyed 2 weeks after campaign was finished.	52% aware of the program, 34% noticed the materials and 41% noticed the leaflets. More people noticed dairy displays than fresh produce. Women more likely to notice materials than men. Of people who saw materials, 66% took leaflets and more likely to be women. 40% of those who took leaflets took the whole set home. 167 people returned coupons for a copy of the cookbook. Of those who noticed the intervention, 36% said it affected their choice and more likely to be women. 38% said it had no effect on their choice. No demographic difference between two groups. 20% said that intervention made them feel good about the purchases they were already making. Of the 99 people who reported changing their choices, 20% of them reported changing their food purchasing behaviour to include the promoted products especially 2% milk, fruit/vegetables, wholemeal bread and cheese. 11% also reported purchasing foods consistent with the program's message, such as lean meat, fish, and chicken and fruit juice. Store managers reported increases in sales of low fat dairy only when taste testing was taking place, but not verified with actual sales data. Also reported increases in sales of low fat milk were backed up by sales data, but this could have been because low fat milk was new to market.	No control supermarkets, interview was store-based not population-based therefore cannot extrapolate to population. No baseline measurements. No follow up. Entirely based on self-report and retrospective behaviour change. No sales data collected. Needs a longer intervention period. Poor quality	Reasonable awareness of program, but effect on behaviour self-reported retrospectively so cannot really assess changes in behaviour.
Patterson et al. 1992 (81)	Matched control, comparative study	2 years matched control	Washington, Baltimore US	20 supermarkets in Washington 20 supermarkets in Baltimore	Determine if multi-component intervention in a supermarket could change consumers' buying practices to increase foods low in fat and high in fibre	POPI, shelf labels, food guides, produce signs, monthly bulletin, advertising	Small signs with calorie and fibre on fresh produce, baked goods, frozen vegetables, canned vegetables, meat and poultry. Shelf labels indicating good choices based on nutritional values. Labelled 'recommended' and 'other than recommended' Multimedia campaign including radio, television and newspapers Monthly flyers with nutrition information Sales data collected in ounces at baseline, 1 year and 2 years. Percent of foods purchased that were recommended, to measure change in market share (variable not influenced by store growth). Strong statistical elements	Mixed results. 2% increase in market share for fresh produce. Positive intervention effect shown for fresh produce, canned vegetables and frozen vegetables. Also for dried fruit but not significant. Negative intervention effects were seen for dry cereal and baked goods. Also for dried beans but not significant. Could be explained by intense promotion of high fibre cereals and baked goods containing oat bran by manufacturers before the intervention period. Awareness of the intervention was high amongst shoppers but limited change in food purchasing behaviour. Large variability in data made it difficult to detect intervention effects.	Good quality Long-term follow-up with matched control. Good uses of sales data as an outcome measure. Control not well matched. Large scale study with good power.	Limited effect on sales data although awareness was good. Modest effect on purchasing behaviour

<p>Rodgers et al. 1994 (82)</p>	<p>Matched control, comparative study</p>	<p>2 years</p>	<p>Washington, Baltimore US</p>	<p>20 supermarkets in Washington 20 supermarkets in Baltimore</p>	<p>Determine if multi-component intervention in a supermarket could change consumers' knowledge, buying practices and attitudes to increase fibre and decrease fat intake</p>	<p>POPI, shelf labels, food guides, produce signs, monthly bulletin, advertising</p>	<p>Small signs with calorie and fibre on fresh produce, baked goods, canned vegetables, meat and poultry. Shelf labels indicating good choices based on nutritional values. Labelled 'recommended' and 'other than recommended'</p> <p>Multimedia campaign including radio, television and newspapers</p> <p>Monthly flyers with nutrition information</p> <p>In-store monitoring for compliance. Three surveys conducted in 3 waves (baseline, year 1, year 2) and FFQ mailed.</p> <p>Sales data measured for fresh produce, dry cereal, baked goods, dry and frozen beans, canned and frozen vegetables, dried fruit (not reported here)</p> <p>Measured self-reported purchasing behaviour.</p>	<p>Compliance was high for implementation of the intervention in the stores for shelf labels and booklets. Monthly bulletins were less compliant with many checkouts not stocked.</p> <p>No differences in self-reported purchasing behaviour of high fibre foods, small effect for reducing purchases of high fat foods.</p> <p>Awareness of the <i>Eat for Health</i> program was good in the intervention stores. Strong evidence to show that intervention increased awareness of diet-cancer relationship and diet-heart relationships. Findings for change in sales shown in Patterson et al. (81)</p>	<p>Good quality</p> <p>Long-term follow-up with matched control. Self-reported purchasing behaviour susceptible to bias. Control not well matched.</p> <p>Large scale study with good power.</p>	<p>Modest effect on self-reported purchasing behaviour and nutrition knowledge</p>
<p>Levy et al. 1995 (93)</p>	<p>Matched control, comparative study</p>	<p>2 years matched control</p>	<p>Washington, Baltimore USA</p>	<p>20 supermarkets in Washington 20 supermarkets in Baltimore</p>	<p>Determine if multi-component intervention (Special Diet Alert Program) in a supermarket increased sales of labelled foods low in fat and high in fibre</p>	<p>POPI, shelf labelling, advertising, 25 page food guide explained guidelines</p>	<p>Simple shelf signs indicating low energy, low fat, low cholesterol and low sodium, signs with calorie and fibre on fresh produce, baked goods, canned vegetables, meat and poultry</p> <p>Shelf labels indicating good choices based on nutritional values. Nutrition criteria based on US federal guidelines</p> <p>25-page food guide. 300 radio and television advertisements were used to promote the program.</p> <p>Measured changes in market share of labelled foods as outcome of intervention by computerised sales data.</p>	<p>1% increase in market share of shelf-labelled products compared to control over 2 years.</p> <p>Initial advertising campaign did not have an effect on sales</p> <p>Price and secular trends proved to be greater influencers on market share than nutrition.</p>	<p>Good quality</p>	<p>Increases in market share of labelled products</p>
<p>Kristal et al. 1997(88)</p>	<p>Randomised Control Trial (RCT)</p>	<p>8 months</p>	<p>Iowa, USA</p>	<p>955 consumers at 8 rural supermarkets (4 intervention, 4 control)</p>	<p>To determine if point of purchase intervention could increase shoppers' consumption of fruit and vegetables</p>	<p>POPI, monetary incentives (50c coupon on fresh fruit and vegetables)</p>	<p>After baseline measurements of sales taken, and interviews with shoppers, four supermarkets randomised to intervention. Intervention consisted of flyers, recipe cards, linked signage with 50c coupon off any fruit or vegetable. Study personnel conducted activities to promote sale items, including food demonstrations.</p> <p>Exit interviews measured demographics, shopping habits, awareness of signage and purchase of fruit and veg.</p> <p>Take home surveys measured intake of fruit and vegetables using validated FFQ, diet habits and stages of change in adopting a diet high in fruit and vegetables.</p>	<p>59% and 67% response rate in intervention and control stores respectively. 84% of respondents were women. No demographic difference between intervention and control responders. Response rate to take home survey was 74% and 72% for intervention and control respectively. No difference in demographics between intervention and control responders. Responders reported high intakes of fruit and vegetables.</p> <p>No significant differences between intervention and control for purchases of fruit and vegetables. 36% of intervention respondents used the coupons and 18% used the recipes. Only 23% recalled seeing health promotion signage in the intervention store.</p> <p>There were no differences in fruit and vegetable intake between groups after the intervention. No change in dietary habits, purchases on the day or usual consumption after intervention</p>	<p>Well designed, good quality RCT. However, sales data would have been better as a measure of purchasing habits. Intervention could have been longer and may have delivered a more significant effect. POPI techniques can cannibalise each other e.g. abundant signage can reduce awareness of flyers. Respondents already had high intakes so were resistant to intervention.</p>	<p>No evidence that POPI increased purchasing or consumption of fruits and vegetables.</p>

Narhinen et al. 1999 (69)	Impact evaluation, pre- and post-	One year	Mikkeli, Finland	600 customers from one supermarket	To determine how customers felt about messages about saturated fat and salt in the supermarket, to encourage healthier choices	POPI, advertising	Intervention included (1) grouping healthy foods together on the shelf (2) advertisement in the local paper (3) newspaper story about the program. 600 people interviewed about awareness and use of POPI. Retrospective self – reported behaviour as outcome measure	Awareness of program was good and reached 50% at the end of Phase 3. However this did not translate into purchasing behaviour with very few reporting that they purchased a healthier item because of the intervention. No one changed their oil purchase or their spreadable fat purchases in response to the intervention. 92% of customers did think was a good idea for the supermarket to promote healthy eating. Women slightly more in favour than men.	Message about saturated fat didn't resonate with customers, but salt message was easier to understand. MESSAGES HAVE TO BE WELL DESIGNED. Moderate quality	No intervention effect – did not affect purchasing behaviour but customers did think it was a good idea and there was good awareness of the program.
Narhinen and Nissenen 2000 (83)	Impact evaluation, pre- and post-	One year	Mikkeli, Finland	One supermarket	Determine the feasibility of using sales data to measure the effect of a POPI campaign to reduce saturated fat and salt	POPI	Stepwise intervention (1) healthy foods grouped together under 'Healthier Choice' (2) Heart Week activities based on healthier choices Promoted packaged foods like milk, bread and sausages, which met certain nutritional criteria for fat and salt. Sales data monitored at 6 months and at one year. No price reductions offered.	No change in proportional sales of the healthier food items in response to promotional activity. Sales data showed spikes in sales of 37–48% where specific food items were promoted rather than a gradual increase in sales of healthier items overall. At 6 months, there were increases in proportion of healthier products sold, due to reformulation by major manufacturers thereby qualifying more reference foods into the healthier choice category. Different foods showed different sensitivity to intervention. Some foods better affected by promotion than others.	No control supermarket. Cooperation with management very important as they know their customers best. Supermarkets more likely to adopt health promotion activities where there are clear nutritional guidelines, e.g. healthy level of saturated fat. Interventions must be longer than 1 year Moderate quality	No intervention effect, but cross-sectional rises in sales in response to active promotion of products.
Lang et al. 2000 (95)	Impact evaluation	One month	Detroit, Michigan	361 participants, 84 white, 256 minority, lower SES, 66% women	Evaluate the awareness of a supermarket shelf labelling program in minority groups	POPI shelf labelling, banners and posters to promote program	Shelf labelling system introduced in 18 chain supermarkets. Foods labelled according to criteria as 'Best Choice' or 'Acceptable Choice'. Consumers surveyed upon exit of supermarket as to their awareness of the program and whether they used the labels to guide choices.	29% aware of the program. Minorities reported higher awareness than whites. No gender differences. People who had had their BP and cholesterol levels checked by a doctor in the past year were more likely to be aware of the program. Of the 109 participants who were aware of the program, 37% did not use the labelling system to affect their choice, 26% used it sometimes, 10% used it often, 13% used it a little and 7% used it always. There were no differences in use according to race, age or gender.	Qualitative aspects Self-reported use and therefore can be biased Not long enough to see significant penetration Sales data not examined to show actual changes in purchasing behaviour Moderate quality	Limited reported use of shelf labelling program to change purchases
Sutherland et al. 2010 (86)	Impact evaluation, observational before and after	2 years	United States	168 stores from a chain supermarket in a number of US states	Describes the effect of a supermarket POPI nutrition navigation program on consumer food and beverage choice (<i>Guiding Stars</i>)	POPI, star rating system on shelf labels.	60,000 food items rated on the basis of nutritional content and eligible foods assigned 0, 1, 2 or 3 stars based on nutritional quality. Stars appeared on shelf tags or printed labels. Brochures and signage throughout the store. Collected sales data for 2 years. RTD cereals were examined in depth to assess changes in nutrient intake in response to intervention.	From 2006–2008 no changes in number of products that qualified for stars. However, the number of products purchased with stars increased over the 2 years (2.9 million more items every month with stars, and equivalent decrease in 0 star products). Similarly, there were increases in the proportion of star products sold monthly over 2 years with 1-star rated products showing the greatest increase. Cereal products with stars showed increases in sales in the second year of measurement resulting in 60kg sugar less and 19kg more fibre being purchased during the study period.	Intervention effect seen immediately after implementation and increased over 2 years. In addition, the large jump from 0-1 star shows that people are improving the nutritional quality of their choices (going from 4% to 2% fat milk). Allows for consumers to make incremental changes to their diet. Good quality	Limited positive effect on a small scale, but on a population level may have some significance. Star system did have effect on purchasing behaviour. No control

Author	Study type	Duration	Location	Sample	Objective	Type of intervention	Method	Results	Comment	Effect (Positive, negative or none)
INTERVENTIONS OFFERING MONETARY INCENTIVES										
Paine-Andrews et al. 1996 (96)	Impact evaluation, interrupted time series	Nineteen observations on each day	Kansas, USA	1 supermarket	To analyse the effects of an environmental intervention on customer purchases of lower fat products in a supermarket	Coupons + prompting + product sampling by demonstrators	<p>Participants were observed purchasing from three categories in the store (milk, dressing/mayonnaise, frozen desserts) to calculate the % of lower fat items purchased.</p> <p>Demonstrators prompted customers to try the lower fat items and provided taste samples.</p> <p>They also distributed coupons for the lower fat items for 40% price reduction valid for that day only together with any price reductions the store was offering on these products.</p> <p>Observation of customer. Quasi-experimental design with interrupted time series.</p>	<p>The intervention appeared to work well for frozen desserts but not for milk or salad dressings.</p> <p>Customers were not persuaded to buy the lower fat items with coupons. This was especially evident for milk, as customers reported not wanting to change from the brand and type of milk they liked.</p> <p>But demonstrators reported that the coupons were key in getting people to change from the higher fat item to the lower fat item.</p> <p>They also reported that the closer they were to the actual item on the shelf the more items they sold.</p>	<p>Taste was a major factor in governing purchase. Taste testing worked well to prompt purchases and may be key in some settings. The switch for milk was met with resistance maybe because people thought that switching from 2% to 1.5% wasn't worth the effort. Although no control, study design compensated by comparisons to baseline conditions.</p> <p>Good quality</p>	Limited effect on observed purchasing behaviour, but taste testing was key to prompt purchase of healthier items
Herman et al. 2006 (87).	RCT	6 months	USA	602 women enrolling in three selected Women, Infant and Child (WIC) Program sites (200 in two intervention groups, 200 in control) – mostly Hispanic, low SES	To evaluate the extent to which participants of a low income supplementation WIC program would take advantage of a fruit and vegetable subsidy. To determine which of the eligible items should be discretionary (in order to reach recommended daily intakes [RDIs]) and assess the practicality of vouchers for fresh food redemption.	Coupons/ vouchers for fresh produce	<p>2 intervention groups, 1 control WIC Program</p> <p>Given vouchers redeemable for fresh produce in large supermarket chains in allocated areas.</p> <p>Intervention groups supplied with fresh produce vouchers for supermarket and local farmers market. Control had a non-food incentive.</p> <p>Intervention was for six months. Initially monitored by 24hr recall for two months to determine baseline intake.</p> <p>Issued \$10 vouchers per week – issued bi-monthly to spend over two-month period. 24 hr recall done by WIC dietitians at baseline, 2 months, 6 months and 6 months post intervention.</p>	<p>90% redemption rate for vouchers.</p> <p>Women were found to use their vouchers completely at both local supermarkets and fresh food markets, showing that the low income consumers make wise, varied and nutritious choices from available produce when allowed free choice within the fresh produce category</p> <p>Choices were mostly high in potassium, vitamin C, vitamin A and fibre: all of which are important to women post pregnancy and during breastfeeding.</p>	<p>Didn't assess whether there was a change in the amount of fruit and vegetables purchased as a result of the voucher scheme but rather whether vouchers were redeemed and whether low-income people chose a variety of items. Didn't say whether the variety was different after the intervention</p> <p>Moderate quality</p>	Vouchers are effective for getting people to purchase fresh produce, but no report of change in purchases because of intervention

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NUTRITION EDUCATION INTERVENTIONS										
Winett et al. 1997 (85)	RCT	8 weeks	Virginia, USA	105 customers from two supermarkets randomised to control and intervention, well-educated	To assess the efficacy of the <i>Nutrition for a Lifetime System</i> (NLS) in promoting shift in food purchases and to assess the role of coupons in promoting shifts in food choices	Multimedia computer nutrition education (prompting) + coupons	<p>Intervention group was to be exposed to a series of interactive information session through a computer kiosk in two supermarkets to educate about lowering fat, increasing fibre and fruit and veg.</p> <p>The kiosk made suggestions based on individuals' intended purchases and then distributed coupons for foods related to each session. Receipts were collected via mail and customers given cash for returning receipts.</p> <p>Control group returned receipts for cash but received no education via the NLS. Foods on receipts matched to a nutrient database.</p>	<p>Intervention group decreased fat levels, increased fibre and fruit/vegetable servings as a result of the intervention, although fruit/vegetable increases resulted from seasonal trends.</p> <p>Lower fat levels purchased for dairy foods, spreads and oils, and prepared foods in intervention group. No change in intervention group for meat and snack foods.</p> <p>Intervention groups purchased more fibre from fruit/vegetables and from cereal, but not bread.</p> <p>Higher SES families had higher post-test fibre levels.</p> <p>Intervention groups also purchased more fruit and vegetables post-test and were found to be more likely to have the recommended levels of fruits and vegetables.</p> <p>Those who redeemed the most coupons decreased their calories from fat and fat from dairy and increased fibre to the greatest extent. They were also more likely to reach the minimum recommendation for servings of fruit and vegetables.</p> <p>Sample size reduced statistical power at 6 months follow up (30% lost) but indicated sustained reduction in fat levels, and increase in fibre levels.</p>	<p>Interesting to see if the coupons promoted healthier choices without the nutrition education to prompt them. Researchers doubt that without the prompting and incentives there would have been significant changes. Previous work showed that without the coupons the changes were much smaller.</p> <p style="color: red;">Good quality</p>	<p>Good evidence of effect on food purchases but relies on coupons together with NLS to see most effective results.</p>
Evans et al. 2000 (92)	Matched control, comparative study	Matched control study, observational	Canada	232 IGA customers (112 intervention, 120 control), mostly female	To assess customer perception of a supermarket nutrition centre run by a registered dietitian	Nutrition education by a dietitian-manned booth in store	<p>Dietitian manned a booth in the supermarket in the intervention store. Booth contains pamphlets, recipe ideas, cooking demonstrations. Randomly selected customers in intervention and control stores surveyed over three consecutive days</p>	<p>Customers at the intervention supermarket reported being more satisfied with the quality of nutrition information supplied.</p> <p>69% of customers at the intervention market reported that having the dietitian was extremely important compared to 31% in the control.</p> <p>Participants at the intervention centre recommended the nutrition booth as a worthwhile activity.</p>	<p>Small-scale study, didn't look at purchasing behaviours, but did have a control. Measurement outcomes were poor.</p> <p style="color: red;">Moderate quality</p>	<p>No evidence of change in self reported purchasing behaviour because dietitian was in the store. Awareness was good among intervention customers.</p>

<p>Reger et al. 2000 (91)</p>	<p>Non - randomised control trial</p>	<p>6 months</p>	<p>West Virginia, USA</p>	<p>Supermarkets in 3 cities matched on demographics 826 telephone surveys selected from randomised telephone numbers Subjects mostly white and female</p>	<p>To assess the effectiveness of a PR campaign with educational activities and a paid advertising campaign in promoting a switch from whole milk to low fat milk</p>	<p>Nutrition education, PR, advertising</p>	<p>One control city with no intervention activities, one city with PR campaign + community educational activities and one city with only a paid advertising scheme Telephone survey assessed used of low fat milk in households. Supermarket sales data collected at baseline, one month after the intervention and at 6 months.</p>	<p>Both interventions increased reported consumption of low fat milk although the PR + educational activities was more effective. However supermarkets sales data showed increases in low fat milk sales these were not significant and not sustained. Previous work showed that PR+paid advertising intervention was more effective than the other two.</p>	<p>Self-reports may be biased. Although trends were there, sales data failed to reach significance. Good quality</p>	<p>Increased consumption of low fat milk in intervention groups. PR together with nutrition education produced the best outcome.</p>
<p>Lewis et al. 2002 (75)</p>	<p>Observational, impact evaluation before and after study</p>	<p>5 months</p>	<p>Australia</p>	<p>1120 women from 5 supermarkets</p>	<p>To investigate different promotion methods in supermarkets for healthy choices</p>	<p>Promotions and advertising. banners, recipe leaflets, demonstrations, price discounts</p>	<p>In five supermarkets, 5 interventions were carried out. Communication materials handed out, recipe cards developed and circulated, in-store food demonstrations, training of supermarket staff and development of linkages with community. Pre- and post- intervention surveys completed in 1120 women.</p>	<p>Poor results of awareness of project. Only 8% of respondents were aware of the healthy promotions (10% in the intervention compared with 5 % in the control). Significantly greater attendance at cooking demonstrations at the intervention supermarkets (12 vs 5%). Significantly greater awareness of recipe leaflets in intervention supermarkets (20 vs 3%). Key stakeholders reported good feedback from project, yet consumers reported being unaware of promotion materials. Long-term planning required involving supermarkets and industry, for successful interventions. Financial returns will be the driver for retailers. Recognition and trust of health authority valued by customers (and hence retailers).</p>	<p>Reporting of results confusing with too many intervention strategies, difficult to assess the effectiveness of the intervention. Intervention effectiveness established by awareness – better outcome would have been sales of the 25 products participating in the demonstrations. No evaluation on the effect of price discounts. Poor quality</p>	<p>Weak evidence of effectiveness</p>
<p>Steenhuis et al. (90)</p>	<p>RCT</p>	<p>6 months</p>	<p>Netherlands</p>	<p>2203 customers from 13 supermarkets, 88% female, medium education level</p>	<p>To assess the effect of nutrition education with or without shelf labelling on fat intake in Dutch supermarkets</p>	<p><i>Nutrition education:</i> posters highlighting program, healthy eating brochures, recipe card and self help manual <i>Labelling:</i> Shelf labels, indicating low fat products in nine categories</p>	<p>13 supermarkets assigned to one of three designs (1) control (2) education without labelling (NE) (3) education with labelling (NE+labelling) Total fat intake and psychosocial determinants of eating less fat measured. Respondents filled out questionnaire a month before the intervention, 2 months after and 6 months after the start of the intervention. Total fat measured with short FFQ. Nutrition education involved posters, brochures, booklet, and recipe cards. Labelling involved identifying low fat items in 9 food categories.</p>	<p>50% of all respondents reported being aware of the program. 25% in the NE+labelling group reported seeing the shelf labelling. 52% in NE+labelling and 60% in NE said they looked at their own fat intake as a result of the intervention. 40% in NE+labelling and 45% in NE said they intended to follow one or more suggestions from the program. No difference between intervention groups for these outcomes. More women reported seeing something of the program than men. There was no difference between the groups for total fat intake at 2 months or 6 months, even though fat intake declined in all groups including the control at 2 months. No differences in psychosocial determinants although intention to eat less fat in the next month was highest amongst those in the NE group.</p>	<p>Social desirability bias from self-report. Not very robust measures for psychosocial determinants of fat intake. FFQ also very limited. Good quality</p>	<p>No effect of intervention. Did not change fat intake in respondents.</p>

Ni Mhurchu et al. 2010 (89)	RCT	6 months	New Zealand	1104 participants (randomised into four groups)	To evaluate the effect of price discounts and tailored nutrition education on supermarket food and nutrient purchases. Supermarket Healthy Options Project SHOP first RCT to examine price discounts in real life setting.	Tailored nutrition education, coupons	<p>Measured individual food purchases in 8 supermarkets in NZ using a hand held scanner (Shop n Go system).</p> <p>Participants scanned items before putting them in the trolley. Ability to gather individual purchasing data on each participant</p> <p>Random assignment to 4 groups:</p> <ol style="list-style-type: none"> (1) price discounts (2) nutrition education (3) Price discounts + nutrition education (4) control <p>Tailored nutrition education was designed around food purchases made by participants at baseline, suggested healthier alternatives, recipes and recommended serving sizes.</p> <p>Price discounts involved 12.5% (equivalent to removal of GST) on all healthier items (based on Tick criteria) for people in price discount groups for 6 months.</p> <p>Outcome measures were % saturated fat at 6mnh (intervention ceased) and 12mnh. Other nutrients measured at 6 mnh and 12mnh.</p>	<p>Neither price discounts nor nutrition education had an effect of nutrient purchases.</p> <p>Those receiving price discounts purchased more healthier items at 6 months and sustained at 12 months, but they were not buying fewer unhealthy items --suggesting that they were using the discount value to buy more discounted food, but still spending a similar amount on the shopping trip, as seen by the lack of change in expenditure over the 12 months.</p> <p>Those in price-discounted group showed sustained changes in healthier shopping at 6 months and lasted till 12 months, suggesting promising strategies for population diet improvement.</p> <p>Large number of subjects had an interest in nutrition (58% with moderate knowledge, 27% with good knowledge).</p>	<p>RCT. Strong statistical nature. Strong outcome measures and large sample size. Large numbers of people from low and high SES and minority groups.</p> <p>The effect of price discounting could also appear from shoppers buying those items at the study location rather than buying them at other retail outlets because of the discount. Sensitivity analysis revealed this was not the case. Price discounts provided by mail – shelf-talkers and signage may have been more effective. Structural interventions like pricing are more effective than those that rely on personal responsibility (education).</p> <p>Good quality</p>	No effect on nutrient purchases but price discounts did seem to encourage increased sales of healthier items, however this was not at the expense of the less healthy items. Hence expenditure remained the same across the 12 months.
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Author	Study type	Duration	Location	Sample	Objective	Type of intervention	Method	Results	Comment	Effect (Positive, negative or none)
INTERVENTIONS INCREASING AVAILABILITY										
Cummins et al. 2005 (43)	Prospective , quasi-experimental, cohort control, comparative study	One year	Glasgow , UK	412 respondents Low SES (191 intervention, 221 control), 61% women	To determine if the introduction of a large scale food retail shop in a low SES area increased the self-reported fruit and vegetable intakes and/or improvements in psychological health	Increased availability	<p>A large superstore that stocked fresh produce opened in a deprived area, and effects of this were tested on local subjects.</p> <p>Postal surveys of 2 areas of sample residents selected on the basis of geographical proximity to new hypermarket and a control store in a similar location.</p> <p>Intervention and control groups were sent out surveys 12 months apart to determine intake of fruit and vegetables, as well as psychological health scores before and after the new store opened.</p>	<p>Subjects were poorly educated, many not working but fruit and vegetable consumption was high with 37% reporting eating 5 or more portions a day.</p> <p>No difference in fruit and vegetable intake between intervention and control group. Some evidence of improvements in psychological health in the intervention group.</p>	<p>Self reported purchasing behaviour and health outcomes was a weakness.</p> <p>Good statistical aspects; response rate low so there may be selection bias.</p> <p>Population already consumed fruit and vegetables as they were slightly older but may be due to over-reporting</p> <p>Good quality</p>	Limited effect, intervention showed no positive improvements in self-reported fruit and veg intake.

<p>Gittelsohn et al. 2010 (110)</p>	<p>Cohort control, comparative study</p>	<p>18 months</p>	<p>Baltimore, United States</p>	<p>84 respondents from East Baltimore (45 intervention) and West Baltimore (39 comparison)</p>	<p>To increase the availability of healthy foods in stores and increase awareness of and skills to prepare these healthier options through POPI and to determine if these affect self-reported purchasing and cooking behaviour in low income respondents</p>	<p>Increased availability, POPI, loyalty cards, coupons</p>	<p>Nine East Baltimore stores, (2 supermarkets and 7 Korean convenience stores) were the intervention. Eight West Baltimore stores (2 supermarkets and 6 convenience stores) were the comparison. Questionnaires pre- and post- intervention' 18 months apart</p> <p>Intervention was in five phases, each for two months: (1) healthy breakfast (2) healthy cooking (3) healthy snacks (4) wholewheat bread and low fat mayonnaise (5) healthy beverages. Various activities around each phase included POPI, posters, loyalty cards, and coupons. Intervention stores required to stock the items referred to in each intervention stage.</p>	<p>Intervention respondents showed higher awareness of educational displays and were more likely to visit the intervention stores than respondents in the comparison area.</p> <p>No significant difference in psychosocial factors such as ability to read labels or food knowledge. However, healthy food preparation scores increased in intervention respondents.</p> <p>Respondents with higher exposure had greater healthy eating intentions.</p> <p>Females with higher socio-economic scores were likely to have highest food knowledge.</p>	<p>Self report. Not sure if this translated to actual purchases. Small sample size.</p> <p>Moderate quality</p>	<p>Some positive impact on food preparation skills and healthy eating intentions.</p>
<p>Jetter et al. 2010 (39)</p>	<p>Observational, impact evaluation, before and after</p>	<p>6 months</p>	<p>Sacramento, USA</p>	<p>1 local convenience store, low SES neighbourhood</p>	<p>To determine whether changing the food environment in a low income neighbourhood by providing fresh produce in the local convenience store would encourage consumers to purchase more fresh produce, thus justifying the added costs of adding a produce case to the store</p>	<p>Increased availability</p>	<p>Selected one convenience store in a low-income neighbourhood with only 1 supermarket, in Sacramento. A refrigerated produce case was installed and launched in Nov 2005. Weekly sales data was recorded until June 2006. The produce section was observed for 2-3 hours each week to determine consumer usage.</p>	<p>If convenience store owners are provided with assistance with fixed costs associated with setting up a fresh produce section then sufficient stock could be sold to cover variable costs (stock, spoilage, electricity).</p> <p>High fixed costs are the biggest barrier to fresh produce sections in convenience stores. Variable management costs are also a large barrier.</p> <p>Upskilling is required for stores that sell perishables such as fresh produce: e.g. inventory control and restocking skills. Time seemed to be the barrier for storeowners.</p> <p>The demand for fresh produce was enough to keep a fresh produce section profitable in a low-income neighbourhood.</p>	<p>Only one store so limited scope. No consumer data was collected to test consumer satisfaction, needs and changes in consumption/purchasing. No control.</p> <p>Moderate quality</p>	<p>Some evidence of effect. There was demand for fresh produce but owners need to invest time in maintaining stock.</p>

Reviews

Author	Location	Sample	Objective	Type of intervention	Method	Results	Comment	Effect (Positive, negative or none)
Seymour et al. 2004 (97)	Georgia, USA	38 nutrition environmental studies in adult populations	To review studies that influence the environment through food availability, access, pricing, point of purchase in worksites, universities, grocery stores and restaurants	Availability, pricing, POPI,	10 intervention studies in grocery stores (82, 88, 93, 101–104, 106–108). Quality of studies assessed according to Weak*, Moderate**, Strong***, Very Strong****(based on details provided, sample size and duration)	1) ***no effect on purchase (101) 2) **no effect on purchase (102) 3) ***no effect on purchase or knowledge (103) 4) ***Increased market share for butter/margarine, canned fish, cottage cheese, mayonnaise, fruit juice, soft drinks, frozen vegetables and tomato sauce (93) 5) ***Increases in sales for fresh produce, frozen vegetables, dried beans and dried fruit, decreased sales of cereals, baked goods and canned beans. Self-reported reduction in purchasing of high fat items during a two year intervention) (82) 6) ***Eight of 16 food categories labelled increased market share (108) 7) ****No effect on purchase or consumption (88) 8) **Some evidence of shift in sales but not sustained (107) 9) **No effect on purchase (104) 10) *Increased display space increased sales, price reductions affected soft fruit only (106)	Limitations of methodologies: Use of sales data biased as % sales does not take into account that sales for the entire category might have shifted Sales data also didn't look at alternative items e.g. fresh and frozen broccoli – i.e. sales of frozen broccoli were at the expense of sales of fresh broccoli so there was no increase in total broccoli sales. Most interventions lasted only a few weeks, except for Rodgers et al., which was a 2 year intervention.	Limited effect of POPI in supermarkets
Hider P 2001 (99)	Christchurch, New Zealand	11 environmental interventions in supermarkets	To review supermarket interventions that influence purchasing behaviour to reduce energy intake		Eleven intervention studies identified in supermarkets, but only 2 measured effects on energy intake, so 9 excluded. (1) Ten supermarkets and ten matched controls, measured sales data of low calorie products over 2 years (93) (2) 61 shoppers (21 shown weekly video programs on healthy substitutions prior to shopping), receipts converted to grams to measure energy intake from fat (109)	1) Some change in sales of low calorie items 2) There was a decrease in percentage of energy from fat in the intervention groups compared to control during the intervention but not at follow-up.		Little evidence to support effect on reduction in calorie intake. Not peer-reviewed
Wall et al. 2006 (98)	Reviewed in NZ, all four studies in USA	5 articles, 4 independent studies	To evaluate effectiveness of monetary incentives in changing dietary behaviours. Reviewed 5 articles reporting results from 4 independent studies RCTs published from 1993 to 2001.	Monetary incentives (payments, coupons, competitions, lotteries)	Reviewed five published RCTs in 4 independent studies looking at monetary incentives and their effect on dietary modification. No studies in supermarkets 1) Payments /food provision for weight loss measured by changes in BMI (124, 125) 2) Food provision for weight loss measured by kg loss (126) 3) Discounts on healthy items in vending machines measured by sales data, (111) 4) Coupons for fresh produce measured by self-administered questionnaires and coupon redemption (112)	Shown that incentives have a positive effect on both food-purchasing patterns and weight loss and are a promising strategy to encourage healthier choices/ dietary modification. Assigned their own system for classifying the quality of the studies used as they recognised the limitations in a review of this nature where outcomes and contexts are so different. 1) Incentives and food provision increased weight loss outcomes. Food provision + monetary payments had the greatest effect. 2) Food provision did not affect weight loss outcomes. 3) Increased sales of discounted items in vending machines 4) Coupons increased self-reported fruit and vegetable consumption.	Systematic review of RCTs. Good quality. Not related to the supermarket setting however provides valuable insights into how monetary incentives may help change health behaviour.	Some evidence for effectiveness of monetary incentives but not in the supermarket setting

<p>Roe et al. 1997 (100)</p>	<p>London, UK</p>	<p>8 studies in the supermarket setting</p>	<p>To evaluate the effectiveness of nutrition interventions in the supermarket setting</p>	<p>POPI</p>	<p>Reviewed eight papers: 4 good quality, 2 moderate quality and 2 poor quality.</p> <p>Good quality papers, cohort, matched control, one RCT, used objective measurement outcomes such as sales data. No studies measured effect on dietary intake.</p> <p><i>Good quality studies</i></p> <ol style="list-style-type: none"> 1) Shelf labels, leaflets and advertising. No significant effect on sales of 246 food items after one year (102) 2) Simple shelf labels indicating low energy, low fat, low cholesterol and low sodium. After two years, a 1% increase in market share of shelf-labelled products (93) 3) Shelf signs, food guides, produce signs, monthly bulletins and advertising. A two per cent increase in market share for fresh produce. Over two years small effects on canned and frozen vegetables, negative effects on dry cereals (81, 82) 4) Brief in-store videos followed by optical scanning of intended purchases for eight weeks. High exclusion rate after randomization (109). Reduction in fat purchases from 38% to 34% of energy versus no change in controls. No difference between purchases of intervention and control four weeks later. 	<p>Three out of four good quality studies showed positive effect from the intervention, although varied in size.</p> <p>Interventions with best results were those with signs on supermarket shelves, accompanied by leaflets and advertising. Simple signs were more effective than detailed signs with nutrient composition data.</p> <p>The educational videos also showed a positive effect on fat although measures one month after intervention showed this was not sustained.</p>	<p>Good quality</p>	<p>Positive effect in most good quality studies using POPI although there were only two.</p>
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Appendix 2: Recommendations for best practice nutrition promotions in supermarkets

Policy	Program	Infrastructure	Timing	Acceptability	Evaluation
<ul style="list-style-type: none"> • Must have a store nutrition promotion policy • Must also be consistent with food labelling and food policy standards • Retailers must maintain commitment to Corporate Nutrition Responsibility activities that encourage healthy eating in their customers 	<ul style="list-style-type: none"> • Consultation with store management regarding nutrition promotion and involvement of staff • Staff training to be discussed with management before commencement of nutritional promotion • There must be mutual agreement between parties as to roles and responsibilities of staff and management • Research must identify the needs and requirements of the segmentation of shoppers visiting the store to tailor point of purchase information to their needs • Messages should focus more on guidance for healthy choices e.g. healthier choice rather than nutrient messages (e.g. low fat, high fibre) that require knowledge of diet and disease relationships • Messages should also have aspects appealing to taste, variety and convenience, to appeal to shoppers' needs • Recipes and meal solutions are effective • Taste testing and demonstrations are effective • Must maintain any materials to make sure they are always available • Price discounting and coupon schemes are effective for encouraging purchase of healthier items, but these should be combined with other information such as point of purchase information or taste testing where ingredients in recipes are discounted. • Discussion needs to take place with management regarding the food categories to be promoted. Research shows low fat foods, fresh fruit and vegetables, canned vegetables, breakfast cereals, dairy, sausages and frozen desserts are more likely to show effect. Meat was less likely to show effect as price is a definitive influencer on purchase. • Focus on the seasonality of fresh produce to bring down costs to consumer • Advertising and promotion is needed to raise awareness of any program, but should not be the sole health promotion method for supermarkets; a multi-strategy approach is more likely to be effective 	<ul style="list-style-type: none"> • Focus on training supermarket staff to deliver nutrition promotions effectively • Refresh point of purchase information materials every 6 weeks to sustain interest • Use of professional merchandisers and marketers to set displays and develop messages that appeal to consumers • A best practice guideline resource for store management may be effective in assisting with health promotion activities. • Stores focus on their strength e.g. if they have a good track record for shelf signage then use that strength. 	<ul style="list-style-type: none"> • Any nutrition promotions need to be lengthy enough to withstand seasonality and industry promotional campaigns • Evidence suggests that evaluation studies need to be 1-2 years in duration 	<ul style="list-style-type: none"> • Focus on healthier items that have high profit margins to deliver cost benefit to the retailer • Retailers would like to sell their fresh produce (which is likely to spoil and be discarded if not sold) so fresh produce should be a priority • Nutrition promotions should not be too intrusive on staff time • Nutrition promotions should not be too excessive and overpower supermarket space • Nutrition promotions need to be independent of food company interests to maintain credibility • Become an ally to parents in their struggle to provide healthy foods for their kids 	<ul style="list-style-type: none"> • Evaluations need to have multiple arms including a control arm to effectively evaluate the different aspects of the intervention.

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